

# PNEUMATIC PRODUCTS

 **ENDURANCE TECHNOLOGY** <sup>SM</sup>



**MAXIMUM DURABILITY**

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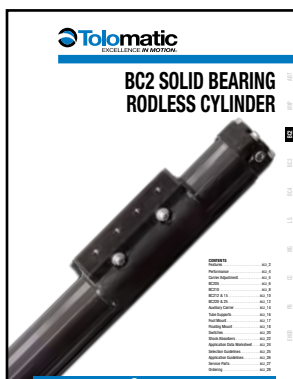
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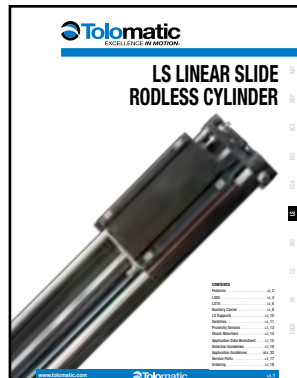
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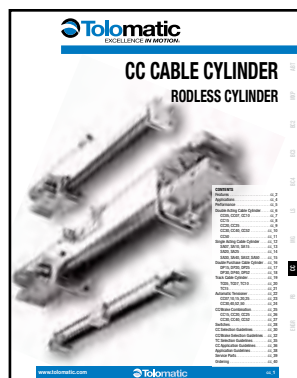
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ABT

MXP

BCZ

BC3

BC4

LS

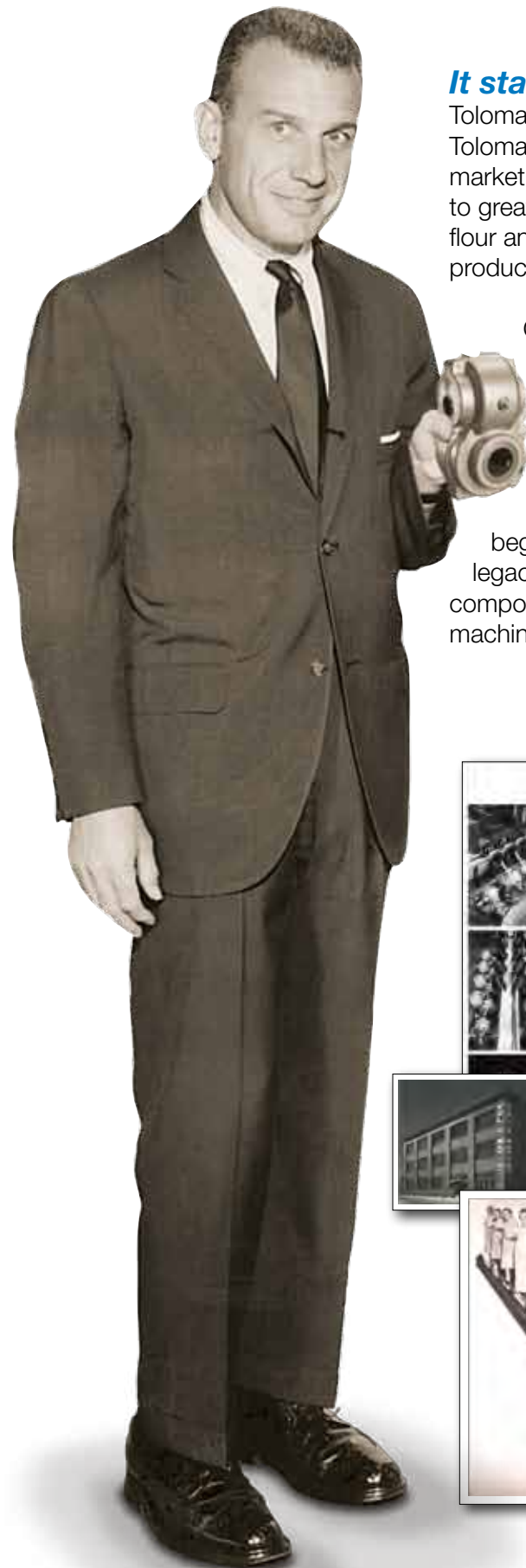
MG

CC

PB

ENGR

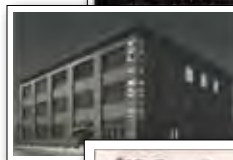




## It started with a custom solution.

Tolomatic's first product, the Float-A-Shaft®, marked the beginning of Tolomatic's innovative product solutions for the industrial automation market. Burton Toles, Tolomatic's founder, designed the Float-A-Shaft to greatly improve the efficiency of bagger/sealing machinery used in the flour and milling industry. The unique right-angle gear box permitted quick product changeover and is still used today by the thousands!

On the same bagger/sealer machine, customers also wanted a low-cost simple mechanism to lift and sort bags. Again, the Tolomatic solution proved to be a winner with the invention of the cable cylinder – the world's first rodless product. Thus began Tolomatic's product innovation legacy: unique and robust automation component solutions to solve customers' machinery motion challenges.

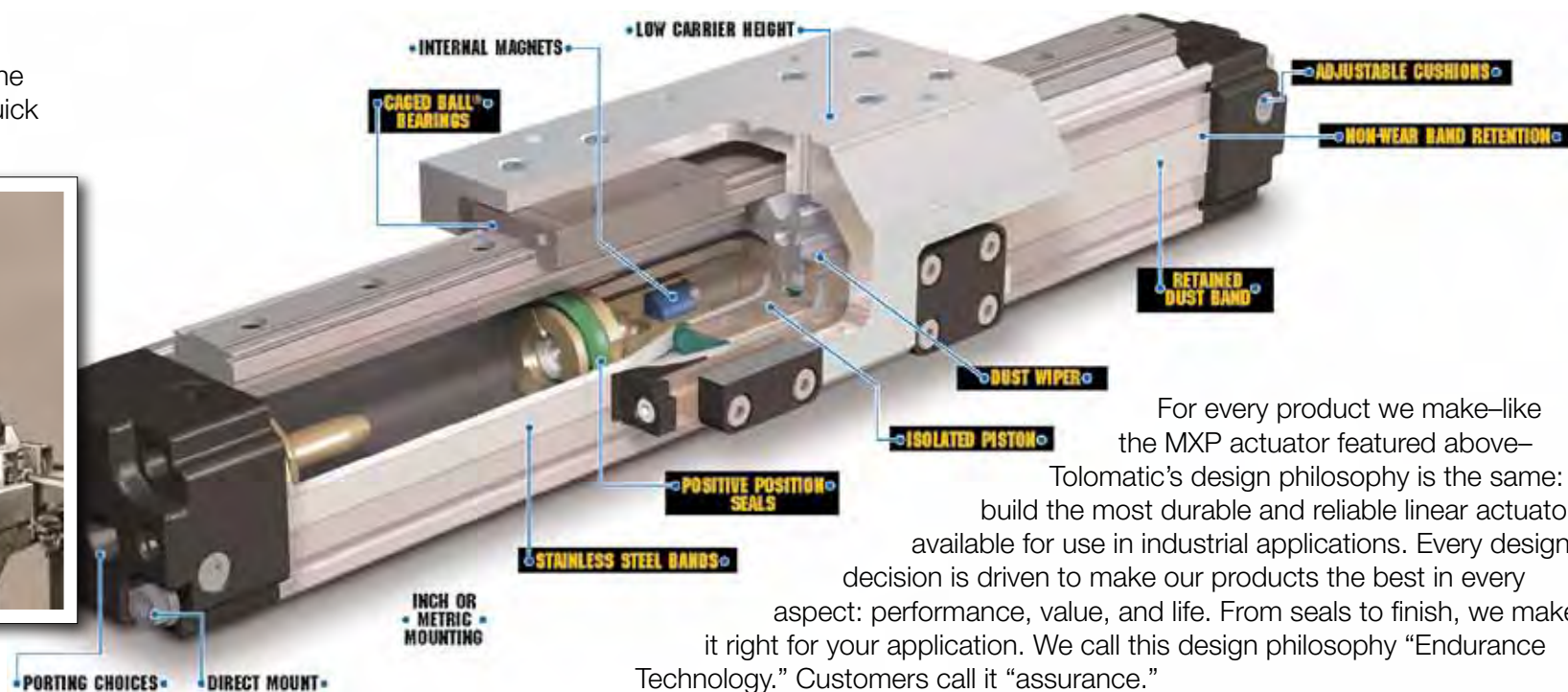


## Tolomatic Milestones

- Founded in 1954 by Burton Toles – invented the first right-angle gearbox that floats along the shaft.
- Designed the first rodless cylinder in 1955 – today cable cylinders ship to over 40 countries!
- Introduced the BC2 in 1985 – the world's best selling pneumatic rodless cylinder.
- Tolomatic entered the electric linear motion and controls market in 1992 with its first electric actuators.
- First certified in 1995 Tolomatic is current with ISO 9001:2008 certification.
- In 2004 the top global auto producer selected Tolomatic as its sole worldwide supplier of servo actuators for robotic welding.
- Tolomatic has an expanding portfolio of patents for actuators, mechanical assemblies and manufacturing processes.
- Today Tolomatic automation components, numbering in the hundreds of millions, continue to perform flawlessly in critical applications throughout the world.

## Durable products, built to last with

## ENDURANCE TECHNOLOGY™



For every product we make—like the MXP actuator featured above—Tolomatic's design philosophy is the same: build the most durable and reliable linear actuator available for use in industrial applications. Every design decision is driven to make our products the best in every aspect: performance, value, and life. From seals to finish, we make it right for your application. We call this design philosophy "Endurance Technology." Customers call it "assurance."

"Your products are built like a tank and run like a deer." – Actual customer quote

## Real data. Real specs. Real world.

Products operate in the real world, not in a lab under a controlled environment. Complex and extreme motion profiles are often the norm. This is why Tolomatic rigorously tests products in a variety of operating conditions and provides complete performance information.

Tolomatic wrote the book on actuator life. Visit [www.tolomatic.com/resources](http://www.tolomatic.com/resources) to view white papers on optimizing service life, selecting the best lead screw and how to avoid sizing mistakes. Want the facts? Turn to Tolomatic.

Thousands of customers... working in material handling, packaging, medical, food & beverage and automotive... rely on Tolomatic products to get the job done. Do what they do – turn to Tolomatic for your machinery motion and automation needs.



Go to [www.tolomatic.com/resources](http://www.tolomatic.com/resources) and get the facts from Tolomatic. Download our latest white papers, guides and technical bulletins.





### Power Transmission

- *Float-A-Shaft®* and *Slide-Rite®* right-angle gearboxes turn power around any corner.
- *Caliper disc brakes* in mechanical, hydraulic, pneumatic and spring-applied models offer a wide variety of industrial stopping power.
- *Disc cone clutches* with high torque output and non-slip, dependable performance.

### Pneumatic Actuators

- *Largest selection of rodless cylinders* in band, cable, and magnetically coupled styles with a wide range of load capacities. We're the only company that offers all three types of rodless cylinders.
- *Rod slides* for maximum force in short stroke packages, perfect for conveyor stops or load lifting applications.

### Electric Actuators

- *Rodless screw and belt designs* solve a wide range of moment, load, precision, speed, and performance requirements.
- *A broad range of rod style actuators.* Offered with acme, ball or roller screws for the force, life and repeatability required. Guided actuator models are available.
- *Integrated rod style actuators* IMA integrates a servo motor with ball & roller screw technologies to deliver a powerful compact actuator. The ICR SmartActuator integrates servo motor and drive with an actuator to create an all-in-one solution.

# More solutions. Built to last.



ABT

MXP

BCZ

BC3

BC4

LS

MG

CC

PB

ENGR

## Drives & Motors

- *Servo controllers, drives and motors* provide smooth, quiet operation and high performance.
- *Stepper controllers, drives and motors*, including the new ACS drive/controller to achieve precise positioning at economical prices.

## Customized Products

- *Industry leading quick turnaround on custom modifications* to Tolomatic standard products.
- *Linear motion solutions with custom design and prototype services.*
- *Your Motor Here* program matches a Tolomatic actuator to customer motor and supplies the in-line or reverse-parallel motor adapter device free of charge, mounted and shipped with the actuator.



## Service & Technical Support

- *Fast service and full technical support.*
- *All pneumatic & power transmission catalog products are built-to-order in the stroke length you specify in 5 days, electric catalog products in 15 days*
- *Sizing & selection software and CAD* available online at [www.tolomatic.com](http://www.tolomatic.com)

**5 DAYS**  
BUILT-TO-ORDER

**15 DAYS**  
BUILT-TO-ORDER

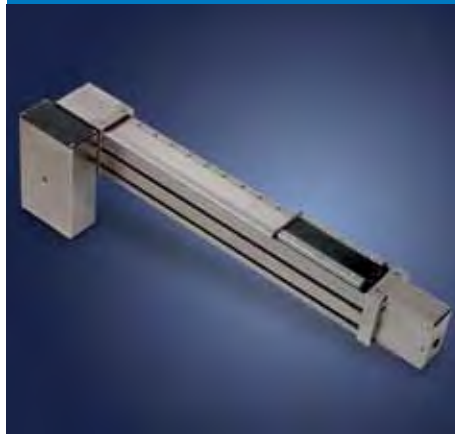
**ACTUATOR**

**SIZING**





## CUSTOM CAPABILITIES



Tolomatic's custom model shop can create first-piece prototypes with the industry's fastest turnaround times.

### Custom Solutions are Standard Business

Hundreds of customers partner with Tolomatic to solve unique automation application challenges. We are geared to handle design requests—from our Model Shop (for fast prototypes) all the way through our ISO 9001:2008 certified manufacturing facility. Over 33% of our total business is based on products not found in our standard catalog.

With a mind-set toward innovation, years of solid industry experience, and fast response times, Tolomatic can help you get the job done. If you are looking for linear motion solutions—pneumatic or electromechanical—and you cannot find a catalog product, get with Tolomatic. You will experience what we mean by **Excellence in Motion.**



## MATERIAL HANDLING



Conveying machinery with built-in lane diverters offer a compact footprint with optimal performance.

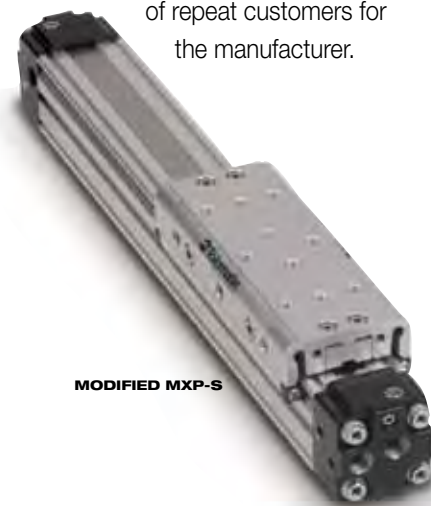
### Customer Challenge:

The traditional method of using tie rod cylinders to operate diverters required too much space to fit in space-restrictive production areas.

### Tolomatic Solution:

Tolomatic recommended a series of pneumatic rodless band cylinders that could be easily retrofitted into production lines by offering a variety of mounting options. The manufacturer's customers were pleased with the space saving results and durability of the machines. The result was an increase

of repeat customers for the manufacturer.



MODIFIED MXP-S

## PACKAGING



Modular bagging system fills and seals a wide range of materials and bag sizes.

### Customer Challenge:

A leader in packaging technology was faced with the problem of compensating for inconsistent bag dimensions on its modular bag filling and sealing system. Irregularly sized bags required manual setup and were slowing the production process which required high-speed accuracy and flexibility.

### Tolomatic Solution:

Tolomatic supplied a series of customized electric screw drive actuators that precisely positioned the incoming bags before insertion into the filling/sealing line. Two actuators adjust the vertical position and two others center the bags in the tray. The results: variations in bag lengths and widths are automatically compensated for eliminating filling, sealing and leakage problems and increasing production.



CUSTOM 2 DIRECTION ELECTRIC ACTUATOR

## MEDICAL



Angiographic-fluid-delivery system combines motion control technology with physician-interactive control.

### Customer Challenge:

Power injection systems used in the angiography technique to diagnose coronary disease did not offer the ability to vary the fluid flow rate during injection. A medical company was looking to improve this technology by giving the physician more control of the process and streamline the complexity of equipment setup. Reliable, consistent performance was a key factor.

### Tolomatic Solution:

Tolomatic designed a customized rod screw actuator to provide the rigidity, precision and repeatability required for the injection system. The compact design is capable of performing the necessary consistent thrust required for fluid delivery. Physicians are able to easily control and monitor the fluid delivery keeping their focus on diagnosis and treatment.



CUSTOM ELECTRIC ACTUATOR

## FOOD & BEVERAGE



Custom designed high force corrosion resistant actuator for volumetric filling.

### Customer Challenge:

A designer and manufacturer of volumetric filling equipment for the food / beverage industry desired to deploy electric actuators to improve performance and minimize product waste. The challenge was to provide an electric actuator that could meet the demanding force, speed and duty cycle requirements with stainless steel construction and IP69K protection.

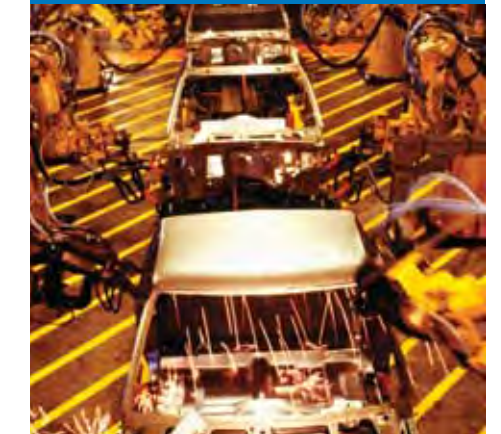
### Tolomatic Solution:

An entirely custom electric actuator was developed by Tolomatic. The solution included a round-bodied actuator made from 316 stainless steel that made it ideal for the wash down operating environment. In addition, Tolomatic deployed high force and long life roller screw technology, heavy duty bearings and corrosion resistant seals while adapting the actuator motor mount to the customer's choice of wash down motor.



CUSTOM STAINLESS STEEL ELECTRIC ACTUATOR

## AUTOMOTIVE



Servo actuators used in resistance spot welding (RSW) increase weld quality.

### Customer Challenge:

A leading automotive manufacturer was creating a state-of-the-art automotive assembly facility using electric technology. Specifications demanded a servo actuator with precise performance to create the highest quality welds possible. The actuator needed to be compatible with leading robot manufacturer equipment with minimized setup and provide zero maintenance operation over the life of the actuator.

### Tolomatic Solution:

Working closely with the customer, Tolomatic developed ServoWeld®, a custom servo actuator with an integral motor. The actuator required no air cooling (a common trait of weld actuators) with zero maintenance. Completely compatible with the top robot manufacturer weld guns, ServoWeld technology proved efficient, durable and helped the customer achieve their 5-star crash rating goal.



GSWA

**Turn to Tolomatic for the best motion control and linear motion solutions for your applications.**

# APPLICATIONS

ABT

MXP

BC2

BC3

BC4

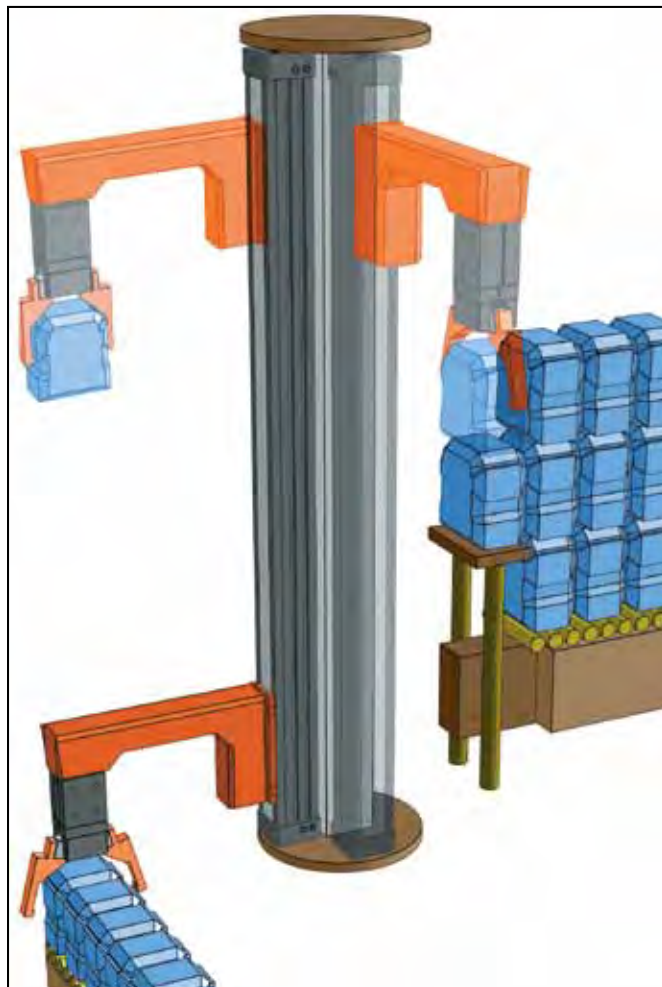
LS

MG

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ENGR



## **APPLICATION DESCRIPTION:**

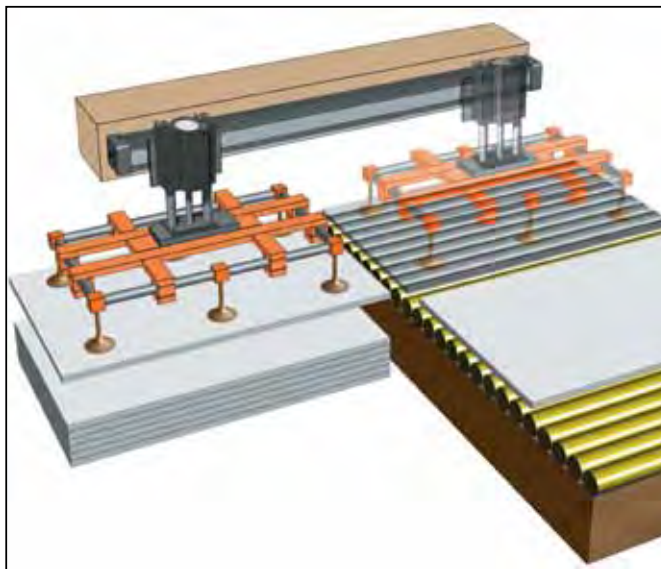
A manufacturer of ceramic blocks needed a method of stacking and moving heavy blocks for final packing. Speed, and power are critical; end-of-stroke position must be consistent. Tolomatic pneumatic products were chosen for this system.

## **APPLICATION REQUIREMENTS:**

- Fast response; 1 block must be moved and stacked each 3 seconds
- Movement from end-of-stroke to end-of-stroke with consistent positioning
- High power; able to move 43 lb. ceramic blocks
- Low cost

## **TOLOMATIC SOLUTION:**

This application uses a Tolomatic BC3 Band Cylinder. The BC3 was chosen because its high bending moment capacity allows it to support the high overhung load at the distance required.



## **APPLICATION DESCRIPTION:**

A manufacturer of battery chargers needed a method of taking sheet metal off of pallets and placing onto the assembly line. Speed is critical and end-of-stroke position must be consistent, thus, Tolomatic pneumatic products were chosen for this system.

## **APPLICATION REQUIREMENTS:**

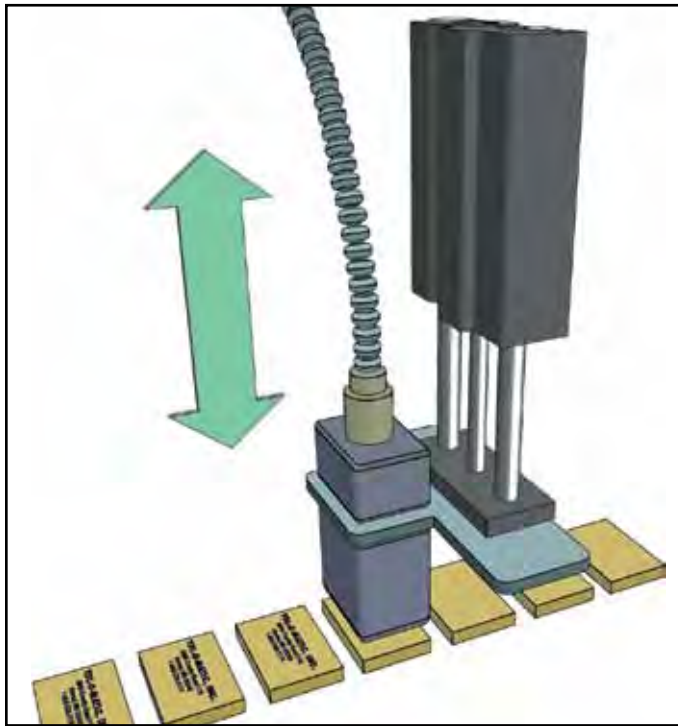
- Fast response, 1 part must be reoriented and moved each 3 seconds
- Movement from end-of-stroke to end-of-stroke with consistent positioning
- Low cost
- End-of-stroke adjustment

## **TOLOMATIC SOLUTION:**

This application uses a Tolomatic PB2 Rod Cylinder Slide, attached to a BC3 Band Cylinder with adjustable shocks. This actuator assembly moves the vacuum grid attachment that holds the sheet metal.



# APPLICATIONS



## **APPLICATION DESCRIPTION:**

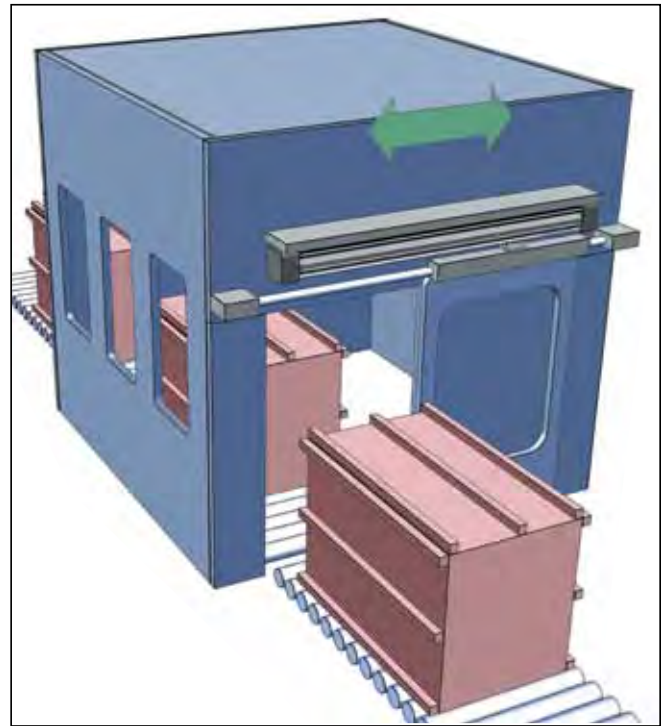
A manufacturer needed a method to stamp information on a plastic case.

## **APPLICATION REQUIREMENTS:**

- Fast response, less than 1 second
- Movement from end-of-stroke to end-of-stroke with consistent positioning
- Relatively high force applied

## **TOLOMATIC SOLUTION:**

This application uses a single Power-Block2 and custom adapter plate with customer's heat stamper.



## **APPLICATION DESCRIPTION:**

A manufacturer of automated spray booths needed actuators to open and close the doors on the spray booth. The doors were already guided and supported.

## **APPLICATION REQUIREMENTS:**

- Fast response; doors to open (close) within 2 seconds
- Movement from end-of-stroke to end-of-stroke with consistent positioning
- Low cost
- End-of-stroke cushioning

## **TOLOMATIC SOLUTION:**

This application had used a competitor's band cylinder in previous designs. The BC4 was chosen because it had the same envelope as the other band cylinder yet offered lower cost, with longer cylinder life. Because thousands of these spray booths are being made, the spray booth manufacturer was able to create a better product and improve its bottom line.

ABT

MXP

BCZ

BC3

BC4

LS

MG

CC

PB

ENGR

# APPLICATIONS



With over 50 years of proven application experience, Tolomatic pneumatic products are key components in the following industries and applications:

## INDUSTRY INSTALLATIONS

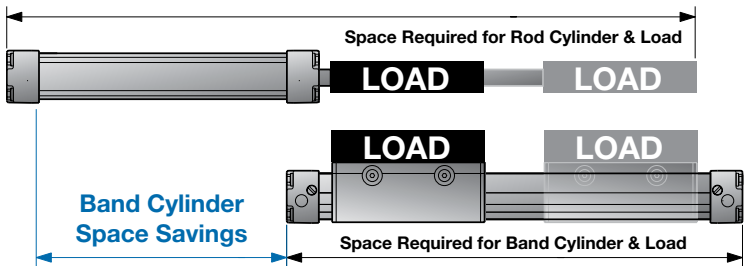
- Packaging
- Automotive
- Food and Beverage
- Material Handling & Conveying
- Plastic Injection Molding
- Metal Processing
- Paper and Textiles
- Medical
- Electronics
- Printing
- and More ...

## APPLICATIONS

- Material Handling
- Part Transfer
- Part Advancement
- Part Sorting
- Cutting
- Elevators
- Palletizing
- Door Closure
- Conveyors
- Robotics
- Machine Tools
- General Automation
- and More ...

# THE RODLESS ADVANTAGE

## TOLOMATIC RODLESS BAND CYLINDERS GET THE JOB DONE IN LESS SPACE THAN ROD STYLE CYLINDERS



**Consider this:** A rodless band cylinder contains its stroke within the cylinder itself. A 2" bore cylinder with a 24" stroke can provide a 43% space savings when compared to an equivalently sized rod cylinder. In addition, the load is supported throughout the entire stroke so there is minimal load deflection when compared to rod style cylinders.

With a Tolomatic Band Cylinder, there is no concern about rod rotation. Also, because rodless cylinders have equal piston areas in both directions, the cylinder experiences zero load variation in either direction.

**GO RODLESS AND SAVE SPACE!**

## ROD STYLE vs RODLESS FEATURE COMPARISON

| Feature                         | Tolomatic Rodless | Rod Style |
|---------------------------------|-------------------|-----------|
| Integrated Load Support         | ✓                 | —         |
| Space Saving Design             | ✓                 | —         |
| Piston Seals Isolated from Load | ✓                 | —         |
| Internal Air Cushioning         | ✓                 | ✓         |



# RODLESS CYLINDER COMPARISON



Use this table as a quick reference to help understand the differences and similarities of each product line

ST = Standard Feature      OP = Optional Feature      – = Not Available

| FEATURE                             | MXP-N            | MXP-S            | MXP-P           | BC4              | BC2              | BC3                        | LS                                    | MG | MGS                                        | CC              |
|-------------------------------------|------------------|------------------|-----------------|------------------|------------------|----------------------------|---------------------------------------|----|--------------------------------------------|-----------------|
| <b>Stainless Steel Band</b>         | ST               | ST               | ST              | ST               | ST               | ST                         | ST                                    | –  | –                                          | –               |
| <b>Internal Air Cushioning</b>      | ST               | ST               | ST              | ST               | ST <sup>3</sup>  | ST                         | –                                     | –  | –                                          | ST              |
| <b>Internal Polyurethane Bumper</b> | –                | –                | –               | –                | –                | –                          | –                                     | ST | –                                          | –               |
| <b>External Shock Absorbers</b>     | OP               | OP               | OP              | OP               | OP <sup>1</sup>  | OP                         | OP                                    | –  | OP                                         | –               |
| <b>Adjustable Shock Absorbers</b>   | OP               | OP               | OP              | –                | OP <sup>1</sup>  | OP                         | –                                     | –  | –                                          | –               |
| <b>Caliper Disc Brake</b>           | –                | –                | –               | –                | –                | –                          | –                                     | –  | –                                          | OP              |
| <b>Foot Mounts</b>                  | OP               | OP               | OP              | OP               | OP               | OP                         | –                                     | OP | –                                          | –               |
| <b>Tube Supports</b>                | OP               | OP               | OP              | OP               | OP               | OP                         | OP                                    | –  | –                                          | –               |
| <b>Floating Mount</b>               | OP               | OP               | –               | OP               | OP               | –                          | –                                     | OP | –                                          | –               |
| <b>Auxiliary Carrier</b>            | OP               | OP               | OP              | OP               | OP               | OP                         | OP                                    | –  | –                                          | –               |
| <b>Dual 180° Carrier</b>            | –                | –                | –               | –                | –                | OP                         | –                                     | –  | –                                          | –               |
| <b>Proximity Sensors</b>            | –                | –                | –               | –                | –                | –                          | OP                                    | –  | OP                                         | –               |
| <b>Long Carrier</b>                 | –                | –                | –               | OP               | –                | –                          | –                                     | –  | –                                          | –               |
| <b>Multi-Ported Head</b>            | ST               | ST               | ST              | ST               | ST <sup>1</sup>  | ST                         | ST                                    | –  | ST                                         | OP              |
| <b>Single End Porting</b>           | OP <sup>4</sup>  | OP <sup>4</sup>  | OP <sup>4</sup> | OP               | –                | ST                         | ST                                    | –  | –                                          | –               |
| <b>Sensors / Switches</b>           | OP               | OP               | OP              | OP               | OP               | OP                         | OP                                    | OP | OP                                         | OP <sup>2</sup> |
| <b>Carrier Bearing Type</b>         | Engineered Resin | Engineered Resin | Profiled Rail   | Engineered Resin | Engineered Resin | Recirculating Ball Bearing | LS05: Composite<br>LS10: Ball Bearing | –  | Composite, Sintered Bronze OR Ball Bearing | –               |
| <b>Piston Isolated From Load</b>    | –                | ST               | ST              | –                | ST               | ST                         | ST                                    | ST | ST                                         | ST              |
| <b>Extruded Aluminum Tube</b>       | ST               | ST               | ST              | ST               | ST               | ST                         | ST                                    | –  | –                                          | –               |

<sup>1</sup>Not available for the BC205    <sup>2</sup>Switches are not available for cable cylinders with steel tube    <sup>3</sup>BC205 features external bumper    <sup>4</sup>Not available for the MXP16

# THE Tolomatic DIFFERENCE

## CUSTOMER SERVICE



- JUST A PHONE CALL AWAY - Expect prompt, courteous replies to all of your application and product questions. Check us out at 1-800-328-2174



- 5 DAYS BUILT-TO-ORDER - pneumatic products assembled, tested and out the door in five days or less.

Our products will be there when you need them. Depend on Tolomatic!

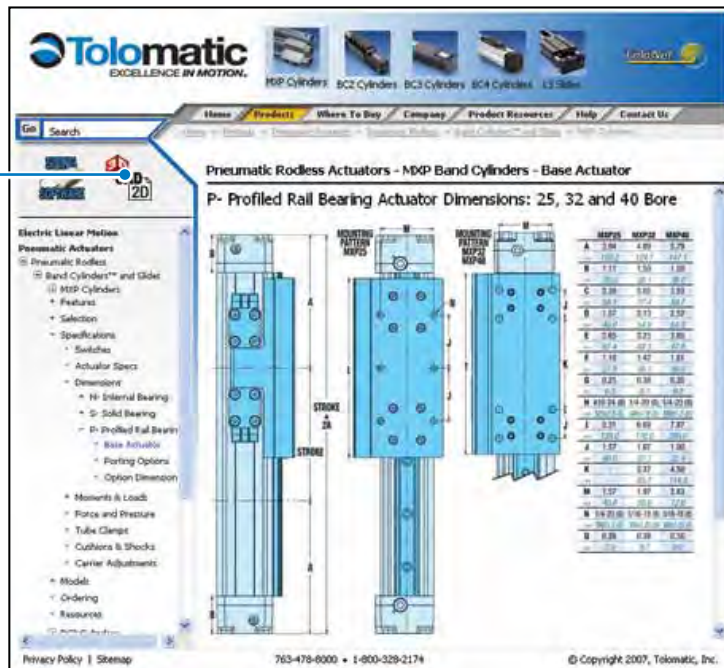


## TECHNICAL AND APPLICATION SUPPORT



3D models and 2D drawings on the web

- Available in all common formats.



- COMPLETE INFORMATION AVAILABLE ONLINE - **www.tolomatic.com** - your definitive source for everything you need to know about Tolomatic and our products.
- Sizing and selection support - step by step instructions, specifications and performance data for every pneumatic product.



# MXP BAND CYLINDER

**ENDURANCE TECHNOLOGY™**

**N** INTERNAL BEARING  
**S** SOLID BEARING  
**P** PROFILED RAIL



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# N INTERNAL BEARING

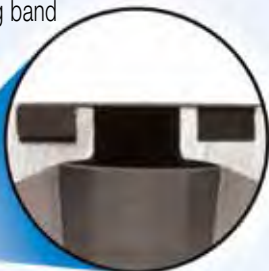
## ENDURANCE TECHNOLOGY<sup>SM</sup>

Endurance Technology features are designed for maximum durability to provide extended service life.

The MXP-N pneumatic rodless cylinder is exactly what you expect from the industry's number one rodless supplier. Featuring durable stainless steel bands, permanently lubricated internal bearing and low breakaway pressure the MXP-N is a low cost solution for applications with limited load and bending moment requirements. Built-to-order in stroke lengths up to 206 inches.

### STAINLESS STEEL BANDS

- Both interior sealing band and exterior dust band made of fatigue resistant stainless steel



STAINLESS STEEL IS DURABLE, FLEXIBLE AND CORROSION RESISTANT

- Does not stretch like bands made of rubber or polymer materials
- Stainless steel sealing bands resist blow out during pressure spikes that may occur during high velocity cushioning

### INTERNAL BEARINGS

- Design maximizes piston bearing surface area for less pressure on bearing surfaces, less pressure results in less wear
- Permanent lubrication for low friction and extended bearing life
- Internal location provides protection from external contaminants, extending life

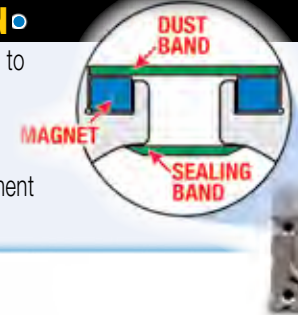


### DUST WIPER

- Formed end cap and side dust wipers keep contaminants from entering the cylinder's internal area

### NON-WEAR BAND RETENTION

- Magnetically retained bands are not subject to wear as are mechanically retained systems
- Immediate band engagement and release results in less drag on piston for lower breakaway force during initial carrier movement



### ADJUSTABLE CUSHIONS

- Easy screw adjustment for smooth deceleration protecting actuator from high stress at end-of-stroke
- Adjustable cushions with retained stainless steel needle screw for increased safety

NOTE: Boxed letters indicate ordering codes

## OPTIONS



### AUXILIARY CARRIER **DW**

- 2X higher Fz (load) capacity
- High bending moment capacity



### FLOATING MOUNT **FL**

- Compensates for non-parallelism between MXP band cylinder and externally guided load



### TUBE CLAMPS **TC**

- Used for intermediate support
- Flush with bottom of actuator to retain low profile
- Drop-in, adjustable mounting locations



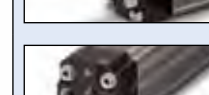
### FOOT MOUNTS **FM**

- For end mounting of MXP band cylinder
- Use to bottom or side mount actuator



### SHOCK ABSORBERS **AL SL AH SH**

- Allows increased operating speed and load
- Self-compensates for load or speed changes
- Minimizes impact load to equipment
- Fixed or adjustable position shocks



### SINGLE-END PORTING **S**

- Convenient single-end air connection (not available on MXP16)



### SWITCHES

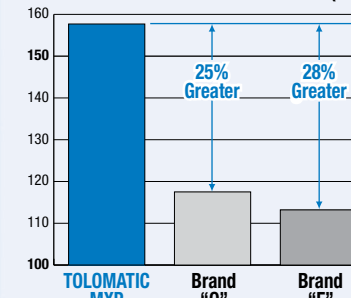
- Wide variety of sensing choices: Reed, Solid State PNP or NPN, all available normally open or normally closed
- Flush mount, drop-in installation, anytime
- Bright LEDs, power & signal indication
- CE rated, RoHS compliant

### HIGH STRENGTH PISTON

- Single piece extrusion for piston bracket and carrier reduces failure points
- Piston bracket neck cross-sectional area is up to 28% greater than competitive designs, providing increased durability



25mm PISTON BRACKET  
MINIMUM CROSS-SECTIONAL AREA (mm<sup>2</sup>)



### INTERNAL MAGNETS

- Standard feature that allows sensor installation on left, right or bottom of the extrusion

### POSITIVE POSITION SEALS

- Sturdy U-cup base section assures positive positioning of seal lip for better sealing and less seal wear
- Made of custom formulated polyurethane for pliable, wear resistant seal lip

### RETAINED DUST BAND

- Retained dust band keeps contaminants from entering the cylinder interior, protecting components for reduced maintenance and increased uptime

### PORTING CHOICES

- 4-ported heads are standard to allow air connections on sides, end or bottom
- Single-end porting allows convenient one end air connection
- NPT, Metric Parallel (ISO-G/BSP) & Metric Taper (Rc/BST) available on both metric and inch (US standard) mount actuators

### DIRECT MOUNT

- Head bolts are tapped for direct mounting

### INCH OR METRIC MOUNTING

- Your choice of inch (US standard) or metric fasteners for carrier and head bolt mounting



# S SOLID BEARING

## ENDURANCE TECHNOLOGY<sup>SM</sup>

Endurance Technology features are designed for maximum durability to provide extended service life.

### STAINLESS STEEL BANDS

- Both interior sealing band and exterior dust band made of fatigue resistant stainless steel



STAINLESS STEEL IS DURABLE, FLEXIBLE AND CORROSION RESISTANT

- Does not stretch like bands made of rubber or polymer materials
- Stainless steel sealing bands resist blow out during pressure spikes that may occur during high velocity cushioning

### RETAINED DUST BAND

- Retained dust band keeps contaminants from entering the cylinder interior, protecting components for reduced maintenance and increased uptime

### POSITIVE POSITION SEALS

- Sturdy U-cup base section assures positive positioning of seal lip for better sealing and less seal wear
- Made of custom formulated polyurethane for pliable, wear resistant seal lip

The MXP-S pneumatic rodless cylinder is exactly what you expect from the industry's number one rodless supplier. Featuring durable stainless steel bands, field replaceable engineered bearings and a large carrier mounting pattern the MXP-S is a great solution for applications that require increased Mx bending moment capacity. Built-to-order in stroke lengths up to 206 inches.

### INTERNAL MAGNETS

- Standard feature that allows sensor installation on left, right or bottom of the extrusion

### ISOLATED PISTON

- Unique design isolates the piston from the applied load, extending the service life of the piston seals



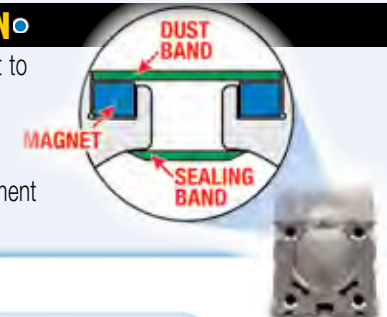
- Piston remains isolated even when the carrier is deflected under load
- Piston bracket and carrier feature single piece extrusions, reducing failure points

### DUST WIPER

- Formed end cap and side dust wipers keep contaminants from entering the cylinder's internal area

### NON-WEAR BAND RETENTION

- Magnetically retained bands are not subject to wear as are mechanically retained systems
- Immediate band engagement and release results in less drag on piston for lower breakaway force during initial carrier movement



### ADJUSTABLE CUSHIONS

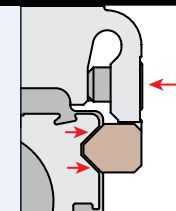
- Easy screw adjustment for smooth deceleration protecting actuator from high stress at end-of-stroke
- Adjustable cushions with retained stainless steel needle screw for increased safety

### LARGE FLEXIBLE MOUNTING PATTERN

- Carrier gives more load stability
- Compatibility with existing BC2 applications
- More fastening options

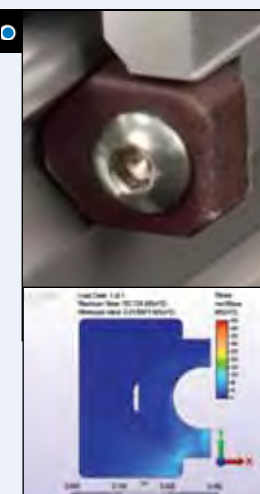
### NON-BINDING BEARING ARMS

- Bearings are tensioned indirectly, providing bind free adjustment



### TRAPEZOIDAL BEARINGS

- Trapezoidal design maximizes bearing surface area for less pressure on bearing surfaces; less pressure results in less wear
- Engineered bearing material has low static and dynamic friction with low wear properties for long lasting, smooth operation
- Bearings are field replaceable for extended service life



## OPTIONS



### AUXILIARY CARRIER **DW**

- 2X higher Fz (load) capacity
- High bending moment capacity



### FLOATING MOUNT **FL**

- Compensates for non-parallelism between MXP band cylinder and externally guided load



### TUBE CLAMPS **TC**

- Used for intermediate support
- Flush with bottom of actuator to retain low profile
- Drop-in, adjustable mounting locations



### FOOT MOUNTS **FM**

- For end mounting of MXP band cylinder
- Use to bottom or side mount actuator



### SHOCK ABSORBERS **AL SL AH SH**

- Allows increased operating speed and load
- Self-compensates for load or speed changes
- Minimizes impact load to equipment
- Fixed or adjustable position shocks



### SINGLE-END PORTING **S**

- Convenient single-end air connection (not available on MXP16)



### SWITCHES

- Wide variety of sensing choices: Reed, Solid State PNP or NPN, all available normally open or normally closed
- Flush mount, drop-in installation, anytime
- Bright LEDs, power & signal indication
- CE rated, RoHS compliant



# P PROFILED RAIL

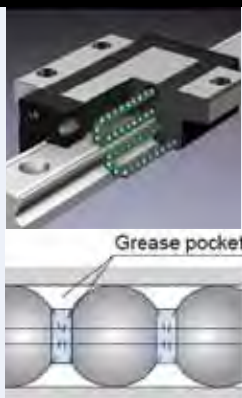
## ENDURANCE TECHNOLOGY<sup>SM</sup>

Endurance Technology features are designed for maximum durability to provide extended service life.

**Tolomatic... MAXIMUM DURABILITY**  
EXCELLENCE IN MOTION<sup>®</sup>

### RECIRCULATING BALL BEARINGS

- Recirculating ball bearings are used to reduce friction and extend actuator life
- Ball bearings with a grease pocket between ball elements, reduces friction, noise and maintenance
- Large permissible moment loads
- Low profile recirculating ball bearings
- High speed operation, low heat generation
- High precision, smooth, low friction motion



The MXP-P pneumatic rodless cylinder is exactly what you expect from the industry's number one rodless supplier. Featuring durable stainless steel bands, a reliable recirculating ball bearing design and smooth, low breakaway pressure the MXP-P is the best solution for applications with high load and bending moment requirements. Built-to-order in stroke lengths up to 206 inches.

### LOW CARRIER HEIGHT

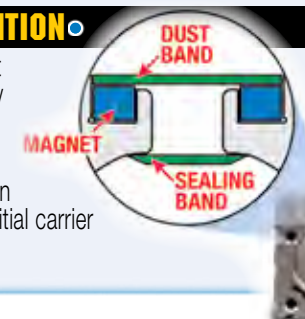
- Reduces overall cylinder envelope
- Large mounting pattern for high load stability

### ADJUSTABLE CUSHIONS

- Easy screw adjustment for smooth deceleration protecting actuator from high stress at end-of-stroke
- Adjustable cushions with retained stainless steel needle screw for increased safety

### NON-WEAR BAND RETENTION

- Magnetically retained bands are not subject to wear as are mechanically retained systems
- Immediate band engagement and release results in less drag on piston for lower breakaway force during initial carrier movement



NOTE: Boxed letters indicate ordering codes

### RETAINED DUST BAND

- Retained dust band keeps contaminants from entering the cylinder interior, protecting components for reduced maintenance and increased uptime

### DUST WIPER

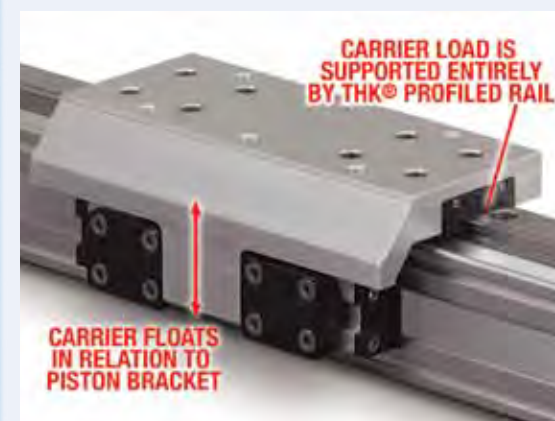
- Formed end cap and side dust wipers keep contaminants from entering the cylinder's internal area

### INTERNAL MAGNETS

- Standard feature that allows sensor installation on the open side or bottom of the extrusion

### ISOLATED PISTON

- Unique design isolates the piston from the applied load, extending the service life of the piston seals



- Piston remains isolated even when the carrier is deflected under load
- Piston bracket and carrier feature single piece extrusions, reducing failure points

### STAINLESS STEEL BANDS

- Both interior sealing band and exterior dust band made of fatigue resistant stainless steel



STAINLESS STEEL IS DURABLE, FLEXIBLE AND CORROSION RESISTANT

- Does not stretch like bands made of rubber or polymer materials
- Stainless steel sealing bands resist blow out during pressure spikes that may occur during high velocity cushioning

### POSITIVE POSITION SEALS

- Sturdy U-cup base section assures positive positioning of seal lip for better sealing and less seal wear
- Made of custom formulated polyurethane for pliable, wear resistant seal lip



### PORTING CHOICES

- 4-ported heads are standard to allow air connections on side, top or end
- Single-end porting allows convenient one end air connection
- NPT, Metric Parallel (ISO-G/BSP) & Metric Taper (Rc/BST) available on both metric and inch (US standard) mount actuators

### DIRECT MOUNT

- Head bolts are tapped for direct mounting

### INCH OR METRIC MOUNTING

- Your choice of inch (US standard) or metric fasteners for carrier and head bolt mounting

## OPTIONS



### AUXILIARY CARRIER **DW**

- 2X higher Fz (load) capacity
- High bending moment capacity



### TUBE CLAMPS **TC**

- Used for intermediate support
- Flush with bottom of actuator to retain low profile
- Drop-in, adjustable mounting locations



### FOOT MOUNTS **FM**

- For end mounting of MXP band cylinder
- Use to bottom or side mount actuator



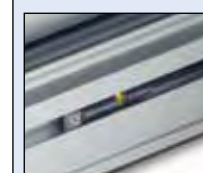
### SHOCK ABSORBERS **AL SL AH SH**

- Allows increased operating speed and load
- Self-compensates for load or speed changes
- Minimizes impact load to equipment
- Fixed or adjustable position shocks



### SINGLE-END PORTING **S**

- Convenient single-end air connection (not available on MXP16)



### SWITCHES

- Wide variety of sensing choices: Reed, Solid State PNP or NPN, all available normally open or normally closed
- Flush mount, drop-in installation, anytime
- Bright LEDs, power & signal indication
- CE rated, RoHS compliant



# INTRODUCING THE MXP BAND CYLINDER – DESIGNED TO OUTLAST EVERY RODLESS CYLINDER ON THE MARKET

The MXP pneumatic rodless cylinder is exactly what you expect from the industry's number one rodless supplier. Designed with our exclusive ENDURANCE TECHNOLOGY<sup>SM</sup> features, the MXP delivers superior performance to meet the most demanding applications. Nobody knows rodless like Tolomatic, and the MXP proves it.

- **DURABLE BEARINGS.** Three bearing choices to match your application needs. Profiled rail design reduces friction and extends actuator life. Solid bearing design reduces stress concentration for optimum performance. Internal bearing design is permanently lubricated for long, trouble-free service.
- **DURABLE BANDS.** Stainless steel bands are stronger and will not elongate like elastomer (non-metallic) bands, providing reliable sealing over the life of the actuator.



## **[N]-INTERNAL BEARING**

- Low cost solution for applications with limited load and bending moment requirements
- Lowest breakaway pressure
- Best in many vertical applications
- Permanently lubed internal bearing

## **[S]-SOLID BEARING**

- Increased Mx moment capacity
- Large bearing surface contact area optimizes stress distribution on bearing for long service life
- Large carrier mounting pattern for more load stability and compatibility with existing BC2 applications
- Engineered bearing material does not require additional lubrication
- Solid bearings are field replaceable

## **[P]-PROFILED RAIL**

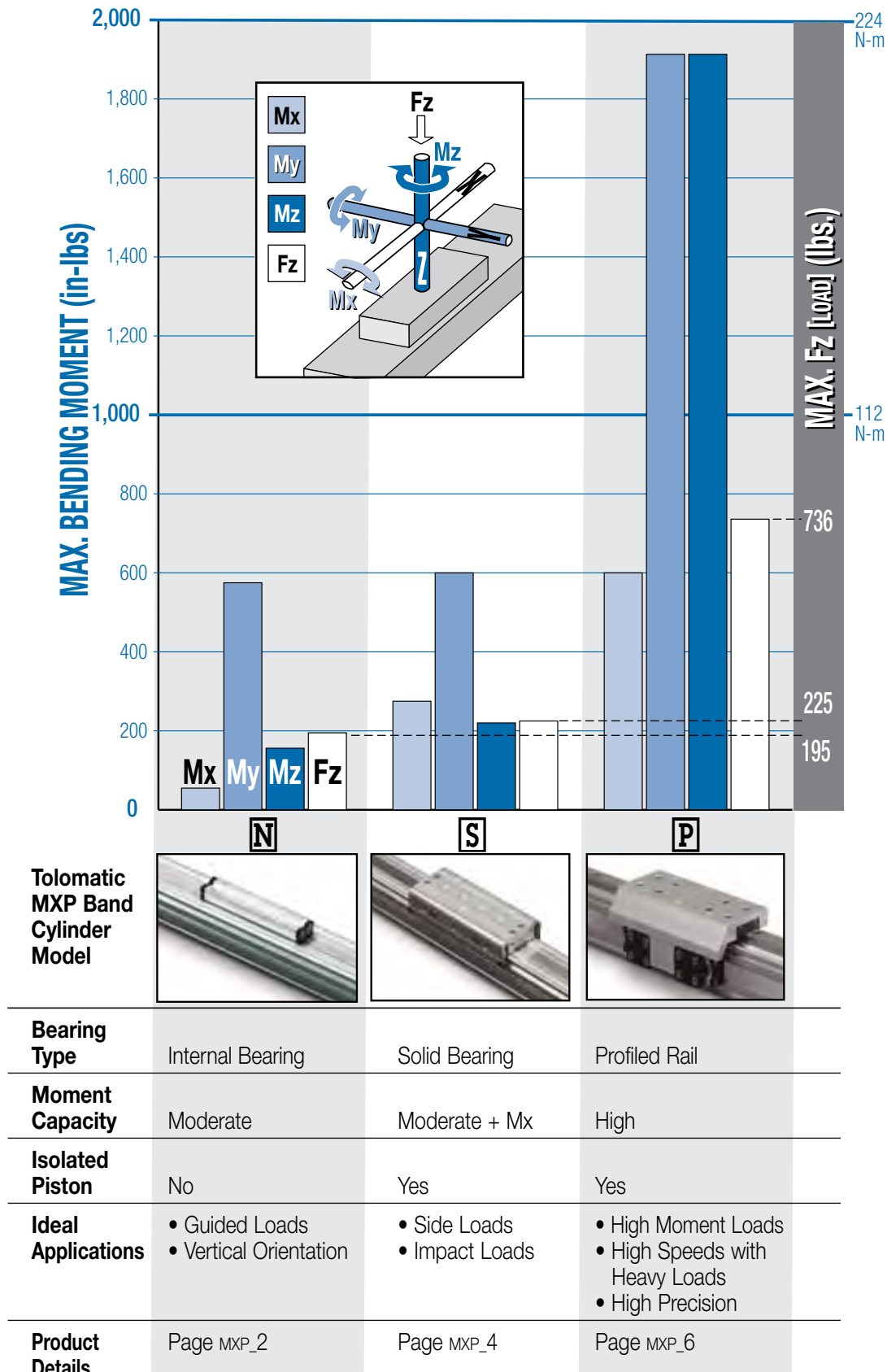
- Recirculating ball bearing design offers reduced friction for reliable service life
- High load and bending moment capacities
- Low profile to fit your application
- High precision bearings feature smooth, low breakaway motion

# SELECT THE PERFORMANCE YOU NEED

Choose from: • Three Bearing Models • Six Bore Sizes • Built to Your Specified Stroke Length!

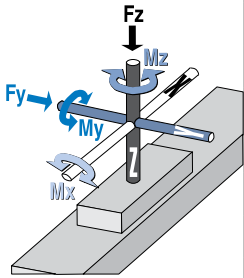
## MOMENT & LOAD CAPACITY COMPARISON

Graph for model comparison, data from MXP40, 38mm (1.5") bore





## STANDARD



| BORE |        |         | MAXIMUM BENDING MOMENTS |                |                | MAX. LOAD      | THRUST       |
|------|--------|---------|-------------------------|----------------|----------------|----------------|--------------|
|      |        |         | M <sub>x</sub>          | M <sub>y</sub> | M <sub>z</sub> | F <sub>z</sub> | (at 100 PSI) |
| 1 6  | Inch   | 0.63 in | 3 in-lbs                | 35 in-lbs      | 5 in-lbs       | 30 lbf         | 30.7 lbf     |
|      | Metric | 16 mm   | 0.3 N-m                 | 4.0 N-m        | 0.6 N-m        | 133 N          | 136 N        |
| 2 5  | Inch   | 1.00 in | 9 in-lbs                | 132 in-lbs     | 27 in-lbs      | 65 lbf         | 78.5 lbf     |
|      | Metric | 25 mm   | 1.0 N-m                 | 14.9 N-m       | 3.1 N-m        | 289 N          | 349 N        |
| 3 2  | Inch   | 1.25 in | 36 in-lbs               | 318 in-lbs     | 120 in-lbs     | 115 lbf        | 123 lbf      |
|      | Metric | 32 mm   | 4.1 N-m                 | 35.9 N-m       | 13.6 N-m       | 512 N          | 546 N        |
| 4 0  | Inch   | 1.50 in | 55 in-lbs               | 575 in-lbs     | 156 in-lbs     | 195 lbf        | 177 lbf      |
|      | Metric | 38 mm   | 6.2 N-m                 | 65 N-m         | 17.6 N-m       | 867 N          | 786 N        |
| 5 0  | Inch   | 2.00 in | 98 in-lbs               | 1,017 in-lbs   | 172 in-lbs     | 270 lbf        | 314 lbf      |
|      | Metric | 50 mm   | 11.1 N-m                | 115 N-m        | 19.4 N-m       | 1,201 N        | 1,397 N      |
| 6 3  | Inch   | 2.50 in | 120 in-lbs              | 1,776 in-lbs   | 216 in-lbs     | 370 lbf        | 491 lbf      |
|      | Metric | 64 mm   | 13.6 N-m                | 201 N-m        | 24.4 N-m       | 1,646 N        | 2,184 N      |



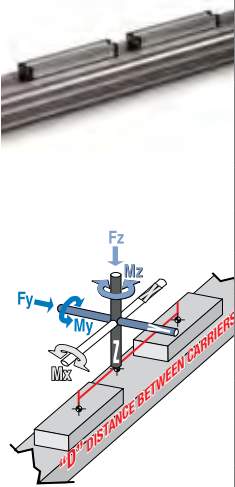
**Ratings are the maximum values for shock-free, vibration-free operation in a typical industrial environment. Contact Tolomatic for assistance in selecting the most appropriate actuator for your application.**

The moment and load capacity of the actuator's bearing system is based on an L10 life of 200,000,000 linear inches of travel. Life of the actuator will vary for each application depending on the combined loads, motion parameters and operating conditions. The load factor ( $L_F$ ) ratios for each application must not exceed a value of 1 (as calculated below). Exceeding a load factor of 1 will diminish the actuator's rated life.

$$L_F = \frac{M_x}{M_{x_{max}}} + \frac{M_y}{M_{y_{max}}} + \frac{M_z}{M_{z_{max}}} + \frac{F_y}{F_{y_{max}}} + \frac{F_z}{F_{z_{max}}} \leq 1$$

**With combined loads,  $L_F$  must not exceed the value 1.**

### DW AUXILIARY CARRIER



| BORE |        |         | "D" MIN | MAXIMUM BENDING MOMENTS |              |            | MAX. LOAD | THRUST (at 100 PSI) |
|------|--------|---------|---------|-------------------------|--------------|------------|-----------|---------------------|
|      |        |         |         | MxA                     | MyA*         | MzA*       | FzA       |                     |
| 16   | Inch   | 0.63 in | 5.0 in  | 3 in-lbs                | 150 in-lbs   | 81 in-lbs  | 60 lbf    | 30.7 lbf            |
|      | Metric | 16 mm   | 127 mm  | 0.3 N-m                 | 16.9 N-m     | 9.1 N-m    | 267 N     | 136 N               |
| 25   | Inch   | 1.00 in | 6.0 in  | 9 in-lbs                | 390 in-lbs   | 143 in-lbs | 130 lbf   | 78.5 lbf            |
|      | Metric | 25 mm   | 152 mm  | 1.0 N-m                 | 44.1 N-m     | 16.2 N-m   | 578 N     | 349 N               |
| 32   | Inch   | 1.25 in | 7.0 in  | 36 in-lbs               | 805 in-lbs   | 302 in-lbs | 230 lbf   | 123 lbf             |
|      | Metric | 32 mm   | 178 mm  | 4.1 N-m                 | 91.0 N-m     | 34.1 N-m   | 1,023 N   | 546 N               |
| 40   | Inch   | 1.50 in | 8.5 in  | 55 in-lbs               | 1,658 in-lbs | 413 in-lbs | 390 lbf   | 177 lbf             |
|      | Metric | 38 mm   | 216 mm  | 6.2 N-m                 | 187 N-m      | 46.7 N-m   | 1,735 N   | 786 N               |
| 50   | Inch   | 2.00 in | 8.6 in  | 98 in-lbs               | 2,322 in-lbs | 707 in-lbs | 540 lbf   | 314 lbf             |
|      | Metric | 50 mm   | 218 mm  | 11.1 N-m                | 262 N-m      | 79.8 N-m   | 2,402 N   | 1,397 N             |
| 63   | Inch   | 2.50 in | 13.0 in | 120 in-lbs              | 4,810 in-lbs | 808 in-lbs | 740 lbf   | 491 lbf             |
|      | Metric | 64 mm   | 330 mm  | 13.6 N-m                | 544 N-m      | 91.0 N-m   | 3,292 N   | 2,184 N             |

\*At minimum "D" distance between carriers see graph below for other distances

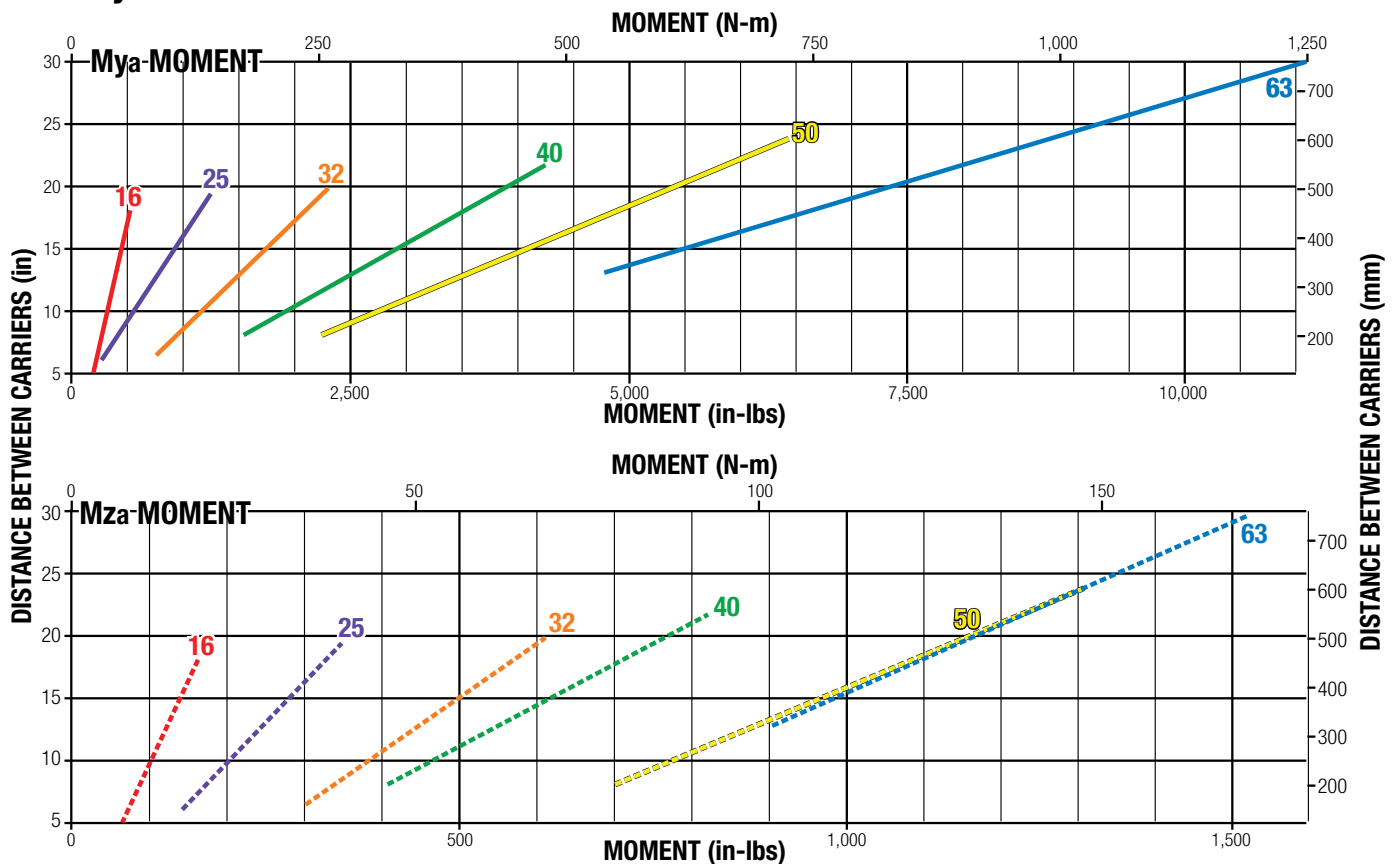
With combined loads,  $L_F$  must not exceed the value 1.

$$L_F = \frac{M_x}{M_{x_{max}}} + \frac{M_y}{M_{y_{max}}} + \frac{M_z}{M_{z_{max}}} + \frac{F_y}{F_{y_{max}}} + \frac{F_z}{F_{z_{max}}} \leq 1$$



**Ratings are the maximum values for shock-free, vibration-free operation in a typical industrial environment. Contact Tolomatic for assistance in selecting the most appropriate actuator for your application.**

### Mya & Mza vs. DISTANCE



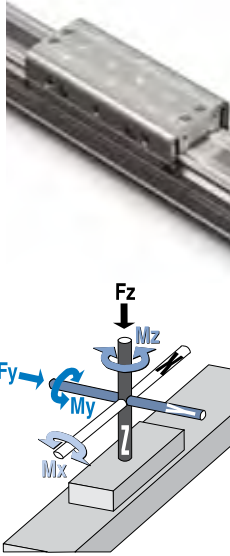
**Ratings were calculated with the following conditions:**

- 1.) Coupling between carriers is rigid.
- 2.) Load is equally distributed between carriers.

- 3.) Coupling device applies no misaligned loads to carriers.



STANDARD



| BORE |        |         | MAXIMUM BENDING MOMENTS |              |            | MAX. LOAD | THRUST       |
|------|--------|---------|-------------------------|--------------|------------|-----------|--------------|
|      |        |         | Mx                      | My           | Mz         | Fz        | (at 100 PSI) |
| 16   | Inch   | 0.63 in | 22 in-lbs               | 19 in-lbs    | 25 in-lbs  | 35 lbf    | 30.7 lbf     |
|      | Metric | 16 mm   | 2.5 N-m                 | 2.1 N-m      | 2.8 N-m    | 156 N     | 136 N        |
| 25   | Inch   | 1.00 in | 60 in-lbs               | 110 in-lbs   | 34 in-lbs  | 70 lbf    | 78.5 lbf     |
|      | Metric | 25 mm   | 6.8 N-m                 | 12.4 N-m     | 3.8 N-m    | 311 N     | 349 N        |
| 32   | Inch   | 1.25 in | 100 in-lbs              | 350 in-lbs   | 140 in-lbs | 150 lbf   | 123 lbf      |
|      | Metric | 32 mm   | 11.3 N-m                | 39.5 N-m     | 15.8 N-m   | 667 N     | 546 N        |
| 40   | Inch   | 1.50 in | 275 in-lbs              | 600 in-lbs   | 220 in-lbs | 225 lbf   | 177 lbf      |
|      | Metric | 38 mm   | 31.1 N-m                | 67.8 N-m     | 24.9 N-m   | 1,001 N   | 786 N        |
| 50   | Inch   | 2.00 in | 315 in-lbs              | 1,155 in-lbs | 341 in-lbs | 315 lbf   | 314 lbf      |
|      | Metric | 50 mm   | 35.6 N-m                | 131 N-m      | 38.5 N-m   | 1,401 N   | 1,397 N      |
| 63   | Inch   | 2.50 in | 585 in-lbs              | 2,340 in-lbs | 520 in-lbs | 520 lbf   | 491 lbf      |
|      | Metric | 64 mm   | 66.1 N-m                | 264 N-m      | 58.8 N-m   | 2,313 N   | 2,184 N      |

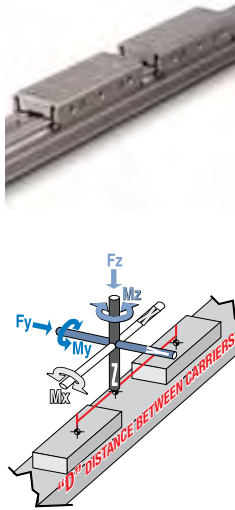
**!** Ratings are the maximum values for shock-free, vibration-free operation in a typical industrial environment. Contact Tolomatic for assistance in selecting the most appropriate actuator for your application.

The moment and load capacity of the actuator's bearing system is based on an L10 life of 200,000,000 linear inches of travel. Life of the actuator will vary for each application depending on the combined loads, motion parameters and operating conditions. The load factor ( $L_F$ ) ratios for each application must not exceed a value of 1 (as calculated below). Exceeding a load factor of 1 will diminish the actuator's rated life.

$$L_F = \frac{M_x}{M_{x_{max}}} + \frac{M_y}{M_{y_{max}}} + \frac{M_z}{M_{z_{max}}} + \frac{F_y}{F_{y_{max}}} + \frac{F_z}{F_{z_{max}}} \leq 1$$

With combined loads,  $L_F$  must not exceed the value 1.

**DW AUXILIARY CARRIER**



| BORE |        |         | "D" MIN | MAXIMUM BENDING MOMENTS* |              |              | MAX. LOAD | THRUST (at 100 PSI) |
|------|--------|---------|---------|--------------------------|--------------|--------------|-----------|---------------------|
|      |        |         |         | MxA                      | MyA          | MzA          | FzA       |                     |
| 16   | Inch   | 0.63 in | 5.0 in  | 44 in-lbs                | 175 in-lbs   | 175 in-lbs   | 70 lbf    | 30.7 lbf            |
|      | Metric | 16 mm   | 127 mm  | 5.0 N-m                  | 19.8 N-m     | 19.8 N-m     | 311 N     | 136 N               |
| 25   | Inch   | 1.00 in | 6.0 in  | 120 in-lbs               | 420 in-lbs   | 420 in-lbs   | 140 lbf   | 78.5 lbf            |
|      | Metric | 25 mm   | 152 mm  | 13.6 N-m                 | 47.5 N-m     | 47.5 N-m     | 623 N     | 349 N               |
| 32   | Inch   | 1.25 in | 7.0 in  | 200 in-lbs               | 1,050 in-lbs | 1,050 in-lbs | 300 lbf   | 123 lbf             |
|      | Metric | 32 mm   | 178 mm  | 22.6 N-m                 | 119 N-m      | 119 N-m      | 1,334 N   | 546 N               |
| 40   | Inch   | 1.50 in | 8.5 in  | 550 in-lbs               | 1,913 in-lbs | 1,913 in-lbs | 450 lbf   | 177 lbf             |
|      | Metric | 38 mm   | 216 mm  | 62.1 N-m                 | 216 N-m      | 216 N-m      | 2,002 N   | 786 N               |
| 50   | Inch   | 2.00 in | 8.6 in  | 630 in-lbs               | 2,709 in-lbs | 2,709 in-lbs | 630 lbf   | 314 lbf             |
|      | Metric | 50 mm   | 218 mm  | 71.2 N-m                 | 306 N-m      | 306 N-m      | 2,802 N   | 1,397 N             |
| 63   | Inch   | 2.50 in | 13.0 in | 1,170 in-lbs             | 6,760 in-lbs | 6,760 in-lbs | 1,040 lbf | 491 lbf             |
|      | Metric | 64 mm   | 330 mm  | 132 N-m                  | 764 N-m      | 764 N-m      | 4,626 N   | 2,184 N             |

\*At minimum "D" distance between carriers see graph below for other distances

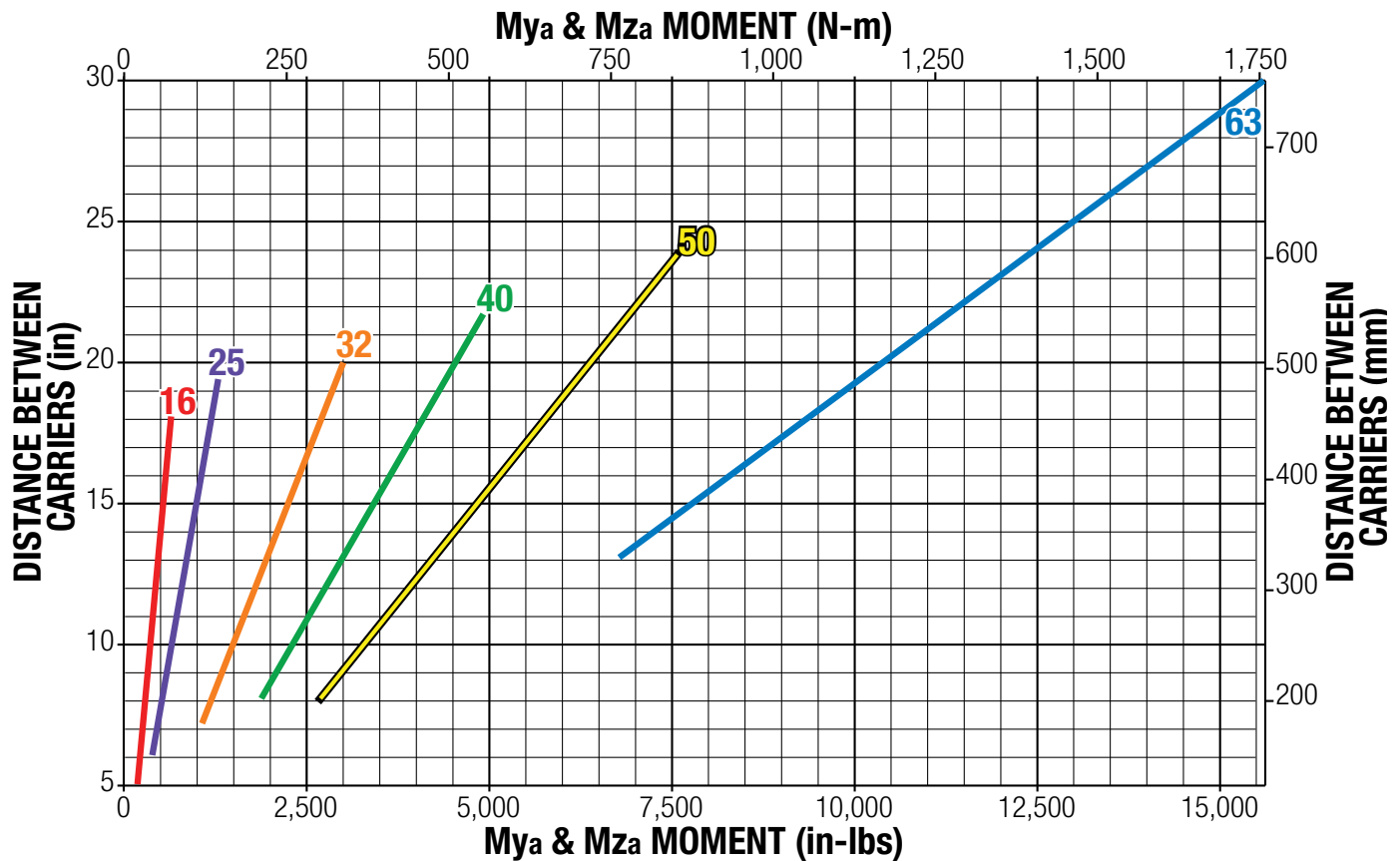
With combined loads,  $L_F$  must not exceed the value 1.

$$L_F = \frac{M_x}{M_{x_{max}}} + \frac{M_y}{M_{y_{max}}} + \frac{M_z}{M_{z_{max}}} + \frac{F_y}{F_{y_{max}}} + \frac{F_z}{F_{z_{max}}} \leq 1$$



**Ratings are the maximum values for shock-free, vibration-free operation in a typical industrial environment. Contact Tolomatic for assistance in selecting the most appropriate actuator for your application.**

## Mya & Mza vs. DISTANCE



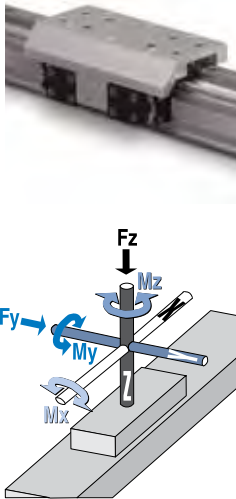
**Ratings were calculated with the following conditions:**

- 1.) Coupling between carriers is rigid.
- 2.) Load is equally distributed between carriers.

- 3.) Coupling device applies no misaligned loads to carriers.



## STANDARD



| BORE |        |         | MAXIMUM BENDING MOMENTS |                |                | MAX. LOAD      |                | THRUST<br>(at 100 PSI) |
|------|--------|---------|-------------------------|----------------|----------------|----------------|----------------|------------------------|
|      |        |         | M <sub>x</sub>          | M <sub>y</sub> | M <sub>z</sub> | F <sub>y</sub> | F <sub>z</sub> |                        |
| 16   | Inch   | 0.63 in | 39 in-lbs               | 339 in-lbs     | 339 in-lbs     | 217 lbf        | 217 lbf        | 30.7 lbf               |
|      | Metric | 16 mm   | 4.5 N-m                 | 38.3 N-m       | 38.3 N-m       | 966 N          | 966 N          | 136 N                  |
| 25   | Inch   | 1.00 in | 126 in-lbs              | 502 in-lbs     | 377 in-lbs     | 449 lbf        | 449 lbf        | 78.5 lbf               |
|      | Metric | 25 mm   | 14.3 N-m                | 56.7 N-m       | 42.6 N-m       | 1,996 N        | 1,996 N        | 349 N                  |
| 32   | Inch   | 1.25 in | 226 in-lbs              | 1,344 in-lbs   | 1,344 in-lbs   | 569 lbf        | 569 lbf        | 123 lbf                |
|      | Metric | 32 mm   | 25.6 N-m                | 152 N-m        | 152 N-m        | 2,531 N        | 2,531 N        | 546 N                  |
| 40   | Inch   | 1.50 in | 600 in-lbs              | 1,913 in-lbs   | 1,913 in-lbs   | 736 lbf        | 736 lbf        | 177 lbf                |
|      | Metric | 38 mm   | 67.8 N-m                | 216 N-m        | 216 N-m        | 3,274 N        | 3,274 N        | 786 N                  |
| 50   | Inch   | 2.00 in | 811 in-lbs              | 3,483 in-lbs   | 3,483 in-lbs   | 1,014 lbf      | 1,014 lbf      | 314 lbf                |
|      | Metric | 50 mm   | 91.7 N-m                | 394 N-m        | 394 N-m        | 4,510 N        | 4,510 N        | 1,397 N                |
| 63   | Inch   | 2.50 in | 1,019 in-lbs            | 5,339 in-lbs   | 5,339 in-lbs   | 1,292 lbf      | 1,292 lbf      | 491 lbf                |
|      | Metric | 64 mm   | 115 N-m                 | 603 N-m        | 603 N-m        | 5,745 N        | 5,745 N        | 2,184 N                |

**NOTE:** Mating surface of component mounted to carrier must maintain a flatness of at least 0.0015" (0.040 mm)

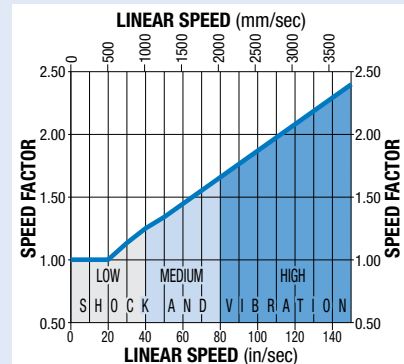
**Ratings are the maximum values for shock-free, vibration-free operation in a typical industrial environment. Contact Tolomatic for assistance in selecting the most appropriate actuator for your application.**



Use sizing software or call Tolomatic (1-800-328-2174) with application information. We will provide any assistance needed to determine the proper MXP band cylinder.

## SPEED FACTOR

**FOR APPLICATIONS WITH HIGH SPEED OR SIGNIFICANT SHOCK AND VIBRATION:** Calculated values of loads and bending moments must be increased by speed factor from the graph at right to obtain full rated life of profiled rail bearing system.



## PROFILED RAIL LUBRICATION

Proper lubrication of profiled rail bearing system is essential for normal operation and achievement of full rated life of MX--P actuators. Lubrication should be performed at intervals of 4,000,000 inches of travel or once every year, whichever occurs first. **However, operating conditions such as high speed or significant shock and vibration may require more frequent lubrication.** Please consult Tolomatic for recommendations.

### Recommended grease types:

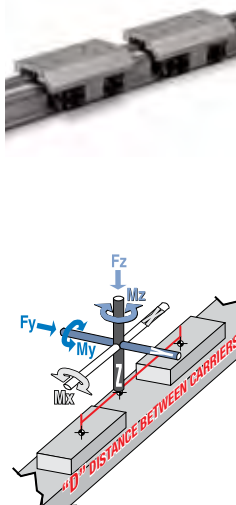
1. Refined mineral oil-based multi-purpose grease with lithium thickening agent.
2. High-grade synthetic oil-based grease with urea thickening agent.

The moment and load capacity of the actuator's bearing system is based on an L10 life of 200,000,000 linear inches of travel. Life of the actuator will vary for each application depending on the combined loads, motion parameters and operating conditions. The load factor ( $L_F$ ) ratios for each application must not exceed a value of 1 (as calculated below). Exceeding a load factor of 1 will diminish the actuator's rated life.

$$L_F = \frac{M_x}{M_{x_{max}}} + \frac{M_y}{M_{y_{max}}} + \frac{M_z}{M_{z_{max}}} + \frac{F_y}{F_{y_{max}}} + \frac{F_z}{F_{z_{max}}} \leq 1$$

With combined loads,  $L_F$  must not exceed the value 1.

## DW AUXILIARY CARRIER



| BORE |        |         | "D" MIN | MAXIMUM BENDING MOMENTS* |              |              | MAX. LOAD |           | THRUST (at 100 PSI) |
|------|--------|---------|---------|--------------------------|--------------|--------------|-----------|-----------|---------------------|
|      |        |         |         | MxA                      | MyA          | MzA          | FzA       | FyA       |                     |
| 16   | Inch   | 0.63 in | 5.0 in  | 79 in-lbs                | 620 in-lbs   | 620 in-lbs   | 434 lbf   | 434 lbf   | 30.7 lbf            |
|      | Metric | 16 mm   | 127 mm  | 8.9 N-m                  | 70.1 N-m     | 70.1 N-m     | 1,932 N   | 1,932 N   | 136 N               |
| 25   | Inch   | 1.00 in | 6.0 in  | 252 in-lbs               | 1,610 in-lbs | 1,610 in-lbs | 898 lbf   | 898 lbf   | 78.5 lbf            |
|      | Metric | 25 mm   | 152 mm  | 28.5 N-m                 | 182 N-m      | 182 N-m      | 3,993 N   | 3,993 N   | 349 N               |
| 32   | Inch   | 1.25 in | 7.0 in  | 453 in-lbs               | 2,202 in-lbs | 2,202 in-lbs | 1,138 lbf | 1,138 lbf | 123 lbf             |
|      | Metric | 32 mm   | 178 mm  | 51.1 N-m                 | 249 N-m      | 249 N-m      | 5,063 N   | 5,063 N   | 546 N               |
| 38   | Inch   | 1.50 in | 8.5 in  | 1,208 in-lbs             | 3,601 in-lbs | 3,601 in-lbs | 1,472 lbf | 1,472 lbf | 177 lbf             |
|      | Metric | 38 mm   | 216 mm  | 137 N-m                  | 407 N-m      | 407 N-m      | 6,549 N   | 6,549 N   | 786 N               |
| 50   | Inch   | 2.00 in | 8.6 in  | 1,623 in-lbs             | 4,966 in-lbs | 4,966 in-lbs | 2,028 lbf | 2,028 lbf | 314 lbf             |
|      | Metric | 50 mm   | 218 mm  | 183 N-m                  | 561 N-m      | 561 N-m      | 9,020 N   | 9,020 N   | 1,397 N             |
| 63   | Inch   | 2.50 in | 13.0 in | 2,038 in-lbs             | 9,508 in-lbs | 9,508 in-lbs | 2,583 lbf | 2,583 lbf | 491 lbf             |
|      | Metric | 64 mm   | 330 mm  | 230 N-m                  | 1,074 N-m    | 1,074 N-m    | 11,490 N  | 11,490 N  | 2,184 N             |

\*At minimum "D" distance between carriers see graph below for other distances

With combined loads,  $L_f$  must not exceed the value 1.

$$L_f = \frac{M_x}{M_{x_{max}}} + \frac{M_y}{M_{y_{max}}} + \frac{M_z}{M_{z_{max}}} + \frac{F_y}{F_{y_{max}}} + \frac{F_z}{F_{z_{max}}} \leq 1$$

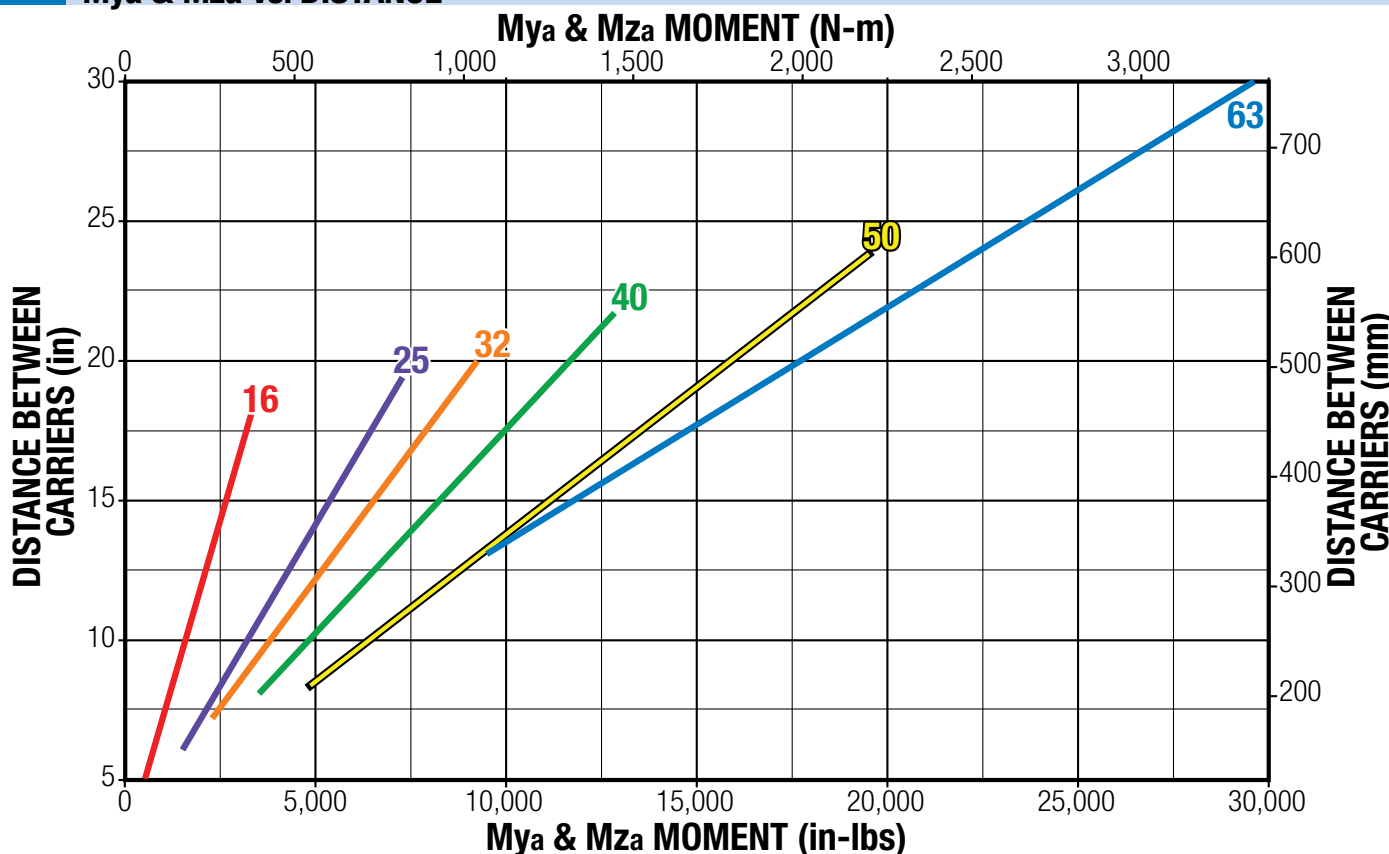


**Ratings are the maximum values for shock-free, vibration-free operation in a typical industrial environment. Contact Tolomatic for assistance in selecting the most appropriate actuator for your application.**



**NOTE: Mating surface of component mounted to carrier must maintain a flatness of at least 0.0015" (0.040 mm)**

## Mya & Mza vs. DISTANCE



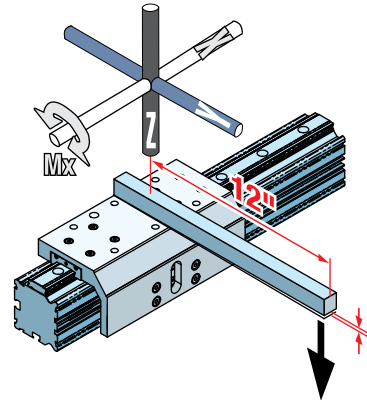
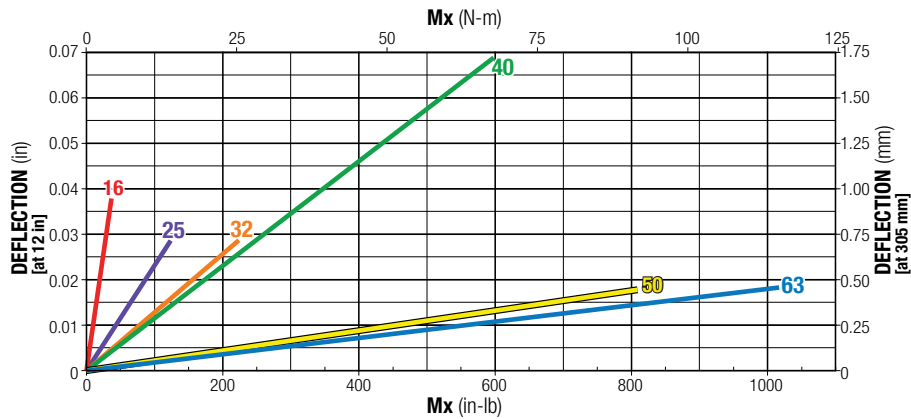
**Ratings were calculated with the following conditions:**

- 1.) Coupling between carriers is rigid.
- 2.) Load is equally distributed between carriers.

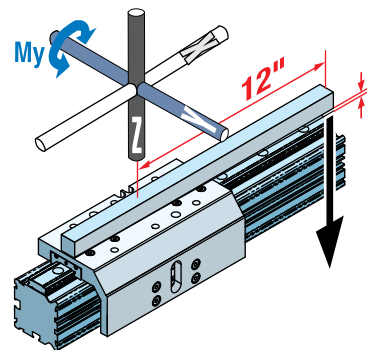
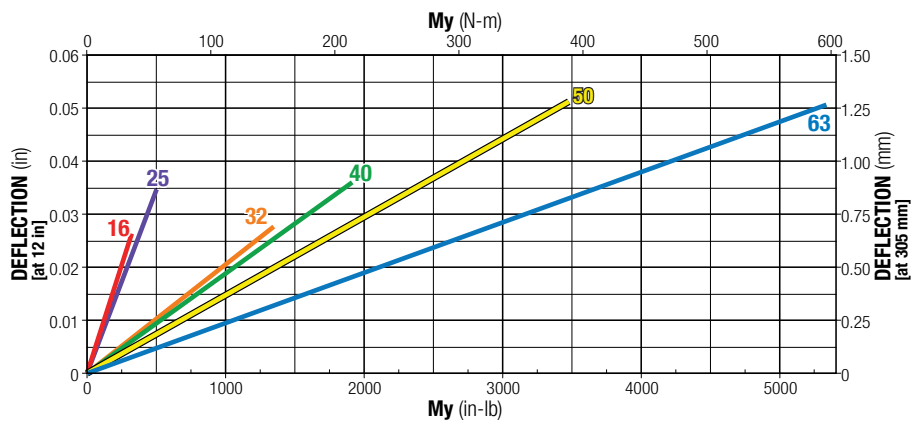
- 3.) Coupling device applies no misaligned loads to carriers.



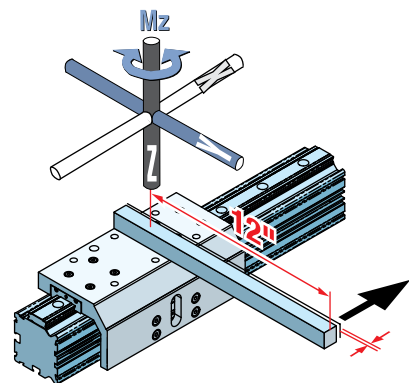
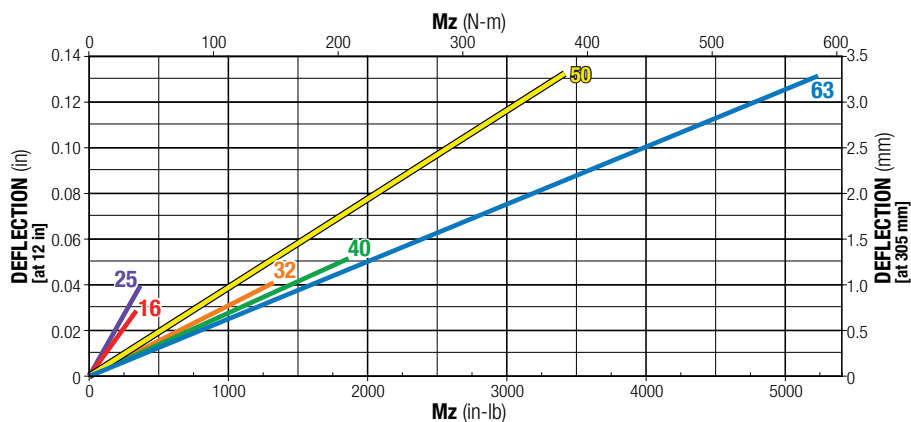
## DEFLECTION ABOUT X AXIS



## DEFLECTION ABOUT Y AXIS



## DEFLECTION ABOUT Z AXIS



### DEFLECTION TESTING WAS DONE UNDER THESE CRITERIA:

- 1.) Actuator was properly mounted with distance between mounting plates within recommendations (see Tube Clamp Requirements page MXP\_20)
- 2.) Deflection was measured at 12" from center of carrier as shown

# SPECIFICATIONS

|                                              |                          | SIZE  | 16        | 25     | 32     | 40     | 50     | 63     |
|----------------------------------------------|--------------------------|-------|-----------|--------|--------|--------|--------|--------|
| ACTUAL BORE SIZE                             |                          | in    | 0.63      | 1.00   | 1.25   | 1.50   | 2.00   | 2.50   |
|                                              |                          | mm    | 16        | 25     | 32     | 38     | 50     | 64     |
| BASE WEIGHT                                  | [N] INTERNAL BEARING     | lb    | 0.73      | 1.70   | 3.58   | 5.57   | 11.07  | 22.59  |
|                                              |                          | kg    | 0.33      | 0.77   | 1.62   | 2.53   | 5.02   | 10.25  |
|                                              | [S] SOLID BEARING        | lb    | 1.07      | 2.30   | 4.68   | 7.64   | 14.03  | 30.78  |
|                                              |                          | kg    | 0.48      | 1.04   | 2.12   | 3.47   | 6.36   | 13.96  |
|                                              | [P] PROFILED RAIL        | lb    | 1.25      | 2.94   | 5.89   | 9.91   | 17.22  | 31.64  |
|                                              |                          | kg    | 0.57      | 1.33   | 2.67   | 4.5    | 7.81   | 14.35  |
| WEIGHT PER UNIT OF STROKE                    | [N] INTERNAL & [S] SOLID | lb/in | 0.082     | 0.134  | 0.233  | 0.306  | 0.513  | 0.879  |
|                                              |                          | kg/mm | 0.0015    | 0.0024 | 0.0042 | 0.0055 | 0.0092 | 0.0157 |
|                                              | [P] PROFILED RAIL        | lb/in | 0.102     | 0.192  | 0.316  | 0.491  | 0.701  | 1.153  |
|                                              |                          | kg/mm | 0.0018    | 0.0034 | 0.0056 | 0.0088 | 0.0125 | 0.0206 |
| MAXIMUM STROKE LENGTH                        |                          | in    | 206       | 206    | 205    | 203    | 203    | 103    |
|                                              |                          | mm    | 5232      | 5232   | 5207   | 5156   | 5156   | 2616   |
| AUXILIARY CARRIER; MIN. "D" BETWEEN CARRIERS |                          | in    | 5.00      | 6.00   | 7.00   | 8.50   | 8.60   | 13.00  |
|                                              |                          | mm    | 127.0     | 152.4  | 177.8  | 215.9  | 218.4  | 330.2  |
| MAXIMUM OPERATING PRESSURE                   |                          | PSI   | 100       |        |        |        |        |        |
|                                              |                          | bar   | 6.9       |        |        |        |        |        |
| TEMPERATURE RANGE                            |                          | °F    | 20 to 140 |        |        |        |        |        |
|                                              |                          | °C    | -7 to 60  |        |        |        |        |        |

## TIPS FOR MAXIMIZING BAND CYLINDER LIFE

TO GET THE MOST LIFE OUT OF YOUR MXP BAND CYLINDER FOLLOW THESE SIMPLE GUIDELINES WHEN SIZING A BAND CYLINDER FOR AN APPLICATION.

Four factors that affect the life of a band cylinder are **Load, Speed, Environment and Deceleration**. The following tips will help you select the appropriate band cylinder for a specific application's loads and speeds to maximize actuator life.

### 1 LOAD: KEEP THE LOAD FACTOR LESS THAN 1

Applications with multiple loads put additional stress on the band cylinder's bearing system. It is important to account for all these loads to make sure the bearing system is not over loaded. Both static and dynamic loads need to be addressed.

The formula below can be used to calculate the load factor:

$$L_F = \frac{M_x}{M_{x_{max}}} + \frac{M_y}{M_{y_{max}}} + \frac{M_z}{M_{z_{max}}} + \frac{F_y}{F_{y_{max}}} + \frac{F_z}{F_{z_{max}}} \leq 1$$

### 2 SPEED: REDUCE SPEEDS

High speeds and cycle rates stress the band cylinder's guidance system more than slower applications. Keeping speeds reduced will optimize the life of the actuator.

### 3 ENVIRONMENT: KEEP CONTAMINATION OFF BAND AND MOVING SURFACES

Contamination will decrease band cylinder service life. Service life can be improved by orienting the band and bearing system 180 degrees from the contamination source. For instance, if solid particulates are falling on the actuator, it is best to try to orient the band cylinder so that the band and bearing system are shielded from the particulates.

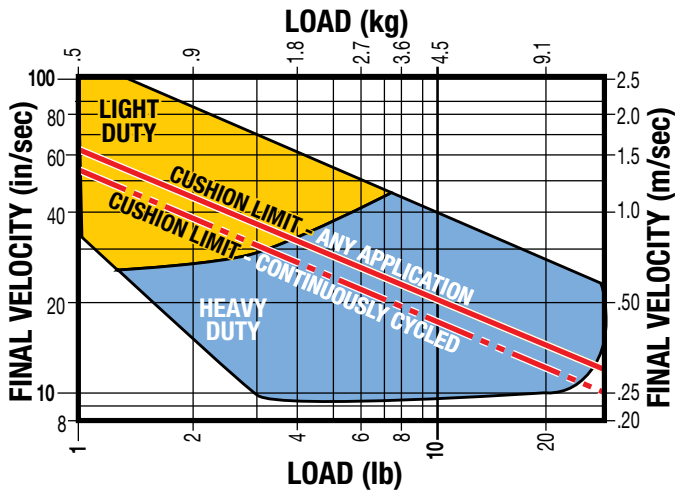
### 4 DECELERATION: DECELERATE WITH SHOCK ABSORBERS

Shock absorbers provide the most controlled and reliable deceleration at the end of stroke. Stopping in a controlled fashion will significantly decrease the inertia loads on the carrier bearings, extending cylinder life. The best location for shock absorbers is at the center of gravity of the load.

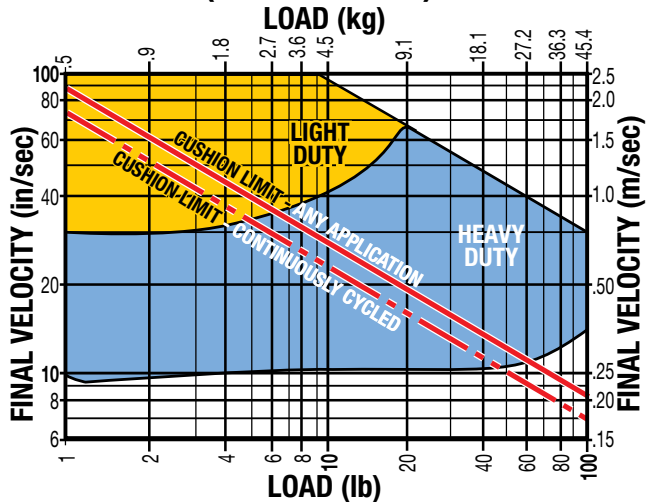


# CUSHION & SHOCK ABSORBER PERFORMANCE

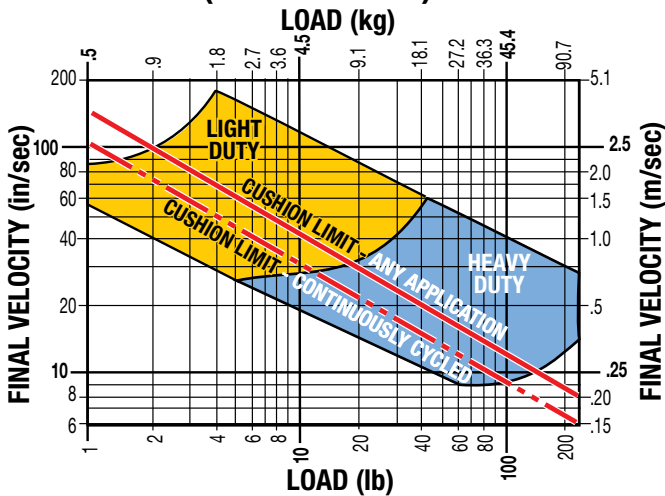
## MXP16 (ALL BEARINGS)



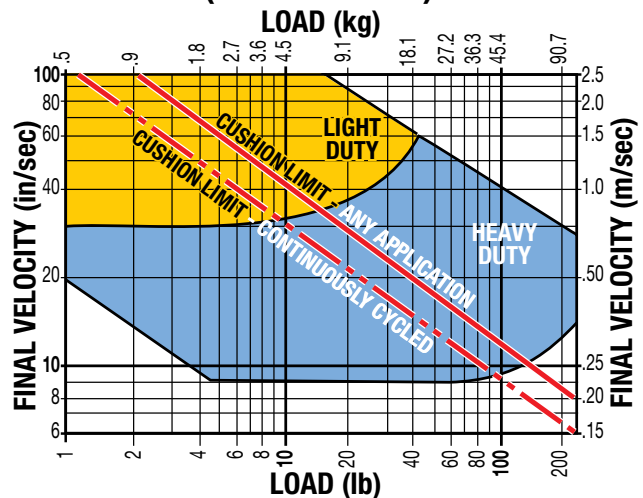
## MXP25 (ALL BEARINGS)



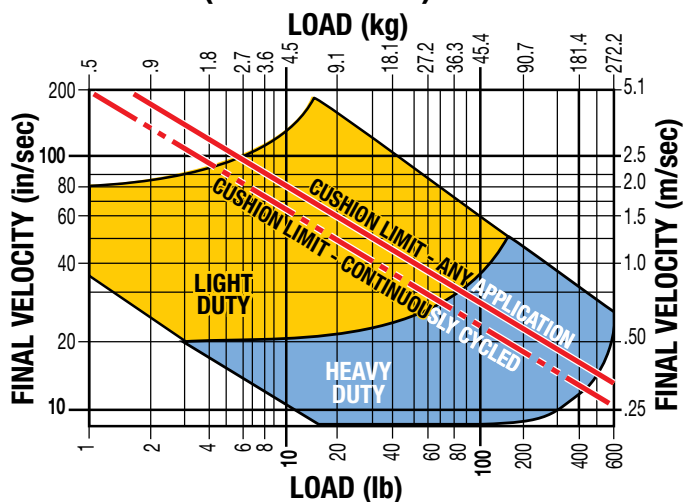
## MXP32 (ALL BEARINGS)



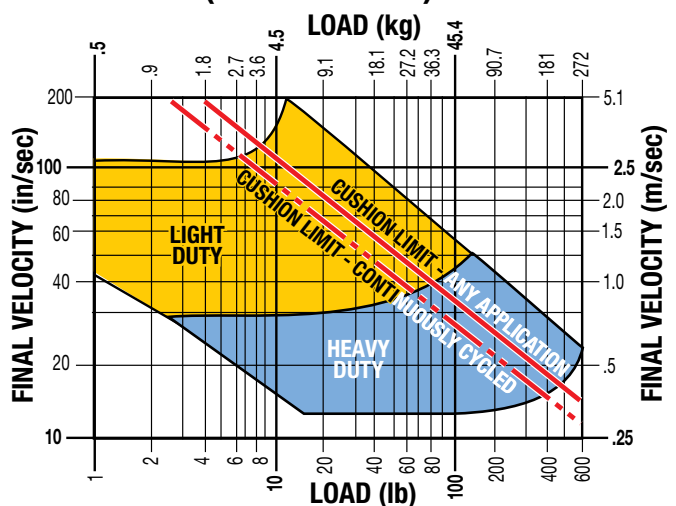
## MXP40 (ALL BEARINGS)



## MXP50 (ALL BEARINGS)



## MXP63 (ALL BEARINGS)



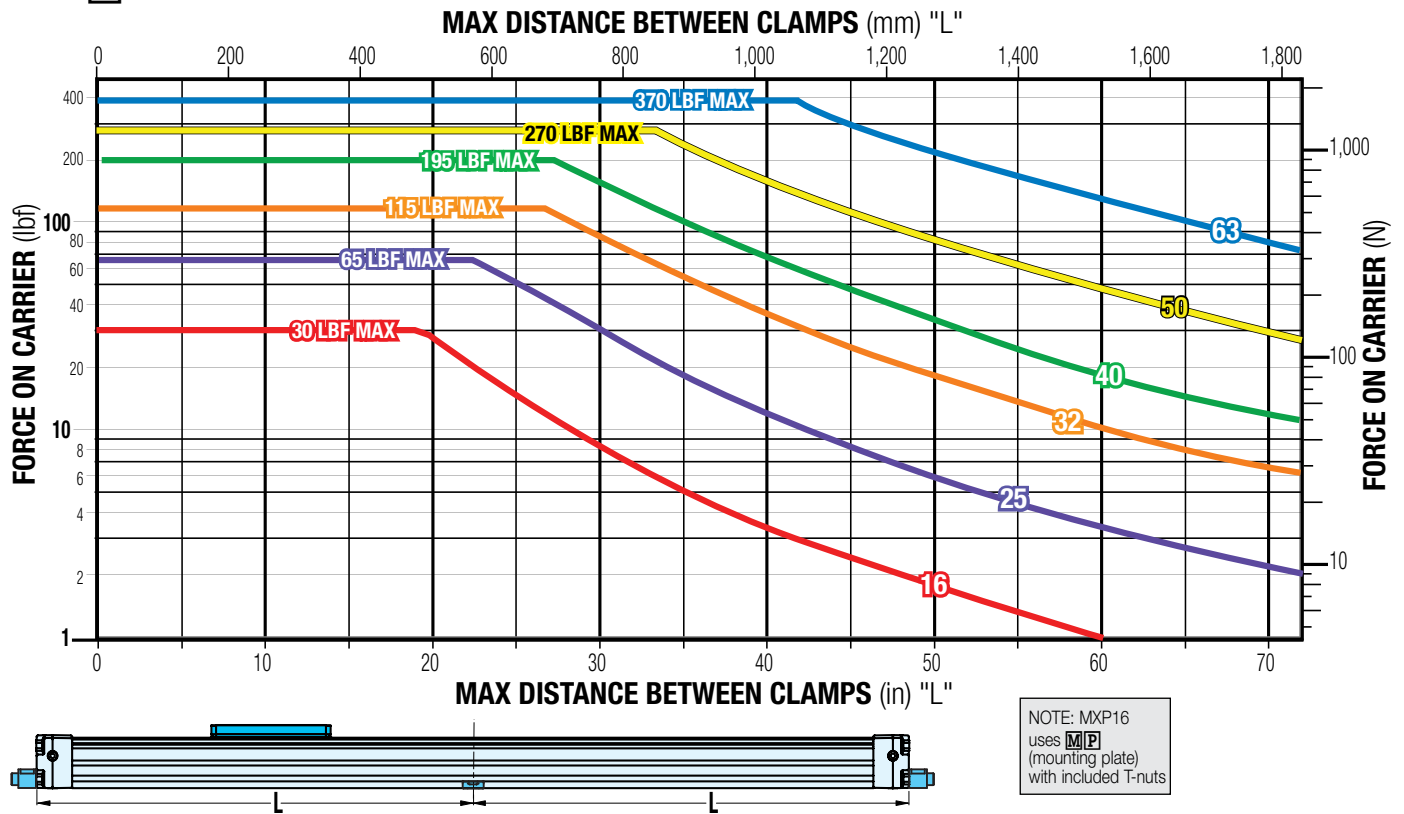
NOTE: If final (impact) velocity cannot be calculated directly, a reasonable guideline to use is 2X average velocity.



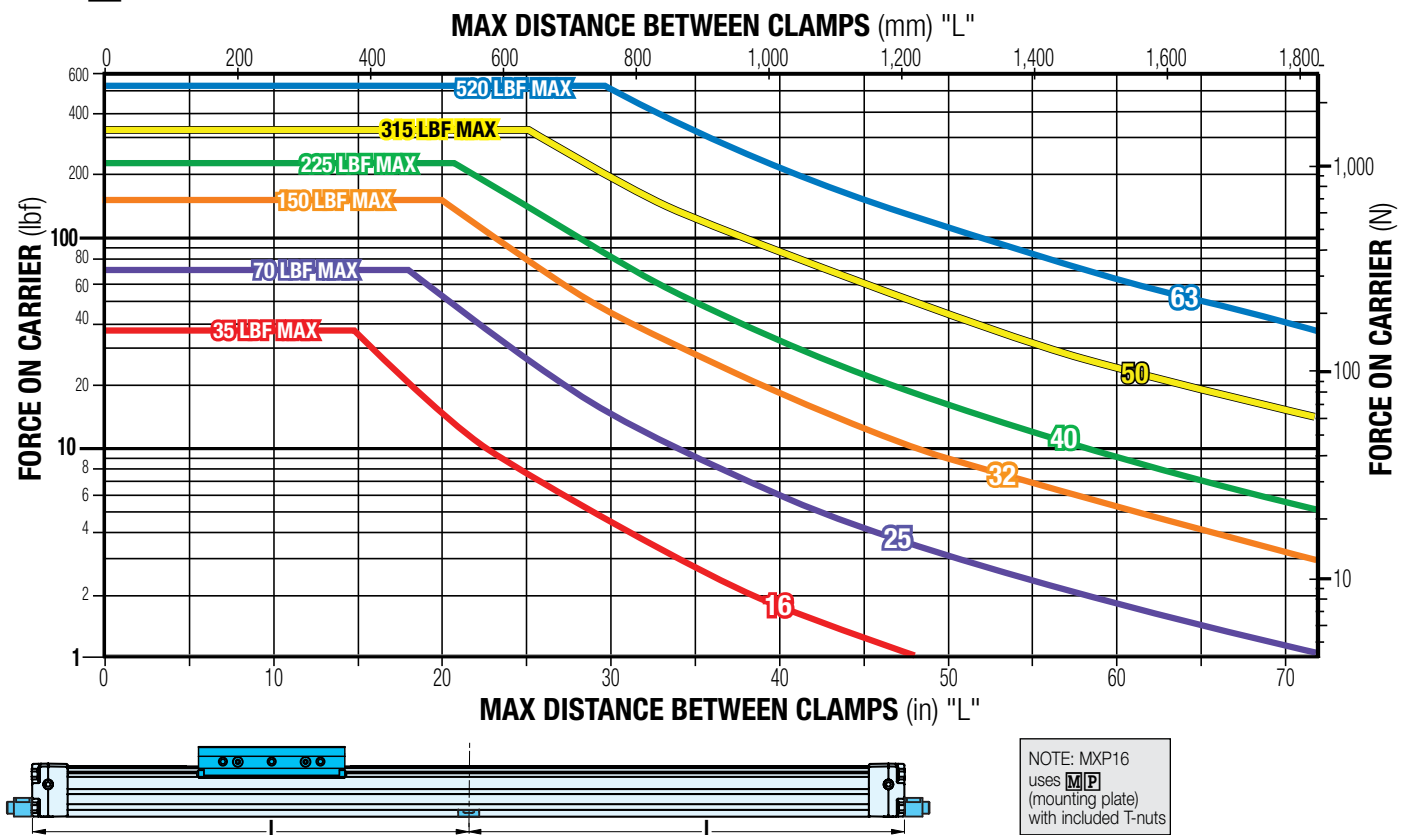
NOTE: When 2 shock absorbers are ordered, the MXP will be assembled with NO internal cushion seals.

# TUBE CLAMP REQUIREMENTS

## N INTERNAL BEARING

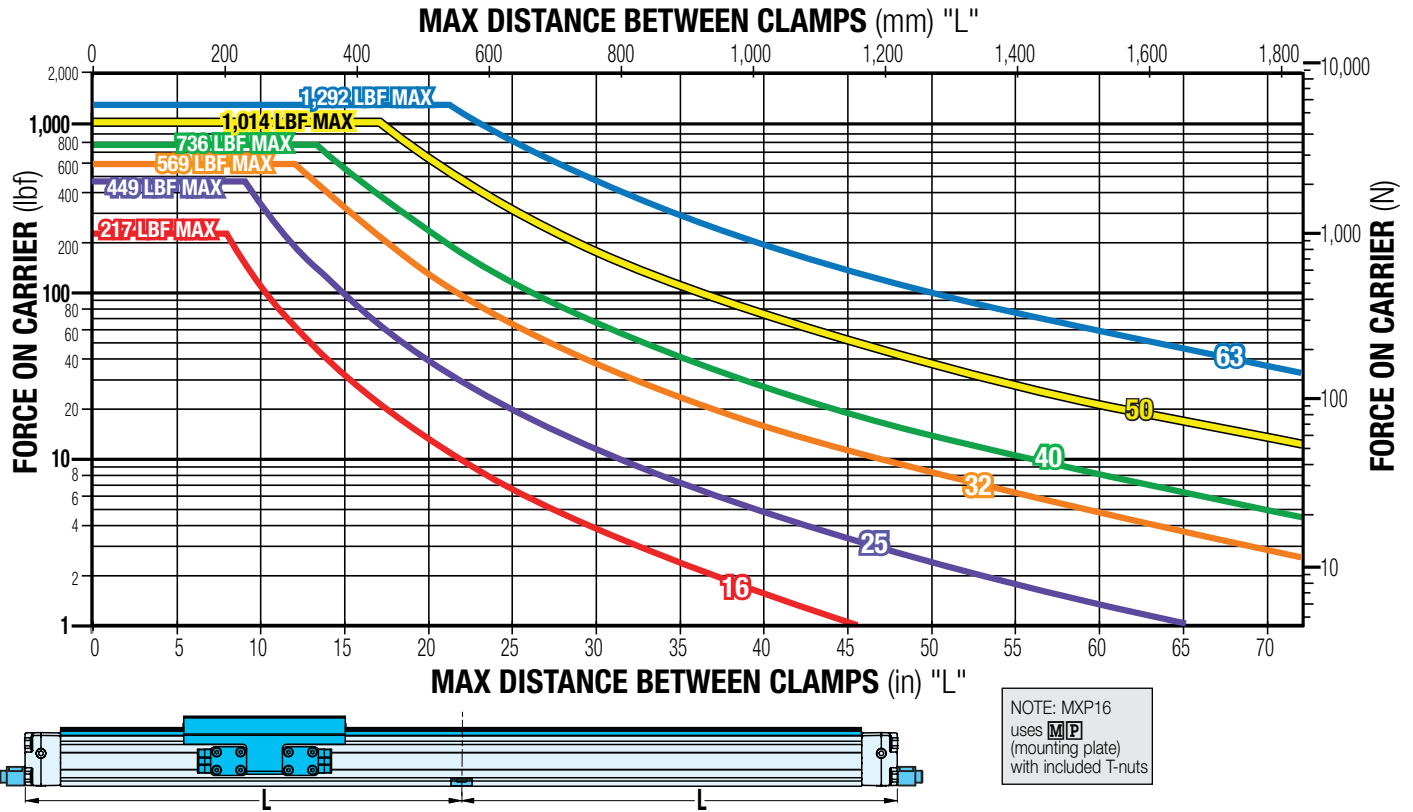


## S SOLID BEARING



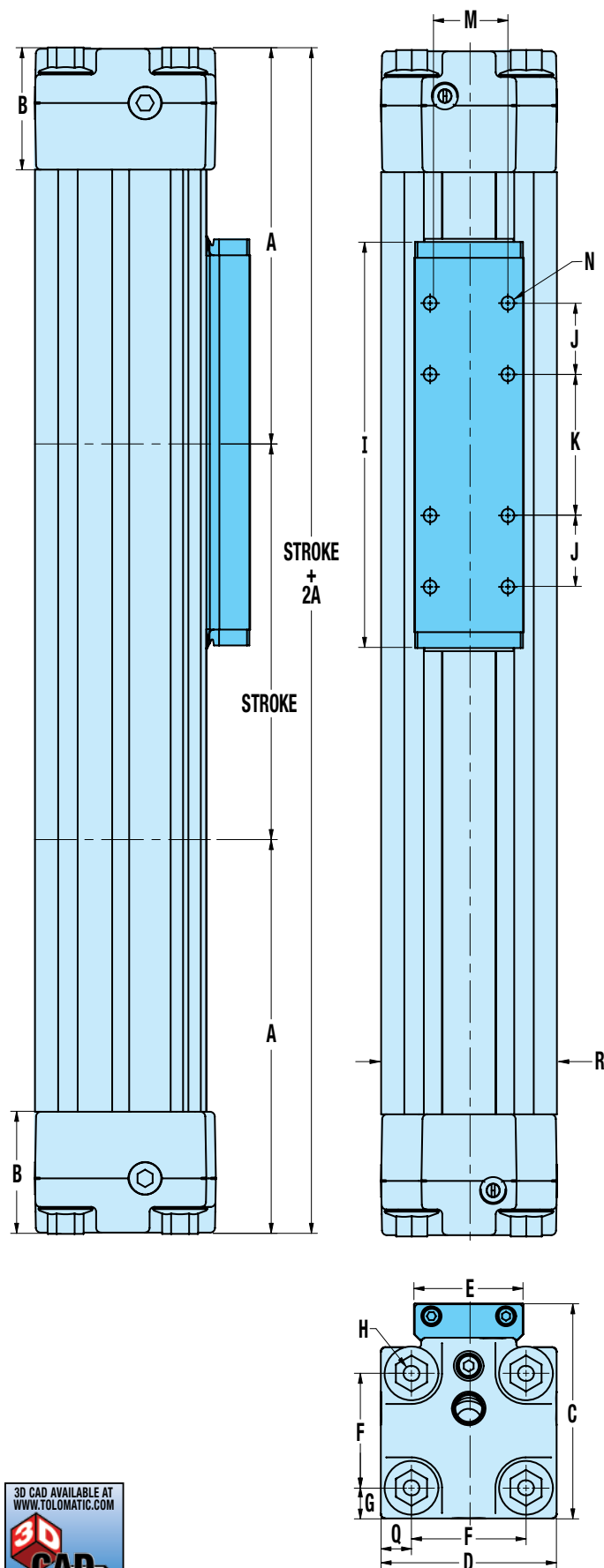
# TUBE CLAMP REQUIREMENTS

## P PROFILED RAIL





# N-INTERNAL BEARING ACTUATOR DIMENSIONS

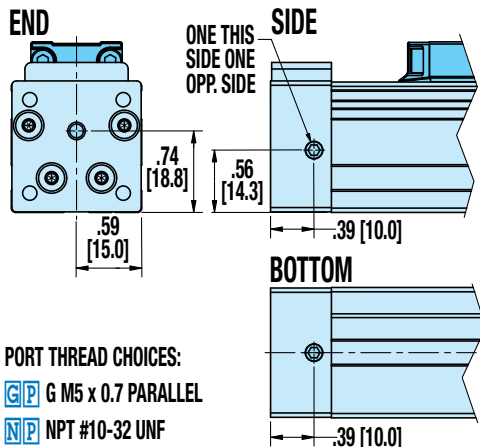


|           | MXP16                 | MXP25                 | MXP32                 | MXP40                 | MXP50                  | MXP63                  |
|-----------|-----------------------|-----------------------|-----------------------|-----------------------|------------------------|------------------------|
| <b>A</b>  | 3.13                  | 3.94                  | 4.89                  | 5.79                  | 6.26                   | 8.42                   |
| <i>mm</i> | <i>79.6</i>           | <i>100.2</i>          | <i>124.1</i>          | <i>147.1</i>          | <i>159.1</i>           | <i>213.8</i>           |
| <b>B</b>  | 0.55                  | 1.11                  | 1.50                  | 1.50                  | 1.97                   | 1.97                   |
| <i>mm</i> | <i>14.0</i>           | <i>28.3</i>           | <i>38.1</i>           | <i>38.0</i>           | <i>50.0</i>            | <i>50.0</i>            |
| <b>C</b>  | 1.55                  | 2.07                  | 2.67                  | 2.98                  | 3.86                   | 4.76                   |
| <i>mm</i> | <i>39.3</i>           | <i>52.6</i>           | <i>67.8</i>           | <i>75.8</i>           | <i>98.1</i>            | <i>120.8</i>           |
| <b>D</b>  | 1.18                  | 1.65                  | 2.18                  | 2.52                  | 3.01                   | 3.94                   |
| <i>mm</i> | <i>30.0</i>           | <i>42.0</i>           | <i>55.4</i>           | <i>64.0</i>           | <i>78.7</i>            | <i>100.0</i>           |
| <b>E</b>  | 0.83                  | 0.83                  | 1.36                  | 1.61                  | 2.13                   | 2.44                   |
| <i>mm</i> | <i>21.0</i>           | <i>21.0</i>           | <i>34.5</i>           | <i>41.0</i>           | <i>54.0</i>            | <i>62.0</i>            |
| <b>F</b>  | 0.85                  | 1.10                  | 1.42                  | 1.81                  | 2.25                   | 2.87                   |
| <i>mm</i> | <i>21.5</i>           | <i>27.9</i>           | <i>36.1</i>           | <i>46.0</i>           | <i>57.2</i>            | <i>73.0</i>            |
| <b>G</b>  | 0.17                  | 0.25                  | 0.38                  | 0.35                  | 0.43                   | 0.53                   |
| <i>mm</i> | <i>4.3</i>            | <i>6.3</i>            | <i>9.7</i>            | <i>9.0</i>            | <i>10.8</i>            | <i>13.5</i>            |
| <b>H</b>  | #8-32<br>(8)          | #10-24<br>(8)         | 1/4-20<br>(8)         | 1/4-20<br>(8)         | 5/16-18<br>(8)         | 5/16-18<br>(8)         |
| <i>mm</i> | <i>M4x0.7<br/>(8)</i> | <i>M5x0.8<br/>(8)</i> | <i>M6x1.0<br/>(8)</i> | <i>M6x1.0<br/>(8)</i> | <i>M8x1.25<br/>(8)</i> | <i>M8x1.25<br/>(8)</i> |
| <b>I</b>  | 3.78                  | 4.45                  | 5.04                  | 5.87                  | 6.57                   | 9.69                   |
| <i>mm</i> | <i>96.0</i>           | <i>113.0</i>          | <i>128.0</i>          | <i>149.0</i>          | <i>166.8</i>           | <i>246.0</i>           |
| <b>J</b>  | 0.59                  | 0.79                  | 0.89                  | 0.63                  | 1.13                   | 1.18                   |
| <i>mm</i> | <i>15.0</i>           | <i>20.0</i>           | <i>22.5</i>           | <i>15.9</i>           | <i>28.6</i>            | <i>30.0</i>            |
| <b>K</b>  | 1.18                  | 1.57                  | 1.75                  | 3.00                  | 2.25                   | 4.33                   |
| <i>mm</i> | <i>30.0</i>           | <i>40.0</i>           | <i>44.5</i>           | <i>76.2</i>           | <i>57.2</i>            | <i>110.0</i>           |
| <b>M</b>  | 0.63                  | 0.59                  | 0.96                  | 1.05                  | 1.50                   | 1.69                   |
| <i>mm</i> | <i>16.0</i>           | <i>15.0</i>           | <i>24.5</i>           | <i>26.7</i>           | <i>38.1</i>            | <i>43.0</i>            |
| <b>N</b>  | #6-32<br>(8)          | #8-32<br>(8)          | #10-32<br>(8)         | 1/4-20<br>(8)         | 5/16-18<br>(8)         | 3/8-16<br>(8)          |
| <i>mm</i> | <i>M3x0.5<br/>(8)</i> | <i>M4x0.7<br/>(8)</i> | <i>M5x0.8<br/>(8)</i> | <i>M6x1.0<br/>(8)</i> | <i>M8x1.25<br/>(8)</i> | <i>M10x1.5<br/>(8)</i> |
| <b>Q</b>  | 0.17                  | 0.28                  | 0.38                  | 0.35                  | 0.43                   | 0.53                   |
| <i>mm</i> | <i>4.3</i>            | <i>7.0</i>            | <i>9.7</i>            | <i>9.0</i>            | <i>10.8</i>            | <i>13.5</i>            |
| <b>R</b>  | 1.18                  | 1.65                  | 2.18                  | 2.52                  | 3.10                   | 3.94                   |
| <i>mm</i> | <i>30.00</i>          | <i>42.00</i>          | <i>55.37</i>          | <i>64.00</i>          | <i>78.74</i>           | <i>100.00</i>          |



## DUAL END PORTING

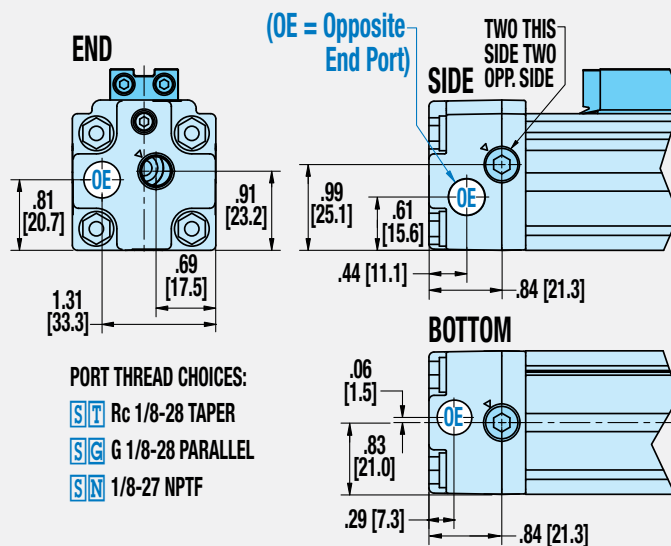
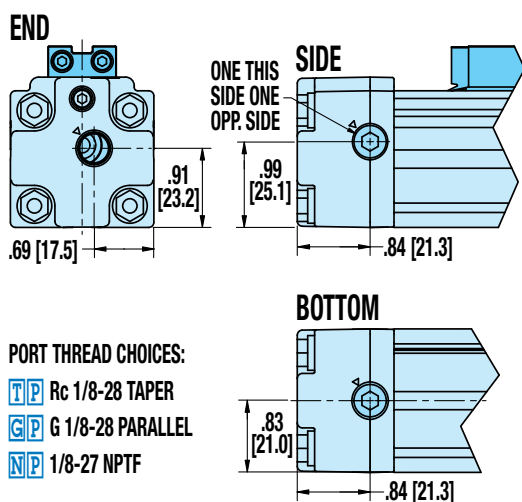
16mm  
BORE



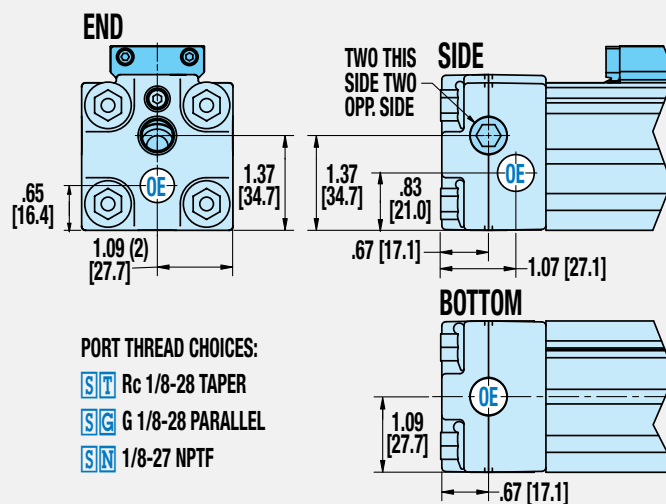
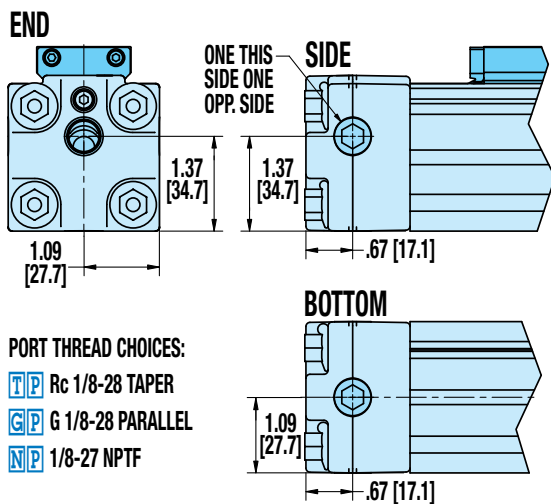
## SINGLE-END PORTING

Not Available for 16mm BORE

25mm  
BORE



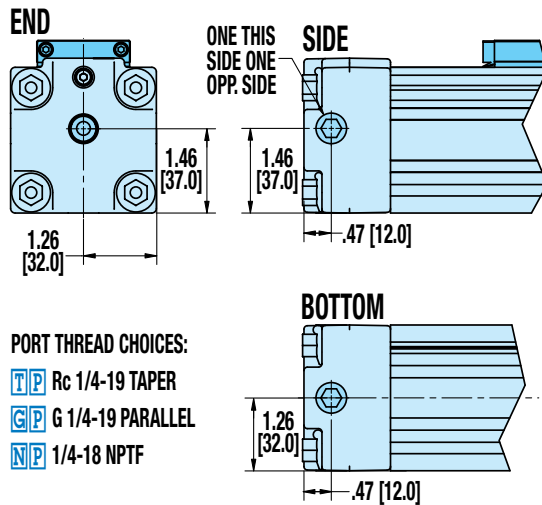
32mm  
BORE



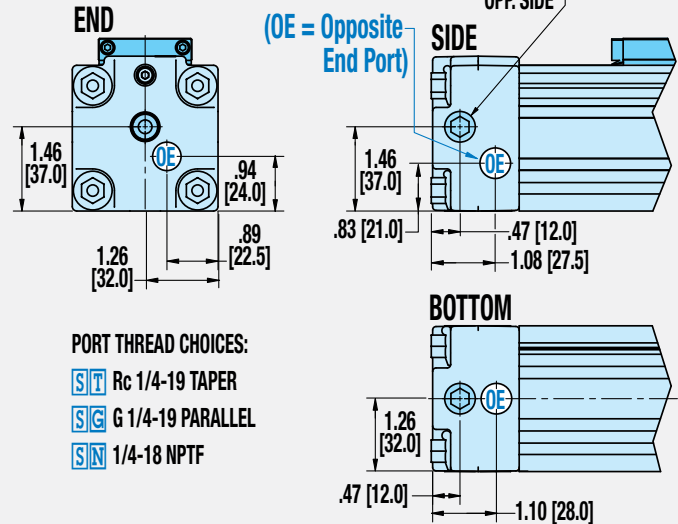
Dimensions in inches [brackets indicate dimensions in millimeters]

40mm  
BORE

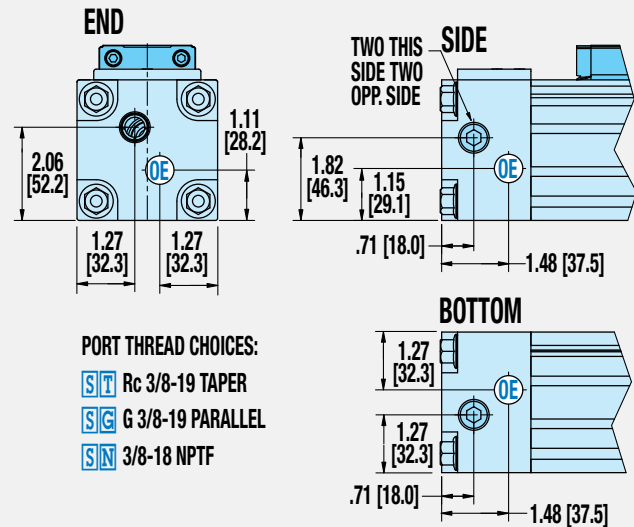
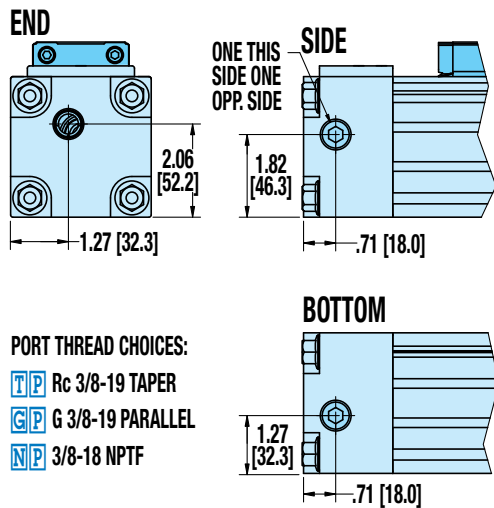
## DUAL END PORTING



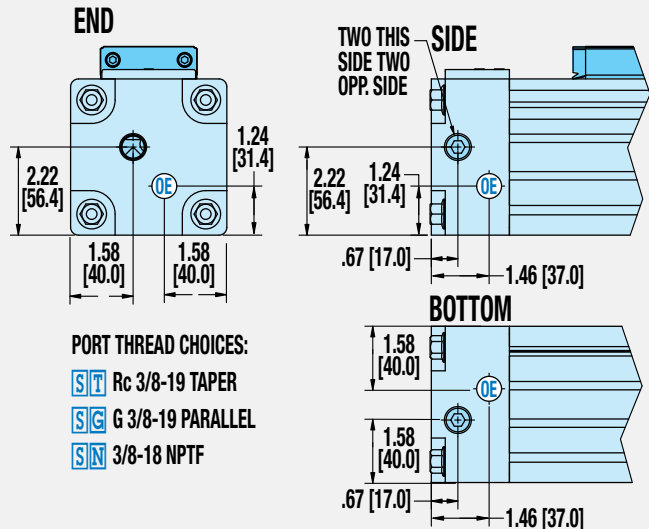
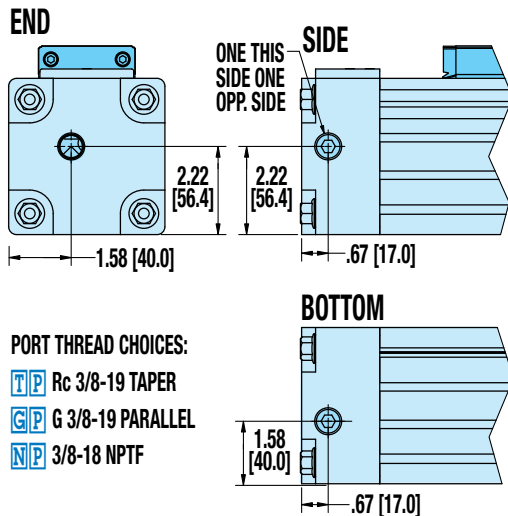
## SINGLE-END PORTING



50mm  
BORE



63mm  
BORE

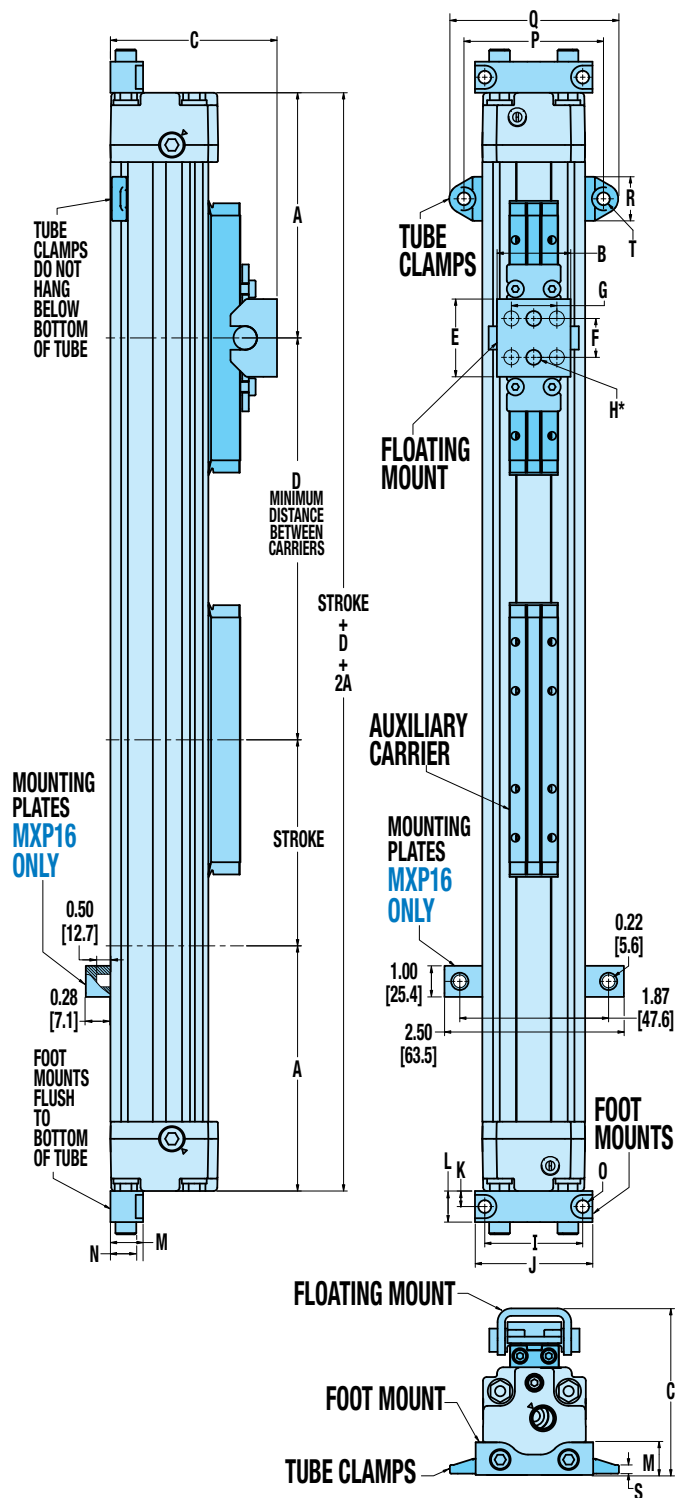


Dimensions in inches [brackets indicate dimensions in millimeters]



# N-INTERNAL BEARING OPTION DIMENSIONS

## AUXILIARY CARRIER, FLOATING MOUNT, FOOT MOUNT, TUBE CLAMPS



|                          | MXP16   | MXP25   | MXP32   | MXP40   | MXP50   | MXP63   |
|--------------------------|---------|---------|---------|---------|---------|---------|
| <b>A</b>                 | 3.13    | 3.94    | 4.89    | 5.79    | 6.26    | 8.42    |
| <i>mm</i>                | 79.6    | 100.2   | 124.1   | 147.1   | 159.1   | 213.8   |
| <b>AUXILIARY CARRIER</b> |         |         |         |         |         |         |
| <b>D</b>                 | 5.00    | 6.00    | 7.00    | 8.50    | 8.60    | 13.00   |
| <i>mm</i>                | 127.0   | 152.4   | 177.8   | 215.9   | 218.4   | 330.0   |
| <b>FLOATING MOUNT</b>    |         |         |         |         |         |         |
| <b>B</b>                 | 1.27    | 1.19    | 2.08    | 2.55    | 3.24    | 3.15    |
| <i>mm</i>                | 32.2    | 30.1    | 52.8    | 64.7    | 82.3    | 80.0    |
| <b>C</b>                 | 1.97    | 2.66    | 3.70    | 4.07    | 4.66    | 5.57    |
| <i>mm</i>                | 50.1    | 67.5    | 94.1    | 103.3   | 118.4   | 141.6   |
| <b>E</b>                 | 0.90    | 1.25    | 1.50    | 1.50    | 3.94    | 5.20    |
| <i>mm</i>                | 22.9    | 31.8    | 38.1    | 38.1    | 100.1   | 132.0   |
| <b>F</b>                 | 0.50    | 0.63    | 0.75    | 0.79    | 3.15    | 4.33    |
| <i>mm</i>                | 12.7    | 15.9    | 19.1    | 20.0    | 80.0    | 110.0   |
| <b>G</b>                 | -       | -       | 1.00    | 1.38    | -       | 1.69    |
| <i>mm</i>                | -       | -       | 25.4    | 35.0    | -       | 43.0    |
| <b>H*</b>                | 0.17(2) | 0.24(2) | 0.28(4) | 0.28(4) | 0.36(2) | 0.34(4) |
| <i>mm</i>                | 4.3(2)  | 6.1(2)  | 7.1(4)  | 7.1(4)  | 9.1(2)  | 8.7(4)  |
| <b>FOOT MOUNTS</b>       |         |         |         |         |         |         |
| <b>I</b>                 | 1.26    | 1.57    | 2.01    | 2.52    | 3.11    | 3.94    |
| <i>mm</i>                | 32.0    | 40.0    | 51.0    | 64.0    | 78.9    | 100.0   |
| <b>J</b>                 | 1.57    | 1.89    | 2.36    | 2.91    | 3.67    | 4.72    |
| <i>mm</i>                | 40.0    | 48.0    | 60.0    | 74.0    | 93.2    | 120.0   |
| <b>K</b>                 | 0.16    | 0.25    | 0.37    | 0.47    | 0.50    | 0.59    |
| <i>mm</i>                | 4.0     | 6.4     | 9.5     | 12.0    | 12.7    | 15.0    |
| <b>L</b>                 | 0.31    | 0.50    | 0.75    | 0.94    | 1.00    | 1.18    |
| <i>mm</i>                | 8.0     | 12.7    | 19.0    | 24.0    | 25.4    | 30.0    |
| <b>M</b>                 | 0.35    | 0.52    | 0.91    | 0.73    | 1.00    | 1.06    |
| <i>mm</i>                | 8.9     | 13.3    | 23.0    | 18.5    | 25.4    | 27.0    |
| <b>N</b>                 | -       | 0.41    | 0.71    | 0.45    | 0.69    | 0.65    |
| <i>mm</i>                | -       | 10.3    | 18.0    | 11.4    | 17.4    | 16.5    |
| <b>O</b>                 | 0.18    | 0.20    | 0.22    | 0.28    | 0.35    | 0.42    |
| <i>mm</i>                | 4.6     | 5.2     | 5.5     | 7.1     | 9.0     | 10.7    |
| <b>TUBE CLAMPS</b>       |         |         |         |         |         |         |
| <b>P</b>                 | -       | 2.24    | 2.92    | 3.26    | 3.84    | 5.19    |
| <i>mm</i>                | -       | 57.0    | 74.1    | 82.7    | 97.5    | 131.7   |
| <b>Q</b>                 | -       | 2.72    | 3.44    | 3.81    | 4.39    | 5.93    |
| <i>mm</i>                | -       | 69.0    | 87.4    | 96.7    | 111.5   | 150.7   |
| <b>R</b>                 | -       | 0.71    | 0.63    | 0.55    | 0.55    | 0.75    |
| <i>mm</i>                | -       | 18.0    | 16.0    | 14.0    | 14.0    | 19.0    |
| <b>S</b>                 | -       | 0.14    | 0.17    | 0.15    | 0.15    | 0.24    |
| <i>mm</i>                | -       | 3.6     | 4.3     | 3.8     | 3.8     | 6.1     |
| <b>T</b>                 | -       | 0.20    | 0.28    | 0.28    | 0.28    | 0.42    |
| <i>mm</i>                | -       | 5.2     | 7.1     | 7.1     | 7.1     | 10.7    |

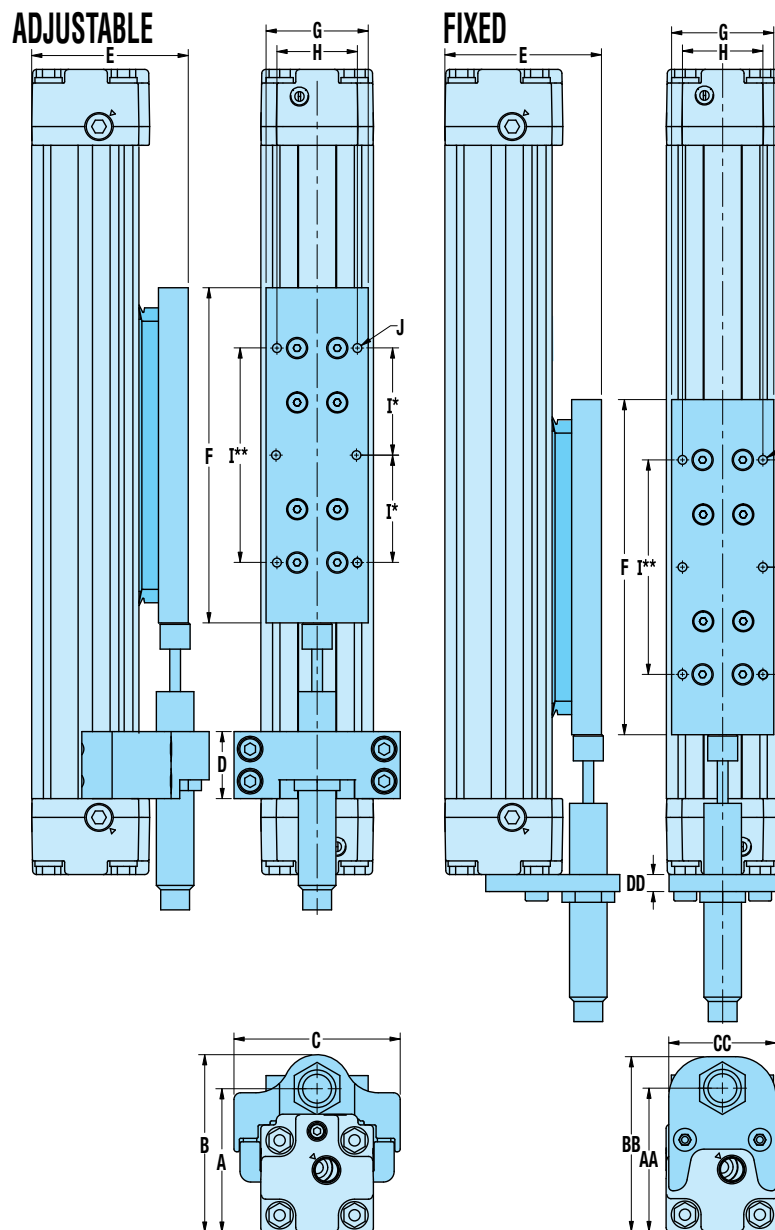
\*MXP16, 25 & 50 use 2 center holes,  
MXP32, 40 & 63 use 4 corner holes

**NOTE:** Auxiliary carrier is N-Internal Bearing carrier, see page MXP\_21 for carrier size and mounting dimensions



# N-INTERNAL BEARING OPTION DIMENSIONS

## ADJUSTABLE AND FIXED SHOCK ABSORBERS



### ADJUSTABLE SHOCK ABSORBER

|           | MXP16       | MXP25       | MXP32       | MXP40       | MXP50        | MXP63        |
|-----------|-------------|-------------|-------------|-------------|--------------|--------------|
| <b>A</b>  | 1.65        | 2.11        | 2.91        | 3.32        | 4.24         | 5.21         |
| <b>mm</b> | <b>42.0</b> | <b>53.5</b> | <b>73.8</b> | <b>84.4</b> | <b>107.6</b> | <b>132.4</b> |
| <b>B</b>  | 1.97        | 2.61        | 3.35        | 3.87        | 4.87         | 5.91         |
| <b>mm</b> | <b>50.0</b> | <b>66.2</b> | <b>85.0</b> | <b>98.4</b> | <b>123.8</b> | <b>150.0</b> |
| <b>C</b>  | 1.74        | 2.44        | 2.95        | 3.43        | 4.09         | 5.20         |
| <b>mm</b> | <b>44.3</b> | <b>62.0</b> | <b>74.9</b> | <b>87.0</b> | <b>103.9</b> | <b>132.0</b> |
| <b>D</b>  | 0.71        | 0.98        | 1.25        | 0.98        | 1.22         | 1.26         |
| <b>mm</b> | <b>18.0</b> | <b>25.0</b> | <b>31.8</b> | <b>25.0</b> | <b>31.0</b>  | <b>32.0</b>  |

### Stroke Adder: Adjustable Shock Absorber

| in | 0.49 | 1.06 | 1.17 | 0.76 | 0.81 | 0.51 |
|----|------|------|------|------|------|------|
| mm | 12.4 | 26.8 | 29.8 | 19.3 | 20.5 | 13.0 |

NOTE: For each adjustable shock absorber ordered, add Stroke Adder value to required stroke to determine configured actuator stroke.

$$\text{Required Stroke} + \left( \frac{\text{Adj. Shock} \times \text{Stroke Adder}}{\text{Quantity}} \right) = \text{Configured Actuator Stroke}$$

Example: MXP25N, 500mm stroke required, 2 adjustable shocks  
 $500 + (2 \times 26.8) = 500 + 53.6 = 553.6\text{mm}$

### SHOCK PLATE

|            | MXP16                 | MXP25                 | MXP32                 | MXP40                 | MXP50                  | MXP63                  |
|------------|-----------------------|-----------------------|-----------------------|-----------------------|------------------------|------------------------|
| <b>E</b>   | 1.81                  | 2.28                  | 3.17                  | 3.61                  | 4.55                   | 5.65                   |
| <b>mm</b>  | <b>46.0</b>           | <b>57.9</b>           | <b>80.5</b>           | <b>91.8</b>           | <b>115.6</b>           | <b>143.4</b>           |
| <b>F</b>   | 3.86                  | 4.92                  | 5.20                  | 6.72***               | 6.65                   | 10.29****              |
| <b>mm</b>  | <b>98.0</b>           | <b>125.0</b>          | <b>132.0</b>          | <b>170.8***</b>       | <b>168.8</b>           | <b>261.4****</b>       |
| <b>G</b>   | 0.94                  | 1.50                  | 1.32                  | 1.61                  | 2.13                   | 2.44                   |
| <b>mm</b>  | <b>24.0</b>           | <b>38.1</b>           | <b>33.5</b>           | <b>41.0</b>           | <b>54.0</b>            | <b>62.0</b>            |
| <b>H</b>   | 0.63                  | 1.18                  | 0.96                  | 1.05                  | 1.50                   | 1.69                   |
| <b>mm</b>  | <b>16.0</b>           | <b>30.0</b>           | <b>24.5</b>           | <b>26.7</b>           | <b>38.1</b>            | <b>43.0</b>            |
| <b>I*</b>  | 0.89                  | 1.57                  | -                     | -                     | -                      | -                      |
| <b>mm</b>  | <b>22.5</b>           | <b>40.0</b>           | -                     | -                     | -                      | -                      |
| <b>I**</b> | -                     | -                     | 1.75                  | 3.00                  | 2.25                   | 4.33                   |
| <b>mm</b>  | -                     | -                     | <b>44.5</b>           | <b>76.2</b>           | <b>57.2</b>            | <b>110.0</b>           |
| <b>J</b>   | #8-32<br>(6)          | #8-32<br>(6)          | #10-32<br>(4)         | 1/4-20<br>(4)         | 5/16-18<br>(4)         | 3/8-16<br>(4)          |
| <b>mm</b>  | <b>M4x0.8<br/>(6)</b> | <b>M4x0.8<br/>(6)</b> | <b>M5x0.8<br/>(4)</b> | <b>M6x1.0<br/>(4)</b> | <b>M8x1.25<br/>(4)</b> | <b>M10x1.5<br/>(4)</b> |

\*MXP16 & 25 Shock plate has 6 mounting holes

\*\*MXP32, 40, 50 & 63 Shock plate has 4 mounting holes

\*\*\*MXP40 Shock Stop Plate has impact bolts. Actual plate length is 5.98" (152mm); Impact bolts, one on each end, add .74" (18.8mm) to total length

\*\*\*\*MXP63 Shock Stop Plate has impact bolts. Actual plate length is 9.84" (250mm); Impact bolts, one on each end, add .45" (11.4mm) to total length

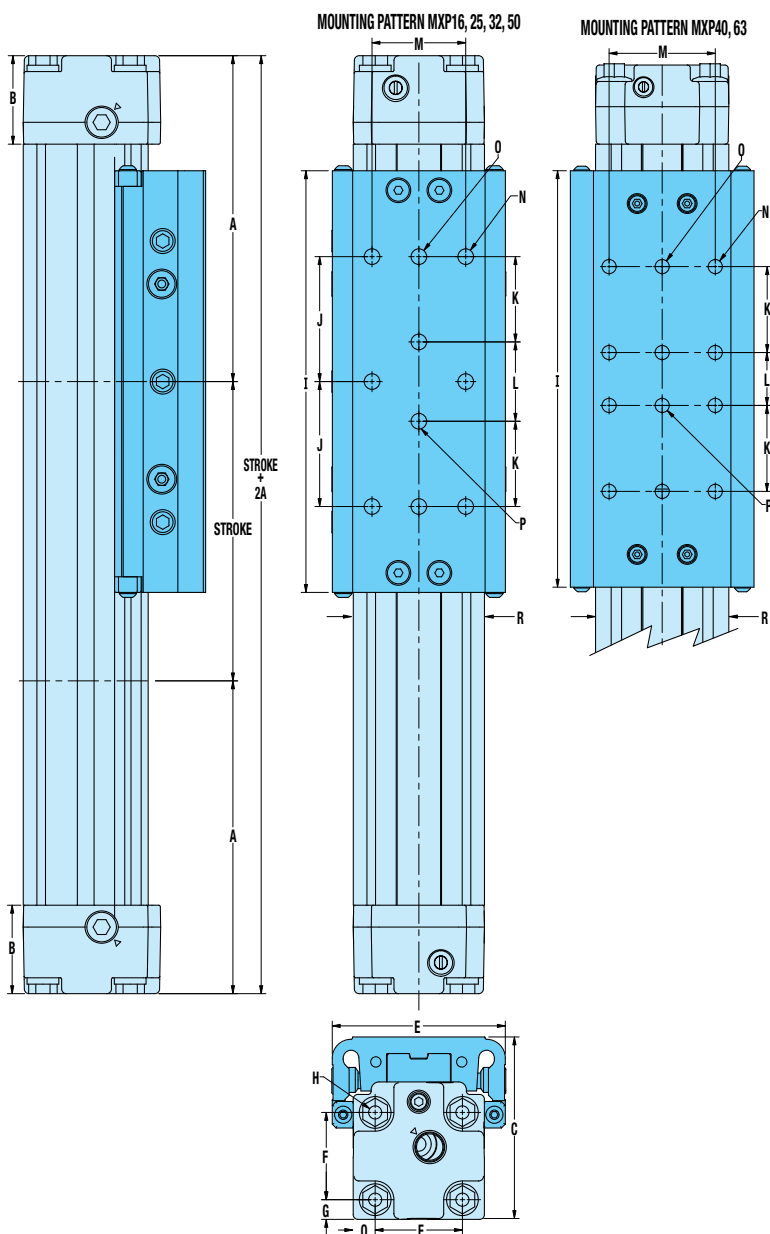
### FIXED SHOCK ABSORBER

|           | MXP16       | MXP25       | MXP32       | MXP40       | MXP50        | MXP63        |
|-----------|-------------|-------------|-------------|-------------|--------------|--------------|
| <b>AA</b> | 1.65        | 2.11        | 2.91        | 3.32        | 4.24         | 5.21         |
| <b>mm</b> | <b>42.0</b> | <b>53.5</b> | <b>73.8</b> | <b>84.4</b> | <b>107.6</b> | <b>132.3</b> |
| <b>BB</b> | 1.95        | 2.57        | 3.42        | 3.87        | 5.09         | 5.92         |
| <b>mm</b> | <b>49.5</b> | <b>65.3</b> | <b>86.8</b> | <b>98.4</b> | <b>129.2</b> | <b>150.3</b> |
| <b>CC</b> | 1.17        | 1.57        | 2.00        | 2.44        | 2.83         | 3.66         |
| <b>mm</b> | <b>29.8</b> | <b>40.0</b> | <b>50.8</b> | <b>62.0</b> | <b>72.0</b>  | <b>93.0</b>  |
| <b>DD</b> | 0.13        | 0.25        | 0.25        | 0.25        | 0.50         | 0.50         |
| <b>mm</b> | <b>3.3</b>  | <b>6.4</b>  | <b>6.4</b>  | <b>6.4</b>  | <b>12.7</b>  | <b>12.7</b>  |



NOTE: Auxiliary carrier is N-Internal Bearing carrier, see page MXP\_21 for carrier size and mounting dimensions

# S-SOLID BEARING ACTUATOR DIMENSIONS



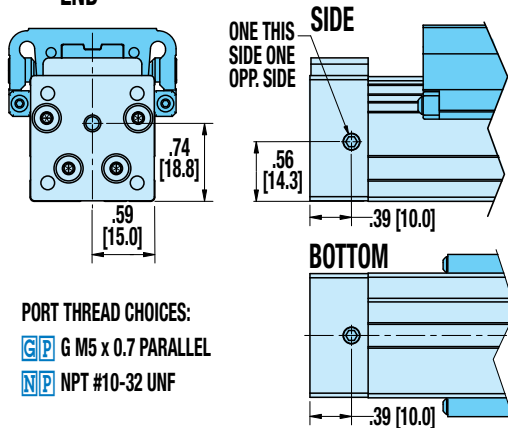
|           | MXP16         | MXP25         | MXP32          | MXP40          | MXP50          | MXP63          |
|-----------|---------------|---------------|----------------|----------------|----------------|----------------|
| <b>A</b>  | 3.13          | 3.94          | 4.89           | 5.79           | 6.26           | 8.42           |
| <i>mm</i> | 79.6          | 100.2         | 124.1          | 147.1          | 159.1          | 213.8          |
| <b>B</b>  | 0.55          | 1.11          | 1.50           | 1.50           | 1.97           | 1.97           |
| <i>mm</i> | 14.0          | 28.3          | 38.1           | 38.0           | 50.0           | 50.0           |
| <b>C</b>  | 1.80          | 2.30          | 3.06           | 3.51           | 4.44           | 5.48           |
| <i>mm</i> | 45.8          | 58.4          | 77.8           | 89.2           | 112.8          | 139.1          |
| <b>D</b>  | 1.18          | 1.65          | 2.18           | 2.52           | 3.01           | 3.94           |
| <i>mm</i> | 30.0          | 42.0          | 55.4           | 64.0           | 78.7           | 100.0          |
| <b>E</b>  | 1.58          | 2.18          | 2.86           | 3.47           | 4.01           | 5.59           |
| <i>mm</i> | 40.1          | 55.4          | 72.6           | 88.2           | 104.1          | 142.0          |
| <b>F</b>  | 0.85          | 1.10          | 1.42           | 1.81           | 2.25           | 2.87           |
| <i>mm</i> | 21.5          | 27.9          | 36.1           | 46.0           | 57.2           | 73.0           |
| <b>G</b>  | 0.17          | 0.25          | 0.38           | 0.35           | 0.43           | 0.53           |
| <i>mm</i> | 4.3           | 6.3           | 9.7            | 9.0            | 10.8           | 13.5           |
| <b>H</b>  | #8-32<br>(8)  | #10-24<br>(8) | 1/4-20<br>(8)  | 1/4-20<br>(8)  | 5/16-18<br>(8) | 5/16-18<br>(8) |
| <i>mm</i> | M4x0.7<br>(8) | M5x0.8<br>(8) | M6x1.0<br>(8)  | M6x1.0<br>(8)  | M8x1.25<br>(8) | M8x1.25<br>(8) |
| <b>I</b>  | 4.12          | 5.31          | 6.02           | 7.87           | 7.91           | 12.11          |
| <i>mm</i> | 104.6         | 135.0         | 153.0          | 200.0          | 200.8          | 307.5          |
| <b>J</b>  | 1.18          | 1.57          | 1.77           | -              | 1.87           | -              |
| <i>mm</i> | 30.0          | 40.0          | 45.0           | -              | 47.6           | -              |
| <b>K</b>  | -             | 1.07          | 1.10           | 1.63           | 1.25           | 1.50           |
| <i>mm</i> | -             | 27.3          | 28.0           | 41.3           | 31.8           | 38.1           |
| <b>L</b>  | -             | 1.00          | 1.00           | 1.00           | 2.50           | 3.00           |
| <i>mm</i> | -             | 25.4          | 25.4           | 25.4           | 63.5           | 76.2           |
| <b>M</b>  | 1.18          | 1.18          | 1.73           | 2.01           | 2.59           | 3.25           |
| <i>mm</i> | 30.0          | 30.0          | 44.0           | 51.0           | 65.8           | 82.6           |
| <b>N</b>  | #8-32<br>(6)  | 1/4-20<br>(6) | 1/4-20<br>(6)  | 5/16-18<br>(8) | 3/8-16<br>(6)  | 3/8-16<br>(8)  |
| <i>mm</i> | M4x0.7<br>(6) | M6x1.0<br>(6) | M8x1.25<br>(6) | M8x1.25<br>(8) | M10x1.5<br>(6) | M10x1.5<br>(8) |
| <b>O</b>  | -             | #10-32<br>(2) | 1/4-20<br>(2)  | 5/16-18<br>(2) | 3/8-16<br>(2)  | 3/8-16<br>(2)  |
| <i>mm</i> | -             | M6x1.0<br>(2) | M8x1.25<br>(2) | M8x1.25<br>(2) | M10x1.5<br>(2) | M10x1.5<br>(2) |
| <b>P</b>  | -             | 1/4-20<br>(2) | 1/4-20<br>(2)  | 1/4-20<br>(2)  | 3/8-16<br>(2)  | 3/8-16<br>(2)  |
| <i>mm</i> | -             | M6x1.0<br>(2) | M8x1.25<br>(2) | M8x1.25<br>(2) | M10x1.5<br>(2) | M10x1.5<br>(2) |
| <b>Q</b>  | 0.17          | 0.28          | 0.38           | 0.35           | 0.43           | 0.53           |
| <i>mm</i> | 4.3           | 7.0           | 9.7            | 9.0            | 10.8           | 13.5           |
| <b>R</b>  | 1.18          | 1.65          | 2.18           | 2.52           | 3.10           | 3.94           |
| <i>mm</i> | 30.00         | 42.00         | 55.37          | 64.00          | 78.74          | 100.00         |





## DUAL END PORTING

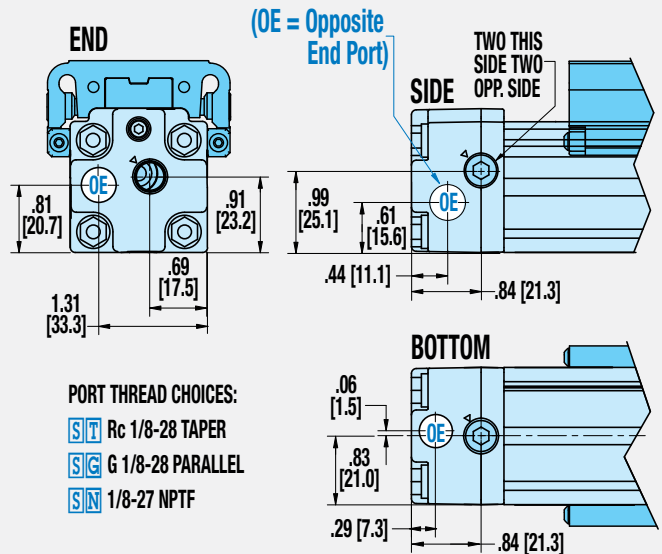
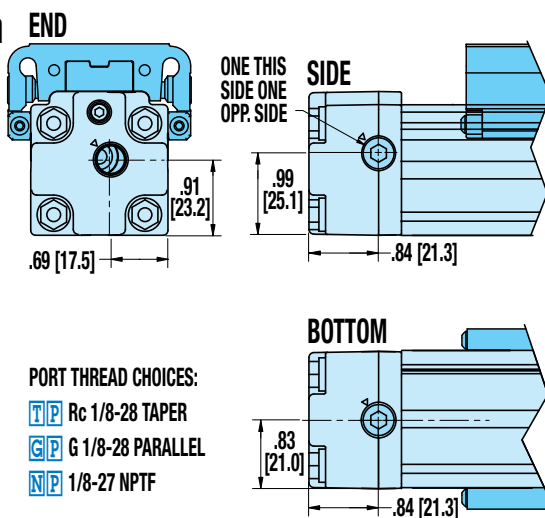
16mm  
BORE



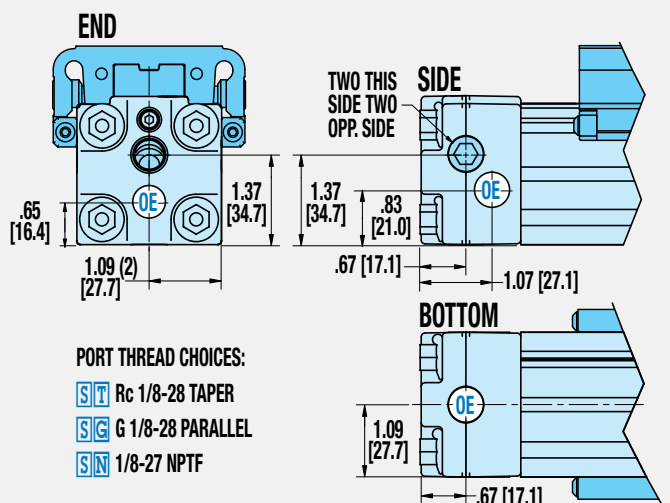
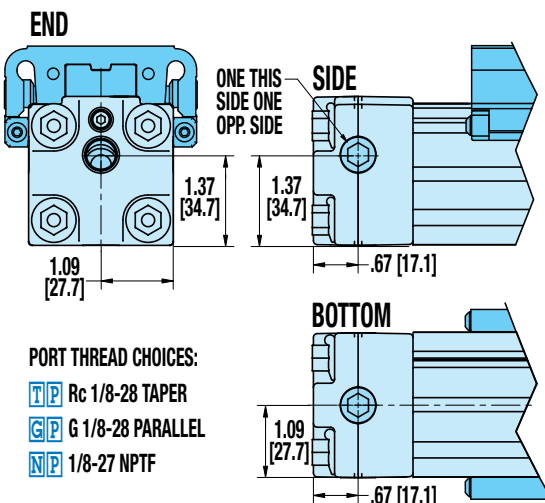
## SINGLE-END PORTING

Not Available for 16mm BORE

25mm  
BORE



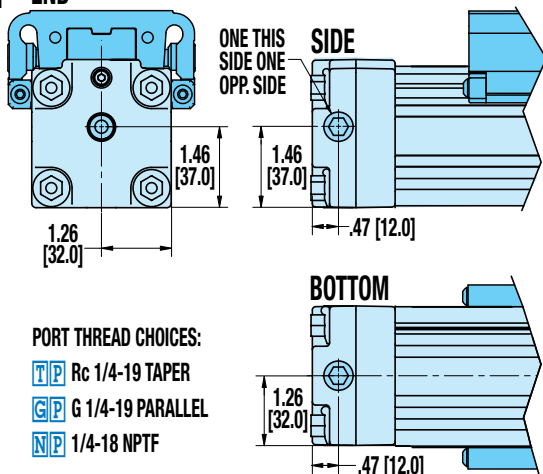
32mm  
BORE



Dimensions in inches [brackets indicate dimensions in millimeters]

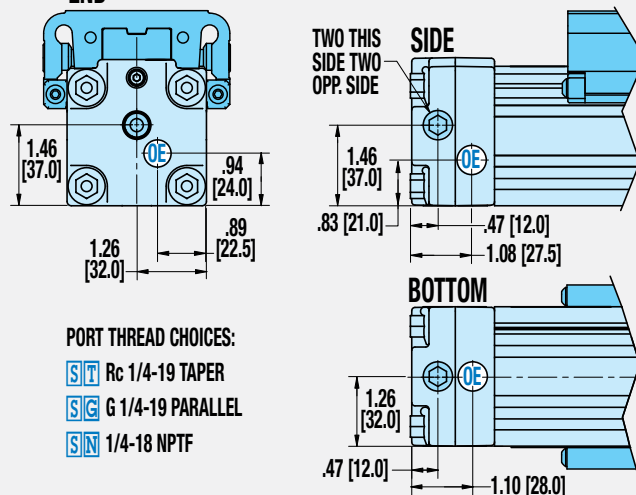
## DUAL END PORTING

40mm BORE

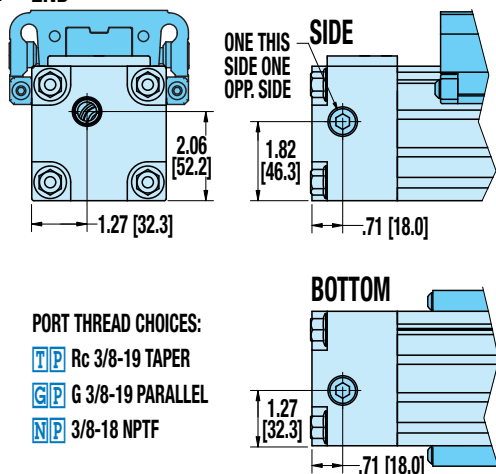


## SINGLE-END PORTING

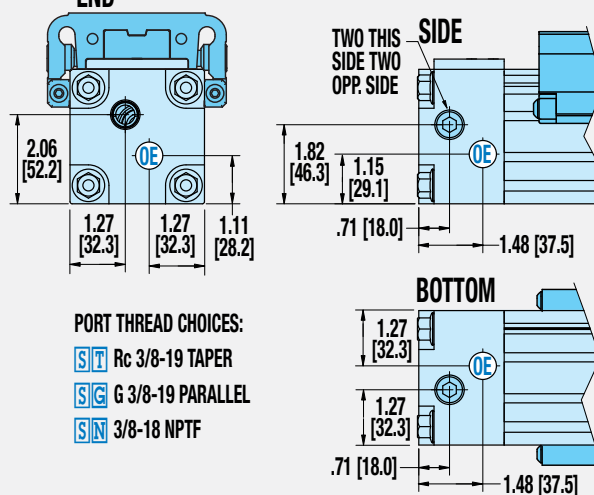
END



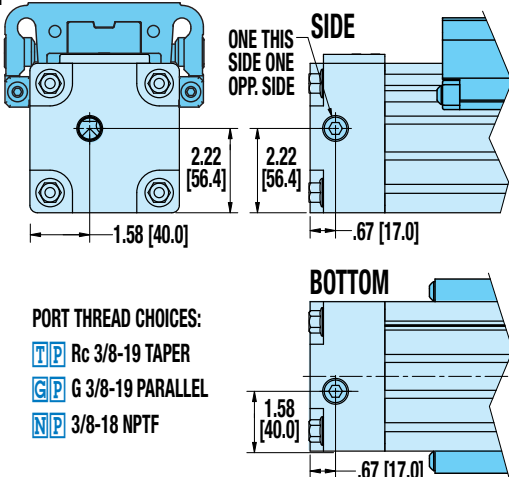
50mm BORE



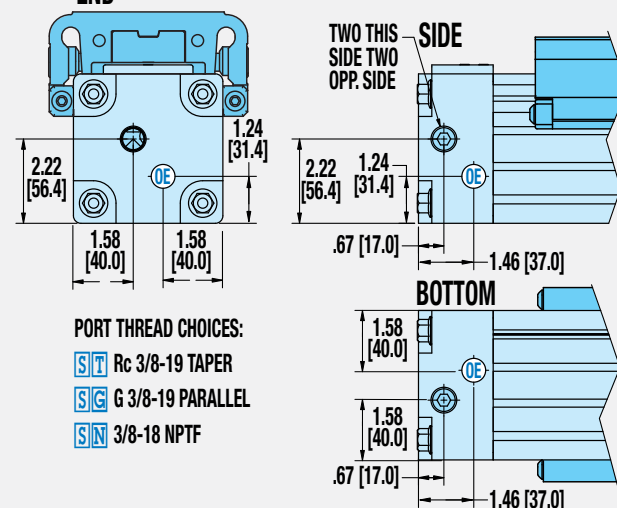
END



63mm BORE



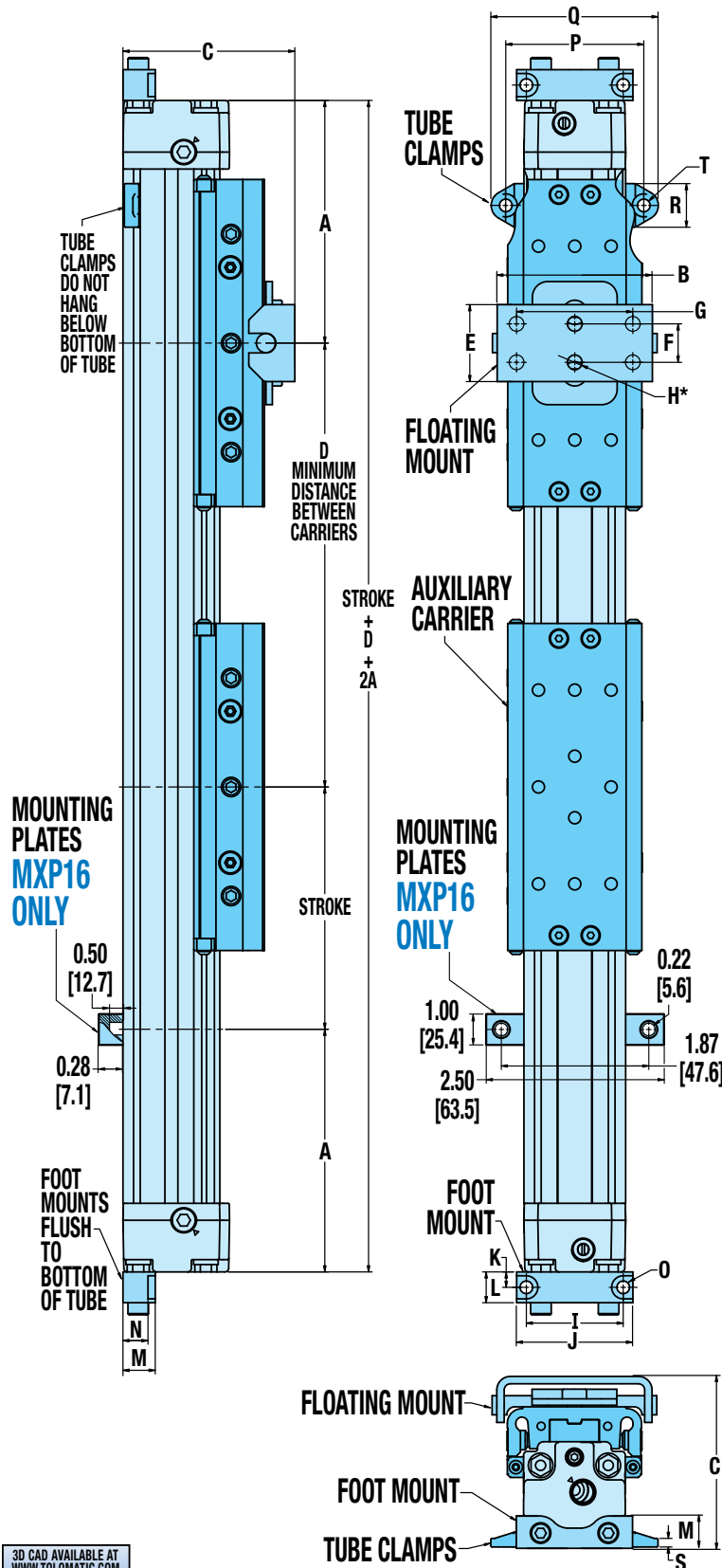
END



Dimensions in inches [brackets indicate dimensions in millimeters]

# S-SOLID BEARING OPTION DIMENSIONS

## AUXILIARY CARRIER, FLOATING MOUNT, FOOT MOUNT, TUBE CLAMPS



|                          | MXP16   | MXP25   | MXP32   | MXP40   | MXP50   | MXP63   |
|--------------------------|---------|---------|---------|---------|---------|---------|
| <b>A</b>                 | 3.13    | 3.94    | 4.89    | 5.79    | 6.26    | 8.42    |
| <b>mm</b>                | 79.6    | 100.2   | 124.1   | 147.1   | 159.1   | 213.8   |
| <b>AUXILIARY CARRIER</b> |         |         |         |         |         |         |
| <b>D</b>                 | 5.00    | 6.00    | 7.00    | 8.50    | 8.60    | 13.00   |
| <b>mm</b>                | 127.0   | 152.4   | 177.8   | 215.9   | 218.4   | 330.0   |
| <b>FLOATING MOUNT</b>    |         |         |         |         |         |         |
| <b>B</b>                 | 1.86    | 2.52    | 3.37    | 4.32    | 5.04    | 6.10    |
| <b>mm</b>                | 47.3    | 64.1    | 85.6    | 109.7   | 128.0   | 155.0   |
| <b>C</b>                 | 2.31    | 2.80    | 3.67    | 4.26    | 5.24    | 6.17    |
| <b>mm</b>                | 58.7    | 71.0    | 93.3    | 108.2   | 133.1   | 156.8   |
| <b>E</b>                 | 0.98    | 1.25    | 2.76    | 3.94    | 3.94    | 5.00    |
| <b>mm</b>                | 25.0    | 31.8    | 70.1    | 100.0   | 100.1   | 127.0   |
| <b>F</b>                 | 0.47    | 0.63    | 1.97    | 2.95    | 3.15    | 3.94    |
| <b>mm</b>                | 12.0    | 15.9    | 50.0    | 74.9    | 80.0    | 100.1   |
| <b>G</b>                 | -       | -       | -       | 2.17    | -       | 2.76    |
| <b>mm</b>                | -       | -       | -       | 55.1    | -       | 70.1    |
| <b>H*</b>                | 0.18(2) | 0.24(2) | 0.28(2) | 0.28(4) | 0.36(2) | 0.34(4) |
| <b>mm</b>                | 4.5(2)  | 6.1(2)  | 7.1(2)  | 7.1(4)  | 9.1(2)  | 8.7(4)  |
| <b>FOOT MOUNT</b>        |         |         |         |         |         |         |
| <b>I</b>                 | 1.26    | 1.57    | 2.01    | 2.52    | 3.11    | 3.94    |
| <b>mm</b>                | 32.0    | 40.0    | 51.0    | 64.0    | 78.9    | 100.0   |
| <b>J</b>                 | 1.57    | 1.89    | 2.36    | 2.91    | 3.67    | 4.72    |
| <b>mm</b>                | 40.0    | 48.0    | 60.0    | 74.0    | 93.2    | 120.0   |
| <b>K</b>                 | 0.16    | 0.25    | 0.37    | 0.47    | 0.50    | 0.59    |
| <b>mm</b>                | 4.0     | 6.4     | 9.5     | 12.0    | 12.7    | 15.0    |
| <b>L</b>                 | 0.31    | 0.50    | 0.75    | 0.94    | 1.00    | 1.18    |
| <b>mm</b>                | 8.0     | 12.7    | 19.0    | 24.0    | 25.4    | 30.0    |
| <b>M</b>                 | 0.35    | 0.52    | 0.91    | 0.73    | 1.00    | 1.06    |
| <b>mm</b>                | 8.9     | 13.3    | 23.0    | 18.5    | 25.4    | 27.0    |
| <b>N</b>                 | -       | 0.41    | 0.71    | 0.45    | 0.69    | 0.65    |
| <b>mm</b>                | -       | 10.3    | 18.0    | 11.4    | 17.4    | 16.5    |
| <b>O</b>                 | 0.18    | 0.20    | 0.22    | 0.28    | 0.35    | 0.42    |
| <b>mm</b>                | 4.6     | 5.2     | 5.5     | 7.1     | 9.0     | 10.7    |
| <b>TUBE CLAMPS</b>       |         |         |         |         |         |         |
| <b>P</b>                 | -       | 2.24    | 2.92    | 3.26    | 3.84    | 5.19    |
| <b>mm</b>                | -       | 57.0    | 74.1    | 82.7    | 97.5    | 131.7   |
| <b>Q</b>                 | -       | 2.72    | 3.44    | 3.81    | 4.39    | 5.93    |
| <b>mm</b>                | -       | 69.0    | 87.4    | 96.7    | 111.5   | 150.7   |
| <b>R</b>                 | -       | 0.71    | 0.63    | 0.55    | 0.55    | 0.75    |
| <b>mm</b>                | -       | 18.0    | 16.0    | 14.0    | 14.0    | 19.0    |
| <b>S</b>                 | -       | 0.14    | 0.17    | 0.15    | 0.15    | 0.24    |
| <b>mm</b>                | -       | 3.6     | 4.3     | 3.8     | 3.8     | 6.1     |
| <b>T</b>                 | -       | 0.20    | 0.28    | 0.28    | 0.28    | 0.42    |
| <b>mm</b>                | -       | 5.2     | 7.1     | 7.1     | 7.1     | 10.7    |

\*MXP16, 25, 32 & 50 use 2 center holes,  
MXP40 & 63 use 4 corner holes

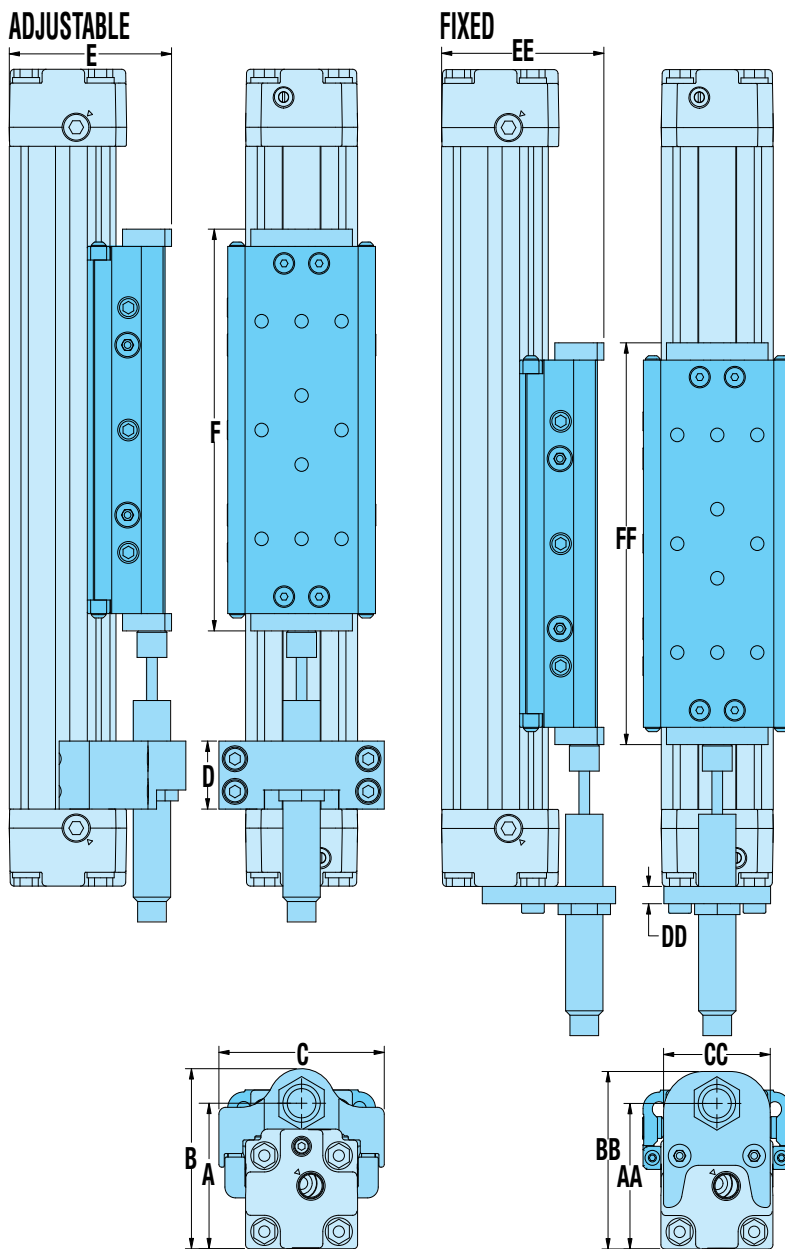
**NOTE:** Auxiliary carrier is S-Solid Bearing carrier, see  
page MXP\_26 for carrier size and mounting dimensions





# S-SOLID BEARING OPTION DIMENSIONS

## ADJUSTABLE AND FIXED SHOCK ABSORBERS



### ADJUSTABLE SHOCK ABSORBER

|           | MXP16 | MXP25              | MXP32              | MXP40              | MXP50              | MXP63              |
|-----------|-------|--------------------|--------------------|--------------------|--------------------|--------------------|
| <b>A</b>  | 1.65  | 2.11               | 2.91               | 3.32               | 4.24               | 5.21               |
| <b>mm</b> | 42.0  | 53.5               | 73.8               | 84.4               | 107.6              | 132.4              |
| <b>B</b>  | 1.97  | 2.61               | 3.35               | 3.87               | 4.87               | 5.91               |
| <b>mm</b> | 50.0  | 66.2               | 85.0               | 98.4               | 123.8              | 150.0              |
| <b>C</b>  | 1.74  | 2.44               | 2.95               | 3.43               | 4.09               | 5.20               |
| <b>mm</b> | 44.3  | 62.0               | 74.9               | 87.0               | 103.9              | 132.0              |
| <b>D</b>  | 0.71  | 0.98               | 1.25               | 0.98               | 1.22               | 1.26               |
| <b>mm</b> | 18.0  | 25.0               | 31.8               | 25.0               | 31.0               | 32.0               |
| <b>E</b>  | 1.80  | 2.39 <sup>1</sup>  | 3.20 <sup>2</sup>  | 3.57 <sup>3</sup>  | 4.53 <sup>4</sup>  | 5.50 <sup>5</sup>  |
| <b>mm</b> | 45.8  | 60.8 <sup>1</sup>  | 81.2 <sup>2</sup>  | 90.7 <sup>3</sup>  | 115.1 <sup>4</sup> | 139.7 <sup>5</sup> |
| <b>F</b>  | 4.12  | 5.81 <sup>1</sup>  | 6.76 <sup>2</sup>  | 8.61 <sup>3</sup>  | 8.35 <sup>4</sup>  | 12.56 <sup>5</sup> |
| <b>mm</b> | 104.6 | 147.7 <sup>1</sup> | 171.8 <sup>2</sup> | 218.8 <sup>3</sup> | 212.2 <sup>4</sup> | 318.9 <sup>5</sup> |

### Stroke Adder: Adjustable Shock Absorber

|            |      |      |      |      |      |      |
|------------|------|------|------|------|------|------|
| <b>in.</b> | 0.62 | 1.50 | 1.96 | 1.70 | 1.66 | 1.65 |
| <b>mm</b>  | 15.7 | 38.1 | 49.7 | 43.3 | 42.1 | 41.8 |

▲ NOTE: For each adjustable shock absorber ordered, add Stroke Adder value to required stroke to determine configured actuator stroke.

$$\text{Required Stroke} + \left( \frac{\text{Adj. Stroke}}{\text{Quantity}} \times \text{Shock Adder value} \right) = \text{Configured Actuator Stroke}$$

Example: MXP25S, 500mm stroke required, 2 adjustable shocks

$$500 + (2 \times 38.1) = 500 + 76.2 = 576.2\text{mm}$$

### FIXED SHOCK ABSORBER

|           | MXP16 | MXP25              | MXP32              | MXP40              | MXP50              | MXP63              |
|-----------|-------|--------------------|--------------------|--------------------|--------------------|--------------------|
| <b>AA</b> | 1.65  | 2.11               | 2.91               | 3.32               | 4.24               | 5.21               |
| <b>mm</b> | 42.0  | 53.5               | 73.8               | 84.4               | 107.6              | 132.4              |
| <b>BB</b> | 1.95  | 2.57               | 3.42               | 3.87               | 5.10               | 5.92               |
| <b>mm</b> | 49.5  | 65.3               | 86.8               | 98.4               | 129.6              | 150.3              |
| <b>CC</b> | 1.17  | 1.57               | 2.00               | 2.44               | 2.83               | 3.66               |
| <b>mm</b> | 29.8  | 40.0               | 50.8               | 62.0               | 72.0               | 93.0               |
| <b>DD</b> | 0.13  | 0.25               | 0.25               | 0.25               | 0.50               | 0.50               |
| <b>mm</b> | 3.3   | 6.4                | 6.4                | 6.4                | 12.7               | 12.7               |
| <b>EE</b> | 1.80  | 2.39 <sup>1</sup>  | 3.20 <sup>2</sup>  | 3.57 <sup>3</sup>  | 4.53 <sup>4</sup>  | 5.50 <sup>5</sup>  |
| <b>mm</b> | 45.8  | 60.8 <sup>1</sup>  | 81.2 <sup>2</sup>  | 90.7 <sup>3</sup>  | 115.1 <sup>4</sup> | 139.7 <sup>5</sup> |
| <b>FF</b> | 4.12  | 5.81 <sup>1</sup>  | 6.76 <sup>2</sup>  | 8.61 <sup>3</sup>  | 8.35 <sup>4</sup>  | 12.56 <sup>5</sup> |
| <b>mm</b> | 104.6 | 147.7 <sup>1</sup> | 171.8 <sup>2</sup> | 218.8 <sup>3</sup> | 212.2 <sup>4</sup> | 318.9 <sup>5</sup> |

<sup>1</sup>Carrier is standard MXP25S, 2.30" (58.4mm) high X 5.31" (135.0mm) long, Impact plates on each end of carrier add .09" (2.4mm) to total height and .50" (12.7mm) to total length

<sup>2</sup>Carrier is standard MXP32S, 3.06" (77.8mm) high X 6.02" (153.0mm) long, Impact bolts on each end of carrier add .13" (3.4mm) to total height and .74" (18.8mm) to total length

<sup>3</sup>Carrier is standard MXP40S, 3.51" (89.2mm) high X 7.87" (200.0mm) long, Impact bolts on each end of carrier add .06" (1.5mm) to total height and .74" (18.8mm) to total length

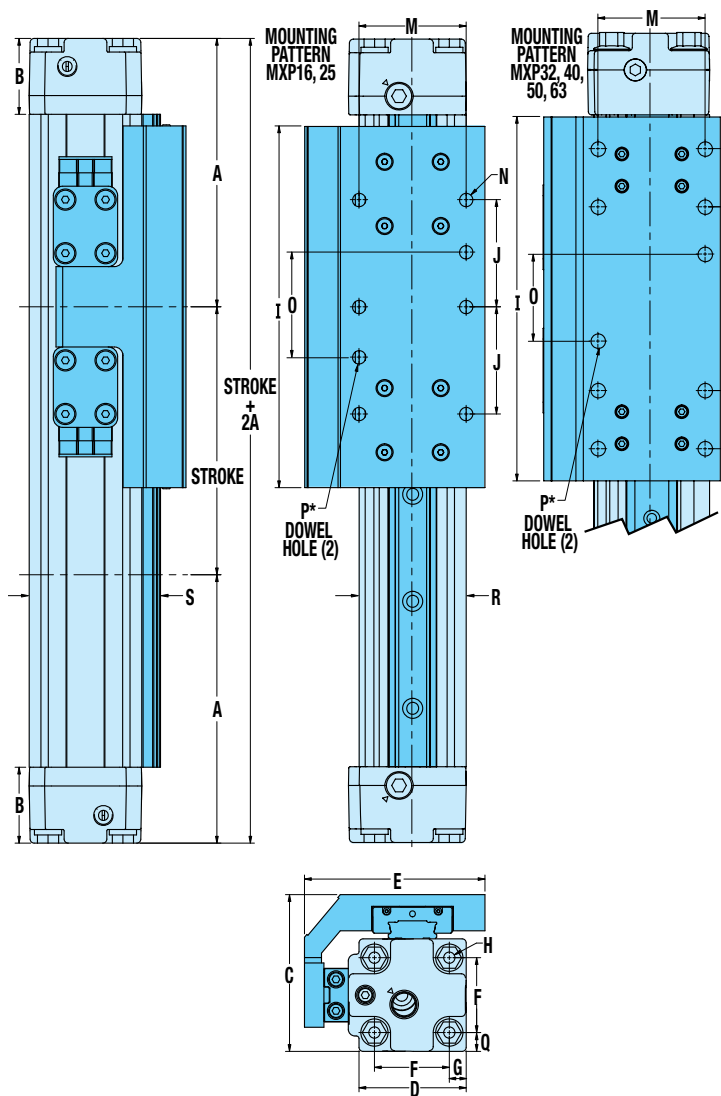
<sup>4</sup>Carrier is standard MXP50S, 4.44" (112.8mm) high X 7.91" (200.8mm) long, Impact bolts on each end of carrier add .09" (2.3mm) to total height and .45" (11.4mm) to total length

<sup>5</sup>Carrier is standard MXP63S, 5.48" (139.1mm) high X 12.11" (307.5mm) long, Impact bolts on each end of carrier add .45" (11.4mm) to total length

NOTE: Auxiliary carrier is S-Solid Bearing carrier, see page MXP\_26 for carrier size and mounting dimensions



# P-PROFILED RAIL ACTUATOR DIMENSIONS

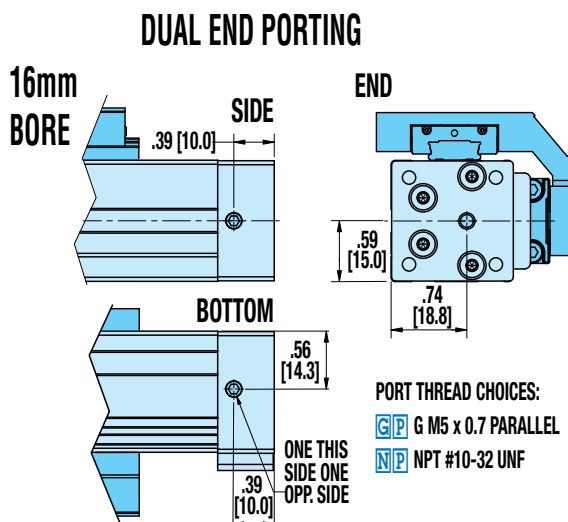


|           | MXP16                        | MXP25                        | MXP32                        | MXP40                         | MXP50                         | MXP63                           |
|-----------|------------------------------|------------------------------|------------------------------|-------------------------------|-------------------------------|---------------------------------|
| <b>A</b>  | 3.13                         | 3.94                         | 4.89                         | 5.79                          | 6.26                          | 8.42                            |
| mm        | 79.6                         | 100.2                        | 124.1                        | 147.1                         | 159.1                         | 213.8                           |
| <b>B</b>  | 0.55                         | 1.11                         | 1.50                         | 1.50                          | 1.97                          | 1.97                            |
| mm        | 14.0                         | 28.3                         | 38.1                         | 38.0                          | 50.0                          | 50.0                            |
| <b>C</b>  | 1.81                         | 2.30                         | 3.05                         | 3.53                          | 4.71                          | 5.51                            |
| mm        | 46.0                         | 58.5                         | 77.4                         | 89.7                          | 119.7                         | 140.0                           |
| <b>D</b>  | 1.19                         | 1.57                         | 2.13                         | 2.52                          | 3.01                          | 2.87                            |
| mm        | 30.3                         | 40.0                         | 54.0                         | 64.0                          | 78.7                          | 73.0                            |
| <b>E</b>  | 1.78                         | 2.65                         | 3.25                         | 3.85                          | 4.62                          | 5.65                            |
| mm        | 45.3                         | 67.4                         | 82.5                         | 97.8                          | 117.4                         | 143.6                           |
| <b>F</b>  | 0.85                         | 1.10                         | 1.42                         | 1.81                          | 2.25                          | 2.87                            |
| mm        | 21.5                         | 27.9                         | 36.1                         | 46.0                          | 57.2                          | 73.0                            |
| <b>G</b>  | 0.17                         | 0.28                         | 0.38                         | 0.35                          | 0.43                          | 0.53                            |
| mm        | 4.3                          | 7.0                          | 9.7                          | 9.0                           | 10.8                          | 13.5                            |
| <b>H</b>  | #8-32<br>(8)                 | #10-24<br>(8)                | 1/4-20<br>(8)                | 1/4-20<br>(8)                 | 5/16-18<br>(8)                | 5/16-18<br>(8)                  |
| mm        | M4x0.7<br>(8)                | M5x0.8<br>(8)                | M6x1.0<br>(8)                | M6x1.0<br>(8)                 | M8x1.25<br>(8)                | M8x1.25<br>(8)                  |
| <b>I</b>  | 4.33                         | 5.31                         | 6.69                         | 7.87                          | 8.50                          | 12.00                           |
| mm        | 110.0                        | 135.0                        | 170.0                        | 200.0                         | 216.0                         | 304.8                           |
| <b>J</b>  | 1.57                         | 1.57                         | 1.07                         | 1.00                          | 1.00                          | 1.57                            |
| mm        | 40.0                         | 40.0                         | 27.1                         | 25.4                          | 25.4                          | 40.0                            |
| <b>K</b>  | -                            | -                            | 3.37                         | 4.50                          | 2.75                          | 5.12                            |
| mm        | -                            | -                            | 85.7                         | 114.3                         | 69.9                          | 130.0                           |
| <b>M</b>  | 1.102                        | 1.575                        | 1.969                        | 2.835                         | 3.125                         | 3.870                           |
| mm        | 28.00                        | 40.00                        | 50.00                        | 72.00                         | 79.38                         | 98.30                           |
| <b>N</b>  | #8-32<br>(6)                 | 1/4-20<br>(6)                | 5/16-18<br>(8)               | 5/16-18<br>(8)                | 5/16-18<br>(10)               | 3/8-16<br>(8)                   |
| mm        | M4x0.7<br>(6)                | M6x1.0<br>(6)                | M8x1.25<br>(8)               | M8x1.25<br>(8)                | M8x1.25<br>(10)               | M10x1.5<br>(8)                  |
| <b>O</b>  | 1.575                        | 1.575                        | 1.772                        | 2.500                         | 1.500                         | 2.559                           |
| mm        | 40.00                        | 40.00                        | 45.00                        | 63.50                         | 38.10                         | 65.00                           |
| <b>P*</b> | Ø.1583/<br>.1573<br>↓.250(2) | Ø.2520/<br>.2512<br>↓.250(2) | Ø.3145/<br>.3135<br>↓.375(2) | Ø.3145/<br>.3135<br>↓.500(2)  | Ø.3145/<br>.3135<br>↓.500(2)  | Ø.3770/<br>.3760<br>↓.500(2)    |
| mm        | Ø4.046<br>/4.021<br>↓6.35(2) | Ø6.045<br>/6.020<br>↓6.35(2) | Ø8.045<br>/8.020<br>↓9.53(2) | Ø8.045<br>/8.020<br>↓12.70(2) | Ø8.045<br>/8.020<br>↓12.70(2) | Ø10.045<br>/10.020<br>↓12.70(2) |
| <b>Q</b>  | 0.17                         | 0.28                         | 0.38                         | 0.35                          | 0.43                          | 0.53                            |
| mm        | 4.3                          | 7.0                          | 9.7                          | 9.0                           | 10.8                          | 13.5                            |
| <b>R</b>  | 1.181                        | 1.58                         | 2.13                         | 2.52                          | 3.10                          | 3.94                            |
| mm        | 30.00                        | 40.00                        | 54.00                        | 64.00                         | 78.74                         | 100.00                          |
| <b>S</b>  | 1.40                         | 1.91                         | 2.48                         | 2.89                          | 3.69                          | 4.53                            |
| mm        | 35.50                        | 48.60                        | 62.87                        | 73.50                         | 93.74                         | 115.00                          |

\*DOWEL HOLES

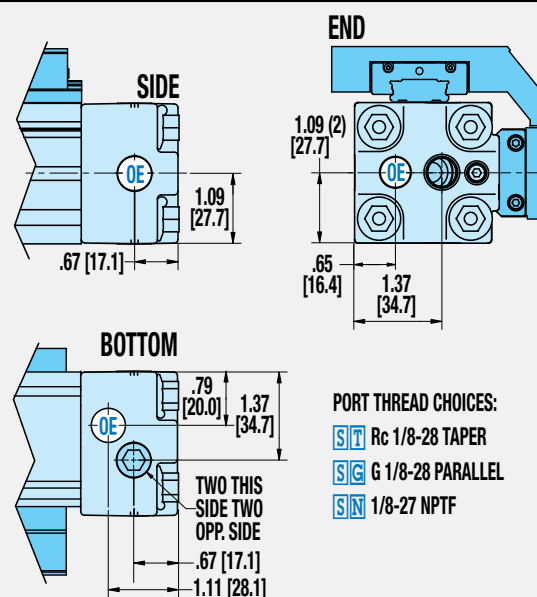
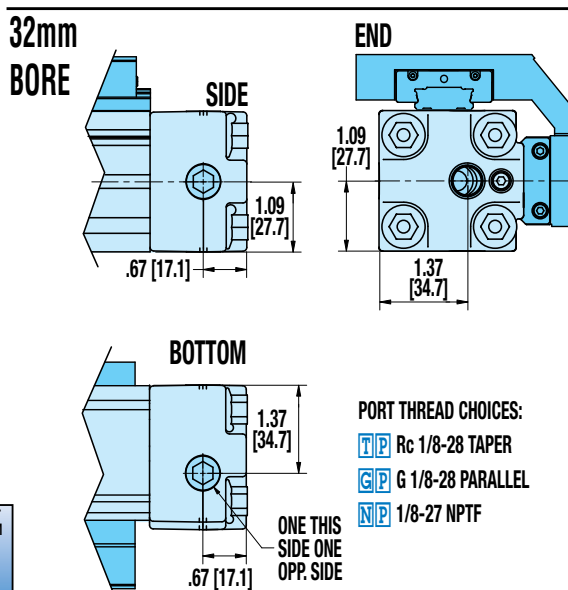
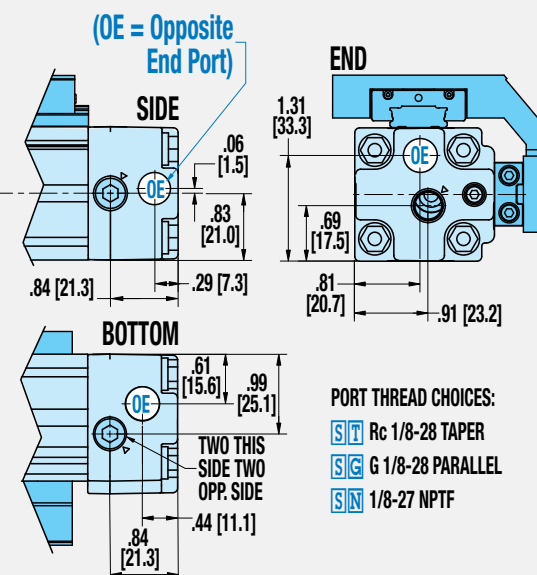
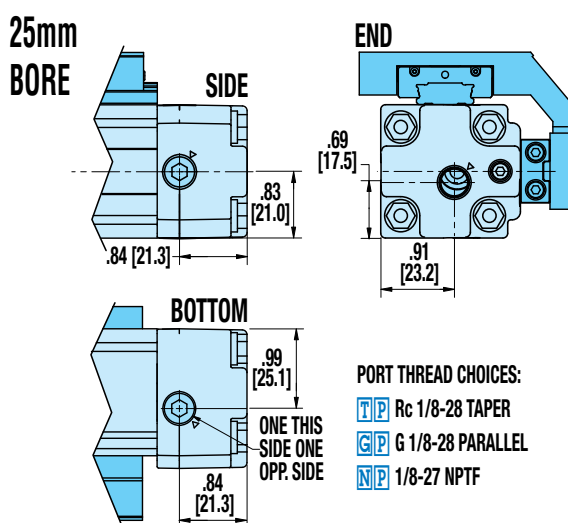
|   |              |
|---|--------------|
| ⌀ | 0.003 in (M) |
| ⌀ | 0.08 mm (M)  |





## SINGLE-END PORTING

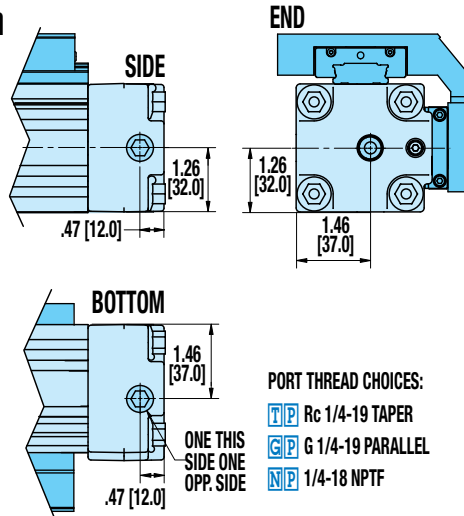
Not Available for 16mm BORE



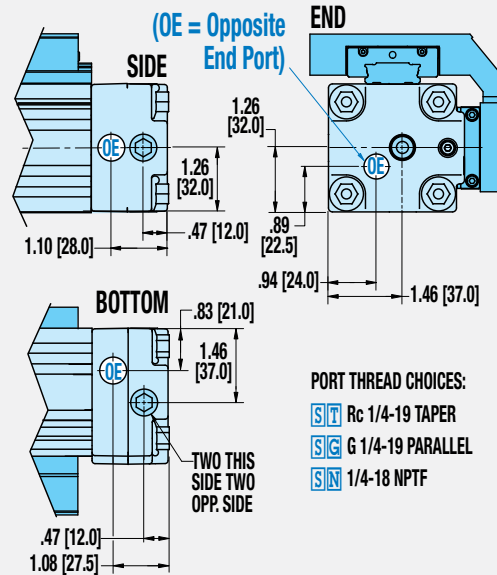


## DUAL END PORTING

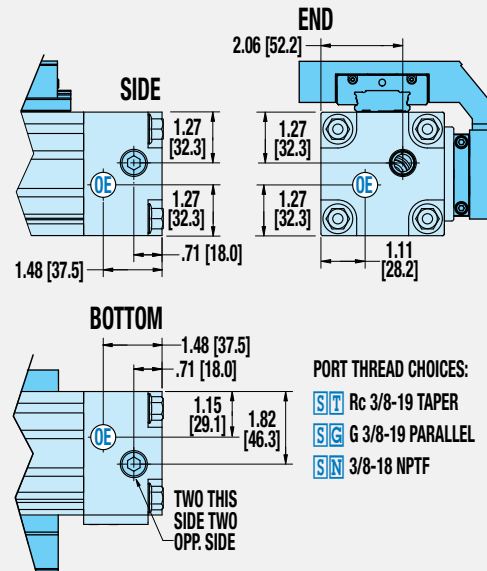
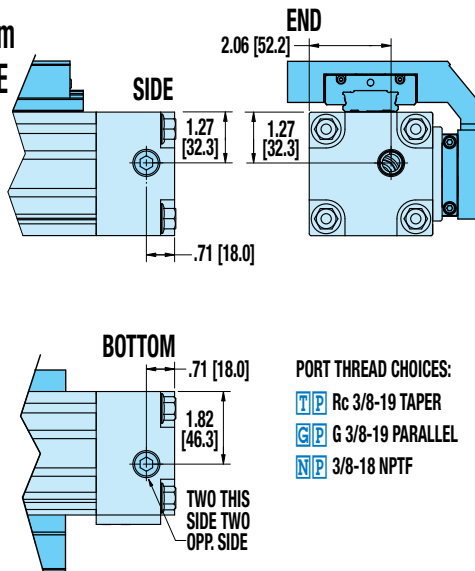
40mm  
BORE



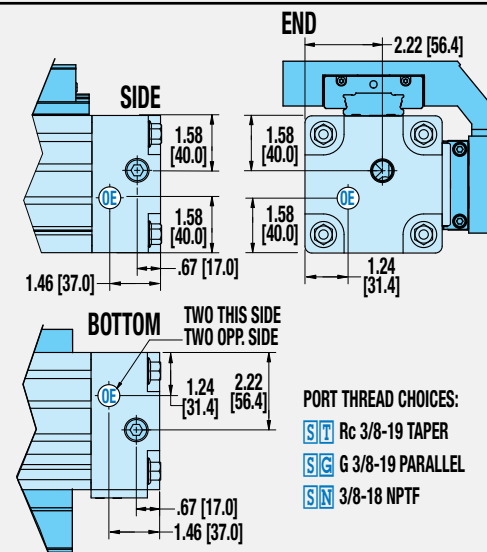
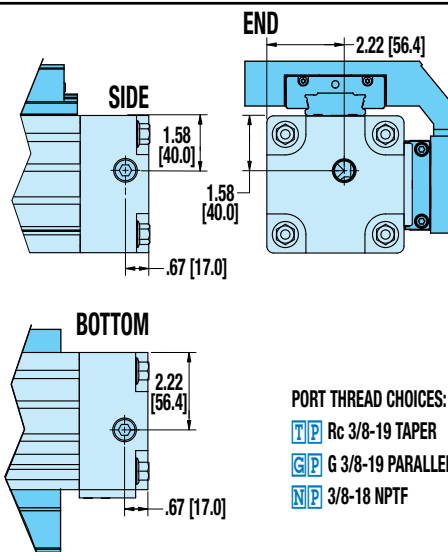
## SINGLE-END PORTING



50mm  
BORE

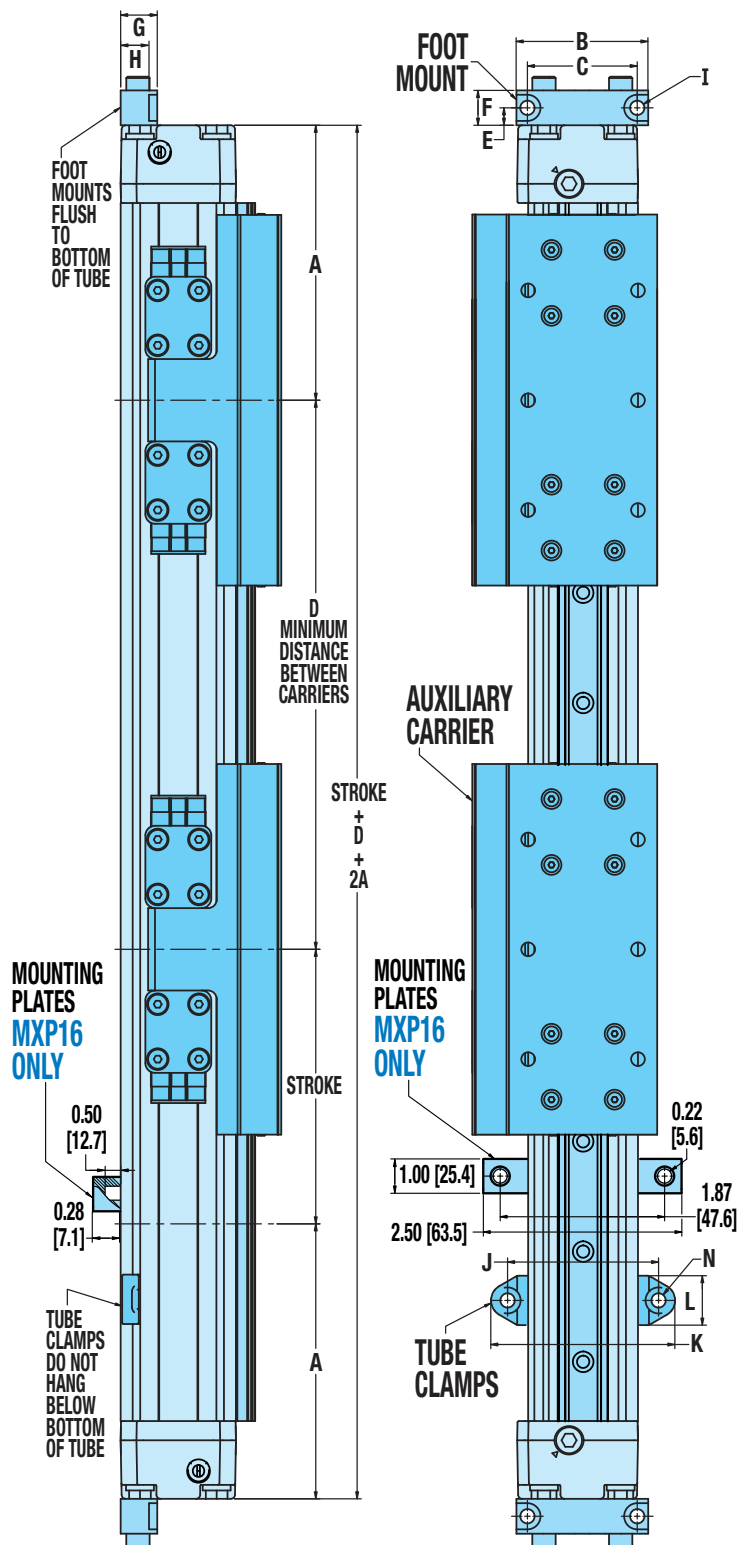


63mm  
BORE



# P-PROFILED RAIL OPTION DIMENSIONS

## AUXILIARY CARRIER, FOOT MOUNT, TUBE CLAMPS



|                          | MXP16 | MXP25 | MXP32 | MXP40 | MXP50 | MXP63 |
|--------------------------|-------|-------|-------|-------|-------|-------|
| <b>A</b>                 | 3.13  | 3.94  | 4.89  | 5.79  | 6.26  | 8.42  |
| <i>mm</i>                | 79.6  | 100.2 | 124.1 | 147.1 | 159.1 | 213.8 |
| <b>AUXILIARY CARRIER</b> |       |       |       |       |       |       |
| <b>D</b>                 | 5.00  | 6.00  | 7.00  | 8.50  | 8.60  | 13.00 |
| <i>mm</i>                | 127.0 | 152.4 | 177.8 | 215.9 | 218.4 | 330.0 |
| <b>FOOT MOUNT</b>        |       |       |       |       |       |       |
| <b>B</b>                 | 1.57  | 1.89  | 2.36  | 2.91  | 3.67  | 4.72  |
| <i>mm</i>                | 40.0  | 48.0  | 60.0  | 74.0  | 93.2  | 120.0 |
| <b>C</b>                 | 1.26  | 1.57  | 2.01  | 2.52  | 3.11  | 3.94  |
| <i>mm</i>                | 32.0  | 40.0  | 51.0  | 64.0  | 78.9  | 100.0 |
| <b>E</b>                 | 0.16  | 0.25  | 0.37  | 0.47  | 0.50  | 0.59  |
| <i>mm</i>                | 4.0   | 6.4   | 9.5   | 12.0  | 12.7  | 15.0  |
| <b>F</b>                 | 0.31  | 0.50  | 0.75  | 0.94  | 1.00  | 1.18  |
| <i>mm</i>                | 8.0   | 12.7  | 19.0  | 24.0  | 25.4  | 30.0  |
| <b>G</b>                 | 0.35  | 0.52  | 0.91  | 0.73  | 1.00  | 1.06  |
| <i>mm</i>                | 8.9   | 13.3  | 23.0  | 18.5  | 25.4  | 27.0  |
| <b>H</b>                 | -     | 0.41  | 0.71  | 0.45  | 0.69  | 0.65  |
| <i>mm</i>                | -     | 10.3  | 18.0  | 11.4  | 17.4  | 16.5  |
| <b>I</b>                 | 0.18  | 0.20  | 0.22  | 0.28  | 0.35  | 0.42  |
| <i>mm</i>                | 4.6   | 5.2   | 5.5   | 7.1   | 9.0   | 10.7  |
| <b>TUBE CLAMPS</b>       |       |       |       |       |       |       |
| <b>J</b>                 | -     | 2.17  | 2.86  | 3.26  | 3.84  | 5.19  |
| <i>mm</i>                | -     | 55.0  | 72.7  | 82.7  | 97.5  | 131.7 |
| <b>K</b>                 | -     | 2.64  | 3.39  | 3.81  | 4.39  | 5.93  |
| <i>mm</i>                | -     | 67.0  | 86.0  | 96.7  | 111.5 | 150.7 |
| <b>L</b>                 | -     | 0.71  | 0.63  | 0.55  | 0.55  | 0.75  |
| <i>mm</i>                | -     | 18.0  | 16.0  | 14.0  | 14.0  | 19.0  |
| <b>M</b>                 | -     | 0.14  | 0.17  | 0.15  | 0.15  | 0.24  |
| <i>mm</i>                | -     | 3.6   | 4.3   | 3.8   | 3.8   | 6.1   |
| <b>N</b>                 | -     | 0.20  | 0.28  | 0.28  | 0.28  | 0.42  |
| <i>mm</i>                | -     | 5.2   | 7.1   | 7.1   | 7.1   | 10.7  |

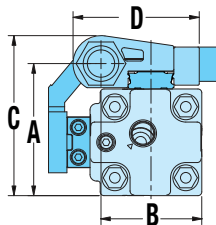
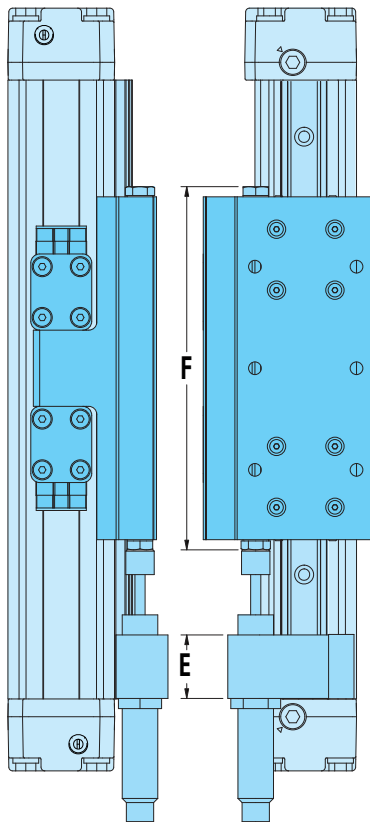
NOTE: Auxiliary carrier is P-Profiled Rail carrier; see page MXP\_31 for carrier size and mounting dimensions



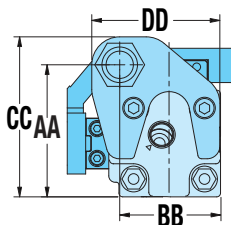
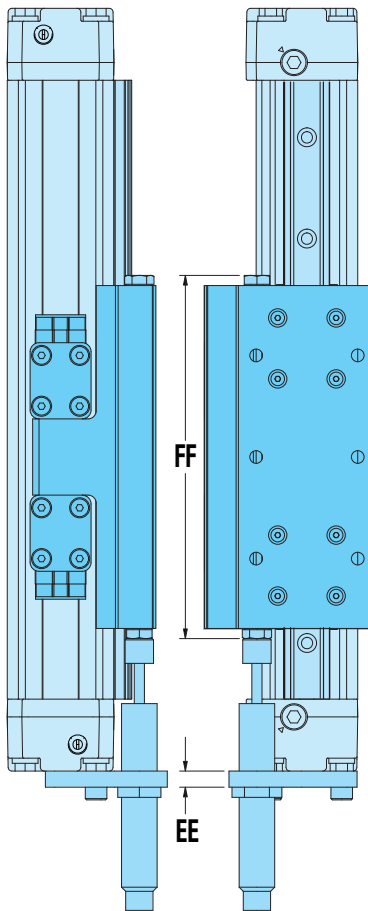
# P-PROFILED RAIL OPTION DIMENSIONS

## ADJUSTABLE AND FIXED SHOCK ABSORBERS

### ADJUSTABLE



### FIXED



### ADJUSTABLE SHOCK ABSORBER

|           | MXP16                    | MXP25                    | MXP32                    | MXP40                    | MXP50                    | MXP63                    |
|-----------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| <b>A</b>  | 1.51                     | 2.05                     | 2.87                     | 3.28                     | 4.20                     | 5.04                     |
| <b>mm</b> | <b>38.3</b>              | <b>52.0</b>              | <b>72.9</b>              | <b>83.2</b>              | <b>106.7</b>             | <b>128.0</b>             |
| <b>B</b>  | 1.38                     | 1.56                     | 2.25                     | 2.63                     | 3.55                     | 3.97                     |
| <b>mm</b> | <b>35.0</b>              | <b>39.7</b>              | <b>57.2</b>              | <b>66.8</b>              | <b>90.2</b>              | <b>100.8</b>             |
| <b>C</b>  | 1.75                     | 2.48                     | 3.46                     | 3.90                     | 4.80                     | 5.73                     |
| <b>mm</b> | <b>44.5</b>              | <b>63.0</b>              | <b>87.9</b>              | <b>99.0</b>              | <b>121.8</b>             | <b>145.5</b>             |
| <b>D</b>  | 1.54                     | 1.96                     | 2.63                     | 3.17                     | 3.55                     | 4.07                     |
| <b>mm</b> | <b>39.2</b>              | <b>49.7</b>              | <b>66.7</b>              | <b>80.6</b>              | <b>90.2</b>              | <b>103.3</b>             |
| <b>E</b>  | 0.79                     | 0.98                     | 1.00                     | 0.98                     | 1.26                     | 1.26                     |
| <b>mm</b> | <b>20.0</b>              | <b>25.0</b>              | <b>25.4</b>              | <b>25.0</b>              | <b>32.0</b>              | <b>32.0</b>              |
| <b>F</b>  | 4.65 <sup>1</sup>        | 5.63 <sup>2</sup>        | 7.43 <sup>3</sup>        | 8.61 <sup>4</sup>        | 8.95 <sup>5</sup>        | 12.45 <sup>6</sup>       |
| <b>mm</b> | <b>118.0<sup>1</sup></b> | <b>143.0<sup>2</sup></b> | <b>188.8<sup>3</sup></b> | <b>218.8<sup>4</sup></b> | <b>227.4<sup>5</sup></b> | <b>316.2<sup>6</sup></b> |

### Stroke Adder: Adjustable Shock Absorber

|           |             |             |             |             |             |             |
|-----------|-------------|-------------|-------------|-------------|-------------|-------------|
| <b>in</b> | 0.96        | 2.10        | 2.73        | 2.40        | 3.15        | 2.74        |
| <b>mm</b> | <b>24.4</b> | <b>53.3</b> | <b>69.3</b> | <b>61.0</b> | <b>80.0</b> | <b>69.6</b> |

**NOTE:** For each adjustable shock absorber ordered, add Stroke Adder value to required stroke to determine configured actuator stroke.

$$\text{Required Stroke} + \left( \begin{matrix} \text{Adj. Stroke} \\ \text{Shock} \times \text{Adder} \\ \text{Quantity} \quad \text{value} \end{matrix} \right) = \text{Configured Actuator Stroke}$$

Example: MXP25P, 500mm stroke required, 2 adjustable shocks  
 $500 + (2 \times 53.3) = 500 + 106.6 = 606.6\text{mm}$

### FIXED SHOCK ABSORBER

|           | MXP16                    | MXP25                    | MXP32                    | MXP40                    | MXP50                    | MXP63                    |
|-----------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| <b>AA</b> | 1.51                     | 2.05                     | 2.89                     | 3.32                     | 4.38                     | 5.22                     |
| <b>mm</b> | <b>38.3</b>              | <b>52.0</b>              | <b>73.4</b>              | <b>84.4</b>              | <b>111.2</b>             | <b>132.5</b>             |
| <b>BB</b> | 1.38                     | 1.56                     | —                        | —                        | —                        | —                        |
| <b>mm</b> | <b>35.0</b>              | <b>39.7</b>              | —                        | —                        | —                        | —                        |
| <b>CC</b> | 1.80                     | 2.48                     | 3.41                     | 3.87                     | 5.09                     | 5.93                     |
| <b>mm</b> | <b>45.8</b>              | <b>63.0</b>              | <b>86.5</b>              | <b>98.4</b>              | <b>129.2</b>             | <b>150.5</b>             |
| <b>DD</b> | 1.66                     | 1.98                     | 2.00                     | 2.44                     | 2.83                     | 3.66                     |
| <b>mm</b> | <b>42.2</b>              | <b>50.4</b>              | <b>50.8</b>              | <b>62.0</b>              | <b>72.0</b>              | <b>93.0</b>              |
| <b>EE</b> | 0.13                     | 0.25                     | 0.25                     | 0.25                     | 0.50                     | 0.50                     |
| <b>mm</b> | <b>3.3</b>               | <b>6.4</b>               | <b>6.4</b>               | <b>6.4</b>               | <b>12.7</b>              | <b>12.7</b>              |
| <b>FF</b> | 4.65 <sup>1</sup>        | 5.63 <sup>2</sup>        | 7.43 <sup>3</sup>        | 8.61 <sup>4</sup>        | 8.95 <sup>5</sup>        | 12.45 <sup>6</sup>       |
| <b>mm</b> | <b>118.0<sup>1</sup></b> | <b>143.0<sup>2</sup></b> | <b>188.8<sup>3</sup></b> | <b>218.8<sup>4</sup></b> | <b>227.4<sup>5</sup></b> | <b>316.2<sup>6</sup></b> |

<sup>1</sup>Carrier is standard MXP16P, 4.33" (110.0mm) long, Impact bolts on each end of carrier add .31" (8.0mm) to total length

<sup>2</sup>Carrier is standard MXP25P, 5.31" (135.0mm) long, Impact bolts on each end of carrier add .31" (8.0mm) to total length

<sup>3</sup>Carrier is standard MXP32P, 6.69" (170.0mm) long, Impact bolts on each end of carrier add .74" (18.8mm) to total length

<sup>4</sup>Carrier is standard MXP40P, 7.87" (200.0mm) long, Impact bolts on each end of carrier add .74" (18.8mm) to total length

<sup>5</sup>Carrier is standard MXP50P, 8.50" (216.0mm) long, Impact bolts on each end of carrier add .45" (11.4mm) to total length

<sup>6</sup>Carrier is standard MXP63P, 12.00" (304.8mm) long, Impact bolts on each end of carrier add .45" (11.4mm) to total length

**NOTE:** Auxiliary carrier is P-Profiled Rail carrier, see page MXP\_31 for carrier size and mounting dimensions





# SWITCHES

## SPECIFICATIONS



MX products offer a large number of sensing choices. There are 12 switch choices: reed, solid state PNP (sourcing) or solid state NPN (sinking); in normally open or normally closed; with flying leads or quick-disconnects.

Commonly used for end-of-stroke positioning, these switches allow drop-in installation anywhere along the entire actuator length. The one-piece design includes the retained fastening hardware and is designed for any open side or bottom slot on the MX. The internal piston magnet is a standard feature, therefore these switches can be installed in the field at anytime.

Switches are used to send digital signals to PLC (programmable logic controller), TTL, CMOS circuit or other controller device. Switches contain reverse polarity protection. Solid state QD cables are shielded; shield should be terminated at flying lead end.

All switches are CE rated and are RoHS compliant. Switches feature bright red or yellow LED signal indicators; solid state switches also have green LED power indicators.

|             | Order Code | Lead             | Switching Logic                | Power LED                                                                           | Signal LED | Operating Voltage | *Power Rating (Watts) | Switching Current (mA max.) | Current Consumption | Voltage Drop | Leakage Current | Temp. Range                  | Shock / Vibration |
|-------------|------------|------------------|--------------------------------|-------------------------------------------------------------------------------------|------------|-------------------|-----------------------|-----------------------------|---------------------|--------------|-----------------|------------------------------|-------------------|
| REED        | <b>R Y</b> | 5m               | SPST Normally Open             | —                                                                                   | Red        | 5 - 240 AC/DC     | *10.0                 | 100mA                       | —                   | 3.0 V max.   | —               | 14 to 158°F<br>[-10 to 70°C] | 50 G / 9 G        |
|             | <b>R K</b> | Quick Disconnect |                                |  |            |                   |                       |                             |                     |              |                 |                              |                   |
|             | <b>N Y</b> | 5m               | SPST Normally Closed           | —                                                                                   | Yellow     | 5 - 110 AC/DC     |                       |                             |                     |              |                 |                              |                   |
|             | <b>N K</b> | Quick Disconnect |                                |  |            |                   |                       |                             |                     |              |                 |                              |                   |
| SOLID STATE | <b>T Y</b> | 5m               | PNP (Sourcing) Normally Open   | Green                                                                               | Yellow     | 10 - 30 Vdc       | *3.0                  | 100mA                       | 20 mA @ 24V         | 2.0 V max.   | 0.05 mA max.    |                              |                   |
|             | <b>T K</b> | Quick Disconnect |                                |  |            |                   |                       |                             |                     |              |                 |                              |                   |
|             | <b>K Y</b> | 5m               | NPN (Sinking) Normally Open    | Green                                                                               | Red        |                   |                       |                             |                     |              |                 |                              |                   |
|             | <b>K K</b> | Quick Disconnect |                                |  |            |                   |                       |                             |                     |              |                 |                              |                   |
|             | <b>P Y</b> | 5m               | PNP (Sourcing) Normally Closed | Green                                                                               | Yellow     |                   |                       |                             |                     |              |                 |                              |                   |
|             | <b>P K</b> | Quick Disconnect |                                |  |            |                   |                       |                             |                     |              |                 |                              |                   |
|             | <b>H Y</b> | 5m               | NPN (Sinking) Normally Closed  | Green                                                                               | Red        |                   |                       |                             |                     |              |                 |                              |                   |
|             | <b>H K</b> | Quick Disconnect |                                |  |            |                   |                       |                             |                     |              |                 |                              |                   |

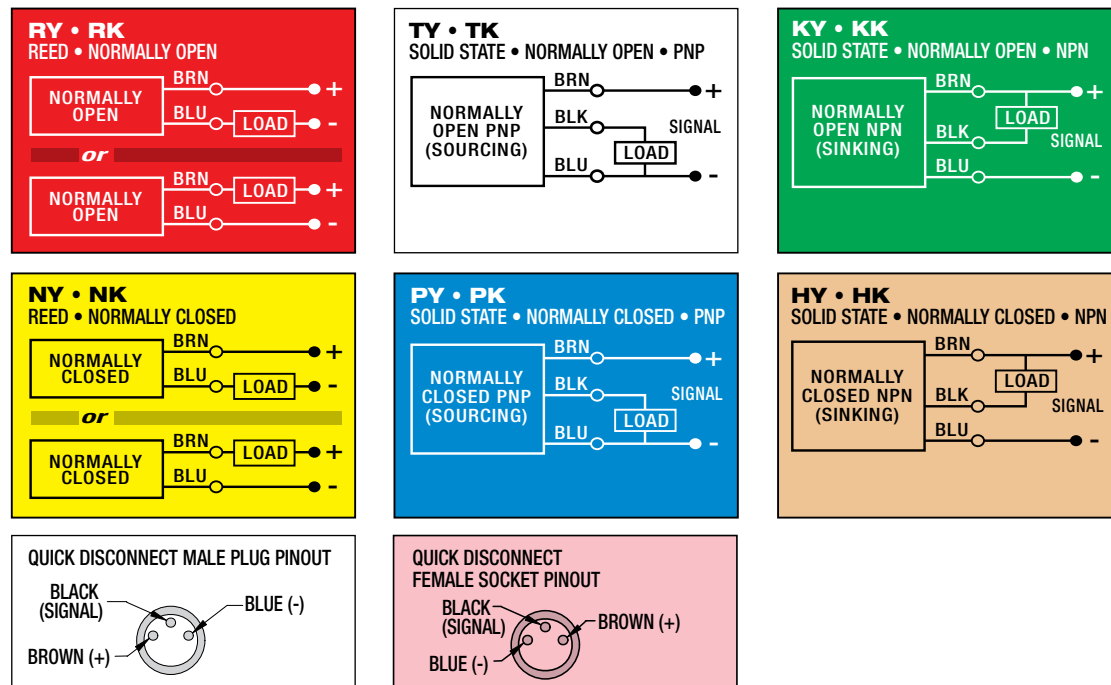
Enclosure classification IEC 529 IP67 (NEMA 6)

CABLES: Robotic grade, oil resistant polyurethane jacket, PVC insulation

⚠️\*WARNING: Do not exceed power rating (Watt = Voltage x Amperage). Permanent damage to sensor will occur.

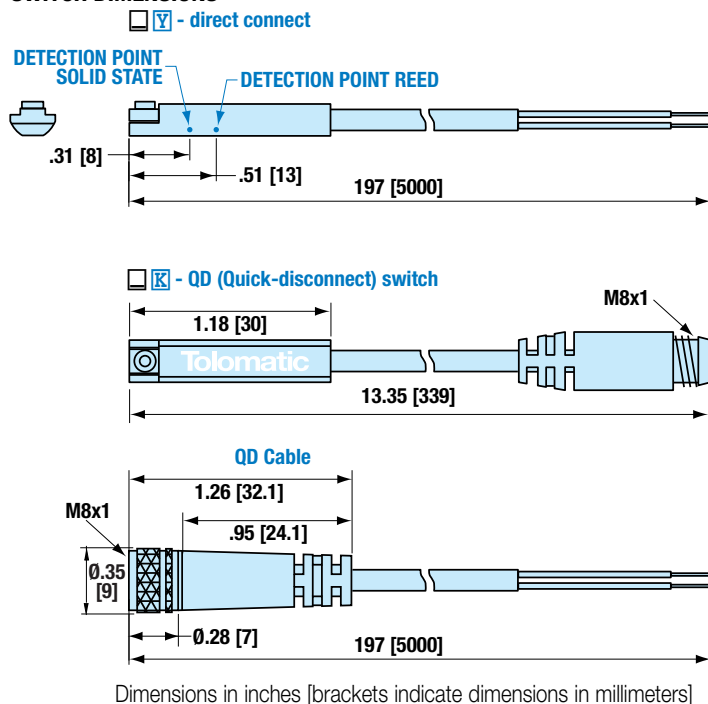
# SWITCHES

## WIRING DIAGRAMS

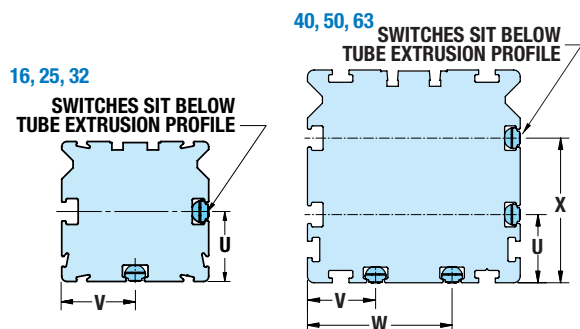


## DIMENSIONS

### SWITCH DIMENSIONS



### MOUNTING DIMENSIONS

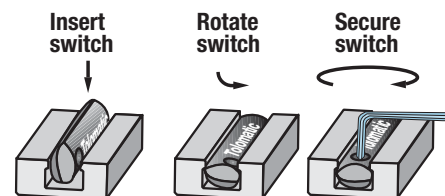


### SWITCH MOUNTING

|           | 16   | 25   | 32   | 40   | 50   | 63   |
|-----------|------|------|------|------|------|------|
| <b>U</b>  | 0.31 | 0.79 | 1.06 | 0.81 | 1.08 | 1.50 |
| <b>mm</b> | 7.9  | 20.0 | 27.0 | 20.5 | 27.4 | 38.0 |
| <b>V</b>  | 0.59 | 0.83 | 1.09 | 0.81 | 1.08 | 1.50 |
| <b>mm</b> | 15.0 | 21.0 | 27.7 | 20.5 | 27.4 | 38.0 |
| <b>W</b>  | —    | —    | —    | 1.71 | 2.02 | 2.44 |
| <b>mm</b> | —    | —    | —    | 43.5 | 51.4 | 62.0 |
| <b>X</b>  | —    | —    | —    | 1.71 | 2.02 | 2.44 |
| <b>mm</b> | —    | —    | —    | 43.5 | 51.4 | 62.0 |

## SWITCH INSTALLATION AND REPLACEMENT

Place switch in side groove on tube at desired location with "Tolomatic" facing outward. While applying light pressure to the switch, rotate the switch halfway into the groove. Maintaining light pressure, rotate the switch in the opposite direction until it is fully inside the groove with "Tolomatic" visible. Re-position the switch to the exact location and lock the switch securely into place by tightening the screw on the switch.



# SELECTION GUIDELINES

## 1 COMPILE APPLICATION REQUIREMENTS

### APPLICATION DATA WORKSHEET

#### STROKE LENGTH

☐ inch (SIZ) (U.S. Standard) ☐ millimeters (SMM) (Metric)

#### AVAILABLE AIR PRESSURE

☐ PSI (U.S. Standard) ☐ bar (Metric)

#### REQUIRED THRUST FORCE

☐ lbf (U.S. Standard) ☐ N (Metric)

#### LOAD

☐ lb (U.S. Standard) ☐ kg (Metric)

#### LOAD CENTER OF GRAVITY DISTANCE TO CARRIER CENTER

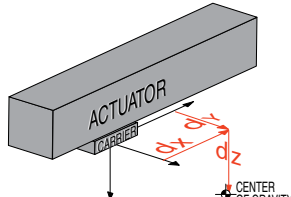
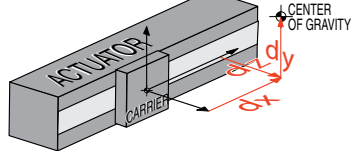
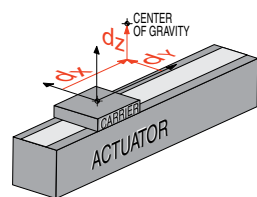
$d_x$  \_\_\_\_\_  
 $d_y$  \_\_\_\_\_  
 $d_z$  \_\_\_\_\_  
☐ inch (U.S. Standard) ☐ millimeters (Metric)

#### ORIENTATION

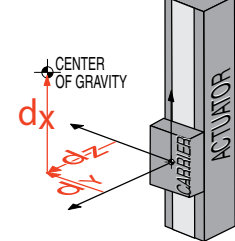
☐ Horizontal

☐ Side

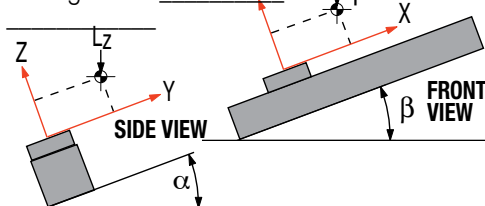
☐ Horizontal Down



☐ Vertical



☐ Angled  $\alpha$



#### OTHER ISSUES:

(i.e. Environment,  
Temperature,  
Contamination, etc.)

#### FORCES APPLIED TO CARRIER

☐ lbf (U.S. Standard) ☐ N (Metric)

$F_z$  \_\_\_\_\_  
 $F_y$  \_\_\_\_\_

#### BENDING MOMENTS APPLIED TO CARRIER

☐ in-lbs (U.S. Standard) ☐ N-m (Metric)

$M_x$  \_\_\_\_\_  
 $M_y$  \_\_\_\_\_  
 $M_z$  \_\_\_\_\_

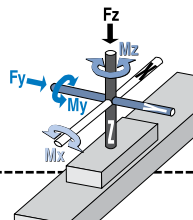
#### FINAL VELOCITY

☐ in/sec (U.S. Standard) ☐ mm/sec (Metric)

#### MOVE TIME sec.

#### NO. OF CYCLES

☐ per minute ☐ per hour



The process of selecting a load bearing actuator for a given application can be complex. **It is highly recommended that you contact Tolomatic for assistance in selecting the best actuator for your application.** The following overview of the selection guidelines are for educational purposes only.

## 2 DETERMINE BORE SIZE

- Consult the Theoretical Force vs. Pressure graph. (See graph at right)
- Find the intersection of the available pressure and required thrust force. If the intersection falls below the plotted bore size curve, the actuator will supply adequate force for the application. If the intersection is above the curve, a larger cylinder bore size will be required.

**NOTE:** Additional force may be required to obtain the necessary acceleration within desired cycle time.

## 3 COMPARE LOAD TO MAXIMUM LOAD CAPACITIES

Calculate the following static loads:  $M_x$ ,  $M_y$ ,  $M_z$ ,  $F_y$ ,  $F_z$

Loads = Applied Moments + Forces

If the load of your application exceeds figures indicated in the MOMENT AND LOAD CAPACITY tables (See pages MXP\_10-15) consider:

- Higher capacity bearing style, i.e. **N** to **S**, **S** to **P**
- Larger Bore Cylinder
- Auxiliary Carrier
- Add External Guides

Contact information: \_\_\_\_\_



Fax (1-763-478-8080) or call Tolomatic (1-800-328-2174) with the above information. We will provide any assistance needed to determine the proper MXP Band Cylinder.

## 4 CALCULATE LOAD FACTOR $L_F$

For combined loads the Load Factor ( $L_F$ ) must not exceed the value 1.

$$L_F = \frac{M_x}{M_{x_{max}}} + \frac{M_y}{M_{y_{max}}} + \frac{M_z}{M_{z_{max}}} + \frac{F_y}{F_{y_{max}}} + \frac{F_z}{F_{z_{max}}} \leq 1$$

If  $L_F$  exceeds the value 1, then consider the four choices listed in step #3.

## SHOCKS

If the intersection of the final velocity and load mass falls in the shaded regions, then shock absorbers should be used.

## 6 CONSIDER PEAK DYNAMIC INERTIA MOMENTS

When a rigidly attached load mass is accelerated or decelerated, its inertia induces

are excessive, consider the four choices listed in step #3 or consider these deceleration methods:

- Reduce final velocity with flow controls or reduced pressure.
- Pneumatic valve deceleration circuits. By reducing the speed before the cushion or shock is reached, the load can decelerate over a longer distance, thereby reducing the deceleration moments.
- Position shock absorbers at the load's center of gravity. This will greatly reduce the moment load applied to the carrier.

## PROFILLED RAIL DECELERATION CONSIDERATIONS

While the **P** Profiled Rail MXP is capable of carrying very large loads, consideration must be given to how to stop the load at the end of stroke. If Tolomatic cushions or shocks are used, stay within the specifications defined. If another type of shock absorber is used, be sure that the deceleration of the load is smooth and over an adequate distance.

## 7 DETERMINE TUBE CLAMP REQUIREMENTS

- Consult the Tube Clamp Requirement chart for the model selected (page MXP\_19-20).
- Cross-reference the load force and maximum distance between supports.
- Divide stroke length by max. distance calculated above to determine number of tube clamps to order.

## 8 CONSIDER PORTING AND OPTIONS

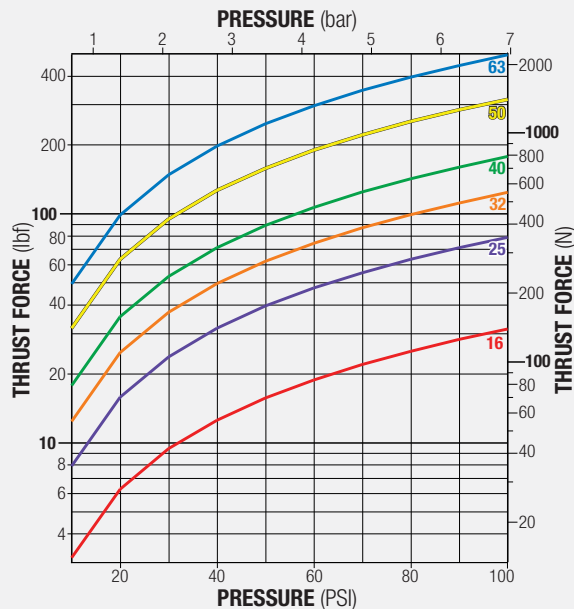
- Choose Single End Porting or Dual End Porting

- Choose NPT, Metric Parallel (ISO-G/BSP) or Metric Taper (Rc/BST) Ports

### OPTIONS:

- Switches – Reed, Solid State PNP or NPN, all available normally open or normally closed
- Shock Absorbers – Heavy or light duty, fixed or adjustable mount – recommended for longer life in most applications
- Foot Mounts
- Floating Mount Bracket – used when lack of parallelism occurs between the cylinder and an externally guided and supported load. Available for **N** internal & **S** solid bearing styles

## THEORETICAL FORCE VS PRESSURE



## 5 DETERMINE CUSHION & SHOCK CAPACITY

Consult the Cushion and Shock Absorber Performance charts for the model selected (see page MXP\_18). The velocities listed on the cushion charts are final or impact velocities. If the final or impact velocity is not known, use of valve deceleration circuits or shock absorbers should be considered.

### CUSHIONS

Find the intersection of the final velocity and load mass. If the intersection is below the diagonal lines, the internal cushions on the actuator may be used.

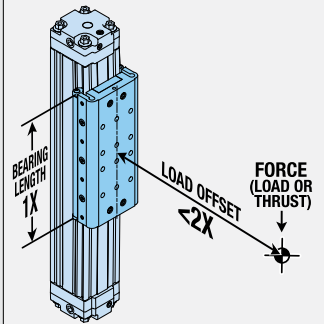
bending moments on the carrier. The magnitude of these inertia moments can be larger than the applied loads. Careful attention to how the load is decelerated at the end of stroke is required for extended actuator performance and application safety.

Evaluate the dynamic inertia moment data:

- 1.) The length of deceleration distance
- 2.) The load attached to the carrier
- 3.) The distance of the load mass center of gravity from the carrier, and
- 4.) The final velocity of the carrier.

If dynamic inertia moments

## S SOLID BEARING 2:1 RULE



For applications using **S** solid bearings, binding or interrupted motion may occur if the load offset is equal to or greater than twice the bearing length (1X). *LOAD OFFSET* is defined as: the distance from the applied force (or the load center of gravity) to the centerline of the carrier.

If the load offset cannot be changed consider:

- 1.) Higher capacity bearing style, i.e. **S** to **P**
- 2.) Larger Bore Cylinder
- 3.) Auxiliary Carrier
- 4.) Add External Guides



# ADJUSTMENT PROCEDURES

## CUSHION NEEDLE ADJUSTMENT

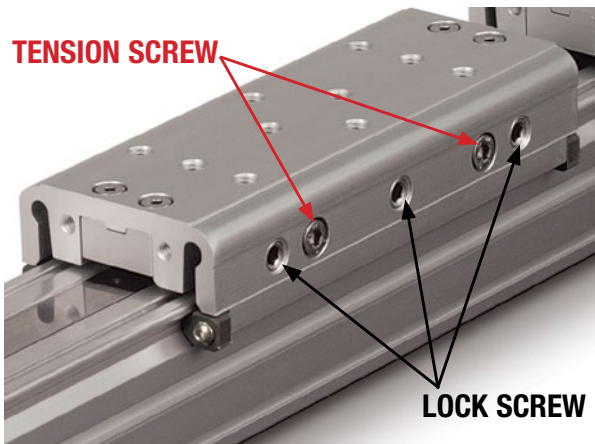


Adjust the cushion needle in the cylinder heads carefully to obtain proper deceleration for your particular application. Proper cushion needle adjustment is achieved when the carrier reaches the end of travel at a velocity approaching

zero. If the carrier reaches the end of stroke at velocity, then the cushion needs to be increased by turning the cushion needle screw clockwise. If the carrier stalls or bounces (quickly oscillating directions) before it reaches the end of stroke, then the cushion needs to be decreased by turning the cushion needle screw counterclockwise. Improper cushion adjustment may cause premature failure of the actuator. Call Tolomatic with any questions.

## S SOLID BEARING CARRIER ADJUSTMENT

The S solid bearing carrier will provide for maximum life when properly adjusted. The carrier design contains both tension and lock screws. The tension screws control the amount of pressure placed on the carrier bearings. The lock screws lock the tension screws in place and provide fine adjustment of the carrier bearings. The number of tension and lock screws will vary depending on the bore size of the actuator.



1. Fully loosen all tension and lock screws. They do not need to be removed, just fully loosened.
2. Tighten tension screws on both sides of carrier roughly 1/8 to 1/4 turn clockwise past where the screw starts to feel snug. The carrier should be very difficult or impossible to move by hand.
3. Next, adjust the lock screws on both sides of the carrier roughly 1/8 to 1/4 turn clockwise past where the screw starts to engage.
4. Ideal carrier tension is achieved when the carrier feels snug in relation to the tube. No rocking motion should be present. The carrier should be loose enough to be moved by hand over the entire length of the actuator. If after this process the carrier has become too loose, equally adjust all of the lock screws with a slight 1/32 turn counterclockwise. A carrier that is adjusted too tight will increase the breakaway pressure required for motion; in extreme cases no motion will occur when air is applied.

During the service life, this process may need to be repeated. Keeping the carrier properly adjusted will prolong the life of the S solid bearing system.

## MXP16

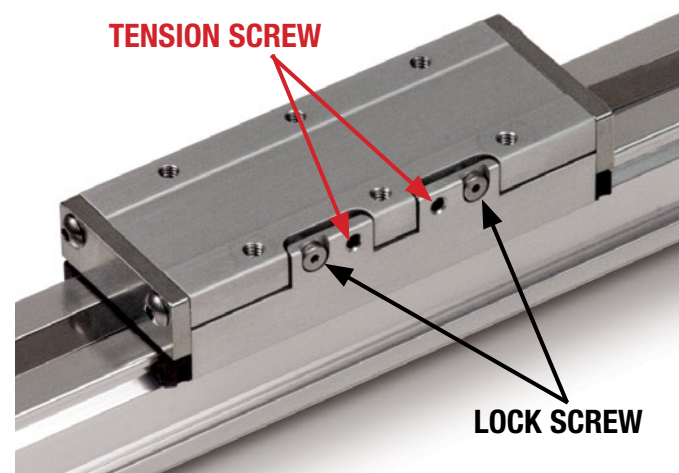


**NOTE: MXP16S requires a different carrier adjustment procedure, see below.**

### Tools Required:

Inch Models: 1/16 inch and 2.5mm Hex Wrench (Key)  
Metric Models: 2 and 2.5 mm Hex Wrench (Key)

1. Loosen endplate screws on both ends of the carrier.
2. Fully loosen all tension and lock screws. They do not need to be removed, just fully loosened.



3. Tighten tension screws by turning them clockwise until the carrier is just tight enough so that no side-to-side rocking motion is present and it can easily be moved by hand over the entire stroke length with no hesitation. Very little torque on the screws is required to obtain this condition.

Note: The Tension Screws are the small set screw style fastener. The Lock Screws are the larger, low head, hex drive screws.

4. Tighten lock screws by turning them clockwise until tight. The carrier should feel snug in relation to the tube, with no side-to-side rocking motion present. If the carrier becomes too loose, loosen the lock screws, tighten the tension screws and then retighten the lock screws.

5. Once ideal carrier tension is achieved, fully tighten end plate screws on both ends of the carrier.

### Allen wrench sizes for carrier adjustment, Solid bearing actuators

|    | Tension Screw |    | Lock Screw |     |
|----|---------------|----|------------|-----|
|    | in            | mm | in         | mm  |
| 16 | 1/16          | 2  | 1/16       | 2   |
| 25 | 5/32          | 4  | 1/8        | 3   |
| 32 | 5/32          | 4  | 3/32       | 2   |
| 40 | 5/32          | 4  | 1/8        | 3   |
| 50 | 3/16          | 4  | 3/32       | 2.5 |
| 63 | 1/4           | 5  | 3/16       | 5   |

# SERVICE PARTS

## REPAIR KITS

Repair kit includes: dust band, seal band, end caps, internal soft seals (piston seals, cushion seals, wipers), [Also for **S** style: bearings and bearing caps]

The part number for a repair kit begins with RK followed by model, bore size, bearing type, and stroke length (**SK** = inch/US Standard, **SM** = metric) (NOTE: If unit has an auxiliary carrier also include DW and distance between carrier centers)

REPAIR KIT MODEL BORE SIZE BEARING TYPE STROKE METRIC STROKE LENGTH AUXILIARY CARRIER DISTANCE BETWEEN CARRIERS

**RK MXP 40 S SM 2007.02 DW 215.9**

## SWITCHES

### TO ORDER SERVICE PARTS SWITCHES:

Switches for MXP include retained mounting hardware and are the same for all bore sizes and bearing styles

| Code       | Lead             | Normally | Sensor Type     |
|------------|------------------|----------|-----------------|
| <b>R Y</b> | 5m (197 in)      | Open     | Reed            |
| <b>R K</b> | Quick-disconnect |          |                 |
| <b>N Y</b> | 5m (197 in)      | Closed   | Reed            |
| <b>N K</b> | Quick-disconnect |          |                 |
| <b>T Y</b> | 5m (197 in)      | Open     | Solid State PNP |
| <b>T K</b> | Quick-disconnect |          |                 |
| <b>K Y</b> | 5m (197 in)      | Open     | Solid State NPN |
| <b>K K</b> | Quick-disconnect |          |                 |
| <b>P Y</b> | 5m (197 in)      | Closed   | Solid State PNP |
| <b>P K</b> | Quick-disconnect |          |                 |
| <b>H Y</b> | 5m (197 in)      | Closed   | Solid State NPN |
| <b>H K</b> | Quick-disconnect |          |                 |

To order switches using configured parts string (will include mating female QD cable if required)

SWITCH KIT MODEL BORE SIZE BEARING TYPE SWITCH CODE QUANTITY

**SW MXP 25 N RK 2**

# SERVICE PARTS MXP16, MXP25, MXP32

| MOUNTING OPTIONS                                             |        | 16         |           |                 | 25         |           |                 | 32         |           |                 |
|--------------------------------------------------------------|--------|------------|-----------|-----------------|------------|-----------|-----------------|------------|-----------|-----------------|
|                                                              |        | N Internal | S Solid   | P Profiled Rail | N Internal | S Solid   | P Profiled Rail | N Internal | S Solid   | P Profiled Rail |
| <b>Foot Mount</b><br>(1 bracket, 2 bolts)                    | Inch   | 8116-9519  | 8116-9519 | 8116-9519       | 8125-9519  | 8125-9519 | 8125-9519       | 8132-9519  | 8132-9519 | 8132-9519       |
|                                                              | Metric | 8116-9019  | 8116-9019 | 8116-9019       | 8125-9019  | 8125-9019 | 8125-9019       | 8132-9019  | 8132-9019 | 8132-9019       |
| <b>Tube Clamp</b><br>(2 clamps)                              |        | NA         | NA        | NA              | 8125-9018  | 8125-9018 | 8125-9018       | 8132-9018  | 8132-9018 | 8132-9018       |
| <b>Floating Mount</b><br>(brackets, pin, mounting fasteners) | Inch   | 8116-9535  | 8116-9536 | NA              | 8125-9535  | 8125-9536 | NA              | 8132-9535  | 8132-9536 | NA              |
|                                                              | Metric | 8116-9035  | 8116-9036 | NA              | 8125-9035  | 8125-9036 | NA              | 8132-9035  | 8132-9036 | NA              |
| <b>Mounting Plate</b><br>(1 plate, 2 bolts)                  | Inch   | 8316-9016  | 8316-9016 | 8316-9016       |            |           |                 |            |           |                 |
|                                                              | Metric | 8316-9016  | 8316-9016 | 8316-9016       |            |           |                 |            |           |                 |

| SHOCK ABSORBER KITS                                                                              |        | 16         |           |                 | 25         |           |                 | 32         |           |                 |
|--------------------------------------------------------------------------------------------------|--------|------------|-----------|-----------------|------------|-----------|-----------------|------------|-----------|-----------------|
|                                                                                                  |        | N Internal | S Solid   | P Profiled Rail | N Internal | S Solid   | P Profiled Rail | N Internal | S Solid   | P Profiled Rail |
| <b>Fixed Shock Absorber Kit - Light Duty</b><br>(2 shock absorbers, all required hardware)       | Inch   | 8116-9510  | 8116-9511 | 8116-9512       | 8125-9510  | 8125-9511 | 8125-9512       | 8132-9510  | 8132-9511 | 8132-9512       |
|                                                                                                  | Metric | 8116-9010  | 8116-9011 | 8116-9012       | 8125-9010  | 8125-9011 | 8125-9012       | 8132-9010  | 8132-9011 | 8132-9012       |
| <b>Fixed Shock Absorber Kit - Heavy Duty</b><br>(2 shock absorbers, all required hardware)       | Inch   | 8116-9525  | 8116-9526 | 8116-9527       | 8125-9525  | 8125-9526 | 8125-9527       | 8132-9525  | 8132-9526 | 8132-9527       |
|                                                                                                  | Metric | 8116-9025  | 8116-9026 | 8116-9027       | 8125-9025  | 8125-9026 | 8125-9027       | 8132-9025  | 8132-9026 | 8132-9027       |
| <b>*Adjustable Shock Absorber Kit - Light Duty</b><br>(2 shock absorbers, all required hardware) | Inch   | 8116-9515  | 8116-9016 | 8116-9517       | 8125-9515  | 8125-9016 | 8125-9517       | 8132-9515  | 8132-9016 | 8132-9517       |
|                                                                                                  | Metric | 8116-9015  | 8116-9016 | 8125-9017       | 8125-9015  | 8125-9016 | 8125-9017       | 8132-9015  | 8132-9016 | 8132-9017       |
| <b>*Adjustable Shock Absorber Kit - Heavy Duty</b><br>(2 shock absorbers, all required hardware) | Inch   | 8116-9530  | 8116-9031 | 8116-9032       | 8125-9530  | 8125-9031 | 8125-9532       | 8132-9530  | 8132-9031 | 8132-9532       |
|                                                                                                  | Metric | 8116-9030  | 8116-9031 | 8116-9032       | 8125-9030  | 8125-9031 | 8125-9032       | 8132-9030  | 8132-9031 | 8132-9032       |

| SHOCK PARTS                                                            |        | 16         |           |                 | 25         |           |                 | 32         |           |                 |
|------------------------------------------------------------------------|--------|------------|-----------|-----------------|------------|-----------|-----------------|------------|-----------|-----------------|
|                                                                        |        | N Internal | S Solid   | P Profiled Rail | N Internal | S Solid   | P Profiled Rail | N Internal | S Solid   | P Profiled Rail |
| <b>Fixed Shock Absorber Mounting Hardware</b><br>(1 shock mount)       | Inch   | 8116-9520  | 8116-9520 | 8116-9522       | 8125-9520  | 8125-9520 | 8125-9522       | 8132-9520  | 8132-9520 | 8132-9522       |
|                                                                        | Metric | 8116-9020  | 8116-9020 | 8116-9022       | 8125-9020  | 8125-9020 | 8125-9022       | 8132-9020  | 8132-9020 | 8132-9022       |
| <b>*Adj. Shock Absorber Mounting Hardware</b><br>(1 shock mount)       |        | 8116-9023  | 8116-9023 | 8116-9024       | 8125-9023  | 8125-9023 | 8125-9024       | 8132-9023  | 8132-9023 | 8132-9024       |
| <b>Shock Stop Kit</b><br>(Hardware needed for shock to strike carrier) | Inch   | 8116-9521  | NA        | 8116-9034       | 8125-9521  | 8125-9013 | 8125-9534       | 8132-9521  | 4912-1063 | 8132-9534       |
|                                                                        | Metric | 8116-9021  | NA        | 8116-9034       | 8125-9021  | 8125-9013 | 8125-9034       | 8132-9021  | 4912-1063 | 8132-9034       |
| <b>Shock Absorber - Heavy Duty</b><br>(1 shock absorber)               |        | 7906-1066  | 7906-1066 | 7906-1066       | 4910-1338  | 4910-1338 | 4910-1338       | 4912-1068  | 4912-1068 | 4912-1068       |
| <b>Shock Absorber - Light Duty</b><br>(1 shock absorber)               |        | 7906-1065  | 7906-1065 | 7906-1065       | 4910-1337  | 4910-1337 | 4910-1337       | 4912-1067  | 4912-1067 | 4912-1067       |

\*NOTE: **N** Internal bearing: Adjustable shock absorbers will decrease actuator stroke, see ▲ Stroke Adder note on page MXP\_25 for more information.  
**S** Solid bearing: Adjustable shock absorbers will decrease actuator stroke, see ▲ Stroke Adder note on page MXP\_30 for more information.  
**P** Profiled rail: Adjustable shock absorbers will decrease actuator stroke, see ▲ Stroke Adder note on page MXP\_35 for more information.

# SERVICE PARTS MXP40, MXP50, MXP63

| MOUNTING OPTIONS                                             |        | 40         |           |                 | 50         |           |                 | 63         |           |                 |
|--------------------------------------------------------------|--------|------------|-----------|-----------------|------------|-----------|-----------------|------------|-----------|-----------------|
|                                                              |        | N Internal | S Solid   | P Profiled Rail | N Internal | S Solid   | P Profiled Rail | N Internal | S Solid   | P Profiled Rail |
| <b>Foot Mount</b><br>(1 bracket, 2 bolts)                    | Inch   | 8140-9519  | 8140-9519 | 8140-9519       | 8150-9519  | 8150-9519 | 8150-9519       | 8163-9519  | 8163-9519 | 8163-9519       |
|                                                              | Metric | 8140-9019  | 8140-9019 | 8140-9019       | 8150-9019  | 8150-9019 | 8150-9019       | 8163-9019  | 8163-9019 | 8163-9019       |
| <b>Tube Clamp</b><br>(2 clamps)                              |        | 8140-9018  | 8140-9018 | 8140-9018       | 8140-9018  | 8140-9018 | 8140-9018       | 8163-9018  | 8163-9018 | 8163-9018       |
| <b>Floating Mount</b><br>(brackets, pin, mounting fasteners) | Inch   | 8140-9535  | 8140-9536 | NA              | 8150-9535  | 8150-9536 | NA              | 8163-9535  | 8163-9536 | NA              |
|                                                              | Metric | 8140-9035  | 8140-9036 | NA              | 8150-9035  | 8150-9036 | NA              | 8163-9035  | 8163-9036 | NA              |

| SHOCK ABSORBER KITS                                                                              |        | 40         |           |                 | 50         |           |                 | 63         |           |                 |
|--------------------------------------------------------------------------------------------------|--------|------------|-----------|-----------------|------------|-----------|-----------------|------------|-----------|-----------------|
|                                                                                                  |        | N Internal | S Solid   | P Profiled Rail | N Internal | S Solid   | P Profiled Rail | N Internal | S Solid   | P Profiled Rail |
| <b>Fixed Shock Absorber Kit - Light Duty</b><br>(2 shock absorbers, all required hardware)       | Inch   | 8140-9510  | 8140-9511 | 8140-9512       | 8150-9510  | 8150-9511 | 8150-9512       | 8163-9510  | 8163-9511 | 8163-9512       |
|                                                                                                  | Metric | 8140-9010  | 8140-9011 | 8140-9012       | 8150-9010  | 8150-9011 | 8150-9012       | 8163-9010  | 8163-9011 | 8163-9012       |
| <b>Fixed Shock Absorber Kit - Heavy Duty</b><br>(2 shock absorbers, all required hardware)       | Inch   | 8140-9525  | 8140-9526 | 8140-9527       | 8150-9525  | 8150-9526 | 8150-9527       | 8163-9525  | 8163-9526 | 8163-9527       |
|                                                                                                  | Metric | 8140-9025  | 8140-9026 | 8140-9027       | 8150-9025  | 8150-9026 | 8150-9027       | 8163-9025  | 8163-9026 | 8163-9027       |
| <b>*Adjustable Shock Absorber Kit - Light Duty</b><br>(2 shock absorbers, all required hardware) | Inch   | 8140-9515  | 8140-9016 | 8140-9517       | 8150-9515  | 8150-9016 | 8150-9517       | 8163-9515  | 8163-9016 | 8163-9517       |
|                                                                                                  | Metric | 8140-9015  | 8140-9016 | 8140-9017       | 8150-9015  | 8150-9016 | 8150-9017       | 8163-9015  | 8163-9016 | 8163-9017       |
| <b>*Adjustable Shock Absorber Kit - Heavy Duty</b><br>(2 shock absorbers, all required hardware) | Inch   | 8140-9530  | 8140-9031 | 8140-9532       | 8150-9530  | 8150-9031 | 8150-9532       | 8163-9530  | 8163-9031 | 8163-9532       |
|                                                                                                  | Metric | 8140-9030  | 8140-9031 | 8140-9032       | 8150-9030  | 8150-9031 | 8150-9032       | 8163-9030  | 8163-9031 | 8163-9032       |

| SHOCK PARTS                                                            |        | 40         |           |                 | 50         |           |                 | 63         |           |                 |
|------------------------------------------------------------------------|--------|------------|-----------|-----------------|------------|-----------|-----------------|------------|-----------|-----------------|
|                                                                        |        | N Internal | S Solid   | P Profiled Rail | N Internal | S Solid   | P Profiled Rail | N Internal | S Solid   | P Profiled Rail |
| <b>Fixed Shock Absorber Mounting Hardware</b><br>(1 shock mount)       | Inch   | 8140-9520  | 8140-9520 | 8140-9520       | 8150-9520  | 8150-9520 | 8150-9522       | 8163-9520  | 8163-9520 | 8163-9520       |
|                                                                        | Metric | 8140-9020  | 8140-9020 | 8140-9020       | 8150-9020  | 8150-9020 | 8150-9022       | 8163-9020  | 8163-9020 | 8163-9020       |
| <b>*Adj. Shock Absorber Mounting Hardware</b><br>(1 shock mount)       |        | 8140-9023  | 8140-9023 | 8140-9024       | 8150-9023  | 8150-9023 | 8163-9024       | 8163-9023  | 8163-9023 | 8163-9024       |
| <b>Shock Stop Kit</b><br>(Hardware needed for shock to strike carrier) | Inch   | 8140-9521  | 4912-1063 | 8140-9534       | 8150-9521  | 4415-1003 | 8150-9034       | 8163-9521  | 4915-1003 | 8150-9034       |
|                                                                        | Metric | 8140-9021  | 4912-1063 | 8140-9034       | 8150-9021  | 4415-1003 | 8150-9034       | 8163-9021  | 4915-1003 | 8150-9034       |
| <b>Shock Absorber - Heavy Duty</b><br>(1 shock absorber)               |        | 4912-1068  | 4912-1068 | 4912-1068       | 4920-1069  | 4920-1069 | 4920-1069       | 4920-1069  | 4920-1069 | 4920-1069       |
| <b>Shock Absorber - Light Duty</b><br>(1 shock absorber)               |        | 4912-1067  | 4912-1067 | 4912-1067       | 4920-1068  | 4920-1068 | 4920-1068       | 4920-1068  | 4920-1068 | 4920-1068       |

\*NOTE: **N** Internal bearing: Adjustable shock absorbers will decrease actuator stroke, see ▲ Stroke Adder note on page MXP\_25 for more information.  
**S** Solid bearing: Adjustable shock absorbers will decrease actuator stroke, see ▲ Stroke Adder note on page MXP\_30 for more information.  
**P** Profiled rail: Adjustable shock absorbers will decrease actuator stroke, see ▲ Stroke Adder note on page MXP\_35 for more information.



# ORDERING

## MODEL SELECTION (MUST BE IN THIS ORDER)

**MXP 40 P SN SM 2007.02**

## OPTIONS (IN ANY ORDER)

**DW 215.9 FM 2 TC 8 TK 2 AH 2**

### MODEL

**MXP** MXP Pneumatic Band Cylinder

### BORE

- 16** 16 mm ( $\frac{5}{8}$ -inch) bore
- 25** 25 mm (1-inch) bore
- 32** 32 mm (1  $\frac{1}{4}$ -inch) bore
- 40** 38 mm (1  $\frac{1}{2}$ -inch) bore
- 50** 50 mm (2-inch) bore
- 63** 64 mm (2  $\frac{1}{2}$ -inch) bore

### BEARING

- N** Internal Bearing
- S** Solid Bearing
- P** Profiled Rail

### PORTING

- TP** Metric Taper (Rc/BST), Dual-end
- GP** Metric Parallel (ISO-G/BSP), Dual-end
- NP** NPT, Dual-end
- ST** Single-end, Metric Taper
- SG** Single-end, Metric Parallel
- SN** Single-end, NPT

⚠ Single End Porting **ST SG SN** is not available for MXP16

⚠ Metric Taper Porting **TP** is not available for MXP16

### STROKE LENGTH & MOUNTING TYPE

**SK** \_\_\_\_\_ Stroke, enter desired stroke length in **inches**

**SM** \_\_\_\_\_ Stroke, enter desired stroke length in **millimeters**

**NOTE: Actuator mounting threads and mounting fasteners will be either inch or metric; depending on how stroke length is indicated**

**SK=inch mounting**

**SM= metric mounting**

### AUXILIARY CARRIER

**DW** \_\_\_\_\_ Auxiliary Carrier, enter center-to-center spacing desired in **inches (SK)** or **millimeters (SM)**

(Same unit of measure as stroke length is required)

⚠ **Center-to-center spacing between carriers adds to overall length of the actuator**, this distance will not be subtracted from stroke length specified in the previous step

### MOUNTING

- FM** Foot Mount, enter quantity desired
- TC** Tube Clamps, enter number of pairs (Not available on MXP16)
- MP** Mounting Plate (includes T-Nuts) for MXP16 ONLY
- FL** Floating Mount

⚠ **NOTE: Floating Mount is not available with "P" Profiled Rail**

⚠ **NOTE: Shock Absorbers are not available with Floating Mount**

### SWITCHES

- RY** Reed Switch (Normally Open) with 5-meter lead, & enter quantity desired
- RK** Reed Switch (Normally Open) with 5-meter lead/QD, & quantity
- NY** Reed Switch (Normally Closed) with 5-meter lead, & quantity
- NK** Reed Switch (Normally Closed) with 5-meter lead/QD, & quantity
- TY** Solid State Switch PNP (Normally Open) w/ 5-meter lead, & quantity
- TK** Solid State Switch PNP (Normally Open) w/ 5-meter lead/QD, & quantity
- KY** Solid State Switch NPN (Normally Open) w/ 5-meter lead, & quantity
- KK** Solid State Switch NPN (Normally Open) w/ 5-meter lead/QD, & quantity
- PY** Solid State Switch PNP (Normally Closed) w/ 5-meter lead, & quantity
- PK** Solid State Switch PNP (Normally Closed) w/ 5-meter lead/QD, & quantity
- HY** Solid State Switch NPN (Normally Closed) w/ 5-meter lead, & quantity
- HK** Solid State Switch NPN (Normally Closed) w/ 5-meter lead/QD, & quantity

### SHOCK ABSORBER

- SD** Fixed Shock Hardware & enter quantity desired
- SL** Fixed Shock Light Duty & enter quantity desired
- SH** Fixed Shock Heavy Duty & enter quantity desired

- AD** Adjustable Shock Hardware & enter quantity desired
- AL** Adjustable Shock Light Duty & enter quantity desired
- AH** Adjustable Shock Heavy Duty & enter quantity desired

⚠ **NOTE: Adjustable Shock Absorbers reduce usable stroke length of the actuator. Please see the following pages for required stroke adder.**

**N** Internal Bearing.....pg. MXP\_25

**S** Solid Bearing.....pg. MXP\_30

**P** Profiled Rail .....pg. MXP\_35

⚠ **NOTE: Floating Mount is not available with Shock Absorbers**

**VISIT [www.tolomatic.com/mxp](http://www.tolomatic.com/mxp) FOR COMPLETE, UP-TO-DATE INFORMATION**

⚠ **Not all codes listed are compatible with all options.**

**Call Tolomatic to determine available options and accessories based on your application requirements.**

# BC2 SOLID BEARING RODLESS CYLINDER

ABT

MXP

BC2

BC3

BC4

LS

MG

CC

PB

ENGR



## CONTENTS

|                                 |        |
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# BC2 BAND CYLINDER

## ● ENDURANCE TECHNOLOGY<sup>SM</sup> ●

*Endurance Technology features are designed for maximum durability to provide extended service life.*

The BC2 is the direct descendent of the industry's first pneumatic rodless cylinder, manufactured by Tolomatic, the number one rodless supplier. Featuring durable stainless steel bands, field replaceable engineered bearings and a large carrier mounting pattern the BC2 is a great solution for applications that require increased Mx bending moment capacity. Built-to-order in stroke lengths up to 350 inches.

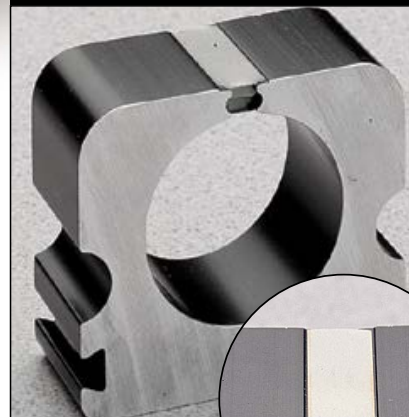
### ● FORMED STEEL PISTON BRACKET ●

- Provides maximum strength at major stress points
- Heat treated carbon steel withstands the toughest dynamic forces
- Strongest bracket design in the industry assures long life with less maintenance



### ● STAINLESS STEEL SEALING BAND SYSTEM ●

- Fatigue resistant stainless steel bands are specifically made to provide longer life and will not elongate, like elastomers
- Outer band keeps out contaminants for extended performance
- Inner band provides a smooth surface for less seal wear



### ● FORMED END CAP WIPER SEAL ●

- Keeps contaminants from entering the sealing area
- Protects internal components
- Reduces maintenance while increasing productivity

### ● ADJUSTABLE CUSHIONS ●

- Adjustable cushions are standard, not optional
- Easy screw adjustment for end-of-stroke deceleration
- Protects actuator and load from damage



# TOLOMATIC...THE RODLESS CYLINDER LEADER



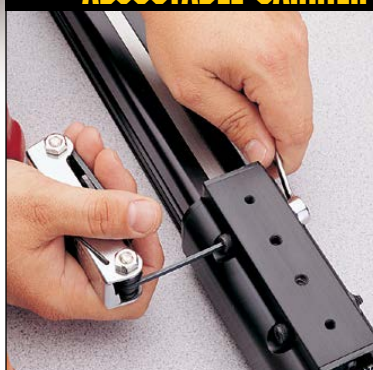
## 3-PORTED HEADS •

- Standard feature
- Simplifies air connections

## RIGID BLACK-ANODIZED EXTRUDED ALUMINUM TUBE •

- Stronger, stiffer tube retains tolerance specs when chamber is pressurized
- Keeps sealing band in place for maximized air efficiency
- Tube supports are minimized
- Solid structural support provides durability and long life performance

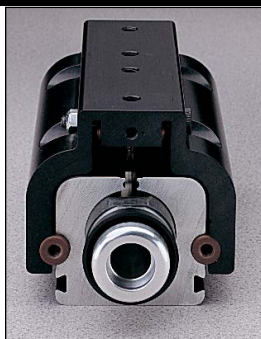
## ADJUSTABLE CARRIER BRACKET •



- 2-bolt adjustment instead of a series of set screws
- Easy to set tension for freer running or stiffer systems
- Minimizes free play while maintaining a higher level of load guidance

## LOAD-BEARING CARRIER DESIGN •

- Load and piston are independent - piston floats, resulting in less friction and longer seal life
- Engineered resin load bearings offer consistently low friction and long wear



## OPTIONS



### AUXILIARY CARRIER

- Substantially higher load capacity
- Substantially higher bending moment capacity



### FLOATING MOUNT

- Compensates for non-parallelism between band cylinder and externally guided load



### TUBE SUPPORT MOUNTS

- Used for intermediate support



### FOOT MOUNTS

- For end mounting of band cylinder



### SHOCK ABSORBERS

- Smooth deceleration
- Allows increased operating speed
- Self-compensates for load or speed changes
- Minimizes impact load to equipment
- Higher equipment productivity
- Adjustable position shocks available



### SWITCHES

- Available in Reed, Hall-effect and Triac
- 15ft. cable with flying leads; available with quick-disconnect couplers

ABT

MXP

BC2

BC3

BC4

LS

MG

CC

PB

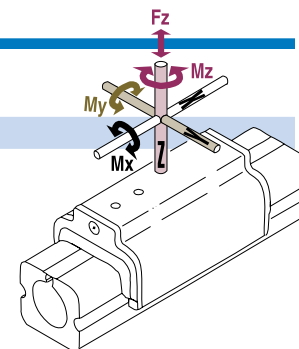
ENGR



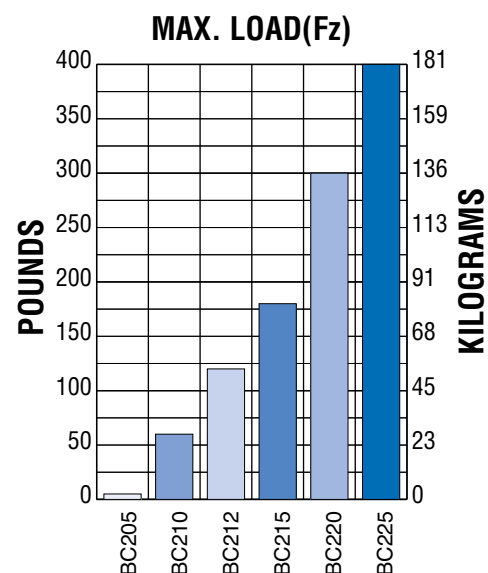
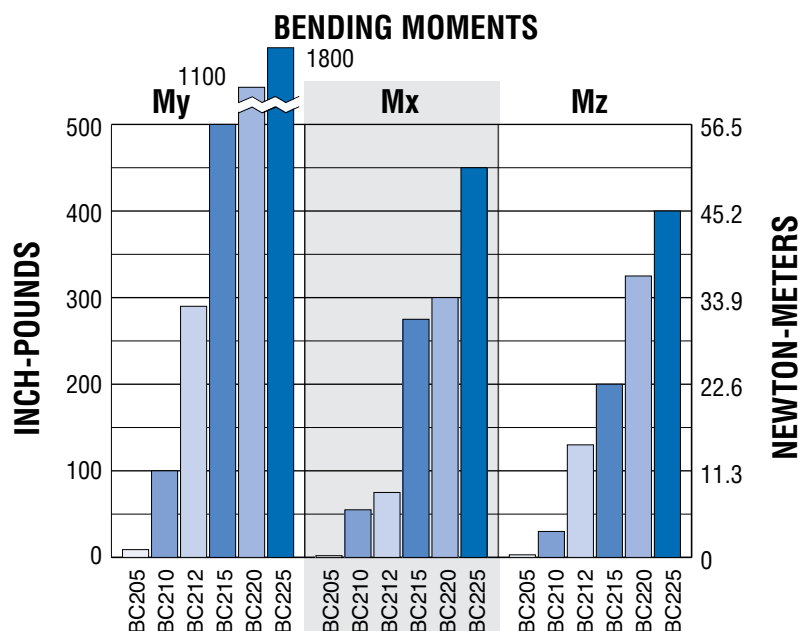
# BC2 Solid Bearing Rodless Cylinder

## PERFORMANCE

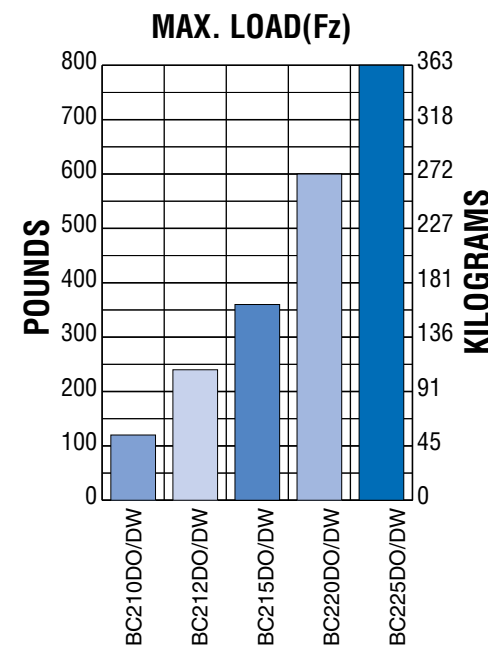
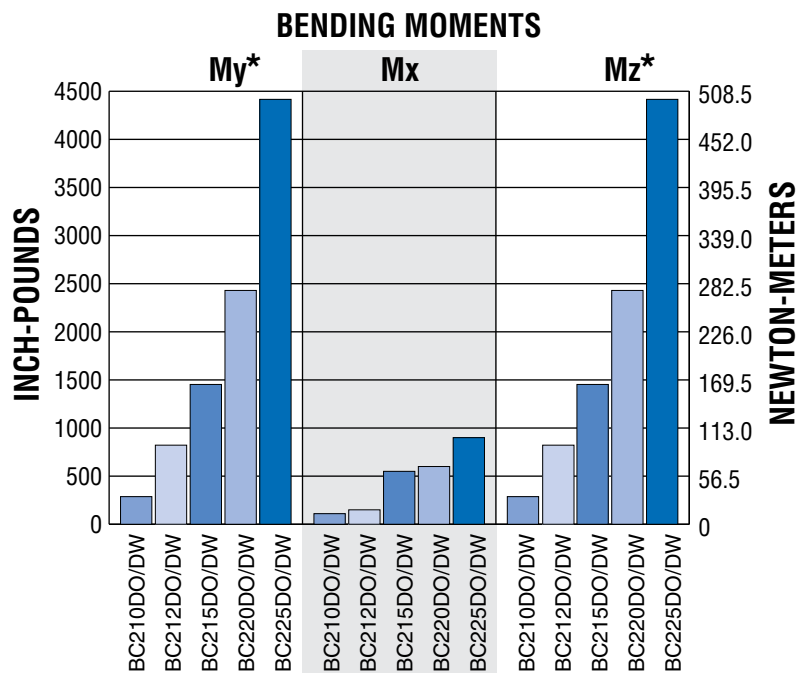
### BC2 BENDING MOMENTS AND LOAD, ALL SIZES



#### STANDARD ACTUATOR



#### AUXILIARY CARRIER OPTION

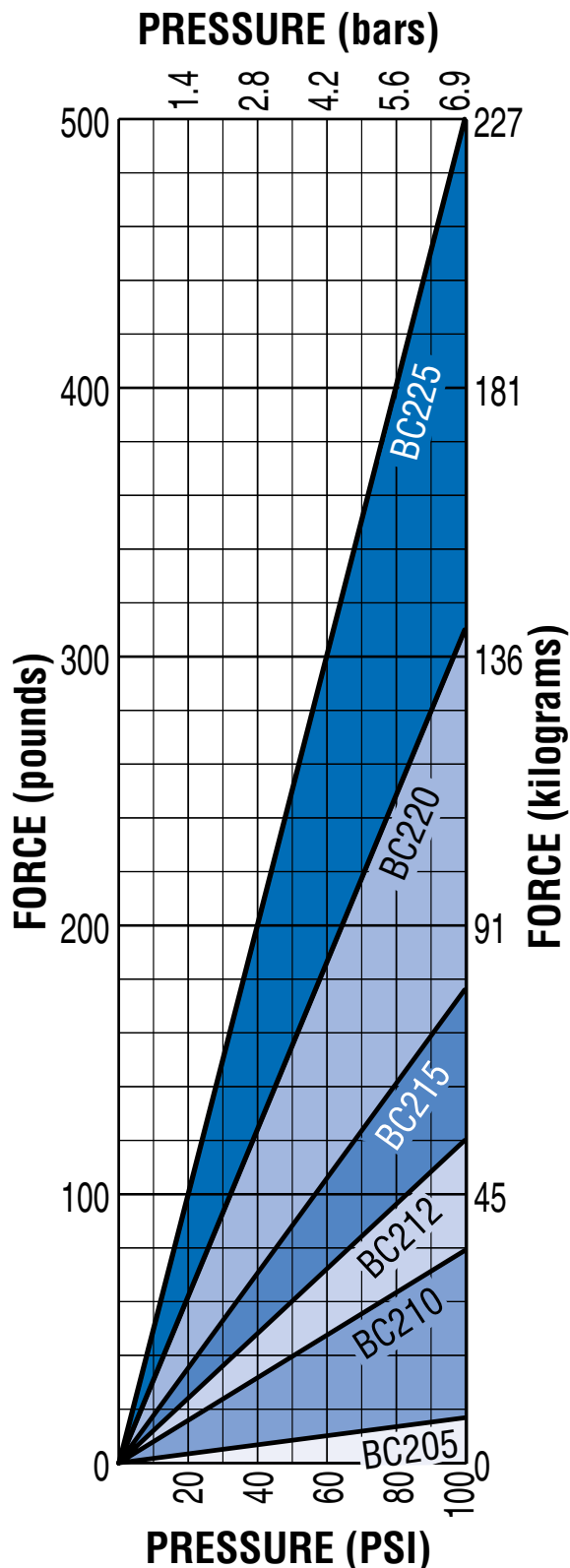


\*Auxiliary carrier bending moments indicated are at minimum center to center distance. Additional My + Mz load capacity can be obtained by increasing "D" dimension. Refer to auxiliary carrier data on page BC2\_14.

# BC2 Solid Bearing Rodless Cylinder

## GUIDELINES

### BC2 THEORETICAL FORCE vs PRESSURE



### BC2 CARRIER BRACKET BOLT ADJUSTMENT



BC2 carrier bracket adjustment bolts should be adjusted to suit each individual application, depending on the degree of rigidity required. A good starting point is to tighten the nut on the bolt until there is no lateral movement of the bolt. Then, equally tighten each nut on the carrier bolt while moving the carrier by hand along the length of the stroke. When all lateral play in the carrier is eliminated and free movement along the length of the stroke is maintained, your carrier bracket is adjusted properly. Some applications may require fine tuning of this adjustment to gain more lateral play or a higher degree of rigidity. In demanding applications, carrier adjustments should be done periodically.

ABT

MXP

BC2

BC3

BC4

LS

MG

CC

PB

ENGR

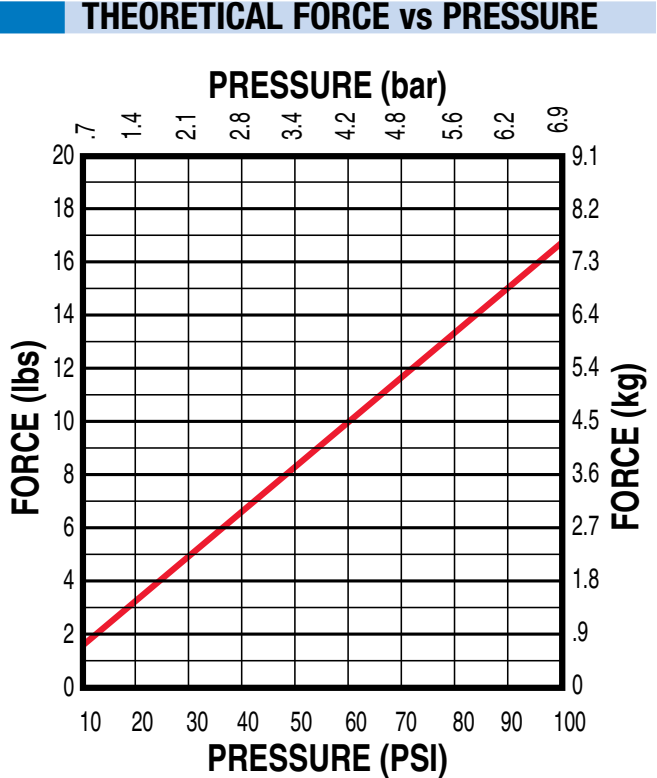
# BC205 Solid Bearing Rodless Cylinder

## PERFORMANCE

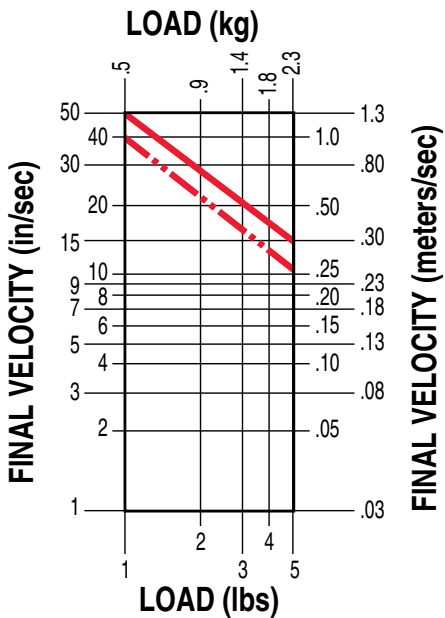
BC205



| BC205 OPTIONS          | Page   |
|------------------------|--------|
| Floating Mount         | BC2_18 |
| Foot Mount             | BC2_17 |
| Switches               | BC2_20 |
| Tube Supports          | BC2_16 |
| MORE INFORMATION       | Page   |
| Application Guidelines | BC2_26 |
| Ordering               | BC2_28 |
| Selection              | BC2_25 |



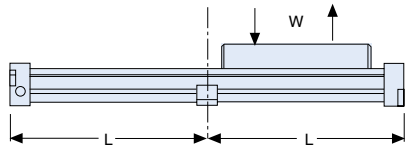
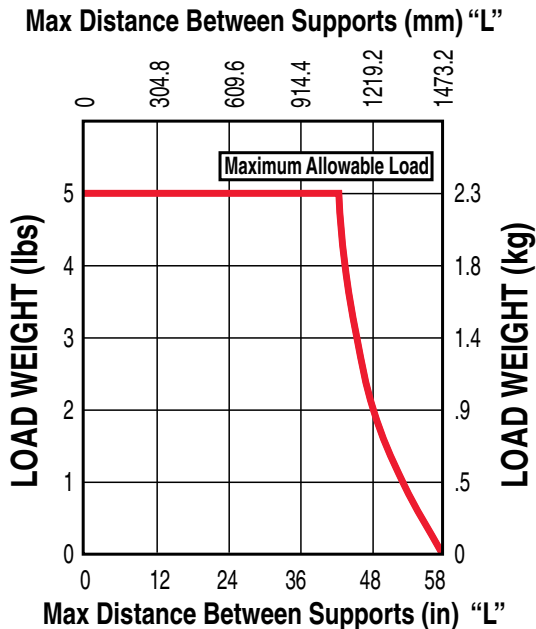
## BUMPER DAMPENING



NOTE:

- Max. for any application
- - - Max. for continuously cycled application

## TUBE SUPPORT REQUIREMENTS



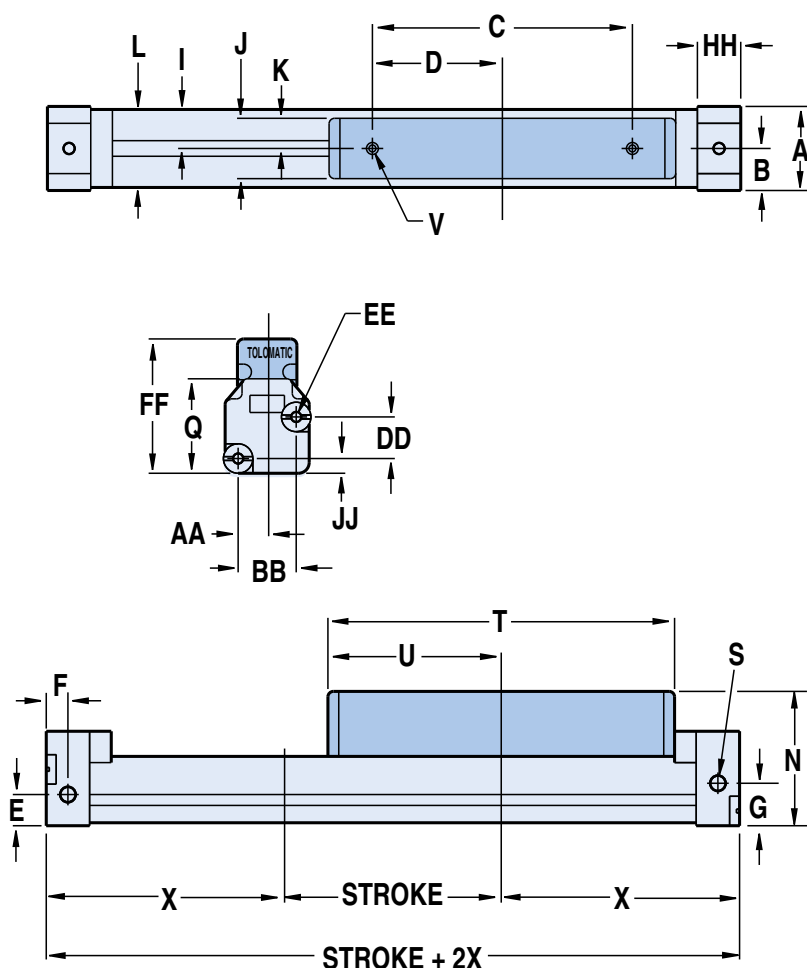
# BC205 Solid Bearing Rodless Cylinder

3D CAD available at  
www.tolomatic.com



## DIMENSIONS

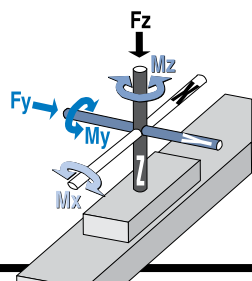
Always use configured CAD solid model  
to determine critical dimensions



|    | U.S. Standard              | Metric            |
|----|----------------------------|-------------------|
| A  | 0.97                       | 24.6              |
| B  | 0.48                       | 12.3              |
| C  | 3.00                       | 76.2              |
| D  | 1.50                       | 38.1              |
| E  | 0.36                       | 9.1               |
| F  | 0.25                       | 6.35              |
| G  | 0.49                       | 12.4              |
| I  | 0.45                       | 11.45             |
| J  | 0.70                       | 17.8              |
| K  | 0.35                       | 8.9               |
| L  | 0.90                       | 22.9              |
| N  | 1.55                       | 39.4              |
| Q  | 1.09                       | 27.7              |
| S  | #10-32 UNF                 | M5                |
| T  | 4.00                       | 101.6             |
| U  | 2.00                       | 50.8              |
| V  | 2x #6-32 UNC<br>x .38 DEEP | M3 x 9.7 DEEP     |
| X* | 2.60 @ 80-100 PSI          | 66.0 @ 80-100 PSI |
|    | 2.66 @ 40-80 PSI           | 67.6 @ 40-80 PSI  |
|    | 2.71 @ 0-40 PSI            | 68.8 @ 0-40 PSI   |
| AA | 0.33                       | 8.4               |
| BB | 0.66                       | 16.8              |
| DD | 0.48                       | 12.2              |
| EE | 4x #6-32UNC<br>x .25 DEEP  | M3 x 6.4 DEEP     |
| FF | 1.55                       | 39.4              |
| HH | 0.50                       | 12.7              |
| JJ | 0.17                       | 4.3               |
|    | INCHES                     | MILLIMETERS       |

## SPECIFICATIONS

### BC205 BENDING MOMENTS AND LOAD



|        | BORE SIZE | MAX. BENDING MOMENT |            |            | MAX. LOAD |
|--------|-----------|---------------------|------------|------------|-----------|
|        |           | My                  | Mx         | Mz         | Fz        |
| U.S.   | 0.50 in   | 9.0 in-lbs          | 2.0 in-lbs | 3.0 in-lbs | 5.0 lbs   |
| Metric | 12 mm     | 1.01 N-m            | 0.22 N-m   | 0.33 N-m   | 2.27 kg   |

|        | BORE SIZE | WEIGHT   |                    | MAX. STROKE LENGTH* | MAX. PRESSURE | TEMPERATURE RANGE |
|--------|-----------|----------|--------------------|---------------------|---------------|-------------------|
|        |           | BASE     | PER UNIT OF STROKE |                     |               |                   |
| U.S.   | 0.50 in   | 0.38 lb  | 0.036 lb/in        | 171 in              | 100 PSI       | 20° to 140° F     |
| Metric | 12 mm     | 0.169 kg | 0.0164 kg/mm       | 4343 mm             | 6.895 bar     | -7° to 60° C      |

**\*For longer strokes, alternate materials, mounting and/or fasteners – consult Tolomatic**



# BC210 Solid Bearing Rodless Cylinder

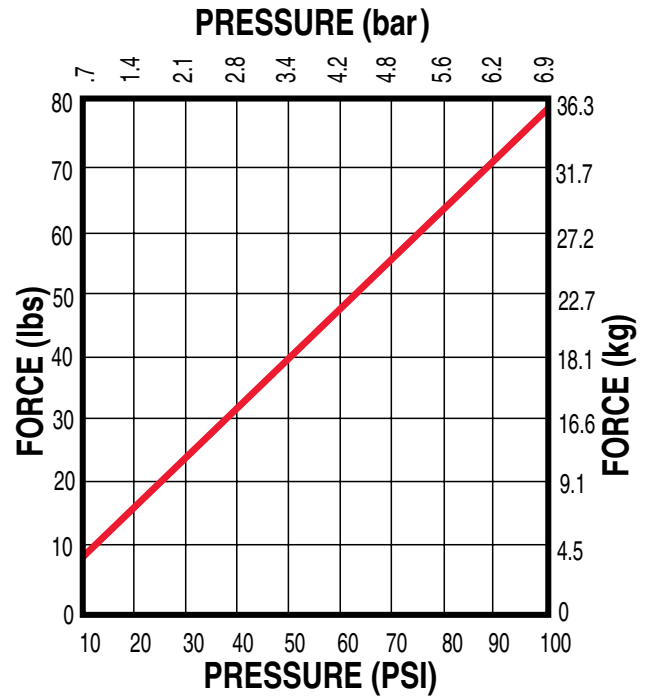
## PERFORMANCE

BC210

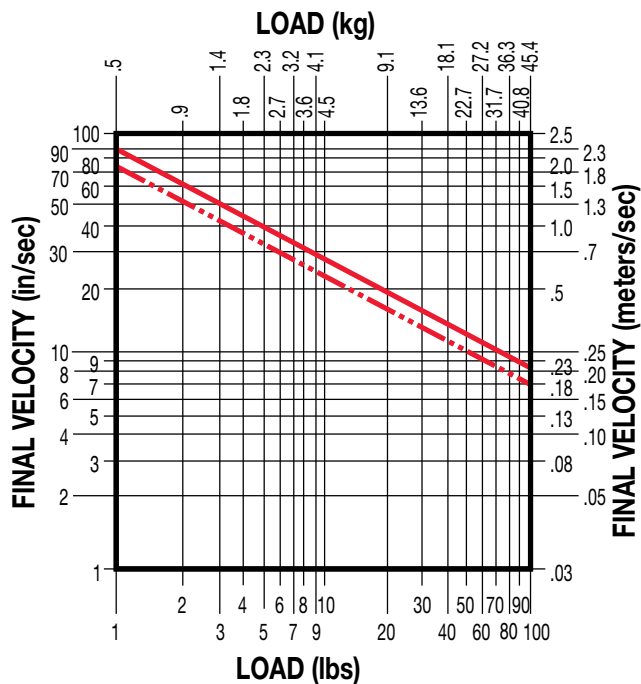


| BC210 OPTIONS          | Page   |
|------------------------|--------|
| Auxiliary Carrier      | BC2_14 |
| Floating Mount         | BC2_18 |
| Foot Mount             | BC2_17 |
| Shock Absorbers        | BC2_22 |
| Switches               | BC2_20 |
| Tube Supports          | BC2_16 |
| MORE INFORMATION       | Page   |
| Application Guidelines | BC2_26 |
| Ordering               | BC2_28 |
| Selection              | BC2_25 |

## THEORETICAL FORCE vs PRESSURE



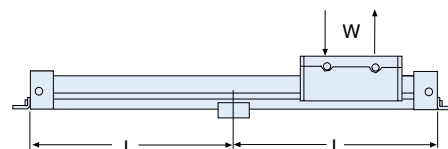
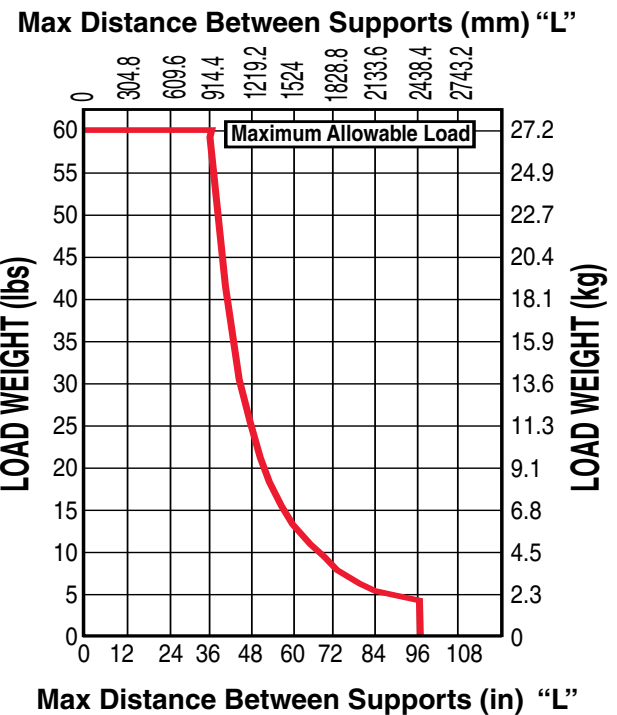
## CUSHION DATA



### NOTE:

- Max. for any application
- ..... Max. for continuously cycled application

## TUBE SUPPORT REQUIREMENTS



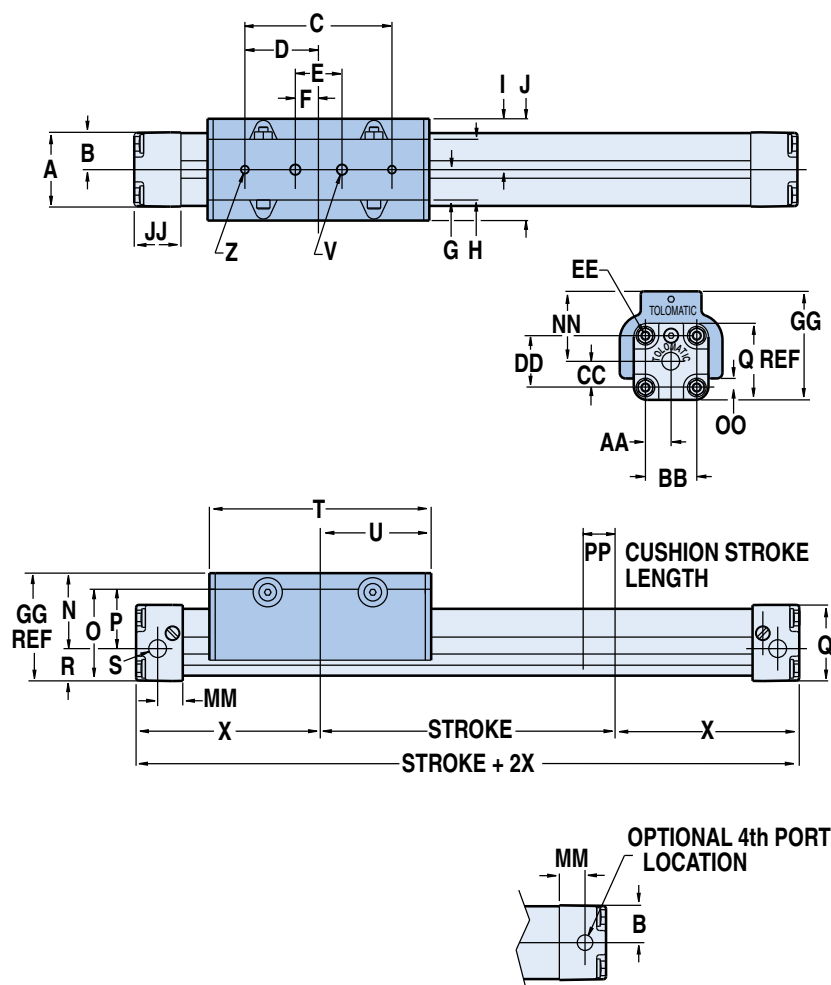
# BC210 Solid Bearing Rodless Cylinder

3D CAD available at  
www.tolomatic.com



Always use configured CAD solid model  
to determine critical dimensions

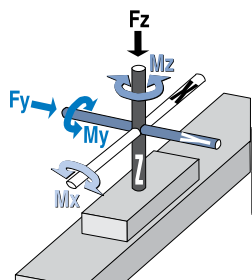
## DIMENSIONS



|    | U.S. Standard         | Metric                           |
|----|-----------------------|----------------------------------|
| A  | 1.58                  | 40.1                             |
| B  | 0.79                  | 20.1                             |
| C  | 3.15                  | 80.0                             |
| D  | 1.57                  | 40.0                             |
| E  | 1.00                  | 25.4                             |
| F  | 0.50                  | 12.7                             |
| G  | 0.65                  | 16.5                             |
| H  | 1.30                  | 33.0                             |
| I  | 1.09                  | 27.7                             |
| J  | 2.18                  | 55.4                             |
| N  | 1.62                  | 41.2                             |
| O  | 1.88                  | 47.7                             |
| P  | 1.20                  | 30.5                             |
| Q  | 1.64                  | 41.5                             |
| R  | 0.68                  | 17.3                             |
| S  | 1/8 NPT (3)           | TP 1/8 BSPT(3)<br>GP 1/8 BSPP(3) |
| T  | 4.75                  | 120.7                            |
| U  | 2.37                  | 60.2                             |
| V  | 1/4-20 UNC X .25 DEEP | M6 X 6 DEEP                      |
| X  | 3.94                  | 100.1                            |
| Z  | 10-32 UNC X .25 DEEP  | M6 X 6 DEEP                      |
| AA | 0.55                  | 14.0                             |
| BB | 1.10                  | 27.9                             |
| CC | 0.55                  | 14.0                             |
| DD | 1.10                  | 27.9                             |
| EE | 10-24 X .43 DEEP      | M5 X 11.0 DEEP                   |
| GG | 2.30                  | 58.4                             |
| JJ | 1.00                  | 25.4                             |
| MM | 0.55                  | 14.0                             |
| NN | 1.50                  | 38.1                             |
| OO | 0.18                  | 4.7                              |
| PP | 0.68                  | 17.3                             |
|    | INCHES                | MILLIMETERS                      |

## SPECIFICATIONS

### BC210 BENDING MOMENTS AND LOAD



|        | BORE SIZE | MAX. BENDING MOMENT |           |           | MAX. LOAD |
|--------|-----------|---------------------|-----------|-----------|-----------|
|        |           | My                  | Mx        | Mz        | Fz        |
| U.S.   | 1.00 in   | 100 in-lbs          | 55 in-lbs | 30 in-lbs | 60 lbs    |
| Metric | 25 mm     | 11.29 N-m           | 6.21 N-m  | 3.39 N-m  | 27.21 kg  |

|        | BORE SIZE | WEIGHT   |                    | MAX. STROKE LENGTH* | MAX. PRESSURE | TEMPERATURE RANGE |
|--------|-----------|----------|--------------------|---------------------|---------------|-------------------|
|        |           | BASE     | PER UNIT OF STROKE |                     |               |                   |
| U.S.   | 1.00 in   | 2.26 lbs | 0.14 lbs/in        | 350 in              | 100 PSI       | 20° to 140° F     |
| Metric | 25 mm     | 1.025 kg | 0.0024 kg/mm       | 8890 mm             | 6.895 bar     | -7° to 60° C      |

\*For longer strokes, alternate materials, mounting and/or fasteners – consult Tolomatic

# BC212 & BC215 Solid Bearing Rodless Cylinder

## PERFORMANCE

BC212

BC215

BC212 & BC215



BC212 & BC215 OPTIONS

Auxiliary Carrier BC2\_14

Floating Mount BC2\_18

Foot Mount BC2\_17

Shock Absorbers BC2\_22

Switches BC2\_20

Tube Supports BC2\_16

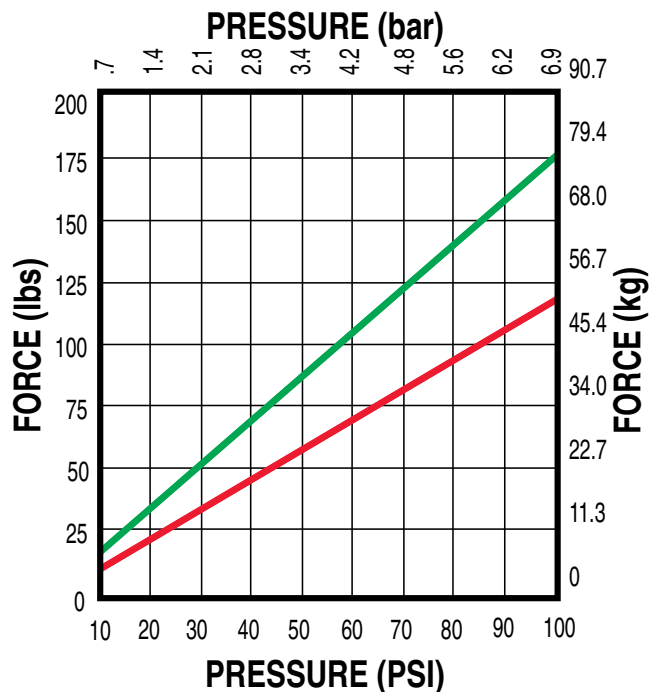
MORE INFORMATION

Application Guidelines BC2\_26

Ordering BC2\_28

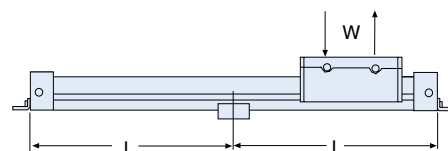
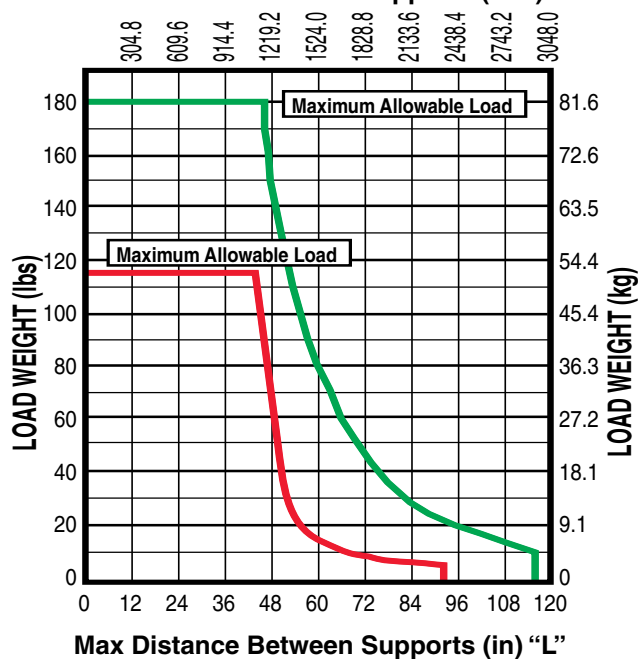
Selection BC2\_25

## THEORETICAL FORCE vs PRESSURE

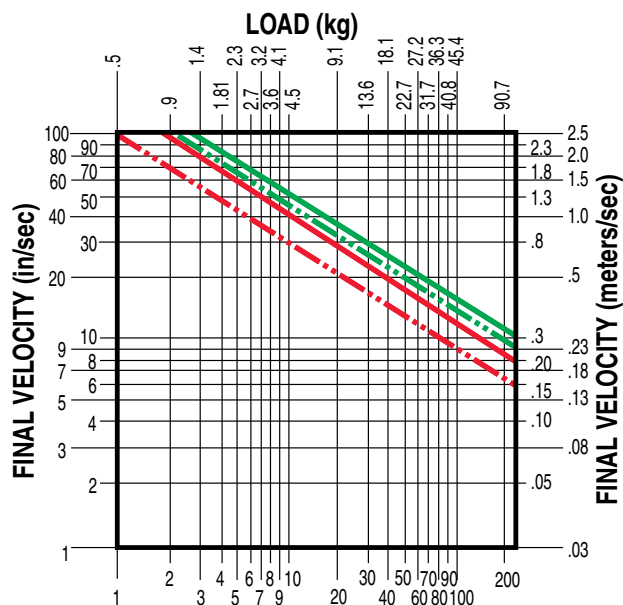


## TUBE SUPPORT REQUIREMENTS

Max Distance Between Supports (mm) "L"



## CUSHION DATA



### NOTE:

- Max. for any application
- Max. for continuously cycled application

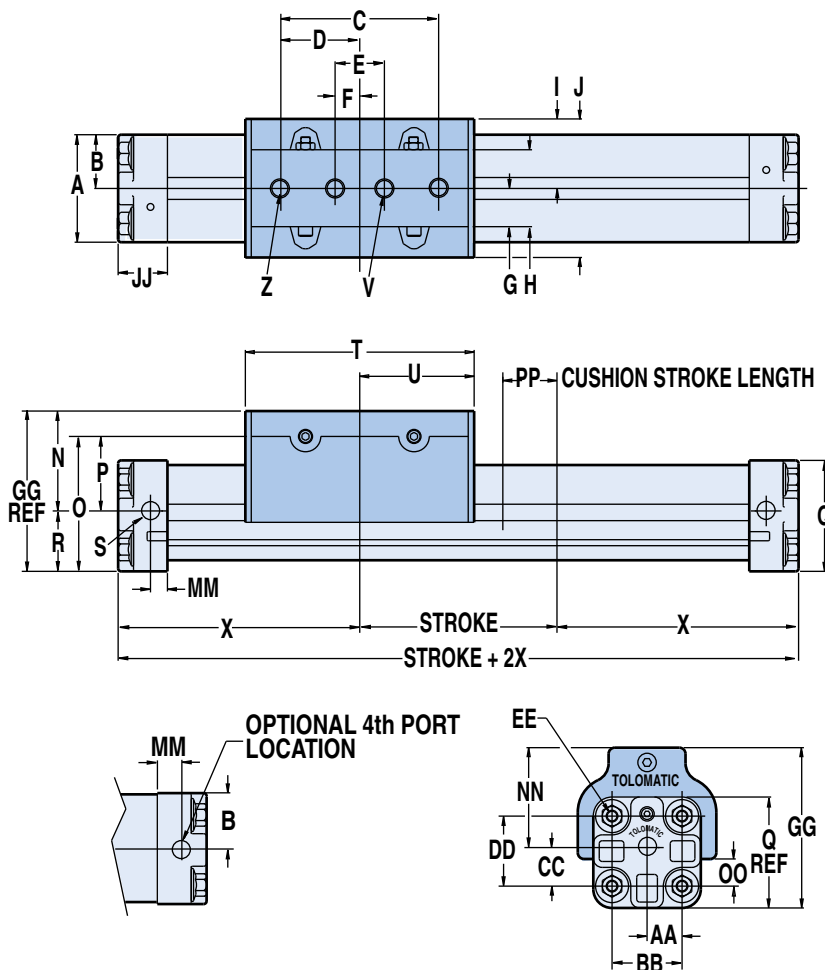
# BC212 & BC215 Solid Bearing Rodless Cylinder

3D CAD available at  
www.tolomatic.com



## DIMENSIONS

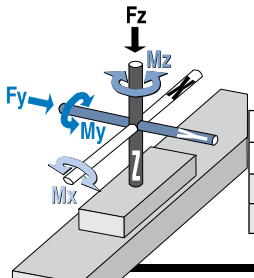
Always use configured CAD solid model  
to determine critical dimensions



|    | U.S.12                     | U.S.15                     | Metric12                              | Metric15                              |
|----|----------------------------|----------------------------|---------------------------------------|---------------------------------------|
| A  | 2.18                       | 2.85                       | 55.4                                  | 72.4                                  |
| B  | 1.09                       | 1.42                       | 27.7                                  | 36.1                                  |
| C  | 3.20                       | 4.25                       | 81.3                                  | 108.0                                 |
| D  | 1.60                       | 2.12                       | 40.6                                  | 53.8                                  |
| E  | 1.00                       | 1.00                       | 25.4                                  | 25.4                                  |
| F  | 0.50                       | 0.50                       | 12.7                                  | 12.7                                  |
| G  | 0.78                       | 0.90                       | 19.8                                  | 22.9                                  |
| H  | 1.56                       | 1.80                       | 39.6                                  | 45.7                                  |
| I  | 1.41                       | 1.75                       | 35.8                                  | 44.5                                  |
| J  | 2.82                       | 3.50                       | 71.6                                  | 89.0                                  |
| N  | 1.83                       | 2.13                       | 46.5                                  | 54.1                                  |
| O  | 2.48                       | 2.95                       | 63.0                                  | 74.9                                  |
| P  | 1.25                       | 1.51                       | 31.0                                  | 38.4                                  |
| Q  | 2.25                       | 2.59                       | 57.2                                  | 65.8                                  |
| R  | 1.23                       | 1.41                       | 31.2                                  | 36.6                                  |
| S  | 1/4 NPT<br>(3)             | 1/4 NPT<br>(3)             | M 1/4<br>BSPT(3)<br>MM 1/4<br>BSPP(3) | M 1/4<br>BSPT(3)<br>MM 1/4<br>BSPP(3) |
| T  | 4.64                       | 5.91                       | 117.9                                 | 150.1                                 |
| U  | 2.32                       | 2.96                       | 58.9                                  | 75.1                                  |
| V  | 5/16-18<br>UNC x<br>.31 DP | 1/4-20<br>UNC x<br>.38 DP  | M8 x 7<br>DP                          | M8 x 10<br>DP                         |
| X  | 4.87                       | 5.91                       | 123.7                                 | 150.1                                 |
| Z  | 1/4-20<br>UNC x<br>.31 DP  | 5/16-18<br>UNC x<br>.38 DP | M8 x 7<br>DP                          | M8 x 10<br>DP                         |
| AA | 0.71                       | 0.91                       | 18.0                                  | 23.1                                  |
| BB | 1.42                       | 1.81                       | 36.1                                  | 46.0                                  |
| CC | 0.78                       | 1.03                       | 19.8                                  | 26.2                                  |
| DD | 1.42                       | 1.81                       | 36.1                                  | 46.0                                  |
| EE | 1/4-20 x<br>.47 DP         | 1/4-20 x<br>.47 DP         | M6 x 12<br>DP                         | M6 x 12<br>DP                         |
| GG | 3.06                       | 3.54                       | 77.7                                  | 90.7                                  |
| JJ | 1.00                       | 1.25                       | 25.4                                  | 31.8                                  |
| MM | 0.34                       | 0.50                       | 8.6                                   | 12.7                                  |
| NN | 1.83                       | 2.13                       | 46.5                                  | 54.1                                  |
| OO | 0.35                       | 0.28                       | 9.0                                   | 7.0                                   |
| PP | 1.10                       | 1.29                       | 27.9                                  | 32.7                                  |
|    | INCHES                     |                            | MILLIMETERS                           |                                       |

## SPECIFICATIONS

### BC212/15 BENDING MOMENTS AND LOAD



|          | BORE<br>SIZE | MAX. BENDING MOMENT |            |            | MAX.<br>LOAD |
|----------|--------------|---------------------|------------|------------|--------------|
|          |              | My                  | Mx         | Mz         | Fz           |
| U.S.12   | 1.25 in      | 290 in-lbs          | 75 in-lbs  | 130 in-lbs | 120 lbs      |
| U.S.15   | 1.50 in      | 500 in-lbs          | 275 in-lbs | 200 in-lbs | 180 lbs      |
| Metric12 | 32 mm        | 32.77 N-m           | 8.47 N-m   | 14.69 N-m  | 54.42 kg     |
| Metric15 | 40 mm        | 56.49 N-m           | 31.07 N-m  | 22.60 N-m  | 81.63 kg     |

|          | BORE<br>SIZE | WEIGHT   |                   | MAX. STROKE<br>LENGTH* | MAX.<br>PRESSURE | TEMPERATURE<br>RANGE |
|----------|--------------|----------|-------------------|------------------------|------------------|----------------------|
|          |              | BASE     | PER UNIT OF STOKE |                        |                  |                      |
| U.S.12   | 1.25 in      | 4.56 lbs | 0.21 lbs/in       | 288 in                 | 100 PSI          | 20° to 140° F        |
| U.S.15   | 1.50 in      | 8.18 lbs | 0.34 lbs/in       | 298 in                 | 100 PSI          | 20° to 140° F        |
| Metric12 | 32 mm        | 2.068 kg | 0.0036 kg/mm      | 7315 mm                | 6.895 bar        | -7° to 60° C         |
| Metric15 | 40 mm        | 3.7 kg   | 0.0058 kg/mm      | 7569 mm                | 6.895 bar        | -7° to 60° C         |

\*For longer strokes, alternate materials, mounting and/or fasteners – consult Tolomatic



# BC220 & BC225 Solid Bearing Rodless Cylinder

## PERFORMANCE

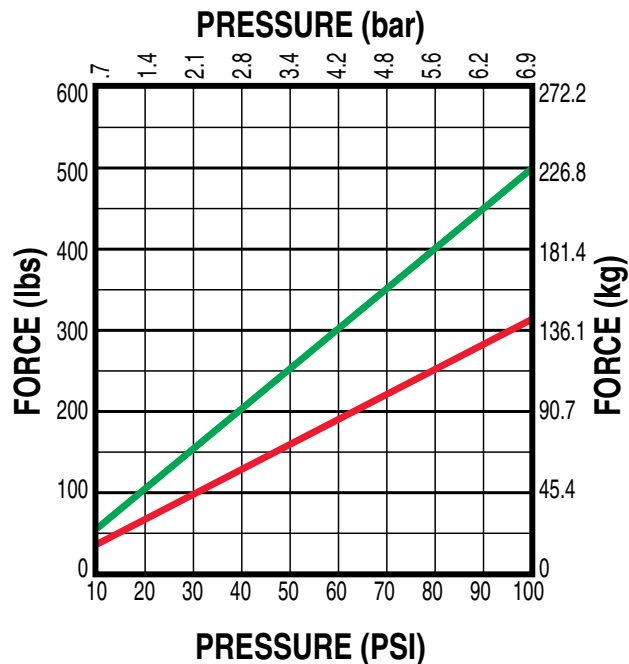
BC220

BC225

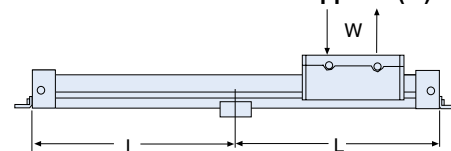
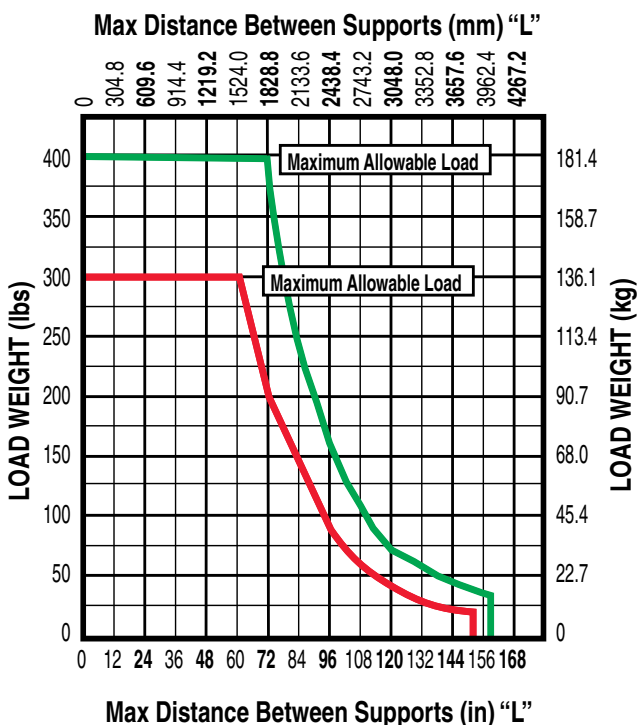


| BC220 & BC225 OPTIONS  |        | Page |
|------------------------|--------|------|
| Auxiliary Carrier      | BC2_14 |      |
| Floating Mount         | BC2_18 |      |
| Foot Mount             | BC2_17 |      |
| Shock Absorbers        | BC2_22 |      |
| Switches               | BC2_20 |      |
| Tube Supports          | BC2_16 |      |
| MORE INFORMATION       |        | Page |
| Application Guidelines | BC2_26 |      |
| Ordering               | BC2_28 |      |
| Selection              | BC2_25 |      |

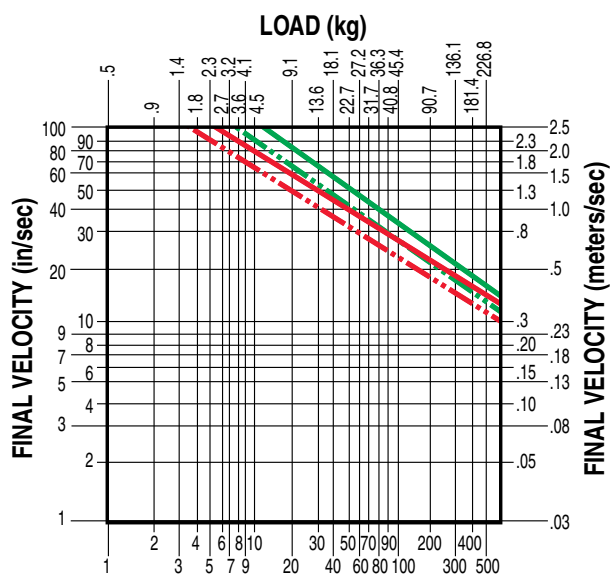
## THEORETICAL FORCE vs PRESSURE



## TUBE SUPPORT REQUIREMENTS



## CUSHION DATA



### NOTE:

- Max. for any application
- Max. for continuously cycled application

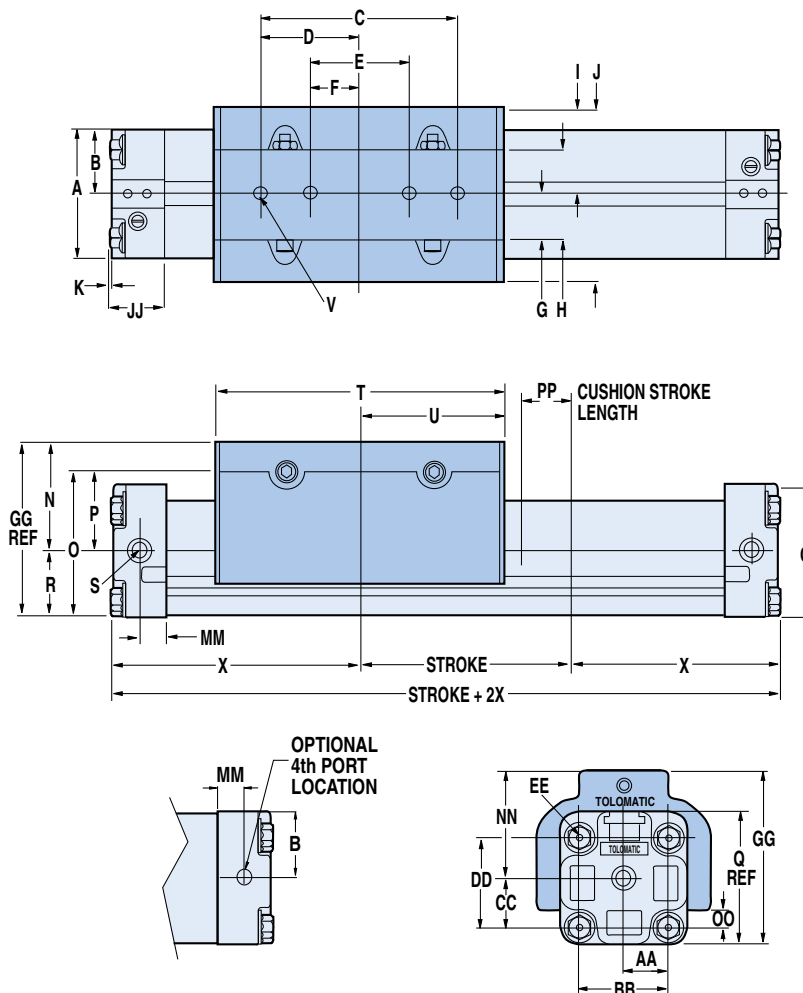
# BC220 & BC225 Solid Bearing Rodless Cylinder

3D CAD available at  
www.tolomatic.com



## DIMENSIONS

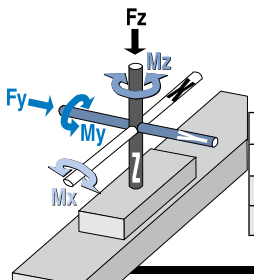
Always use configured CAD solid model  
to determine critical dimensions



|        | U.S.20                    | U.S.25                    | Metric20                              | Metric25                              |
|--------|---------------------------|---------------------------|---------------------------------------|---------------------------------------|
| A      | 3.25                      | 4.25                      | 82.6                                  | 108.0                                 |
| B      | 1.62                      | 2.13                      | 41.1                                  | 54.1                                  |
| C      | 5.00                      | 6.00                      | 127.0                                 | 152.4                                 |
| D      | 2.50                      | 3.00                      | 63.5                                  | 76.2                                  |
| E      | 2.50                      | 3.00                      | 63.5                                  | 76.2                                  |
| F      | 1.25                      | 1.50                      | 31.8                                  | 38.1                                  |
| G      | 1.16                      | 1.27                      | 29.5                                  | 32.4                                  |
| H      | 2.30                      | 2.55                      | 58.4                                  | 64.8                                  |
| I      | 2.22                      | 2.81                      | 56.4                                  | 71.4                                  |
| J      | 4.44                      | 5.62                      | 112.8                                 | 142.8                                 |
| K      | 0.06                      | 0.03                      | 1.5                                   | 0.8                                   |
| N      | 2.75                      | 3.20                      | 69.9                                  | 81.3                                  |
| O      | 3.69                      | 4.67                      | 93.7                                  | 118.6                                 |
| P      | 2.00                      | 2.37                      | 50.8                                  | 60.2                                  |
| Q      | 3.38                      | 4.37                      | 85.9                                  | 111.0                                 |
| R      | 1.69                      | 2.30                      | 42.9                                  | 58.4                                  |
| S      | 3/8 NPT<br>(3)            | 3/8 NPT<br>(3)            | M 3/8<br>BSPT(3)<br>GP 3/8<br>BSPP(3) | M 3/8<br>BSPT(3)<br>GP 3/8<br>BSPP(3) |
| T      | 7.37                      | 8.86                      | 187.2                                 | 225.0                                 |
| U      | 3.68                      | 4.43                      | 93.5                                  | 112.5                                 |
| V      | 3/8-16<br>UNC x<br>.44 DP | 3/8-16<br>UNC x<br>.50 DP | M10 x 11<br>DP                        | M10 x 12<br>DP                        |
| X      | 6.30                      | 8.45                      | 160.0                                 | 214.6                                 |
| AA     | 1.12                      | 1.44                      | 28.5                                  | 36.6                                  |
| BB     | 2.25                      | 2.88                      | 57.2                                  | 73.2                                  |
| CC     | 1.25                      | 1.75                      | 31.8                                  | 44.5                                  |
| DD     | 2.25                      | 2.88                      | 57.2                                  | 73.2                                  |
| EE     | 5/16-18 x<br>.88 DP       | 5/16-18 x<br>.88 DP       | M8 x 22<br>DP                         | M8 x 22<br>DP                         |
| GG     | 4.44                      | 5.50                      | 112.8                                 | 139.7                                 |
| JJ     | 1.44                      | 2.06                      | 36.6                                  | 52.3                                  |
| MM     | 0.69                      | 1.00                      | 17.5                                  | 25.4                                  |
| NN     | 2.75                      | 3.20                      | 69.9                                  | 81.3                                  |
| OO     | 0.43                      | 0.76                      | 10.9                                  | 19.3                                  |
| PP     | 1.35                      | 1.97                      | 34.3                                  | 50.0                                  |
| INCHES |                           |                           | MILLIMETERS                           |                                       |

## SPECIFICATIONS

### BC220/25 BENDING MOMENTS AND LOAD



|          | BORE SIZE | MAX. BENDING MOMENT |            |            | MAX. LOAD |
|----------|-----------|---------------------|------------|------------|-----------|
|          |           | My                  | Mx         | Mz         | Fz        |
| U.S.20   | 2.00 in   | 1,100 in-lbs        | 300 in-lbs | 325 in-lbs | 300 lbs   |
| U.S.25   | 2.50 in   | 1,800 in-lbs        | 450 in-lbs | 400 in-lbs | 400 lbs   |
| Metric20 | 50 mm     | 124.28 N-m          | 33.90 N-m  | 36.72 N-m  | 136.05 kg |
| Metric25 | 63 mm     | 203.37 N-m          | 50.84 N-m  | 45.19 N-m  | 181.4 kg  |

|          | BORE SIZE | WEIGHT    |                    | MAX. STROKE LENGTH* | MAX. PRESSURE | TEMPERATURE RANGE |
|----------|-----------|-----------|--------------------|---------------------|---------------|-------------------|
|          |           | BASE      | PER UNIT OF STROKE |                     |               |                   |
| U.S.20   | 2.00 in   | 14.12 lbs | 0.54 lbs/in        | 274 in              | 100 PSI       | 20° to 140° F     |
| U.S.25   | 2.50 in   | 31.90 lbs | 1.01 lbs/in        | 163 in              | 100 PSI       | 20° to 140° F     |
| Metric20 | 50 mm     | 6.4 kg    | 0.0093 kg/mm       | 6959 mm             | 6.895 bar     | -7° to 60° C      |
| Metric25 | 63 mm     | 14.467 kg | 0.0173 kg/mm       | 4140 mm             | 6.895 bar     | -7° to 60° C      |

\*For longer strokes, alternate materials, mounting and/or fasteners – consult Tolomatic

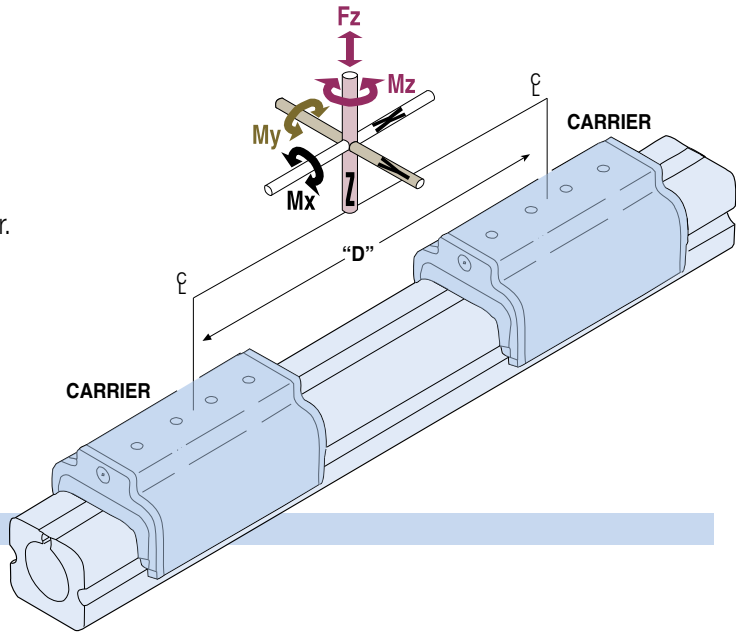
# BC2 Auxiliary Carrier - 10, 12, 15, 20, 25 Sizes

## PERFORMANCE

The auxiliary carrier option substantially increases load carrying and bending moments capacity over the standard single carrier models. As a general rule, the auxiliary carrier option is highly recommended in vertical applications (My) if the distance from the carrier mounting surface to the load center of gravity (CG) exceeds the overall length of the carrier. Auxiliary carriers can be ordered with (DW) or without (DO) an internal piston. (Auxiliary carriers without a piston have no cushion on the cylinder end closest to the auxiliary carrier.)

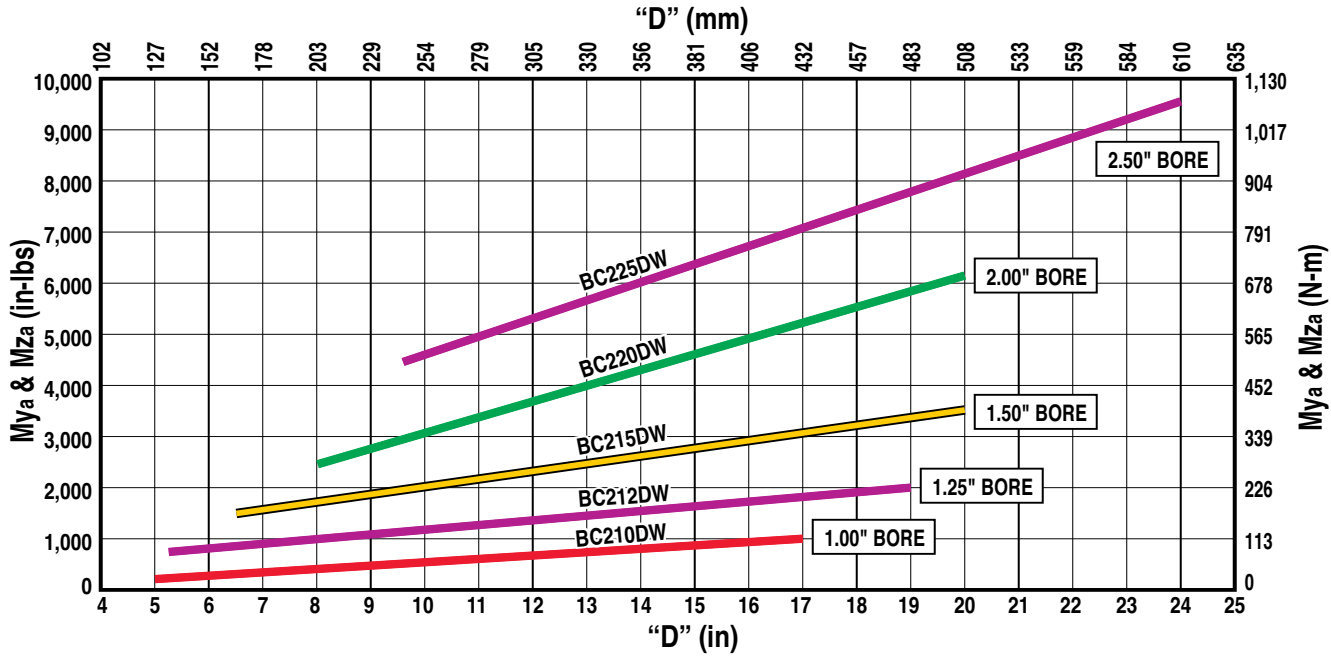


NOTE: breakaway pressure will increase when using auxiliary carrier.



## BENDING MOMENTS

### MOMENT LOAD vs. DISTANCE



- Rates were calculated with the following assumptions:
- 1.) Coupling between carriers is rigid.
  - 2.) Load is equally distributed between carriers.
  - 3.) Coupling device applies no misalignment loads to carriers.

|    | BORE SIZE |    | "D" MINIMUM * |       |             |        | MAX. BENDING MOMENT |       |        |       |        |       | MAX. LOAD |       |
|----|-----------|----|---------------|-------|-------------|--------|---------------------|-------|--------|-------|--------|-------|-----------|-------|
|    |           |    | (w/o Piston)  |       | (w/ Piston) |        | My**                |       | Mx     |       | Mz**   |       | Fz        |       |
|    | in        | mm | in            | mm    | in          | mm     | in-lbs              | N-m   | in-lbs | N-m   | in-lbs | N-m   | lbs       | kg    |
| 10 | 1.00      | 25 | 5.07          | 129.0 | 5.07        | 129.0  | 287                 | 32.4  | 110    | 12.4  | 287    | 32.4  | 120       | 54.4  |
| 12 | 1.25      | 32 | 5.17          | 131.0 | 6.85        | 174.0  | 822                 | 92.9  | 150    | 16.9  | 822    | 92.9  | 240       | 108.9 |
| 15 | 1.50      | 40 | 6.46          | 164.0 | 8.07        | 205.0  | 1,453               | 164.1 | 550    | 62.1  | 1,453  | 164.1 | 360       | 163.3 |
| 20 | 2.00      | 50 | 8.10          | 206.0 | 8.10        | 206.0  | 2,430               | 274.6 | 600    | 67.8  | 2,430  | 274.6 | 600       | 272.2 |
| 25 | 2.50      | 63 | 9.62          | 244.0 | 11.04       | 2810.4 | 4,416               | 498.9 | 900    | 101.7 | 4,416  | 498.9 | 800       | 362.9 |

\* "D" is distance between carriers  
\*\* Loads calculated are at minimum "D", for substantially higher My and Mz loads increase "D" and refer to graph above

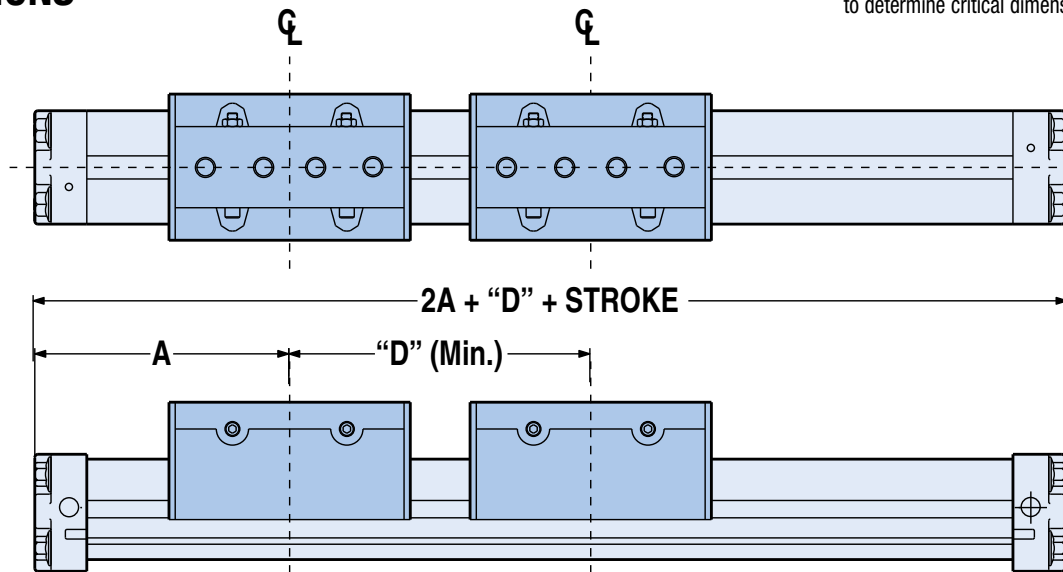
# BC2 Auxiliary Carrier - 10, 12, 15, 20, 25 Sizes

3D CAD available at  
www.tolomatic.com

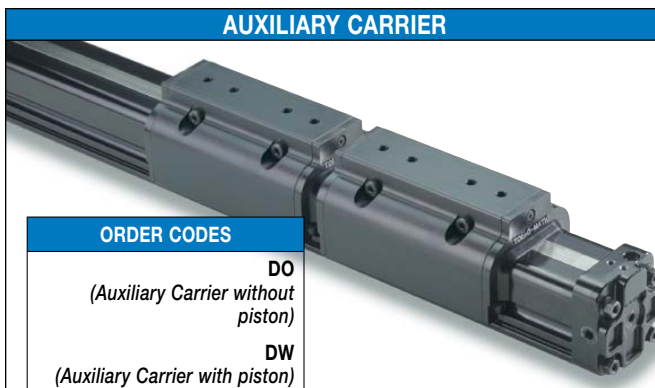


## DIMENSIONS

Always use configured CAD solid model  
to determine critical dimensions



|    | BORE SIZE |    | A    |       | "D" MINIMUM * |       |             |       |
|----|-----------|----|------|-------|---------------|-------|-------------|-------|
|    | in        | mm | in   | mm    | (w/o Piston)  |       | (w/ Piston) |       |
|    |           |    |      |       | in            | mm    | in          | mm    |
| 10 | 1.00      | 25 | 3.94 | 100.1 | 5.07          | 129.0 | 5.07        | 129.0 |
| 12 | 1.25      | 32 | 4.90 | 124.5 | 5.17          | 131.0 | 6.85        | 174.0 |
| 15 | 1.50      | 40 | 5.91 | 150.1 | 6.46          | 164.0 | 8.07        | 205.0 |
| 20 | 2.00      | 50 | 6.30 | 160.0 | 8.10          | 206.0 | 8.10        | 206.0 |
| 25 | 2.50      | 63 | 8.46 | 214.9 | 9.62          | 244.0 | 11.04       | 280.4 |

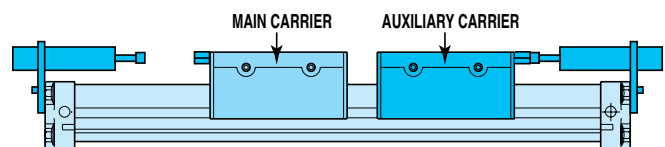
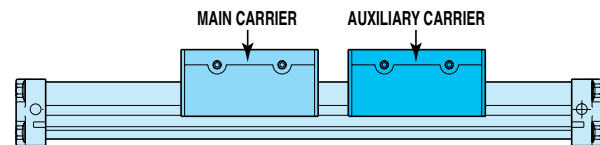


## ASSEMBLY INFORMATION



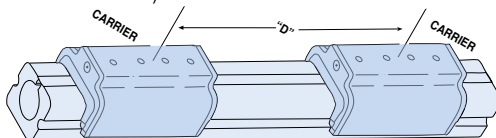
### IMPORTANT INFORMATION REGARDING AUXILIARY CARRIER PLACEMENT

When a BC2 cylinder is ordered with auxiliary carrier, it is always placed to the right (while facing the switch mounted or open port side) of the main carrier. This is for auxiliary carriers with (DW)/or without (DO) piston and for units with/ or without shock absorbers. When the auxiliary carrier is ordered without (DO) piston the carrier without piston will be marked.



## ORDERING INFORMATION

When ordering, determine the minimum distance required between carriers (dimension "D" in Auxiliary Carrier Bending Moments chart).



Determine your working stroke and your "D" dimension, then enter these into your configuration string. (Example: BC215SK50.00DW15.00RT2) The configurator will calculate the overall length of the actuator.



# BC2 Tube Supports - ALL Sizes

3D CAD available at  
www.tolomatic.com



Always use configured CAD solid model  
to determine critical dimensions



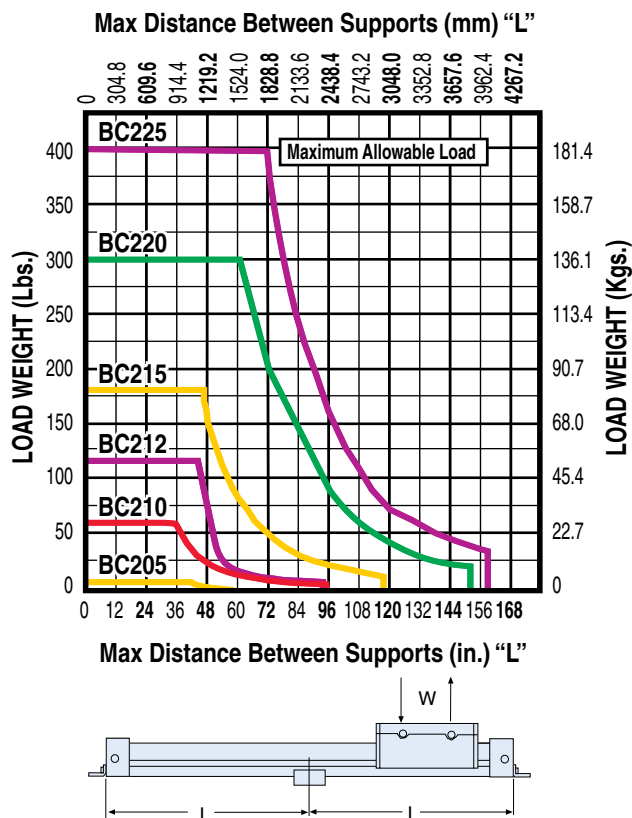
Tube supports are mounted to the BC2 band cylinder during assembly procedure. Made of black-anodized aluminum, tube supports are designed to fit into dovetail grooves which run the length of the cylinder tube. Refer to the tube support graph to determine the number of tube supports required.



NOTE: Switches cannot be mounted on the same face of the actuator as tube supports.

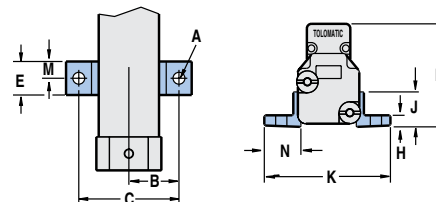
## PERFORMANCE

### TUBE SUPPORT REQUIREMENTS

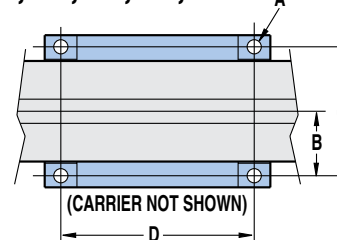


## DIMENSIONS

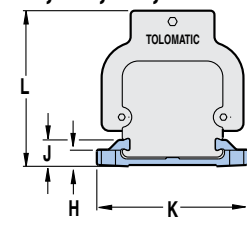
05



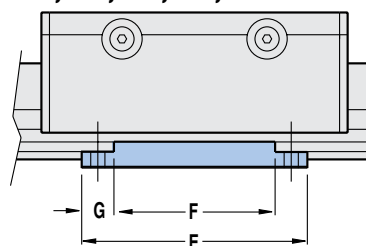
10, 12, 15, 20, 25



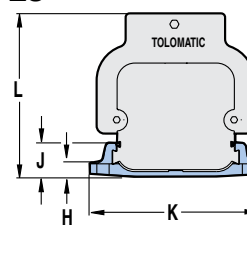
10, 12, 15, 20



10, 12, 15, 20, 25



25



| U.S. Standard | BORE SIZE | A Ø  | B     | C     | D    | E    | F    | G    | H     | J    | K    | L    | M    | N    |
|---------------|-----------|------|-------|-------|------|------|------|------|-------|------|------|------|------|------|
| 05            | 0.50      | 0.18 | 0.75  | 1.50  | —    | 0.50 | —    | —    | 0.18  | 0.54 | 1.88 | 1.60 | 0.65 | 0.50 |
| 10            | 1.00      | 0.22 | 1.00  | 2.00  | 3.00 | 3.50 | 2.50 | 0.50 | 0.25  | 0.41 | 2.36 | 2.43 | —    | —    |
| 12            | 1.25      | 0.27 | 1.31  | 2.63  | 4.50 | 5.00 | 4.00 | 0.50 | 0.40  | 0.81 | 3.12 | 3.23 | —    | —    |
| 15            | 1.50      | 0.27 | 1.50  | 3.00  | 4.50 | 5.00 | 4.00 | 0.50 | 0.31  | 0.70 | 3.50 | 3.62 | —    | —    |
| 20            | 2.00      | 0.41 | 1.875 | 3.750 | 5.75 | 6.38 | 5.00 | 0.69 | 0.375 | 0.87 | 4.44 | 4.53 | —    | —    |
| 25            | 2.50      | 0.42 | 2.563 | 5.125 | 7.75 | 8.50 | 7.00 | 0.75 | 0.437 | 1.17 | 6.00 | 5.56 | —    | —    |

Dimensions in inches

| Metric | BORE SIZE | A Ø  | B    | C     | D     | E     | F     | G    | H    | J    | K     | L     | M    | N    |
|--------|-----------|------|------|-------|-------|-------|-------|------|------|------|-------|-------|------|------|
| 05     | 12        | 4.6  | 19.1 | 38.1  | —     | 12.7  | —     | —    | 4.6  | 13.7 | 47.7  | 40.6  | 16.5 | 12.7 |
| 10     | 25        | 5.6  | 25.4 | 50.8  | 76.2  | 88.9  | 63.5  | 12.7 | 6.3  | 10.4 | 59.9  | 61.7  | —    | —    |
| 12     | 32        | 6.7  | 33.3 | 66.8  | 114.3 | 127.0 | 101.6 | 12.7 | 10.2 | 20.6 | 79.2  | 82.0  | —    | —    |
| 15     | 40        | 6.7  | 38.1 | 76.2  | 114.3 | 127.0 | 101.6 | 12.7 | 7.9  | 17.8 | 88.9  | 91.9  | —    | —    |
| 20     | 50        | 10.5 | 47.6 | 95.3  | 146.1 | 162.1 | 127.0 | 17.5 | 9.5  | 22.1 | 112.8 | 115.1 | —    | —    |
| 25     | 63        | 10.7 | 65.1 | 130.2 | 196.9 | 215.9 | 177.8 | 19.1 | 11.1 | 29.7 | 152.4 | 141.2 | —    | —    |

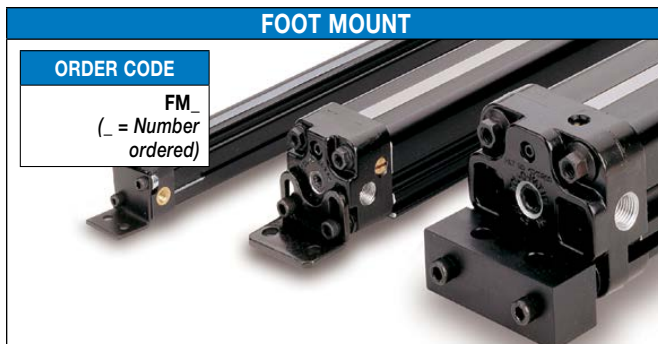
Dimensions in millimeters

# BC2 Foot Mounts - ALL Sizes

3D CAD available at  
www.tolomatic.com



Always use configured CAD solid model  
to determine critical dimensions



For mounting other than flush. Foot mounts may be specified on one or both ends of the cylinder.

ABT

MXP

BC2

BC3

BC4

LS

MG

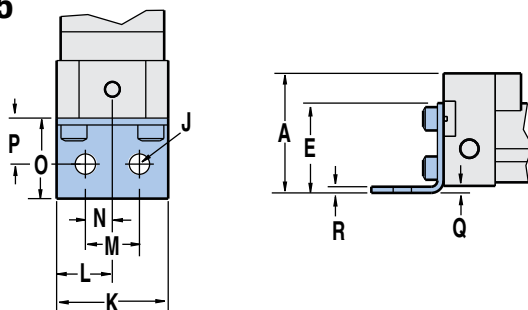
CC

PB

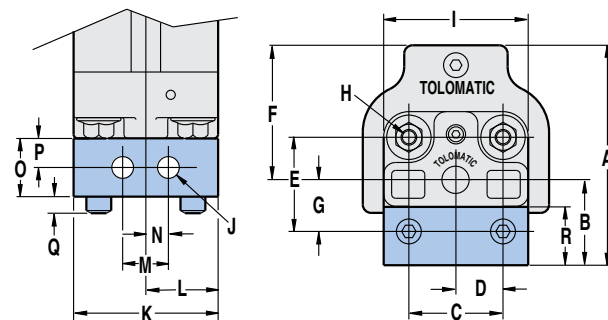
ENGR

## DIMENSIONS

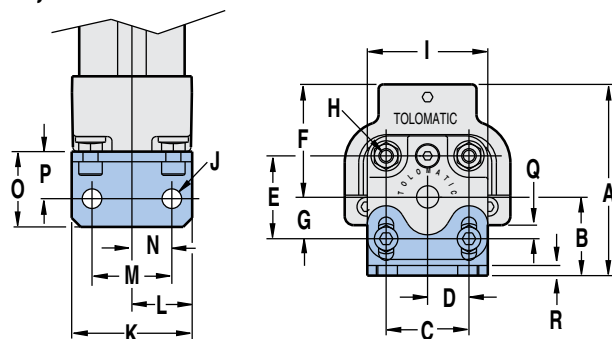
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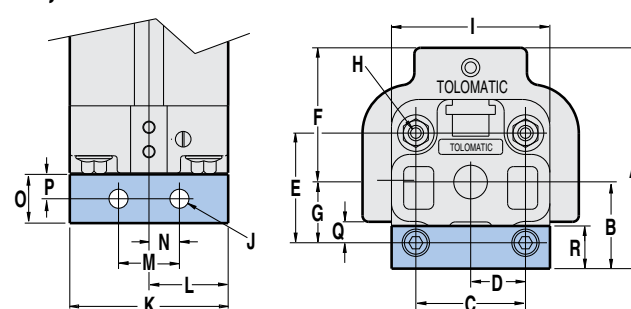
15



10, 12



20, 25



| U.S. Std. | BORE SIZE | A         | B         | C    | D    | E    | F    | G    | H                | I    | J Ø   | K    | L    | M    | N    | O    | P    | Q    | R    |
|-----------|-----------|-----------|-----------|------|------|------|------|------|------------------|------|-------|------|------|------|------|------|------|------|------|
| 05        | 0.50      | 1.62      | -         | -    | -    | 0.87 | -    | -    | -                | -    | 0.180 | 0.97 | 0.49 | 0.47 | 0.24 | 0.70 | 0.40 | 0.06 | 0.06 |
| 10        | 1.00      | 2.36/2.73 | 0.86/1.23 | 1.10 | 0.55 | 1.10 | 1.50 | 0.55 | #10-24 x .43 DP  | 1.58 | 0.260 | 1.60 | 0.80 | 1.06 | 0.53 | 1.00 | 0.63 | 0.18 | 0.14 |
| 12        | 1.25      | 3.21/3.71 | 1.38/1.88 | 1.42 | 0.71 | 1.42 | 1.83 | 0.78 | 1/4-20 x .47 DP  | 2.18 | 0.328 | 2.09 | 1.05 | 1.42 | 0.71 | 0.84 | 0.49 | 0.35 | 0.13 |
| 15        | 1.50      | 3.69      | 1.56      | 1.82 | 0.91 | 1.81 | 2.13 | 1.03 | 1/4-20 x .47 DP  | 2.85 | 0.328 | 2.83 | 1.42 | 1.18 | 0.59 | 1.00 | 0.50 | 0.25 | 1.00 |
| 20        | 2.00      | 4.53      | 1.78      | 2.25 | 1.13 | 2.25 | 2.75 | 1.25 | 5/16-18 x 1.0 DP | 3.25 | 0.390 | 3.25 | 1.63 | 1.25 | 0.63 | 1.00 | 0.50 | 0.43 | 0.88 |
| 25        | 2.50      | 5.65      | 2.45      | 2.88 | 1.44 | 2.88 | 3.20 | 1.75 | 5/16-18 x 1.0 DP | 4.25 | 0.437 | 4.25 | 2.13 | 1.89 | 0.95 | 1.18 | 0.59 | 0.76 | 1.00 |

Dimensions in inches

| Metric | BORE SIZE | A         | B         | C    | D    | E    | F    | G    | H          | I     | J Ø  | K     | L    | M    | N    | O    | P    | Q    | R    |
|--------|-----------|-----------|-----------|------|------|------|------|------|------------|-------|------|-------|------|------|------|------|------|------|------|
| 05     | 12        | 41.1      | -         | -    | -    | 22.1 | -    | -    | -          | -     | 4.6  | 24.6  | 12.3 | 11.9 | 6.0  | 20.4 | 10.2 | 1.5  | 1.5  |
| 10     | 25        | 59.7/69.3 | 21.8/31.2 | 27.9 | 14.0 | 27.9 | 38.1 | 14.0 | M5 x 11 DP | 40.1  | 6.6  | 40.6  | 20.3 | 26.9 | 13.5 | 25.4 | 15.9 | 4.7  | 3.4  |
| 12     | 32        | 81.5/94.2 | 35.1/47.8 | 36.1 | 18.0 | 36.1 | 46.5 | 19.8 | M6 x 12 DP | 55.4  | 8.3  | 53.1  | 26.7 | 36.1 | 18.0 | 21.3 | 12.4 | 9.0  | 3.2  |
| 15     | 40        | 93.7      | 39.6      | 46.2 | 23.1 | 46.0 | 54.1 | 26.2 | M6 x 12 DP | 72.4  | 8.3  | 71.9  | 36.1 | 30.0 | 15.0 | 25.4 | 12.7 | 6.0  | 25.4 |
| 20     | 50        | 115.1     | 45.7      | 57.2 | 28.7 | 57.2 | 69.9 | 31.8 | M8 x 25 DP | 82.6  | 9.9  | 82.6  | 41.2 | 31.8 | 16.0 | 25.4 | 12.7 | 10.9 | 22.2 |
| 25     | 63        | 143.5     | 62.2      | 73.2 | 35.6 | 73.2 | 81.3 | 44.5 | M8 x 25 DP | 108.0 | 11.1 | 108.0 | 54.1 | 48.0 | 24.1 | 30.0 | 15.0 | 19.3 | 25.4 |

Dimensions in millimeters

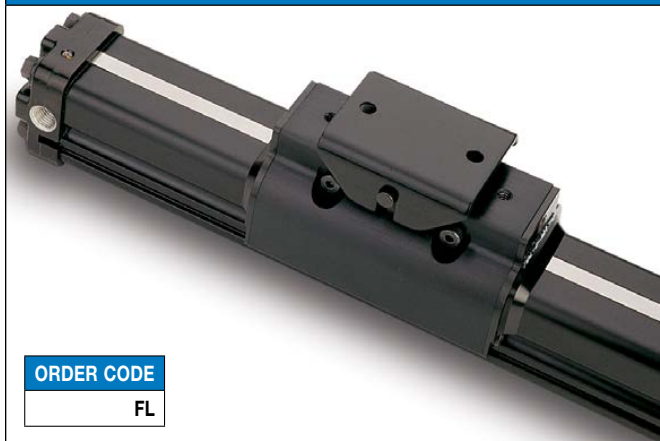
# BC2 Floating Mount Bracket - ALL Sizes

3D CAD available at  
www.tolomatic.com



Always use configured CAD solid model  
to determine critical dimensions

## FLOATING MOUNT BRACKET



ORDER CODE

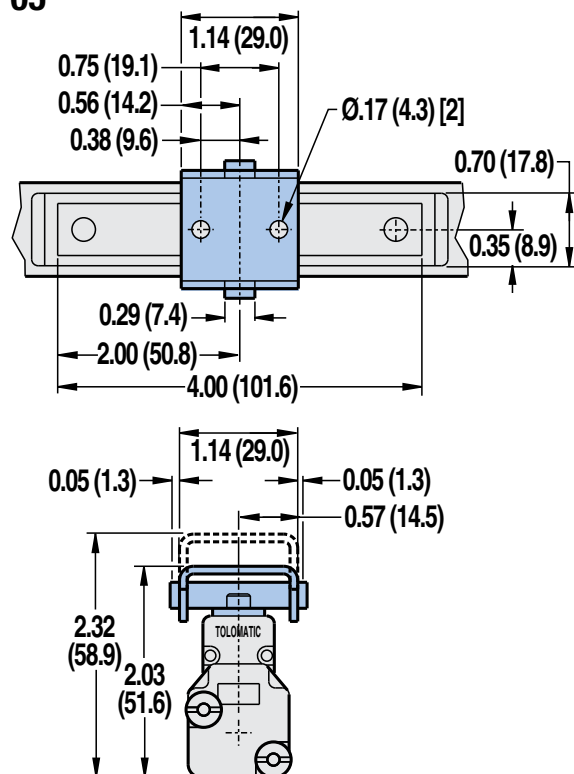
FL

For applications where a BC2 band cylinder is moving a load that is externally guided and supported. An externally guided load, not parallel to the BC2 band cylinder may result in cylinder binding. The floating mount bracket compensates for nonparallelism between the cylinder and the external guide.

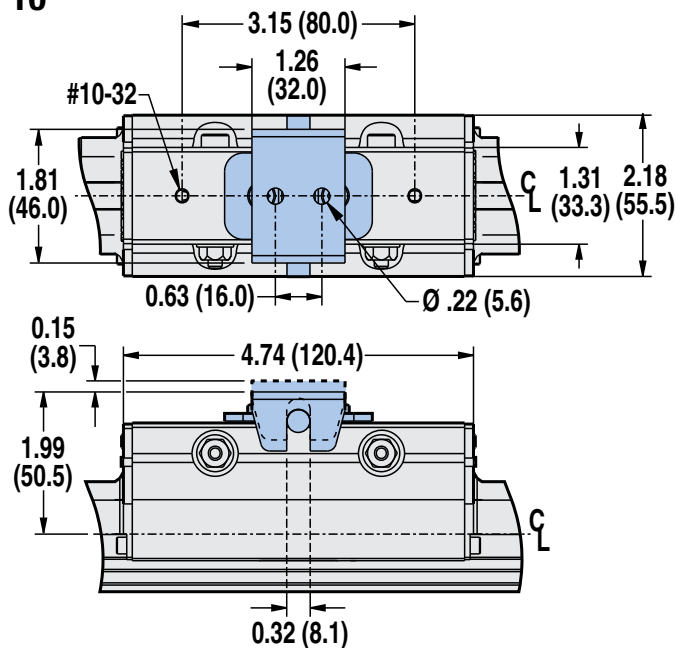
✗ (Floating mount brackets are not to be used in conjunction with shock absorbers)

## DIMENSIONS

05



10



Dimensions in inches (parenthesis indicate dimensions in millimeters)

# BC2 Floating Mount Bracket - ALL Sizes

3D CAD available at  
www.tolomatic.com



Always use configured CAD solid model  
to determine critical dimensions

ABT

IMXP

BC2

BC3

BC4

LS

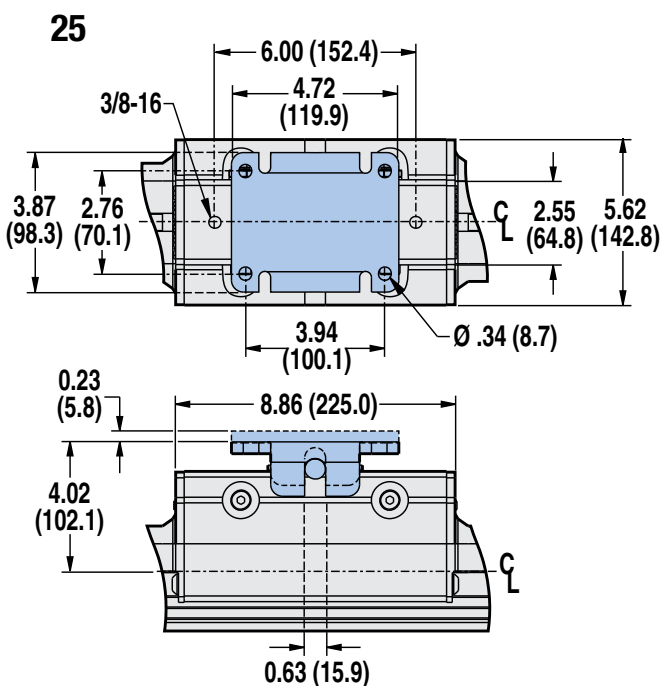
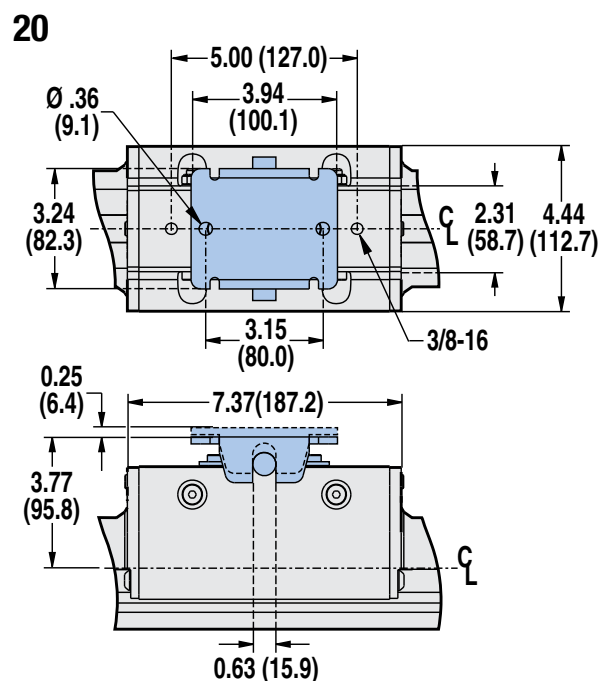
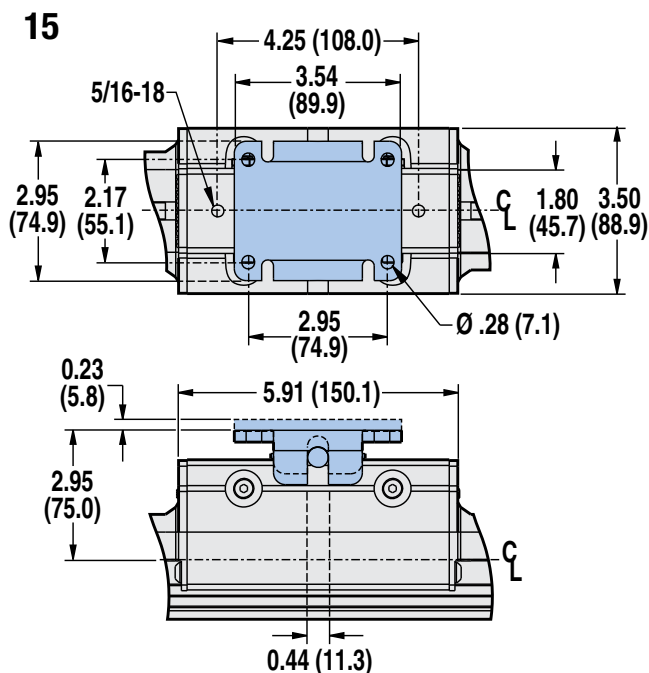
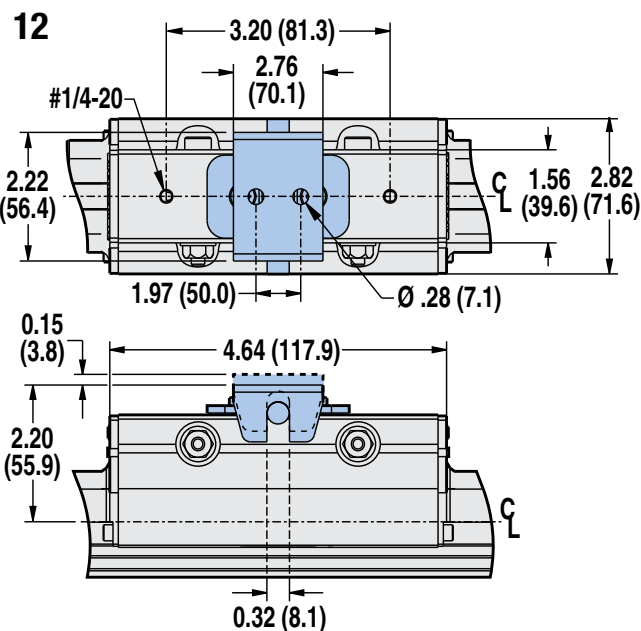
MG

CC

PB

ENGR

## DIMENSIONS

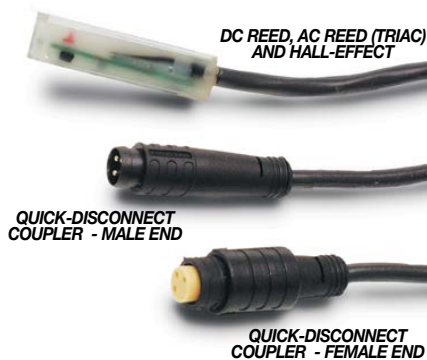


Dimensions in inches (parenthesis indicate dimensions in millimeters)



# BC2 Switches - ALL Sizes

## SWITCHES

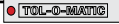
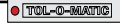


There are 10 sensing choices: DC reed, form A (open) or form C (open or closed); AC reed (Triac, open); Hall-effect, sourcing, PNP (open); Hall-effect, sinking, NPN (open); each with either flying leads or QD (quick disconnect). Commonly used to send analog signals to PLC (programmable logic controllers), TLL, CMOS circuit or other controller device. These switches are activated by the actuator's magnet.

Switches contain reverse polarity protection. QD cables are shielded; shield should be terminated at flying lead end.

If necessary to remove factory installed switches, be sure to reinstall on the same side of actuator with scored face of switch toward internal magnet.

## SPECIFICATIONS

|                              | REED DC                                                                               |                 |                                     |               | REED AC                  |                            | HALL-EFFECT DC                                                                          |               |                                                                                         |               |
|------------------------------|---------------------------------------------------------------------------------------|-----------------|-------------------------------------|---------------|--------------------------|----------------------------|-----------------------------------------------------------------------------------------|---------------|-----------------------------------------------------------------------------------------|---------------|
| ORDER CODE                   | <div>RT</div>                                                                         | <div>RM</div>   | <div>BT</div>                       | <div>BM</div> | <div>CT</div>            | <div>CM</div>              | <div>TT</div>                                                                           | <div>TM</div> | <div>KT</div>                                                                           | <div>KM</div> |
| LEAD                         | 5m                                                                                    | QD*             | 5m                                  | QD*           | 5m                       | QD*                        | 5m                                                                                      | QD*           | 5m                                                                                      | QD*           |
| CABLE SHIELDING              | Unshielded                                                                            | Shielded†       | Unshielded                          | Shielded†     | Unshielded               | Shielded†                  | Unshielded                                                                              | Shielded†     | Unshielded                                                                              | Shielded†     |
| SWITCHING LOGIC              | "A" Normally Open                                                                     |                 | "C" Normally Open or Closed         |               | Triac Normally Open      |                            | PNP (Sourcing) Normally Open                                                            |               | NPN (Sinking) Normally Open                                                             |               |
| MECHANICAL CONTACTS          | Single-Pole Single-Throw                                                              |                 | Single-Pole Double-Throw            |               | Single-Pole Single-Throw |                            | NO, These Are Solid State Components                                                    |               |                                                                                         |               |
| COIL DIRECT                  | Yes                                                                                   |                 | Yes                                 |               | Yes                      |                            | —                                                                                       |               |                                                                                         |               |
| POWER LED                    | None                                                                                  |                 | None                                |               | None                     |                            | None                                                                                    |               | None                                                                                    |               |
| SIGNAL LED                   | Red  |                 | None                                |               | None                     |                            | Red  |               | Red  |               |
| OPERATING VOLTAGE            | 200 Vdc max.                                                                          |                 | 120 Vdc max.                        |               | 120 Vac max.             |                            | 5 - 25 Vdc                                                                              |               |                                                                                         |               |
| OUTPUT RATING                | —                                                                                     |                 |                                     |               | —                        |                            | 25 Vdc, 200mA dc                                                                        |               |                                                                                         |               |
| OPERATING TIME               | 0 .6msec max.<br>(including bounce)                                                   |                 | 0 .7msec max.<br>(including bounce) |               | —                        |                            | < 10 micro sec.                                                                         |               |                                                                                         |               |
| OPERATING TEMPERATURE        | -40°F [-40°C] to 158°F [70°C]                                                         |                 |                                     |               |                          |                            | 0°F [-18°C] to 150°F [66°C]                                                             |               |                                                                                         |               |
| RELEASE TIME                 | 1 .0msec. max.                                                                        |                 |                                     |               | —                        |                            | —                                                                                       |               |                                                                                         |               |
| ON TRIP POINT                | —                                                                                     |                 |                                     |               | —                        |                            | 150 Gauss maximum                                                                       |               |                                                                                         |               |
| OFF TRIP POINT               | —                                                                                     |                 |                                     |               | —                        |                            | 40 Gauss minimum                                                                        |               |                                                                                         |               |
| **POWER RATING (WATTS)       | 10 .0 <sup>s</sup>                                                                    |                 | 3 .0 <sup>s</sup> <sup>§</sup>      |               | 10 .                     |                            | 5 .                                                                                     |               |                                                                                         |               |
| VOLTAGE DROP                 | 2 .6V typical at 100 mA                                                               |                 | NA                                  |               | —                        |                            | —                                                                                       |               |                                                                                         |               |
| RESISTANCE                   | 0 . Ω Initial (Max .                                                                  |                 |                                     |               | —                        |                            | —                                                                                       |               |                                                                                         |               |
| CURRENT CONSUMPTION          | —                                                                                     |                 |                                     |               | 1 Amp at<br>86°F [30°C]  | 0 .5Amp at<br>140°F [60°C] | 200 mA at 25 Vdc                                                                        |               |                                                                                         |               |
| FREQUENCY                    | —                                                                                     |                 |                                     |               | 47 - 63 Hz               |                            | —                                                                                       |               |                                                                                         |               |
| CABLE MIN.<br>BEND<br>RADIUS | STATIC                                                                                | 0 .630" [16mm]  |                                     |               |                          |                            |                                                                                         |               |                                                                                         |               |
|                              | DYNAMIC                                                                               | Not Recommended |                                     |               |                          |                            |                                                                                         |               |                                                                                         |               |

**CAUTION: DO NOT OVER TIGHTEN SWITCH HARDWARE WHEN INSTALLING!**

**WARNING:** Do not exceed power rating (Watt = Voltage X Amperage). Permanent damage to sensor will occur.

\*QD = Quick Disconnect; Male coupler is located 6" [152mm] from sensor, Female coupler to flying lead (part #2503-1025) distance is 197" [5m] also see Cable Shielding specification above

**REPLACEMENT OF QD SWITCHES MANUFACTURED BEFORE JULY 1, 1997:** It will be necessary to replace or rewire the female end coupler.



**Reed Switch Life Expectancy:** Up to 200,000,000 cycles (depending on load current, duty cycle and environmental conditions)

†Shielded from the female quick disconnect coupler to the flying leads. Shield should be terminated at flying lead end.

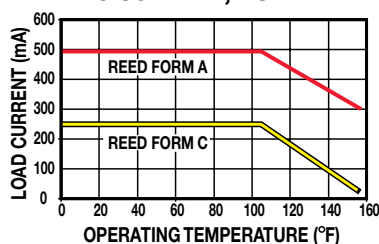
<sup>s</sup> Maximum current 500mA (not to exceed 10VA) Refer to Temperature vs. Current graph and Voltage Derating graph

<sup>§§</sup> Maximum current 250mA (not to exceed 3VA) Refer to Temperature vs. Current graph and Voltage Derating graph

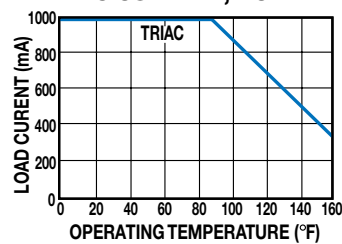
# BC2 Switches - ALL Sizes

## PERFORMANCE

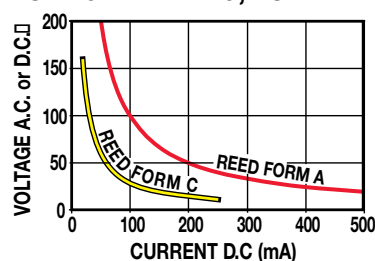
TEMP. vs CURRENT, DC REED



TEMP. vs CURRENT, AC REED

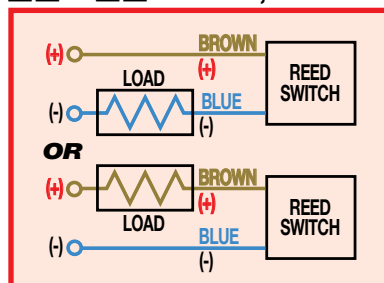


VOLTAGE DERATING, DC REED

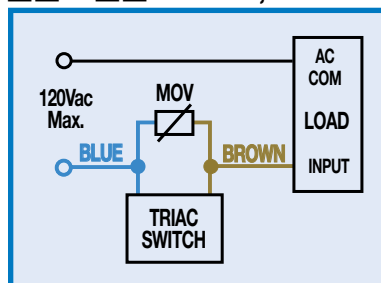


## WIRING DIAGRAMS

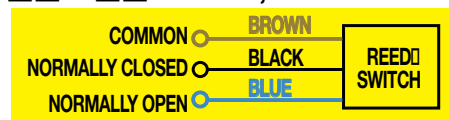
**R T** & **R M** DC REED, FORM A



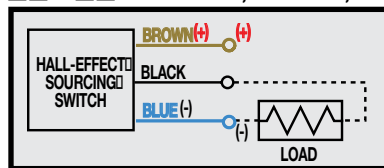
**C T** & **C M** AC REED, TRIAC



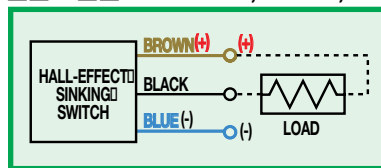
**B T** & **B M** DC REED, FORM C



**T T** & **T M** HALL-EFFECT, SOURCING, PNP



**K T** & **K M** HALL-EFFECT, SINKING, NPN



## INSTALLATION INFORMATION

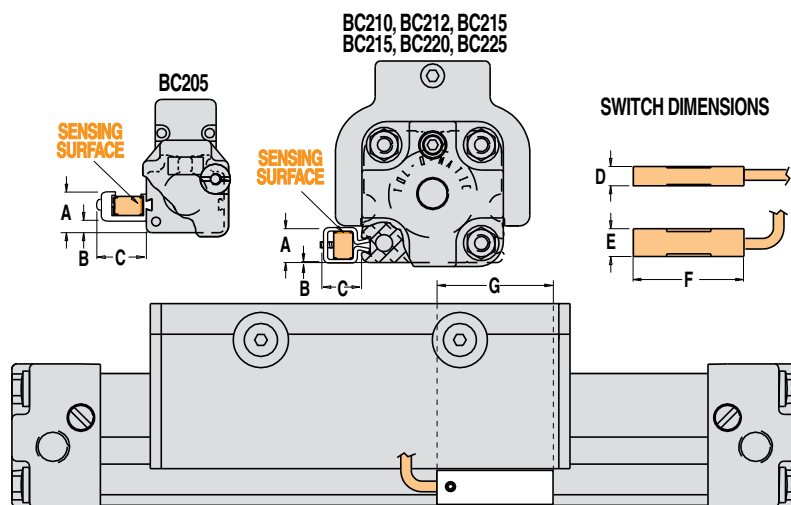


**⚠** THE NOTCHED FACE OF THE SWITCH INDICATES THE SENSING SURFACE AND MUST FACE TOWARD THE MAGNET.

**📌** HALL-EFFECT SWITCHES ARE NOT AVAILABLE FOR BC205

**📌** Some actuators may require switch mounting on a specific side of the assembly. Call Tolomatic for details.

## DIMENSIONS



| SIZE | BORE | A     | B     | C     | D     | E     | F    | G    |
|------|------|-------|-------|-------|-------|-------|------|------|
| 05   | 0.50 | 0.445 | 0.157 | 0.518 | 0.219 | 0.315 | 1.25 | 1.45 |
| 10   | 1.00 | 0.383 | 0.011 | 0.448 | 0.219 | 0.315 | 1.25 | 1.45 |
| 12   | 1.25 | 0.541 | 0.169 | 0.448 | 0.219 | 0.315 | 1.25 | 1.45 |
| 15   | 1.50 | 0.548 | 0.161 | 0.432 | 0.219 | 0.315 | 1.25 | 1.45 |
| 20   | 2.00 | 0.732 | 0.344 | 0.448 | 0.219 | 0.315 | 1.25 | 1.45 |
| 25   | 2.50 | 1.082 | 0.710 | 0.432 | 0.219 | 0.315 | 1.25 | 1.45 |

Dimensions in inches

| SIZE | BORE | A     | B     | C     | D    | E    | F     | G     |
|------|------|-------|-------|-------|------|------|-------|-------|
| 05   | 12   | 11.30 | 3.99  | 13.16 | 5.56 | 8.00 | 31.75 | 36.83 |
| 10   | 25   | 9.73  | 0.28  | 11.38 | 5.56 | 8.00 | 31.75 | 36.83 |
| 12   | 32   | 13.74 | 4.29  | 11.38 | 5.56 | 8.00 | 31.75 | 36.83 |
| 15   | 40   | 13.92 | 4.09  | 10.97 | 5.56 | 8.00 | 31.75 | 36.83 |
| 20   | 50   | 18.59 | 8.74  | 11.38 | 5.56 | 8.00 | 31.75 | 36.83 |
| 25   | 63   | 27.48 | 18.03 | 10.97 | 5.56 | 8.00 | 31.75 | 36.83 |

Dimensions in millimeters

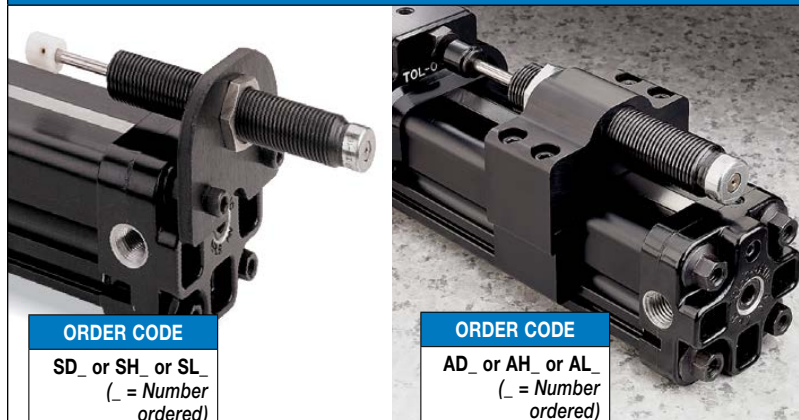
# BC2 Shock Absorbers - 10, 12, 15, 20, 25 Sizes

3D CAD available at  
www.tolomatic.com



Always use configured CAD solid model  
to determine critical dimensions

## SHOCK ABSORBERS



### ORDER CODE

SD\_ or SH\_ or SL\_  
(\_ = Number  
ordered)

### ORDER CODE

AD\_ or AH\_ or AL\_  
(\_ = Number  
ordered)

Rodless cylinders with standard internal cushion offer an effective method of decelerating loads. However, all Tolomatic rodless cylinders are capable of carrying heavier loads at higher velocities than the cylinder cushion can absorb. Optional shock absorbers can be used to increase the cylinder's life and broaden the application range for the cylinder model you have chosen.

Tolomatic offers two types of shock absorber options for use with rodless cylinders. Standard shock absorbers, which are positioned on the cylinder heads for end-of-stroke deceleration and adjustable shock absorbers which allows the shock to be positioned at any point along the cylinder.

Typical shock absorber life varies between 1-2 million cycles (depending on environment) appropriate preventative maintenance should be considered in high cyclic applications.

**NOTE:** When 2 shock absorbers are ordered, the unit will be assembled with NO internal cushions.

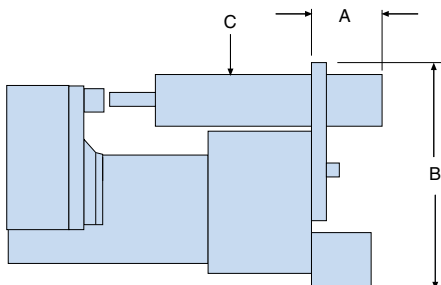
**NOTE:** Adjustable shock absorbers will reduce stroke length. To maintain desired stroke length: when ordering increase stroke length by the dimension in the table below for each adjustable shock absorber ordered.

| 10             | 12            | 15            | 20             | 25             |
|----------------|---------------|---------------|----------------|----------------|
| 0.75" [19.0mm] | 0.03" [0.7mm] | 0.35" [8.9mm] | 0.85" [21.6mm] | 0.85" [21.6mm] |

**CAUTION:** In applications which result in a load bending moment at deceleration, care should be taken to decelerate the load rather than the carrier of the band cylinder.

## DIMENSIONS

### STANDARD SHOCK



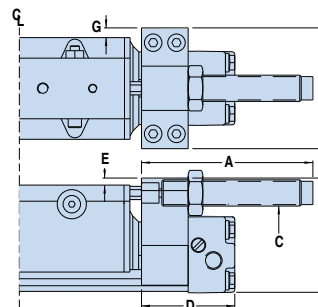
| SIZE | BORE | A    | B    | C (Thread Size) |
|------|------|------|------|-----------------|
| 10   | 1.00 | 2.35 | 2.50 | 9/16-18 UNF-2B  |
| 12   | 1.25 | 2.23 | 3.50 | 3/4-16 UNF-2B   |
| 15   | 1.50 | 2.23 | 4.00 | 3/4-16 UNF-2B   |
| 20   | 2.00 | 2.62 | 4.70 | 1-12 UNF-2B     |
| 25   | 2.50 | 1.17 | 6.00 | 1-12 UNF-2B     |

Dimensions in inches

| SIZE | BORE | A    | B     | C (Thread Size) |
|------|------|------|-------|-----------------|
| 10   | 25   | 59.7 | 63.5  | M14x1.5-6g      |
| 12   | 32   | 56.6 | 88.9  | M20x1.5-6g      |
| 15   | 40   | 56.6 | 101.6 | M20x1.5-6g      |
| 20   | 50   | 66.5 | 119.4 | M25x1.5-6g      |
| 25   | 63   | 29.7 | 152.4 | M25x1.5-6g      |

Dimensions in millimeters

### ADJUSTABLE POSITION SHOCK



| SIZE | BORE | A    | B    | C (Thread Size) | D    | E    | F    | G    |
|------|------|------|------|-----------------|------|------|------|------|
| 10   | 1.00 | 3.68 | 2.45 | 9/16-18 UNF-2B  | 2.00 | 0.15 | 2.59 | 0.21 |
| 12   | 1.25 | 4.39 | 3.19 | 3/4-16 UNF-2B   | 2.25 | 0.13 | 2.82 | 0    |
| 15   | 1.50 | 4.39 | 3.62 | 3/4-16 UNF-2B   | 2.50 | 0.05 | 3.50 | 0    |
| 20   | 2.00 | 4.75 | 4.60 | 1-12 UNF-2B     | 3.13 | 0.16 | 4.44 | 0    |
| 25   | 2.50 | 4.75 | 5.63 | 1-12 UNF-2B     | 4.47 | 0.17 | 5.63 | 0    |

Dimensions in inches

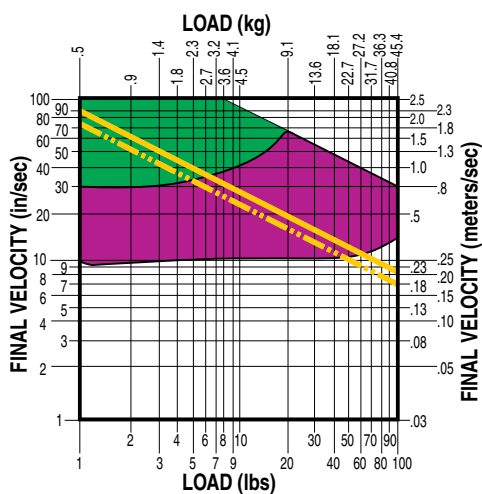
| SIZE | BORE | A     | B     | C (Thread Size) | D     | E   | F     | G   |
|------|------|-------|-------|-----------------|-------|-----|-------|-----|
| 10   | 25   | 93.5  | 62.2  | M14x1.5-6g      | 50.8  | 3.8 | 65.8  | 5.3 |
| 12   | 32   | 111.5 | 81.0  | M20x1.5-6g      | 57.2  | 3.3 | 71.6  | 0   |
| 15   | 40   | 111.5 | 92.0  | M20x1.5-6g      | 63.5  | 1.3 | 88.9  | 0   |
| 20   | 50   | 120.7 | 116.8 | M25x1.5-6g      | 79.5  | 4.1 | 112.8 | 0   |
| 25   | 63   | 120.7 | 143.0 | M25x1.5-6g      | 113.5 | 4.3 | 143.0 | 0   |

Dimensions in millimeters

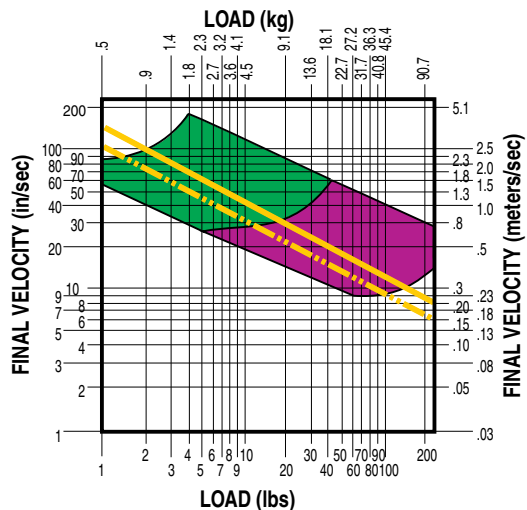
# BC2 Shock Absorbers - 10, 12, 15, 20, 25 Sizes: PERFORMANCE

## VELOCITY vs LOAD

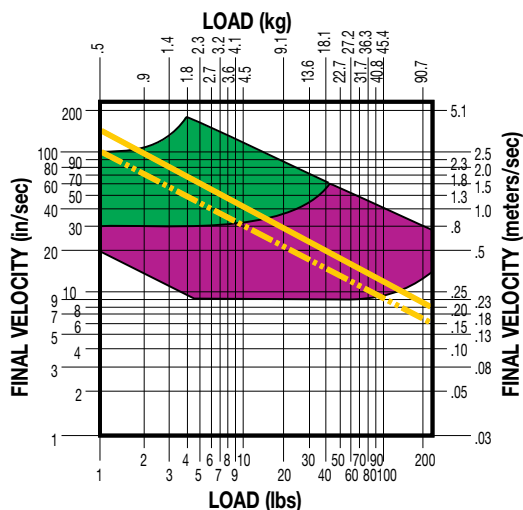
BC210



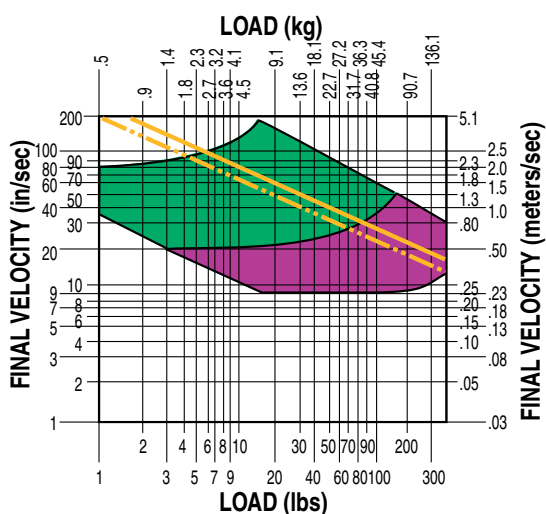
BC212



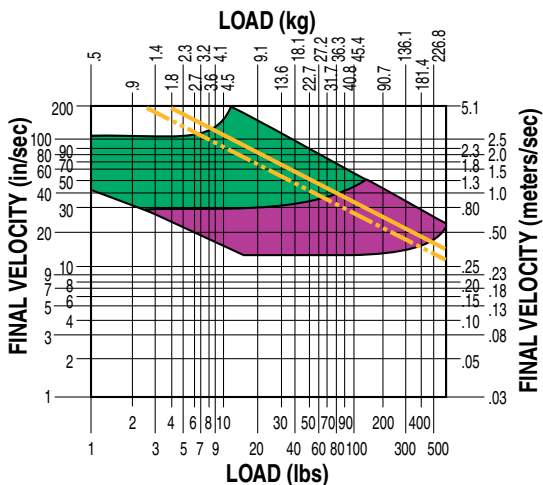
BC215



BC220



BC225



 LIGHT DUTY (Light load/High velocity)

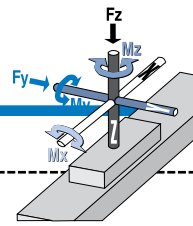
 HEAVY DUTY (Heavy load/Low velocity)

 AIR CUSHION DATA

 NOTE: If final (or impact) velocity cannot be calculated directly, a reasonable guideline to use is 2 x average velocity.



# Application Data Worksheet



## STROKE LENGTH

☐ inch (S.K.) ☐ millimeters  
(U.S. Standard) (Metric)

## AVAILABLE AIR PRESSURE

☐ PSI ☐ bar  
(U.S. Standard) (Metric)

## REQUIRED THRUST FORCE

☐ lbf ☐ N  
(U.S. Standard) (Metric)

## LOAD

☐ lb ☐ kg  
(U.S. Standard) (Metric)

## LOAD CENTER OF GRAVITY DISTANCE TO CARRIER CENTER

☐ inch ☐ millimeters  
(U.S. Standard) (Metric)

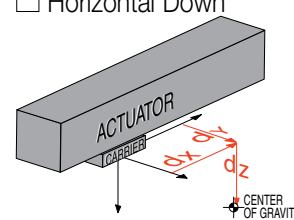
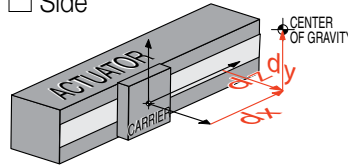
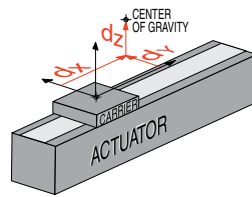
$d_x$  \_\_\_\_\_  
 $d_y$  \_\_\_\_\_  
 $d_z$  \_\_\_\_\_

## ORIENTATION

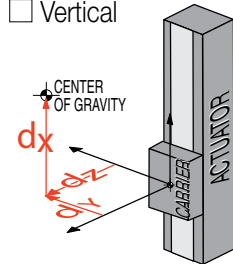
☐ Horizontal

☐ Side

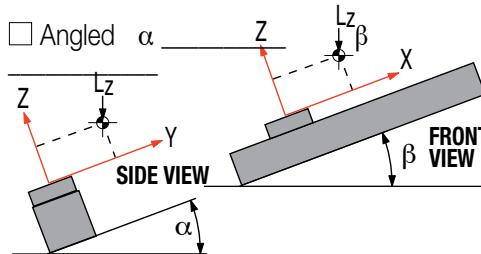
☐ Horizontal Down



☐ Vertical



☐ Angled  $\alpha$



## OTHER ISSUES:

(i.e. Environment,  
Temperature,  
Contamination, etc.)

Contact information:

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



Fax (1-763-478-8080) or call Tolomatic (1-800-328-2174) with the above information.  
We will provide any assistance needed to determine the proper actuator.

# Rodless Cylinder Selection Guidelines - BC2, BC3, BC4, LS - All Sizes

## PROVIDING LOAD GUIDANCE AND SUPPORT

The process of selecting a load bearing actuator for a given application can be complex. It is highly recommended that you contact Tolomatic or a Tolomatic Distributor for assistance in selecting the best actuator for your application. The following overview of the selection guidelines are for educational purposes only.

### 1 COMPILE APPLICATION REQUIREMENTS

To determine the appropriate Band Cylinder or Linear Slide model for an application, compile the following information:

- Available pressure (PSI)
- Weight of load (lbs or kg)
- Orientation of load (lbs or kgs)
- Velocity of load (in/sec or mm/sec)
- Stroke length (in or mm)

HINT: Use Tolomatic sizing and selection software, download at: [tolomatic.co](http://tolomatic.co)

### 2 SELECT CYLINDER SIZE

- Consult the Theoretical Force vs. Pressure charts.
- Cross-reference the load force (or load weight if force is not known) and the available operating pressure. If the intersection falls below the diagonal line, and if moments do not exceed maximum values listed for that model (see Step 3), the actuator will accommodate the application.

If the intersection is above the diagonal line, a larger cylinder bore size should be considered.

NOTE: Additional force may be required to obtain the necessary acceleration for vertical or horizontal loads.

### 3 DETERMINE NATURE OF LOAD AND THE EFFECT OF BENDING MOMENTS

If the cylinder will guide and support a load located directly over the center of carrier, bending moments will not be a factor in the cylinder selection.

NOTE: The maximum load "L" must not exceed the capacity limits of the cylinder selected.

- Bending Moments

For off center or side loads, determine the distance from the center of mass of the load to the center of the carrier bracket. This measurement is needed to calculate the torque for bending moments. (Refer to Bending Moment chart for each model.)

Should the resulting maximum bending moment exceed figures indicated on the chart, external guides, auxiliary carrier/s or a larger cylinder should be considered.

- Auxiliary Carrier Bending Moments

The auxiliary carrier option (available on most models) increases load carrying capacity and bending moments. Auxiliary carriers can be ordered with or without an internal piston. (Auxiliary

carriers without a piston have no internal cushion on the cylinder end closest to the auxiliary carrier.)

IMPORTANT: When ordering, determine the working stroke, then the minimum distance required between carriers (dimension "D" in Auxiliary Carrier Bending Moments chart). When ordered, Tolomatic's configurator will calculate the overall length of the actuator.

NOTE: breakaway pressure will increase when using auxiliary carriers.

### 4 DETERMINE INTERNAL CUSHION CAPACITY

- Consult the Cushion Data chart for the model selected. The velocities listed on the cushion charts are final or cushion impact velocities. On applications where the internal cushions or bumpers are to be used, be sure the actual, final or impact velocity is known. If the velocity is not known, use of limit switches with valve deceleration circuits or shock absorbers should be considered. NOTE: The BC205 uses external bumpers in place of internal cushions, LS05 & LS10 do not have cushions or bumpers.
- Cross-reference the final velocity and weight of the load. If the intersection is below the diagonal lines, the internal cushions on the actuator may be used. If the point falls above the dashed diagonal line or if the velocity is not known, use deceleration circuits, external shock absorbers or select a

larger cylinder with greater cushion capacity. On high-cyclic applications, use of external stops is strongly recommended.

### 5 DETERMINE TUBE SUPPORT REQUIREMENTS

- Consult the Tube Support chart for the model selected.
- Cross reference the load weight and maximum distance between supports.

### 6 CONSIDER OPTIONS

- Switches— dc Reed, Hall-effect or ac Triac

Band Cylinders and Linear Slides each have different standard features and options. Check the options section for the actuator you have selected.

- Shock Absorbers— if needed.
- Foot Mounting Kits
- Floating Mount Bracket — use when lack of parallelism occurs between the cylinder and an external guided and supported load.
- Single End Porting (BC3, BC4)
- Long Carrier (BC4)
- Proximity Sensors (LS)
- Dual 180° Carrier (BC3)

ABT

IMXP

BC2

BC3

BC4

LS

MG

CC

PB

ENGR

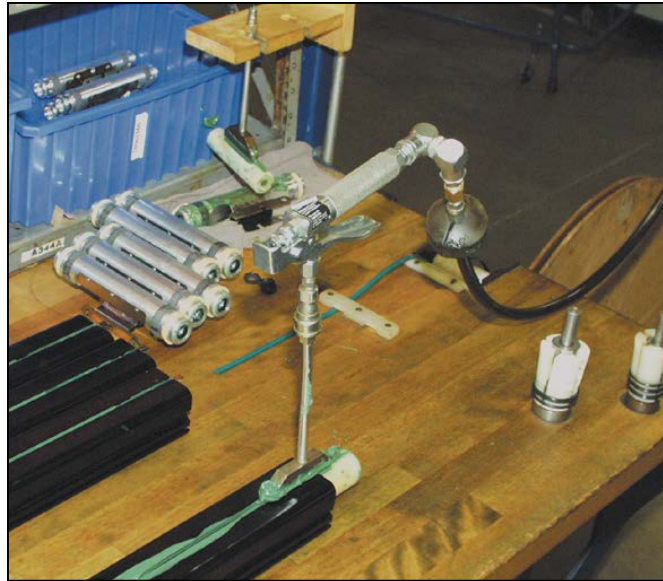
# Application Guidelines

The following conditional statements are intended as general guidelines for use of Tolomatic actuators. Since all applications have their own specific operating requirements, consult Tolomatic, Inc. or your local Tolomatic distributor if an application is unconventional or if questions arise regarding the selection process.

## CUSHION NEEDLE ADJUSTMENT (BC2, BC3, BC4, CC, SA, DP, TC ONLY)



Adjust the cushion needles in the cylinder heads carefully to obtain a smooth, hesitation free deceleration for your particular application. If there are questions on proper adjustment, please consult Tolomatic, Inc.



## LUBRICATION GUIDELINES

All Tolomatic actuators (except Cable Cylinders) are prelubricated at the factory. To ensure maximum actuator life, the following guidelines should be followed.

### • Filtration

We recommend the use of dry, filtered air in our products. "Filtered air" means a level of 10 Micron or less. "Dry" means air should be free of appreciable amounts of moisture. Regular maintenance of installed

filters will generally keep excess moisture in check.

### • External Lubricators (optional)

The factory prelubrication of Tolomatic actuators will provide optimal performance without the use of external lubrication. However, external lubricators can further extend service life of pneumatic actuators if the supply is kept constant.

Oil lubricators, (mist or drop) should supply a minimum of 1 drop per 20 standard cubic feet per minute to the

cylinder. As a rule of thumb, double that rate if water in the system is suspected. Demanding conditions may require more lubricant.

If lubricators are used, we recommend a non-detergent, 20cP @ 140°F 10-weight lubricant. Optimum conditions for standard cylinder operation are +32° to +150°F (+0° to 65 .5°C)

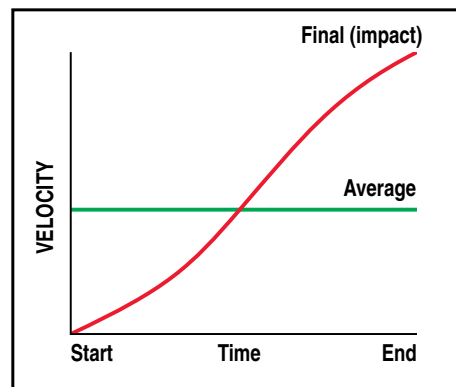
**NOTE:** Use of external lubricators may wash away the factory installed lubrication. External lubricants must be maintained in a constant supply or the results will be a dry actuator prone to premature wear.

### • Sanitary Environments

Oil mist lubricators must dispense "Food Grade" lubricants to the air supply. Use fluids with ORAL LD50 toxicity ratings of 35 or higher such as Multitherm® PG-1 or equivalent. Demanding conditions can require a review of the application.

## FINAL VELOCITY CALCULATION

Velocity calculations for all rodless cylinders need to differentiate between final velocity and average velocity. For example: Stroking a 100-inch BC3 model in one second yields an average velocity of 100 inches per second. To properly determine the inertial forces for cushioning, it is important to know the



final (or impact) velocity. Rodless cylinders accelerate and decelerate at each end of the stroke. Therefore this acceleration must be considered (see diagram).

If final (or impact) velocity cannot be calculated directly, a reasonable guideline is to use 2 x average velocity.

# BC2 Service Parts Ordering - ALL Sizes

| Inch (U.S. Standard) SIZE                                     | 05        | 10        | 12        | 15        | 20        | 25        |
|---------------------------------------------------------------|-----------|-----------|-----------|-----------|-----------|-----------|
| <b>Aux. Carrier Assembly (w/piston) (each)</b>                | NA        | 0510-9057 | 0512-9057 | 0515-9057 | 0520-9057 | 0525-9057 |
| <b>Aux. Carrier Assembly (wo/piston) (each)</b>               | NA        | 0510-9095 | 0512-9095 | 0515-9095 | 0520-9095 | 0525-9095 |
| <b>Floating Mount Bracket Kit</b>                             | 0905-9115 | 0510-9007 | 0512-9007 | 0515-9007 | 0520-9007 | 0525-9007 |
| <b>Foot Mount Kit<sup>1</sup></b>                             | 0905-9010 | 0510-9125 | 0512-9125 | 0515-9125 | 0520-9125 | 0525-9125 |
| <b>Shock Field Retrofit Kit – Heavy Dut <sup>2,8</sup></b>    | NA        | 0510-9090 | 0512-9090 | 0515-9090 | 0520-9090 | 0525-9090 |
| <b>Shock Field Retrofit Kit – Light Dut <sup>2,8</sup></b>    | NA        | 0510-9091 | 0512-9091 | 0515-9091 | 0520-9091 | 0525-9091 |
| <b>Shock Field Mount Kit (Hardware Only)<sup>3,8</sup></b>    | NA        | 0510-9092 | 0512-9092 | 0515-9092 | 0520-9092 | 0525-9092 |
| <b>Adj. Shock Field Retrofit Kit – Heavy Dut <sup>2</sup></b> | NA        | 0510-9048 | 0512-9011 | 0515-9011 | 0520-9011 | 0525-9011 |
| <b>Adj. Shock Field Retrofit Kit – Light Dut <sup>2</sup></b> | NA        | 0510-9049 | 0512-9012 | 0515-9012 | 0520-9012 | 0525-9012 |
| <b>Adj. Shock Field Mount Kit (Hardware Only)<sup>3</sup></b> | NA        | 0510-9072 | 0512-9072 | 0515-9072 | 0520-9072 | 0525-9013 |
| <b>Tube Supports<sup>4</sup></b>                              | 0905-1034 | 4510-1010 | 4512-1010 | 4515-1010 | 4520-1010 | 4525-1010 |
| <b>Repair Kits<sup>5,6,7</sup></b>                            | RKBC205NP | RKBC210NP | RKBC212NP | RKBC215NP | RKBC220NP | RKBC225NP |

| Metric SIZE                                                   | 05            | 10            | 12            | 15            | 20            | 25            |
|---------------------------------------------------------------|---------------|---------------|---------------|---------------|---------------|---------------|
| <b>Aux. Carrier Assembly (w/piston) (each)</b>                | NA            | 4510-9057     | 4512-9057     | 4515-9057     | 4520-9057     | 4525-9057     |
| <b>Aux. Carrier Assembly (wo/piston) (each)</b>               | NA            | 4510-9095     | 4512-9095     | 4515-9095     | 4520-9095     | 4525-9095     |
| <b>Floating Mount Bracket Kit</b>                             | 4905-9115     | 4510-9007     | 4512-9007     | 4515-9007     | 4520-9007     | 4525-9007     |
| <b>Foot Mount Kit<sup>1</sup></b>                             | 4905-9010     | 4510-9125     | 4512-9125     | 4515-9125     | 4520-9125     | 4525-9125     |
| <b>Shock Field Retrofit Kit – Heavy Dut <sup>2,8</sup></b>    | NA            | 4510-9090     | 4512-9090     | 4515-9090     | 4520-9090     | 4525-9090     |
| <b>Shock Field Retrofit Kit – Light Dut <sup>2,8</sup></b>    | NA            | 4510-9091     | 4512-9091     | 4515-9091     | 4520-9091     | 4525-9091     |
| <b>Shock Field Mount Kit (Hardware Only)<sup>3,8</sup></b>    | NA            | 4510-9092     | 4512-9092     | 4515-9092     | 4520-9092     | 4525-9092     |
| <b>Adj. Shock Field Retrofit Kit – Heavy Dut <sup>2</sup></b> | NA            | 4510-9013     | 4512-9013     | 4515-9013     | 4520-9013     | 4525-9013     |
| <b>Adj. Shock Field Retrofit Kit – Light Dut <sup>2</sup></b> | NA            | 4510-9014     | 4512-9014     | 4515-9014     | 4520-9014     | 4525-9014     |
| <b>Adj. Shock Field Mount Kit (Hardware Only)<sup>3</sup></b> | NA            | 4510-9025     | 4512-9025     | 4515-9025     | 4520-9025     | 4525-9025     |
| <b>Tube Supports<sup>4</sup></b>                              | 0905-1034     | 4510-1010     | 4512-1010     | 4515-1010     | 4520-1010     | 4525-1010     |
| <b>Repair Kits<sup>5,6,7</sup></b>                            | RKBC205TP(GP) | RKBC210TP(GP) | RKBC212TP(GP) | RKBC215TP(GP) | RKBC220TP(GP) | RKBC225TP(GP) |

| CONFIG. CODE ORDERING                         |      |
|-----------------------------------------------|------|
| Mounting Hardware & FE conn. included         |      |
| DESCRIPTION                                   | CODE |
| Switch Kit, Reed, Form C, 5m                  | BT   |
| Switch Kit, Reed, Form C, Male Conn.          | BM   |
| Switch Kit, Reed, Form A, 5m                  | RT   |
| Switch Kit, Reed, Form A, Male Conn.          | RM   |
| Switch Kit, Triac, 5m                         | CT   |
| Switch Kit, Triac, Male Conn.                 | CM   |
| Switch Kit, Hall-effect, Sinking, 5m          | KT   |
| Switch Kit, Hall-effect, Sinking, Male Conn.  | KM   |
| Switch Kit, Hall-effect, Sourcing, 5m         | TT   |
| Switch Kit, Hall-effect, Sourcing, Male Conn. | TM   |

NOTE: When kit is ordered female connector & all mounting hardware is included

## Switch Ordering NOTES:

To order field retrofit switch and hardware kits for all Tolomatic actuators: SW (Then the model and bore size, and type of switch required)

**Example: SWBC215RT**

(Hardware and Form A Reed switch with 5 meter lead for 1.5" bore BC2 band cylinder)



## Service Parts Ordering NOTES:

- 1 Foot Mount Kit contains two foot mount brackets and mounting hardware
- 2 Shock Field Retrofit Kit contains one Shock Absorber and mounting hardware
- 3 Shock Field Mount Kit contains one set of mounting hardware only
- 4 A minimum of 2 (two) Tube Supports required per cylinder
- 5 Repair Kit for 05 size contains O-rings, U-Cups, End Caps, Wear Strips, Band Inserts, Spring Clamps, Sealing Band, Dust Band and Shock Absorbing Pads
- 6 Repair Kit for 10, 12, 15, 20 & 25 size contains End Caps, Bearing Rods, O-rings, U-cups, Wear Rings, Cushion Seals, Band Inserts, Spring Clamps, Sealing Band and Dust Band.
- 7 When ordering repair kits, specify stroke as "SK" then indicate the desired length in decimal inches after the order code indicated above. EXAMPLE: RKBC210SK10.00
- 8 Standard end-of-stroke shock absorbers are designed to operate without the assistance of the standard band cylinder cushion. To ensure proper shock absorber performance, make sure the air cushion is disabled.

NA = Not Available



# BC2 Ordering - ALL Sizes

## MODEL, BORE, STROKE

BC2 10 NP SK 100 250

## OPTIONS

DW 6 0 TS 3 FM 2 SH 2 BM 2

### MODEL & MOUNTING

BC2 BC2 Band Cylinder

### BORE SIZE

|    |              |
|----|--------------|
| 05 | 0.50" (12mm) |
| 10 | 1.00" (25mm) |
| 12 | 1.25" (32mm) |
| 15 | 1.50" (40mm) |
| 20 | 2.00" (50mm) |
| 25 | 2.50" (63mm) |

### MOUNTING & PORTS

|     |                                           |
|-----|-------------------------------------------|
| NP  | US standard mounting & NPT ports          |
| TP† | Metric mounting with metric taper port    |
| GP† | Metric mounting with metric parallel port |

† The metric version provides metric tapped holes for mounting of the load to the carrier and of the actuator to mounting surfaces & metric ports

### STROKE LENGTH & MOUNTING TYPE

|     |                                                    |
|-----|----------------------------------------------------|
| SK  | Stroke, enter desired stroke length in inches      |
| SM† | Stroke, enter desired stroke length in millimeters |

**NOTE:** Actuator mounting threads and mounting fasteners will be either inch or metric; depending on how stroke length is indicated.

SK = inch mounting  
SM = metric mounting

### MAXIMUM STROKE

| SIZE | ...SK | ...SM |
|------|-------|-------|
|      | in    | mm    |
| 05   | 171   | 4,343 |
| 10   | 350   | 8,890 |
| 12   | 288   | 7,315 |
| 15   | 298   | 7,569 |
| 20   | 274   | 6,959 |
| 25   | 163   | 4,140 |

Not all codes listed are compatible with all options. Contact Tolomatic with any questions.

### AUXILIARY CARRIER (BC2\_14)

- DW** Auxiliary carrier With piston & "D" distance  
**DO** Auxiliary carrier Without piston & "D" distance  
-- -- -- "D" Distance between carriers "D" Distance between carriers in inches (**SK**) or millimeters (**SM**)

(Same unit of measure as stroke length is required)

✗ Not available for 05 size

### MINIMUM "D" DISTANCE BETWEEN CARRIERS

|    | (DO) w/o Piston |     | (DW) w/ Piston |     |
|----|-----------------|-----|----------------|-----|
|    | in              | mm  | in             | mm  |
| 10 | 5.07            | 129 | 5.07           | 129 |
| 12 | 5.17            | 131 | 6.85           | 174 |
| 15 | 6.46            | 164 | 8.07           | 205 |
| 20 | 8.10            | 206 | 8.10           | 206 |
| 25 | 9.62            | 244 | 11.06          | 281 |

\*When ordering auxiliary carrier option, enter the distance required between carriers. The configurator will calculate the overall length of the actuator.

### TUBE SUPPORTS (BC2\_16)

TS Tube Support & number required

### FOOT MOUNT (BC2\_17)

FM Foot Mount & number required (1 or 2)

### FLOATING MOUNT (BC2\_18)

FL Floating Mount Bracket

✗ Not compatible with shock absorbers

### PORTING OPTION

**HDL** 4-Ported Head - Left End  
**HDR** 4-Ported Head - Right End  
**HDB** 4-Ported Head - Both Ends

✗ Not available for 05 size

### SHOCK ABSORBERS (BC2\_22)

- SD** Shock hardware Only and number required  
**SH** Shock, Heavy duty and number required  
**SL** Shock, Light duty and number required  
**\*AD** Adjustable shock hardware Only and number required  
**\*AH** Adjustable shock, Heavy duty and number required  
**\*AL** Adjustable shock, Light duty and number required

✗ Not available for 05 size

\*NOTE: Adjustable Shock will reduce working stroke (see page BC2\_22)

### SWITCHES (BC2\_20)

| TYPE        |         | QUICK-DISCONNECT | CODE | QUANTITY                          | LEAD LENGTH |
|-------------|---------|------------------|------|-----------------------------------|-------------|
| REED        | Form A  | QD               | RM   | After code enter quantity desired | 5 meters    |
|             |         | no               | RT   |                                   |             |
| Form C      |         | QD               | BM   |                                   |             |
|             |         | no               | BT   |                                   |             |
| HALL-EFFECT | Sinking | QD               | *KM  | After code enter quantity desired | 5 meters    |
|             |         | no               | *KT  |                                   |             |
| Sourcing    |         | QD               | *TM  |                                   |             |
|             |         | no               | *TT  |                                   |             |
| TRIAC       |         | QD               | CM   |                                   |             |
|             |         | no               | CT   |                                   |             |

MDR Dual Magnet (Reed, Hall-effect, Triac)

\*✗ Not available for 05 size



1 WEEK  
BUILT-TO-ORDER

# BC3 RECIRCULATING BALL BEARING RODLESS CYLINDER



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# BC3 BAND CYLINDER

## ● ENDURANCE TECHNOLOGY ●<sup>SM</sup>

*Endurance Technology features are designed for maximum durability to provide extended service life.*

The BC3 is the most capable pneumatic rodless cylinder in the industry today. Featuring durable stainless steel bands, a reliable recirculating ball bearing design and smooth, low breakaway pressure the BC3 is a great solution for applications with high load and bending moment requirements. Built-to-order in stroke lengths up to 205 inches.

### ● FORMED END CAP WIPER SEAL ●

- Keeps contaminants from entering the sealing area
- Protects internal components
- Reduces maintenance while increasing productivity

### ● SEALED BALL BEARING SYSTEM ●

- All bearing components covered by seal strip
- Bearing components are sealed and lubricated at the factory
- Assures maximum resistance to contamination

### ● STAINLESS STEEL SEALING BAND SYSTEM ●

- Fatigue resistant stainless steel bands are specifically made to provide longer life and will not elongate, like elastomers
- Outer band keeps out contaminants for extended performance
- Inner band provides a smooth surface for less seal wear

### ● FORMED STEEL PISTON BRACKET ●

- Provides maximum strength at major stress points
- Heat treated carbon steel withstands the toughest dynamic forces
- Strongest bracket design in the industry assures long life with less maintenance





# TOLOMATIC...THE RODLESS CYLINDER LEADER

## LOAD-BEARING CARRIER DESIGN

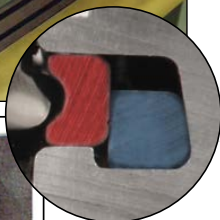
- Load and piston are independent - piston floats, resulting in less friction and longer seal life
- Recirculating ball bearing system guides and supports load for consistent long term performance
- Constant level of friction is maintained even when load orientation changes

## ADJUSTABLE CUSHIONS

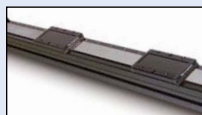
- Adjustable cushions are standard, not optional
- Easy screw adjustment for end-of-stroke deceleration
- Protects actuator and load from damage

## PATENTED WEDGE BEARING SYSTEM

- Bearing surfaces adjusted at the factory for optimum pre-load
- Bearing surfaces adjusted by and supported by a steel wedge assuring long term stability



## OPTIONS



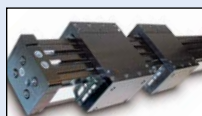
### AUXILIARY CARRIER

- Substantially higher load capacity
- Substantially higher bending moment capacity



### DUAL 180° CARRIER

- Substantially higher load capacity
- Substantially higher bending moment capacity



### AUXILIARY DUAL 180°

- Highest load capacity
- Highest bending moment capacity



### TUBE SUPPORT MOUNTS

- Used for intermediate support



### FOOT MOUNTS

- For end mounting of band cylinder



### SHOCK ABSORBERS

- Smooth deceleration, higher productivity
- Allows increased operating speed
- Self-compensates for load or speed changes
- Minimizes impact load to equipment
- Adjustable position shocks available



### SWITCHES

- Available in Reed, Hall-effect and Triac
- 15ft. cable with flying leads; available with quick-disconnect couplers



# BC3 Recirculating Ball Bearing Rodless Cylinder

## APPLICATIONS

### Material Handling



Automatic sorting of products on conveyors.

#### **Customer Challenge:**

A manufacturer of sorting equipment had created some in-house automation solutions on their sorting equipment but they could not achieve the speed or reliability to keep up with their distribution requirements. They needed to speed up production and find a way to sort to more locations with limited floor space.

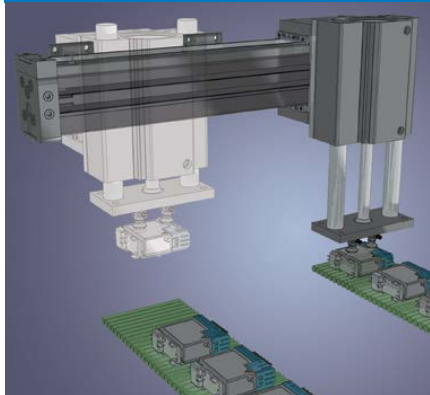
#### **Tolomatic Solution:**

A BC3 rodless pneumatic cylinder with was selected for this application because of their space-saving characteristics. The BC3 cylinder sits parallel over the top of the conveyor and is fitted with a paddle. The BC3 cylinder moves the paddle which pushes product both directions to different conveyors. Speed requirements of 30 in/sec were achieved easily achieved.

#### **Result:**

The rodless approach provided long-lasting durability for reliable performance at the required speed. The customer achieved flexibility on the number of products they could sort and increased the number of sorting locations maximizing their limited floor space. Most important, they were able to meet their distribution demands. The customer ordered 300 units for a total of \$400,000.

### Material Handling



A pick and place application for moving product between conveyors.

#### **Customer Challenge:**

A manufacturer of consumer electronic equipment needed a method to move finished product from one conveyor to another quickly without damage or waste.

#### **Application Requirements:**

- Fast response, throughput of 20 products per minute
- Consistent positioning
- End-of-stroke adjustment to accommodate varying product lines

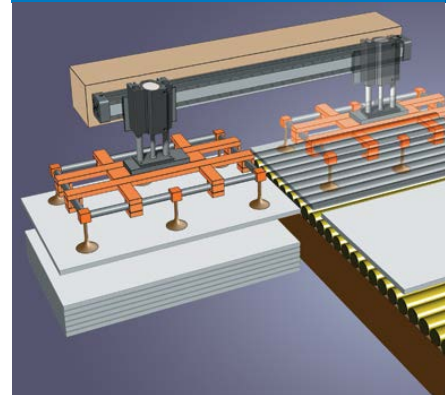
#### **Tolomatic Solution:**

This side mounted BC3D Band Cylinder with dual 180° option provides the motion along the X axis and support for the PB2 rod cylinder slide which provides the Y axis motion. In this application dual vacuum cups are used, however they are often replaced with a gripper unit with custom tooled fingers for product that does not present a smooth flat surface.

#### **Result:**

This continuing customer is pleased with the durability, price and delivery that the BC3 and PB2 actuators manufactured by Tolomatic provide.

### Material Handling



Vacuumized sheet transfer application.

#### **Customer Challenge:**

A manufacturer of battery chargers needed a method of taking sheet metal off of pallets and placing onto the assembly line. Speed is critical and end-of-stroke position must be consistent, thus, Tolomatic pneumatic products were chosen for this system.

#### **Application Requirements:**

- Fast response, 1 part must be reoriented and moved each 3 seconds
- Movement from end-of-stroke to end-of-stroke with consistent positioning
- Low cost
- End-of-stroke adjustment

#### **Tolomatic Solution:**

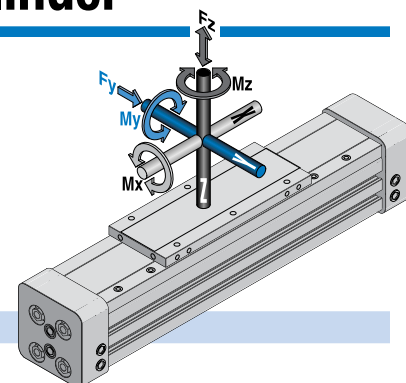
This application uses a Tolomatic PB2 Rod Cylinder Slide, attached to a BC3 Band Cylinder with adjustable shocks. This actuator assembly moves the vacuum grid attachment that holds the sheet metal.

#### **Result:**

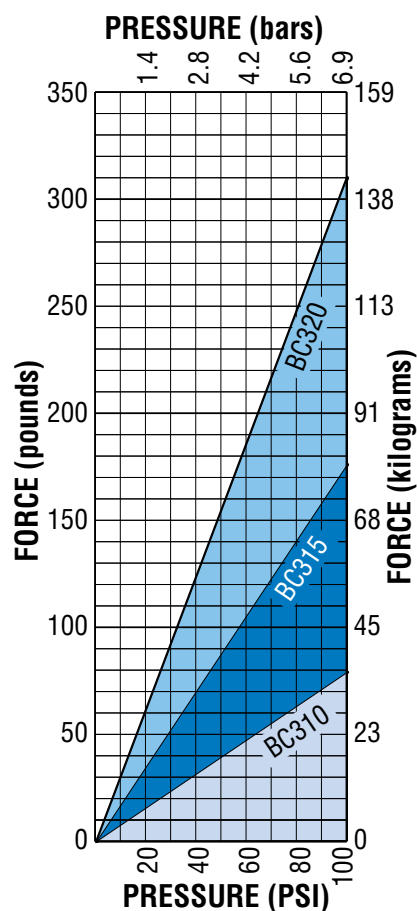
The BC3 and PB2 has long-lasting durability for reliable performance at the required speed. This continuing customer is pleased with the price and delivery that Tolomatic provides.

# BC3 Recirculating Ball Bearing Rodless Cylinder

## PERFORMANCE



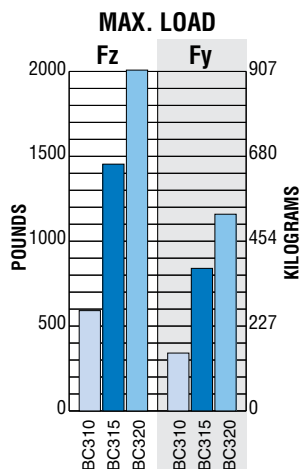
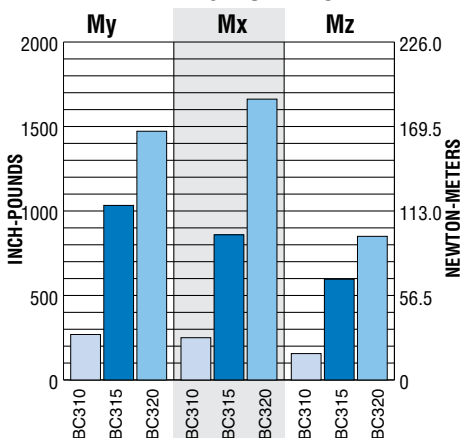
### THEORETICAL FORCE vs PRESSURE



### BENDING MOMENTS, LOAD

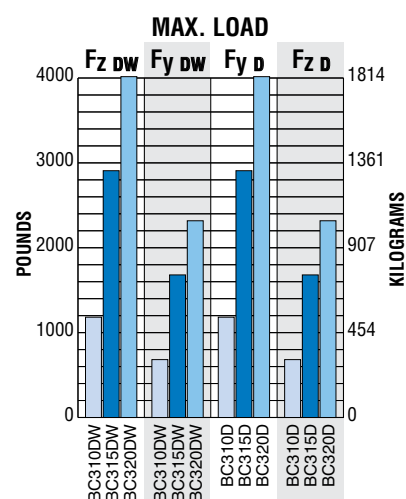
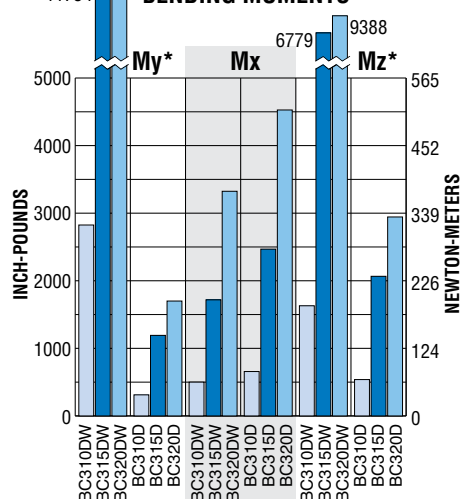
#### STANDARD ACTUATOR

##### BENDING MOMENTS



#### AUXILIARY CARRIER & DUAL 180° CARRIER\*\* OPTIONS

##### BENDING MOMENTS



\*Auxiliary carrier bending moments indicated are at minimum center to center distance. Additional My + Mz load capacity can be obtained by increasing "D" dimension. Refer to auxiliary carrier data on page BC3\_16.

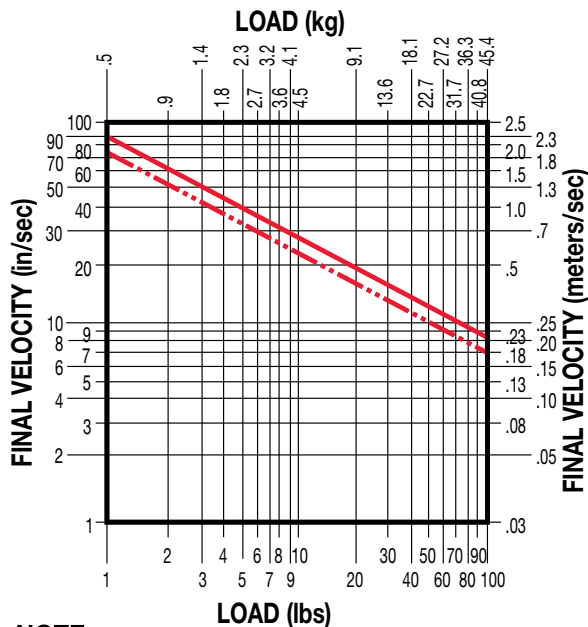
\*\*Dual 180° carrier bending moments are not an exact comparison with other types of carriers. See page BC3\_14.

# BC310 Band Cylinder

## PERFORMANCE

| BC310                                                                             |        |
|-----------------------------------------------------------------------------------|--------|
|  |        |
| BC310 OPTIONS                                                                     | Page   |
| Auxiliary Carrier                                                                 | BC3_16 |
| Auxiliary Dual 180° Carrier                                                       | BC3_17 |
| Dual 180° Carrier                                                                 | BC3_14 |
| Foot Mounts                                                                       | BC3_13 |
| Shock Absorbers                                                                   | BC3_21 |
| Switches                                                                          | BC3_19 |
| Tube Supports                                                                     | BC3_12 |
| MORE INFORMATION                                                                  | Page   |
| Application Guidelines                                                            | BC3_25 |
| Cushion Needle Adjustment                                                         | BC3_25 |
| Ordering                                                                          | BC3_28 |
| Selection                                                                         | BC3_24 |
| STANDARD FEATURE                                                                  | Page   |
| Single End Porting                                                                | BC3_18 |

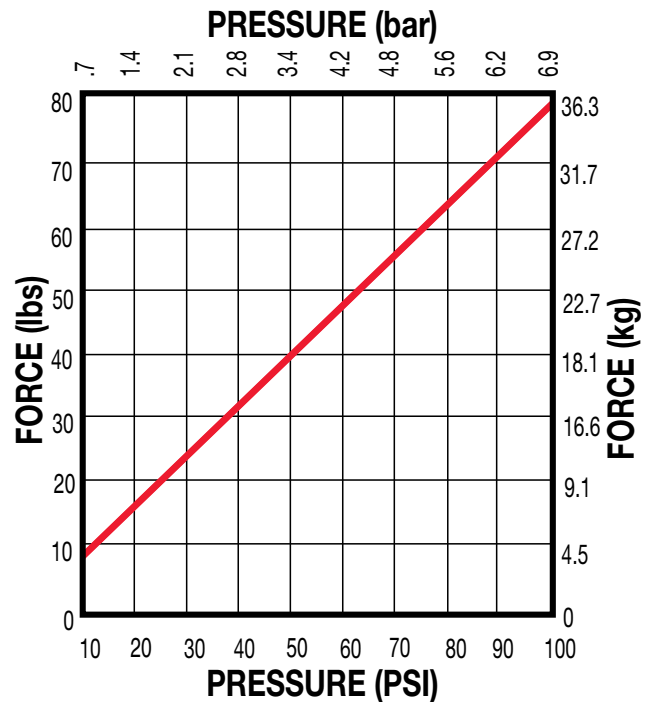
## CUSHION DATA



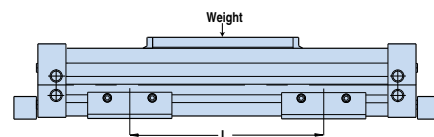
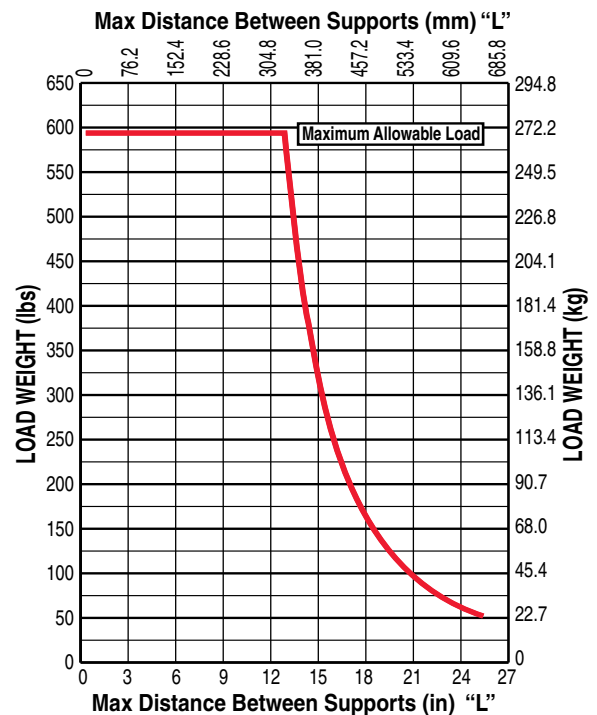
### NOTE:

- Max. for any application
- ..... Max. for continuously cycled application

## THEORETICAL FORCE vs PRESSURE



## TUBE SUPPORT REQUIREMENTS



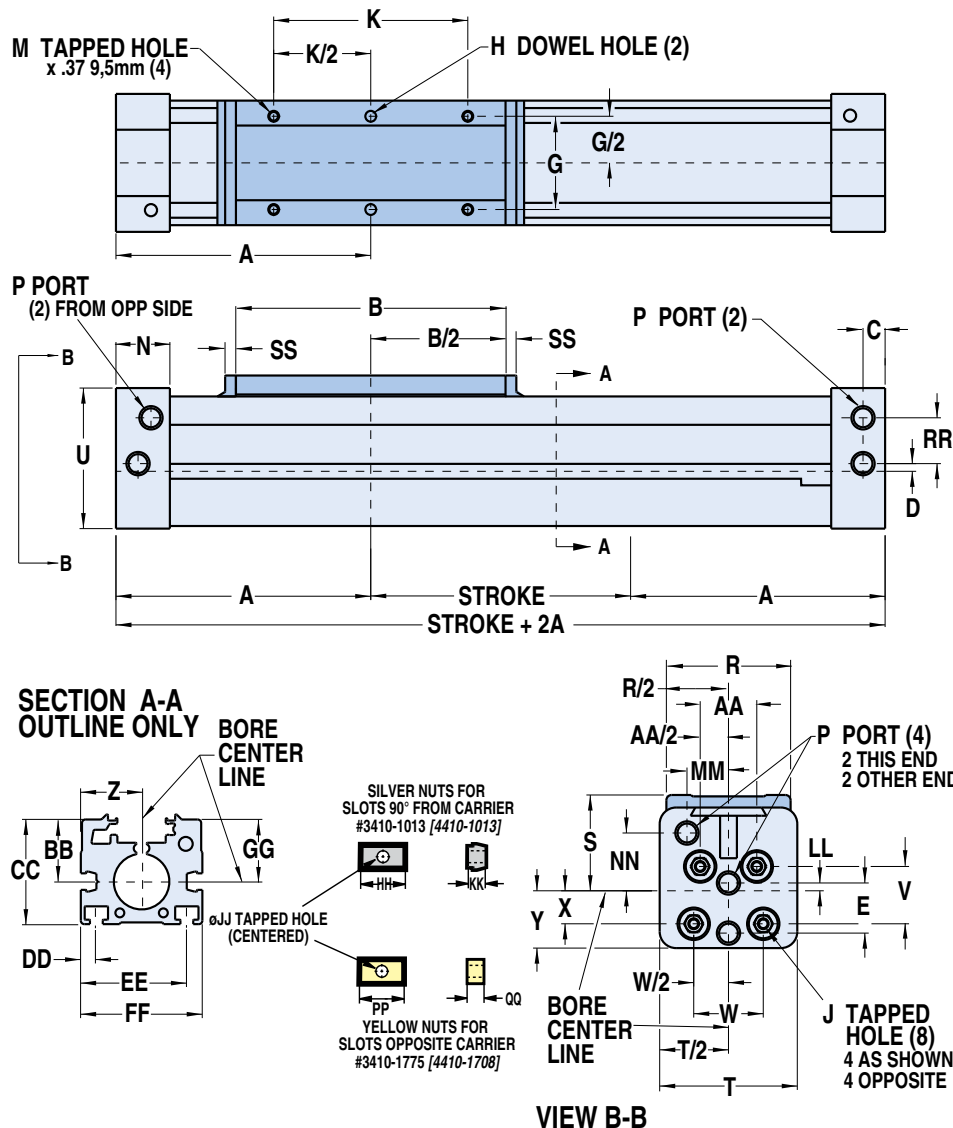
# BC310 Band Cylinder

3D CAD available at  
www.tolomatic.com



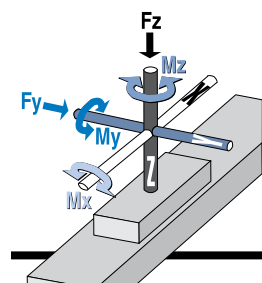
## DIMENSIONS

Always use configured CAD solid model  
to determine critical dimensions



## SPECIFICATIONS

### BC310 BENDING MOMENTS AND LOAD



|               | BORE SIZE | MAX. BENDING MOMENT |            |            | MAX. LOAD |          |
|---------------|-----------|---------------------|------------|------------|-----------|----------|
|               |           | My                  | Mx         | Mz         | Fz        | Fy       |
| <b>U.S.</b>   | 1.00 in   | 269 in-lbs          | 250 in-lbs | 156 in-lbs | 591 lbs   | 341 lbs  |
| <b>Metric</b> | 25 mm     | 30.4 N-m            | 28.2 N-m   | 17.9 N-m   | 268.1 kg  | 154.7 kg |

|        | MODELS          |                                  |
|--------|-----------------|----------------------------------|
|        | U.S Standard    | Metric                           |
| A      | 3.94            | 100.0                            |
| B      | 3.67            | 93.3                             |
| C      | .45             | 11.4                             |
| D      | .047            | 1.19                             |
| E      | .611            | 15.52                            |
| G      | 1.781           | 45.24                            |
| H*     | .252/.251 x .25 | 6.045/6.020 x 6.4                |
| J      | 10-24 x .43     | M5-0.8 x 11.0                    |
| K      | 2.250           | 57.15                            |
| M      | 1/4-20          | M6-1.0                           |
| N      | 1.00            | 25.4                             |
| P      | 1/8-27 NPT      | TP 1/8-28 BSPT<br>GP 1/8-28 BSPP |
| R      | 2.16            | 54.8                             |
| S      | 1.54            | 39.1                             |
| T      | 2.19            | 55.6                             |
| U      | 2.17            | 55.1                             |
| V      | .750            | 19.05                            |
| W      | 1.250           | 31.75                            |
| X      | .330            | 8.38                             |
| Y      | .76             | 19.3                             |
| Z      | 1.094           | 27.79                            |
| AA     | 1.063           | 27.00                            |
| BB     | 1.12            | 28.45                            |
| CC     | 1.88            | 47.8                             |
| DD     | .266            | 6.76                             |
| EE     | 1.922           | 48.82                            |
| FF     | 2.19            | 55.6                             |
| GG     | 1.12            | 28.45                            |
| HH     | .66             | 16.8                             |
| JJ     | 10-24           | M5-0.8                           |
| KK     | .25             | 6.4                              |
| LL     | .142            | 3.61                             |
| MM     | .547            | 13.89                            |
| NN     | .890            | 22.6                             |
| PP     | .75             | 19.1                             |
| QQ     | .188            | 4.8                              |
| RR     | .845            | 21.46                            |
| SS     | .203            | 5.2                              |
| INCHES |                 | MILLIMETERS                      |

\*DOWEL PINS  $\pm .003$   $\pm .076$

|                      | BORE SIZE | WEIGHT   |                    | MAX. STROKE LENGTH** | MAX. PRESSURE | TEMPERATURE RANGE |
|----------------------|-----------|----------|--------------------|----------------------|---------------|-------------------|
|                      |           | BASE     | PER UNIT OF STROKE |                      |               |                   |
| <b>U.S. Standard</b> | 1.00 in   | 2.71 lbs | 0.23 lbs/in        | 205 in               | 100 PSI       | 20° to 140° F     |
| <b>Metric</b>        | 25 mm     | 1.23 kg  | 0.0041 kg/mm       | 5207 mm              | 6.895 bar     | -7° to 60° C      |

**\*\*For longer strokes, alternate materials, mounting and/or fasteners – consult Tolomatic**

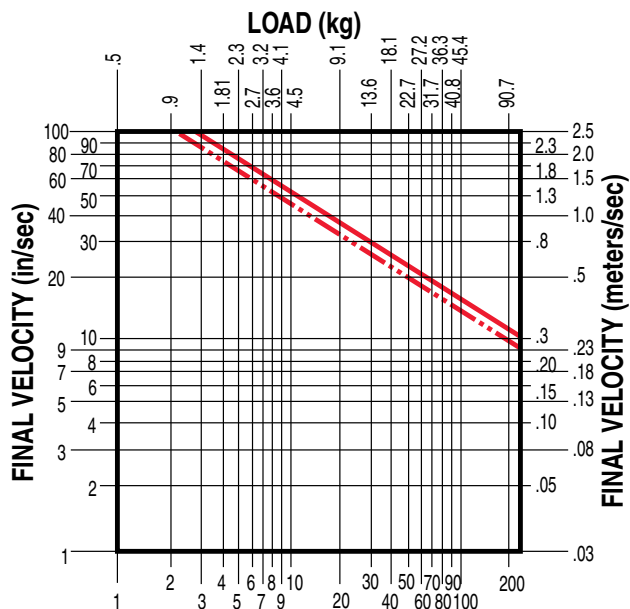


# BC315 Band Cylinder

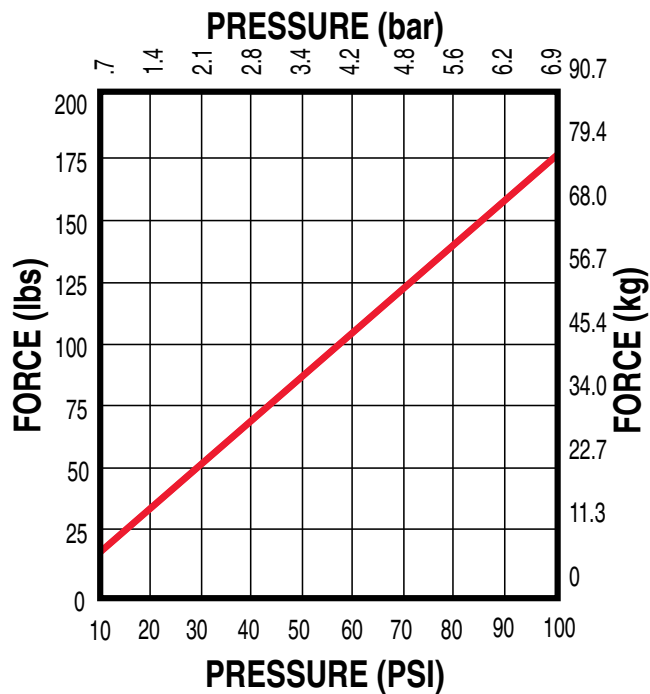
## PERFORMANCE

| BC315                                                                             |        |
|-----------------------------------------------------------------------------------|--------|
|  |        |
| BC315 OPTIONS                                                                     | Page   |
| Auxiliary Carrier                                                                 | BC3_16 |
| Auxiliary Dual 180° Carrier                                                       | BC3_17 |
| Dual 180° Carrier                                                                 | BC3_14 |
| Foot Mounts                                                                       | BC3_13 |
| Shock Absorbers                                                                   | BC3_21 |
| Switches                                                                          | BC3_19 |
| Tube Supports                                                                     | BC3_12 |
| MORE INFORMATION                                                                  | Page   |
| Application Guidelines                                                            | BC3_25 |
| Cushion Needle Adjustment                                                         | BC3_25 |
| Ordering                                                                          | BC3_28 |
| Selection                                                                         | BC3_24 |
| STANDARD FEATURE                                                                  | Page   |
| Single End Porting                                                                | BC3_18 |

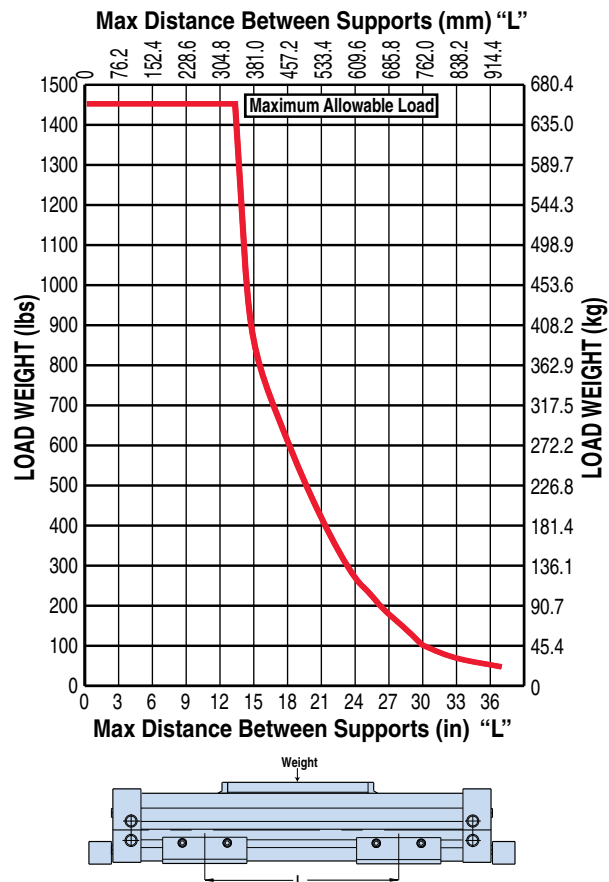
## CUSHION DATA



## THEORETICAL FORCE vs PRESSURE



## TUBE SUPPORT REQUIREMENTS



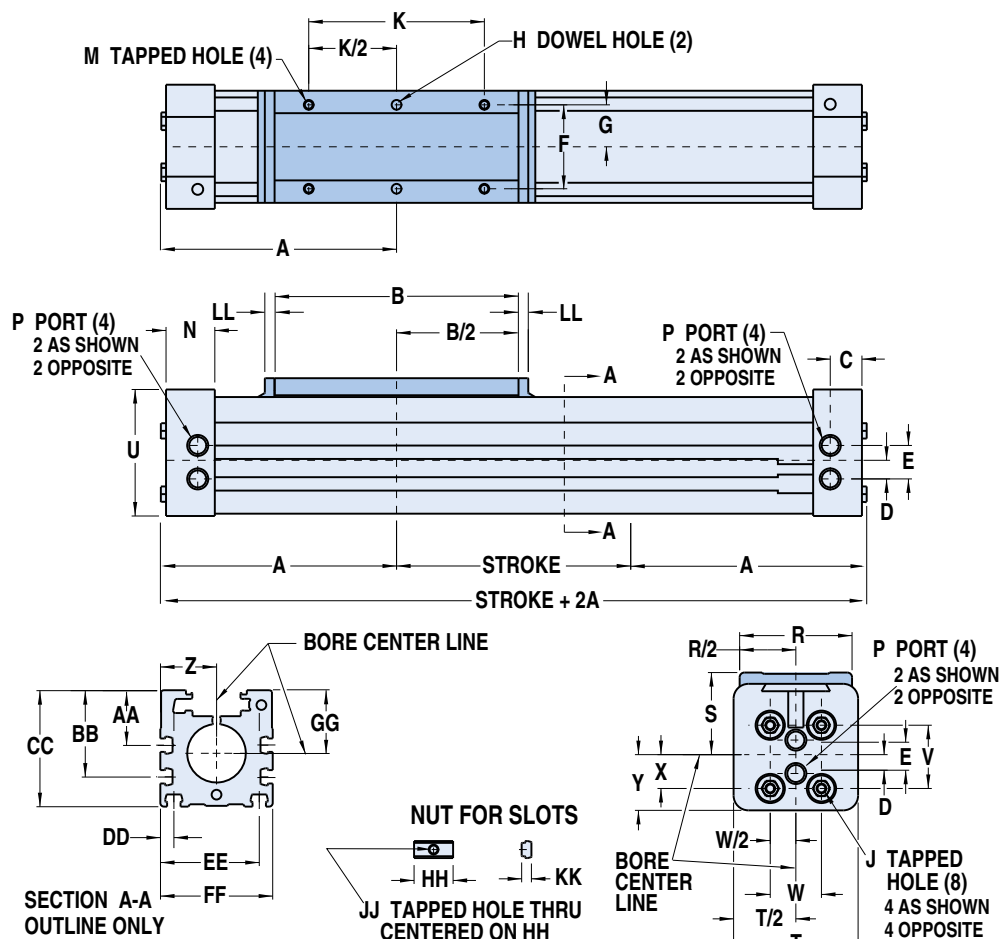
# BC315 Band Cylinder

## DIMENSIONS

3D CAD available at  
www.tolomatic.com



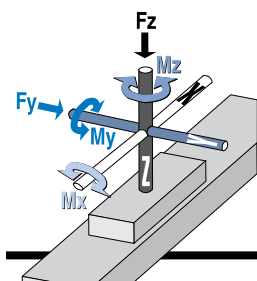
Always use configured CAD solid model  
to determine critical dimensions



|        | MODELS          |                                  |
|--------|-----------------|----------------------------------|
|        | U.S. Std.       | Metric                           |
| A      | 5.93            | 150.7                            |
| B      | 6.25            | 158.8                            |
| C      | .84             | 21.3                             |
| D      | .48             | 12.2                             |
| E      | .86             | 21.8                             |
| F      | 2.156           | 54.76                            |
| G      | 1.078           | 27.38                            |
| H*     | .252-.251 x .25 | 6.045-6.020 x 6.4                |
| J      | 1/4-20 x .47    | M6-1 x 12                        |
| K      | 4.500           | 114.30                           |
| M      | 1/4-20 X .44    | M6- x 11                         |
| N      | 1.27            | 32.3                             |
| P      | 1/4-18 NPT      | TP 1/4-19 BSPT<br>GP 1/4-19 BSPP |
| R      | 2.88            | 73.0                             |
| S      | 2.109           | 53.57                            |
| T      | 3.19            | 81.0                             |
| U      | 3.25            | 82.6                             |
| V      | 1.625           | 41.28                            |
| W      | 1.313           | 33.35                            |
| X      | .875            | 22.23                            |
| Y      | 1.46            | 37.1                             |
| Z      | 1.44            | 36.5                             |
| AA     | 1.41            | 35.81                            |
| BB     | 2.22            | 56.38                            |
| CC     | 2.99            | 75.95                            |
| DD     | .35             | 8.9                              |
| EE     | 2.53            | 64.3                             |
| FF     | 2.88            | 73.0                             |
| GG     | 1.62            | 41.15                            |
| HH     | .75             | 19.1                             |
| JJ     | 1/4-20          | M6-1                             |
| KK     | .25             | 6.4                              |
| LL     | .25             | 6.4                              |
| INCHES |                 | MILLIMETERS                      |

## SPECIFICATIONS

### BC315 BENDING MOMENTS AND LOAD



|        | BORE SIZE | MAX. BENDING MOMENT |            |            | MAX. LOAD |          |
|--------|-----------|---------------------|------------|------------|-----------|----------|
|        |           | My                  | Mx         | Mz         | Fz        | Fy       |
| U.S.   | 1.50 in   | 1033 in-lbs         | 859 in-lbs | 596 in-lbs | 1454 lbs  | 840 lbs  |
| Metric | 40 mm     | 116.7 N-m           | 97.1 N-m   | 67.3 N-m   | 659.5 kg  | 381.0 kg |

|             |   |      |   |
|-------------|---|------|---|
| *DOWEL PINS | ⌀ | .003 | Ⓜ |
|             | ⌀ | .076 | Ⓜ |

|               | BORE SIZE | WEIGHT    |                    | MAX. STROKE LENGTH** | MAX. PRESSURE | TEMPERATURE RANGE |
|---------------|-----------|-----------|--------------------|----------------------|---------------|-------------------|
|               |           | BASE      | PER UNIT OF STROKE |                      |               |                   |
| U.S. Standard | 1.50 in   | 10.94 lbs | 0.53 lbs/in        | 202 in               | 100 PSI       | 20° to 140° F     |
| Metric        | 40 mm     | 4.96 kg   | 0.0095 kg/mm       | 5130 mm              | 6.895 bar     | -7° to 60° C      |

**\*\*For longer strokes, alternate materials, mounting and/or fasteners – consult Tolomatic**

# BC320 Band Cylinder

## PERFORMANCE

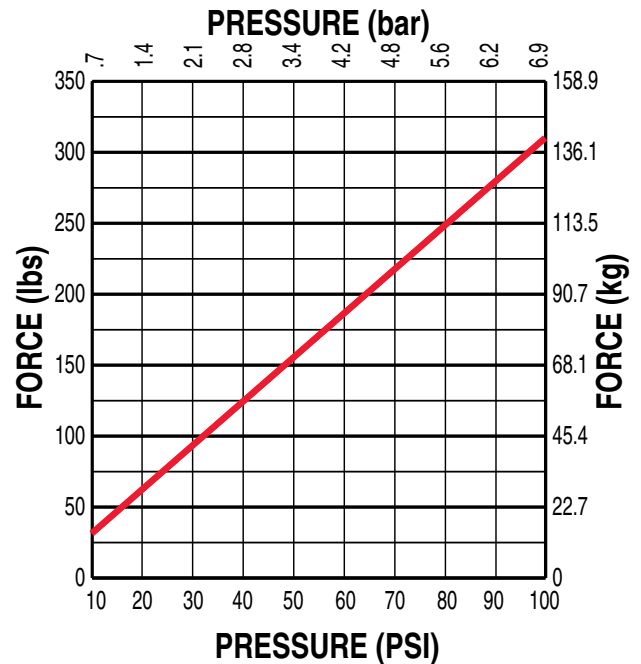


**BC320**

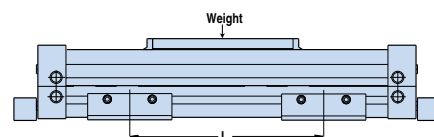
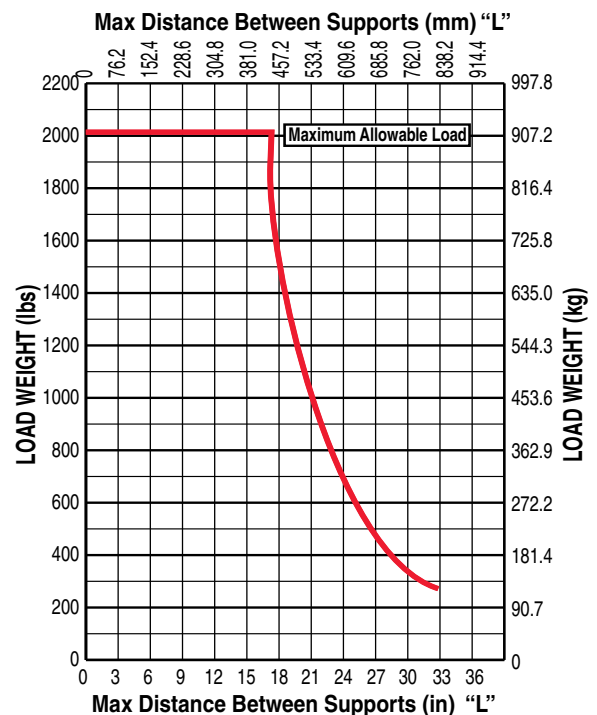
| ORDER CODES    |                             |
|----------------|-----------------------------|
| <b>BC320</b>   | inch (U.S. Standard)        |
| <b>BC3M20</b>  | (metric with taper port)    |
| <b>BC3MM20</b> | (metric with parallel port) |

| BC320 OPTIONS               | Page   |
|-----------------------------|--------|
| Auxiliary Carrier           | BC3_16 |
| Auxiliary Dual 180° Carrier | BC3_17 |
| Dual 180° Carrier           | BC3_14 |
| Foot Mounts                 | BC3_13 |
| Shock Absorbers             | BC3_21 |
| Switches                    | BC3_19 |
| Tube Supports               | BC3_12 |
| MORE INFORMATION            |        |
| Application Guidelines      | BC3_25 |
| Cushion Needle Adjustment   | BC3_25 |
| Ordering                    | BC3_28 |
| Selection                   | BC3_24 |
| STANDARD FEATURE            |        |
| Single End Porting          | BC3_18 |

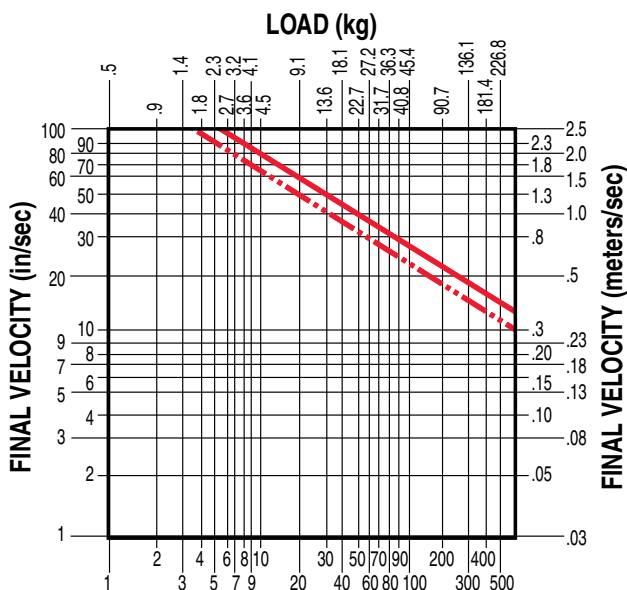
## THEORETICAL FORCE vs PRESSURE



## TUBE SUPPORT REQUIREMENTS



## CUSHION DATA



**NOTE:**

- Max. for any application
- - - - - Max. for continuously cycled application

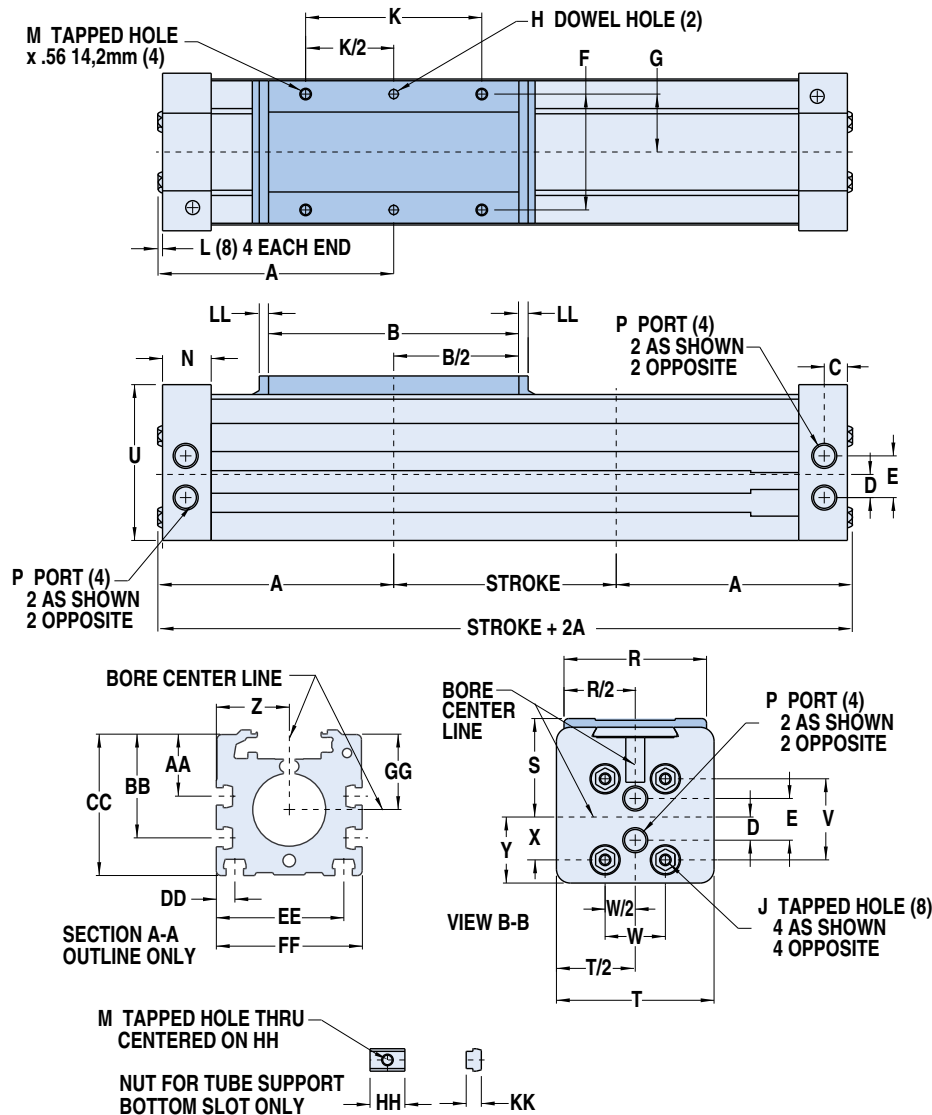
# BC320 Band Cylinder

3D CAD available at  
www.tolomatic.com



## DIMENSIONS

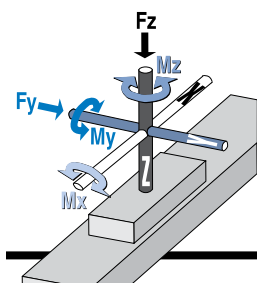
Always use configured CAD solid model  
to determine critical dimensions



|    | MODELS          |                                  |
|----|-----------------|----------------------------------|
|    | BC320           | BC3M/MM20                        |
| A  | 6.27            | 159.0                            |
| B  | 6.75            | 171.5                            |
| C  | 0.625           | 15.88                            |
| D  | 0.625           | 15.88                            |
| E  | 1.125           | 28.58                            |
| F  | 3.125           | 79.38                            |
| G  | 1.563           | 39.70                            |
| H* | .252/.251 x .25 | 6.045/6.020 x 6.4                |
| J  | 5/16-18 x .88   | M8-1.25 x 22                     |
| K  | 4.750           | 120.65                           |
| L  | 0.063           | 1.60                             |
| M  | 5/16-18         | M8-1.25                          |
| N  | 1.31            | 33.3                             |
| P  | 3/8-18 NPT      | TP 3/8-19 BSPT<br>GP 3/8-19 BSPP |
| R  | 3.84            | 97.5                             |
| S  | 2.663           | 67.64                            |
| T  | 4.25            | 108.0                            |
| U  | 4.20            | 106.7                            |
| V  | 2.188           | 55.58                            |
| W  | 1.625           | 41.28                            |
| X  | 1.156           | 29.36                            |
| Y  | 1.78            | 45.2                             |
| Z  | 1.969           | 50.01                            |
| AA | 1.67            | 42.4                             |
| BB | 2.80            | 71.0                             |
| CC | 3.81            | 96.7                             |
| DD | 0.500           | 12.70                            |
| EE | 3.438           | 87.33                            |
| FF | 3.94            | 100.1                            |
| GG | 2.03            | 51.6                             |
| HH | 0.94            | 23.9                             |
| JJ | 5/16-18         | M8-1.25                          |
| KK | .41             | 10.4                             |
| LL | .25             | 6.4                              |
|    | INCHES          | MILLIMETERS                      |

## SPECIFICATIONS

### BC320 BENDING MOMENTS AND LOAD



|        | BORE SIZE | MAX. BENDING MOMENT |             |            | MAX. LOAD |           |
|--------|-----------|---------------------|-------------|------------|-----------|-----------|
|        |           | $M_y$               | $M_x$       | $M_z$      | $F_z$     | $F_y$     |
| U.S.   | 2.00 in   | 1472 in-lbs         | 1662 in-lbs | 850 in-lbs | 2008 lbs  | 1159 lbs  |
| Metric | 50 mm     | 166.3 N-m           | 187.8 N-m   | 96.0 N-m   | 910.8 kg  | 525.77 kg |

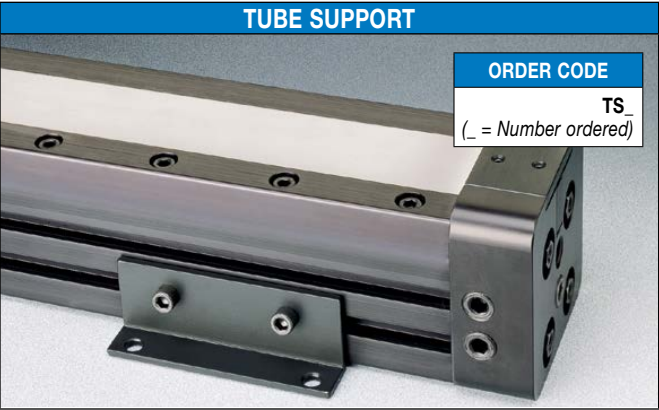
|             |               |      |         |
|-------------|---------------|------|---------|
| *DOWEL PINS | $\varnothing$ | .003 | $\odot$ |
|             | $\varnothing$ | .076 | $\odot$ |

|               | BORE SIZE | WEIGHT    |                    | MAX. STROKE LENGTH** | MAX. PRESSURE | TEMPERATURE RANGE |
|---------------|-----------|-----------|--------------------|----------------------|---------------|-------------------|
|               |           | BASE      | PER UNIT OF STROKE |                      |               |                   |
| U.S. Standard | 2.00 in   | 17.00 lbs | 0.86 lbs/in        | 142 in               | 100 PSI       | 20° to 140° F     |
| Metric        | 50 mm     | 7.71 kg   | 0.0154 kg/mm       | 3606 mm              | 6.895 bar     | -7° to 60° C      |

**\*\*For longer strokes, alternate materials, mounting and/or fasteners – consult Tolomatic**



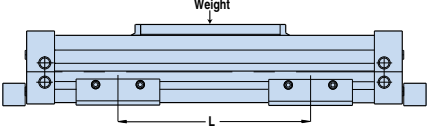
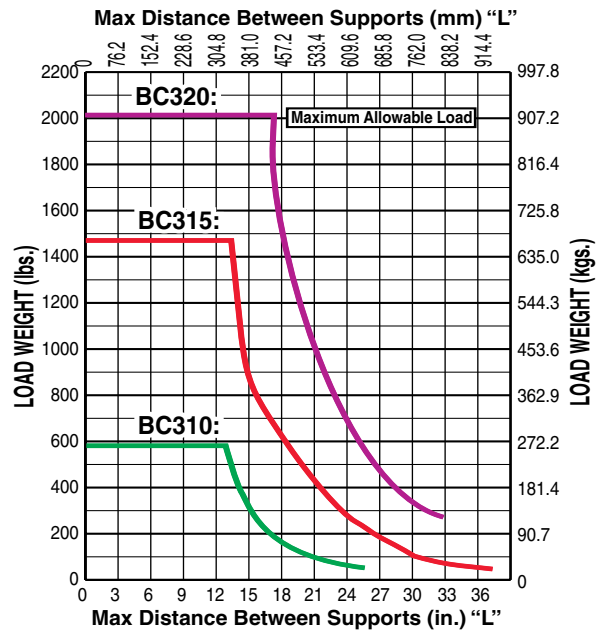
# BC3 TUBE SUPPORTS - All Sizes



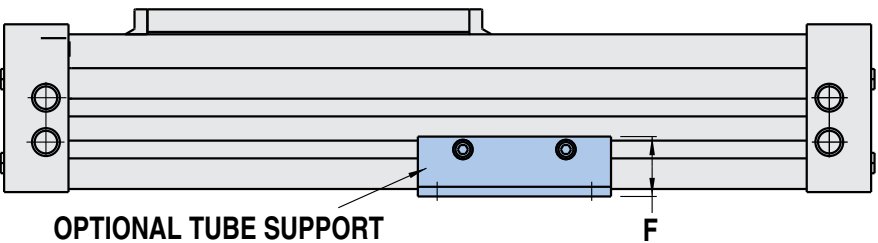
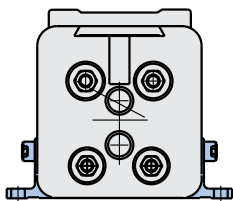
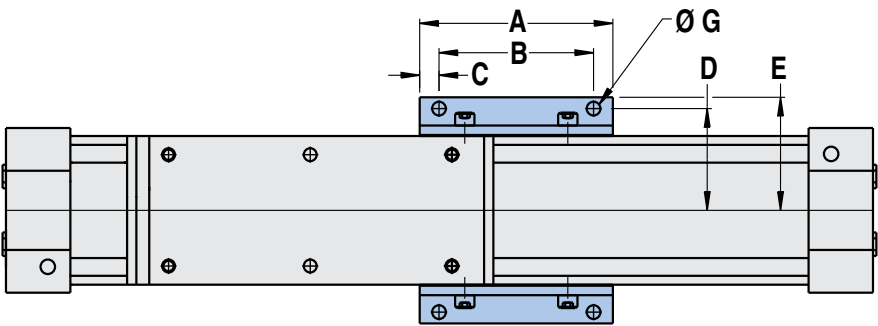
For intermediate support, tube support brackets can be mounted to the BC3 model. Made of black-anodized aluminum, the brackets are attached to the bottom and sides of the cylinder tube with rail nuts. The number of tube support brackets required and their placement depends on the overall length of the BC3 model and the load weight being moved and supported. Refer to the tube support data chart below. Note: Switches cannot be mounted on the same face of the actuator as tube supports.

## PERFORMANCE

### TUBE SUPPORT REQUIREMENTS



## DIMENSIONS



OPTIONAL TUBE SUPPORT

|    | BORE SIZE | A    | B     | C    | D    | E    | F    | G     |
|----|-----------|------|-------|------|------|------|------|-------|
| 10 | 1.00      | 2.75 | 2.250 | 0.25 | 1.53 | 1.76 | 1.09 | 0.206 |
| 15 | 1.50      | 3.75 | 3.000 | 0.38 | 1.97 | 2.19 | 1.16 | 0.266 |
| 20 | 2.00      | 4.00 | 3.375 | 0.31 | 2.56 | 2.84 | 1.50 | 0.328 |

Dimensions in inches

|    | BORE SIZE | A      | B     | C   | D    | E    | F    | G     |
|----|-----------|--------|-------|-----|------|------|------|-------|
| 10 | 25        | 69.85  | 57.15 | 6.4 | 38.9 | 44.7 | 27.7 | 5.232 |
| 15 | 40        | 95.30  | 76.20 | 9.7 | 50.0 | 55.6 | 29.5 | 6.756 |
| 20 | 50        | 101.60 | 85.73 | 7.9 | 65.0 | 72.1 | 38.1 | 8.331 |

Dimensions in millimeters

# BC3 FOOT MOUNT KIT - All Sizes

3D CAD available at  
www.tolomatic.com

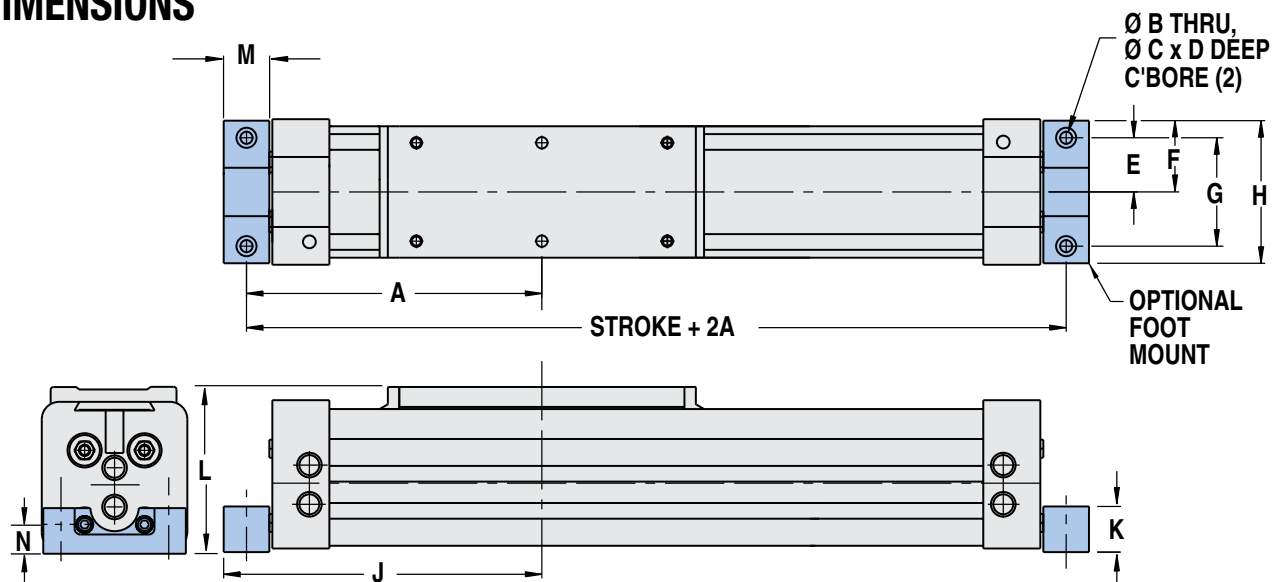


Always use configured CAD solid model  
to determine critical dimensions



Foot mounts are an option on BC3 Series Band Cylinders when an application requires the mounting to be different than flush. They may be specified on one or both ends of the cylinder.

## DIMENSIONS



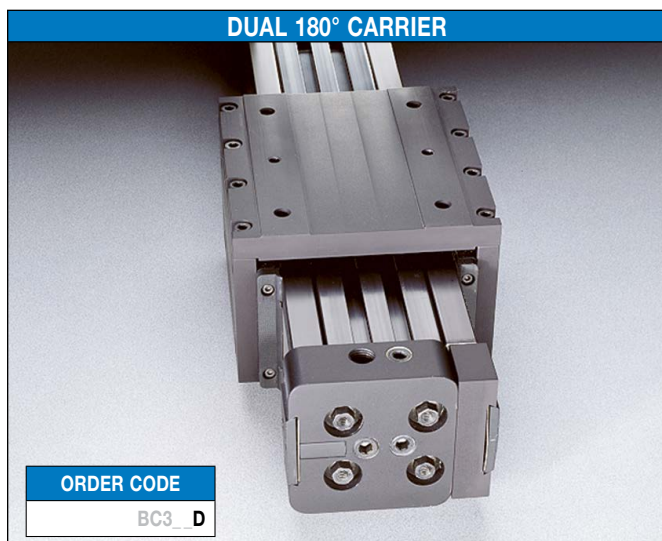
|    | BORE SIZE | A    | B     | C     | D    | E     | F     | G     | H    | J    | K    | L    | M    | N     |
|----|-----------|------|-------|-------|------|-------|-------|-------|------|------|------|------|------|-------|
| 10 | 1.00      | 4.31 | Ø.206 | Ø .38 | 0.22 | 0.906 | 1.095 | 1.812 | 2.19 | 4.69 | 0.88 | 2.44 | 0.75 | 0.574 |
| 15 | 1.25      | 6.43 | Ø.266 | Ø .44 | 0.28 | 1.188 | 1.560 | 2.375 | 3.13 | 6.93 | 1.00 | 3.63 | 1.00 | 0.641 |
| 20 | 1.50      | 6.80 | Ø.328 | Ø .53 | 0.34 | 1.500 | 2.000 | 3.000 | 4.00 | 7.30 | 1.13 | 4.53 | 1.00 | 0.719 |

Dimensions in inches

|    | BORE SIZE | A     | B      | C      | D   | E     | F    | G     | H     | J     | K    | L     | M    | N    |
|----|-----------|-------|--------|--------|-----|-------|------|-------|-------|-------|------|-------|------|------|
| 10 | 25        | 109.5 | Ø 5.23 | Ø 9.7  | 5.6 | 23.01 | 27.8 | 46.02 | 55.6  | 119.1 | 22.4 | 62.0  | 19.1 | 14.6 |
| 15 | 32        | 163.4 | Ø 6.76 | Ø 11.2 | 7.1 | 30.18 | 39.7 | 60.33 | 79.4  | 176.1 | 25.4 | 92.2  | 25.4 | 16.3 |
| 20 | 40        | 172.7 | Ø 8.33 | Ø 13.5 | 8.6 | 38.10 | 50.8 | 76.20 | 101.6 | 185.4 | 28.7 | 115.1 | 25.4 | 18.3 |

Dimensions in millimeters

# BC3 DUAL 180° CARRIER - All Sizes



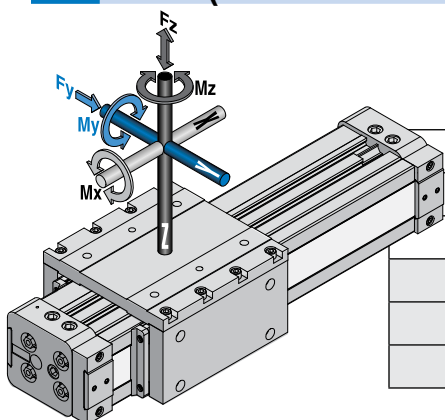
## DUAL 180° CARRIER

The Dual 180° Carrier option may be used when load factors exceed those of a single carrier actuator. This option allows the load to be rotated 90° from the cylinder's carrier providing an additional load bearing mounting surface.

NOTE: The Dual 180° Carrier option requires its own proprietary tube supports and foot mounts. See dimensional information below. Breakaway pressure will increase when using the Dual 180° Carrier option.

## PERFORMANCE

### BC3D (DUAL 180° CARRIER) BENDING MOMENTS AND LOAD



|               | BORE SIZE | MAX. BENDING MOMENT |               |               | MAX. LOAD   |             |
|---------------|-----------|---------------------|---------------|---------------|-------------|-------------|
|               |           | My                  | Mx            | Mz            | Fz          | Fy          |
| <b>BC310D</b> | 1.00 in.  | 312 in.-lbs.        | 657 in.-lbs.  | 538 in.-lbs.  | 1182 lbs.   | 682 lbs.    |
| <b>BC315D</b> | 1.50 in.  | 1192 in.-lbs.       | 2468 in.-lbs. | 2066 in.-lbs. | 2908 lbs.   | 1680 lbs.   |
| <b>BC320D</b> | 2.00 in.  | 1700 in.-lbs.       | 4527 in.-lbs. | 2944 in.-lbs. | 4016 lbs.   | 2318 lbs.   |
| <b>BC310D</b> | 25mm      | 35.3 N-m            | 74.2 N-m      | 60.8 N-m      | 536.1 kgs.  | 309.3 kgs.  |
| <b>BC315D</b> | 40mm      | 134.7 N-m           | 278.9 N-m     | 233.4 N-m     | 1319.0 kgs. | 762.0 kgs.  |
| <b>BC320D</b> | 50mm      | 192.1 N-m           | 511.5 N-m     | 332.6 N-m     | 1821.6 kgs. | 1051.4 kgs. |

|               | BORE SIZE | WEIGHT**   |                    | MAX. STROKE LENGTH* | MAX. PRESSURE | TEMPERATURE RANGE |
|---------------|-----------|------------|--------------------|---------------------|---------------|-------------------|
|               |           | BASE       | PER UNIT OF STROKE |                     |               |                   |
| <b>BC310D</b> | 1.00 in.  | 5.37 lbs.  | 0.32 lbs.          | 205 in              | 100 PSI       | 20° to 140° F     |
| <b>BC315D</b> | 1.50 in.  | 17.2 lbs.  | 0.69 lbs.          | 202 in              |               |                   |
| <b>BC320D</b> | 2.00 in.  | 28.9 lbs.  | 1.12 lbs.          | 142 in              |               |                   |
| <b>BC310D</b> | 25mm      | 2.43 kgs.  | 0.14 kgs.          | 5207 mm             | 6.895 bar     | -7° to 60° C      |
| <b>BC315D</b> | 40mm      | 7.76 kgs.  | 0.31 kgs.          | 5130 mm             |               |                   |
| <b>BC320D</b> | 50mm      | 13.11 kgs. | 0.50 kgs.          | 3606 mm             |               |                   |

**\*For longer strokes, alternate materials, mounting and/or fasteners – consult Tolomatic**



\*\*Use these figures to calculate actuator weight instead of standard weights on pages BC3\_7, BC3\_9, BC3\_11

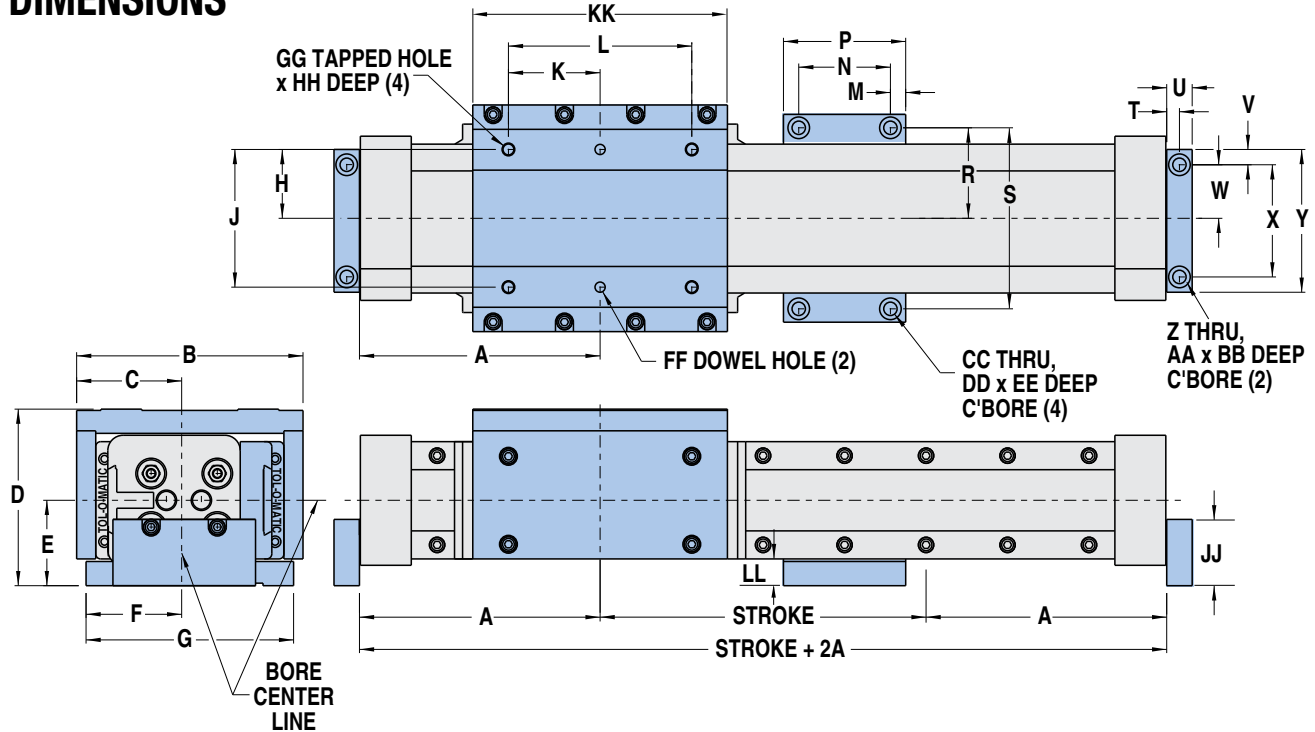
# BC3 DUAL 180° CARRIER - All Sizes

3D CAD available at  
www.tolomatic.com



Always use configured CAD solid model  
to determine critical dimensions

## DIMENSIONS



**NOTE:** In vertical mounting applications, supplemental mounting may be required besides factory foot mounts.

Optional Tube Supports and Foot Mounts are shown.

| MODELS | BORE    | A    | B    | C    | D    | E    | F    | G    | H     | J     | K     | L     | M   | N     | P    | R     | S     |
|--------|---------|------|------|------|------|------|------|------|-------|-------|-------|-------|-----|-------|------|-------|-------|
| BC310  | 1.0 in. | 3.93 | 4.31 | 2.13 | 3.33 | 1.61 | 1.75 | 3.50 | 1.192 | 2.437 | 1.531 | 3.062 | .28 | 2.563 | 3.12 | 1.469 | 2.937 |
| BC315  | 1.5 in. | 5.93 | 6.00 | 2.78 | 4.33 | 2.09 | 2.35 | 5.09 | 1.48  | 3.375 | 2.250 | 4.500 | .38 | 2.250 | 3.00 | 2.02  | 4.437 |
| BC320  | 2.0 in. | 6.27 | 7.41 | 3.51 | 5.30 | 2.59 | 2.80 | 6.00 | 2.358 | 5.125 | 3.000 | 6.000 | .38 | 2.250 | 3.00 | 2.422 | 5.250 |

| MODELS | BORE    | T    | U   | V   | W     | X     | Y    | Z    | AA  | BB  | CC   | DD  | EE  | FF*             | GG      | HH  | JJ   | KK   | LL  |
|--------|---------|------|-----|-----|-------|-------|------|------|-----|-----|------|-----|-----|-----------------|---------|-----|------|------|-----|
| BC310  | 1.0 in. | .307 | .62 | .28 | .891  | 1.688 | 2.25 | .266 | .44 | .28 | .266 | .44 | .28 | .252/.251 x .25 | 1/4-20  | .47 | 1.25 | 3.67 | .52 |
| BC315  | 1.5 in. | .312 | .62 | .38 | 1.312 | 2.750 | 3.50 | .266 | .44 | .28 | .328 | .53 | .34 | .252/.251 x .25 | 5/16-18 | .59 | 1.62 | 6.25 | .66 |
| BC320  | 2.0 in. | .312 | .62 | .31 | 1.625 | 3.375 | 4.00 | .328 | .53 | .34 | .391 | .63 | .41 | .252/.251 x .25 | 3/8-16  | .66 | 2.00 | 6.75 | .63 |

Dimensions in inches

| MODELS | BORE  | A     | B     | C     | D     | E    | F    | G     | H     | J      | K     | L      | M   | N     | P    | R     | S      |
|--------|-------|-------|-------|-------|-------|------|------|-------|-------|--------|-------|--------|-----|-------|------|-------|--------|
| BC310  | 25 mm | 99.8  | 109.5 | 54.1  | 84.6  | 40.9 | 44.5 | 88.9  | 30.28 | 61.90  | 38.89 | 77.77  | 7.1 | 65.10 | 79.2 | 37.31 | 74.60  |
| BC315  | 40 mm | 150.6 | 152.4 | 70.61 | 110.0 | 53.1 | 59.7 | 129.3 | 37.59 | 85.73  | 57.15 | 114.30 | 9.7 | 57.15 | 76.2 | 51.31 | 112.70 |
| BC320  | 50 mm | 159.3 | 188.2 | 89.15 | 135.6 | 68.8 | 71.1 | 152.4 | 59.89 | 130.18 | 76.20 | 152.40 | 9.7 | 57.15 | 76.2 | 61.52 | 133.35 |

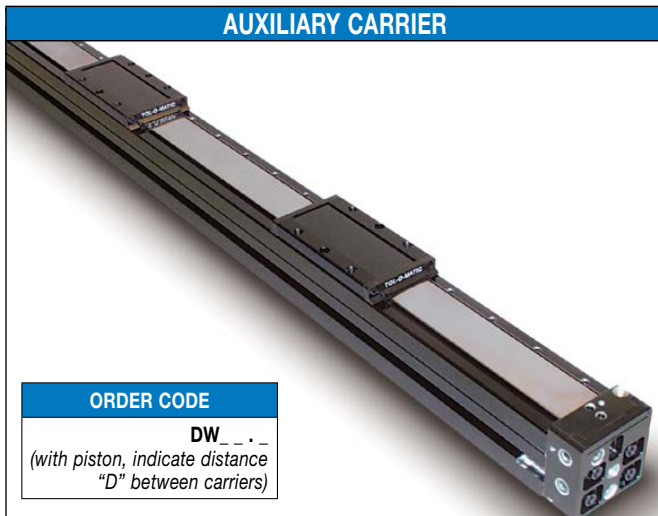
| MODELS | BORE  | T    | U    | V   | W     | X     | Y     | Z    | AA   | BB  | CC   | DD   | EE   | FF*               | GG         | HH   | JJ   | KK    | LL   |
|--------|-------|------|------|-----|-------|-------|-------|------|------|-----|------|------|------|-------------------|------------|------|------|-------|------|
| BC310  | 25 mm | 7.80 | 15.7 | 7.1 | 22.63 | 42.88 | 57.2  | 6.76 | 11.2 | 7.1 | 6.8  | 11.2 | 7.1  | 6.045/6.020 x 6.4 | M6 x 1.00  | 11.9 | 31.8 | 93.2  | 13.2 |
| BC315  | 40 mm | 7.92 | 15.7 | 9.7 | 33.32 | 69.85 | 88.9  | 6.76 | 11.2 | 7.1 | 8.33 | 13.5 | 8.6  | 6.045/6.020 x 6.4 | M8 x 1.25  | 15.0 | 41.1 | 158.8 | 16.8 |
| BC320  | 50 mm | 7.92 | 15.7 | 7.9 | 41.28 | 85.73 | 101.6 | 8.33 | 13.5 | 8.6 | 9.93 | 16.0 | 10.4 | 6.045/6.020 x 6.4 | M10 x 1.50 | 16.8 | 50.8 | 171.8 | 16.0 |

Dimensions in millimeters

|             |            |            |
|-------------|------------|------------|
| *DOWEL PINS | $\pm .003$ | $\text{M}$ |
|             | $\pm .076$ | $\text{M}$ |



# BC3 AUXILIARY CARRIER - All Sizes



## AUXILIARY CARRIER

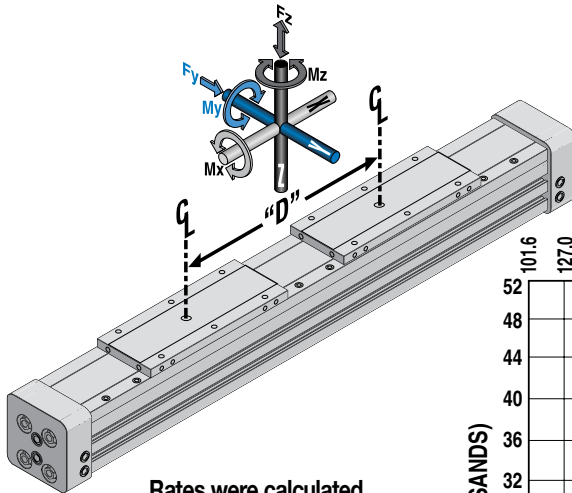
The auxiliary carrier option substantially increases load carrying capacity and bending moments. Auxiliary carriers can only be ordered with an internal piston. When ordering, determine the minimum distance required between carriers (dimension "D" in Auxiliary Carrier Bending Moments chart below). Determine

**ORDERING PROCEDURE** your working stroke. Enter these into your configuration string. (Example BC315SK50.00DW10.00) the configurator will calculate the overall length of the actuator.

**NOTE:** Breakaway pressure will increase when using auxiliary carriers.

## PERFORMANCE

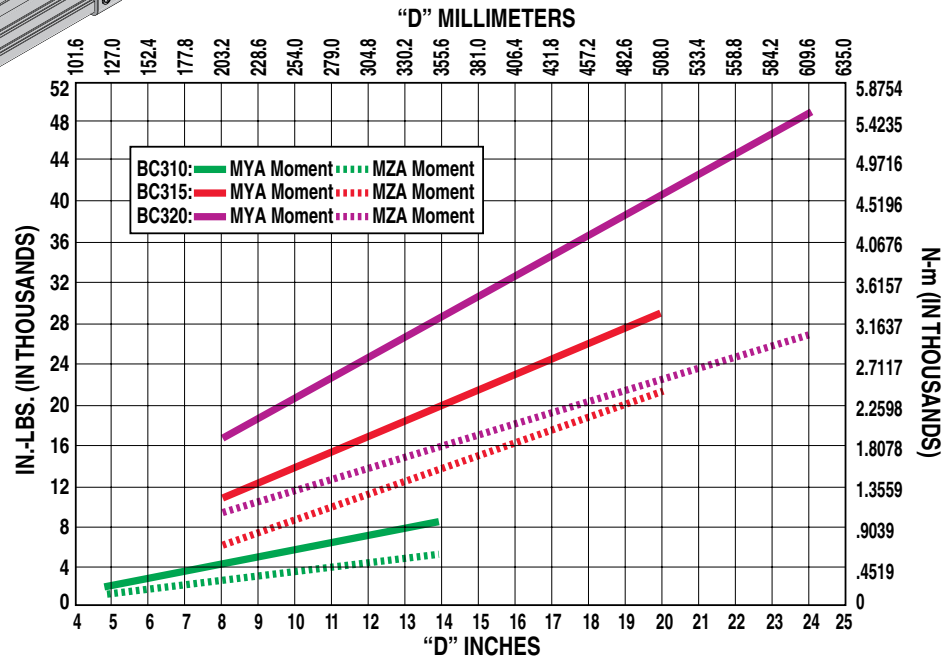
### BC3--DW (AUXILIARY CARRIER) BENDING MOMENTS AND LOAD



Rates were calculated with the following assumptions:

- 1.) Coupling between carriers is rigid.
- 2.) Load is equally distributed between carriers.
- 3.) Coupling device applies no misalignment loads to carriers.

## LOAD vs. DISTANCE BC3 SERIES

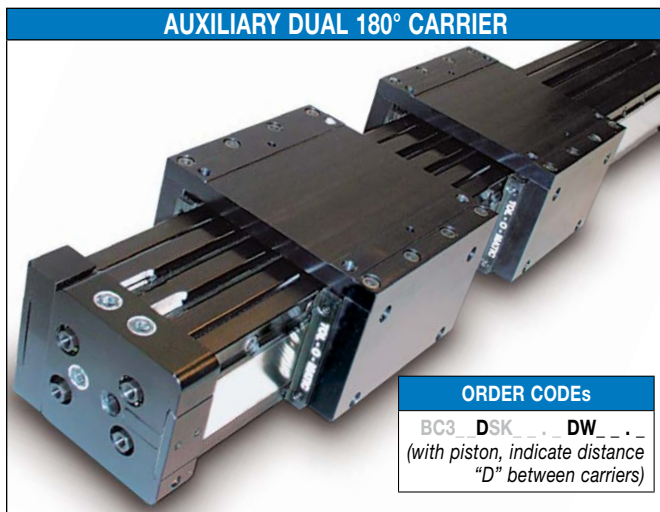


| MODEL NO. | "D" MIN. | MAXIMUM BENDING MOMENT |               |               | MAXIMUM LOAD |             |
|-----------|----------|------------------------|---------------|---------------|--------------|-------------|
|           |          | $M_{YA}^{**}$          | $M_{XA}$      | $M_{ZA}^{**}$ | $F_{ZA}$     | $F_{YA}$    |
| BC310DW   | 4.88 in. | 2825 in.-lbs.          | 500 in.-lbs.  | 1630 in.-lbs. | 1182 lbs.    | 682 lbs.    |
| BC315DW   | 8.07 in. | 11734 in.-lbs.         | 1718 in.-lbs. | 6779 in.-lbs. | 2908 lbs.    | 1680 lbs.   |
| BC320DW   | 8.10 in. | 16265 in.-lbs.         | 3324 in.-lbs. | 9388 in.-lbs. | 4016 lbs.    | 2318 lbs.   |
| BC310DW   | 124.0mm  | 319.2 N-m              | 56.5 N-m      | 184.2 N-m     | 536.1 kgs.   | 309.3 kgs.  |
| BC315DW   | 205.0mm  | 1325.8 N-m             | 194.1 N-m     | 765.9 N-m     | 1319.0 kgs.  | 762.0 kgs.  |
| BC320DW   | 205.7mm  | 1837.8 N-m             | 375.6 N-m     | 1060.8 N-m    | 1821.6 kgs.  | 1051.4 kgs. |

\* D is distance between carriers.

\*\* Loads calculated are at minimum "D", for substantially higher  $M_y + M_z$  loads increase "D" and refer to graph at left

# BC3 AUXILIARY DUAL 180° CARRIER - All Sizes



## AUXILIARY DUAL 180° CARRIER

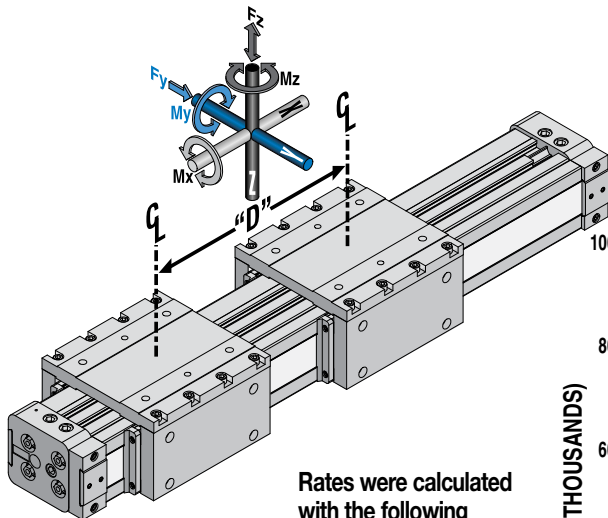
The auxiliary dual 180° carrier option substantially increases load carrying capacity and bending moments. Auxiliary carriers can only be ordered with an internal piston. When ordering, determine the minimum distance required between carriers (dimension "D" in Auxiliary Dual 180° Carrier Bending Moments chart below). Determine your working stroke. Enter

these into your configuration string. (Example BC3D15SK50.00DW10.00) The configurator will calculate the overall length of the actuator.

**NOTE:** Breakaway pressure will increase when using auxiliary dual 180° carriers.

## PERFORMANCE

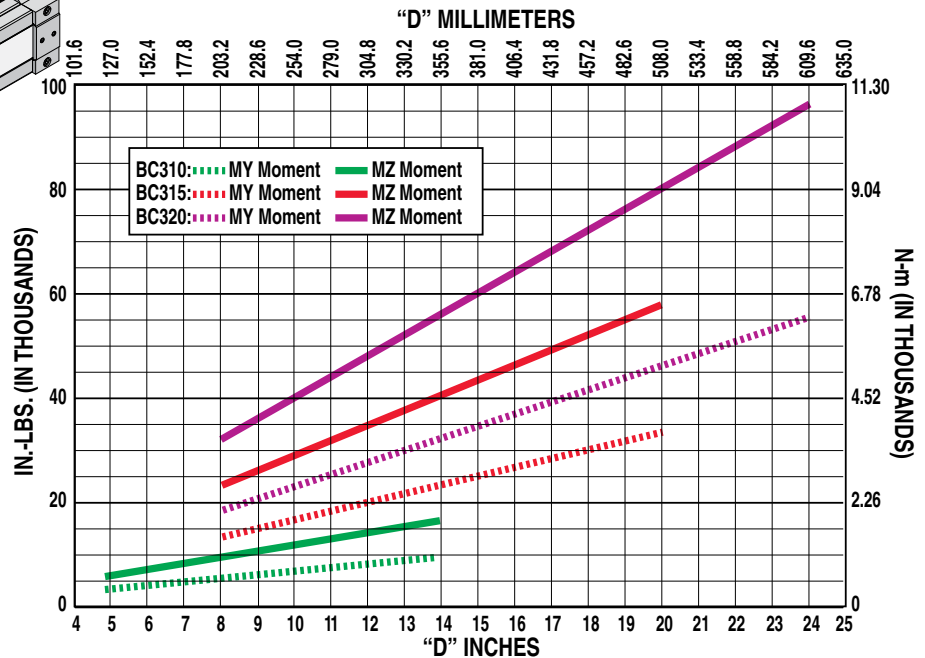
### BC3D--DW (DUAL 180°, AUXILIARY CARRIER) BENDING MOMENTS AND LOAD



Rates were calculated with the following assumptions:

- 1.) Coupling between carriers is rigid.
- 2.) Load is equally distributed between carriers.
- 3.) Coupling device applies no misalignment loads to carriers.

## LOAD vs. DISTANCE BC3 SERIES

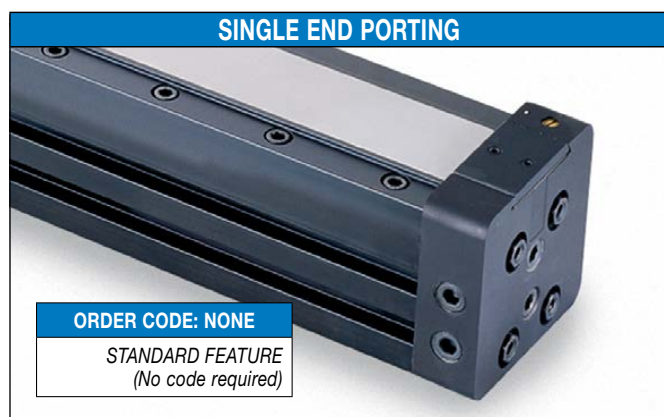


| MODEL NO. | "D" MIN. | MAXIMUM BENDING MOMENT |               |                | MAXIMUM LOAD |           |
|-----------|----------|------------------------|---------------|----------------|--------------|-----------|
|           |          | $M_y^{**}$             | $M_x$         | $M_z^{**}$     | $F_z$        | $F_y$     |
| BC3D10DW  | 4.88 in. | 3328 in.-lbs.          | 1314 in.-lbs. | 5768 in.-lbs.  | 1364 lbs.    | 2364 lbs. |
| BC3D15DW  | 8.07 in. | 13558 in.-lbs.         | 4936 in.-lbs. | 23468 in.-lbs. | 3360 lbs.    | 5816 lbs. |
| BC3D20DW  | 8.10 in. | 18776 in.-lbs.         | 9054 in.-lbs. | 32530 in.-lbs. | 4636 lbs.    | 8032 lbs. |
| BC3D10DW  | 124.0mm  | 373 N-m                | 147 N-m       | 646 N-m        | 619 kgs.     | 1072 kgs. |
| BC3D15DW  | 205.0mm  | 1518 N-m               | 553 N-m       | 2628 N-m       | 1524 kgs.    | 2638 kgs. |
| BC3D20DW  | 205.7mm  | 2103 N-m               | 1014 N-m      | 3643 N-m       | 2103 kgs.    | 3643 kgs. |

\* D is distance between carriers.

\*\* Loads calculated are at minimum "D", for substantially higher  $M_y + M_z$  loads increase "D" and refer to graph at left

# BC3 SINGLE END PORTING - All Sizes



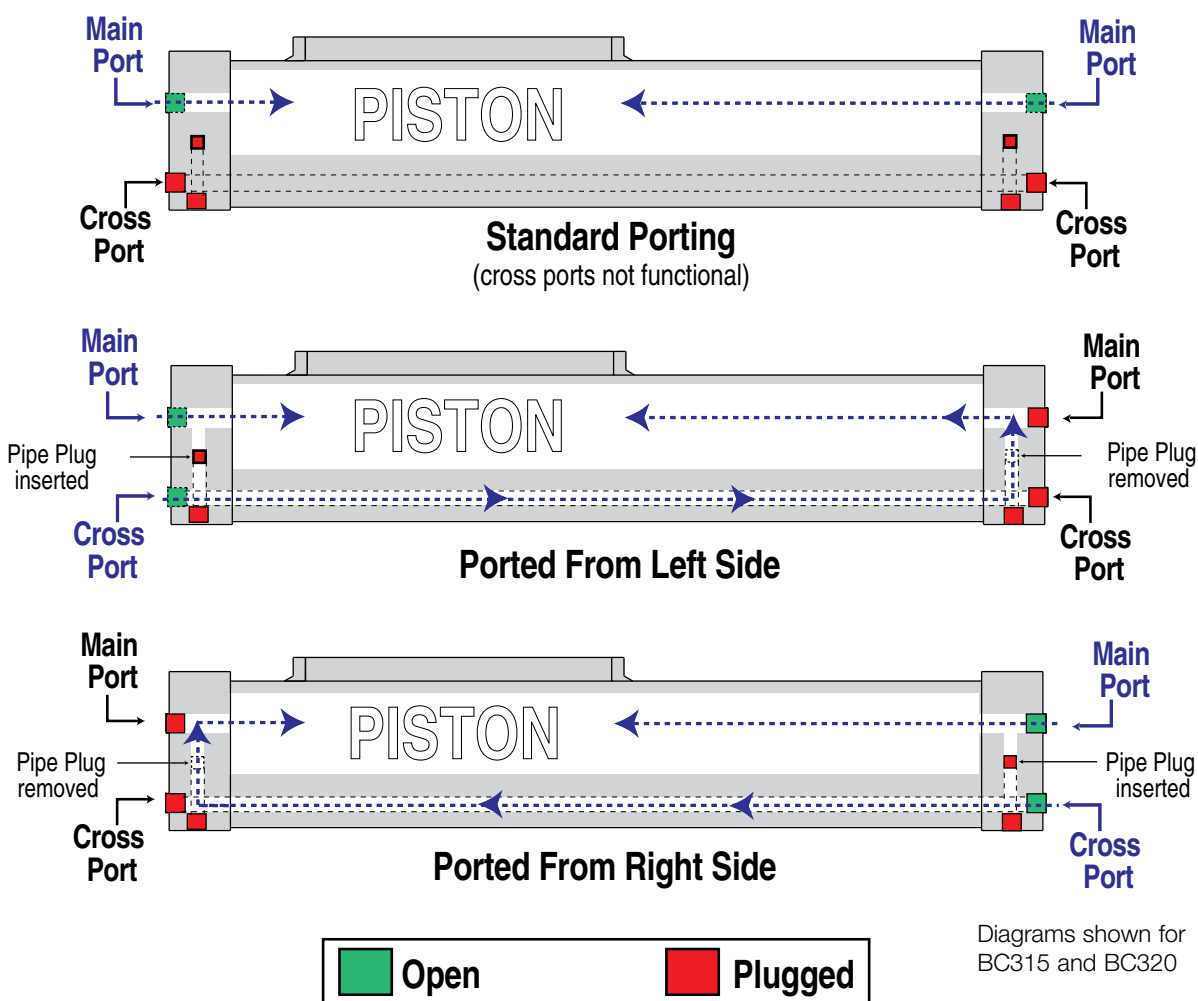
The BC3 is uniquely designed for multiple port locations including single end porting. This is a standard feature on all bore sizes of the BC3. The lower ports on the head assembly only function when used to cross port the cylinder for single end porting.

To convert to single end porting, remove access pipe plug fitting from the opposite head assembly that the air lines will be installed into. Then remove the internal port pipe plug. Reinstall access pipe plug into the bottom of the head. Remove pipe plug from the head that the air lines will be installed.

## AIR FLOW DIAGRAMS

### SINGLE END PORTING ALLOWS THE GREATEST FLEXIBILITY IN AIR HOOK UP

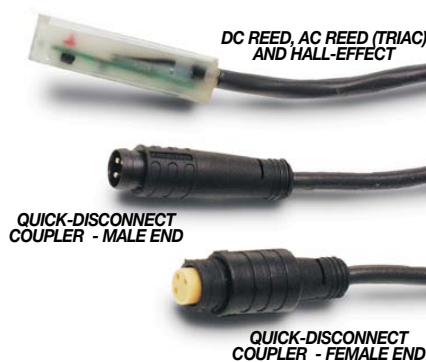
Converting from Standard porting to Left or Right side porting can be achieved if plugs are placed as in the diagram below.



Note: Standard porting may be field converted to ported from left or ported from right. For complete instructions refer to parts sheet.

# BC3 SWITCHES - All Sizes

## SWITCHES

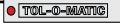


There are 10 sensing choices: DC reed, form A (open) or form C (open or closed); AC reed (Triac, open); Hall-effect, sourcing, PNP (open); Hall-effect, sinking, NPN (open); each with either flying leads or QD (quick disconnect). Commonly used to send analog signals to PLC (programmable logic controllers), TLL, CMOS circuit or other controller device. These switches are activated by the actuator's magnet.

Switches contain reverse polarity protection. QD cables are shielded; shield should be terminated at flying lead end.

If necessary to remove factory installed switches, be sure to reinstall on the same side of actuator with scored face of switch toward internal magnet.

## SPECIFICATIONS

|                              | REED DC                                                                               |                 |                                     |               | REED AC                  |                            | HALL-EFFECT DC                                                                          |               |                                                                                         |               |
|------------------------------|---------------------------------------------------------------------------------------|-----------------|-------------------------------------|---------------|--------------------------|----------------------------|-----------------------------------------------------------------------------------------|---------------|-----------------------------------------------------------------------------------------|---------------|
| ORDER CODE                   | <div>RT</div>                                                                         | <div>RM</div>   | <div>BT</div>                       | <div>BM</div> | <div>CT</div>            | <div>CM</div>              | <div>TT</div>                                                                           | <div>TM</div> | <div>KT</div>                                                                           | <div>KM</div> |
| LEAD                         | 5m                                                                                    | QD*             | 5m                                  | QD*           | 5m                       | QD*                        | 5m                                                                                      | QD*           | 5m                                                                                      | QD*           |
| CABLE SHIELDING              | Unshielded                                                                            | Shielded†       | Unshielded                          | Shielded†     | Unshielded               | Shielded†                  | Unshielded                                                                              | Shielded†     | Unshielded                                                                              | Shielded†     |
| SWITCHING LOGIC              | "A" Normally Open                                                                     |                 | "C" Normally Open or Closed         |               | Triac Normally Open      |                            | PNP (Sourcing) Normally Open                                                            |               | NPN (Sinking) Normally Open                                                             |               |
| MECHANICAL CONTACTS          | Single-Pole Single-Throw                                                              |                 | Single-Pole Double-Throw            |               | Single-Pole Single-Throw |                            | NO, These Are Solid State Components                                                    |               |                                                                                         |               |
| COIL DIRECT                  | Yes                                                                                   |                 | Yes                                 |               | Yes                      |                            | —                                                                                       |               |                                                                                         |               |
| POWER LED                    | None                                                                                  |                 | None                                |               | None                     |                            | None                                                                                    |               | None                                                                                    |               |
| SIGNAL LED                   | Red  |                 | None                                |               | None                     |                            | Red  |               | Red  |               |
| OPERATING VOLTAGE            | 200 Vdc max.                                                                          |                 | 120 Vdc max.                        |               | 120 Vac max.             |                            | 5 - 25 Vdc                                                                              |               |                                                                                         |               |
| OUTPUT RATING                | —                                                                                     |                 |                                     |               | —                        |                            | 25 Vdc, 200mA dc                                                                        |               |                                                                                         |               |
| OPERATING TIME               | 0.6 msec max.<br>(including bounce)                                                   |                 | 0.7 msec max.<br>(including bounce) |               | —                        |                            | < 10 micro sec.                                                                         |               |                                                                                         |               |
| OPERATING TEMPERATURE        | -40°F [-40°C] to 158°F [70°C]                                                         |                 |                                     |               |                          |                            | 0°F [-18°C] to 150°F [66°C]                                                             |               |                                                                                         |               |
| RELEASE TIME                 | 1.0 msec. max.                                                                        |                 |                                     |               | —                        |                            | —                                                                                       |               |                                                                                         |               |
| ON TRIP POINT                | —                                                                                     |                 |                                     |               | —                        |                            | 150 Gauss maximum                                                                       |               |                                                                                         |               |
| OFF TRIP POINT               | —                                                                                     |                 |                                     |               | —                        |                            | 40 Gauss minimum                                                                        |               |                                                                                         |               |
| **POWER RATING (WATTS)       | 10.0 §                                                                                |                 | 3.0 §§                              |               | 10.0                     |                            | 5.0                                                                                     |               |                                                                                         |               |
| VOLTAGE DROP                 | 2.6 V typical at 100 mA                                                               |                 | NA                                  |               | —                        |                            | —                                                                                       |               |                                                                                         |               |
| RESISTANCE                   | 0.1 Ω Initial (Max.)                                                                  |                 |                                     |               | —                        |                            | —                                                                                       |               |                                                                                         |               |
| CURRENT CONSUMPTION          | —                                                                                     |                 |                                     |               | 1 Amp at<br>86°F [30°C]  | 0.5 Amp at<br>140°F [60°C] | 200 mA at 25 Vdc                                                                        |               |                                                                                         |               |
| FREQUENCY                    | —                                                                                     |                 |                                     |               | 47 - 63 Hz               |                            | —                                                                                       |               |                                                                                         |               |
| CABLE MIN.<br>BEND<br>RADIUS | STATIC                                                                                | 0.630" [16mm]   |                                     |               |                          |                            |                                                                                         |               |                                                                                         |               |
|                              | DYNAMIC                                                                               | Not Recommended |                                     |               |                          |                            |                                                                                         |               |                                                                                         |               |

**CAUTION: DO NOT OVER TIGHTEN SWITCH HARDWARE WHEN INSTALLING!**

**\*\* WARNING:** Do not exceed power rating (Watt = Voltage X Amperage). Permanent damage to sensor will occur.

\*QD = Quick Disconnect; Male coupler is located 6" [152mm] from sensor, Female coupler to flying lead (part #2503-1025) distance is 197" [5m] also see Cable Shielding specification above

**REPLACEMENT OF QD SWITCHES MANUFACTURED BEFORE JULY 1, 1997:** It will be necessary to replace or rewire the female end coupler.



**Reed Switch Life Expectancy:** Up to 200,000,000 cycles (depending on load current, duty cycle and environmental conditions)

†Shielded from the female quick disconnect coupler to the flying leads. Shield should be terminated at flying lead end.

§ Maximum current 500mA (not to exceed 10VA) Refer to Temperature vs. Current graph and Voltage Derating graph

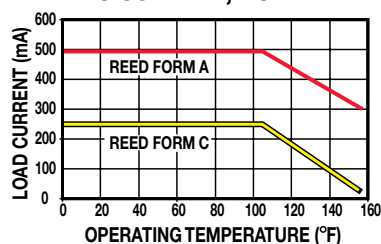
§§ Maximum current 250mA (not to exceed 3VA) Refer to Temperature vs. Current graph and Voltage Derating graph



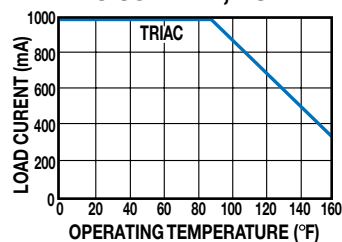
# BC3 SWITCHES - All Sizes

## PERFORMANCE

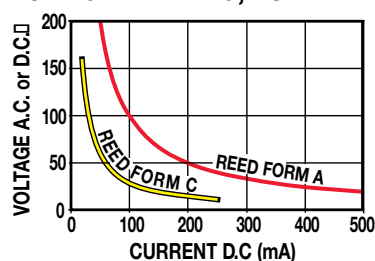
TEMP. vs CURRENT, DC REED



TEMP. vs CURRENT, AC REED

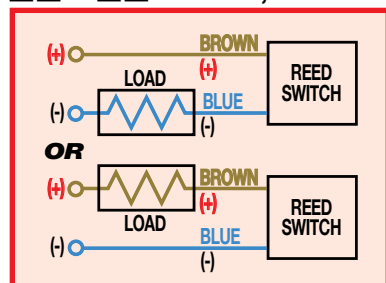


VOLTAGE DERATING, DC REED

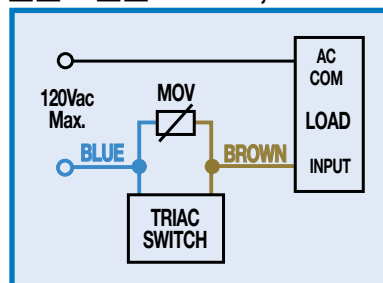


## WIRING DIAGRAMS

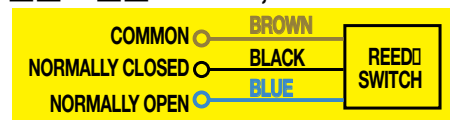
**R**T & **R**M DC REED, FORM A



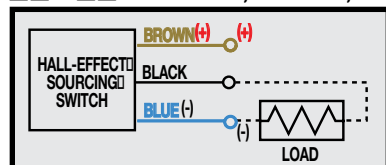
**C**T & **C**M AC REED, TRIAC



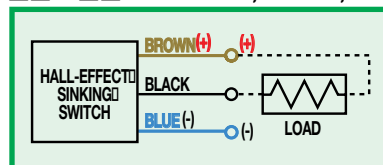
**B**T & **B**M DC REED, FORM C



**T**T & **T**M HALL-EFFECT, SOURCING, PNP



**K**T & **K**M HALL-EFFECT, SINKING, NPN



## INSTALLATION INFORMATION

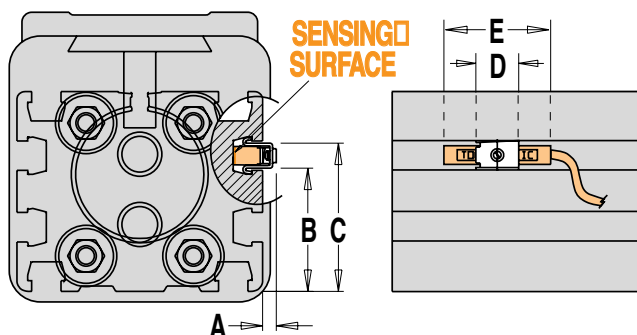


**⚠** THE NOTCHED FACE OF THE SWITCH INDICATES THE SENSING SURFACE AND MUST FACE TOWARD THE MAGNET.



**⚠** THE NOTCHED GROOVE IN THE ACTUATOR INDICATES THE GROOVE TO INSTALL THE SWITCH. CONTACT TOLOMATIC IF SWITCHES ARE REQUIRED ON ANOTHER SIDE OF ACTUATOR.

## DIMENSIONS



**📌** Some actuators may require switch mounting on a specific side of the assembly. Call Tolomatic for details.

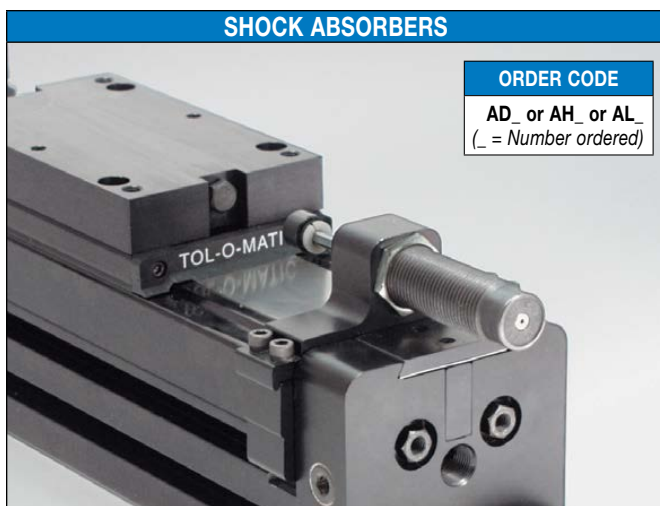
| SIZE | BORE  | A     | B     | C     | D     | E     |
|------|-------|-------|-------|-------|-------|-------|
| 10   | 1.000 | 0.194 | 0.822 | 0.906 | 0.500 | 1.250 |
| 15   | 1.500 | 0.160 | 1.428 | 1.721 | 0.500 | 1.250 |
| 20   | 2.000 | 0.036 | 1.994 | 2.287 | 0.500 | 1.250 |

Dimensions in inches

| SIZE | BORE | A    | B     | C     | D     | E     |
|------|------|------|-------|-------|-------|-------|
| 10   | 25   | 4.93 | 20.88 | 23.01 | 12.70 | 31.75 |
| 15   | 40   | 4.06 | 36.27 | 43.71 | 12.70 | 31.75 |
| 20   | 50   | 0.91 | 50.65 | 58.09 | 12.70 | 31.75 |

Dimensions in millimeters

# BC3 SHOCK ABSORBERS - All Sizes



Rodless cylinders with standard internal cushion offer an effective method of decelerating loads. However, all Tolomatic rodless cylinders are capable of carrying heavier loads at higher velocities than the cylinder cushion can absorb. Optional shock absorbers can be used to increase the cylinder's life and broaden the application range for the cylinder model you have chosen.

Tolomatic offers adjustable shock absorbers for the BC3. They allow the shock to be positioned at any point along the cylinder.

A shock stop plate must be used in conjunction with the BC3 shock to provide a stopping surface on the carrier.

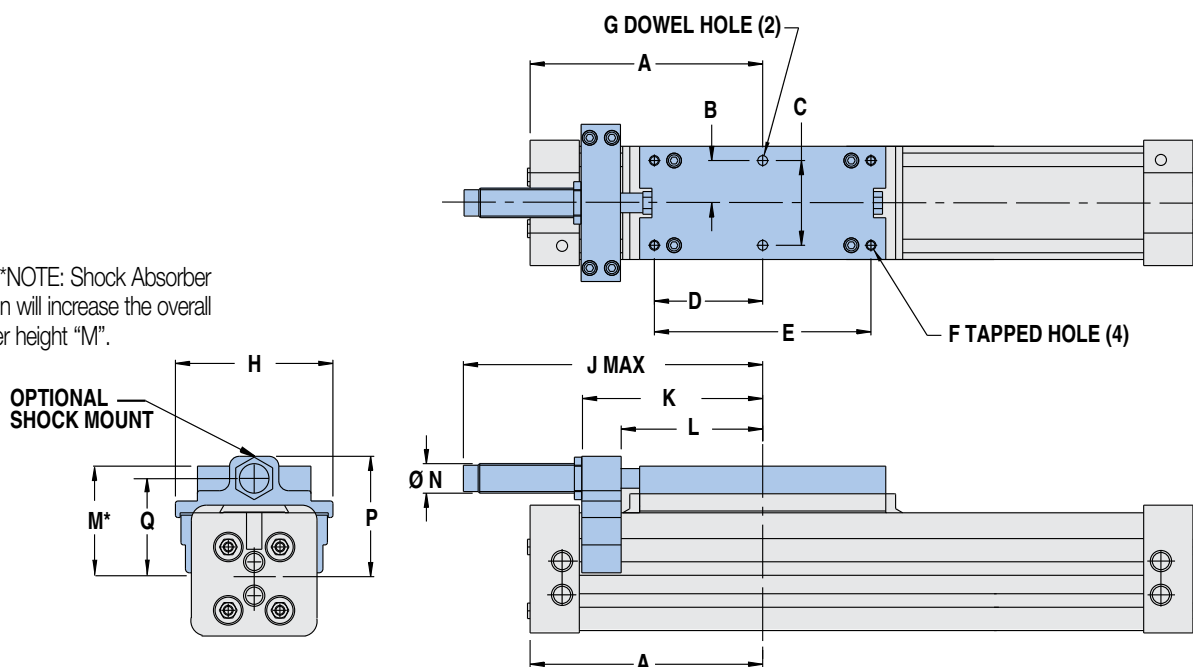
Typical shock absorber life varies between 1-2 million cycles (depending on environment) appropriate preventative maintenance should be considered in high cyclic applications.

**NOTE:** When 2 shock absorbers are ordered, the unit will be assembled with NO internal cushions.

**CAUTION:** In applications which result in a load bending moment at deceleration, care should be taken to decelerate the load rather than the carrier of the band cylinder.

## DIMENSIONS

**\*NOTE:** Shock Absorber option will increase the overall carrier height "M".



| SIZE | BORE | A    | B     | C     | D     | E     | F               | G**             | H    | J    | K    | L    | M     | N    | P    | Q     |
|------|------|------|-------|-------|-------|-------|-----------------|-----------------|------|------|------|------|-------|------|------|-------|
| 10   | 1.00 | 3.93 | 0.890 | 1.781 | 1.562 | 3.125 | 1/4-20 x .50DP  | .252-.251 x .25 | 3.09 | 5.47 | 2.91 | 2.22 | 2.223 | 0.50 | 2.46 | 1.964 |
| 15   | 1.50 | 5.93 | 1.078 | 2.156 | 2.750 | 5.500 | 1/4-20 x .50DP  | .252-.251 x .25 | 4.00 | 7.65 | 4.59 | 3.59 | 2.812 | 0.75 | 3.06 | 2.495 |
| 20   | 2.00 | 6.27 | 1.563 | 3.125 | 2.938 | 5.875 | 5/16-18 x .75DP | .252-.251 x .69 | 5.06 | 8.14 | 4.88 | 3.88 | 3.594 | 1.00 | 3.88 | 3.230 |

\*\*DOWEL PINS  $\pm .003$   $\text{M}$

Dimensions in inches

| SIZE | BORE | A     | B     | C     | D     | E      | F                | G**              | H     | J     | K     | L    | M     | N    | P    | Q     |
|------|------|-------|-------|-------|-------|--------|------------------|------------------|-------|-------|-------|------|-------|------|------|-------|
| 10   | 25   | 99.8  | 22.62 | 45.24 | 39.69 | 79.38  | M6-1.0 x 12.7DP  | 6.05-6.02 x 6.4  | 78.5  | 138.9 | 73.9  | 56.4 | 56.46 | 14.0 | 62.5 | 49.89 |
| 15   | 40   | 150.7 | 27.38 | 54.76 | 69.85 | 139.70 | M6-1.0 x 12.7DP  | 6.05-6.02 x 6.4  | 101.6 | 194.2 | 116.6 | 91.2 | 71.42 | 20.0 | 77.7 | 63.37 |
| 20   | 50   | 159.3 | 39.69 | 79.38 | 76.62 | 149.23 | M8-1.25 x 19.1DP | 6.05-6.02 x 17.5 | 128.5 | 206.8 | 124.0 | 98.6 | 91.29 | 25.4 | 98.6 | 82.04 |

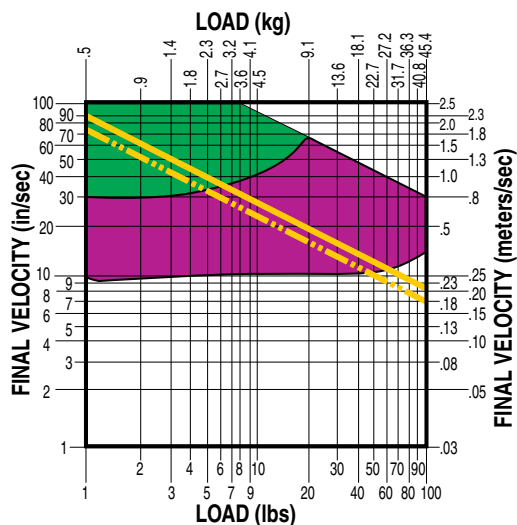
\*\*DOWEL PINS  $\pm .076$   $\text{M}$

Dimensions in millimeters

# BC3 Shock Absorbers - All Sizes - PERFORMANCE

## VELOCITY vs LOAD

### BC310

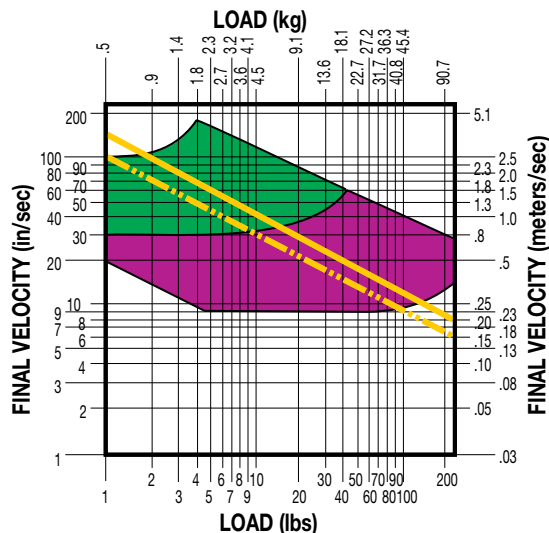


 LIGHT DUTY (Light load/High velocity)

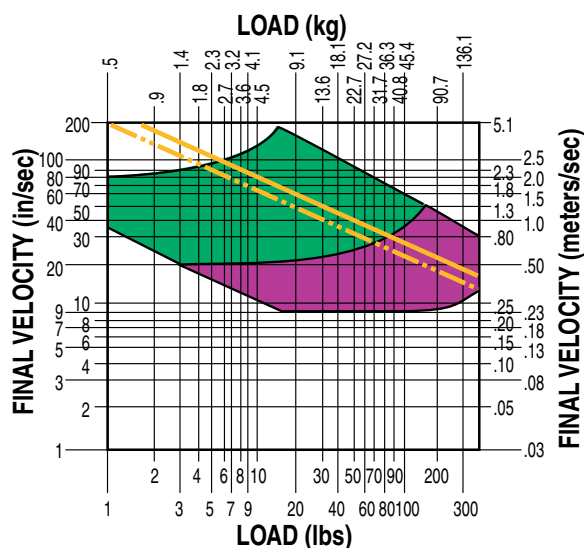
 HEAVY DUTY (Heavy load/Low velocity)

 AIR CUSHION DATA

### BC315

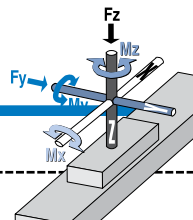


### BC320



 NOTE: If final (or impact) velocity cannot be calculated directly, a reasonable guideline to use is 2 x average velocity.

# Application Data Worksheet



## STROKE LENGTH

☐ inch (S) ☒ (K)  
(U.S. Standard)

☐ millimeters  
(Metric)

## AVAILABLE AIR PRESSURE

☐ PSI  
(U.S. Standard)

☐ bar  
(Metric)

## REQUIRED THRUST FORCE

☐ lbf  
(U.S. Standard)

☐ N  
(Metric)

## LOAD

☐ lb  
(U.S. Standard)

☐ kg  
(Metric)

## LOAD CENTER OF GRAVITY DISTANCE TO CARRIER CENTER

☐ inch  
(U.S. Standard)

☐ millimeters  
(Metric)

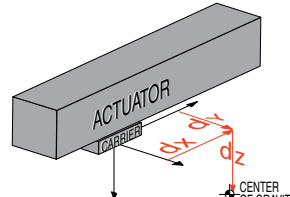
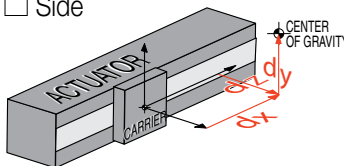
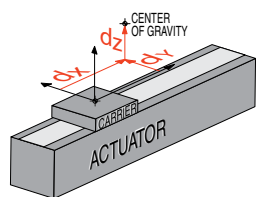
$d_x$  \_\_\_\_\_  
 $d_y$  \_\_\_\_\_  
 $d_z$  \_\_\_\_\_

## ORIENTATION

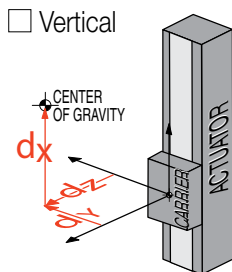
☐ Horizontal

☐ Side

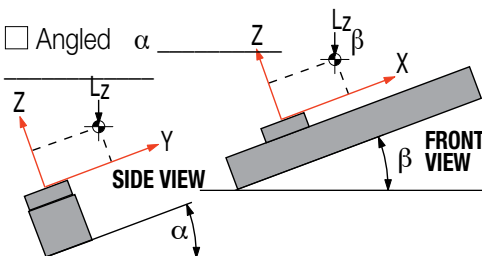
☐ Horizontal Down



☐ Vertical



☐ Angled  $\alpha$



## OTHER ISSUES:

(i.e. Environment,  
Temperature,  
Contamination, etc.)

Contact information:



Fax (1-763-478-8080) or call Tolomatic (1-800-328-2174) with the above information.  
We will provide any assistance needed to determine the proper actuator.



# Rodless Cylinder Selection Guidelines - BC2, BC3, BC4, LS - All Sizes

## PROVIDING LOAD GUIDANCE AND SUPPORT

The process of selecting a load bearing actuator for a given application can be complex. It is highly recommended that you contact Tolomatic or a Tolomatic Distributor for assistance in selecting the best actuator for your application. The following overview of the selection guidelines are for educational purposes only.

### 1 COMPILE APPLICATION REQUIREMENTS

To determine the appropriate Band Cylinder or Linear Slide model for an application, compile the following information:

- Available pressure (PSI)
- Weight of load (lbs or kg)
- Orientation of load (lbs or kgs)
- Velocity of load (in/sec or mm/sec)
- Stroke length (in or mm)

HINT: Use Tolomatic sizing and selection software, download at: [tolomatic.com](http://tolomatic.com)

### 2 SELECT CYLINDER SIZE

- Consult the Theoretical Force vs. Pressure charts.
- Cross-reference the load force (or load weight if force is not known) and the available operating pressure. If the intersection falls below the diagonal line, and if moments do not exceed maximum values listed for that model (see Step 3), the actuator will accommodate the application.

If the intersection is above the diagonal line, a larger cylinder bore size should be considered.

NOTE: Additional force may be required to obtain the necessary acceleration for vertical or horizontal loads.

### 3 DETERMINE NATURE OF LOAD AND THE EFFECT OF BENDING MOMENTS

If the cylinder will guide and support a load located directly over the center of carrier, bending moments will not be a factor in the cylinder selection.

NOTE: The maximum load "L" must not exceed the capacity limits of the cylinder selected.

- Bending Moments

For off center or side loads, determine the distance from the center of mass of the load to the center of the carrier bracket. This measurement is needed to calculate the torque for bending moments. (Refer to Bending Moment chart for each model.)

Should the resulting maximum bending moment exceed figures indicated on the chart, external guides, auxiliary carrier/s or a larger cylinder should be considered.

- Auxiliary Carrier Bending Moments

The auxiliary carrier option (available on most models) increases load carrying capacity and bending moments. Auxiliary carriers can be ordered with or without an internal piston. (Auxiliary

carriers without a piston have no internal cushion on the cylinder end closest to the auxiliary carrier.)

IMPORTANT: When ordering, determine the working stroke, then the minimum distance required between carriers (dimension "D" in Auxiliary Carrier Bending Moments chart). When ordered, Tolomatic's configurator will calculate the overall length of the actuator.

NOTE: breakaway pressure will increase when using auxiliary carriers.

### 4 DETERMINE INTERNAL CUSHION CAPACITY

- Consult the Cushion Data chart for the model selected. The velocities listed on the cushion charts are final or cushion impact velocities. On applications where the internal cushions or bumpers are to be used, be sure the actual, final or impact velocity is known. If the velocity is not known, use of limit switches with valve deceleration circuits or shock absorbers should be considered. NOTE: The BC205 uses external bumpers in place of internal cushions, LS05 & LS10 do not have cushions or bumpers.
- Cross-reference the final velocity and weight of the load. If the intersection is below the diagonal lines, the internal cushions on the actuator may be used. If the point falls above the dashed diagonal line or if the velocity is not known, use deceleration circuits, external shock absorbers or select a

larger cylinder with greater cushion capacity. On high-cyclic applications, use of external stops is strongly recommended.

### 5 DETERMINE TUBE SUPPORT REQUIREMENTS

- Consult the Tube Support chart for the model selected.
- Cross reference the load weight and maximum distance between supports.

### 6 CONSIDER OPTIONS

- Switches— dc Reed, Hall-effect or ac Triac

Band Cylinders and Linear Slides each have different standard features and options. Check the options section for the actuator you have selected.

- Shock Absorbers— if needed.
- Foot Mounting Kits
- Floating Mount Bracket – use when lack of parallelism occurs between the cylinder and an external guided and supported load.
- Single End Porting (BC3, BC4)
- Long Carrier (BC4)
- Proximity Sensors (LS)
- Dual 180° Carrier (BC3)

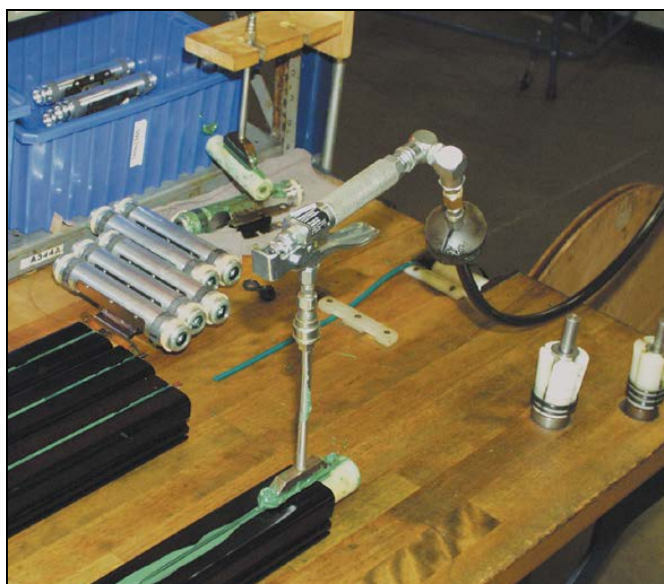
# Application Guidelines

The following conditional statements are intended as general guidelines for use of Tolomatic actuators. Since all applications have their own specific operating requirements, consult Tolomatic, Inc. or your local Tolomatic distributor if an application is unconventional or if questions arise regarding the selection process.

## **CUSHION NEEDLE ADJUSTMENT (BC2, BC3, BC4, CC, SA, DP, TC ONLY)**



Adjust the cushion needles in the cylinder heads carefully to obtain a smooth, hesitation free deceleration for your particular application. If there are questions on proper adjustment, please consult Tolomatic, Inc.



## **LUBRICATION GUIDELINES**

All Tolomatic actuators (except Cable Cylinders) are prelubricated at the factory. To ensure maximum actuator life, the following guidelines should be followed.

### **• Filtration**

We recommend the use of dry, filtered air in our products. "Filtered air" means a level of 10 Micron or less. "Dry" means air should be free of appreciable amounts of moisture. Regular maintenance of installed

filters will generally keep excess moisture in check.

### **• External Lubricators (optional)**

The factory prelubrication of Tolomatic actuators will provide optimal performance without the use of external lubrication. However, external lubricators can further extend service life of pneumatic actuators if the supply is kept constant.

Oil lubricators, (mist or drop) should supply a minimum of 1 drop per 20 standard cubic feet per minute to the

cylinder. As a rule of thumb, double that rate if water in the system is suspected. Demanding conditions may require more lubricant.

If lubricators are used, we recommend a non-detergent, 20cP @ 140°F 10-weight lubricant. Optimum conditions for standard cylinder operation are +32° to +150°F (+0° to 65.5°C).

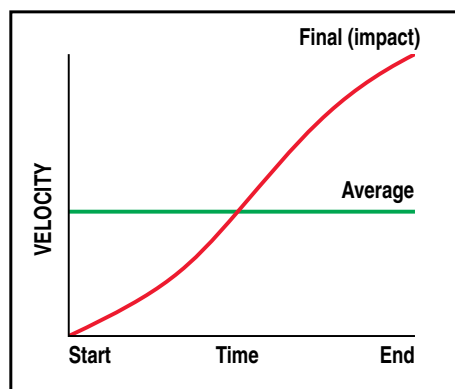
 **NOTE:** Use of external lubricators may wash away the factory installed lubrication. External lubricants must be maintained in a constant supply or the results will be a dry actuator prone to premature wear.

### **• Sanitary Environments**

Oil mist lubricators must dispense "Food Grade" lubricants to the air supply. Use fluids with ORAL LD50 toxicity ratings of 35 or higher such as Multitherm® PG-1 or equivalent. Demanding conditions can require a review of the application.

## **FINAL VELOCITY CALCULATION**

Velocity calculations for all rodless cylinders need to differentiate between final velocity and average velocity. For example: Stroking a 100-inch BC3 model in one second yields an average velocity of 100 inches per second. To properly determine the inertial forces for cushioning, it is important to know the



final (or impact) velocity. Rodless cylinders accelerate and decelerate at each end of the stroke. Therefore this acceleration must be considered (see diagram).

If final (or impact) velocity cannot be calculated directly, a reasonable guideline is to use 2 x average velocity.

# BC3 APPLICATION GUIDELINES

## BC3 DECELERATION CONSIDERATIONS

While the BC3 is capable of carrying very large loads, consideration must be given to how to stop the load at the end of stroke. If Tolomatic cushions or shocks are to be used, please stay within the specifications on page BC3\_22. If you should decide to utilize another type of shock absorber, be sure that the deceleration of the load is smooth and over adequate distance.

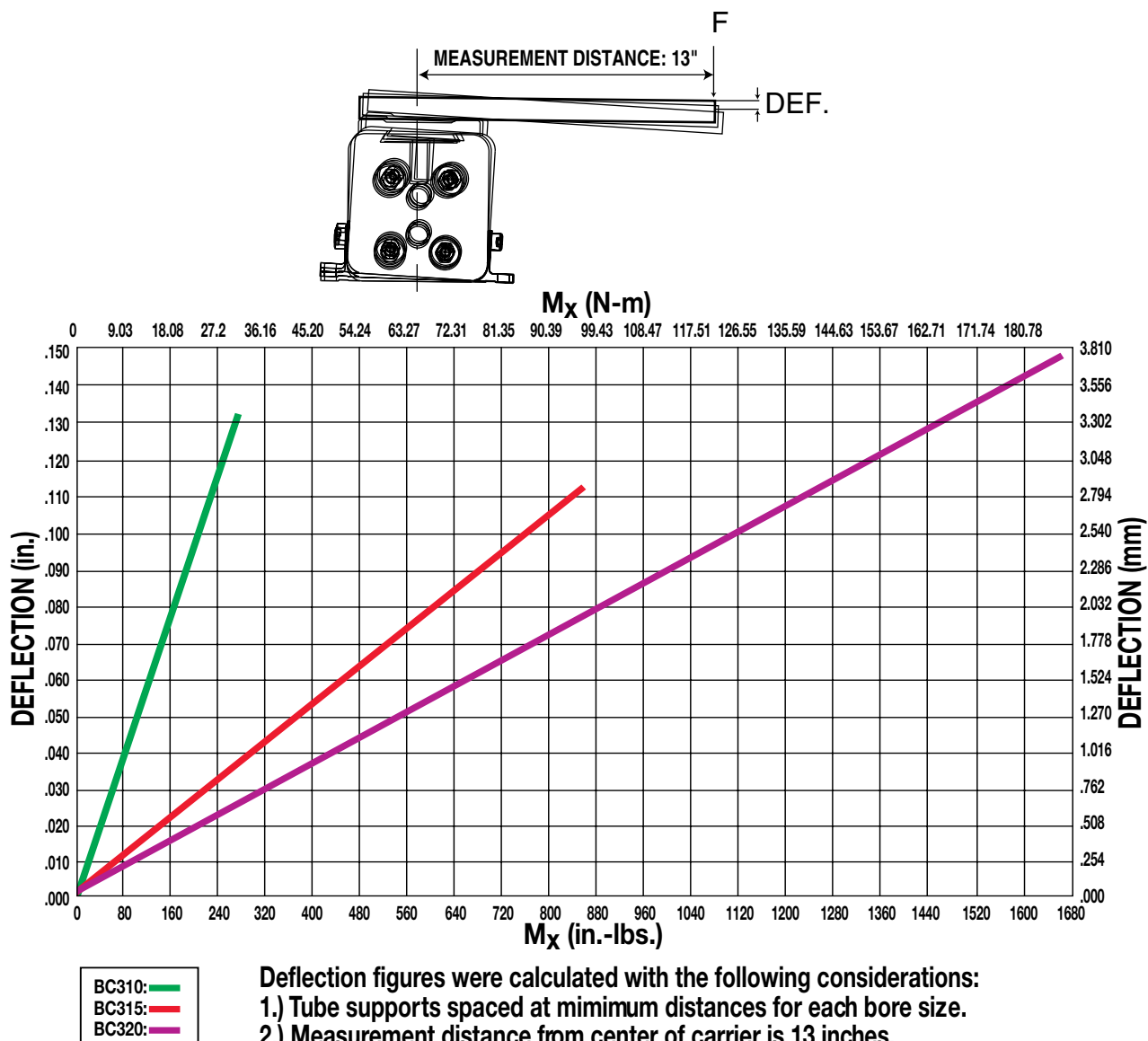
**⚠ CAUTION:** In applications which result in a load bending moment at deceleration, care should be taken to decelerate the load rather than the carrier of the band cylinder.

## BC3 BEARING LUBRICATION

The bearing system for the BC3 is prelubricated at the factory with a high quality No. 2 lithium-soap base grease. Relubrication is recommended every 10 million linear feet using a lithium-soap base grease for optimal bearing performance. To relubricate, lift back upper sealing band and apply grease directly to the stationary ball ways. Applications that are exposed to moisture or dirt, may require more frequent relubrication.

## PERFORMANCE

### BC3 CYLINDER/LOAD DEFLECTION



# BC3 Service Parts Ordering - ALL Sizes

| Inch (U.S. Standard) SIZE                                    | 10        | D10        | 15        | D15        | 20        | D20        |
|--------------------------------------------------------------|-----------|------------|-----------|------------|-----------|------------|
| <b>Foot Mount Kits<sup>1</sup></b>                           | 3410-9005 | 3410-9025  | 3415-9005 | 3415-9025  | 3420-9005 | 3420-9025  |
| <b>Shock Mount Kit w/ Shock<sup>2</sup> – Heavy Duty</b>     | 3410-9013 | 3410-9013  | 3415-9013 | 3415-9013  | 3420-9013 | 3420-9013  |
| <b>Shock Mount Kit w/ Shock<sup>2</sup> – Lite Duty</b>      | 3410-9010 | 3410-9010  | 3415-9010 | 3415-9010  | 3420-9010 | 3420-9010  |
| <b>Shock Mount Kit w/o Shock<sup>3</sup> (Hardware Only)</b> | 3410-9003 | 3410-9003  | 3415-9003 | 3415-9003  | 3420-9003 | 3420-9003  |
| <b>Shock Stop Plate Kit<sup>4</sup></b>                      | 3410-9004 | 3410-9004  | 3415-9004 | 3415-9004  | 3420-9004 | 3420-9004  |
| <b>Tube Supports<sup>5</sup></b>                             | 3410-9006 | 3410-9026  | 3415-9006 | 3415-9026  | 3420-9006 | 3420-9026  |
| <b>Repair Kit<sup>6</sup></b>                                | RKBC310NP | RKBC3D10NP | RKBC315NP | RKBC3D15NP | RKBC320NP | RKBC3D20NP |

| Metric SIZE                                                  | 10            | 10D            | 15            | 15D            | 20            | 20D            |
|--------------------------------------------------------------|---------------|----------------|---------------|----------------|---------------|----------------|
| <b>Foot Mount Kits<sup>1</sup></b>                           | 4410-9005     | 4410-9025      | 4415-9005     | 4415-9025      | 4420-9005     | 4420-9025      |
| <b>Shock Mount Kit w/ Shock<sup>2</sup> – Heavy Duty</b>     | 4410-9013     | 4410-9013      | 4415-9013     | 4415-9013      | 4420-9013     | 4420-9013      |
| <b>Shock Mount Kit w/ Shock<sup>2</sup> – Lite Duty</b>      | 4410-9010     | 4410-9010      | 4415-9010     | 4415-9010      | 4420-9010     | 4420-9010      |
| <b>Shock Mount Kit w/o Shock<sup>3</sup> (Hardware Only)</b> | 4410-9003     | 4410-9003      | 4415-9003     | 4415-9003      | 4420-9003     | 4420-9003      |
| <b>Shock Stop Plate Kit<sup>4</sup></b>                      | 4410-9004     | 4410-9004      | 4415-9004     | 4415-9004      | 4420-9004     | 4420-9004      |
| <b>Tube Supports<sup>5</sup></b>                             | 4410-9006     | 4410-9026      | 4415-9006     | 4415-9026      | 4420-9006     | 4420-9026      |
| <b>Repair Kit<sup>6</sup></b>                                | RKBC310TP(GP) | RKBC310DTP(GP) | RKBC315TP(GP) | RKBC315DTP(GP) | RKBC320TP(GP) | RKBC320DTP(GP) |

| CONFIG. CODE ORDERING                         |      |
|-----------------------------------------------|------|
| Mounting Hardware & FE conn. included         |      |
| DESCRIPTION                                   | CODE |
| Switch Kit, Reed, Form C, 5m                  | BT   |
| Switch Kit, Reed, Form C, Male Conn.          | BM   |
| Switch Kit, Reed, Form A, 5m                  | RT   |
| Switch Kit, Reed, Form A, Male Conn.          | RM   |
| Switch Kit, Triac, 5m                         | CT   |
| Switch Kit, Triac, Male Conn.                 | CM   |
| Switch Kit, Hall-effect, Sinking, 5m          | KT   |
| Switch Kit, Hall-effect, Sinking, Male Conn.  | KM   |
| Switch Kit, Hall-effect, Sourcing, 5m         | TT   |
| Switch Kit, Hall-effect, Sourcing, Male Conn. | TM   |

NOTE: When kit is ordered female connector & all mounting hardware is included

## Switch Ordering NOTES:

To order field retrofit switch and hardware kits for all Tolomatic actuators: SW (Then the model and bore size, and type of switch required)

**Example: SWBC315RT**

(Hardware and Form A Reed switch with 5 meter lead for 1.5" bore BC3 band cylinder)



## Service Parts Ordering NOTES:

- 1 Foot Mount Kit contains one bracket and mounting hardware.
- 2 Shock Field Retrofit Kit contains one shock absorber and mounting hardware.
- 3 Shock Field Mount Kit contains one set of mounting hardware.
- 4 Shock Stop Plate Kit contains shock plate, impact bolts, screws and dowel pins.
- 5 Contains one tube support and mounting hardware.
- 6 Repair Kit contains external dust band, internal seal band, wipers, end caps and internal soft seals. Stroke length must be indicated after repair kit code.



# BC3 Ordering - ALL Sizes

## MODEL, BORE, STROKE

BC3 10 D NP SK 100 0.250

### MODEL & MOUNTING

BC3 BC3 Band Cylinder

### BORE SIZE

|    |       |        |
|----|-------|--------|
| 10 | 1.00" | (25mm) |
| 15 | 1.50" | (40mm) |
| 20 | 2.00" | (50mm) |

### DUAL 180° CARRIER (BC3\_14)

D Dual 180° Carrier Option

### MOUNTING & PORTS

- NP US standard mounting & NPT ports
- TP† Metric mounting with metric taper port
- GP† Metric mounting with metric parallel port

† The metric version provides metric tapped holes for mounting of the load to the carrier and of the actuator to mounting surfaces & metric ports

### STROKE LENGTH & MOUNTING TYPE

- SK \_ \_ \_ Stroke, enter desired stroke length in inches
- SM† \_ \_ \_ Stroke, enter desired stroke length in millimeters

**NOTE:** Actuator mounting threads and mounting fasteners will be either inch or metric; depending on how stroke length is indicated.

SK = inch mounting  
SM = metric mounting

#### MAXIMUM STROKE

|      | ...SK | ...SM |
|------|-------|-------|
| SIZE | in    | mm    |
| 10   | 205   | 5,207 |
| 15   | 202   | 5,130 |
| 20   | 142   | 3,606 |

**NOTE:** Prelubrication is standard on all BC3 Band Cylinders (see Application Guidelines on page BC3\_25)

## OPTIONS

DW6 0 TS3 FM2 AH2 BM2

### AUXILIARY CARRIER (BC3\_16)

DW Auxiliary carrier With piston & "D" distance  
"D" Distance between carriers "D" Distance between carriers in inches (SK) or millimeters (SM)  
(Same unit of measure as stroke length is required)

#### MINIMUM "D" DISTANCE BETWEEN CARRIERS

|    | with Piston |       |
|----|-------------|-------|
|    | in          | mm    |
| 10 | 4.88        | 124.0 |
| 15 | 8.07        | 205.0 |
| 20 | 8.10        | 205.7 |

**When ordering auxiliary carrier option, enter the distance required between carriers. The configurator will calculate the overall length of the actuator.**

### TUBE SUPPORTS (BC3\_12)

TS Tube Support & number required

Each TS includes two (2) tube support halves

### T-NUTS

TN additional T-Nuts (see individual dimensional drawings for sizes)

### FOOT MOUNT (BC3\_13)

FM Foot Mount & number required (1 or 2)

### SHOCK ABSORBERS (BC3\_21)

- \*AD Shock hardware Only and number required
- \*AH Shock, Heavy duty and number required
- \*AL Shock, Light duty and number required

**\*NOTE:** When shock absorbers are ordered cushion seals are removed.

### SWITCHES (BC3\_19)

|             | TYPE     | QUICK-DISCONNECT | CODE | QUANTITY                          | LEAD LENGTH |
|-------------|----------|------------------|------|-----------------------------------|-------------|
| REED        | Form A   | QD               | RM   | After code enter quantity desired | 5 meters    |
|             |          | no               | RT   |                                   |             |
| HALL-EFFECT | Form C   | QD               | BM   |                                   |             |
|             |          | no               | BT   |                                   |             |
|             | Sinking  | QD               | KM   |                                   |             |
|             |          | no               | KT   |                                   |             |
| TRIAC       | Sourcing | QD               | TM   |                                   |             |
|             |          | no               | TT   |                                   |             |
|             |          | QD               | CM   |                                   |             |
|             |          | no               | CT   |                                   |             |



**1 WEEK  
BUILT-TO-ORDER**

**Not all codes listed are compatible with all options. Contact Tolomatic with any questions.**

# BC4 INTERNAL BEARING RODLESS CYLINDER



## CONTENTS

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# BC4 BAND CYLINDER

## ● ENDURANCE TECHNOLOGY<sup>SM</sup> ●

*Endurance Technology features are designed for maximum durability to provide extended service life.*

### ● LOAD-SUPPORTING BEARING DESIGN ●

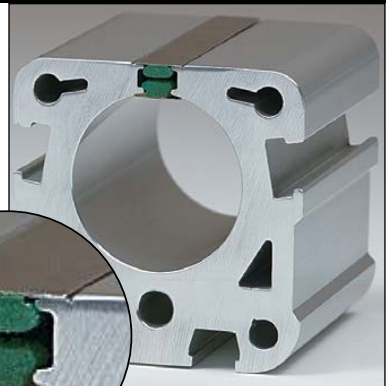
- Self-lubricating bearing runs the length of carrier web for maximum bearing surface, this patented floating bearing system provides smooth movement and maximum transverse load resistance
- Durable, engineered resin piston has 50% greater bearing area
- Thicker and longer web has 60% greater material for increased robustness
- Maximum bearing life for millions of cycles



The BC4 was designed in response to customer requests for a basic rodless cylinder for use in applications that have guidance and support for the load. The BC4 features durable stainless steel bands, field replaceable engineered bearings and a large carrier mounting pattern. Built-to-order in stroke lengths up to 206 inches.

### ● STAINLESS STEEL SEALING BAND SYSTEM ●

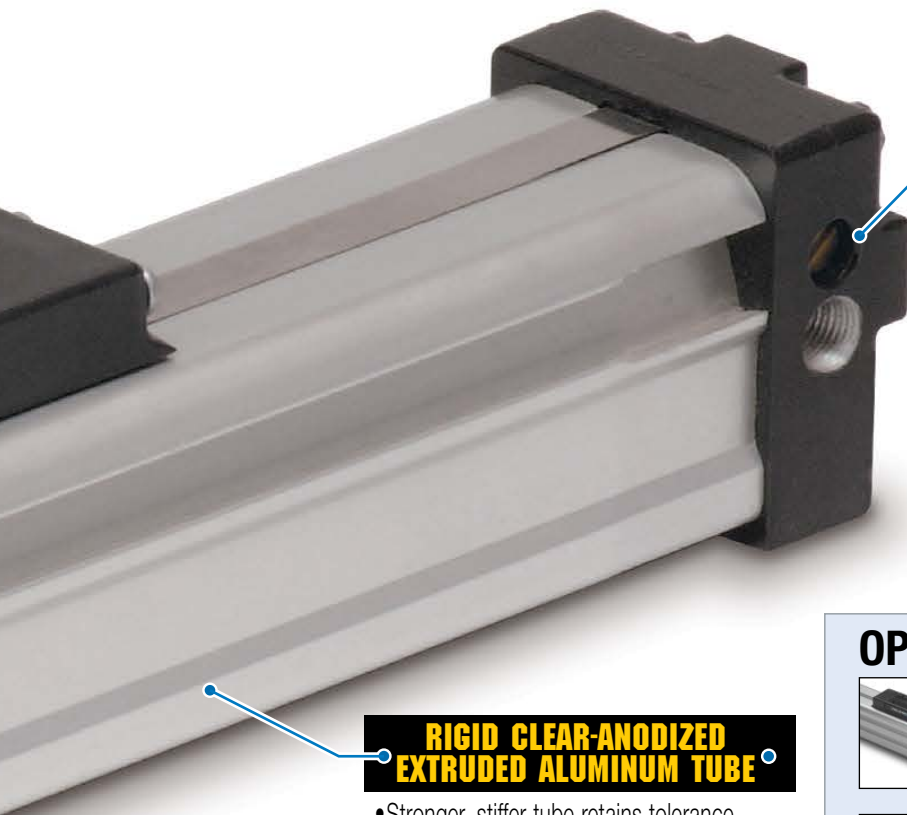
- Fatigue resistant stainless steel bands are specifically made to provide longer life and will not elongate, like elastomers
- Outer band keeps out contaminants for extended performance
- Inner band provides a smooth surface for less seal wear



### ● FORMED END CAP WIPER SEAL ●

- Keeps contaminants from entering the sealing area
- Protects internal components
- Reduces maintenance while increasing productivity

# TOLOMATIC...THE RODLESS CYLINDER LEADER



## ADJUSTABLE CUSHIONS

- Adjustable cushions are standard, not optional
- Easy screw adjustment for end-of-stroke deceleration
- Protects actuator and load from damage

## RIGID CLEAR-ANODIZED EXTRUDED ALUMINUM TUBE

- Stronger, stiffer tube retains tolerance specifications when chamber is pressurized
- Keeps sealing band in place for maximized air efficiency
- Tube supports are minimized
- Solid structural support provides durability and long life performance

## OPTIONS



### AUXILIARY CARRIER

- Substantially higher load capacity
- Substantially higher bending moment capacity



### LONG CARRIER

- Substantially higher  $M_y$  and  $M_z$  bending moment capacity
- Larger load bearing mounting surface



### FLOATING MOUNT

- Compensates for non-parallelism between band cylinder and externally guided load



### TUBE SUPPORT MOUNTS

- Used for intermediate support



### FOOT MOUNTS

- For end mounting of band cylinder



### SHOCK ABSORBERS

- Smooth deceleration, higher productivity
- Allows increased operating speed
- Self-compensates for load or speed changes
- Minimizes impact load to equipment
- Adjustable position shocks available



### SINGLE END PORTING

- Simplifies air connections



### SWITCHES

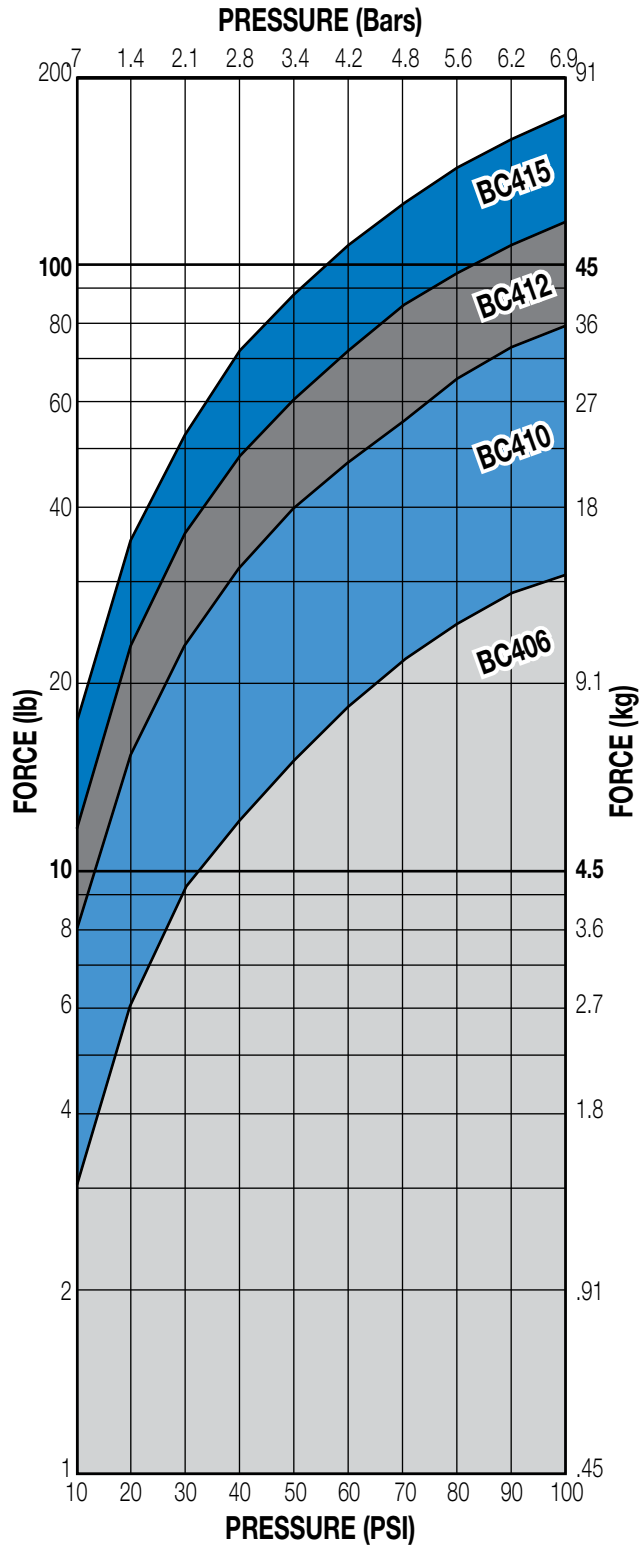
- Available in Reed, Hall-effect and Triac
- 15ft. cable with flying leads; available with quick-disconnect couplers



# BC4 Internal Bearing Rodless Cylinder

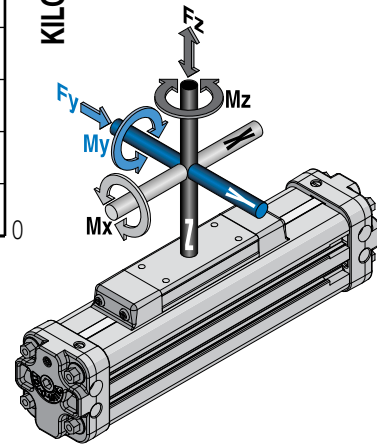
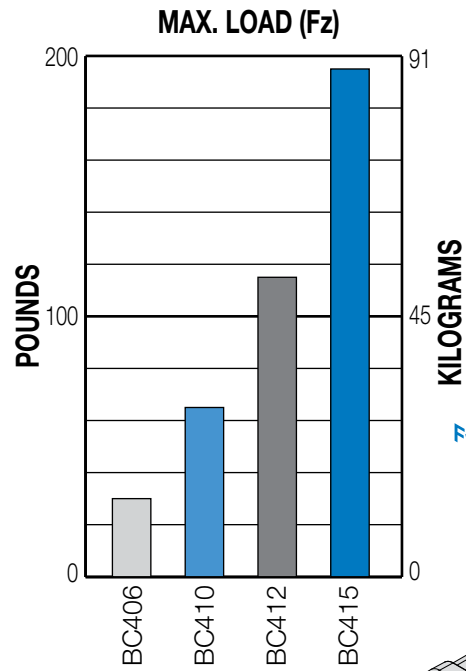
## PERFORMANCE

### BC4 THEORETICAL FORCE vs PRESSURE

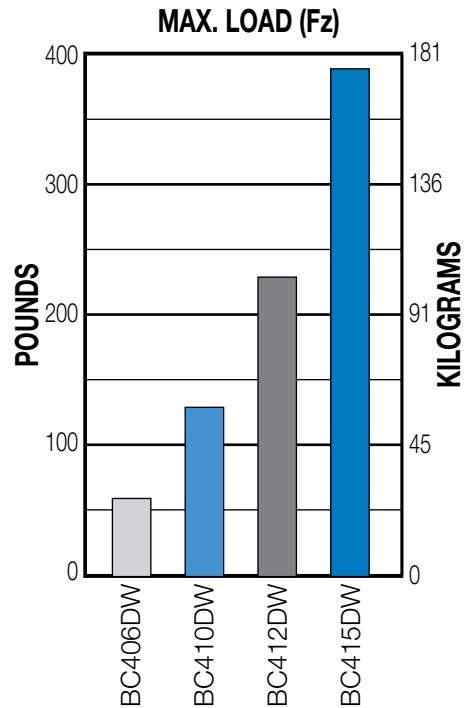


### BC4 MAX. LOAD

#### STANDARD ACTUATOR



#### AUXILIARY CARRIER OPTION

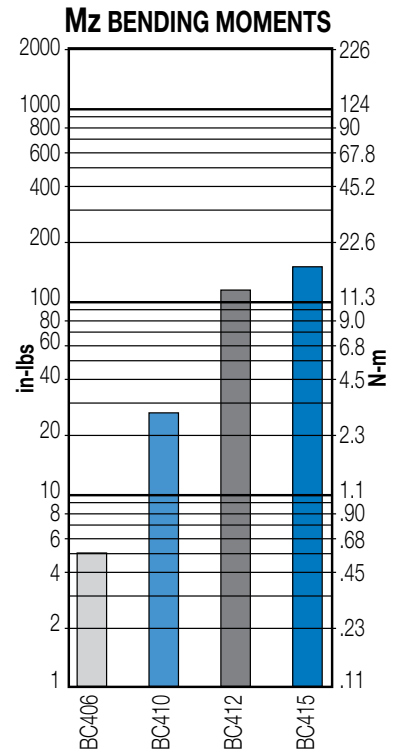
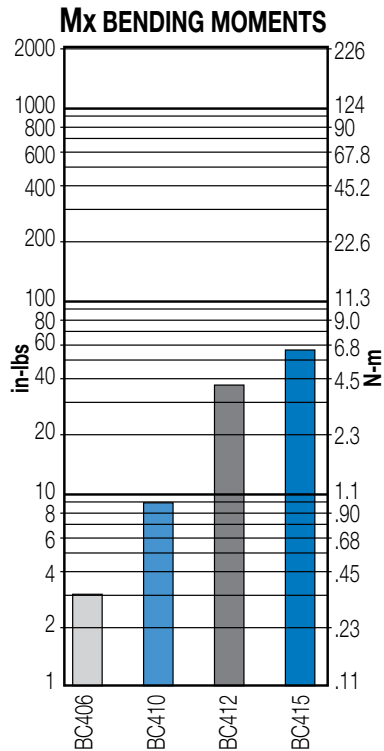
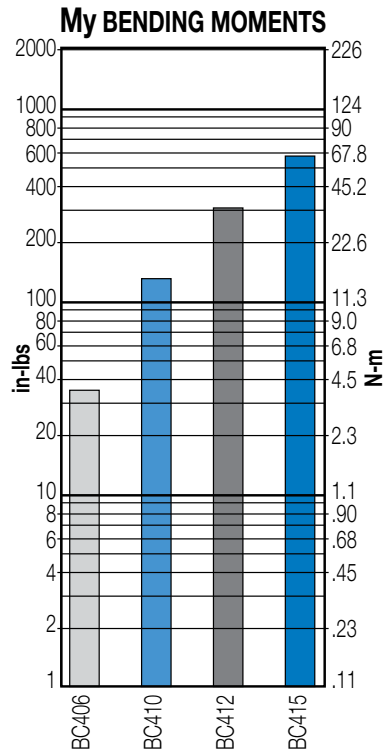


# BC4 Internal Bearing Rodless Cylinder

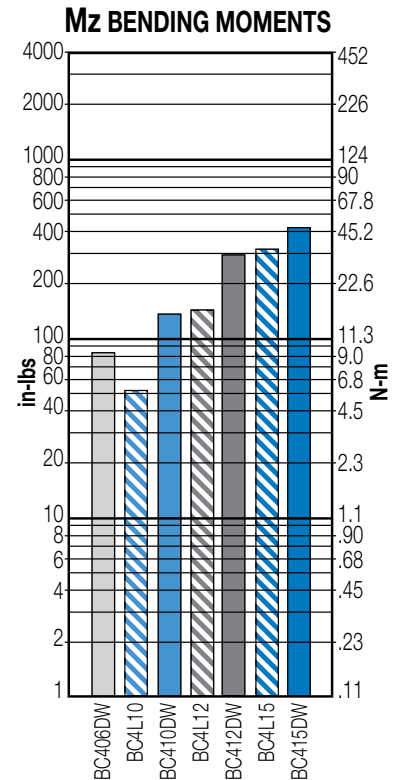
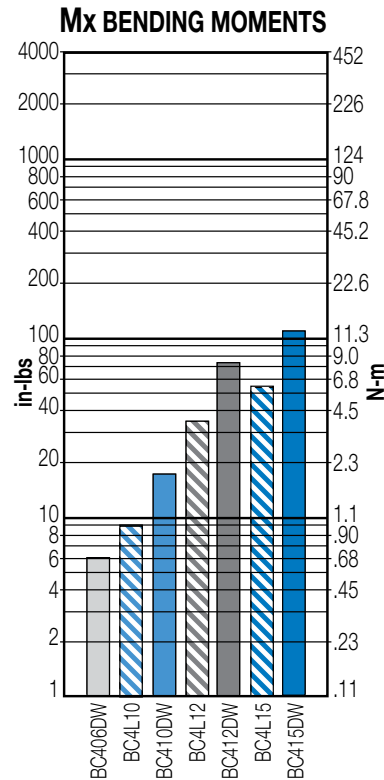
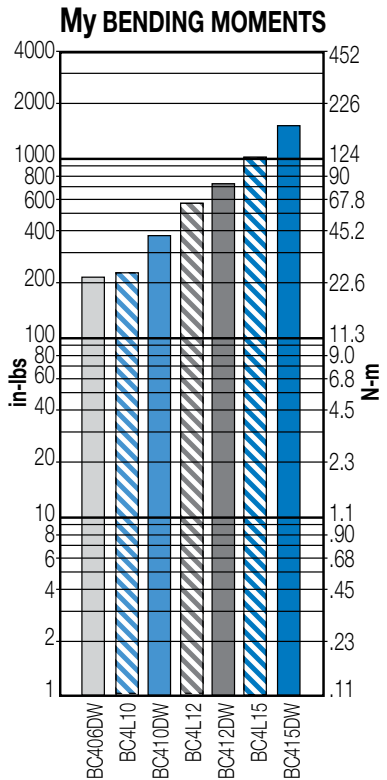
## PERFORMANCE

### BC4 BENDING MOMENTS AND LOAD

#### STANDARD ACTUATOR



#### AUXILIARY CARRIER & LONG CARRIER OPTIONS



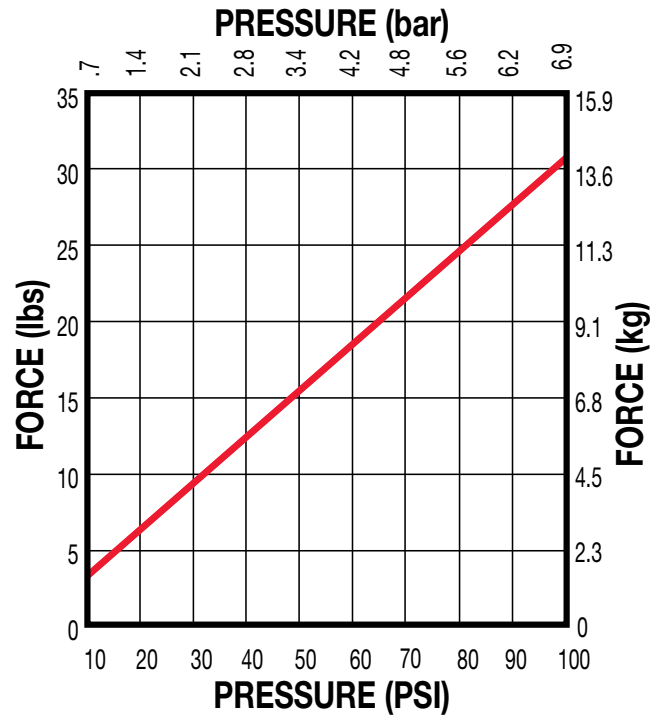
\*Auxiliary carrier bending moments indicated are at minimum center to center distance. Additional My + Mz load capacity can be obtained by increasing "D" dimension. Refer to auxiliary carrier data on page BC4\_16.

# BC406 Internal Bearing Rodless Cylinder

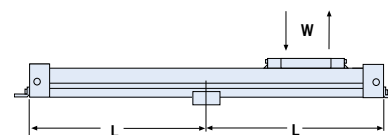
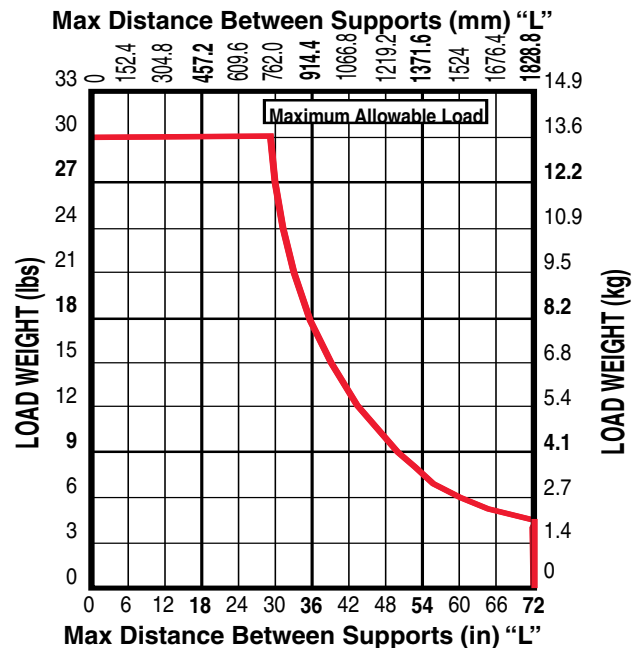
## PERFORMANCE

| BC406                                                                             |        |
|-----------------------------------------------------------------------------------|--------|
|  |        |
| BC406 OPTIONS                                                                     | Page   |
| Auxiliary Carrier                                                                 | BC4_16 |
| Floating Mount Bracket                                                            | BC4_21 |
| Foot Mounts                                                                       | BC4_19 |
| Long Carrier                                                                      | BC4_14 |
| Shock Absorbers                                                                   | BC4_24 |
| Switches                                                                          | BC4_22 |
| Tube Supports                                                                     | BC4_20 |
| MORE INFORMATION                                                                  | Page   |
| Application Guidelines                                                            | BC4_28 |
| Cushion Needle Adjustment                                                         | BC4_28 |
| Ordering                                                                          | BC4_30 |
| Selection                                                                         | BC4_27 |

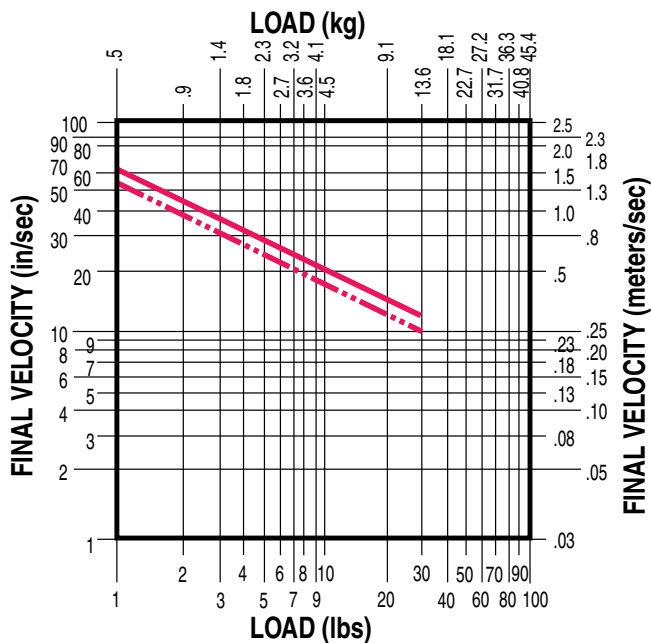
## THEORETICAL FORCE vs PRESSURE



## TUBE SUPPORT REQUIREMENTS



## CUSHION DATA



### NOTE:

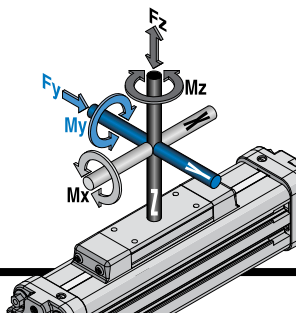
- Max. for any application
- - - Max. for continuously cycled application

## DIMENSIONS

[illegible]

Dimensions in inches [brackets indicate dimensions in millimeters]

## BC406 BENDING MOMENTS AND LOAD



|        | BORE SIZE | MAX. BENDING MOMENT |            |            | MAX. LOAD |
|--------|-----------|---------------------|------------|------------|-----------|
|        |           | My                  | Mx         | Mz         | Fz        |
| U.S.   | 0.625 in  | 35 in-lbs           | 3.0 in-lbs | 5.0 in-lbs | 30.0 lbs  |
| Metric | 16 mm     | 3.95 N-m            | 0.34 N-m   | 0.56 N-m   | 13.61 kg  |

|        | BORE SIZE | WEIGHT  |                    | MAX. STROKE LENGTH* | MAX. PRESSURE | TEMPERATURE RANGE |
|--------|-----------|---------|--------------------|---------------------|---------------|-------------------|
|        |           | BASE    | PER UNIT OF STROKE |                     |               |                   |
| U.S.   | 0.625 in  | 0.68 lb | 0.063 lb/in        | 206 in              | 100 PSI       | 20° to 140° F     |
| Metric | 16 mm     | 0.31 kg | 0.028 kg/mm        | 5232 mm             | 6.895 bar     | -7° to 60° C      |

**www.tolomatic.com**

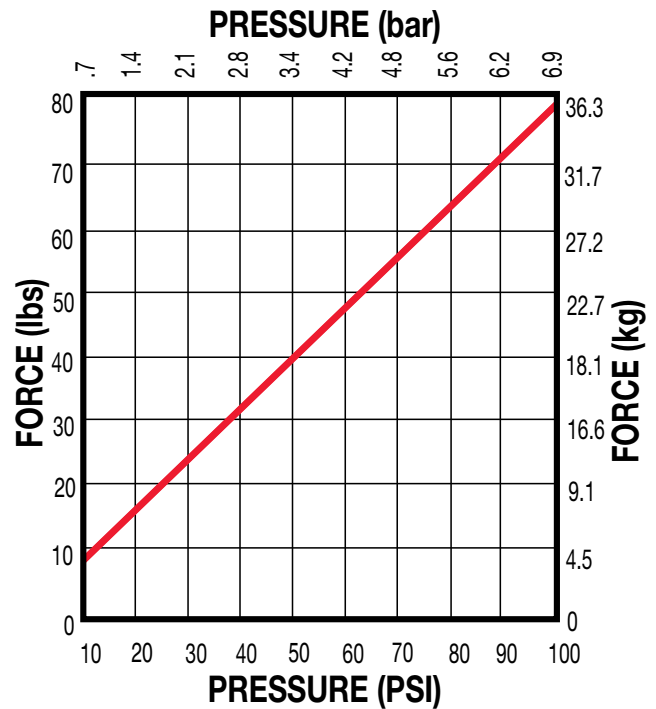


# BC410 Internal Bearing Rodless Cylinder

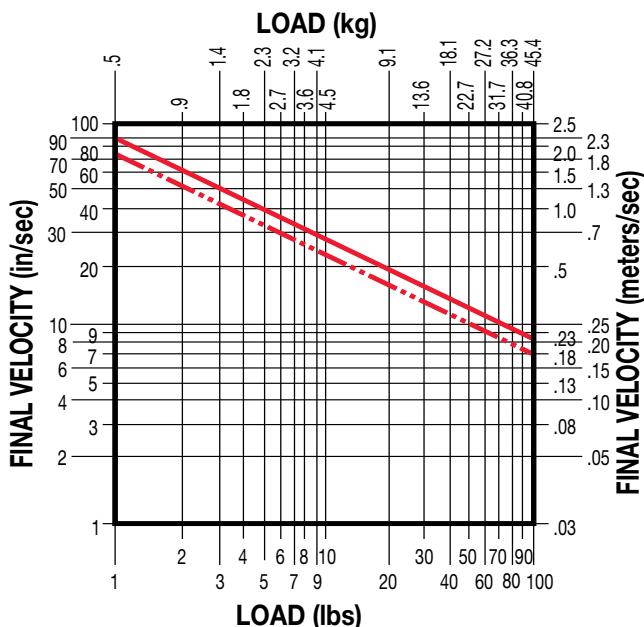
## PERFORMANCE

| BC410                                                                             |        |
|-----------------------------------------------------------------------------------|--------|
|  |        |
| BC410 OPTIONS                                                                     | Page   |
| Auxiliary Carrier                                                                 | BC4_16 |
| Floating Mount Bracket                                                            | BC4_21 |
| Foot Mounts                                                                       | BC4_19 |
| Long Carrier                                                                      | BC4_14 |
| Shock Absorbers                                                                   | BC4_24 |
| Single End Porting                                                                | BC4_18 |
| Switches                                                                          | BC4_22 |
| Tube Supports                                                                     | BC4_20 |
| MORE INFORMATION                                                                  | Page   |
| Application Guidelines                                                            | BC4_28 |
| Cushion Needle Adjustment                                                         | BC4_28 |
| Ordering                                                                          | BC4_30 |
| Selection                                                                         | BC4_27 |

## THEORETICAL FORCE vs PRESSURE



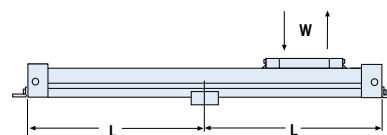
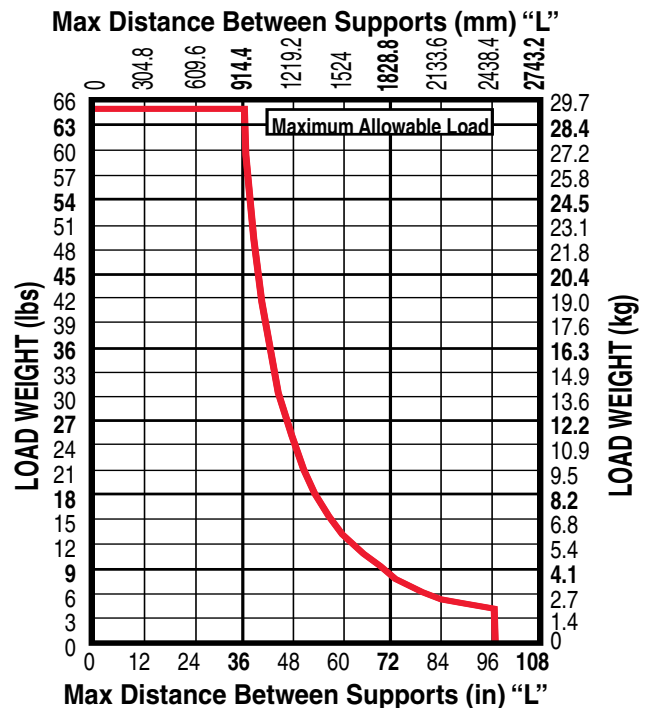
## CUSHION DATA



### NOTE:

- Max. for any application
- - - Max. for continuously cycled application

## TUBE SUPPORT REQUIREMENTS



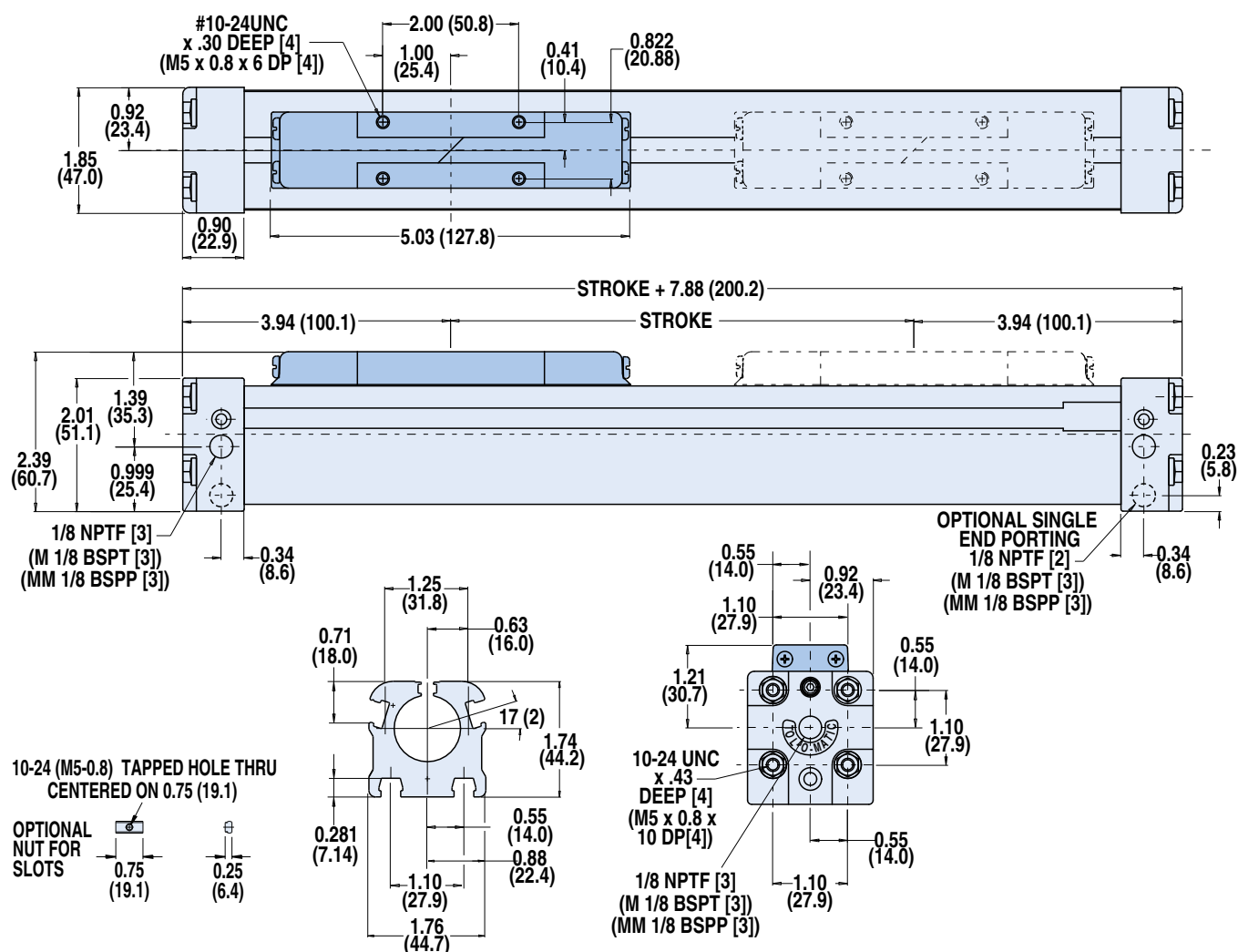
# BC410 Internal Bearing Rodless Cylinder

3D CAD available at  
www.tolomatic.com



## DIMENSIONS

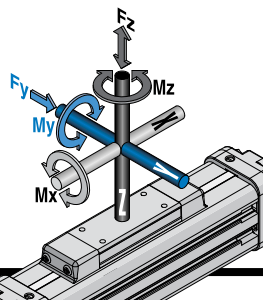
Always use configured CAD solid model  
to determine critical dimensions



Dimensions in inches (parenthesis indicate dimensions in millimeters)

## SPECIFICATIONS

### BC410 BENDING MOMENTS AND LOAD



|               | BORE SIZE | MAX. BENDING MOMENT |          |             | MAX. LOAD |
|---------------|-----------|---------------------|----------|-------------|-----------|
|               |           | My                  | Mx       | Mz          | Fz        |
| <b>U.S.</b>   | 1.00 in   | 132 in-lbs          | 9 in-lbs | 27.0 in-lbs | 65 lbs    |
| <b>Metric</b> | 25 mm     | 14.91 N-m           | 1.02 N-m | 3.05 N-m    | 29.48 kg  |

|               | BORE SIZE | WEIGHT   |                    | MAX. STROKE LENGTH* | MAX. PRESSURE | TEMPERATURE RANGE |
|---------------|-----------|----------|--------------------|---------------------|---------------|-------------------|
|               |           | BASE     | PER UNIT OF STROKE |                     |               |                   |
| <b>U.S.</b>   | 1.00 in   | 2.36 lbs | 0.17 lbs/in        | 205 in              | 100 PSI       | 20° to 140° F     |
| <b>Metric</b> | 25 mm     | 1.07 kg  | 0.0771 kg/mm       | 5207 mm             | 6.895 bar     | -7° to 60° C      |

**\*For longer strokes, alternate materials, mounting and/or fasteners – consult Tolomatic**

# BC412 Internal Bearing Rodless Cylinder

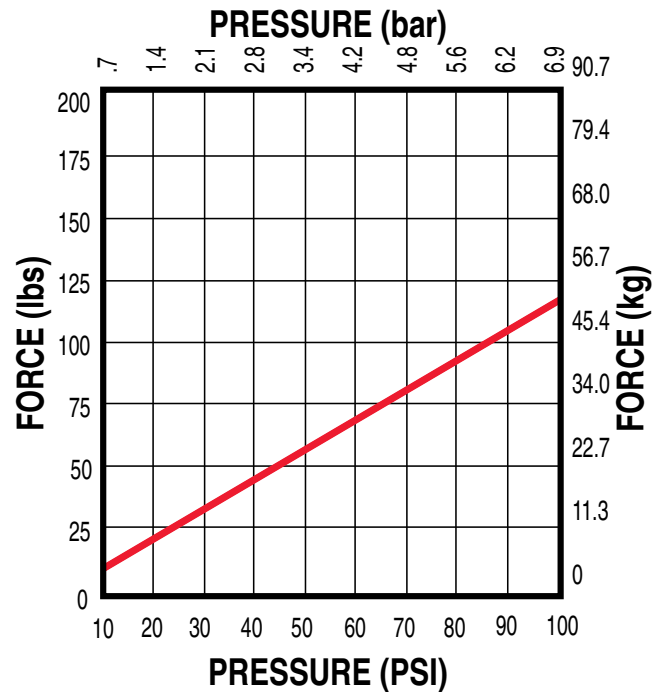
## PERFORMANCE

BC412

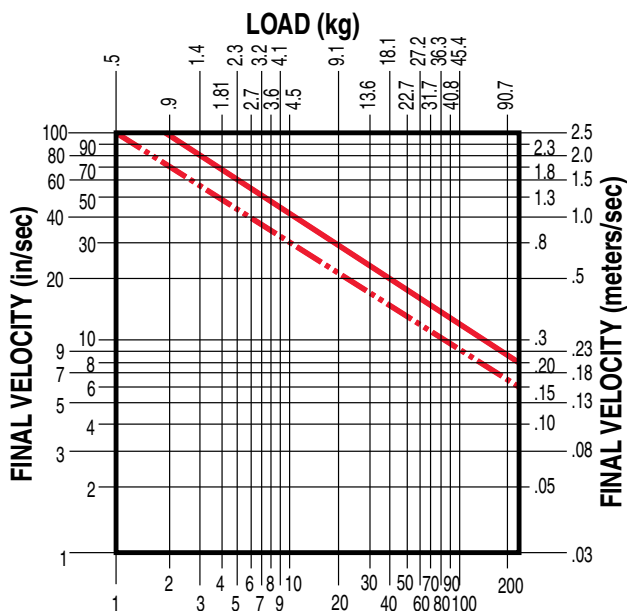


| BC412 OPTIONS             | Page   |
|---------------------------|--------|
| Auxiliary Carrier         | BC4_16 |
| Floating Mount Bracket    | BC4_21 |
| Foot Mounts               | BC4_19 |
| Long Carrier              | BC4_14 |
| Shock Absorbers           | BC4_24 |
| Single End Porting        | BC4_18 |
| Switches                  | BC4_22 |
| Tube Supports             | BC4_20 |
| MORE INFORMATION          | Page   |
| Application Guidelines    | BC4_28 |
| Cushion Needle Adjustment | BC4_28 |
| Ordering                  | BC4_30 |
| Selection                 | BC4_27 |

## THEORETICAL FORCE vs PRESSURE



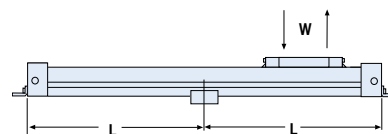
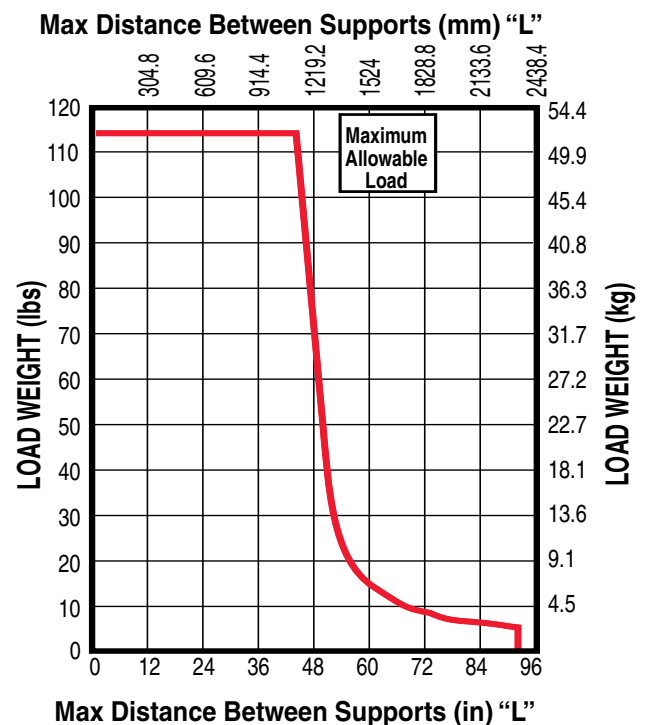
## CUSHION DATA



### NOTE:

- Max. for any application
- ..... Max. for continuously cycled application

## TUBE SUPPORT REQUIREMENTS



## DIMENSIONS



Technical drawing of the 1/2" NPTF x 10 DP (M16-1 X 10 DP) hydraulic cylinder, showing front, side, and end views with dimensions in inches and millimeters.

**Front View Dimensions:**

- Overall Length: 5.21 (132.3)
- Stroke: 2.60 (66.0)
- Stroke + 9.73 (247.1)
- End Porting: 1.75 (44.4)
- End Porting (Optional): 0.88 (22.4)
- End Porting (Optional): 0.71 (18.0)
- End Porting (Optional): 0.38 (9.7)
- End Porting (Optional): 1.42 (36.1)
- End Porting (Optional): 0.75 (19.0)
- End Porting (Optional): 1.19 (30.2)
- End Porting (Optional): 1.33 (33.8)

**Side View Dimensions:**

- Stroke: 4.87 (123.7)
- Stroke + 9.73 (247.1)
- Stroke: 4.87 (123.7)
- End Porting: 0.33 (8.4)
- End Porting (Optional): 0.66 (16.8)
- End Porting (Optional): 1.05 (26.7)
- End Porting (Optional): 2.61 (66.3)
- End Porting (Optional): 0.336 (8.53)
- End Porting (Optional): 3.06 (77.7)

**End View Dimensions:**

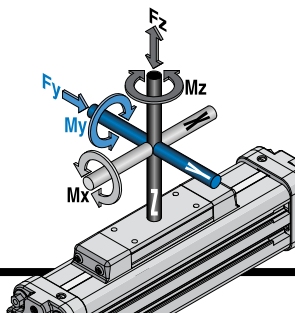
- Stroke: 1.62 (41.1)
- Stroke + 9.73 (247.1)
- Stroke: 1.62 (41.1)
- End Porting: 0.81 (20.6)
- End Porting (Optional): 1.19 (30.2)
- End Porting (Optional): 1.62 (41.1)
- End Porting (Optional): 2.38 (60.5)
- End Porting (Optional): 0.58 (14.7)
- End Porting (Optional): 0.11 (2.8)
- End Porting (Optional): 0.44 (11.2)
- End Porting (Optional): 0.61 (15.5)
- End Porting (Optional): 1.62 (41.1)

**Other Dimensions:**

- 10-24 (M5-0.8) TAPPED HOLE THRU CENTERED ON 0.75 (19.1)
- OPTIONAL NUT FOR SLOTS
- 1/4-20 X .375 DP [4] (M6-1 X 10 DP [4])
- 1/4-18 NPTF BOTH SIDES (M 1/4-19 BSPT BOTH SIDES) (MM 1/4-19 BSPP BOTH SIDES)
- Ø .19 (4.8) THRU TO BORE
- 1/4-20 X .47 DP [4] (M6-1 X 12 DP [4])
- OPTIONAL SINGLE 1/4 NPTF [2] END PORTING (M 1/4 BSPT [2]) (MM 1/4 BSPP [2])
- 10.00° 1.45 (36.8)
- 0.84 (21.3)
- 2.14 (54.4)
- 0.281 (7.14)
- 0.63 (16.0)
- 0.90 (22.9)
- 1.08 (27.4)
- 1.53 (38.9)
- 2.16 (54.9)

Dimensions in inches (parenthesis indicate dimensions in millimeters)

## BC412 BENDING MOMENTS AND LOAD



|        | BORE<br>SIZE | MAX. BENDING MOMENT |           |            | MAX. LOAD |
|--------|--------------|---------------------|-----------|------------|-----------|
|        |              | My                  | Mx        | Mz         | Fz        |
| U.S.   | 1.25 in      | 318 in-lbs          | 36 in-lbs | 120 in-lbs | 115 lbs   |
| Metric | 32 mm        | 35.93 N-m           | 3.95 N-m  | 13.56 N-m  | 52.16 kg  |

|        | BORE<br>SIZE | WEIGHT   |                    | MAX. STROKE<br>LENGTH* | MAX.<br>PRESSURE | TEMPERATURE<br>RANGE |
|--------|--------------|----------|--------------------|------------------------|------------------|----------------------|
|        |              | BASE     | PER UNIT OF STROKE |                        |                  |                      |
| U.S.   | 1.25 in      | 3.98 lbs | 0.27 lbs/in        | 204 in                 | 100 PSI          | 20° to 140° F        |
| Metric | 32 mm        | 1.81 kg  | 0.1225 kg/mm       | 5182 mm                | 6.895 bar        | -7° to 60° C         |

**\*For longer strokes, alternate materials, mounting and/or fasteners – consult Tolomatic**

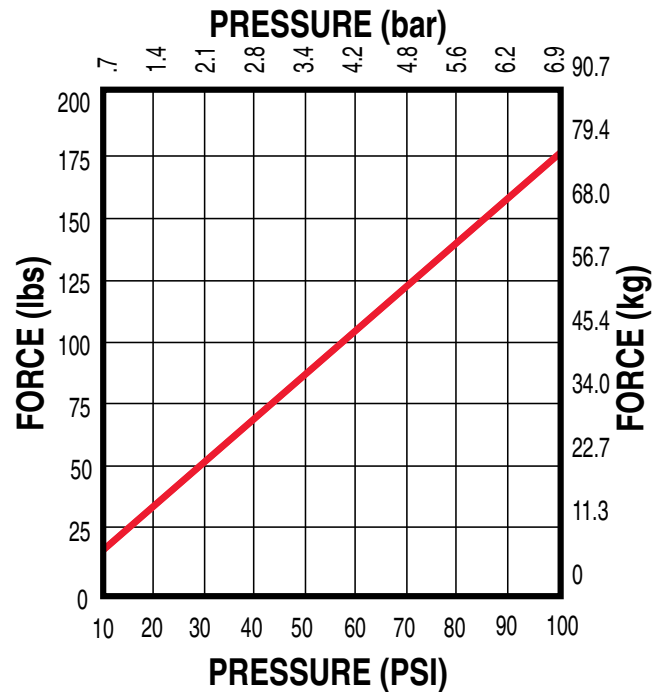


# BC415 Internal Bearing Rodless Cylinder

## PERFORMANCE

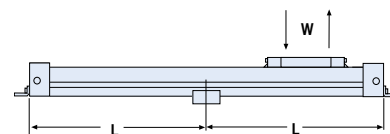
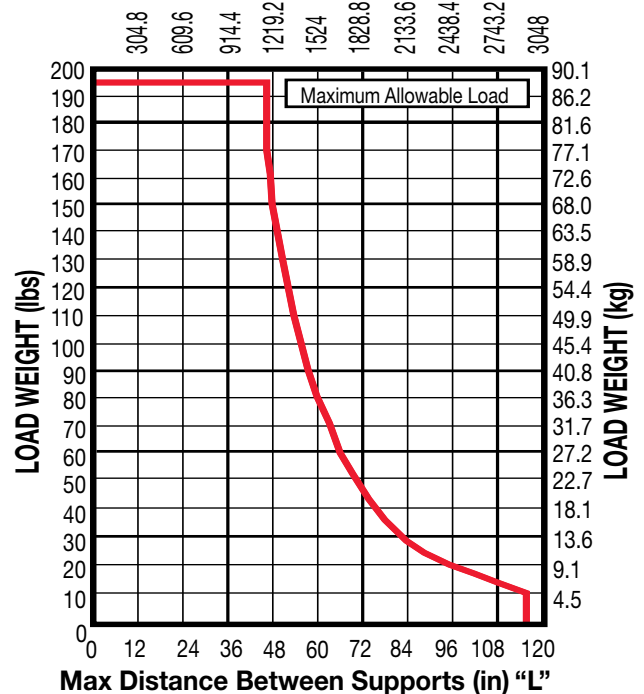
| BC415                                                                             |        |
|-----------------------------------------------------------------------------------|--------|
|  |        |
| BC415 OPTIONS                                                                     | Page   |
| Auxiliary Carrier                                                                 | BC4_16 |
| Floating Mount Bracket                                                            | BC4_21 |
| Foot Mounts                                                                       | BC4_19 |
| Long Carrier                                                                      | BC4_14 |
| Shock Absorbers                                                                   | BC4_24 |
| Single End Porting                                                                | BC4_18 |
| Switches                                                                          | BC4_22 |
| Tube Supports                                                                     | BC4_20 |
| MORE INFORMATION                                                                  | Page   |
| Application Guidelines                                                            | BC4_28 |
| Cushion Needle Adjustment                                                         | BC4_28 |
| Ordering                                                                          | BC4_30 |
| Selection                                                                         | BC4_27 |

## THEORETICAL FORCE vs PRESSURE

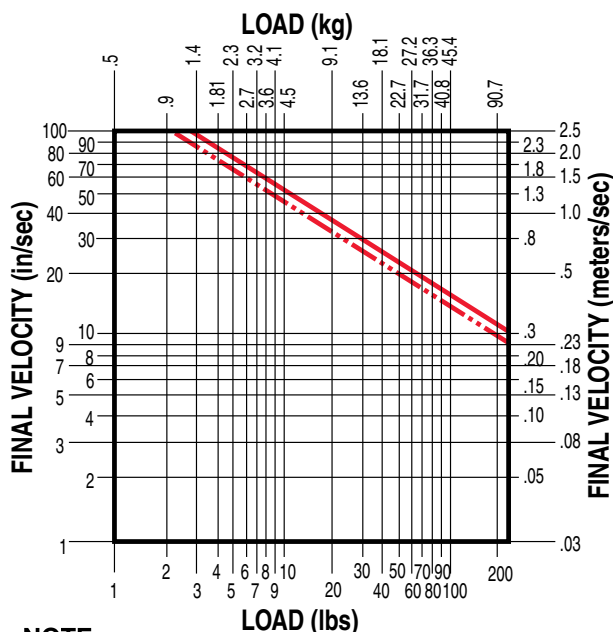


## TUBE SUPPORT REQUIREMENTS

### Max Distance Between Supports (mm) "L"



## CUSHION DATA



### NOTE:

- Max. for any application
- ..... Max. for continuously cycled application

## DIMENSIONS

[illegible]

Dimensions in inches (parenthesis indicate dimensions in millimeters)

## SPECIFICATIONS

A diagram of a robotic arm with a vertical Z-axis. A force vector  $F_z$  points upwards along the Z-axis. A moment vector  $M_z$  points along the Z-axis, indicated by a curved arrow. A force vector  $F_y$  points along the Y-axis, indicated by a curved arrow. A moment vector  $M_y$  points along the Y-axis, indicated by a curved arrow. A moment vector  $M_x$  points along the X-axis, indicated by a curved arrow. The arm is mounted on a base with a motor.

|        | BORE<br>SIZE | MAX. BENDING MOMENT |           |            | MAX. LOAD |
|--------|--------------|---------------------|-----------|------------|-----------|
|        |              | My                  | Mx        | Mz         | Fz        |
| U.S.   | 1.50 in      | 575 in-lbs          | 55 in-lbs | 156 in-lbs | 195 lbs   |
| Metric | 40 mm        | 64.97 N-m           | 6.21 N-m  | 17.63 N-m  | 88.45 kg  |

|        | BORE<br>SIZE | WEIGHT   |                    | MAX. STROKE<br>LENGTH* | MAX.<br>PRESSURE | TEMPERATURE<br>RANGE |
|--------|--------------|----------|--------------------|------------------------|------------------|----------------------|
|        |              | BASE     | PER UNIT OF STROKE |                        |                  |                      |
| U.S.   | 1.50 in      | 7.56 lbs | 0.41 lbs/in        | 202 in                 | 100 PSI          | 20° to 140° F        |
| Metric | 40 mm        | 3.43 kg  | 0.1860 kg/mm       | 5130 mm                | 6.895 bar        | -7° to 60° C         |

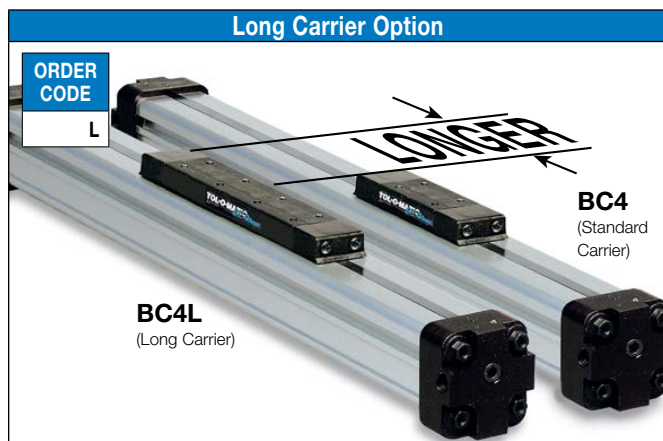
**\*For longer strokes, alternate materials, mounting and/or fasteners – consult Tolomatic**

# BC4 Long Carrier - All Sizes

3D CAD available at  
www.tolomatic.com



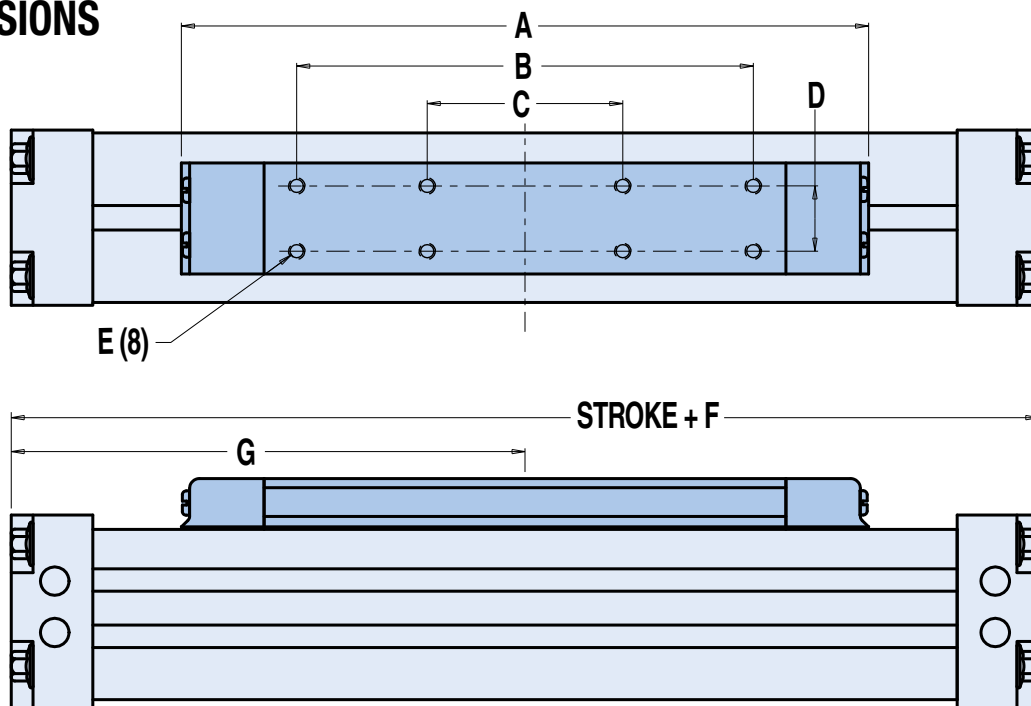
Always use configured CAD solid model  
to determine critical dimensions



**Long carrier option greatly increases the “My” and “Mz” moment load capacity.** This broadens the application range for these models. Other benefits include larger mounting surface and virtual elimination of chatter for vertical cantilever loads.

**NOTE:** Not available for BC406/BC4M06 size

## DIMENSIONS



|            | BORE | A     | B*   | C*   | D    | E               | F <sup>§</sup> | G    |
|------------|------|-------|------|------|------|-----------------|----------------|------|
| <b>L10</b> | 1.00 | 8.03  | 4.75 | 2.00 | 0.82 | #10-24 x .30 DP | 10.63          | 5.31 |
| <b>L12</b> | 1.25 | 8.53  | 5.00 | 1.75 | 0.75 | 1/4-20 x .38 DP | 13.06          | 6.53 |
| <b>L15</b> | 1.50 | 10.53 | 7.00 | 3.00 | 1.00 | 1/4-20 x .38 DP | 15.75          | 7.88 |

Dimensions in inches

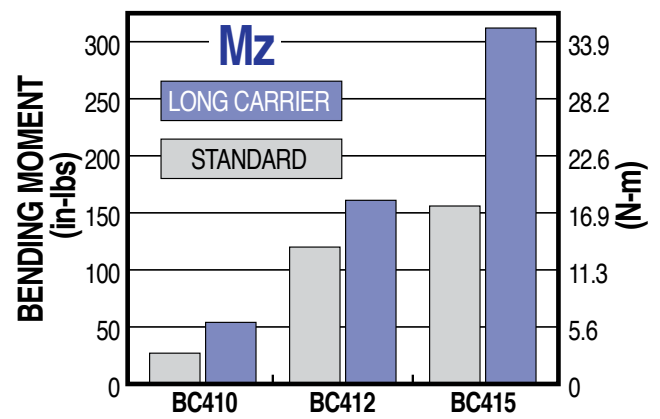
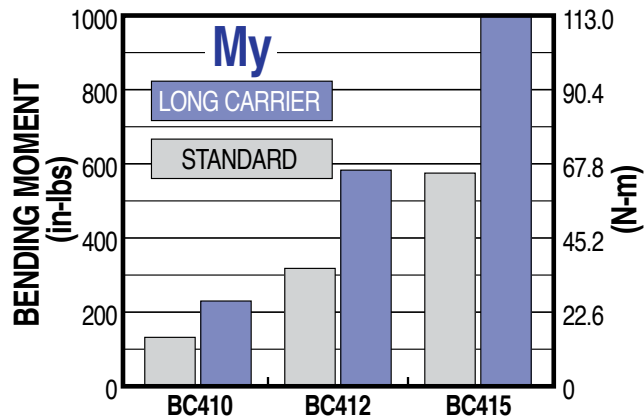
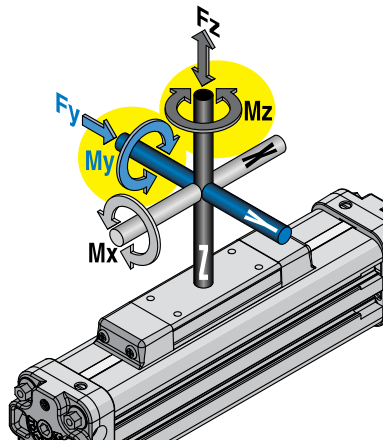
|            | BORE | A     | B*    | C*   | D    | E               | F <sup>§</sup> | G     |
|------------|------|-------|-------|------|------|-----------------|----------------|-------|
| <b>L10</b> | 25   | 204.0 | 120.7 | 50.8 | 20.9 | M5 x 0.8 x 6DP  | 270.0          | 134.9 |
| <b>L12</b> | 32   | 216.7 | 127.0 | 44.5 | 19.1 | M6 x 1.0 x 10DP | 331.7          | 165.8 |
| <b>L15</b> | 40   | 267.5 | 177.8 | 76.2 | 25.4 | M6 x 1.0 x 10DP | 400.1          | 200.0 |

Dimensions in millimeters

\*Not the same as standard BC4 carrier  
§Actuator is longer than with standard BC4 carrier

# BC4 Long Carrier - All Sizes

## PERFORMANCE



|     | BORE SIZE | MAXIMUM BENDING MOMENT |                      |             |               |                     | MAX. LOAD |
|-----|-----------|------------------------|----------------------|-------------|---------------|---------------------|-----------|
|     |           | My (Standard)          | My (Long)            | Mx†         | Mz (Standard) | Mz (Long)           | Fz†       |
| L10 | 1.00 in   | 132 in.-lbs.           | <b>230 in.-lbs.</b>  | 9 in.-lbs.  | 27 in.-lbs.   | <b>54 in.-lbs.</b>  | 65 lbs.   |
| L12 | 1.25 in   | 318 in.-lbs.           | <b>583 in.-lbs.</b>  | 36 in.-lbs. | 120 in.-lbs.  | <b>161 in.-lbs.</b> | 115 lbs.  |
| L15 | 1.50 in   | 575 in.-lbs.           | <b>1003 in.-lbs.</b> | 55 in.-lbs. | 156 in.-lbs.  | <b>312 in.-lbs.</b> | 195 lbs.  |

Dimensions in inches

|     | BORE SIZE | MAXIMUM BENDING MOMENT |                   |          |               |                  | MAX. LOAD |
|-----|-----------|------------------------|-------------------|----------|---------------|------------------|-----------|
|     |           | My (Standard)          | My (Long)         | Mx†      | Mz (Standard) | Mz (Long)        | Fz†       |
| L10 | 25mm      | 14.91 N-m              | <b>25.99 N-m</b>  | 1.02 N-m | 0.33 N-m      | <b>6.10 N-m</b>  | 29.48 kg  |
| L12 | 32mm      | 35.93 N-m              | <b>65.83 N-m</b>  | 3.95 N-m | 13.56 N-m     | <b>18.20 N-m</b> | 52.16 kg  |
| L15 | 40mm      | 64.97 N-m              | <b>113.36 N-m</b> | 6.21 N-m | 17.63 N-m     | <b>35.26 N-m</b> | 88.45 kg  |

Dimensions in millimeters

†Mx Bending Moment and Fz (Maximum Load) are the same for Standard and Long Carrier BC4.

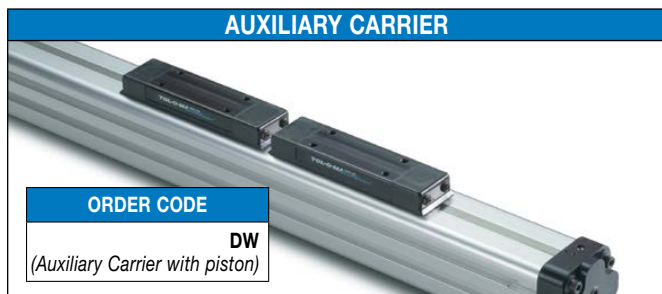


# BC4 Auxiliary Carrier - All Sizes

3D CAD available at  
www.tolomatic.com



Always use configured CAD solid model  
to determine critical dimensions



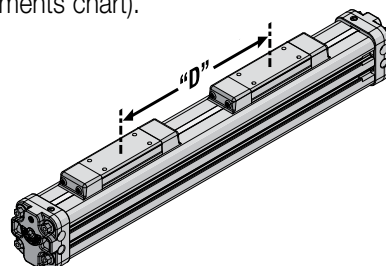
The auxiliary carrier option substantially increases load carrying and bending moments capacity over the standard single carrier models. As a general rule, the auxiliary carrier option is highly recommended in vertical applications (My) if the distance from the carrier mounting surface to the load center of gravity (CG) exceeds the overall length of the carrier. For the BC4 auxiliary carriers can only be ordered with "DW" an internal piston. (BC2 & BC3 auxiliary carriers may be ordered "DO" without a piston.)



NOTE: breakaway pressure will increase when using auxiliary carrier.

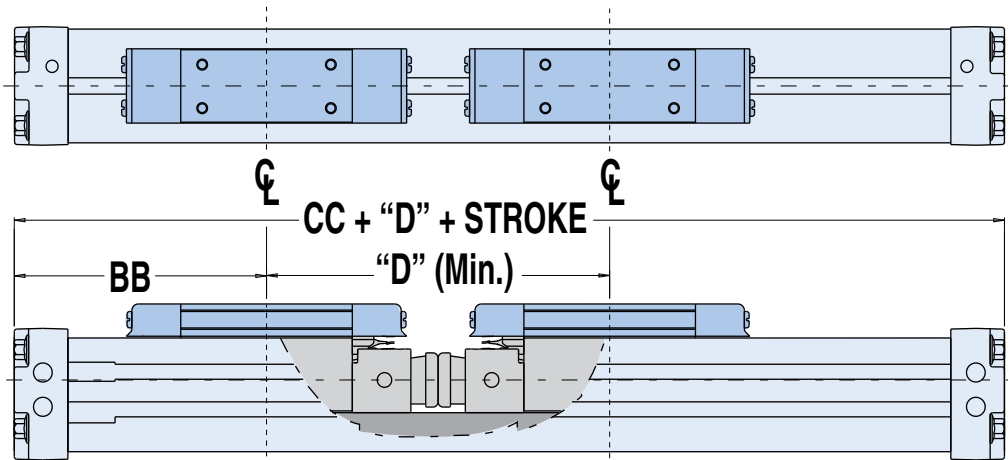
## ORDERING INFORMATION

When ordering, determine the minimum distance required between carriers (dimension "D" in Auxiliary Carrier Bending Moments chart).



Determine your working stroke and your "D" dimension, then enter these into your configuration string. (Example: BC415SK50.00DW15.00RT2) The configurator will calculate the overall length of the actuator.

## DIMENSIONS

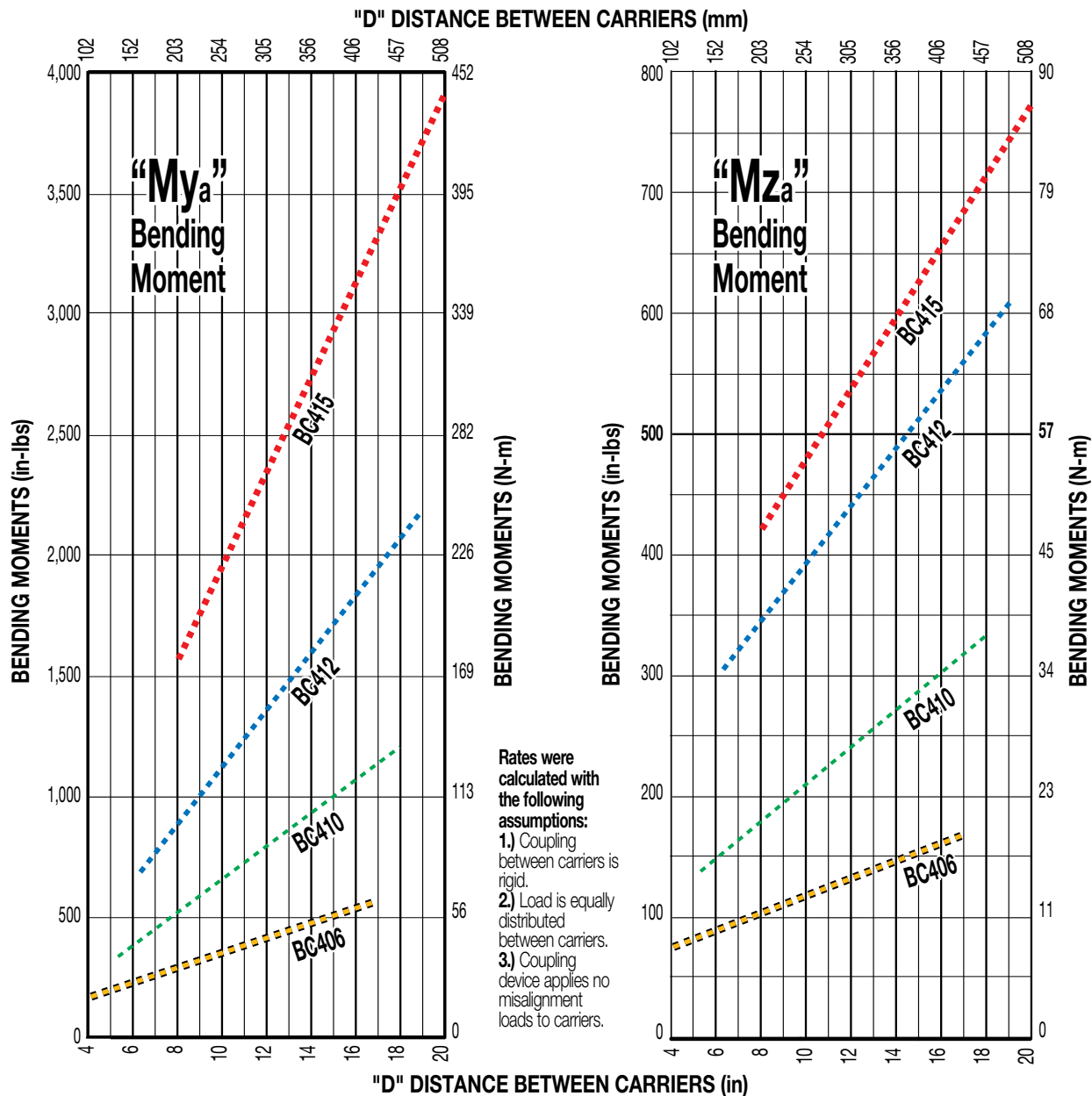


|           | BORE SIZE |    | BB   |       | CC    |       | "D" MINIMUM<br>(with Piston) |       |
|-----------|-----------|----|------|-------|-------|-------|------------------------------|-------|
|           | in        | mm | in   | mm    | in    | mm    | in                           | mm    |
| <b>06</b> | 0.625     | 16 | 3.15 | 79.9  | 6.30  | 159.8 | 4.26                         | 108.2 |
| <b>10</b> | 1.00      | 25 | 3.94 | 100.2 | 7.88  | 200.4 | 5.30                         | 134.6 |
| <b>12</b> | 1.25      | 32 | 4.87 | 123.7 | 9.74  | 247.4 | 6.23                         | 158.2 |
| <b>15</b> | 1.50      | 40 | 5.88 | 149.4 | 11.81 | 300.0 | 8.00                         | 203.2 |

# BC4 Auxiliary Carrier - All Sizes

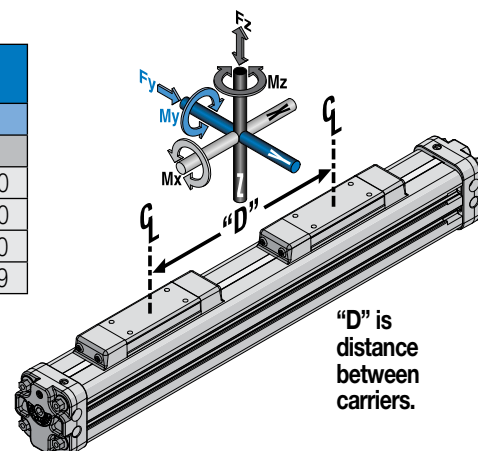
## PERFORMANCE

### BENDING MOMENTS

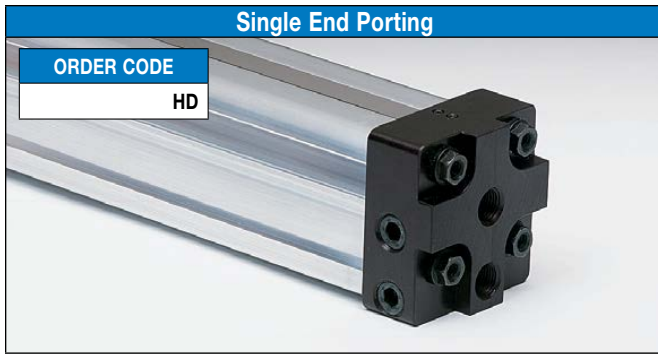


|    | BORE SIZE |    | “D” MINIMUM * |       | MAX. BENDING MOMENT |       | MAX. LOAD |       |
|----|-----------|----|---------------|-------|---------------------|-------|-----------|-------|
|    |           |    |               |       | (with Piston)       |       | Mx        |       |
|    | in        | mm | in            | mm    | in-lbs              | N-m   | lbs       | kg    |
| 06 | 0.625     | 16 | 4.26          | 108.2 | 6                   | 0.68  | 60        | 27.0  |
| 10 | 1.00      | 25 | 5.30          | 134.5 | 18                  | 2.03  | 130       | 59.0  |
| 12 | 1.25      | 32 | 6.23          | 158.2 | 72                  | 8.13  | 230       | 104.0 |
| 15 | 1.50      | 40 | 8.00          | 203.2 | 110                 | 12.43 | 390       | 176.9 |

\* "D" is distance between carriers



# BC4 Single End Porting - 10, 12, 15 Sizes

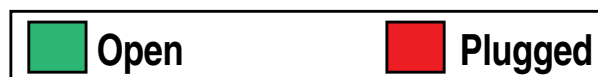
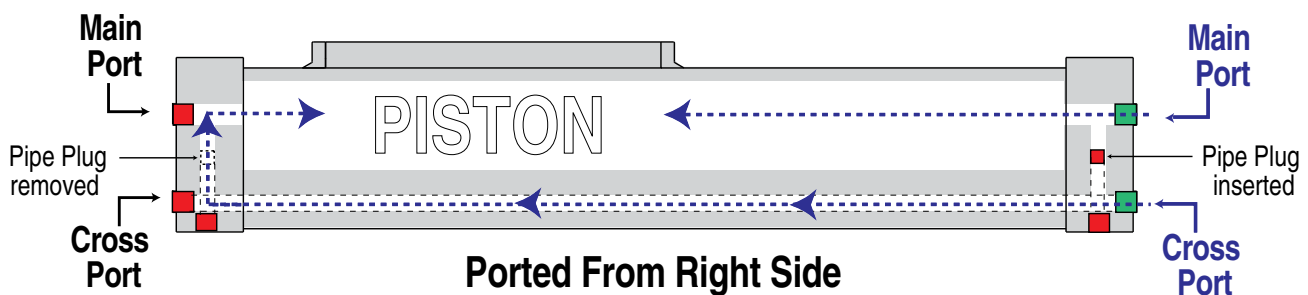
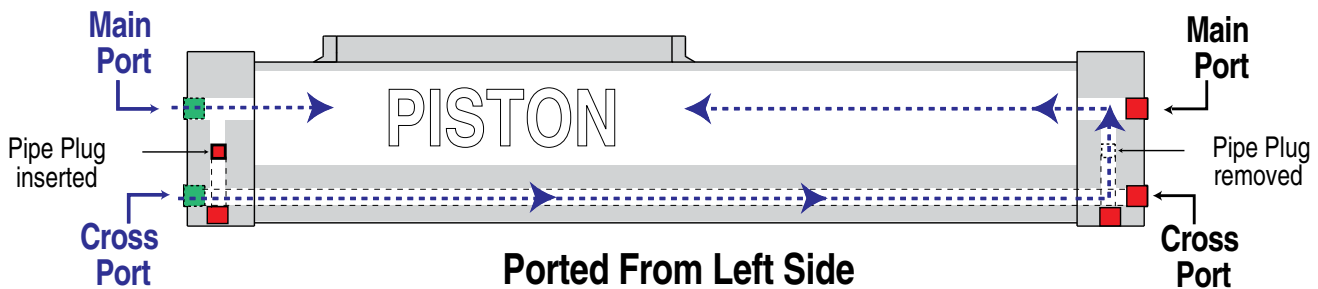
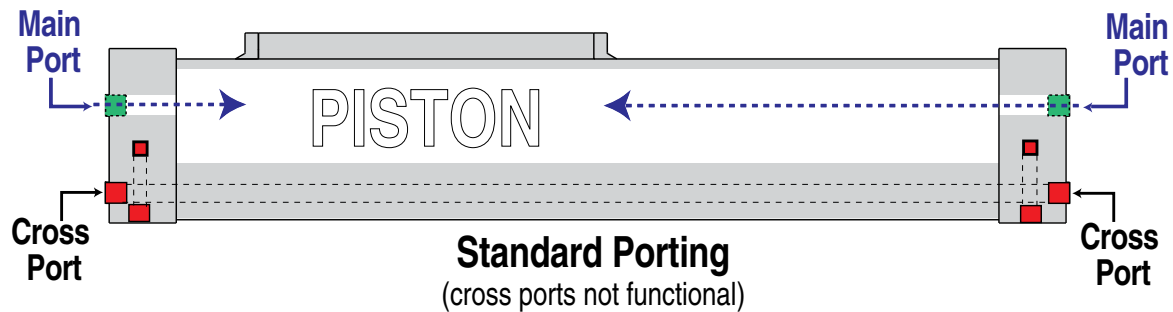


## SINGLE END PORTING ALLOWS THE GREATEST FLEXIBILITY IN AIR HOOK UP.

This option allows you to run air lines to just one end of the BC4, simplifying air hook up. The Single End Porting option for the BC410 is factory installed on the right side.

✗ Not available for 06 (5/8" bore).

## AIR FLOW DIAGRAMS



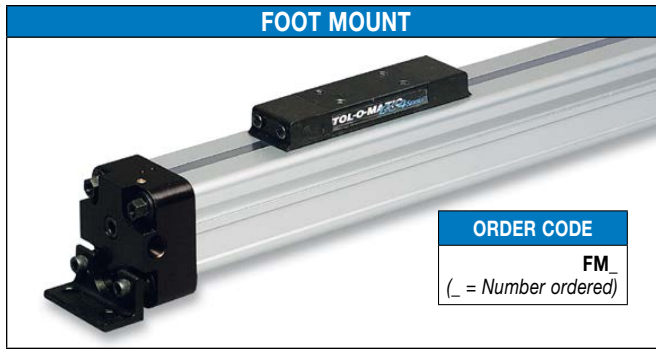
NOTE: Standard porting may be field converted to ported from left or ported from right. For complete instructions refer to parts sheet.

# BC4 Foot Mounts - ALL Sizes

3D CAD available at  
www.tolomatic.com



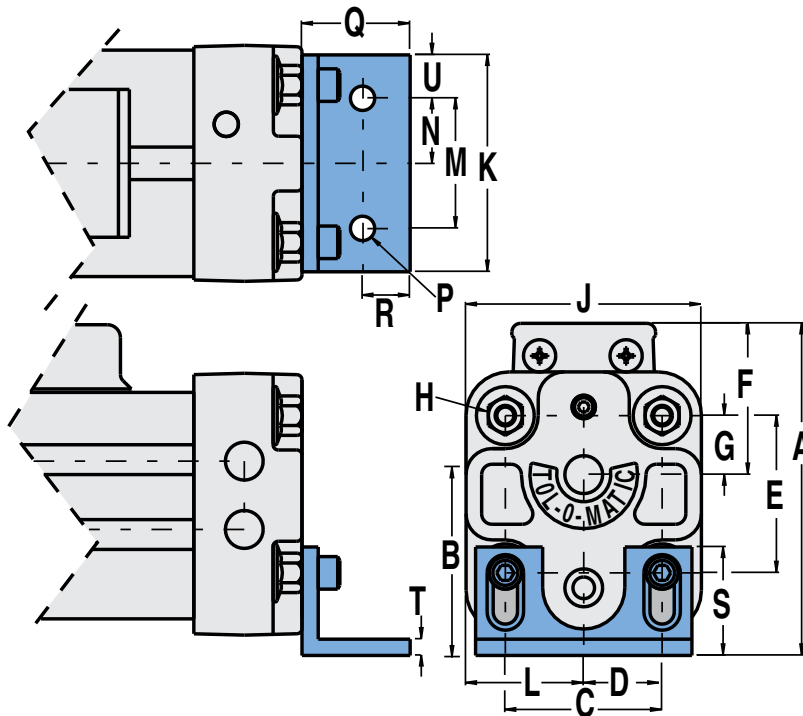
Always use configured CAD solid model  
to determine critical dimensions



For mounting other than flush. Foot mounts may be specified on one or both ends of the cylinder.

## DIMENSIONS

06, 10, 12, 15



|    | BORE SIZE | A MIN. | A MAX. | B    | C    | D    | E    | F    | G    | H                    | J    | K    | L    | M    | N    | P              | Q    | R    | S    | T    | U    |
|----|-----------|--------|--------|------|------|------|------|------|------|----------------------|------|------|------|------|------|----------------|------|------|------|------|------|
| 06 | 0.625     | 1.87   | 1.87   | 0.90 | 0.75 | 0.38 | 1.00 | 0.97 | 0.36 | —                    | 1.18 | 1.00 | 0.59 | 0.50 | 0.25 | Ø .15 Thru (2) | 0.70 | 0.30 | 0.38 | 0.06 | 0.25 |
| 10 | 1.00      | 2.19   | 2.54   | 0.98 | 1.10 | 0.55 | 1.10 | 1.21 | 0.55 | 10-24 $\nabla$ 0.43  | 1.85 | 1.60 | 0.92 | 1.00 | 0.50 | Ø .27 Thru (2) | 1.00 | 0.28 | 0.98 | 0.19 | 0.30 |
| 12 | 1.25      | 2.93   | 3.20   | 1.46 | 1.62 | 0.81 | 1.62 | 1.47 | 0.61 | 1/4-20 $\nabla$ 0.47 | 2.38 | 2.25 | 1.19 | 1.50 | 0.75 | Ø .28 Thru (2) | 1.00 | 0.40 | 1.00 | 0.19 | 0.38 |
| 15 | 1.50      | 3.38   | 3.83   | 1.64 | 1.81 | 0.91 | 1.81 | 1.74 | 0.68 | 1/4-20 $\nabla$ 0.47 | 2.72 | 2.50 | 1.36 | 1.50 | 0.75 | Ø .28 Thru (2) | 1.25 | 0.55 | 1.25 | 0.19 | 0.50 |

Dimensions in inches

|    | BORE SIZE | A MIN. | A MAX. | B    | C    | D    | E    | F    | G    | H              | J    | K    | L    | M    | N    | P              | Q    | R    | S    | T   | U     |
|----|-----------|--------|--------|------|------|------|------|------|------|----------------|------|------|------|------|------|----------------|------|------|------|-----|-------|
| 06 | 16        | 47.5   | 47.5   | 22.9 | 19.1 | 9.7  | 25.4 | 24.6 | 9.1  | —              | 30.0 | 25.4 | 15.0 | 12.7 | 6.3  | Ø 3.8 Thru (2) | 17.8 | 7.6  | 9.7  | 1.5 | 6.35  |
| 10 | 25        | 55.6   | 64.5   | 24.9 | 27.9 | 14.0 | 27.9 | 30.8 | 14.0 | M5 $\nabla$ 10 | 47.0 | 40.6 | 23.4 | 25.4 | 12.7 | Ø 6.9 Thru (2) | 25.4 | 7.0  | 24.9 | 4.8 | 7.62  |
| 12 | 32        | 74.3   | 81.3   | 37.1 | 41.1 | 20.6 | 41.1 | 37.3 | 15.5 | M6 $\nabla$ 12 | 60.5 | 57.1 | 30.2 | 38.1 | 19.1 | Ø 7.1 Thru (2) | 25.4 | 10.2 | 25.4 | 4.8 | 9.65  |
| 15 | 40        | 85.9   | 97.3   | 41.7 | 46.0 | 23.1 | 46.0 | 44.2 | 17.3 | M6 $\nabla$ 12 | 69.1 | 63.5 | 34.5 | 38.1 | 19.1 | Ø 7.1 Thru (2) | 31.8 | 14.0 | 31.8 | 4.8 | 12.70 |

Dimensions in millimeters



# BC4 Tube Supports - ALL Sizes

3D CAD available at  
www.tolomatic.com



Always use configured CAD solid model  
to determine critical dimensions



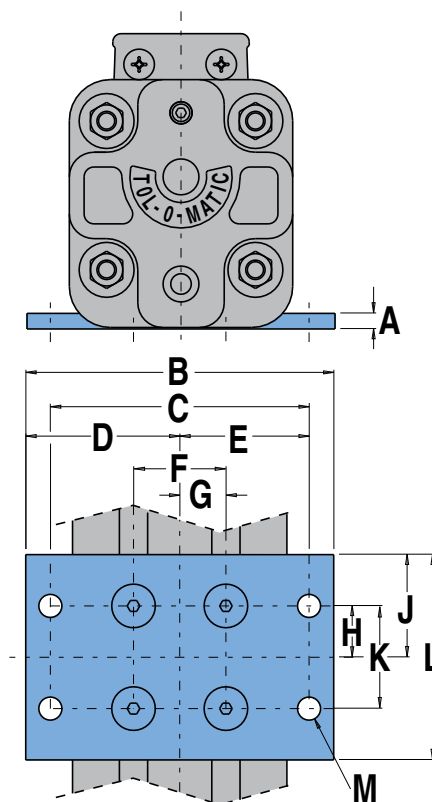
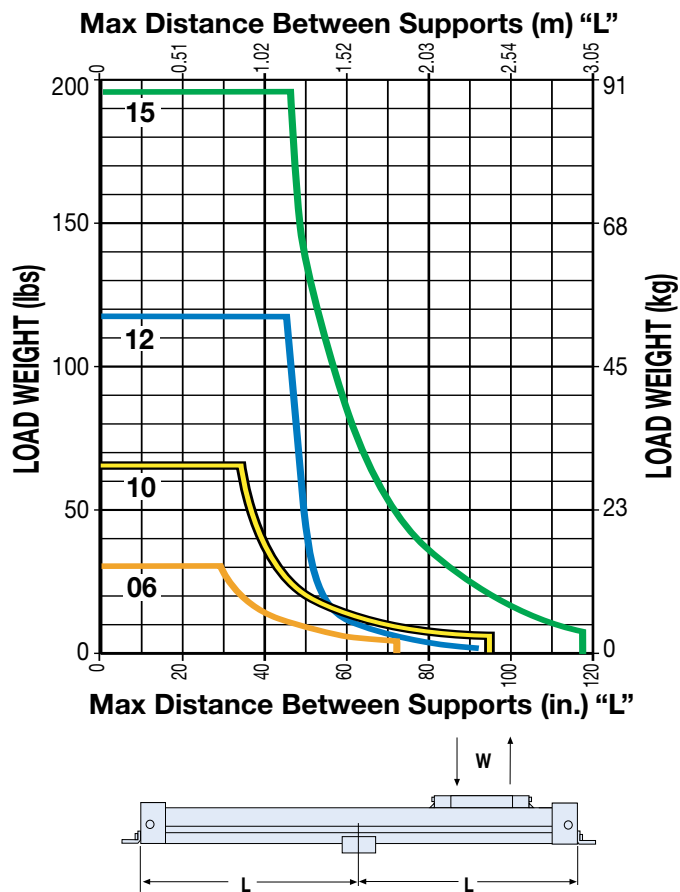
Made of anodized aluminum, BC4 tube supports are designed to attach to T-nuts inside the grooves which run the length of the cylinder tube. Refer to the tube support graph to determine the number of tube supports required.



NOTE: Switches cannot be mounted on the same face of the actuator as tube supports.

## PERFORMANCE

### TUBE SUPPORT REQUIREMENTS



|    | BORE SIZE | A    | B    | C    | D    | E    | F    | G    | H    | J    | K    | L    | M              |
|----|-----------|------|------|------|------|------|------|------|------|------|------|------|----------------|
| 06 | 0.625     | 0.12 | 1.69 | 1.38 | 0.84 | 0.69 | 0.50 | 0.25 | 0.75 | 1.00 | 1.50 | 2.00 | Ø .15 Thru (4) |
| 10 | 1.00      | 0.19 | 2.75 | 2.25 | 1.38 | 1.13 | 1.10 | 0.55 | 0.50 | 0.88 | 1.00 | 1.75 | Ø .23 Thru (4) |
| 12 | 1.25      | 0.30 | 3.50 | 2.84 | 1.75 | 1.42 | 0.90 | 0.45 | 0.50 | 1.00 | 1.00 | 2.00 | Ø .28 Thru (4) |
| 15 | 1.50      | 0.19 | 3.75 | 3.15 | 1.88 | 1.58 | 1.13 | 0.56 | 0.63 | 1.25 | 1.25 | 2.50 | Ø .28 Thru (4) |

Dimensions in inches

|    | BORE SIZE | A   | B    | C    | D    | E    | F    | G    | H    | J    | K    | L    | M              |
|----|-----------|-----|------|------|------|------|------|------|------|------|------|------|----------------|
| 06 | 16        | 3.2 | 41.7 | 34.9 | 21.4 | 17.5 | 12.7 | 6.4  | 19.1 | 25.4 | 38.1 | 50.8 | Ø 3.9 Thru (4) |
| 10 | 25        | 4.8 | 69.9 | 57.1 | 35.1 | 28.7 | 27.9 | 14.0 | 12.7 | 22.2 | 25.4 | 44.4 | Ø 5.8 Thru (4) |
| 12 | 32        | 7.6 | 88.9 | 72.1 | 44.4 | 38.1 | 22.9 | 11.4 | 12.7 | 25.4 | 25.4 | 50.8 | Ø 7.1 Thru (4) |
| 15 | 40        | 4.8 | 95.3 | 80.0 | 47.8 | 40.1 | 28.7 | 14.2 | 16.0 | 31.8 | 31.8 | 63.5 | Ø 7.1 Thru (4) |

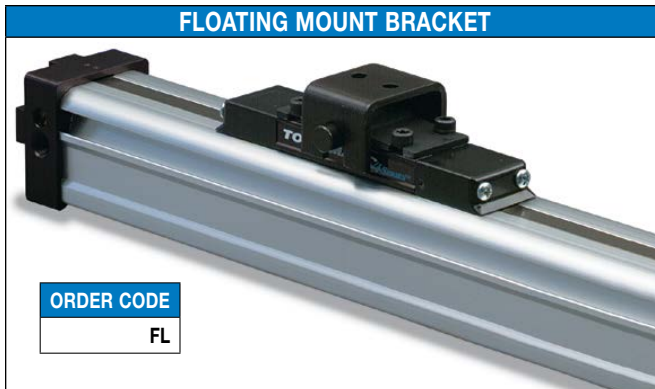
Dimensions in millimeters

# BC4 Floating Mount Bracket - ALL Sizes

3D CAD available at  
www.tolomatic.com



Always use configured CAD solid model  
to determine critical dimensions



ORDER CODE  
FL

For applications where a BC4 band cylinder is moving a load that is externally guided and supported. An externally guided load, not parallel to the BC4 band cylinder may result in cylinder binding. The floating mount bracket compensates for nonparallelism between the cylinder and the external guide.

✗ (Floating mount brackets are not to be used in conjunction with shock absorbers)

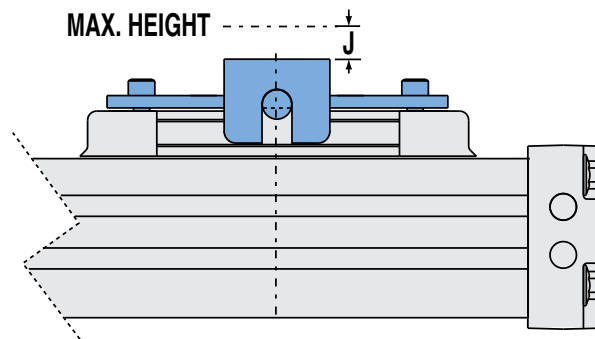
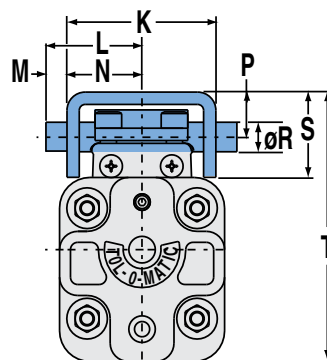
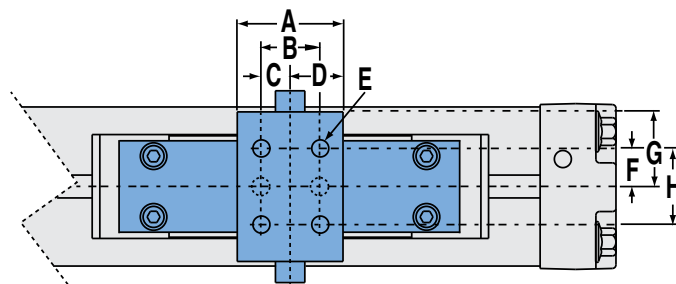
## DIMENSIONS

06, 10, 12, 15

**Please Note: For Dimension "E"**

BC406 and BC410 use 2 center holes

BC412 and BC415 use 4 corner holes



|    | BORE SIZE | A    | B    | C    | D    | E              | F    | G    | H    | J    | K    | L    | M    | N    | P    | ØR   | S    | T    |
|----|-----------|------|------|------|------|----------------|------|------|------|------|------|------|------|------|------|------|------|------|
| 06 | 0.625     | 0.90 | 0.50 | 0.25 | 0.45 | Ø .17 Thru (2) | —    | 0.63 | —    | 0.33 | 1.27 | 0.81 | 0.18 | 0.63 | 0.38 | 0.25 | 0.72 | 2.18 |
| 10 | 1.00      | 1.26 | 0.63 | 0.32 | 0.63 | Ø .22 Thru (2) | —    | 0.82 | —    | 0.33 | 1.64 | 1.00 | 0.18 | 0.82 | 0.56 | 0.38 | 1.01 | 3.04 |
| 12 | 1.25      | 1.50 | 0.75 | 0.37 | 0.75 | Ø .28 Thru (4) | 0.50 | 1.09 | 1.00 | 0.44 | 2.18 | 1.50 | 0.41 | 1.09 | 0.99 | 0.44 | 1.49 | 4.10 |
| 15 | 1.50      | 1.50 | 0.75 | 0.38 | 0.75 | Ø .28 Thru (4) | 0.63 | 1.24 | 1.25 | 0.52 | 2.48 | 1.63 | 0.39 | 1.24 | 0.99 | 0.44 | 1.56 | 4.62 |

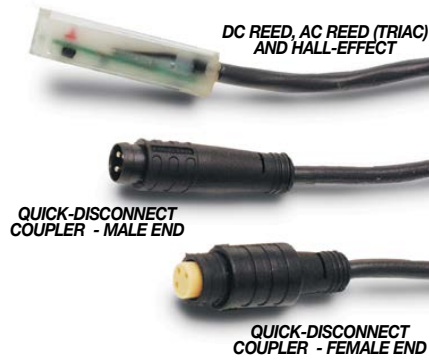
Dimensions in inches

|    | BORE SIZE | A    | B    | C   | D    | E              | F    | G    | H    | J    | K    | L    | M    | N    | P    | ØR   | S    | T     |
|----|-----------|------|------|-----|------|----------------|------|------|------|------|------|------|------|------|------|------|------|-------|
| 06 | 16        | 22.9 | 12.7 | 6.4 | 11.5 | Ø 4.3 Thru (2) | —    | 16.1 | —    | 8.3  | 32.2 | 20.7 | 4.6  | 16.0 | 9.7  | 6.4  | 18.3 | 55.4  |
| 10 | 25        | 32.0 | 16.0 | 8.0 | 16.0 | Ø 5.3 Thru (2) | —    | 20.8 | —    | 8.3  | 41.7 | 25.4 | 4.6  | 20.8 | 14.2 | 9.7  | 25.7 | 77.2  |
| 12 | 32        | 38.1 | 19.0 | 9.4 | 19.0 | Ø 7.1 Thru (4) | 12.7 | 27.7 | 25.4 | 11.2 | 55.4 | 38.1 | 10.4 | 27.7 | 25.1 | 11.2 | 37.8 | 104.1 |
| 15 | 40        | 38.1 | 19.0 | 9.7 | 19.0 | Ø 7.1 Thru (4) | 16.0 | 31.5 | 31.8 | 13.2 | 63.0 | 41.4 | 9.9  | 31.5 | 25.1 | 11.2 | 39.6 | 117.3 |

Dimensions in millimeters

# BC4 Switches - ALL Sizes

## SWITCHES



There are 10 sensing choices: DC reed, form A (open) or form C (open or closed); AC reed (Triac, open); Hall-effect, sourcing, PNP (open); Hall-effect, sinking, NPN (open); each with either flying leads or QD (quick disconnect). Commonly used to send analog signals to PLC (programmable logic controllers), TLL, CMOS circuit or other controller device. These switches are activated by the actuator's magnet.

Switches contain reverse polarity protection. QD cables are shielded; shield should be terminated at flying lead end.

If necessary to remove factory installed switches, be sure to reinstall on the same side of actuator with scored face of switch toward internal magnet.

## SPECIFICATIONS

|                              | REED DC                             |                                                                                   |                                     |           | REED AC                  |                            | HALL-EFFECT DC                       |                                                                                     |                             |                                                                                     |
|------------------------------|-------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------|-----------|--------------------------|----------------------------|--------------------------------------|-------------------------------------------------------------------------------------|-----------------------------|-------------------------------------------------------------------------------------|
| ORDER CODE                   | RT                                  | RM                                                                                | BT                                  | BM        | CT                       | CM                         | TT                                   | TM                                                                                  | KT                          | KM                                                                                  |
| LEAD                         | 5m                                  | QD*                                                                               | 5m                                  | QD*       | 5m                       | QD*                        | 5m                                   | QD*                                                                                 | 5m                          | QD*                                                                                 |
| CABLE SHIELDING              | Unshielded                          | Shielded†                                                                         | Unshielded                          | Shielded† | Unshielded               | Shielded†                  | Unshielded                           | Shielded†                                                                           | Unshielded                  | Shielded†                                                                           |
| SWITCHING LOGIC              | "A" Normally Open                   |                                                                                   | "C" Normally Open or Closed         |           | Triac Normally Open      |                            | PNP (Sourcing) Normally Open         |                                                                                     | NPN (Sinking) Normally Open |                                                                                     |
| MECHANICAL CONTACTS          | Single-Pole Single-Throw            |                                                                                   | Single-Pole Double-Throw            |           | Single-Pole Single-Throw |                            | NO, These Are Solid State Components |                                                                                     |                             |                                                                                     |
| COIL DIRECT                  | Yes                                 |                                                                                   | Yes                                 |           | Yes                      |                            | —                                    |                                                                                     |                             |                                                                                     |
| POWER LED                    | None                                |                                                                                   | None                                |           | None                     |                            | None                                 |                                                                                     | None                        |                                                                                     |
| SIGNAL LED                   | Red                                 |  |                                     |           |                          |                            | Red                                  |  | Red                         |  |
| OPERATING VOLTAGE            | 200 Vdc max.                        |                                                                                   | 120 Vdc max.                        |           | 120 Vac max.             |                            | 5 - 25 Vdc                           |                                                                                     |                             |                                                                                     |
| OUTPUT RATING                | —                                   |                                                                                   |                                     |           | —                        |                            | 25 Vdc, 200mA dc                     |                                                                                     |                             |                                                                                     |
| OPERATING TIME               | 0.6 msec max.<br>(including bounce) |                                                                                   | 0.7 msec max.<br>(including bounce) |           | —                        |                            | < 10 micro sec.                      |                                                                                     |                             |                                                                                     |
| OPERATING TEMPERATURE        | -40°F [-40°C] to 158°F [70°C]       |                                                                                   |                                     |           |                          |                            | 0°F [-18°C] to 150°F [66°C]          |                                                                                     |                             |                                                                                     |
| RELEASE TIME                 | 1.0 msec. max.                      |                                                                                   |                                     |           | —                        |                            | —                                    |                                                                                     |                             |                                                                                     |
| ON TRIP POINT                | —                                   |                                                                                   |                                     |           | —                        |                            | 150 Gauss maximum                    |                                                                                     |                             |                                                                                     |
| OFF TRIP POINT               | —                                   |                                                                                   |                                     |           | —                        |                            | 40 Gauss minimum                     |                                                                                     |                             |                                                                                     |
| **POWER RATING (WATTS)       | 10.0 §                              |                                                                                   | 3.0 §§                              |           | 10.0                     |                            | 5.0                                  |                                                                                     |                             |                                                                                     |
| VOLTAGE DROP                 | 2.6 V typical at 100 mA             |                                                                                   | NA                                  |           | —                        |                            | —                                    |                                                                                     |                             |                                                                                     |
| RESISTANCE                   | 0.1 Ω Initial (Max.)                |                                                                                   |                                     |           | —                        |                            | —                                    |                                                                                     |                             |                                                                                     |
| CURRENT CONSUMPTION          | —                                   |                                                                                   |                                     |           | 1 Amp at<br>86°F [30°C]  | 0.5 Amp at<br>140°F [60°C] | 200 mA at 25 Vdc                     |                                                                                     |                             |                                                                                     |
| FREQUENCY                    | —                                   |                                                                                   |                                     |           | 47 - 63 Hz               |                            | —                                    |                                                                                     |                             |                                                                                     |
| CABLE MIN.<br>BEND<br>RADIUS | STATIC                              | 0.630" [16mm]                                                                     |                                     |           |                          |                            |                                      |                                                                                     |                             |                                                                                     |
|                              | DYNAMIC                             | Not Recommended                                                                   |                                     |           |                          |                            |                                      |                                                                                     |                             |                                                                                     |

**CAUTION: DO NOT OVER TIGHTEN SWITCH HARDWARE WHEN INSTALLING!**

**\*\* WARNING:** Do not exceed power rating (Watt = Voltage X Amperage). Permanent damage to sensor will occur.

\*QD = Quick Disconnect; Male coupler is located 6" [152mm] from sensor, Female coupler to flying lead distance is 197" [5m] also see Cable Shielding specification above

**REPLACEMENT OF QD SWITCHES MANUFACTURED BEFORE JULY 1, 1997:** It will be necessary to replace or rewire the female end coupler.



**Reed Switch Life Expectancy:** Up to 200,000,000 cycles (depending on load current, duty cycle and environmental conditions)

†Shielded from the female quick disconnect coupler to the flying leads. Shield should be terminated at flying lead end.

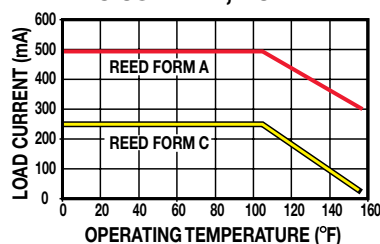
§ Maximum current 500mA (not to exceed 10VA) Refer to Temperature vs. Current graph and Voltage Derating graph

§§ Maximum current 250mA (not to exceed 3VA) Refer to Temperature vs. Current graph and Voltage Derating graph

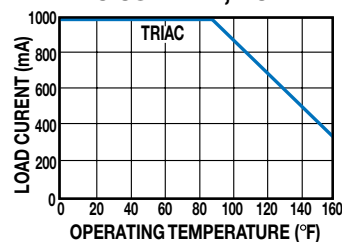
# BC4 Switches - ALL Sizes

## PERFORMANCE

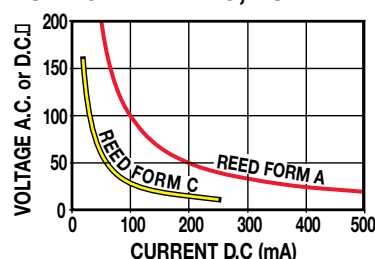
TEMP. vs CURRENT, DC REED



TEMP. vs CURRENT, AC REED

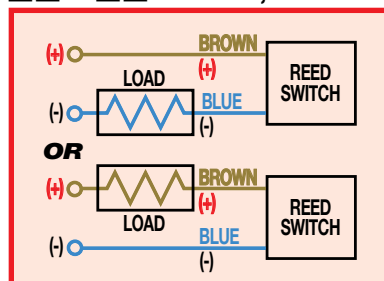


VOLTAGE DERATING, DC REED

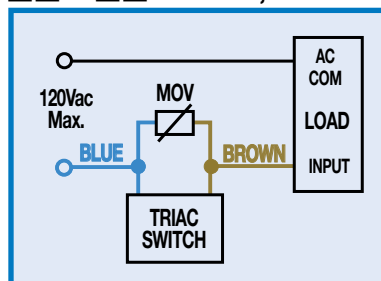


## WIRING DIAGRAMS

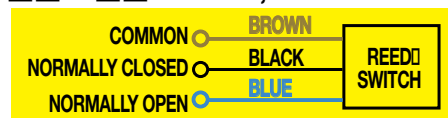
**R****T** & **R****M** DC REED, FORM A



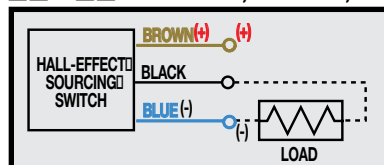
**C****T** & **C****M** AC REED, TRIAC



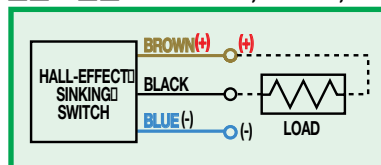
**B****T** & **B****M** DC REED, FORM C



**T****T** & **T****M** HALL-EFFECT, SOURCING, PNP



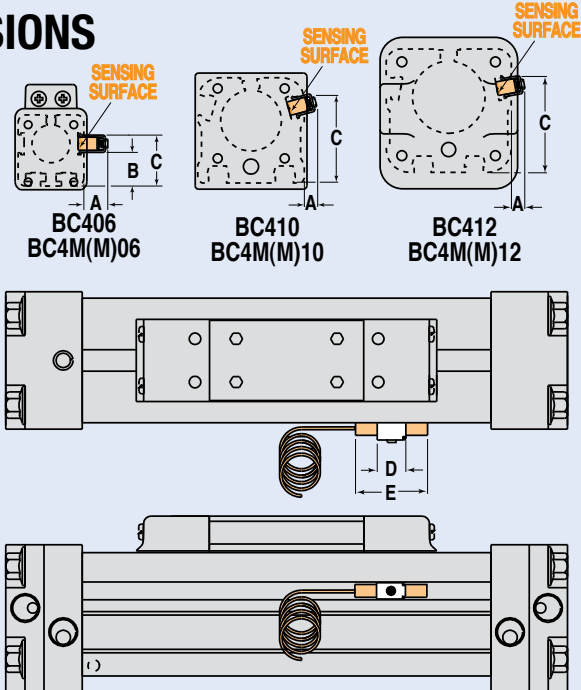
**K****T** & **K****M** HALL-EFFECT, SINKING, NPN



**⚠** THE NOTCHED FACE OF THE SWITCH INDICATES THE SENSING SURFACE AND MUST FACE TOWARD THE MAGNET.

Some actuators may require switch mounting on a specific side of the assembly. Call Tolomatic for details.

## DIMENSIONS



| SIZE | BORE  | A    | B    | C    | D    | E    |
|------|-------|------|------|------|------|------|
| 06   | 0.625 | 0.39 | 0.55 | 0.84 | 0.50 | 1.25 |
| 10   | 1.000 | 0.22 | -    | 1.47 | 0.50 | 1.25 |
| 12   | 1.250 | 0.23 | -    | 1.66 | 0.50 | 1.25 |
| 15   | 1.500 | 0.16 | -    | 1.98 | 0.50 | 1.25 |

Dimensions in inches

| SIZE | BORE | A    | B     | C     | D     | E     |
|------|------|------|-------|-------|-------|-------|
| 06   | 12   | 9.91 | 13.97 | 21.34 | 12.70 | 31.75 |
| 10   | 25   | 5.59 | -     | 37.34 | 12.70 | 31.75 |
| 12   | 32   | 5.84 | -     | 42.16 | 12.70 | 31.75 |
| 15   | 40   | 4.06 | -     | 50.29 | 12.70 | 31.75 |

Dimensions in millimeters

# BC4 Shock Absorbers - All Sizes

3D CAD available at  
www.tolomatic.com



Always use configured CAD solid model  
to determine critical dimensions

## SHOCK ABSORBERS



### ORDER CODE

SD\_ or SH\_ or SL\_  
(\_ = Number ordered)

Rodless cylinders with standard internal cushion offer an effective method of decelerating loads. However, all Tolomatic rodless cylinders are capable of carrying heavier loads at higher velocities than the cylinder cushion can absorb. Optional shock absorbers can be used to increase the cylinder's life and broaden the application range for the cylinder model you have chosen.

A shock stop plate must be used in conjunction with the BC4 shock to provide a stopping surface on the carrier.

Typical shock absorber life varies between 1-2 million cycles (depending on environment) appropriate preventative maintenance should be considered in high cyclic applications.

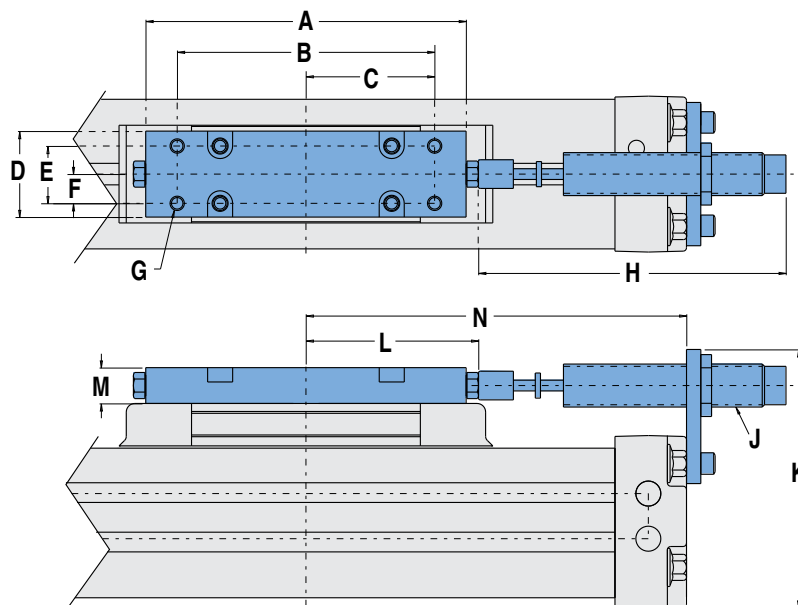


NOTE: When 2 shock absorbers are ordered, the unit will be assembled with NO internal cushions.



CAUTION: In applications which result in a load bending moment at deceleration, care should be taken to decelerate the load rather than the carrier of the band cylinder.

## DIMENSIONS



| SIZE | BORE  | A    | B    | C    | D    | E    | F    | G               | H(min.) | H(max.) | J              | K    | L    | M    | N    |
|------|-------|------|------|------|------|------|------|-----------------|---------|---------|----------------|------|------|------|------|
| 06   | 0.625 | 3.89 | 2.25 | 1.13 | 0.72 | 0.50 | 0.25 | #6-32 Thru (4)  | 2.25    | 2.79    | 3/8-32 UNF-2B  | 2.25 | 1.72 | 0.44 | 3.15 |
| 10   | 1.000 | 4.00 | 3.00 | 1.50 | 1.09 | 0.75 | 0.38 | #10-24 Thru (4) | 3.71    | 4.25    | 9/16-18 UNF-2B | 3.03 | 2.18 | 0.50 | 3.94 |
| 12   | 1.250 | 4.00 | 3.18 | 1.58 | 1.31 | 0.75 | 0.37 | 1/4-20 Thru (4) | 4.50    | 5.38    | 3/4-16 UNF THD | 3.92 | 2.25 | 0.63 | 5.89 |
| 15   | 1.500 | 5.60 | 4.50 | 2.25 | 1.50 | 1.00 | 0.51 | 1/4-20 Thru (4) | 4.50    | 5.38    | 3/4-16 UNF THD | 4.50 | 3.02 | 0.63 | 6.65 |

Dimensions in inches

| SIZE | BORE | A     | B     | C    | D    | E    | F    | G                 | H(min.) | H(max.) | J         | K     | L    | M    | N     |
|------|------|-------|-------|------|------|------|------|-------------------|---------|---------|-----------|-------|------|------|-------|
| 06   | 16   | 98.8  | 57.2  | 28.6 | 18.3 | 12.7 | 6.4  | #6-32 Thru (4)    | 57.2    | 70.9    | M8 x 1.0  | 57.2  | 43.6 | 11.1 | 79.9  |
| 10   | 25   | 101.6 | 76.2  | 38.1 | 27.7 | 19.0 | 9.7  | M5 x 0.8 Thru (4) | 94.2    | 107.9   | M14 x 1.5 | 77.0  | 55.4 | 12.7 | 100.1 |
| 12   | 32   | 101.6 | 80.8  | 40.4 | 33.3 | 19.0 | 9.4  | M6 x 1.0 Thru (4) | 114.3   | 136.7   | M20 x 1.5 | 99.6  | 57.1 | 16.0 | 149.6 |
| 15   | 38   | 142.2 | 114.3 | 57.1 | 38.1 | 25.4 | 13.0 | M6 x 1.0 Thru (4) | 114.3   | 136.7   | M20 x 1.5 | 114.3 | 76.7 | 16.0 | 168.9 |

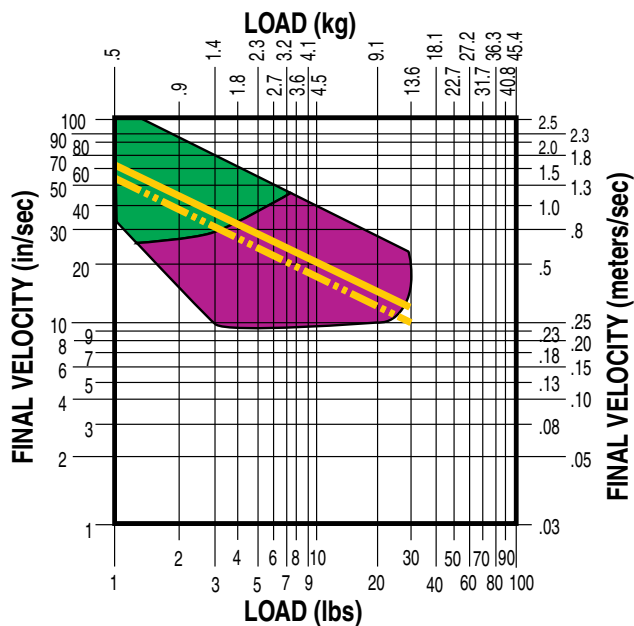
Dimensions in millimeters



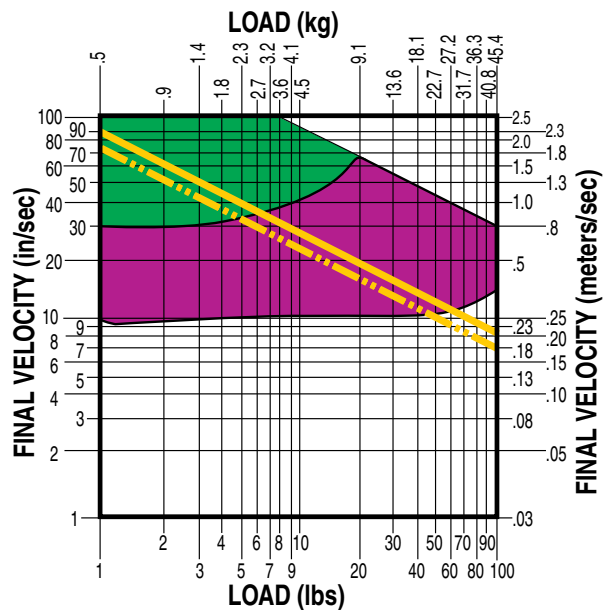
# BC4 Shock Absorbers - All Sizes - PERFORMANCE

## VELOCITY vs LOAD

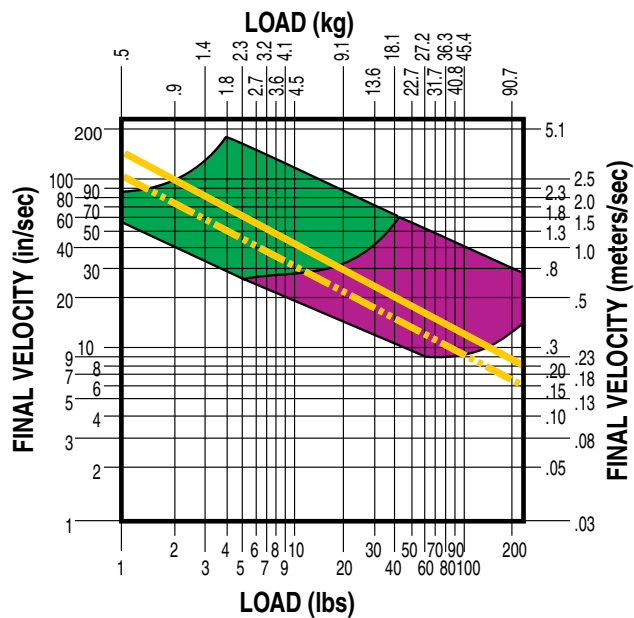
**BC406**



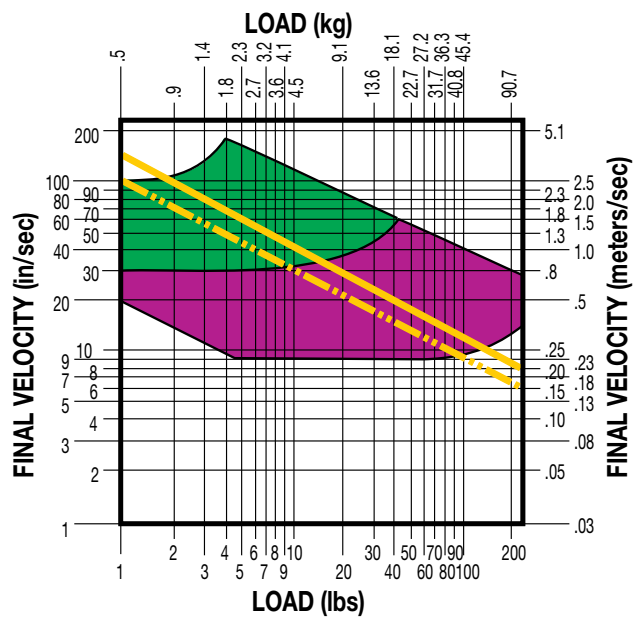
**BC410**



**BC412**



**BC415**



LIGHT DUTY (Light load/High velocity)

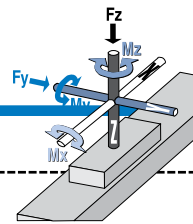
HEAVY DUTY (Heavy load/Low velocity)

AIR CUSHION DATA



NOTE: If final (or impact) velocity cannot be calculated directly, a reasonable guideline to use is 2 x average velocity.

# Application Data Worksheet



## STROKE LENGTH

☐ inch (S I) (U.S. Standard) ☐ millimeters (Metric)

## AVAILABLE AIR PRESSURE

☐ PSI (U.S. Standard) ☐ bar (Metric)

## REQUIRED THRUST FORCE

☐ lbf (U.S. Standard) ☐ N (Metric)

## LOAD

☐ lb (U.S. Standard) ☐ kg (Metric)

## LOAD CENTER OF GRAVITY DISTANCE TO CARRIER CENTER

☐ inch (U.S. Standard) ☐ millimeters (Metric)

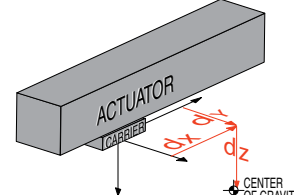
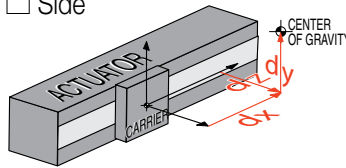
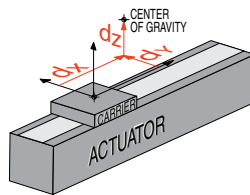
$d_x$  \_\_\_\_\_  
 $d_y$  \_\_\_\_\_  
 $d_z$  \_\_\_\_\_

## ORIENTATION

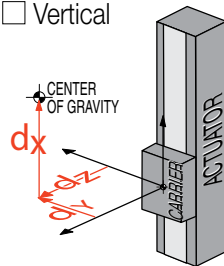
☐ Horizontal

☐ Side

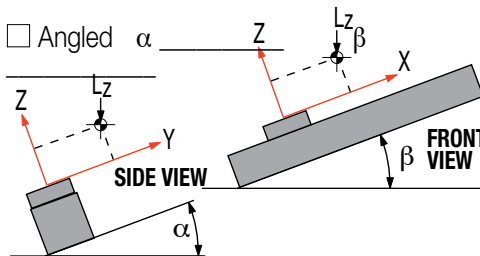
☐ Horizontal Down



☐ Vertical



☐ Angled  $\alpha$



## OTHER ISSUES:

(i.e. Environment,  
Temperature,  
Contamination, etc.)

Contact information:



Fax (1-763-478-8080) or call Tolomatic (1-800-328-2174) with the above information. We will provide any assistance needed to determine the proper actuator.

# Rodless Cylinder Selection Guidelines - BC2, BC3, BC4, LS - All Sizes

## PROVIDING LOAD GUIDANCE AND SUPPORT

The process of selecting a load bearing actuator for a given application can be complex. It is highly recommended that you contact Tolomatic or a Tolomatic Distributor for assistance in selecting the best actuator for your application. The following overview of the selection guidelines are for educational purposes only.

### 1 COMPILE APPLICATION REQUIREMENTS

To determine the appropriate Band Cylinder or Linear Slide model for an application, compile the following information:

- Available pressure (PSI)
- Weight of load (lbs or kg)
- Orientation of load (lbs or kgs)
- Velocity of load (in/sec or mm/sec)
- Stroke length (in or mm)

HINT: Use Tolomatic sizing and selection software, download at: [tolomatic.com](http://tolomatic.com)

### 2 SELECT CYLINDER SIZE

- Consult the Theoretical Force vs. Pressure charts.
- Cross-reference the load force (or load weight if force is not known) and the available operating pressure. If the intersection falls below the diagonal line, and if moments do not exceed maximum values listed for that model (see Step 3), the actuator will accommodate the application.

If the intersection is above the diagonal line, a larger cylinder bore size should be considered.

NOTE: Additional force may be required to obtain the necessary acceleration for vertical or horizontal loads.

### 3 DETERMINE NATURE OF LOAD AND THE EFFECT OF BENDING MOMENTS

If the cylinder will guide and support a load located directly over the center of carrier, bending moments will not be a factor in the cylinder selection.

NOTE: The maximum load "L" must not exceed the capacity limits of the cylinder selected.

- Bending Moments

For off center or side loads, determine the distance from the center of mass of the load to the center of the carrier bracket. This measurement is needed to calculate the torque for bending moments. (Refer to Bending Moment chart for each model.)

Should the resulting maximum bending moment exceed figures indicated on the chart, external guides, auxiliary carrier/s or a larger cylinder should be considered.

- Auxiliary Carrier Bending Moments

The auxiliary carrier option (available on most models) increases load carrying capacity and bending moments. Auxiliary carriers can be ordered with or without an internal piston. (Auxiliary

carriers without a piston have no internal cushion on the cylinder end closest to the auxiliary carrier.)

IMPORTANT: When ordering, determine the working stroke, then the minimum distance required between carriers (dimension "D" in Auxiliary Carrier Bending Moments chart). When ordered, Tolomatic's configurator will calculate the overall length of the actuator.

NOTE: breakaway pressure will increase when using auxiliary carriers.

### 4 DETERMINE INTERNAL CUSHION CAPACITY

- Consult the Cushion Data chart for the model selected. The velocities listed on the cushion charts are final or cushion impact velocities. On applications where the internal cushions or bumpers are to be used, be sure the actual, final or impact velocity is known. If the velocity is not known, use of limit switches with valve deceleration circuits or shock absorbers should be considered. NOTE: The BC205 uses external bumpers in place of internal cushions, LS05 & LS10 do not have cushions or bumpers.
- Cross-reference the final velocity and weight of the load. If the intersection is below the diagonal lines, the internal cushions on the actuator may be used. If the point falls above the dashed diagonal line or if the velocity is not known, use deceleration circuits, external shock absorbers or select a

larger cylinder with greater cushion capacity. On high-cyclic applications, use of external stops is strongly recommended.

### 5 DETERMINE TUBE SUPPORT REQUIREMENTS

- Consult the Tube Support chart for the model selected.
- Cross reference the load weight and maximum distance between supports.

### 6 CONSIDER OPTIONS

- Switches— dc Reed, Hall-effect or ac Triac

Band Cylinders and Linear Slides each have different standard features and options. Check the options section for the actuator you have selected.

- Shock Absorbers— if needed.
- Foot Mounting Kits
- Floating Mount Bracket — use when lack of parallelism occurs between the cylinder and an external guided and supported load.
- Single End Porting (BC3, BC4)
- Long Carrier (BC4)
- Proximity Sensors (LS)
- Dual 180° Carrier (BC3)

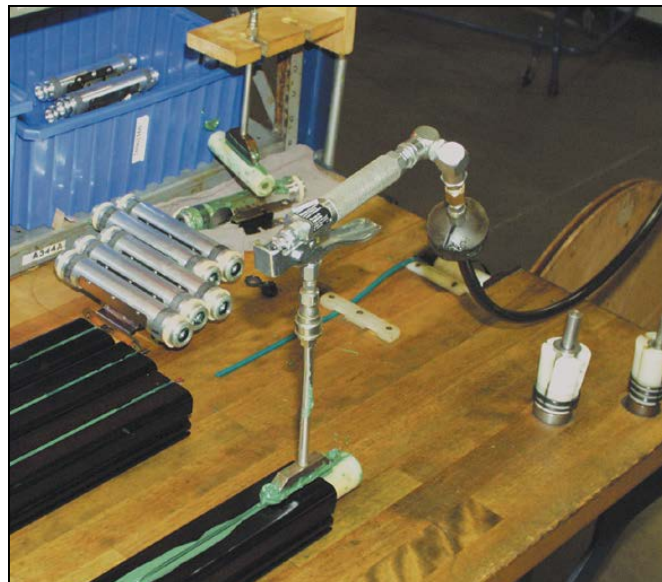
# Application Guidelines

The following conditional statements are intended as general guidelines for use of Tolomatic actuators. Since all applications have their own specific operating requirements, consult Tolomatic, Inc. or your local Tolomatic distributor if an application is unconventional or if questions arise regarding the selection process.

## CUSHION NEEDLE ADJUSTMENT (BC2, BC3, BC4, CC, SA, DP, TC ONLY)



Adjust the cushion needles in the cylinder heads carefully to obtain a smooth, hesitation free deceleration for your particular application. If there are questions on proper adjustment, please consult Tolomatic, Inc.



## LUBRICATION GUIDELINES

All Tolomatic actuators (except Cable Cylinders) are prelubricated at the factory. To ensure maximum actuator life, the following guidelines should be followed.

### • Filtration

We recommend the use of dry, filtered air in our products. "Filtered air" means a level of 10 Micron or less. "Dry" means air should be free of appreciable amounts of moisture. Regular maintenance of installed

filters will generally keep excess moisture in check.

### • External Lubricators (optional)

The factory prelubrication of Tolomatic actuators will provide optimal performance without the use of external lubrication. However, external lubricators can further extend service life of pneumatic actuators if the supply is kept constant.

Oil lubricators, (mist or drop) should supply a minimum of 1 drop per 20 standard cubic feet per minute to the

cylinder. As a rule of thumb, double that rate if water in the system is suspected. Demanding conditions may require more lubricant.

If lubricators are used, we recommend a non-detergent, 20cP @ 140°F 10-weight lubricant. Optimum conditions for standard cylinder operation are +32° to +150°F (+0° to 65.5°C).

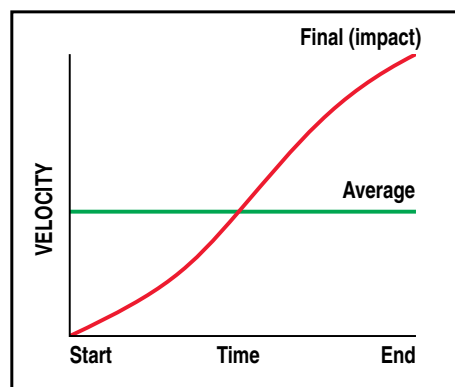
NOTE: Use of external lubricators may wash away the factory installed lubrication. External lubricants must be maintained in a constant supply or the results will be a dry actuator prone to premature wear.

### • Sanitary Environments

Oil mist lubricators must dispense "Food Grade" lubricants to the air supply. Use fluids with ORAL LD50 toxicity ratings of 35 or higher such as Multitherm® PG-1 or equivalent. Demanding conditions can require a review of the application.

## FINAL VELOCITY CALCULATION

Velocity calculations for all rodless cylinders need to differentiate between final velocity and average velocity. For example: Stroking a 100-inch BC3 model in one second yields an average velocity of 100 inches per second. To properly determine the inertial forces for cushioning, it is important to know the



final (or impact) velocity. Rodless cylinders accelerate and decelerate at each end of the stroke. Therefore this acceleration must be considered (see diagram).

If final (or impact) velocity cannot be calculated directly, a reasonable guideline is to use 2 x average velocity.

# BC4 Service Parts Ordering - ALL Sizes

| Inch (U.S. Standard) SIZE                                      | 06        | 10        | 12        | 15        | 20        | 25        | 30        | 40        |
|----------------------------------------------------------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| <b>Auxiliary Carrier Option</b>                                | 6906-9023 | 6910-9023 | 6912-9023 | 6915-9023 | 6920-9023 | 6925-9023 | 6930-9023 | 6940-9023 |
| <b>Floating Mount Kits</b>                                     | 6906-9004 | 6910-9004 | 6912-9004 | 6915-9004 | 6920-9004 | 6925-9004 | 6930-9004 | 6940-9004 |
| <b>Foot Mount Kits</b> <sup>1</sup>                            | 6906-9003 | 6910-9003 | 6912-9003 | 6915-9003 | 6920-9003 | 6925-9003 | 6930-9003 | 6940-9003 |
| <b>Shock Abs. Field Retrofit Kit – Heavy Duty</b> <sup>2</sup> | 6906-9006 | 6910-9020 | 6912-9020 | 6915-9020 | 6920-9020 | 6925-9020 | –         | –         |
| <b>Shock Abs. Field Retrofit Kit – Lite Duty</b> <sup>2</sup>  | 6906-9005 | 6910-9005 | 6912-9005 | 6915-9005 | 6920-9005 | 6925-9005 | –         | –         |
| <b>Shock Abs. Field Mount Kit (Hardware Only)</b> <sup>3</sup> | 6906-9024 | 6910-9024 | 6912-9024 | 6915-9024 | 6920-9024 | 6925-9024 | –         | –         |
| <b>Shock Stop Kit</b> <sup>4</sup>                             | 6906-9019 | 6910-9019 | 6912-9019 | 6915-9019 | 6920-9019 | 6925-9019 | –         | –         |
| <b>Shock Stop Kit (Long Carrier)</b> <sup>4</sup>              | 6906-9029 | 6912-9029 | 6912-9029 | 6915-9029 | –         | –         | –         | –         |
| <b>Single End Porting</b> <sup>5</sup>                         | NA        | 6910-9018 | 6912-9018 | 6915-9018 | 6920-9017 | 6925-9017 | Std.      | Std.      |
| <b>Tube Supports</b> <sup>6</sup>                              | 6906-9002 | 6910-9002 | 6912-9002 | 6915-9002 | 6920-9002 | 6925-9002 | 6930-9002 | 6940-9002 |
| <b>Repair Kits</b> <sup>7,8</sup>                              | RKBC406NP | RKBC410NP | RKBC412NP | RKBC415NP | RKBC420NP | RKBC425NP | RKBC430NP | RKBC440NP |
| <b>Seal Kits</b> <sup>9</sup>                                  | 6906-9022 | 6910-9022 | 6912-9022 | 6915-9022 | 6920-9022 | 6925-9022 | 6930-9022 | 6940-9022 |

| Metric SIZE                                                    | 06        | 10        | 12        | 15        | 20        | 25        | 30        | 40        |
|----------------------------------------------------------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| <b>Auxiliary Carrier Option</b>                                | 7906-9023 | 7910-9023 | 7912-9023 | 7915-9023 | 7920-9023 | 7925-9023 | 7930-9023 | 7940-9023 |
| <b>Floating Mount Kits</b>                                     | 7906-9004 | 7910-9004 | 7912-9008 | 7915-9008 | 7920-9004 | 7925-9004 | 7930-9005 | 7940-9005 |
| <b>Foot Mount Kits</b> <sup>1</sup>                            | 7906-9003 | 7910-9003 | 7912-9004 | 7915-9003 | 7920-9003 | 7925-9003 | 7930-9003 | 7940-9003 |
| <b>Shock Abs. Field Retrofit Kit – Heavy Duty</b> <sup>2</sup> | 7906-9006 | 7910-9007 | 7912-9006 | 7915-9005 | 7920-9020 | 7925-9020 | –         | –         |
| <b>Shock Abs. Field Retrofit Kit – Lite Duty</b> <sup>2</sup>  | 7906-9005 | 7910-9005 | 7912-9005 | 7915-9006 | 7920-9005 | 7925-9005 | –         | –         |
| <b>Shock Abs. Field Mount Kit (Hardware Only)</b> <sup>3</sup> | 7906-9024 | 7910-9024 | 7912-9024 | 7915-9024 | 7920-9024 | 7925-9024 | –         | –         |
| <b>Shock Stop Kit</b> <sup>4</sup>                             | 7906-9019 | 7910-9008 | 7912-9007 | 7915-9004 | 7920-9019 | 7925-9019 | –         | –         |
| <b>Shock Stop Kit (Long Carrier)</b> <sup>4</sup>              | 7906-9029 | 7910-9029 | 7912-9029 | 7915-9029 | –         | –         | –         | –         |
| <b>Single End Porting Taper (TP)</b> <sup>5</sup>              | NA        | 7910-9006 | 7912-9001 | 7915-9001 | 7920-9017 | 7925-9017 | Std.      | Std.      |
| <b>Single End Porting Parallel (GP)</b> <sup>5</sup>           |           | 8910-9002 | 8912-9001 | 8915-9001 | 8920-9017 | 8925-9017 |           |           |
| <b>Tube Supports</b> <sup>6</sup>                              | 7906-9002 | 7910-9002 | 7912-9002 | 7915-9002 | 7920-9002 | 7925-9002 | 7930-9002 | 7940-9002 |
| <b>Repair Kits (Taper Port “TP”)</b> <sup>7,8</sup>            | RKBC406TP | RKBC410TP | RKBC412TP | RKBC415TP | RKBC420TP | RKBC425TP | RKBC430TP | RKBC440TP |
| <b>Repair Kits (Parallel Port “GP”)</b> <sup>7,8</sup>         | RKBC406GP | RKBC410GP | RKBC412GP | RKBC415GP | RKBC420GP | RKBC425GP | RKBC430GP | RKBC440GP |
| <b>Seal Kits</b> <sup>9</sup>                                  | 6906-9022 | 6910-9022 | 6912-9022 | 6915-9022 | 6920-9022 | 6925-9022 | 6930-9022 | 6940-9022 |

| CONFIG. CODE ORDERING                         |      |
|-----------------------------------------------|------|
| Mounting Hardware & FE conn. included         |      |
| DESCRIPTION                                   | CODE |
| Switch Kit, Reed, Form C, 5m                  | BT   |
| Switch Kit, Reed, Form C, Male Conn.          | BM   |
| Switch Kit, Reed, Form A, 5m                  | RT   |
| Switch Kit, Reed, Form A, Male Conn.          | RM   |
| Switch Kit, Triac, 5m                         | CT   |
| Switch Kit, Triac, Male Conn.                 | CM   |
| Switch Kit, Hall-effect, Sinking, 5m          | KT   |
| Switch Kit, Hall-effect, Sinking, Male Conn.  | KM   |
| Switch Kit, Hall-effect, Sourcing, 5m         | TT   |
| Switch Kit, Hall-effect, Sourcing, Male Conn. | TM   |

NOTE: When kit is ordered female connector & all mounting hardware is included

## Switch Ordering NOTES:

To order field retrofit switch and hardware kits for all Tolomatic actuators: SW (Then the model and bore size, and type of switch required)

**Example: SWBC415RT**

(Hardware and Form A Reed switch with 5 meter lead for 1.5" bore BC4 band cylinder)



## Service Parts Ordering NOTES:

- 1 Foot Mount Kit contains one bracket and mounting hardware.
- 2 Shock Field Retrofit Kit contains one shock absorber, impact bolt, and mounting hardware.
- 3 Shock Field Mount Kit contains one set of mounting hardware and impact bolt.
- 4 Shock Stop Kit contains shock plate and screws.
- 5 Single End Porting Kit contains replacement head and plugs.
- 6 Contains one tube support and mounting hardware.
- 7 Repair Kit contains End Caps, Bearing Rods, O-rings, U-cups, Wear Rings, Cushion Seals, Band Inserts, Spring Clamps, Sealing Band and Dust Band.
- 8 When ordering repair kits, specify stroke as “SK” then indicate the desired length in decimal inches after the order code indicated above. EXAMPLE: RKBC410SK10.00
- 9 Seal Kit contains End Caps, Bearing Rods, O-rings, U-cups, Wear Rings, Cushion Seals, Band Inserts and Spring Clamps.

**NA** = Not Available

**Std.** = Standard Feature



# BC4 Ordering - ALL Sizes

**MODEL, BORE, STROKE** **OPTIONS**

BC4 10 L NP SK100-250 DW6-0 TS3 FM2 SH2 BM2

## MODEL

**BC4** BC4 Band Cylinder

## BORE SIZE

|           |               |
|-----------|---------------|
| <b>06</b> | 0.625" (16mm) |
| <b>10</b> | 1.00" (25mm)  |
| <b>12</b> | 1.25" (32mm)  |
| <b>15</b> | 1.50" (40mm)  |

## LONG CARRIER (BC4\_14)

**L** Long carrier available for 10, 12, 15 sizes

## MOUNTING & PORTS

- NP** US standard mounting & NPT ports
- TP†** Metric mounting with metric taper port
- GP†** Metric mounting with metric parallel port

† The metric version provides metric tapped holes for mounting of the load to the carrier and of the actuator to mounting surfaces & metric ports

## STROKE LENGTH & MOUNTING TYPE

- SK** \_ \_ \_ Stroke, enter desired stroke length in inches
- SM†** \_ \_ \_ Stroke, enter desired stroke length in millimeters

**NOTE:** Actuator mounting threads and mounting fasteners will be either inch or metric; depending on how stroke length is indicated.

**SK** = inch mounting  
**SM** = metric mounting

## MAXIMUM STROKE

| SIZE      | ...SK | ...SM |
|-----------|-------|-------|
|           | in    | mm    |
| <b>06</b> | 206   | 5,232 |
| <b>10</b> | 205   | 5,207 |
| <b>12</b> | 204   | 5,182 |
| <b>15</b> | 202   | 5,130 |

 Not all codes listed are compatible with all options. Contact Tolomatic with any questions.

## AUXILIARY CARRIER (BC4\_16)

**DW** Auxiliary carrier With piston & "D" distance  
\_ \_ \_ "D" Distance between carriers in inches (**SK**) or millimeters (**SM**)

(Same unit of measure as stroke length is required)

✗ Not available for 06 size

## MINIMUM "D" DISTANCE BETWEEN CARRIERS

|           | with Piston |       |
|-----------|-------------|-------|
|           | in          | mm    |
| <b>06</b> | 4.26        | 108.2 |
| <b>10</b> | 5.30        | 134.6 |
| <b>12</b> | 6.23        | 158.2 |
| <b>15</b> | 8.00        | 203.2 |

\*When ordering auxiliary carrier option, enter the distance required between carriers. The configurator will calculate the overall length of the actuator.

## TUBE SUPPORTS (BC4\_20)

**TS** \_ Tube Support & number required

## T-NUTS

**TN** \_ additional T-Nuts (see individual dimensional drawings for sizes)

## FOOT MOUNT (BC4\_19)

**FM** \_ Foot Mount & number required (1 or 2)

## FLOATING MOUNT (BC4\_21)

**FL** Floating Mount Bracket

✗ Not compatible with shock absorbers

## SHOCK ABSORBERS (BC4\_24)

**\*SD** \_ Shock hardware Only and number required

**\*SH** \_ Shock, Heavy duty and number required

**\*SL** \_ Shock, Light duty and number required

 **\*NOTE:** When shock absorbers are ordered cushion seals are removed.

## SWITCHES (BC4\_22)

| TYPE        |          | QUICK-DISCONNECT | CODE | QUANTITY                          | LEAD LENGTH |
|-------------|----------|------------------|------|-----------------------------------|-------------|
| REED        | Form A   | QD               | RM   | After code enter quantity desired | 5 meters    |
|             |          | no               | RT   |                                   |             |
|             | Form C   | QD               | BM   |                                   |             |
|             |          | no               | BT   |                                   |             |
| HALL-EFFECT | Sinking  | QD               | KM   |                                   |             |
|             |          | no               | KT   |                                   |             |
|             | Sourcing | QD               | TM   |                                   |             |
|             |          | no               | TT   |                                   |             |
| TRIAC       |          | QD               | CM   |                                   |             |
|             |          | no               | CT   |                                   |             |

## PORTING OPTION

**HD** Single End Porting

✗ Not available for 06 size



# LS LINEAR SLIDE RODLESS CYLINDER



## CONTENTS

|                                  |        |
|----------------------------------|--------|
| Features .....                   | LS_2   |
| LS05 .....                       | LS_4   |
| LS10 .....                       | LS_6   |
| Auxiliary Carrier .....          | LS_8   |
| LS Supports .....                | LS_10  |
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| Proximity Sensors .....          | LS_13  |
| Shock Absorbers .....            | LS_14  |
| Application Data Worksheet ..... | LS_15  |
| Selection Guidelines .....       | LS_16  |
| Application Guidelines .....     | BC4_32 |
| Service Parts .....              | LS_17  |
| Ordering .....                   | LS_18  |

ABT

MXP

BC2

BC3

BC4

**LS**

MG

CC

PB

ENGR

# LS - LINEAR SLIDE

## ENDURANCE TECHNOLOGY<sup>SM</sup>

Endurance Technology features are designed for maximum durability to provide extended service life.

Adapted from the popular BC2, the Linear Slide features 2 precision steel guide rods integrated with the extrusion to provide positive support of the load. This makes the Linear Slide more rugged and capable with greater load capacity and higher bending moments. Built-to-order in stroke lengths up to 72 inches.

### STAINLESS STEEL SEALING BAND SYSTEM



- Fatigue resistant stainless steel bands are specifically made to offer longer life and will not elongate like elastomers
- Outer band keeps out contaminants for extended performance
- Inner band provides a smooth surface for less seal wear

### FORMED END CAP WIPER SEAL

- Keeps contaminants from entering the sealing area
- Protects internal components
- Reduces maintenance while increasing productivity

### LOW CARRIER HEIGHT

- Reduces overall actuator envelope
- Large mounting area for high load stability
- T-Slots for mounting flexibility

### STROKE ADJUSTMENT

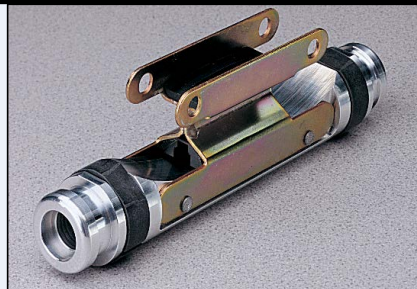
- End of stroke
- Integrated into design

### 3-PORTED HEADS

- Single End Porting
- Standard feature
- Simplifies air connections

### FORMED STEEL PISTON BRACKET

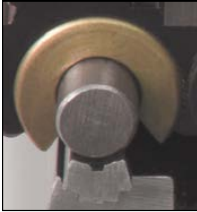
- Provides maximum strength at major stress points
- Heat treated carbon steel withstands the toughest dynamic forces
- Strongest bracket design in the industry assures long life with less maintenance





# TOLOMATIC...THE RODLESS CYLINDER LEADER

## STEEL GUIDE RODS



- Two precision ground steel guide rods integrated with extrusion provides positive support of load

## RETAINED DUST BAND

- Retained dust band keeps contaminants from entering the cylinder interior, protecting components for reduced maintenance and increased uptime

## RIGID BLACK-ANODIZED EXTRUDED ALUMINUM TUBE

- Stronger, stiffer tube retains tolerance specs when chamber is pressurized
- Keeps sealing band in place for maximized air efficiency
- Tube supports are minimized
- Solid structural support provides durability and long life performance

## LOAD-BEARING CARRIER DESIGN

- Load and piston are independent - piston floats, resulting in less friction and longer seal life



- Bearings offer consistently low friction and long wear; 1/2" bore features composite bearings, 1" bore features precision linear ball bearings

NOTE: Boxed letters indicate ordering codes

## OPTIONS



### AUXILIARY CARRIER **DW DO**

- Substantially higher load capacity
- Substantially higher bending moment capacity



### SUPPORTS **MP**

- Used for intermediate support
- Flush with bottom of actuator to retain low profile
- Drop-in, adjustable mounting locations



### T-NUTS

- Used for intermediate support, combine with Tube Supports or mount directly to surface



### SHOCK ABSORBERS **SL SH**

- Smooth deceleration
- Allows increased operating speed
- Self-compensates for load or speed changes
- Minimizes impact load to equipment
- Higher equipment productivity
- Integrated to carrier design



### SWITCHES

- Available in Proximity, Reed, Hall-effect and Triac
- 15ft. cable with flying leads; available with quick-disconnect couplers



# LS05 Linear Slide Rodless Cylinder

## PERFORMANCE

ABT

MXP

BC2

BC3

BC4

LS

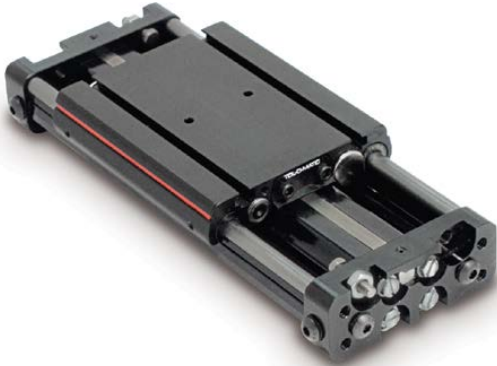
MG

CC

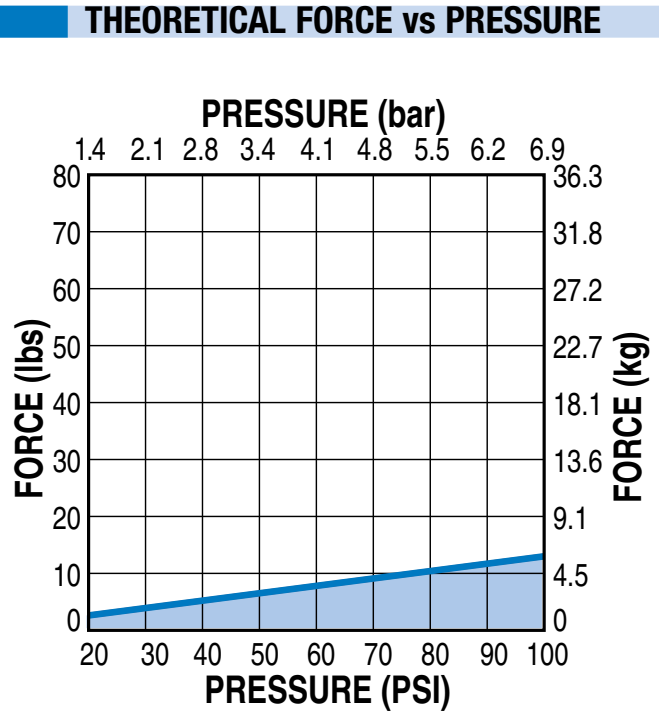
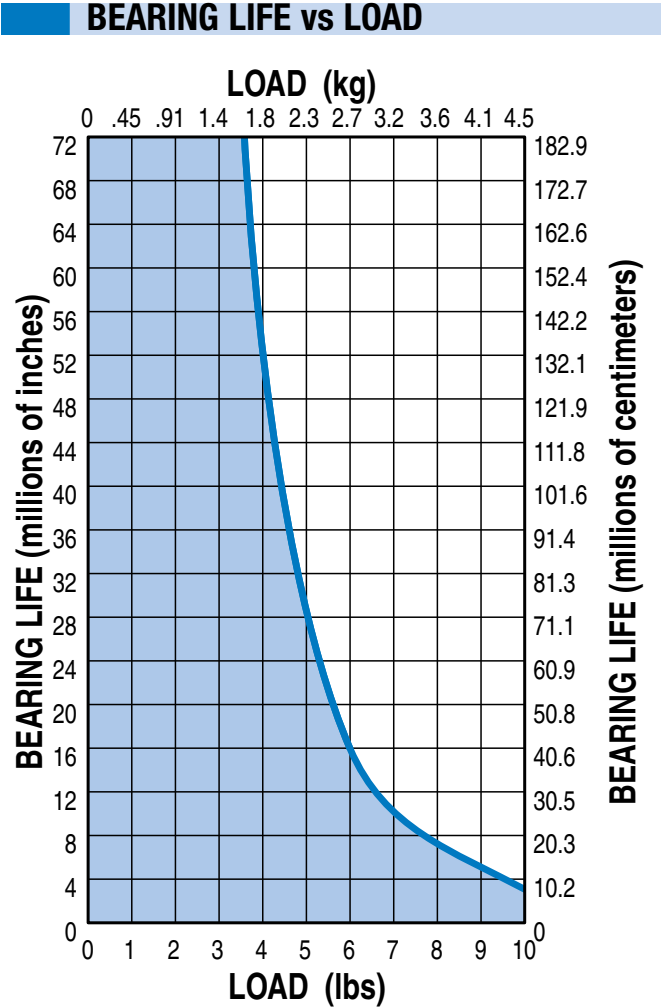
PB

ENGR

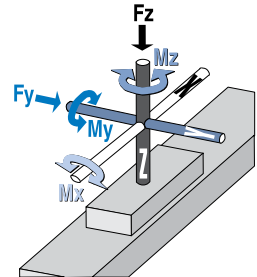
LS05



| LS05 OPTIONS           | Page   |
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| Auxiliary Carrier      | LS_8   |
| Proximity Sensors      | LS_13  |
| Shock Absorbers        | LS_14  |
| Switches               | LS_11  |
| Supports               | LS_10  |
| MORE INFORMATION       | Page   |
| Application Guidelines | BC4_32 |
| Ordering               | LS_18  |
| Selection              | LS_16  |



## SPECIFICATIONS



LS05 BENDING MOMENTS AND LOAD

|        | BORE SIZE | MAX. BENDING MOMENT |            |            | MAX. LOAD |
|--------|-----------|---------------------|------------|------------|-----------|
|        |           | My                  | Mx         | Mz         | Fz        |
| U.S.   | 0.50 in   | 4.0 in-lbs          | 8.0 in-lbs | 6.0 in-lbs | 10.0 lbs  |
| Metric | 12 mm     | 0.45 N-m            | 0.90 N-m   | 0.68 N-m   | 4.5 kg    |



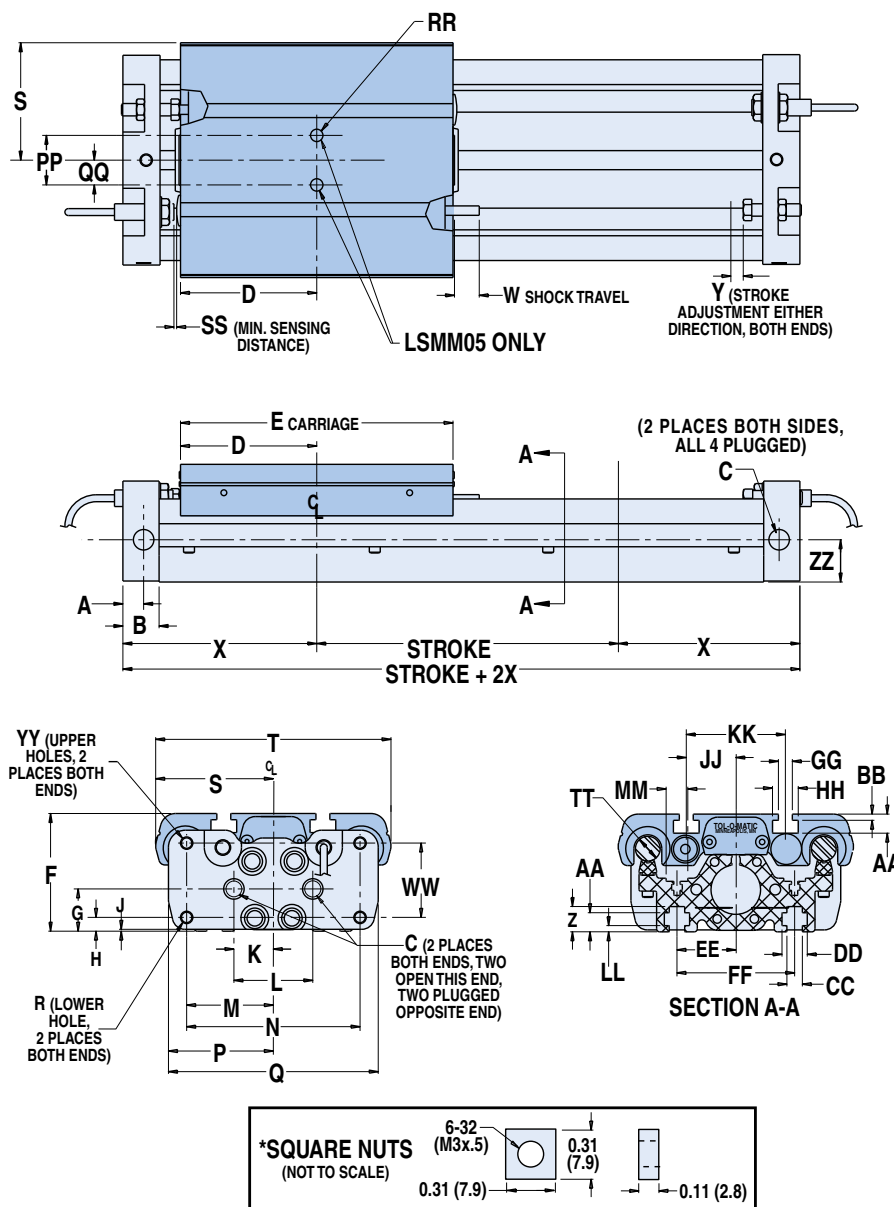
# LS05 Linear Slide Rodless Cylinder

3D CAD available at  
www.tolomatic.com



Always use configured CAD solid model  
to determine critical dimensions

## DIMENSIONS



\*NOTE: Four square nuts are provided with each linear slide for base mounting. Additionally 2 square nuts are provided for 30" of stroke and 2 for every 20" of stroke thereafter.

|    | U.S.            | Metric           |
|----|-----------------|------------------|
| A  | 0.32            | 8.1              |
| B  | 0.50            | 12.7             |
| C  | #10-32 PORTS    | M5 x 0.8         |
| D  | 1.82            | 46.1             |
| E  | 3.63            | 92.2             |
| F  | 1.31            | 33.3             |
| G  | 0.43            | 10.8             |
| H  | 0.24            | 6.0              |
| J  | 0.02            | 0.5              |
| K  | 0.88            | 22.23            |
| L  | 1.75            | 44.45            |
| M  | 1.13            | 28.58            |
| N  | 2.25            | 57.15            |
| P  | 1.39            | 35.5             |
| Q  | 2.78            | 70.6             |
| R  | #10-24 x .38 DP | M5 x 0.8 x 10 DP |
| S  | 1.50            | 38.1             |
| T  | 3.00            | 76.2             |
| W  | 0.18            | 4.6              |
| X  | 2.69            | 62.9             |
| Y  | 0.13            | 3.2              |
| Z  | 0.34            | 8.59             |
| AA | 0.19            | 4.88             |
| BB | 0.06            | 1.57             |
| CC | 0.16            | 3.96             |
| DD | 0.33            | 8.43             |
| EE | 0.81            | 20.62            |
| FF | 1.63            | 41.28            |
| GG | 0.16            | 3.96             |
| HH | 0.33            | 8.43             |
| JJ | 0.94            | 23.83            |
| KK | 1.88            | 47.63            |
| LL | 0.13            | 3.18             |
| MM | 0.28            | 7.14             |
| PP | 1.00            | 25.4             |
| QQ | 0.50            | 12.7             |
| RR | .13 x .09 DP    | 3.18 x 2.4 DP    |
| SS | 0.04            | 1                |
| TT | .25 Nominal     | 6.35 Nominal     |
| WW | 0.50            | 12.7             |
| YY | #10-24 x .21 DP | M5 x 0.8 x 5 DP  |
| ZZ | 0.47            | 11.8             |
|    | INCHES          | MILLIMETERS      |

## SPECIFICATIONS

|        | BORE SIZE | WEIGHT  |                    | MAX. STROKE LENGTH* | MAX. PRESSURE | TEMPERATURE RANGE | END-OF-STROKE POSITIONING ACCURACY | STROKE ADJUSTMENT |
|--------|-----------|---------|--------------------|---------------------|---------------|-------------------|------------------------------------|-------------------|
|        |           | BASE    | PER UNIT OF STROKE |                     |               |                   |                                    |                   |
| U.S.   | 0.50 in   | 1.2 lbs | 0.15 lbs/in        | 72 in               | 100 PSI       | 20° to 140° F     | ±0.0005 in                         | ±0.12 in per end  |
| Metric | 12 mm     | 0.54 kg | 0.068 kg/mm        | 1829 mm             | 6.895 bar     | -7° to 60° C      | 0.0127 mm                          | ±3.05 mm per end  |

\*For longer strokes, alternate materials, mounting and/or fasteners – consult Tolomatic

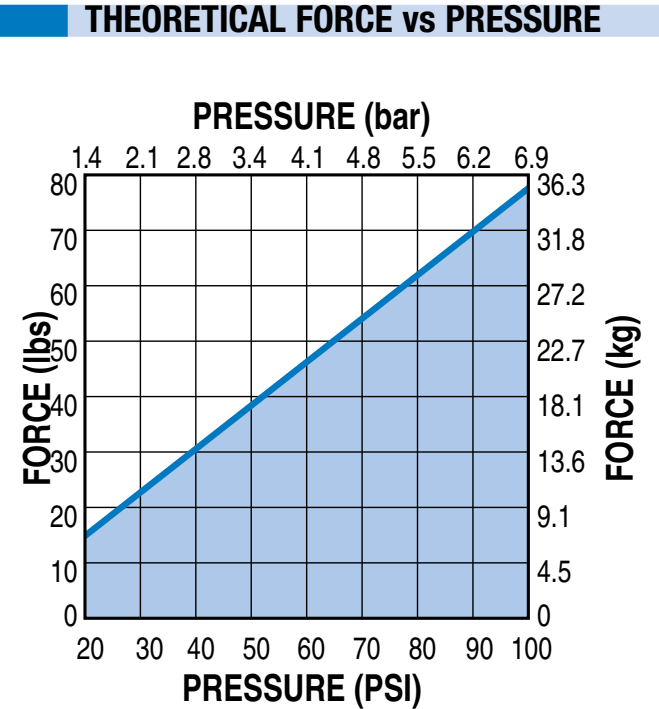
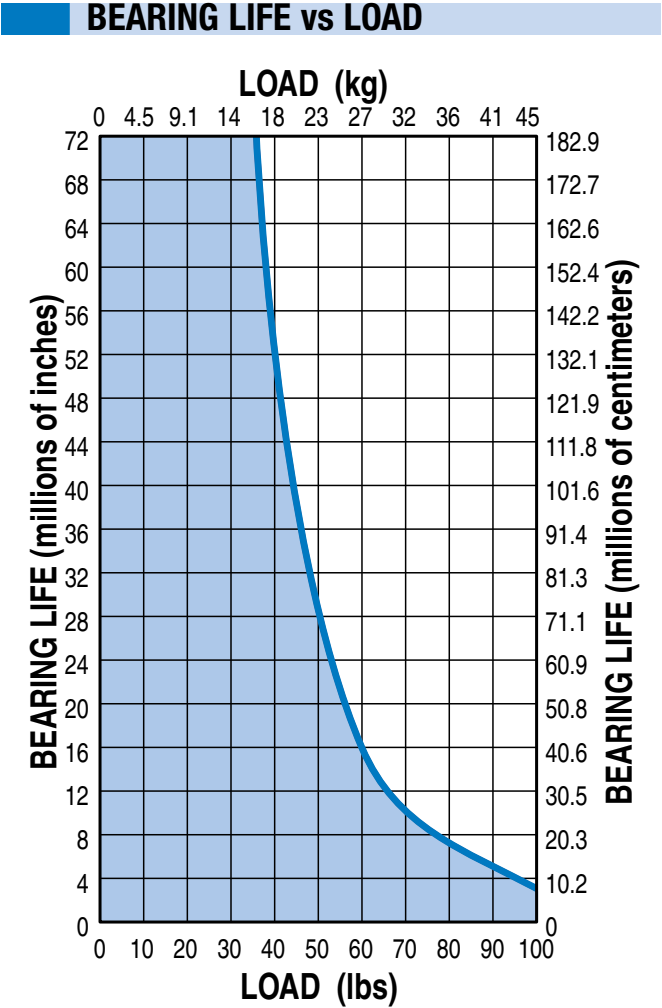
# LS10 Linear Slide Rodless Cylinder

## PERFORMANCE

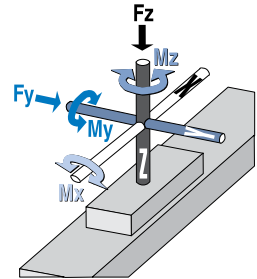
LS10



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| Auxiliary Carrier      | LS_8   |
| Proximity Sensors      | LS_13  |
| Shock Absorbers        | LS_14  |
| Switches               | LS_11  |
| Supports               | LS_10  |
| MORE INFORMATION       | Page   |
| Application Guidelines | BC4_32 |
| Ordering               | LS_18  |
| Selection              | LS_16  |



## SPECIFICATIONS



### LS10 BENDING MOMENTS AND LOAD

|        | BORE SIZE | MAX. BENDING MOMENT |           |            | MAX. LOAD |
|--------|-----------|---------------------|-----------|------------|-----------|
|        |           | My                  | Mx        | Mz         | Fz        |
| U.S.   | 1.00 in   | 80 in-lbs           | 80 in-lbs | 125 in-lbs | 100 lbs   |
| Metric | 25 mm     | 9.0 N-m             | 9.0 N-m   | 14.0 N-m   | 45.4 kg   |

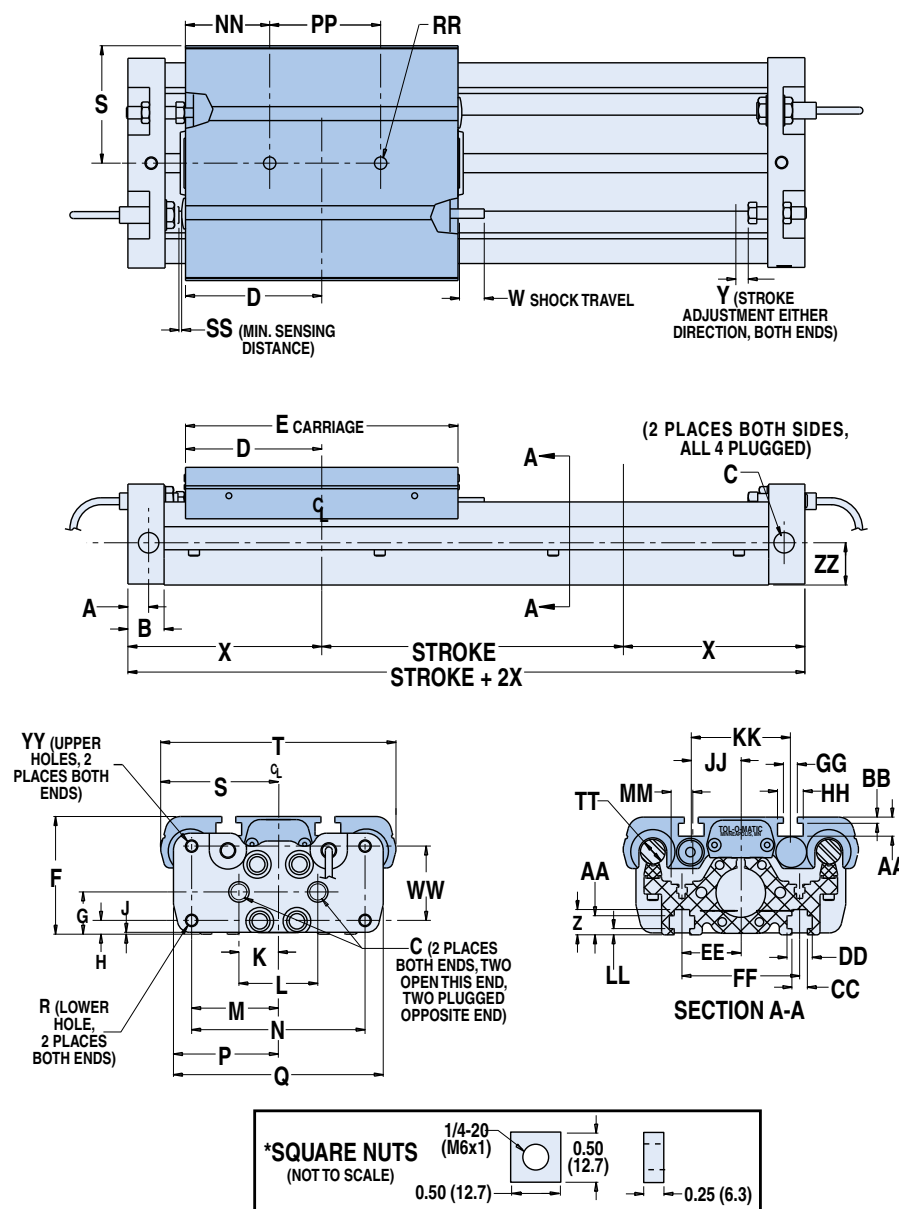
# LS10 Linear Slide Rodless Cylinder

3D CAD available at  
www.tolomatic.com



Always use configured CAD solid model  
to determine critical dimensions

## DIMENSIONS



\*NOTE: Four square nuts are provided with each linear slide for base mounting. Additionally 2 square nuts are provided for 30" of stroke and 2 for every 20" of stroke thereafter.

|    | U.S.            | Metric            |
|----|-----------------|-------------------|
| A  | 0.42            | 10.7              |
| B  | 0.73            | 18.5              |
| C  | 1/8 NPT PORT    | G 1/8-28 Parallel |
| D  | 2.75            | 69.9              |
| E  | 5.50            | 139.7             |
| F  | 2.38            | 60.5              |
| G  | 0.86            | 21.7              |
| H  | 0.28            | 7.1               |
| J  | 0.04            | 1.0               |
| K  | 0.80            | 20.3              |
| L  | 1.59            | 40.4              |
| M  | 1.75            | 44.5              |
| N  | 3.50            | 88.9              |
| P  | 2.13            | 54.1              |
| Q  | 4.25            | 107.9             |
| R  | 1/4-20 x .50 DP | M6 x 1.0 x 12 DP  |
| S  | 2.38            | 60.5              |
| T  | 4.75            | 120.7             |
| W  | 0.43            | 10.9              |
| X  | 3.89            | 98.8              |
| Y  | 0.25            | 6.4               |
| Z  | 0.51            | 12.9              |
| AA | 0.39            | 9.8               |
| BB | 0.10            | 2.5               |
| CC | 0.31            | 7.9               |
| DD | 0.51            | 13.0              |
| EE | 1.19            | 30.2              |
| FF | 2.38            | 60.3              |
| GG | 0.28            | 7.1               |
| HH | 0.52            | 13.2              |
| JJ | 1.00            | 25.4              |
| KK | 2.00            | 50.8              |
| LL | 0.13            | 3.2               |
| MM | 0.44            | 11.1              |
| NN | 1.75            | 44.5              |
| PP | 2.00            | 50.8              |
| RR | .25 x .20 DP    | 6.35 x 5.1 DP     |
| SS | 0.04            | 1.0               |
| TT | .472 Nominal    | 12.0 Nominal      |
| WW | 1.50            | 38.1              |
| YY | 1/4-20 x .38 DP | M6 x 1.0 x 9 DP   |
|    | INCHES          | MILLIMETERS       |

## SPECIFICATIONS

|        | BORE SIZE | WEIGHT  |                    | MAX. STROKE LENGTH* | MAX. PRESSURE | TEMPERATURE RANGE | END-OF-STROKE POSITIONING ACCURACY | STROKE ADJUSTMENT |
|--------|-----------|---------|--------------------|---------------------|---------------|-------------------|------------------------------------|-------------------|
|        |           | BASE    | PER UNIT OF STROKE |                     |               |                   |                                    |                   |
| U.S.   | 1.00 in   | 5.2 lbs | 0.4 lbs/in         | 72 in               | 100 PSI       | 20° to 140° F     | ±0.0005 in                         | ±0.25 in per end  |
| Metric | 25 mm     | 2.36 kg | 0.181 kg/mm        | 1829 mm             | 6.895 bar     | -7° to 60° C      | 0.0127 mm                          | ±6.35 mm per end  |

\*For longer strokes, alternate materials, mounting and/or fasteners – consult Tolomatic

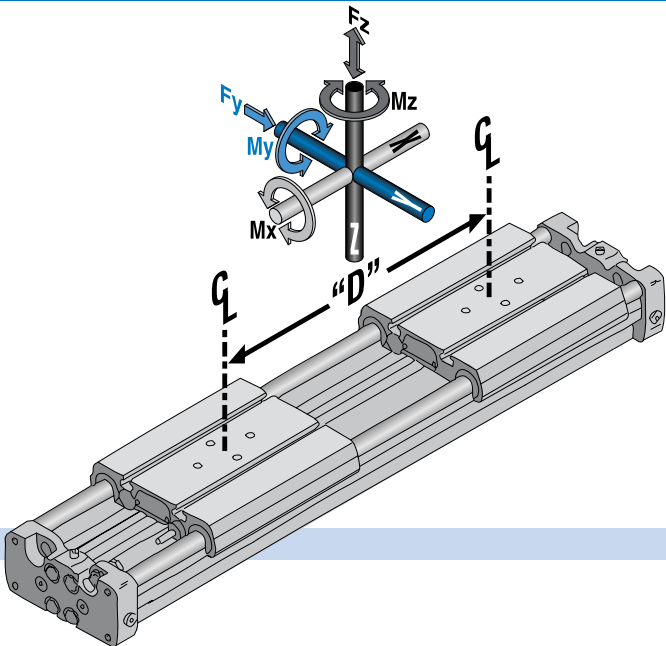
# LS Auxiliary Carrier - All Sizes

## PERFORMANCE

The auxiliary carrier option substantially increases load carrying and bending moments capacity over the standard single carrier models. As a general rule, the auxiliary carrier option is highly recommended in vertical applications (My) if the distance from the carrier mounting surface to the load center of gravity (CG) exceeds the overall length of the carrier. Auxiliary carriers can be ordered with (DW) or without (DO) an internal piston. (Auxiliary carriers without a piston have no cushion on the cylinder end closest to the auxiliary carrier.)

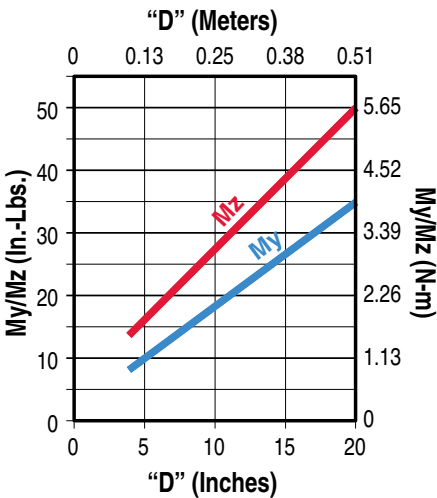


NOTE: breakaway pressure will increase when using auxiliary carrier.

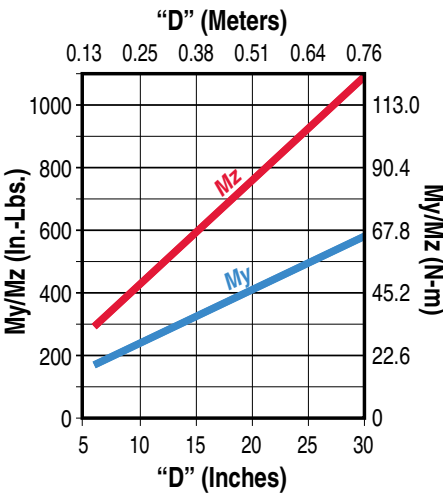


## BENDING MOMENTS

LS05 AUXILIARY CARRIER  
LOAD vs DISTANCE



LS10 AUXILIARY CARRIER  
LOAD vs DISTANCE



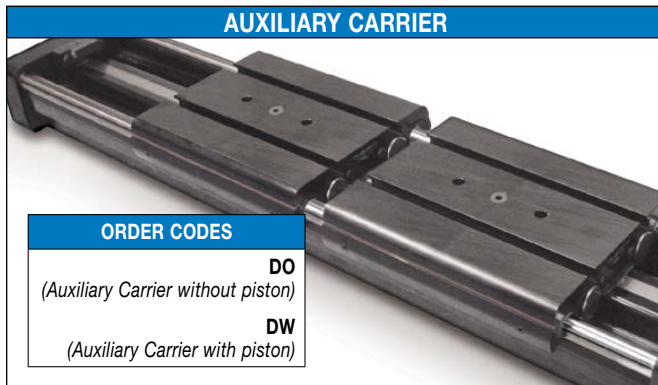
Rates were calculated with the following assumptions:  
1.) Coupling between carriers is rigid. 2.) Load is equally distributed between carriers.  
3.) Coupling device applies no misalignment loads to carriers.

|    | BORE SIZE |    | “D” MINIMUM * |       | MAX. BENDING MOMENT |       |        |       |        |       | MAX. LOAD |      |
|----|-----------|----|---------------|-------|---------------------|-------|--------|-------|--------|-------|-----------|------|
|    |           |    |               |       | My**                |       | Mx     |       | Mz**   |       | Fz        |      |
|    | in        | mm | in            | mm    | in-lbs              | N-m   | in-lbs | N-m   | in-lbs | N-m   | lbs       | kg   |
| 05 | 0.50      | 12 | 3.63          | 92.2  | 9.51                | 1.07  | 16.00  | 1.81  | 14.27  | 1.61  | 20        | 9.08 |
| 10 | 1.00      | 25 | 5.75          | 146.1 | 177.80              | 20.09 | 160.00 | 18.08 | 277.80 | 31.30 | 200       | 90.8 |

\* "D" is distance between carriers

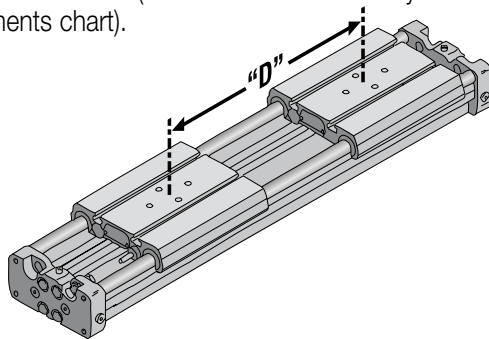
\*\* Loads calculated are at minimum "D", for substantially higher My and Mz loads increase "D" and refer to graph above

# LS Auxiliary Carrier - All Sizes



## ORDERING INFORMATION

When ordering, determine the minimum distance required between carriers (dimension "D" in Auxiliary Carrier Bending Moments chart).



Determine your working stroke and your "D" dimension, then enter these into your configuration string. (Example: LS10SK30.00DW8.00RT2) The configurator will calculate the overall length of the actuator. Refer to page LS\_18 for complete LS ordering information.

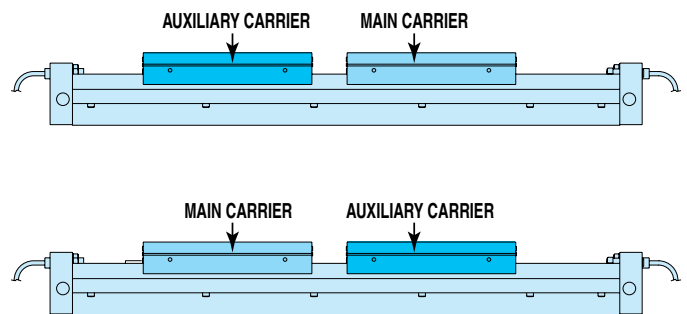
## ASSEMBLY INFORMATION



### IMPORTANT INFORMATION REGARDING AUXILIARY CARRIER PLACEMENT

When an LS is ordered without shock absorbers, the auxiliary carrier is always placed to the left (while facing the switch mounted or open port side) of the main carrier.

When an LS is ordered with shock absorbers, the auxiliary carrier is always placed to the right (while facing the switch mounted or open port side) of the main carrier.



ABT

IXP

BC2

BC3

BC4

LS

MG

CC

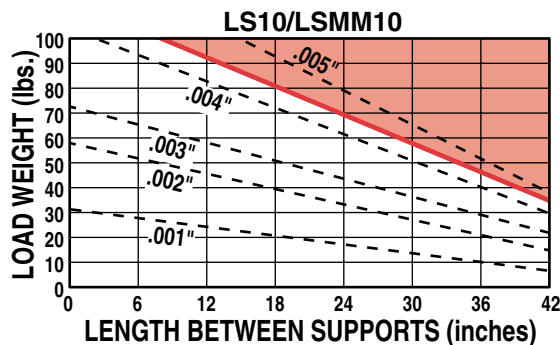
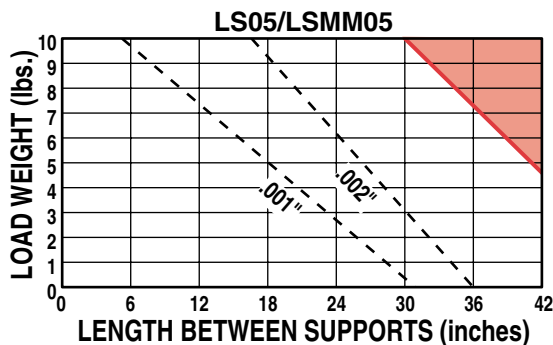
PB

ENGR



## PERFORMANCE

### DISTANCE BETWEEN SUPPORTS

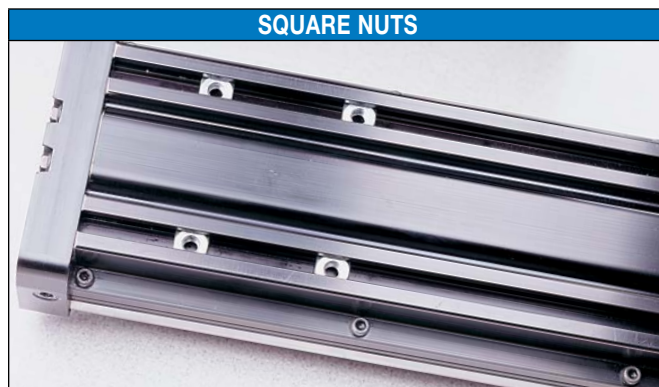


-- Deflection Rates — Tube supports recommended above this line.

#### MP SUPPORTS



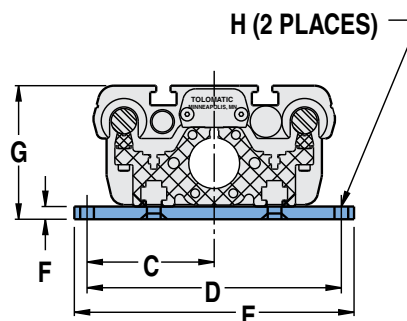
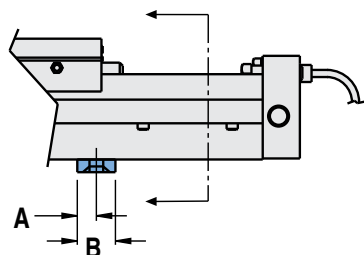
#### SQUARE NUTS



Base mounting linear slides may be accomplished by fastening directly to "T" slot nuts provided in the base of the slide (shown at right) or by using the MP mounting plates.

\*NOTE: Four square nuts are provided with each linear slide for base mounting. Additionally 2 square nuts are provided for 30" of stroke and 2 for every 20" of stroke thereafter.

## DIMENSIONS



|    | BORE SIZE | A    | B    | C    | D    | E    | F    | G    | H Ø   |
|----|-----------|------|------|------|------|------|------|------|-------|
| 05 | 0.50      | 0.38 | 0.75 | 1.60 | 3.30 | 3.60 | 0.25 | 1.60 | 0.156 |
| 10 | 1.00      | 0.38 | 0.75 | 2.50 | 5.00 | 5.50 | 0.25 | 2.63 | 0.270 |

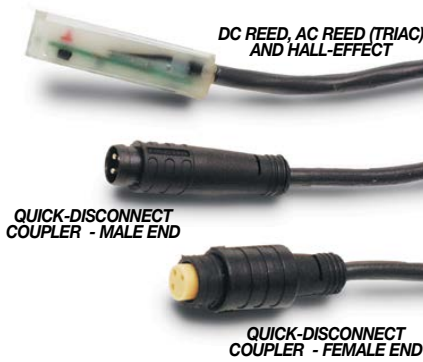
Dimensions in inches

|    | BORE SIZE | A   | B    | C    | D     | E     | F   | G    | H Ø  |
|----|-----------|-----|------|------|-------|-------|-----|------|------|
| 05 | 12        | 9.7 | 19.1 | 41.4 | 82.6  | 92.2  | 6.4 | 39.6 | 3.96 |
| 10 | 25        | 9.7 | 19.1 | 63.5 | 127.0 | 139.7 | 6.4 | 66.8 | 6.86 |

Dimensions in millimeters

# LS Switches - All Sizes

## SWITCHES

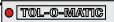


There are 10 sensing choices: DC reed, form A (open) or form C (open or closed); AC reed (Triac, open); Hall-effect, sourcing, PNP (open); Hall-effect, sinking, NPN (open); each with either flying leads or QD (quick disconnect). Commonly used to send analog signals to PLC (programmable logic controllers), TLL, CMOS circuit or other controller device. These switches are activated by the actuator's magnet.

Switches contain reverse polarity protection. QD cables are shielded; shield should be terminated at flying lead end.

If necessary to remove factory installed switches, be sure to reinstall on the same side of actuator with scored face of switch toward internal magnet.

## SPECIFICATIONS

|                              | REED DC                                                                               |                 |                                     |           | REED AC                  |                            | HALL-EFFECT DC                                                                          |           |                                                                                         |           |
|------------------------------|---------------------------------------------------------------------------------------|-----------------|-------------------------------------|-----------|--------------------------|----------------------------|-----------------------------------------------------------------------------------------|-----------|-----------------------------------------------------------------------------------------|-----------|
| ORDER CODE                   | RT                                                                                    | RM              | BT                                  | BM        | CT                       | CM                         | TT                                                                                      | TM        | KT                                                                                      | KM        |
| LEAD                         | 5m                                                                                    | QD*             | 5m                                  | QD*       | 5m                       | QD*                        | 5m                                                                                      | QD*       | 5m                                                                                      | QD*       |
| CABLE SHIELDING              | Unshielded                                                                            | Shielded†       | Unshielded                          | Shielded† | Unshielded               | Shielded†                  | Unshielded                                                                              | Shielded† | Unshielded                                                                              | Shielded† |
| SWITCHING LOGIC              | "A" Normally Open                                                                     |                 | "C" Normally Open or Closed         |           | Triac Normally Open      |                            | PNP (Sourcing) Normally Open                                                            |           | NPN (Sinking) Normally Open                                                             |           |
| MECHANICAL CONTACTS          | Single-Pole Single-Throw                                                              |                 | Single-Pole Double-Throw            |           | Single-Pole Single-Throw |                            | NO, These Are Solid State Components                                                    |           |                                                                                         |           |
| COIL DIRECT                  | Yes                                                                                   |                 | Yes                                 |           | Yes                      |                            | —                                                                                       |           |                                                                                         |           |
| POWER LED                    | None                                                                                  |                 | None                                |           | None                     |                            | None                                                                                    |           | None                                                                                    |           |
| SIGNAL LED                   | Red  |                 |                                     |           |                          |                            | Red  |           | Red  |           |
| OPERATING VOLTAGE            | 200 Vdc max.                                                                          |                 | 120 Vdc max.                        |           | 120 Vac max.             |                            | 5 - 25 Vdc                                                                              |           |                                                                                         |           |
| OUTPUT RATING                | —                                                                                     |                 |                                     |           | —                        |                            | 25 Vdc, 200mA dc                                                                        |           |                                                                                         |           |
| OPERATING TIME               | 0.6 msec max.<br>(including bounce)                                                   |                 | 0.7 msec max.<br>(including bounce) |           | —                        |                            | < 10 micro sec.                                                                         |           |                                                                                         |           |
| OPERATING TEMPERATURE        | -40°F [-40°C] to 158°F [70°C]                                                         |                 |                                     |           |                          |                            | 0°F [-18°C] to 150°F [66°C]                                                             |           |                                                                                         |           |
| RELEASE TIME                 | 1.0 msec. max.                                                                        |                 |                                     |           | —                        |                            | —                                                                                       |           |                                                                                         |           |
| ON TRIP POINT                | —                                                                                     |                 |                                     |           | —                        |                            | 150 Gauss maximum                                                                       |           |                                                                                         |           |
| OFF TRIP POINT               | —                                                                                     |                 |                                     |           | —                        |                            | 40 Gauss minimum                                                                        |           |                                                                                         |           |
| **POWER RATING (WATTS)       | 10.0 §                                                                                |                 | 3.0 §§                              |           | 10.0                     |                            | 5.0                                                                                     |           |                                                                                         |           |
| VOLTAGE DROP                 | 2.6 V typical at 100 mA                                                               |                 | NA                                  |           | —                        |                            | —                                                                                       |           |                                                                                         |           |
| RESISTANCE                   | 0.1 Ω Initial (Max.)                                                                  |                 |                                     |           | —                        |                            | —                                                                                       |           |                                                                                         |           |
| CURRENT CONSUMPTION          | —                                                                                     |                 |                                     |           | 1 Amp at<br>86°F [30°C]  | 0.5 Amp at<br>140°F [60°C] | 200 mA at 25 Vdc                                                                        |           |                                                                                         |           |
| FREQUENCY                    | —                                                                                     |                 |                                     |           | 47 - 63 Hz               |                            | —                                                                                       |           |                                                                                         |           |
| CABLE MIN.<br>BEND<br>RADIUS | STATIC                                                                                | 0.630" [16mm]   |                                     |           |                          |                            |                                                                                         |           |                                                                                         |           |
|                              | DYNAMIC                                                                               | Not Recommended |                                     |           |                          |                            |                                                                                         |           |                                                                                         |           |

**CAUTION: DO NOT OVER TIGHTEN SWITCH HARDWARE WHEN INSTALLING!**

**\*\* WARNING:** Do not exceed power rating (Watt = Voltage X Amperage). Permanent damage to sensor will occur.

\*QD = Quick Disconnect; Male coupler is located 6" [152mm] from sensor,  
Female coupler to flying lead (part #2503-1025) distance is 197" [5m] also see Cable Shielding specification above

**REPLACEMENT OF QD SWITCHES MANUFACTURED BEFORE JULY 1, 1997:** It will be necessary to replace or rewire the female end coupler.



**Reed Switch Life Expectancy:** Up to 200,000,000 cycles (depending on load current, duty cycle and environmental conditions)

†Shielded from the female quick disconnect coupler to the flying leads. Shield should be terminated at flying lead end.

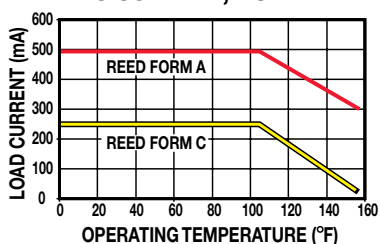
§ Maximum current 500mA (not to exceed 10VA) Refer to Temperature vs. Current graph and Voltage Derating graph

§§ Maximum current 250mA (not to exceed 3VA) Refer to Temperature vs. Current graph and Voltage Derating graph

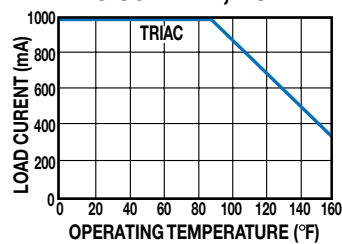
# LS Switches - All Sizes

## PERFORMANCE

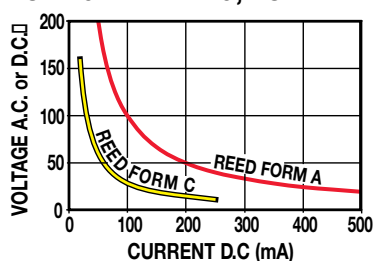
TEMP. vs CURRENT, DC REED



TEMP. vs CURRENT, AC REED

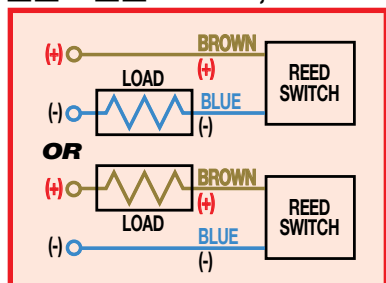


VOLTAGE DERATING, DC REED

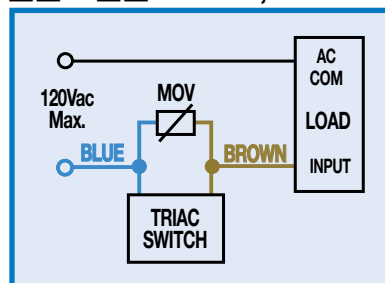


## WIRING DIAGRAMS

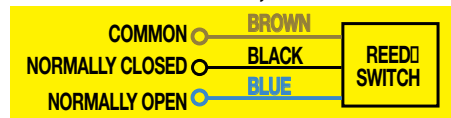
**R**T & **R**M DC REED, FORM A



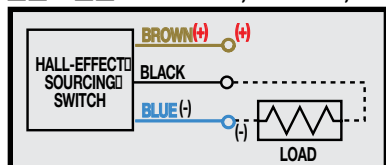
**C**T & **C**M AC REED, TRIAC



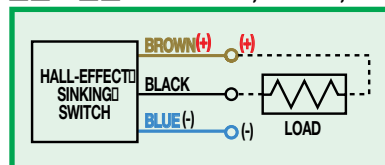
**B**T & **B**M DC REED, FORM C



**T**T & **T**M HALL-EFFECT, SOURCING, PNP



**K**T & **K**M HALL-EFFECT, SINKING, NPN

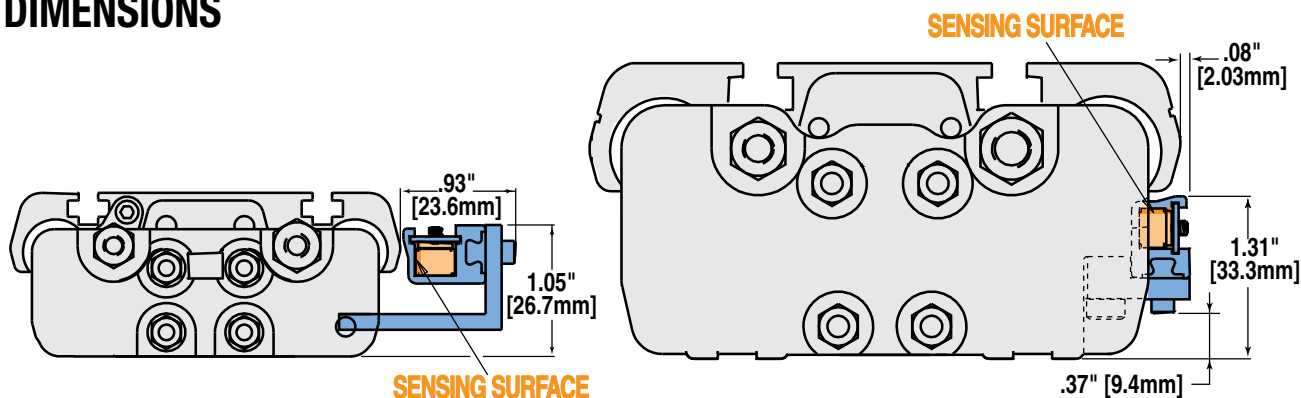


## INSTALLATION INFORMATION

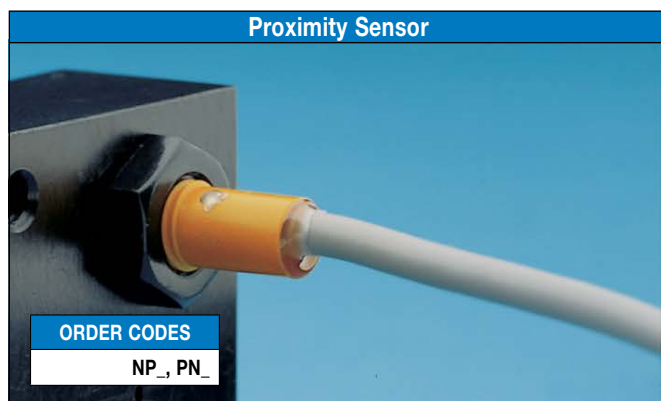


**⚠** THE NOTCHED FACE OF THE SWITCH INDICATES THE SENSING SURFACE AND MUST FACE TOWARD THE MAGNET.

## DIMENSIONS



# LS Proximity Sensors - All Sizes



This L.E.D. device senses end-of-stroke with one of two normally open inductive d.c. proximity sensors. NPN supplies a sinking signal; PNP supplies a sourcing signal to a device such as a programmable logic controller.

Ambient Temp.: -13° to 158° F, (-25° to 70° C.)

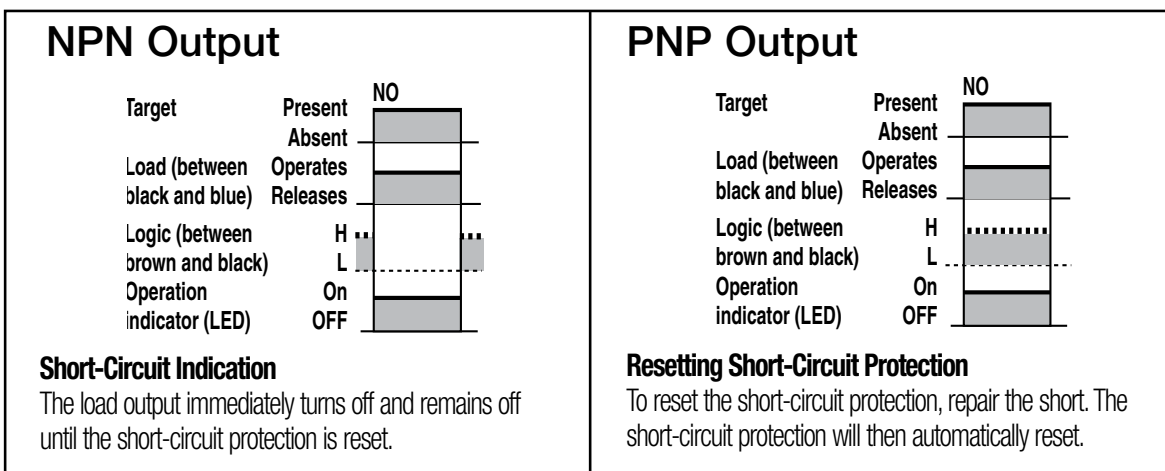
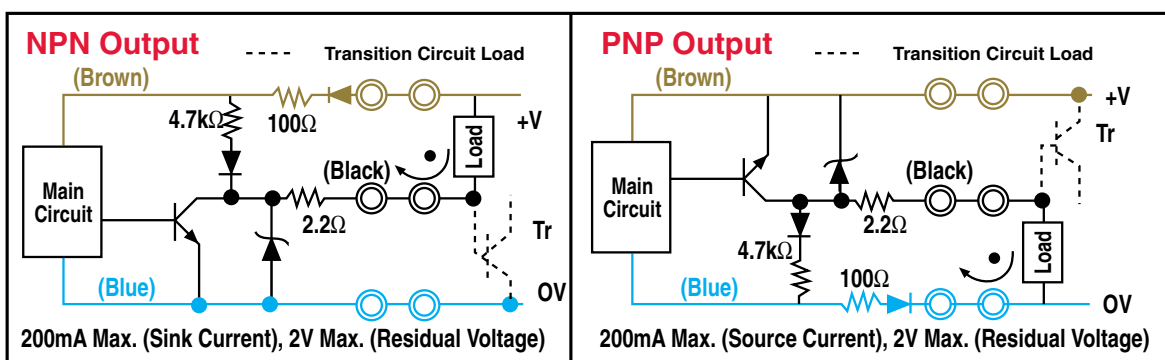
NEMA Encl. Rating: 1, 3, 4, 6, 12, 13

Lead Length: 6.56 feet (2.0m)

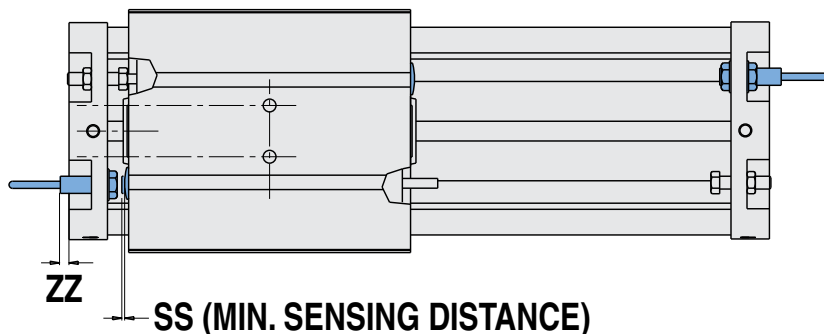
Max. Sensing Distance (LS05): .059" (1.5mm)

Max. Sensing Distance (LS10): .039" (1.0mm)

## Wiring Diagrams



## DIMENSIONS



| SIZE | BORE |      | SS   |      | ZZ   |       |
|------|------|------|------|------|------|-------|
|      | in   | mm   | in   | mm   | in   | mm    |
| 05   | 0.50 | 12.7 | 0.04 | 1.02 | 0.46 | 11.68 |
| 10   | 1.00 | 25.4 | 0.04 | 1.02 | 0.40 | 10.16 |

# LS Shock Absorbers - All Sizes

3D CAD available at  
www.tolomatic.com



Always use configured CAD solid model  
to determine critical dimensions

## SHOCK ABSORBERS



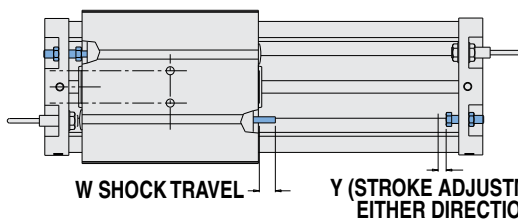
Rodless cylinders with standard internal cushion offer an effective method of decelerating loads. However, all Tolomatic rodless cylinders are capable of carrying heavier loads at higher velocities than the cylinder cushion can absorb. Optional shock absorbers can be used to increase the cylinder's life and broaden the application range for the cylinder model you have chosen.

Typical shock absorber life varies between 1-2 million cycles (depending on environment). Appropriate preventative maintenance should be considered in high cyclic applications.

**NOTE:** Actuators ordered without selecting a shock absorber MUST have external stops. The LS does NOT have internal bumpers or cushions.

**CAUTION:** In applications which result in a load bending moment at deceleration, care should be taken to decelerate the load rather than the carrier of the band cylinder.

## DIMENSIONS



| SIZE | BORE  | W    | Y    |
|------|-------|------|------|
| 05   | 0.375 | 0.18 | 0.13 |
| 10   | 0.625 | 0.43 | 0.25 |

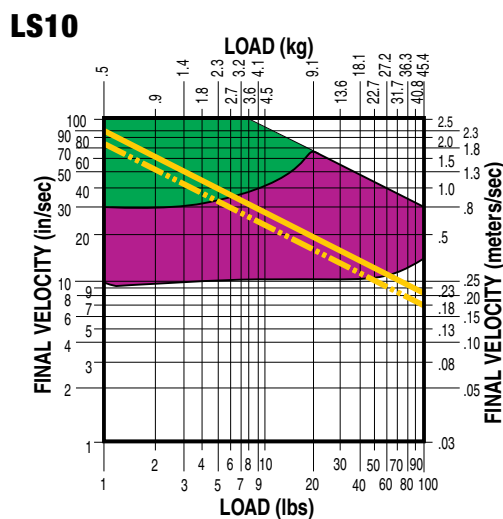
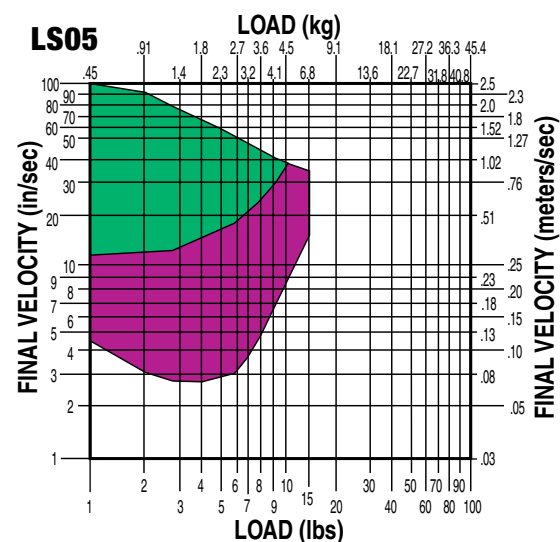
Dimensions in inches

| SIZE | BORE | W    | Y   |
|------|------|------|-----|
| 05   | 12   | 4.6  | 3.2 |
| 10   | 25   | 10.9 | 6.4 |

Dimensions in millimeters

## PERFORMANCE

### VELOCITY vs LOAD

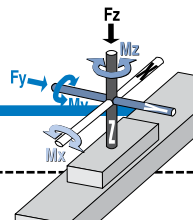


**LIGHT DUTY** (Light load/High velocity)

**HEAVY DUTY** (Heavy load/Low velocity)



# Application Data Worksheet



## STROKE LENGTH

☐ inch (S) ☒ (K)  
(U.S. Standard)

☐ millimeters  
(Metric)

## AVAILABLE AIR PRESSURE

☐ PSI  
(U.S. Standard)

☐ bar  
(Metric)

## REQUIRED THRUST FORCE

☐ lbf  
(U.S. Standard)

☐ N  
(Metric)

## LOAD

☐ lb  
(U.S. Standard)

☐ kg  
(Metric)

## LOAD CENTER OF GRAVITY DISTANCE TO CARRIER CENTER

☐ inch  
(U.S. Standard)

☐ millimeters  
(Metric)

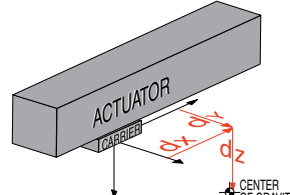
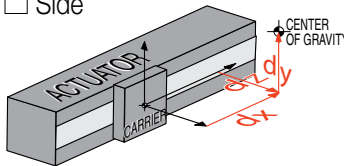
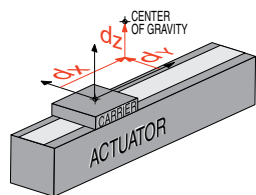
$d_x$  \_\_\_\_\_  
 $d_y$  \_\_\_\_\_  
 $d_z$  \_\_\_\_\_

## ORIENTATION

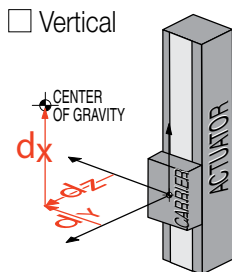
☐ Horizontal

☐ Side

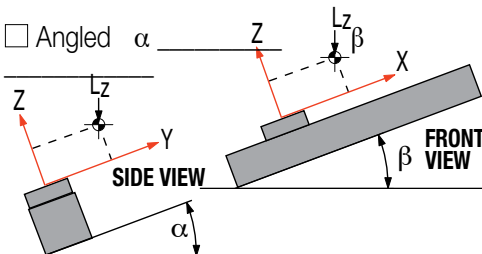
☐ Horizontal Down



☐ Vertical



☐ Angled  $\alpha$



## OTHER ISSUES:

(i.e. Environment,  
Temperature,  
Contamination, etc.)

Contact information:

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



Fax (1-763-478-8080) or call Tolomatic (1-800-328-2174) with the above information.  
We will provide any assistance needed to determine the proper actuator.

ABT

MXP

BC2

BC3

BC4

LS

MG

CC

PB

ENGR

# Rodless Cylinder Selection Guidelines - BC2, BC3, BC4, LS - All Sizes

## PROVIDING LOAD GUIDANCE AND SUPPORT

The process of selecting a load bearing actuator for a given application can be complex. It is highly recommended that you contact Tolomatic or a Tolomatic Distributor for assistance in selecting the best actuator for your application. The following overview of the selection guidelines are for educational purposes only.

### 1 COMPILE APPLICATION REQUIREMENTS

To determine the appropriate Band Cylinder or Linear Slide model for an application, compile the following information:

- Available pressure (PSI)
- Weight of load (lbs or kg)
- Orientation of load (lbs or kgs)
- Velocity of load (in/sec or mm/sec)
- Stroke length (in or mm)

HINT: Use Tolomatic sizing and selection software, download at: [tolomatic.com](http://tolomatic.com)

### 2 SELECT CYLINDER SIZE

- Consult the Theoretical Force vs. Pressure charts.
- Cross-reference the load force (or load weight if force is not known) and the available operating pressure. If the intersection falls below the diagonal line, and if moments do not exceed maximum values listed for that model (see Step 3), the actuator will accommodate the application.

If the intersection is above the diagonal line, a larger cylinder bore size should be considered.

NOTE: Additional force may be required to obtain the necessary acceleration for vertical or horizontal loads.

### 3 DETERMINE NATURE OF LOAD AND THE EFFECT OF BENDING MOMENTS

If the cylinder will guide and support a load located directly over the center of carrier, bending moments will not be a factor in the cylinder selection.

NOTE: The maximum load "L" must not exceed the capacity limits of the cylinder selected.

- Bending Moments

For off center or side loads, determine the distance from the center of mass of the load to the center of the carrier bracket. This measurement is needed to calculate the torque for bending moments. (Refer to Bending Moment chart for each model.)

Should the resulting maximum bending moment exceed figures indicated on the chart, external guides, auxiliary carrier/s or a larger cylinder should be considered.

- Auxiliary Carrier Bending Moments

The auxiliary carrier option (available on most models) increases load carrying capacity and bending moments. Auxiliary carriers can be ordered with or without an internal piston. (Auxiliary

carriers without a piston have no internal cushion on the cylinder end closest to the auxiliary carrier.)

IMPORTANT: When ordering, determine the working stroke, then the minimum distance required between carriers (dimension "D" in Auxiliary Carrier Bending Moments chart). When ordered, Tolomatic's configurator will calculate the overall length of the actuator.

NOTE: breakaway pressure will increase when using auxiliary carriers.

### 4 DETERMINE INTERNAL CUSHION CAPACITY

- Consult the Cushion Data chart for the model selected. The velocities listed on the cushion charts are final or cushion impact velocities. On applications where the internal cushions or bumpers are to be used, be sure the actual, final or impact velocity is known. If the velocity is not known, use of limit switches with valve deceleration circuits or shock absorbers should be considered. NOTE: The BC205 uses external bumpers in place of internal cushions, LS05 & LS10 do not have cushions or bumpers.
- Cross-reference the final velocity and weight of the load. If the intersection is below the diagonal lines, the internal cushions on the actuator may be used. If the point falls above the dashed diagonal line or if the velocity is not known, use deceleration circuits, external shock absorbers or select a

larger cylinder with greater cushion capacity. On high-cyclic applications, use of external stops is strongly recommended.

### 5 DETERMINE TUBE SUPPORT REQUIREMENTS

- Consult the Tube Support chart for the model selected.
- Cross reference the load weight and maximum distance between supports.

### 6 CONSIDER OPTIONS

- Switches— dc Reed, Hall-effect or ac Triac

Band Cylinders and Linear Slides each have different standard features and options. Check the options section for the actuator you have selected.

- Shock Absorbers— if needed.
- Foot Mounting Kits
- Floating Mount Bracket – use when lack of parallelism occurs between the cylinder and an external guided and supported load.
- Single End Porting (BC3, BC4)
- Long Carrier (BC4)
- Proximity Sensors (LS)
- Dual 180° Carrier (BC3)

# LS Service Parts Ordering - ALL Sizes

| SIZE                                                                          | Inch (U.S. Standard) |              | Metric          |                 |
|-------------------------------------------------------------------------------|----------------------|--------------|-----------------|-----------------|
|                                                                               | 05                   | 10           | 05              | 10              |
| <b>Support<sup>1</sup></b>                                                    | 0605-9010            | 0610-9010    | 5605-9010       | 5610-9010       |
| <b>Inductive DC Proximity Sensors - 10-24 volts NPN NO Sink<sup>2</sup></b>   | 0605-1023            | 0610-1023    | 0605-1023       | 0610-1023       |
| <b>Inductive DC Proximity Sensors - 10-24 volts PNP NO Source<sup>2</sup></b> | 0605-1024            | 0610-1024    | 0605-1024       | 0610-1024       |
| <b>Switch Rail and Rail Hardware (specify stroke)<sup>3</sup></b>             | 0605-9100SK_         | 0610-9100SK_ | 0605-9100SK_    | 0610-9100SK_    |
| <b>Shock Absorbers Field Retrofit Kit - Heavy Duty<sup>4,5</sup></b>          | 0605-9009            | 0610-9023    | 0605-9009       | 0610-9023       |
| <b>Shock Absorbers Field Retrofit Kit - Lite Duty<sup>4,5</sup></b>           | 0605-9008            | 0610-9022    | 0605-9008       | 0610-9022       |
| <b>T-Nuts (Each)</b>                                                          | 0605-1042            | 0610-1042    | 5605-1042       | 5610-1042       |
| <b>Configured Repair Kit<sup>6</sup></b>                                      | RKLS05NPSK_          | RKLS10NPSK_  | RKLS05TP(GP)SK_ | RKLS10TP(GP)SK_ |
| <b>Configured Repair Kit (Manufactured before May 1, 1998)<sup>6</sup></b>    | RKLS05NPSK_          | 0610-9033SK_ | RKLS05SK_       | 0610-9033SK_    |

| CONFIG. CODE ORDERING                         |      |
|-----------------------------------------------|------|
| Mounting Hardware & FE conn. included         |      |
| DESCRIPTION                                   | CODE |
| Switch Kit, Reed, Form C, 5m                  | BT   |
| Switch Kit, Reed, Form C, Male Conn.          | BM   |
| Switch Kit, Reed, Form A, 5m                  | RT   |
| Switch Kit, Reed, Form A, Male Conn.          | RM   |
| Switch Kit, Triac, 5m                         | CT   |
| Switch Kit, Triac, Male Conn.                 | CM   |
| Switch Kit, Hall-effect, Sinking, 5m          | KT   |
| Switch Kit, Hall-effect, Sinking, Male Conn.  | KM   |
| Switch Kit, Hall-effect, Sourcing, 5m         | TT   |
| Switch Kit, Hall-effect, Sourcing, Male Conn. | TM   |

NOTE: When kit is ordered female connector & all mounting hardware is included

## Switch Ordering NOTES:

To order field retrofit switch and hardware kits for all Tolomatic actuators: SW (Then the model and bore size, and type of switch required)

### Example: SWLS10RT

(Hardware and Form A Reed switch with 5 meter lead for 1.0" bore LS linear slide)

⚠ Replacing an existing switch on an actuator manufactured BEFORE 7-1-1997

**Order using CONFIGURATOR CODE in table above**

**Also order SWITCH RAIL and RAIL HARDWARE**

If replacing a quick-disconnect switch on an actuator manufactured BEFORE 7-1-1997 it will also be necessary to replace or require the female-end coupler with the in-line splice (see page LS\_11)

⚠ Adding a switch to an actuator manufactured without switches

**Order using CONFIGURATOR CODE in table above**

**Also order SWITCH RAIL and RAIL HARDWARE**



## Service Parts Ordering NOTES:

- 1 Support Kit contains one bracket and two screws
- 2 Proximity sensors for the LS05 have 5mm thread size; LS10 have 8mm thread size
- 3 When replacing an existing switch on an actuator manufactured BEFORE 7-1-1997 switch rail and hardware must be ordered stroke length is required. Order switch using Configurator Code in table at left.
- 4 Shock absorber kit includes one shock and mounting hardware
- 5 NOTE: Actuators ordered without selecting a shock absorber MUST have external stops. The LS does NOT have internal bumpers or cushions.
- 6 Repair Kit for LS contains external dust band, internal seal band, wipers, end caps and internal soft seals. Stroke length must be included after number or code.

NA = Not Available

# LS Ordering - All Sizes



**MODEL, BORE, STROKE**      **OPTIONS**

**LS 10 NP SK 55-250 DW 6-0 MP 3 SH 2 BM 2**

**MODEL & MOUNTING**

**LS** LS Linear Slide

**BORE SIZE**

**05** 0.50" (12mm)  
**10** 1.00" (25mm)

**MOUNTING & PORTS**

**NP** US standard mounting & NPT ports  
**TP†** Metric mounting with metric taper ports  
**GP†** Metric mounting with metric parallel ports

† The metric version provides metric tapped holes for mounting of the load to the carrier and of the actuator to mounting surfaces & metric ports

## STROKE LENGTH & MOUNTING TYPE

**SK** \_\_\_ Stroke, enter desired stroke length in inches  
**SM†** \_\_\_ Stroke, enter desired stroke length in millimeters

**NOTE:** Actuator mounting threads and mounting fasteners will be either inch or metric; depending on how stroke length is indicated.

**SK** = inch mounting  
**SM** = metric mounting

| SIZE      | MAXIMUM STROKE |             |
|-----------|----------------|-------------|
|           | ...SK<br>in    | ...SM<br>mm |
| <b>05</b> | 72             | 1,829       |
| <b>10</b> | 72             | 1,829       |

Not all codes listed are compatible with all options. Contact Tolomatic with any questions.

See page BC4\_16 for application guidelines

## AUXILIARY CARRIER (LS\_8)

**DW** Auxiliary carrier With piston & "D" distance  
**DO** Auxiliary carrier Without piston & "D" distance  
 "D" Distance between carriers in inches (**SK**) or millimeters (**SM**)

### MINIMUM "D" DISTANCE BETWEEN CARRIERS

|           | in   | mm  |
|-----------|------|-----|
| <b>05</b> | 5.07 | 129 |
| <b>10</b> | 5.17 | 131 |

\*When ordering auxiliary carrier option, enter the distance required between carriers. The configurator will calculate the overall length of the actuator.

## SUPPORTS (LS\_10)

**MP** Support & number required

\*NOTE: Four square nuts are provided with each linear slide for base mounting. Additionally 2 square nuts are provided for 30" of stroke and 2 for every 20" of stroke thereafter.

## SHOCK ABSORBERS (LS\_14)

**SH** Shock, Heavy duty and number required  
**SL** Shock, Light duty and number required

NOTE: Actuators ordered without selecting a shock absorber MUST have external stops. The LS does NOT have internal bumpers or cushions.

## PROXIMITY SENSOR (LS\_13)

**NP** Sinking type proximity sensor (NPN)  
**PN** Sourcing type proximity sensor (PNP)

## SWITCHES (LS\_11)

(Quantity desired follows ordering code)

**RM** Reed Switch (Form A) with 5-meter lead/QD (Quick-disconnect)  
**RT** Reed Switch (Form A) with 5-m lead  
**BM** Reed Switch (Form C) with 5-meter lead/QD  
**BT** Reed Switch (Form C) with 5-m lead  
**KM** Hall-effect Sinking Switch with 5-meter lead/QD  
**KT** Hall-effect Sinking Switch w/ 5-m lead  
**TM** Hall-effect Sourcing Switch with 5-meter lead/QD  
**TT** Hall-effect Sourcing Switch with 5-meter lead  
**CM** TRIAC Switch with 5-meter lead/QD  
**CT** TRIAC Switch with 5-meter lead  
**MDR** Dual Magnet (Reed, Hall-effect, Triac)

# MG & MGS MAGNETICALLY COUPLED RODLESS CYLINDER/SLIDE



## CONTENTS

|                                  |       |
|----------------------------------|-------|
| Features .....                   | MG_2  |
| MG Performance .....             | MG_4  |
| MG Specs, Dimensions .....       | MG_5  |
| MGS Performance .....            | MG_6  |
| MGS Specs, Dimensions .....      | MG_7  |
| MG Foot Mount .....              | MG_8  |
| MG Floating Mount .....          | MG_9  |
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| MGS Selection Guidelines .....   | MG_17 |
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| MGS Ordering .....               | MG_20 |



# MAG COUPLED CYLINDER

## ENDURANCE TECHNOLOGY<sup>SM</sup>

Endurance Technology features are designed for maximum durability to provide extended service life.

With magnetically coupled cylinders there is no mechanical connection of the carrier to the piston. The fully enclosed actuator body prevents contaminants from entering or escaping the actuator body. The perfect choice for applications where there are environmental concerns. Features internal polyurethane bumpers for dampened end-of-travel impact, anodized aluminum heads and actuator block, and a field-repairable design to practically eliminate maintenance downtime.

Air or oil actuated to 100 PSIG. With no mechanical piston connection, the actuator block can be easily rotated for increased mounting flexibility.

### MGS MAG SLIDE

#### BEARING CHOICE

- Precision linear ball bearing or
- Sintered bronze

#### DECELERATION

- Built-in shock absorber mounting
- External bumpers standard
- End of stroke adjustment

#### MULTIPLE-PORTED HEAD BLOCKS

- Flexible air connection to suit your application

#### HARDENED STEEL SHAFTS

- Corrosion resistant, durable and stable support system

#### STAINLESS STEEL TUBING

- Precision milled interior on these long lasting, corrosion resistant tubes

#### ANODIZED ALUMINUM CARRIER

- Durable and corrosion resistant
- Precision milled

#### ENGINEERED ELASTOMER WIPER

- No leak construction
- Durable, long lasting material

#### FIELD REPAIRABLE DESIGN

- Unique in the industry
- Durable and reliable

### MG MAG CYLINDER

#### ANODIZED ALUMINUM HEADS

- Durable and corrosion resistant

## TOLOMATIC...THE RODLESS CYLINDER LEADER

#### MAGNETIC FORCE CONNECTS PISTON TO CARRIER

- Rare earth magnets create positive connection between piston and carrier
- 3 coupling strengths
- Decouples at known force (useful in a variety of applications)
- Wear bearing for long life

### OPTIONS - CYLINDER



#### FLOATING MOUNT BRACKET [FL]

- Compensates for non-parallelism between cylinder and independently guided load
- Makes installation easier, increases actuator block bearing life



#### FOOT MOUNT [FM]

- Best mounting choice in most applications
- Made from plated stamped steel



#### SWITCHES

- Available in Reed, Hall-effect and Triac
- 15ft. cable with flying leads; available with quick-disconnect couplers



#### CORROSION RESISTANT

- Stainless steel components with seals for use in harsh environments

### OPTIONS - SLIDE



#### SHOCK ABSORBERS [SL] [SH]

- Smoother deceleration
- Self-compensates for load changes
- Reduces need for equipment maintenance



#### PROXIMITY SENSOR

- L.E.D. device senses end-of-stroke with one of two normally open inductive dc proximity sensors.



#### SWITCHES

- Available in Reed, Hall-effect and Triac
- 15ft. cable with flying leads; available with quick-disconnect couplers

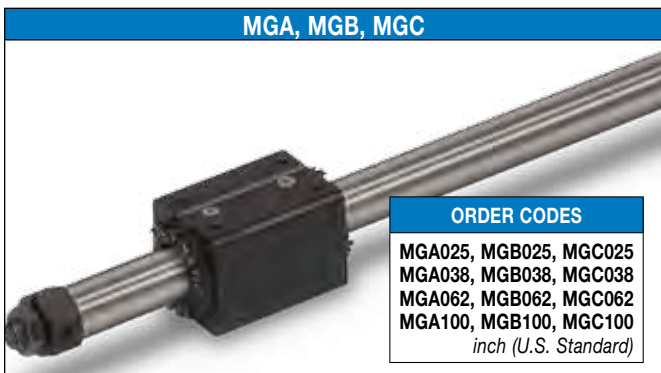
#### PNEUMATICALLY OR HYDRAULICALLY POWERED

- No leak construction
- Up to 100 PSI

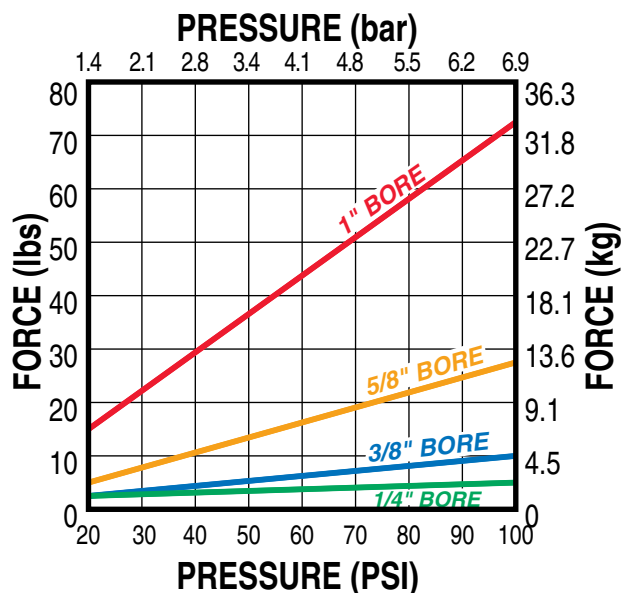


# MG Magnetically Coupled Cylinder - All Sizes

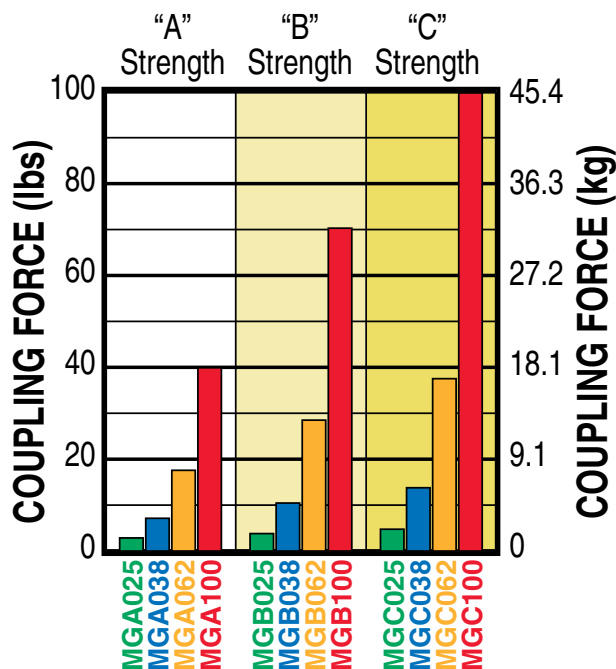
## PERFORMANCE

| MGA, MGB, MGC                                                                                                                       |       |
|-------------------------------------------------------------------------------------------------------------------------------------|-------|
|                                                    |       |
| ORDER CODES                                                                                                                         |       |
| MGA025, MGB025, MGC025<br>MGA038, MGB038, MGC038<br>MGA062, MGB062, MGC062<br>MGA100, MGB100, MGC100<br><i>inch (U.S. Standard)</i> |       |
| MG OPTIONS                                                                                                                          | Page  |
| Floating Mount Bracket                                                                                                              | MG_9  |
| Foot Mounts                                                                                                                         | MG_8  |
| Switches                                                                                                                            | MG_10 |
| MORE INFORMATION                                                                                                                    | Page  |
| Application Guidelines                                                                                                              | MG_18 |
| Ordering                                                                                                                            | MG_19 |
| Selection                                                                                                                           | MG_16 |

## THEORETICAL FORCE vs PRESSURE



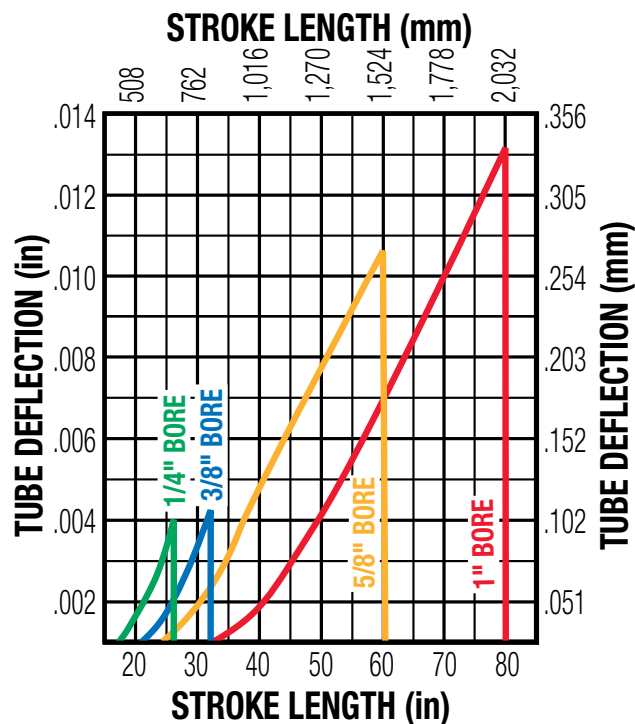
## MAGNETIC COUPLING STRENGTH



### NOTES REGARDING MAGNETIC COUPLING

- 1) De-coupling will occur if coupling force is exceeded.
- 2) All coupling forces listed are for horizontal applications. For vertical applications, Tolomatic recommends using a 2-to-1 coupling force safety factor.

## TUBE DEFLECTION



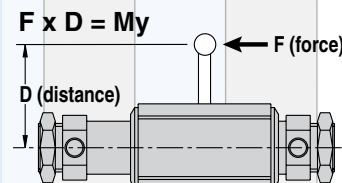
# MG Magnetically Coupled Cylinder - All Sizes

## SPECIFICATIONS

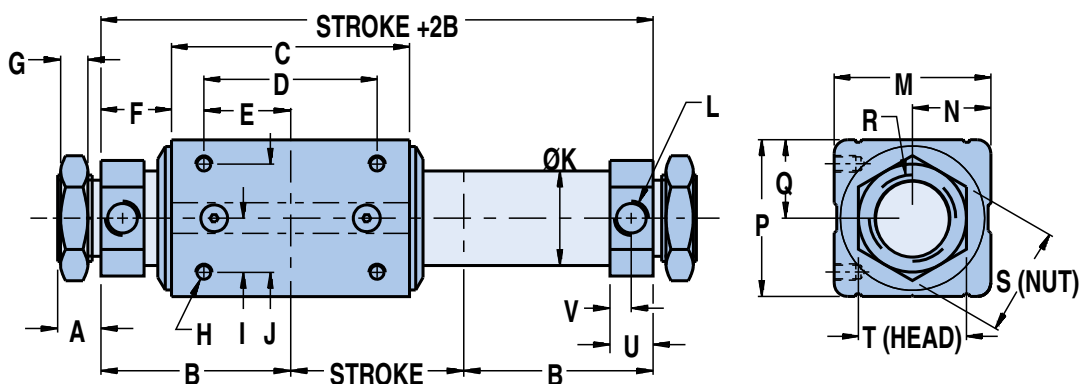
### MGA, MGB, MGC BENDING MOMENT, WEIGHT, ETC.

| MAGNET CODE | SIZE | BORE SIZE |     | BASE WEIGHT |      | WEIGHT/UNIT |         | MAX. STROKE |        | MAX. BENDING MOMENT $M_y$ |       | MAX. PRESSURE |       | TEMPERATURE RANGE |            |
|-------------|------|-----------|-----|-------------|------|-------------|---------|-------------|--------|---------------------------|-------|---------------|-------|-------------------|------------|
|             |      | in        | mm  | lbs         | kg   | lbs/in      | kg/mm   | in          | mm     | in-lbs                    | N-m   | PSI           | bar   | °F                | °C         |
| A           | 025  | 0.250     | 6.4 | 0.12        | 0.05 | 0.01        | 0.00018 | 26.00       | 660.4  | 3.00                      | 0.339 | 100           | 6.895 | 20° to 140°       | -7° to 60° |
| B           |      |           |     | 0.12        | 0.05 |             |         |             |        |                           |       |               |       |                   |            |
| C           |      |           |     | 0.13        | 0.06 |             |         |             |        |                           |       |               |       |                   |            |
| A           | 038  | 0.375     | 9.5 | 0.20        | 0.09 | 0.01        | 0.00018 | 32.00       | 812.8  | 4.00                      | 0.452 | 100           | 6.895 | 20° to 140°       | -7° to 60° |
| B           |      |           |     | 0.21        | 0.10 |             |         |             |        |                           |       |               |       |                   |            |
| C           |      |           |     | 0.24        | 0.11 |             |         |             |        |                           |       |               |       |                   |            |
| A           | 062  | 0.625     | 16  | 0.49        | 0.22 | 0.02        | 0.00036 | 60.00       | 1524.0 | 9.00                      | 1.017 | 100           | 6.895 | 20° to 140°       | -7° to 60° |
| B           |      |           |     | 0.51        | 0.23 |             |         |             |        |                           |       |               |       |                   |            |
| C           |      |           |     | 0.57        | 0.26 |             |         |             |        |                           |       |               |       |                   |            |
| A           | 100  | 1.000     | 25  | 1.52        | 0.69 | 0.04        | 0.00071 | 80.00       | 2032.0 | 35.00                     | 3.954 | 100           | 6.895 | 20° to 140°       | -7° to 60° |
| B           |      |           |     | 1.55        | 0.70 |             |         |             |        |                           |       |               |       |                   |            |
| C           |      |           |     | 1.79        | 0.81 |             |         |             |        |                           |       |               |       |                   |            |

**\*For longer strokes, alternate materials, mounting and/or fasteners – consult Tolomatic**



## DIMENSIONS



|     | BORE  | F    | G    | H               | I    | J    | K     | L       | M    | N    | P    | Q    | R         | S    | T    | U    | V    |
|-----|-------|------|------|-----------------|------|------|-------|---------|------|------|------|------|-----------|------|------|------|------|
| 025 | 0.250 | 0.47 | 0.23 | #5-40UNC x .18  | 0.20 | 0.39 | Ø.31  | #10-32  | 0.67 | 0.34 | 0.67 | 0.34 | 3/8-24UNF | 0.56 | 0.56 | 0.41 | 0.21 |
| 038 | 0.375 | 0.50 | 0.23 | #5-40UNC x .18  | 0.31 | 0.63 | Ø.44  | #10-32  | 0.98 | 0.49 | 0.98 | 0.49 | 3/8-24UNF | 0.56 | 0.56 | 0.41 | 0.21 |
| 062 | 0.625 | 0.67 | 0.23 | #8-32UNC x .24  | 0.37 | 0.75 | Ø.69  | #10-32  | 1.38 | 0.69 | 1.38 | 0.69 | 3/8-24UNF | 0.56 | 0.75 | 0.44 | 0.22 |
| 100 | 1.000 | 0.81 | 0.32 | #10-32UNC x .25 | 0.62 | 1.25 | Ø1.09 | 1/8 NPT | 1.81 | 0.91 | 1.81 | 0.91 | 1-12UNF   | 1.25 | 1.25 | 0.50 | 0.25 |

Dimensions in inches

|     | BORE  | A    | B    | B*   | C    | C*   | D    | E    |
|-----|-------|------|------|------|------|------|------|------|
| 025 | 0.250 | 0.38 | 1.25 | 1.32 | 1.56 | 1.70 | 1.00 | 0.50 |
| 038 | 0.375 | 0.38 | 1.25 | 1.35 | 1.50 | 1.70 | 1.12 | 0.56 |
| 062 | 0.625 | 0.38 | 1.62 | 1.75 | 1.92 | 2.19 | 1.50 | 0.75 |
| 100 | 1.000 | 0.50 | 2.19 | 2.40 | 2.75 | 3.17 | 2.00 | 1.00 |

Dimensions in inches

*\*For "C strength" configurations only.*

|     | BORE | A    | B    | B*   | C    | C*   | D    | E    |
|-----|------|------|------|------|------|------|------|------|
| 025 | 6.4  | 9.7  | 31.8 | 33.5 | 39.6 | 43.2 | 25.4 | 12.7 |
| 038 | 9.5  | 9.7  | 31.8 | 34.3 | 38.1 | 43.2 | 28.4 | 14.2 |
| 062 | 16   | 9.7  | 41.1 | 44.5 | 48.8 | 55.6 | 38.1 | 19.1 |
| 100 | 25   | 12.7 | 55.6 | 61.0 | 69.9 | 80.5 | 50.8 | 25.4 |

Dimensions in millimeters

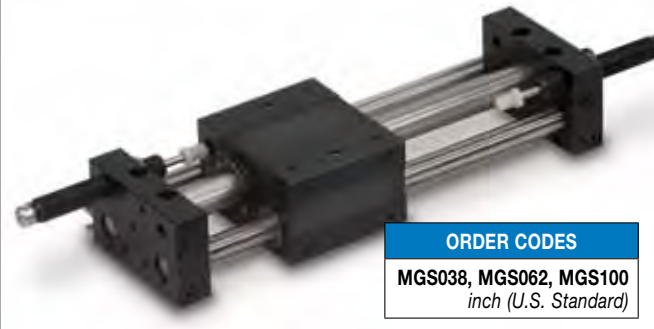
|     | BORE | F    | G   | H               | I    | J    | K    | L       | M    | N    | P    | Q    | R         | S    | T    | U    | V   |
|-----|------|------|-----|-----------------|------|------|------|---------|------|------|------|------|-----------|------|------|------|-----|
| 025 | 6.4  | 11.9 | 5.8 | #5-40UNC x .18  | 5.1  | 9.9  | 7.9  | #10-32  | 17.0 | 8.6  | 17.0 | 8.6  | 3/8-24UNF | 14.2 | 14.2 | 10.4 | 5.3 |
| 038 | 9.5  | 12.7 | 5.8 | #5-40UNC x .18  | 7.9  | 16.0 | 11.2 | #10-32  | 24.9 | 12.4 | 24.9 | 12.4 | 3/8-24UNF | 14.2 | 14.2 | 10.4 | 5.3 |
| 062 | 16   | 17.0 | 5.8 | #8-32UNC x .24  | 9.4  | 19.1 | 17.5 | #10-32  | 35.1 | 17.5 | 35.1 | 17.5 | 3/8-24UNF | 14.2 | 19.1 | 11.2 | 5.6 |
| 100 | 25   | 20.6 | 8.1 | #10-32UNC x .25 | 15.7 | 31.8 | 27.7 | 1/8 NPT | 46.0 | 23.1 | 46.0 | 23.1 | 1-12UNF   | 31.8 | 31.8 | 12.7 | 6.4 |

Dimensions in millimeters



# MGS Magnetically Coupled Slide - All Sizes

## PERFORMANCE

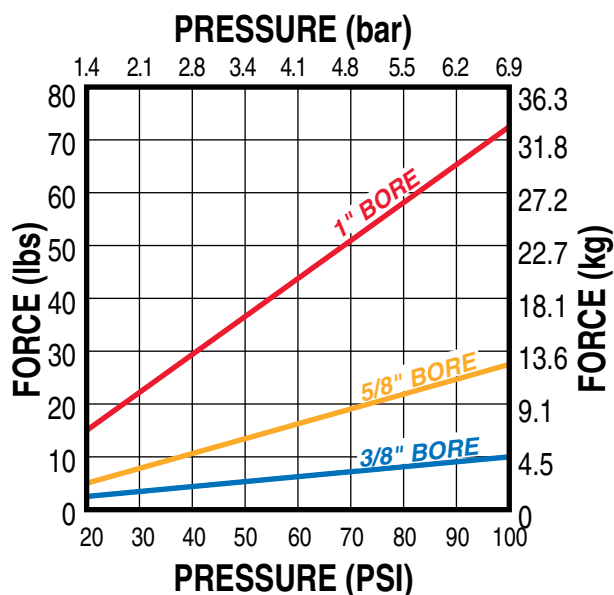


**ORDER CODES**

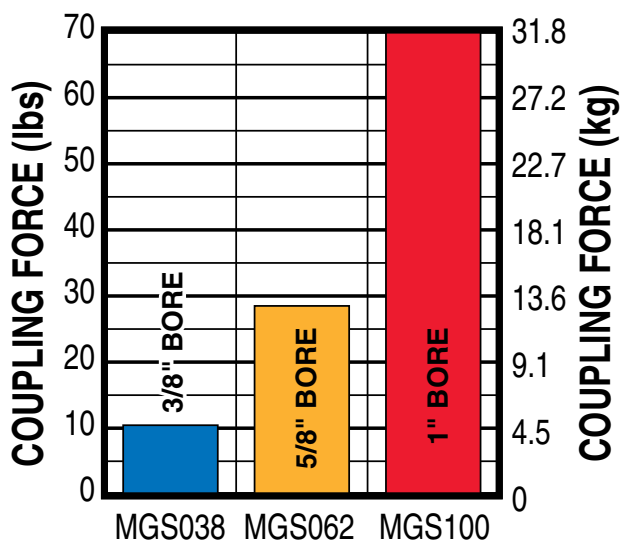
**MGS038, MGS062, MGS100**  
inch (U.S. Standard)

| MGS OPTIONS            | Page  |
|------------------------|-------|
| Proximity Sensor       | MG_12 |
| Shock Absorber         | MG_13 |
| Switches               | MG_10 |
| MORE INFORMATION       | Page  |
| Application Guidelines | MG_18 |
| Ordering               | MG_20 |
| Selection              | MG_17 |

### THEORETICAL FORCE vs PRESSURE



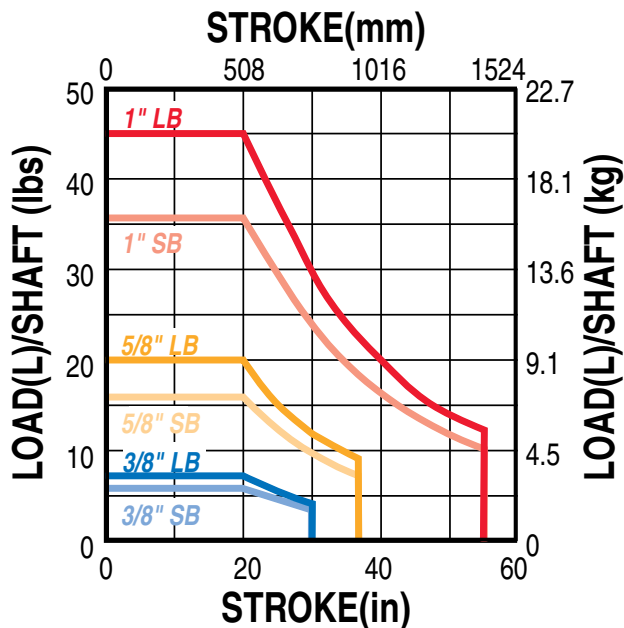
### MAGNETIC COUPLING STRENGTH



#### NOTES REGARDING MAGNETIC COUPLING

- 1) De-coupling will occur if coupling force is exceeded.
- 2) All coupling forces listed are for horizontal applications. For vertical applications, Tolomatic recommends using a 2-to-1 coupling force safety factor.

### LOAD vs STROKE



SB = Sintered Bronze Bearings  
LB = Linear Ball Bearings

Also see formulae on page MG\_12

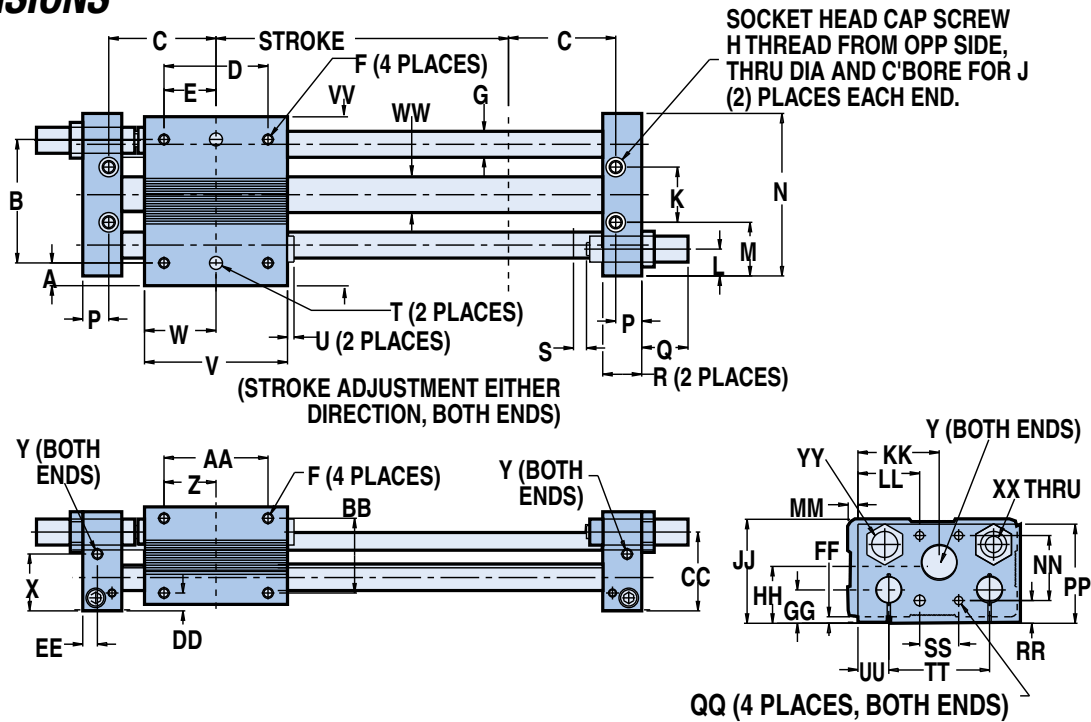
# MGS Magnetically Coupled Slide - All Sizes

## SPECIFICATIONS

| SIZE | BORE SIZE |     | BASE WEIGHT |      | WEIGHT/UNIT |          | MAX. STROKE |        | MAX. PRESSURE |       | TEMPERATURE RANGE |            |
|------|-----------|-----|-------------|------|-------------|----------|-------------|--------|---------------|-------|-------------------|------------|
|      | in        | mm  | lbs         | kg   | lbs/in      | kg/mm    | in          | mm     | PSI           | bar   | °F                | °C         |
| 038  | 0.375     | 9.5 | 1.24        | 0.56 | 0.004       | 0.000071 | 30.00       | 762.0  | 100           | 6.895 | 20° to 140°       | -7° to 60° |
| 062  | 0.625     | 16  | 3.14        | 1.42 | 0.130       | 0.002322 | 37.00       | 939.8  |               |       |                   |            |
| 100  | 1.000     | 25  | 4.89        | 2.22 | 0.180       | 0.003214 | 55.00       | 1397.0 |               |       |                   |            |

**\*For longer strokes, alternate materials, mounting and/or fasteners – consult Tolomatic**

## DIMENSIONS



| MODEL  | BORE  | A    | B*    | C    | D    | E    | F              | G    | H               | J   | K    | L    | M    | N    | P    | Q         | R    | S    | T                  | U    | V    | W    |
|--------|-------|------|-------|------|------|------|----------------|------|-----------------|-----|------|------|------|------|------|-----------|------|------|--------------------|------|------|------|
| MGS038 | 0.375 | 0.30 | 1.875 | 1.66 | 1.19 | 0.59 | 10-24 x .38 DP | 0.38 | 1/4-20 x .50 DP | #8  | 0.75 | 0.45 | 0.81 | 2.38 | 0.41 | 1.26 max. | 0.63 | 0.25 | 2495/2500 x .20 DP | 0.13 | 2.00 | 1.00 |
| MGS062 | 0.625 | 0.44 | 2.375 | 2.06 | 2.00 | 1.00 | 10-24 x .38 DP | 0.50 | 1/4-20 x .50 DP | #10 | 1.06 | 0.52 | 1.03 | 3.12 | 0.50 | 1.14 max. | 0.75 | 0.25 | 2495/2500 x .20 DP | 0.13 | 2.75 | 1.38 |
| MGS100 | 1.000 | 0.42 | 3.250 | 2.28 | 2.50 | 1.25 | 10-24 x .38 DP | 0.63 | 1/4-20 x .50 DP | #10 | 1.63 | 0.63 | 1.22 | 4.06 | 0.53 | 1.14 max. | 0.75 | 0.25 | 2495/2500 x .20 DP | 0.13 | 3.25 | 1.63 |

| MODEL  | X    | Y           | Z    | AA   | BB   | CC   | DD   | EE   | FF   | GG   | HH   | JJ   | KK   | LL   | MM   | NN   | PP   | QQ             | RR   | SS   | TT   | UU   | VV   | WW   | XX   | YY                        |
|--------|------|-------------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|----------------|------|------|------|------|------|------|------|---------------------------|
| MGS038 | 1.03 | #10-32 Port | 0.81 | 1.63 | 1.06 | 1.34 | 0.44 | 0.19 | 0.25 | 0.66 | 1.08 | 1.69 | 1.19 | 0.81 | 0.16 | 0.75 | 1.62 | 8-32 x .31 DP  | 0.56 | 0.75 | 1.44 | 0.47 | 2.47 | 0.44 | M8-1 | 3/8-32 Thru, 0.500x.31DP  |
| MGS062 | 1.09 | #10-32 Port | 1.00 | 2.00 | 1.44 | 1.52 | 0.34 | 0.28 | 0.13 | 0.64 | 1.08 | 2.00 | 1.56 | 1.19 | 0.19 | 1.25 | 1.91 | 10-24 x .38 DP | 0.44 | 0.75 | 1.94 | 0.59 | 3.25 | 0.69 | M8-1 | 1/2-20 Thru, 0.625x.33DP  |
| MGS100 | 1.31 | 1/8-27 Port | 1.00 | 2.00 | 1.69 | 1.75 | 0.34 | 0.28 | 0.13 | 0.81 | 1.31 | 2.34 | 2.08 | 1.47 | 0.09 | 1.13 | 2.22 | 10-24 x .38 DP | 0.75 | 1.13 | 2.63 | 0.72 | 4.09 | 1.09 | M8-1 | 9/16-18 Thru, 0.688x.31DP |

**\*Tolerance between dowel pins is ±.001"**

Above dimensions in inches

| MODEL  | BORE | A    | B*   | C    | D    | E    | F              | G    | H               | J   | K    | L    | M    | N     | P    | Q         | R    | S   | T                  | U   | V    | W    |
|--------|------|------|------|------|------|------|----------------|------|-----------------|-----|------|------|------|-------|------|-----------|------|-----|--------------------|-----|------|------|
| MGS038 | 9.5  | 7.6  | 47.6 | 42.2 | 30.2 | 15.0 | 10-24 x .38 DP | 9.7  | 1/4-20 x .50 DP | #8  | 19.1 | 11.4 | 20.6 | 60.5  | 10.4 | 32.0 max. | 16.0 | 6.4 | 2495/2500 x .20 DP | 3.3 | 50.8 | 25.4 |
| MGS062 | 15.9 | 11.2 | 60.3 | 52.3 | 50.8 | 25.4 | 10-24 x .38 DP | 12.7 | 1/4-20 x .50 DP | #10 | 26.9 | 13.2 | 26.2 | 79.2  | 12.7 | 29.0 max. | 19.1 | 6.4 | 2495/2500 x .20 DP | 3.3 | 69.9 | 35.1 |
| MGS100 | 25.4 | 10.7 | 82.6 | 57.9 | 63.5 | 31.8 | 10-24 x .38 DP | 16.0 | 1/4-20 x .50 DP | #10 | 41.4 | 16.0 | 31.0 | 103.1 | 13.5 | 29.0 max. | 19.1 | 6.4 | 2495/2500 x .20 DP | 3.3 | 82.6 | 41.4 |

| MODEL  | X    | Y           | Z    | AA   | BB   | CC   | DD   | EE  | FF  | GG   | HH   | JJ   | KK   | LL   | MM  | NN   | PP   | QQ             | RR   | SS   | TT   | UU   | VV    | WW   | XX   | YY                        |
|--------|------|-------------|------|------|------|------|------|-----|-----|------|------|------|------|------|-----|------|------|----------------|------|------|------|------|-------|------|------|---------------------------|
| MGS038 | 26.2 | #10-32 Port | 20.6 | 41.4 | 26.9 | 34.0 | 11.2 | 4.8 | 6.4 | 16.8 | 27.4 | 42.9 | 30.2 | 20.6 | 4.1 | 19.1 | 41.1 | 8-32 x .31 DP  | 14.2 | 19.1 | 36.6 | 11.9 | 62.7  | 11.2 | M8-1 | 3/8-32 Thru, 0.500x.31DP  |
| MGS062 | 27.7 | #10-32 Port | 25.4 | 50.8 | 36.6 | 38.6 | 8.6  | 7.1 | 3.3 | 16.3 | 27.4 | 50.8 | 39.6 | 30.2 | 4.8 | 31.8 | 48.5 | 10-24 x .38 DP | 11.2 | 19.1 | 49.3 | 15.0 | 82.6  | 17.5 | M8-1 | 1/2-20 Thru, 0.625x.33DP  |
| MGS100 | 33.3 | 1/8-27 Port | 25.4 | 50.8 | 42.9 | 44.5 | 8.6  | 7.1 | 3.3 | 20.6 | 33.3 | 59.4 | 52.8 | 37.3 | 2.3 | 28.7 | 56.4 | 10-24 x .38 DP | 19.1 | 28.7 | 66.8 | 18.3 | 103.9 | 27.7 | M8-1 | 9/16-18 Thru, 0.688x.31DP |

**\*Tolerance between dowel pins is ±.025mm**

Above dimensions in millimeters

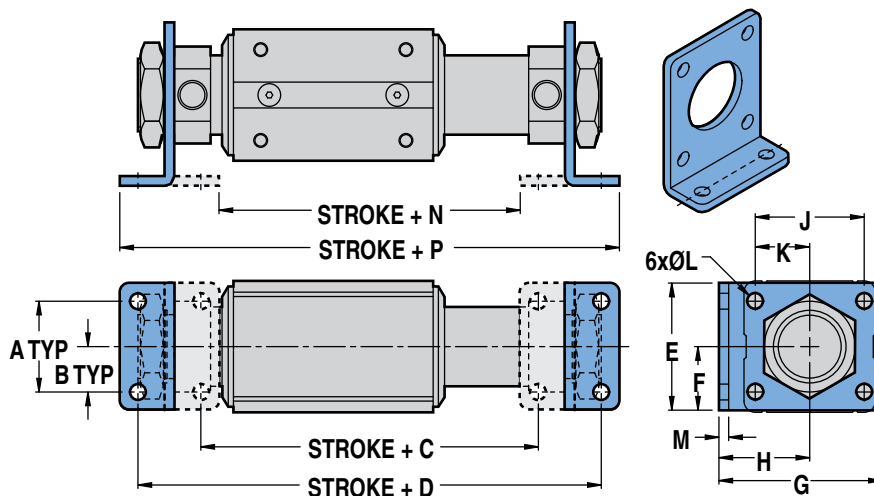


# MG Foot Mount - All Sizes



Foot mounts are an excellent mounting alternative. Made from plated stamped steel, foot mounts are attached to cylinder heads as shown in the dimension drawing, below. Foot mounts may be ordered for one or both ends of the cylinder. Foot mounts can then be attached to almost any surface at a 90° angle to provide solid support without affecting stroke.

## DIMENSIONS



|     | BORE  | A    | B    | C    | C*   | D    | D*   | E    | F    | G    | H    | J    | K    | L    | M    | N    | N*   | P    | P*   |
|-----|-------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| 025 | 0.250 | 1.13 | 0.56 | 2.06 | 2.20 | 3.06 | 3.20 | 1.50 | 0.75 | 1.16 | 0.72 | 0.50 | 0.25 | Ø.17 | 0.06 | 1.49 | 1.89 | 3.36 | 3.23 |
| 038 | 0.375 | 1.13 | 0.56 | 2.06 | 2.26 | 3.06 | 3.26 | 1.50 | 0.75 | 1.16 | 0.72 | 0.50 | 0.25 | Ø.17 | 0.06 | 1.49 | 1.95 | 3.36 | 3.29 |
| 062 | 0.625 | 1.13 | 0.56 | 2.80 | 3.07 | 3.80 | 4.07 | 1.50 | 0.75 | 1.16 | 0.72 | 0.50 | 0.25 | Ø.17 | 0.06 | 2.50 | 2.77 | 4.12 | 4.39 |
| 100 | 1.000 | 1.25 | 0.63 | 3.65 | 4.07 | 5.38 | 5.80 | 1.75 | 0.88 | 2.25 | 1.25 | 1.50 | 0.75 | Ø.22 | 0.13 | 3.15 | 3.58 | 5.88 | 6.31 |

Dimensions in inches

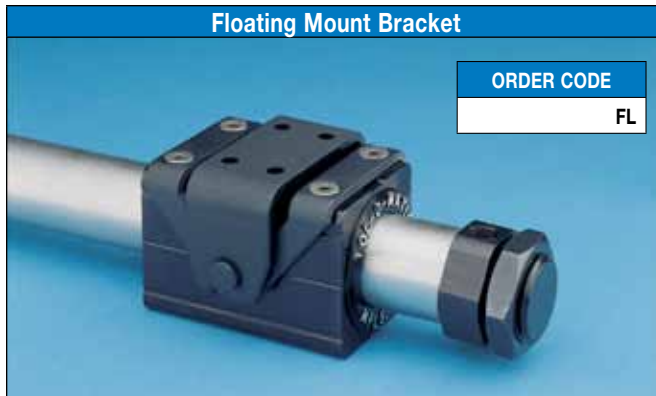
\*For "C strength" configurations only.

|     | BORE | A    | B    | C    | C*    | D     | D*    | E    | F    | G    | H    | J    | K    | L   | M   | N    | N*   | P     | P*    |
|-----|------|------|------|------|-------|-------|-------|------|------|------|------|------|------|-----|-----|------|------|-------|-------|
| 025 | 6.4  | 28.7 | 14.2 | 52.3 | 55.9  | 77.7  | 81.3  | 38.1 | 19.1 | 29.5 | 18.3 | 12.7 | 6.4  | 4.3 | 1.5 | 37.8 | 48.0 | 85.3  | 82.0  |
| 038 | 9.5  | 28.7 | 14.2 | 52.3 | 57.4  | 77.7  | 82.8  | 38.1 | 19.1 | 29.5 | 18.3 | 12.7 | 6.4  | 4.3 | 1.5 | 37.8 | 49.5 | 85.3  | 83.6  |
| 062 | 16   | 28.7 | 14.2 | 71.1 | 78.0  | 96.5  | 103.4 | 38.1 | 19.1 | 29.5 | 18.3 | 12.7 | 6.4  | 4.3 | 1.5 | 63.5 | 70.4 | 104.6 | 111.5 |
| 100 | 25   | 31.8 | 16.0 | 92.7 | 103.4 | 136.7 | 147.3 | 44.5 | 22.4 | 57.2 | 31.8 | 38.1 | 19.1 | 5.6 | 3.3 | 80.0 | 90.9 | 149.4 | 160.3 |

Dimensions in millimeters

| SIZE | BORE SIZE |     | WEIGHT |       |
|------|-----------|-----|--------|-------|
|      | in        | mm  | lbs    | kg    |
| 025  | 0.250     | 6.4 | 0.07   | 0.032 |
| 038  | 0.375     | 9.5 | 0.07   | 0.032 |
| 062  | 0.625     | 16  | 0.17   | 0.077 |
| 100  | 1.000     | 25  | 0.28   | 0.127 |

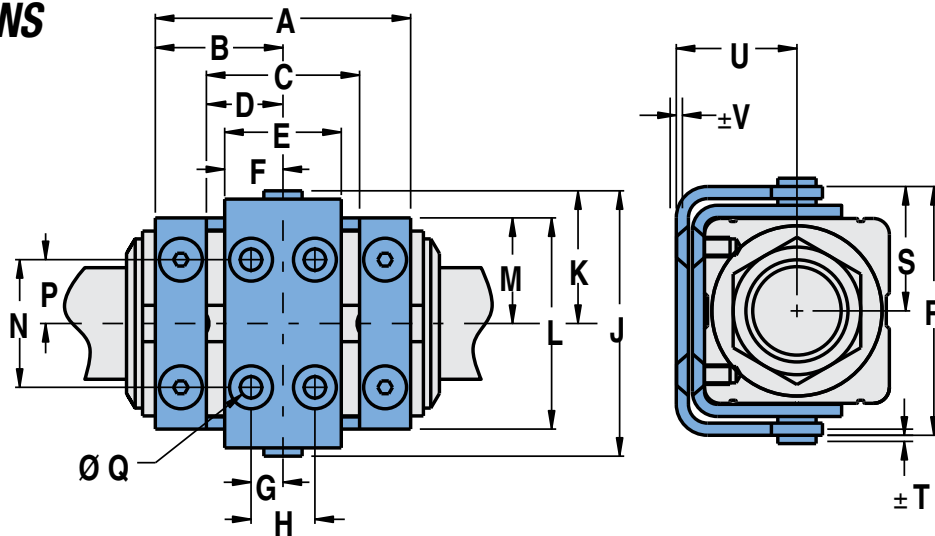
# MG Floating Mount Bracket - All Sizes



The integral floating mount bracket is available for applications in which a load is externally guided and supported and there is a need to compensate for non-parallelism between the cylinder and the independently-guided load.

Loads which are not parallel to the cylinder may result in the cylinder binding if the floating mount bracket is not used. Also, use of the floating mount is highly recommended to provide easier set-up of guide/support system and to help increase actuator block bearing life.

## DIMENSIONS



|     | BORE  | A    | B    | C    | D    | E    | F    | G    | H    | J    | K    | L    | M    | N    | P    | Q     | R    | S    | T    | U    | V    |
|-----|-------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|-------|------|------|------|------|------|
| 025 | 0.250 | 1.34 | 0.67 | 0.66 | 0.33 | 0.63 | 0.31 | 0.16 | 0.31 | 1.26 | 0.63 | 0.87 | 0.43 | 0.37 | 0.18 | Ø.14  | 1.14 | 0.57 | 0.04 | 0.53 | 0.08 |
| 038 | 0.375 | 1.47 | 0.73 | 0.78 | 0.39 | 0.69 | 0.34 | 0.16 | 0.31 | 1.57 | 0.78 | 1.18 | 0.59 | 0.63 | 0.31 | Ø.14  | 1.45 | 0.72 | 0.04 | 0.69 | 0.08 |
| 062 | 0.625 | 1.88 | 0.94 | 1.12 | 0.56 | 0.79 | 0.39 | 0.19 | 0.38 | 2.09 | 1.05 | 1.64 | 0.82 | 0.75 | 0.38 | Ø.19  | 1.99 | 0.99 | 0.04 | 0.93 | 0.08 |
| 100 | 1.000 | 2.50 | 1.25 | 1.50 | 0.75 | 1.14 | 0.57 | 0.31 | 0.62 | 2.60 | 1.30 | 2.07 | 1.03 | 1.25 | 0.63 | Ø.248 | 2.44 | 1.22 | 0.06 | 1.20 | 0.08 |

Dimensions in inches

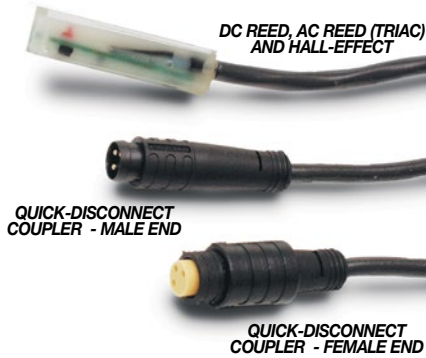
|     | BORE | A    | B    | C    | D    | E    | F    | G   | H    | J    | K    | L    | M    | N    | P    | Q   | R    | S    | T   | U    | V   |
|-----|------|------|------|------|------|------|------|-----|------|------|------|------|------|------|------|-----|------|------|-----|------|-----|
| 025 | 6.4  | 34.0 | 17.0 | 16.8 | 8.4  | 16.0 | 7.9  | 4.1 | 7.9  | 32.0 | 16.0 | 22.1 | 10.9 | 9.4  | 4.6  | 3.6 | 29.0 | 14.5 | 1.0 | 13.5 | 2.0 |
| 038 | 9.5  | 37.3 | 18.5 | 19.8 | 9.9  | 17.5 | 8.6  | 4.1 | 7.9  | 39.9 | 19.8 | 30.0 | 15.0 | 16.0 | 7.9  | 3.6 | 36.8 | 18.3 | 1.0 | 17.5 | 2.0 |
| 062 | 15.9 | 47.8 | 23.9 | 28.4 | 14.2 | 20.1 | 9.9  | 4.8 | 9.7  | 53.1 | 26.7 | 41.7 | 20.8 | 19.1 | 9.7  | 4.8 | 50.5 | 25.1 | 1.0 | 23.6 | 2.0 |
| 100 | 25.4 | 63.5 | 31.8 | 38.1 | 19.1 | 29.0 | 14.5 | 7.9 | 15.7 | 66.0 | 33.0 | 52.6 | 26.2 | 31.8 | 16.0 | 6.3 | 62.0 | 31.0 | 1.5 | 30.5 | 2.0 |

Dimensions in millimeters

| SIZE | BORE SIZE |     | WEIGHT |       |
|------|-----------|-----|--------|-------|
|      | in        | mm  | lbs    | kg    |
| 025  | 0.250     | 6.4 | 0.06   | 0.027 |
| 038  | 0.375     | 9.5 | 0.08   | 0.036 |
| 062  | 0.625     | 16  | 0.18   | 0.082 |
| 100  | 1.000     | 25  | 0.33   | 0.150 |

# MG & MGS Switches - All Sizes

## SWITCHES

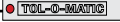
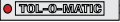


There are 10 sensing choices: DC reed, form A (open) or form C (open or closed); AC reed (Triac, open); Hall-effect, sourcing, PNP (open); Hall-effect, sinking, NPN (open); each with either flying leads or QD (quick disconnect). Commonly used to send analog signals to PLC (programmable logic controllers), TLL, CMOS circuit or other controller device. These switches are activated by the actuator's magnet.

Switches contain reverse polarity protection. QD cables are shielded; shield should be terminated at flying lead end.

If necessary to remove factory installed switches, be sure to reinstall on the same of side of actuator with scored face of switch toward internal magnet.

## SPECIFICATIONS

|                              | REED DC                             |                                                                                   |                                     |           | REED AC                  |                            | HALL-EFFECT DC                       |           |                                                                                     |           |
|------------------------------|-------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------|-----------|--------------------------|----------------------------|--------------------------------------|-----------|-------------------------------------------------------------------------------------|-----------|
| ORDER CODE                   | RT                                  | RM                                                                                | BT                                  | BM        | CT                       | CM                         | TT                                   | TM        | KT                                                                                  | KM        |
| LEAD                         | 5m                                  | QD*                                                                               | 5m                                  | QD*       | 5m                       | QD*                        | 5m                                   | QD*       | 5m                                                                                  | QD*       |
| CABLE SHIELDING              | Unshielded                          | Shielded†                                                                         | Unshielded                          | Shielded† | Unshielded               | Shielded†                  | Unshielded                           | Shielded† | Unshielded                                                                          | Shielded† |
| SWITCHING LOGIC              | "A" Normally Open                   |                                                                                   | "C" Normally Open or Closed         |           | Triac Normally Open      |                            | PNP (Sourcing) Normally Open         |           | NPN (Sinking) Normally Open                                                         |           |
| MECHANICAL CONTACTS          | Single-Pole Single-Throw            |                                                                                   | Single-Pole Double-Throw            |           | Single-Pole Single-Throw |                            | NO, These Are Solid State Components |           |                                                                                     |           |
| COIL DIRECT                  | Yes                                 |                                                                                   | Yes                                 |           | Yes                      |                            | —                                    |           |                                                                                     |           |
| POWER LED                    | None                                |  |                                     | None      |                          | None                       |                                      | None      |  |           |
| SIGNAL LED                   | Red                                 |                                                                                   |                                     |           |                          |                            |                                      | Red       |                                                                                     |           |
| OPERATING VOLTAGE            | 200 Vdc max.                        |                                                                                   | 120 Vdc max.                        |           | 120 Vac max.             |                            | 5 - 25 Vdc                           |           |                                                                                     |           |
| OUTPUT RATING                | —                                   |                                                                                   |                                     |           | —                        |                            | 25 Vdc, 200mA dc                     |           |                                                                                     |           |
| OPERATING TIME               | 0.6 msec max.<br>(including bounce) |                                                                                   | 0.7 msec max.<br>(including bounce) |           | —                        |                            | < 10 micro sec.                      |           |                                                                                     |           |
| OPERATING TEMPERATURE        | -40°F [-40°C] to 158°F [70°C]       |                                                                                   |                                     |           |                          |                            | 0°F [-18°C] to 150°F [66°C]          |           |                                                                                     |           |
| RELEASE TIME                 | 1.0 msec. max.                      |                                                                                   |                                     |           | —                        |                            | —                                    |           |                                                                                     |           |
| ON TRIP POINT                | —                                   |                                                                                   |                                     |           | —                        |                            | 150 Gauss maximum                    |           |                                                                                     |           |
| OFF TRIP POINT               | —                                   |                                                                                   |                                     |           | —                        |                            | 40 Gauss minimum                     |           |                                                                                     |           |
| **POWER RATING (WATTS)       | 10.0 §                              |                                                                                   | 3.0 §§                              |           | 10.0                     |                            | 5.0                                  |           |                                                                                     |           |
| VOLTAGE DROP                 | 2.6 V typical at 100 mA             |                                                                                   | NA                                  |           | —                        |                            | —                                    |           |                                                                                     |           |
| RESISTANCE                   | 0.1 Ω Initial (Max.)                |                                                                                   |                                     |           | —                        |                            | —                                    |           |                                                                                     |           |
| CURRENT CONSUMPTION          | —                                   |                                                                                   |                                     |           | 1 Amp at<br>86°F [30°C]  | 0.5 Amp at<br>140°F [60°C] | 200 mA at 25 Vdc                     |           |                                                                                     |           |
| FREQUENCY                    | —                                   |                                                                                   |                                     |           | 47 - 63 Hz               |                            | —                                    |           |                                                                                     |           |
| CABLE MIN.<br>BEND<br>RADIUS | STATIC                              | 0.630" [16mm]                                                                     |                                     |           |                          |                            |                                      |           |                                                                                     |           |
|                              | DYNAMIC                             | Not Recommended                                                                   |                                     |           |                          |                            |                                      |           |                                                                                     |           |

**CAUTION: DO NOT OVER TIGHTEN SWITCH HARDWARE WHEN INSTALLING!**

**\*\* WARNING:** Do not exceed power rating (Watt = Voltage X Amperage). Permanent damage to sensor will occur.

\*QD = Quick Disconnect; Male coupler is located 6" [152mm] from sensor, Female coupler to flying lead (part #2503-1025) distance is 197" [5m] also see Cable Shielding specification above

**REPLACEMENT OF QD SWITCHES MANUFACTURED BEFORE JULY 1, 1997:** It will be necessary to replace or rewire the female end coupler.



**Reed Switch Life Expectancy:** Up to 200,000,000 cycles (depending on load current, duty cycle and environmental conditions)

†Shielded from the female quick disconnect coupler to the flying leads. Shield should be terminated at flying lead end.

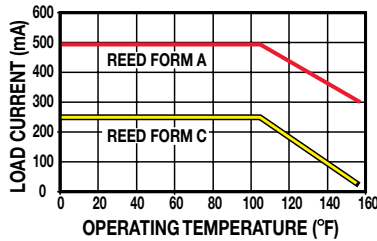
§ Maximum current 500mA (not to exceed 10VA) Refer to Temperature vs. Current graph and Voltage Derating graph

§§ Maximum current 250mA (not to exceed 3VA) Refer to Temperature vs. Current graph and Voltage Derating graph

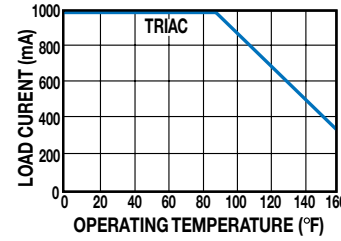
# MG & MGS Switches - All Sizes

## PERFORMANCE

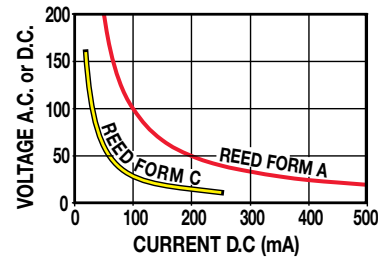
TEMP. vs CURRENT, DC REED



TEMP. vs CURRENT, AC REED

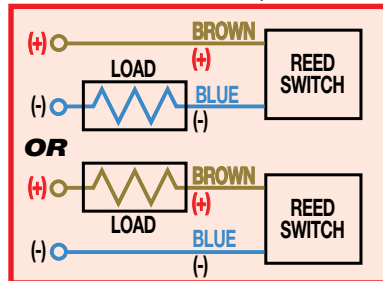


VOLTAGE DERATING, DC REED

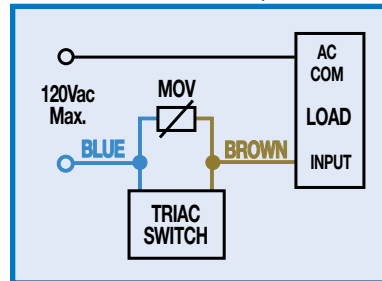


## WIRING DIAGRAMS

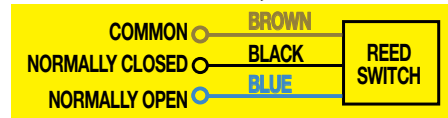
**R T** & **R M** DC REED, FORM A



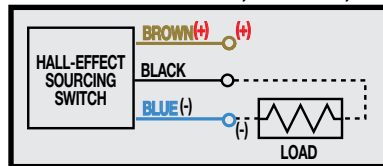
**C T** & **C M** AC REED, TRIAC



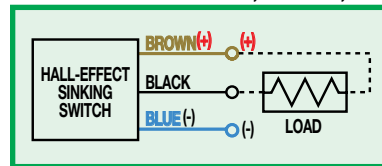
**B T** & **B M** DC REED, FORM C



**T T** & **T M** HALL-EFFECT, SOURCING, PNP



**K T** & **K M** HALL-EFFECT, SINKING, NPN



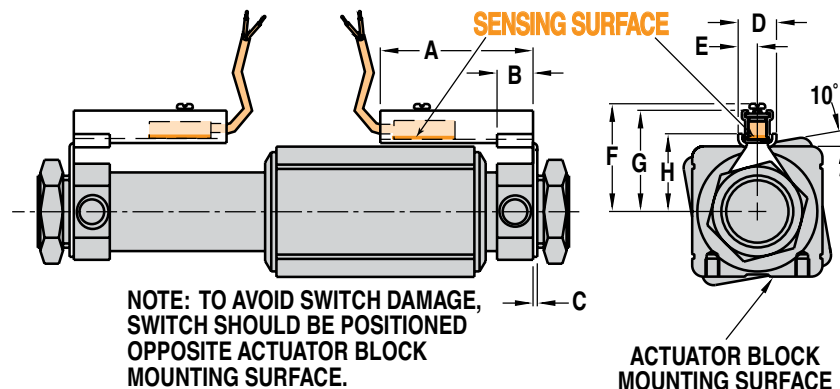
## INSTALLATION INFORMATION



**⚠** THE NOTCHED FACE OF THE SWITCH INDICATES THE SENSING SURFACE AND MUST FACE TOWARD THE MAGNET.

## MG Magnetically Coupled Cylinder

### DIMENSIONS



|            | BORE  | A    | B    | C    | D    | E    | F    | G    | H    |
|------------|-------|------|------|------|------|------|------|------|------|
| <b>025</b> | 0.250 | 1.23 | 0.40 | 0.06 | 0.53 | 0.27 | 0.91 | 0.88 | 0.51 |
| <b>038</b> | 0.375 | 1.23 | 0.40 | 0.06 | 0.53 | 0.27 | 1.07 | 1.04 | 0.67 |
| <b>062</b> | 0.625 | 1.60 | 0.45 | 0.06 | 0.53 | 0.27 | 1.27 | 1.24 | 0.87 |
| <b>100</b> | 1.000 | 2.12 | 0.50 | 0.06 | 0.53 | 0.27 | 1.48 | 1.45 | 1.08 |

Dimensions in inches

|            | BORE | A     | B     | C    | D     | E    | F     | G     | H     |
|------------|------|-------|-------|------|-------|------|-------|-------|-------|
| <b>025</b> | 6.4  | 31.24 | 10.16 | 1.52 | 13.46 | 6.86 | 23.16 | 22.35 | 12.95 |
| <b>038</b> | 9.5  | 31.24 | 10.16 | 1.52 | 13.46 | 6.86 | 27.18 | 26.42 | 17.02 |
| <b>062</b> | 15.9 | 40.64 | 11.43 | 1.52 | 13.46 | 6.86 | 32.26 | 31.50 | 22.10 |
| <b>100</b> | 25.4 | 53.85 | 12.70 | 1.52 | 13.46 | 6.86 | 37.59 | 36.83 | 27.43 |

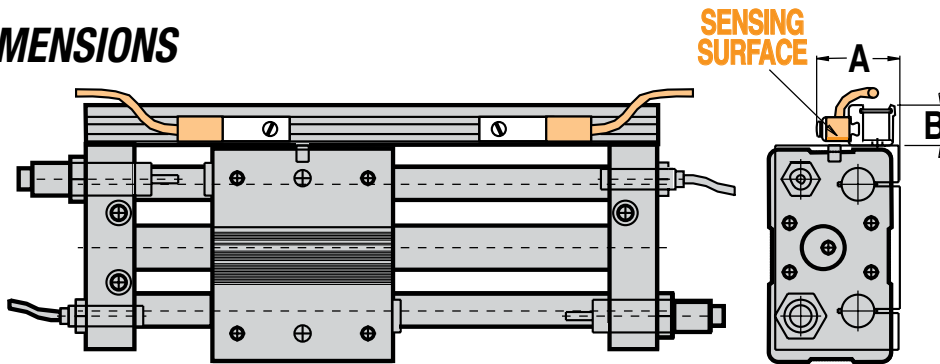
Dimensions in millimeters

# MGS Switches - All Sizes



## MGS Magnetically Coupled Slide

### DIMENSIONS



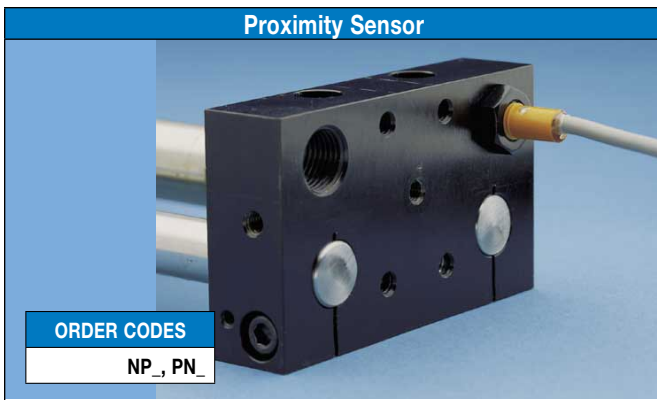
|     | BORE  | A    | B    |
|-----|-------|------|------|
| 038 | 0.375 | 1.24 | 0.47 |
| 062 | 0.625 | 1.16 | 0.47 |
| 100 | 1.000 | 1.47 | 0.47 |

Dimensions in inches

|     | BORE | A     | B     |
|-----|------|-------|-------|
| 038 | 9.5  | 31.50 | 11.94 |
| 062 | 15.9 | 29.46 | 11.94 |
| 100 | 25.4 | 37.34 | 11.94 |

Dimensions in millimeters

## MGS Proximity Sensor



This L.E.D. device senses end-of-stroke with one of two normally open inductive d.c. proximity sensors. NPN supplies a sinking signal; PNP supplies a sourcing signal to a device such as a programmable logic controller.

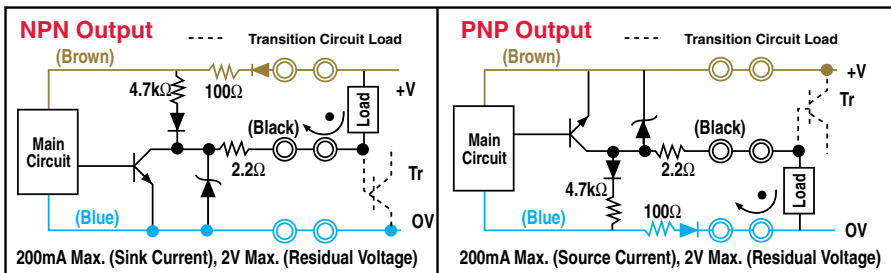
Ambient Temp.: -13° to 158° F., (-25° to 70° C.)

NEMA Encl. Rating: 1, 3, 4, 6, 12, 13

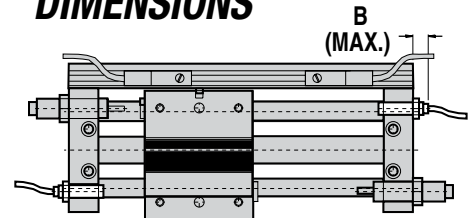
Lead Length: 6.56 feet (2.0m)

Max. Sensing Distance: 0.016" (0.4mm)

### Wiring Diagrams

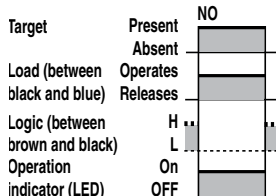


### DIMENSIONS



|      | BORE  |     | B    |      | WEIGHT |       |
|------|-------|-----|------|------|--------|-------|
| SIZE | in    | mm  | in   | mm   | lbs    | kg    |
| 038  | 0.375 | 9.5 | 0.63 | 16.0 | 0.24   | 0.109 |
| 062  | 0.625 | 16  | 0.52 | 13.2 | 0.24   | 0.109 |
| 100  | 1.000 | 25  | 0.52 | 13.2 | 0.25   | 0.113 |

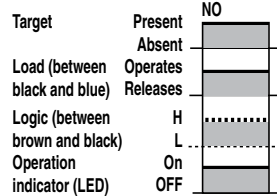
#### NPN Output



#### Short-Circuit Indication

The load output immediately turns off and remains off until the short-circuit protection is reset.

#### PNP Output

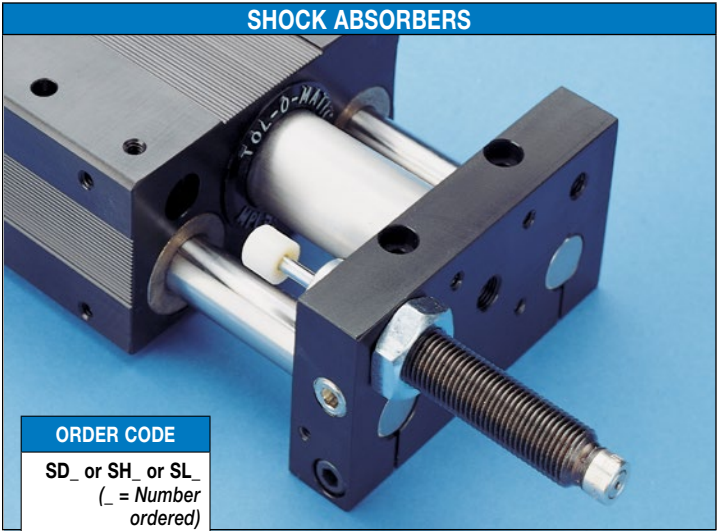


#### Resetting Short-Circuit Protection

To reset the short-circuit protection, repair the short. The short-circuit protection will then automatically reset.



# MGS Shock Absorbers - All Sizes

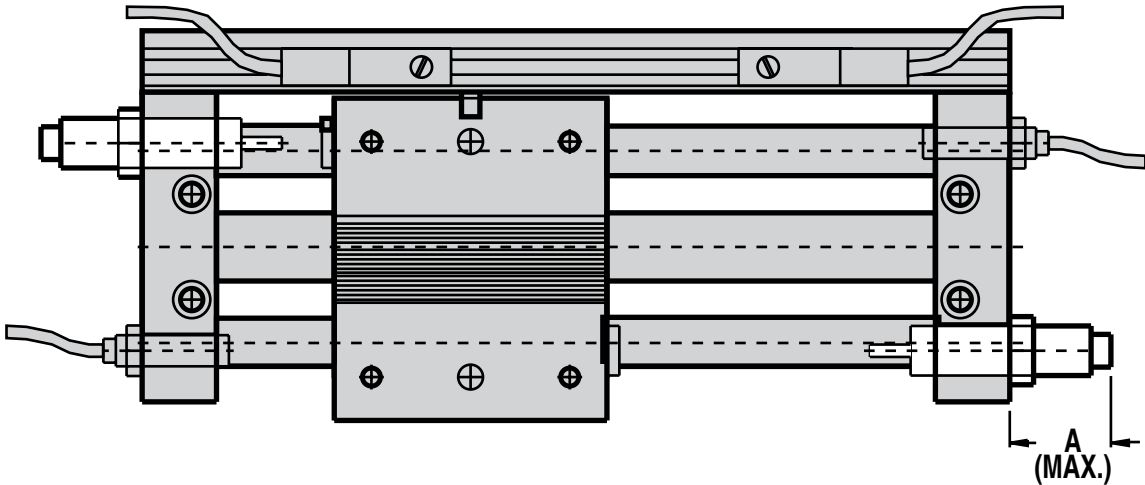


Magnetically coupled slides with standard internal bumpers offer an effective method of decelerating loads. However, magnetically coupled slides are capable of carrying heavier loads at higher velocities than the internal bumpers can absorb. Optional shock absorbers can be used to increase the unit's life and broaden the application range for the magnetically coupled slide you have chosen.

Typical shock absorber life varies between 1-2 million cycles (depending on environment). Appropriate preventative maintenance should be considered in high cyclic applications.

**⚠ CAUTION:** In applications which result in a load bending moment at deceleration, care should be taken to decelerate the load rather than the carrier of the magnetically coupled slide.

## DIMENSIONS

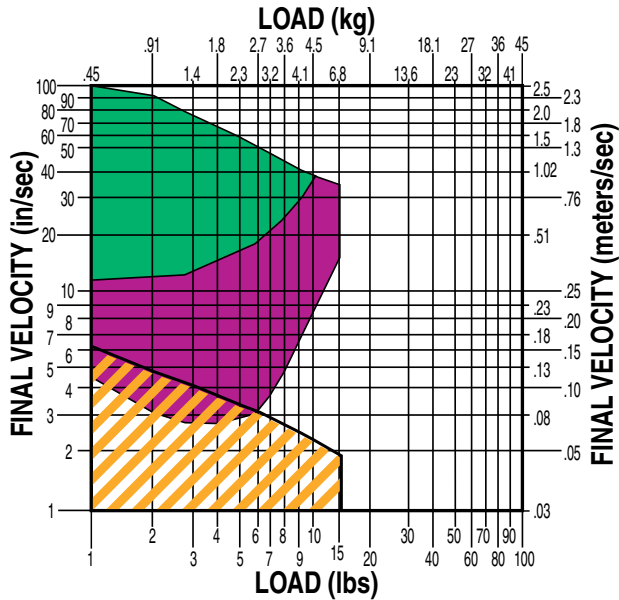


| SIZE | BORE  |     | A    |      | WEIGHT |       |
|------|-------|-----|------|------|--------|-------|
|      | in    | mm  | in   | mm   | lbs    | kg    |
| 038  | 0.375 | 9.5 | 0.94 | 23.9 | 0.01   | 0.005 |
| 062  | 0.625 | 16  | 2.48 | 63.0 | 0.02   | 0.009 |
| 100  | 1.000 | 25  | 2.63 | 66.8 | 0.04   | 0.018 |

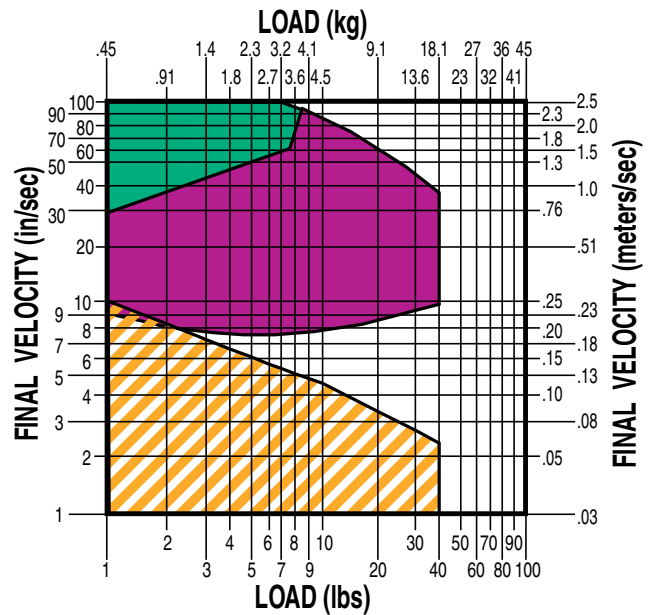
# MGS Shock Absorbers - All Sizes - PERFORMANCE

## VELOCITY vs LOAD

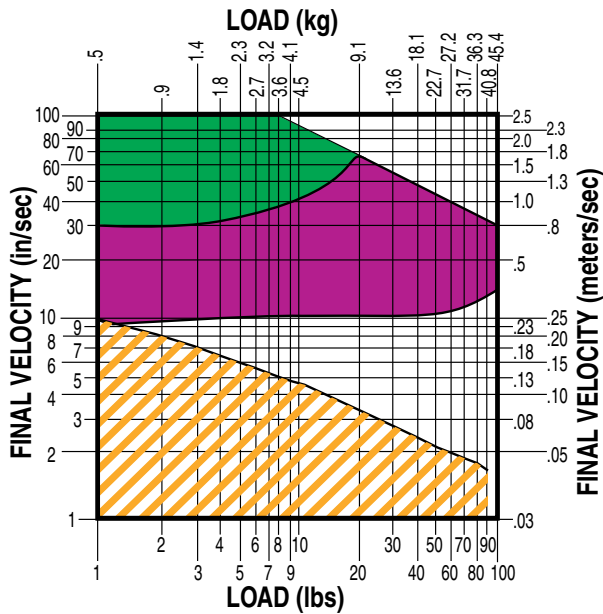
**MGS038**



**MGS062**



**MGS100**



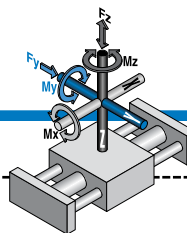
LIGHT DUTY (Light load/High velocity)

HEAVY DUTY (Heavy load/Low velocity)

Bumpers

**NOTE:** If final (or impact) velocity cannot be calculated directly, a reasonable guideline to use is 2 x average velocity.

# Application Data Worksheet



## STROKE LENGTH

☐ inch (S) ☒ (K)  
(U.S. Standard)

☐ millimeters  
(Metric)

## AVAILABLE AIR PRESSURE

☐ PSI  
(U.S. Standard)

☐ bar  
(Metric)

## REQUIRED THRUST FORCE

☐ lbf  
(U.S. Standard)

☐ N  
(Metric)

## LOAD

☐ lb  
(U.S. Standard)

☐ kg  
(Metric)

## LOAD CENTER OF GRAVITY DISTANCE TO CARRIER CENTER

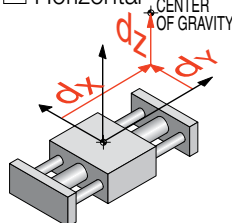
☐ inch  
(U.S. Standard)

☐ millimeters  
(Metric)

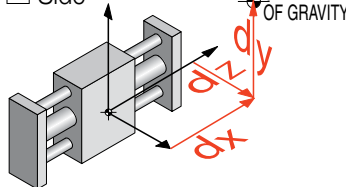
$d_x$  \_\_\_\_\_  
 $d_y$  \_\_\_\_\_  
 $d_z$  \_\_\_\_\_

## ORIENTATION

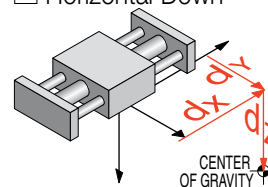
☐ Horizontal



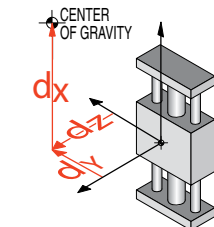
☐ Side



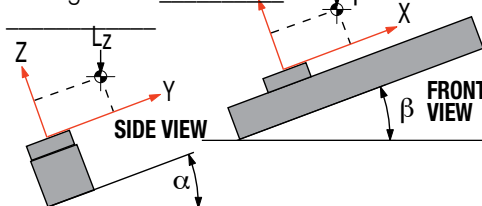
☐ Horizontal Down



☐ Vertical



☐ Angled



## OTHER ISSUES:

(i.e. Environment,  
Temperature,  
Contamination, etc.)

Contact information:

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



Fax (1-763-478-8080) or call Tolomatic (1-800-328-2174) with the above information.  
We will provide any assistance needed to determine the proper actuator.

# MG: Mag Coupled Cylinder Selection Guidelines - All Sizes

## EXTERNAL LOAD GUIDANCE AND SUPPORT

The process of selecting a magnetically coupled cylinder for a given application can be complex. **It is highly recommended that you contact Tolomatic or a Tolomatic Distributor for assistance in selecting the best actuator for your application. The following overview of the selection guidelines are for educational purposes only.**

### 1 COMPILE APPLICATION REQUIREMENTS

To determine the appropriate Magnetically Coupled Cylinder model for an application, compile the following information:

- Available pressure (PSI)
- Weight of load (lbs. or kgs.)
- Orientation of load (lbs. or kgs.)
- Velocity of load (in./sec. or mm/sec.)
- Stroke length (in. or mm)

### 2 SELECT CYLINDER SIZE

- Consult the Theoretical Force vs. Pressure charts.
- Cross-reference the load force (or load weight if force is not known) and the available operating pressure. If the intersection falls below the diagonal line, and if moments do not exceed maximum values listed for that model (see Step 3), the actuator will accommodate the application. If the intersection is above the diagonal line, a larger cylinder bore size should be considered.

NOTE: Additional force may be required to obtain the necessary acceleration for vertical or horizontal loads.

### 3 DETERMINE COUPLING FORCE REQUIREMENTS

Use the following formula:

$$F = .013 \times \text{Weight} \times \text{Velocity}^2$$

Calculated value must be less than the Magnetic Coupling Strength values. (page MG\_4)

### 4 DETERMINE INTERNAL CUSHION CAPACITY

- Consult the Cushion Data chart for the model selected. The velocities listed on the cushion charts are final or cushion impact velocities. On applications where the internal cushions or bumpers are to be used, be sure the actual, final or impact velocity is known. If the velocity is not known, use of limit switches with valve deceleration circuits or shock absorbers should be considered.

Cross-reference the final velocity and weight of the load. If the intersection is below the diagonal lines, the internal cushions on the actuator may be used. If the point falls above the dashed diagonal line or if the velocity is not known, use deceleration circuits, external shock absorbers or select a larger cylinder with greater cushion capacity. On high-cyclic applications, use of external stops is strongly recommended.

NOTE: Magnetically coupled cylinders do not have internal cushions. Heavier loads require external stops or shock absorbers.

# MGS: Mag Coupled Slide Selection Guidelines - All Sizes

## PROVIDING LOAD GUIDANCE AND SUPPORT

### 1 COMPILE APPLICATION REQUIREMENTS

To determine the appropriate Magnetically Coupled Slide for an application, compile the following information:

- Available pressure (PSI)
- Weight of load (lbs. or kgs.)
- Orientation of load (lbs. or kgs.)
- Velocity of load (in./sec. or mm/sec.)
- Stroke length (in. or mm)

### 2 SELECT CYLINDER SIZE

- Consult the Theoretical Force vs. Pressure charts.
- Cross-reference the load force (or load weight if force is not known) and the available operating pressure. If the intersection falls below the diagonal line, and if moments do not exceed maximum values listed for that model (see Step 3), the actuator will accommodate the application. If the intersection is above the

diagonal line, a larger cylinder bore size should be considered.

NOTE: Additional force may be required to obtain the necessary acceleration for vertical or horizontal loads.

### 3 KEEP UNDER MAXIMUM STROKE LENGTH

There are specific maximum stroke lengths for each model.  
MGS038: 30.00"  
MGS062: 37.00"  
MGS100: 55.00"

### 4 DETERMINE NATURE OF LOAD AND THE EFFECT OF BENDING MOMENTS

If the actuator will guide and support a load located directly over the center of carrier, bending moments will not be a factor in the actuator selection. Magnetically Coupled Slides perform best that way. See the Bending Moments Formulae below if your application requires the load to be away from center of the carrier.

### 5 DETERMINE THE BEARING ROD LOAD CAPACITY

Determine whether the Load Weight and Stroke Length will be within the load capacity for the bearing rods.

Cross reference the load weight and stroke on the Load Weight vs. Stroke chart for the selected bore size. (Page MG\_6) If the intersection falls below the curve, the cylinder will accommodate the application requirements. If the intersection falls outside the curve, consult the chart of a larger bore size that will accommodate the required load weight and stroke for your application.

The weight on the bearing rods causes them to bend or deflect slightly over their length. This deflection is increased for longer rods and/or higher weights on the bearing block. For proper operation, rod deflection must not exceed .30".

### 6 DETERMINE COUPLING FORCE REQUIRED

- Consult the Mag Coupling Strength chart (page MG\_6). If the load value is less than the coupling force for the chosen actuator, it may be used for the application. If the load value is greater than the coupling force for the chosen actuator, select a larger actuator.

### 7 DETERMINE INTERNAL BUMPER CAPACITY

- Consult the Cushion Data chart (Bumper Data for Magnetically Coupled Slides page MG\_14) for the model selected. The velocities listed on the cushion charts are final or cushion impact velocities. On applications where internal bumpers are to be used, be sure the actual, final or impact velocity is known. If the velocity is not known, use of limit switches with valve deceleration circuits or shock absorbers should be considered.

## BENDING MOMENTS

### Loading Equation Data

| MODEL  | BORE SIZE | A (in.) | D (in.) | F (lbs.) | G (lbs.) |
|--------|-----------|---------|---------|----------|----------|
| MGS038 | 3/8"      | 1.44    | 1.13    | 14.00    | 11.00    |
| MGS062 | 5/8"      | 1.94    | 1.50    | 40.00    | 32.00    |
| MGS100 | 1"        | 2.62    | 2.00    | 90.00    | 72.00    |

(See MGS Load vs Stroke graph on page MG\_6)

### Loading Equation Key

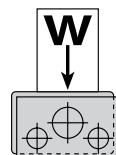
A = Distance between shaft centers  
B = Distance from load center to center of nearest shaft (in.); determined by application

L = Load per shaft (lbs.)  
W = Payload weight (lbs.)  
D = Axial distance between center of bearings (in.)

F = Max. bearing sliding load (linear bearings) (lbs.)  
G = Max. bearing sliding load (sintered bronze bearings) (lbs.)

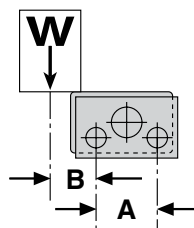
#### "L" MOMENT

$$L = \frac{W}{2}$$



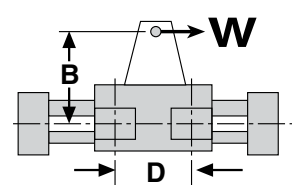
#### "Mx" MOMENT

$$L = \frac{WB}{A}$$



#### "My" / "Mz" MOMENT

$$F \text{ or } G = 2L = \frac{WB}{D}$$

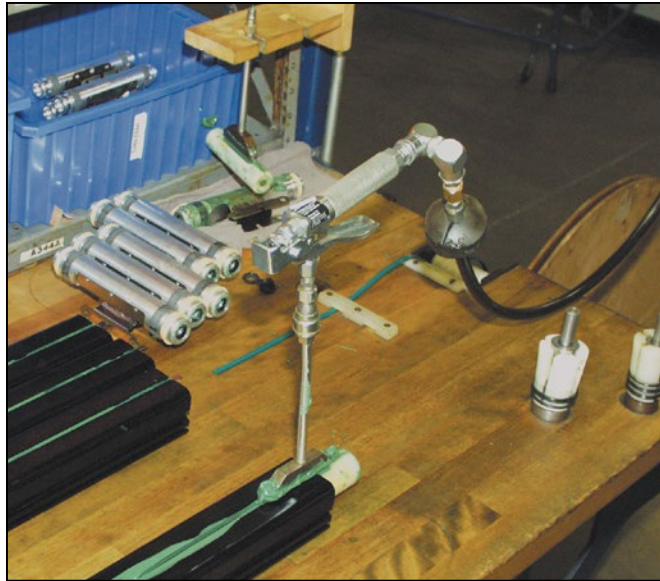


L should be below curve for the corresponding slide on the "Load vs. Stroke" chart (for sintered bronze or linear bearings - Mag Coupled Slides).



# Application Guidelines

The following conditional statements are intended as general guidelines for use of Tolomatic actuators. Since all applications have their own specific operating requirements, consult Tolomatic, Inc. or your local Tolomatic distributor if an application is unconventional or if questions arise regarding the selection process.



## LUBRICATION GUIDELINES

All Tolomatic actuators (except Cable Cylinders) are prelubricated at the factory. To ensure maximum actuator life, the following guidelines should be followed.

### • Filtration

We recommend the use of dry, filtered air in our products. "Filtered air" means a level of 10 Micron or less. "Dry" means air should be free of appreciable amounts of moisture. Regular maintenance of installed

filters will generally keep excess moisture in check.

### • External Lubricators (optional)

The factory prelubrication of Tolomatic actuators will provide optimal performance without the use of external lubrication. However, external lubricators can further extend service life of pneumatic actuators if the supply is kept constant.

Oil lubricators, (mist or drop) should supply a minimum of 1 drop per 20 standard cubic feet per minute to the

cylinder. As a rule of thumb, double that rate if water in the system is suspected. Demanding conditions may require more lubricant.

If lubricators are used, we recommend a non-detergent, 20cP @ 140°F 10-weight lubricant. Optimum conditions for standard cylinder operation are +32° to +150°F (+0° to 65.5°C).

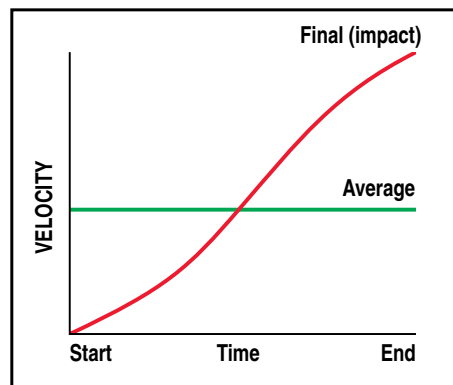
NOTE: Use of external lubricators may wash away the factory installed lubrication. External lubricants must be maintained in a constant supply or the results will be a dry actuator prone to premature wear.

### • Sanitary Environments

Oil mist lubricators must dispense "Food Grade" lubricants to the air supply. Use fluids with ORAL LD50 toxicity ratings of 35 or higher such as Multitherm® PG-1 or equivalent. Demanding conditions can require a review of the application.

## FINAL VELOCITY CALCULATION

Velocity calculations for all rodless cylinders need to differentiate between final velocity and average velocity. For example: Stroking a 100-inch BC3 model in one second yields an average velocity of 100 inches per second. To properly determine the inertial forces for cushioning, it is important to know the



final (or impact) velocity. Rodless cylinders accelerate and decelerate at each end of the stroke. Therefore this acceleration must be considered (see diagram).

If final (or impact) velocity cannot be calculated directly, a reasonable guideline is to use 2 x average velocity.

# MG Ordering - ALL Sizes

**MODEL, BORE, STROKE**

**MGC 062 SK58-250**

**OPTIONS**

**FM2 FL BM2**

**MODEL & MAG COUPLING**

**MGA** Low coupling strength mag coupled cylinder

**MGB** Medium coupling strength mag coupled cylinder

**MGC** High coupling strength mag coupled cylinder

**STROKE LENGTH**

**SK\_** Enter desired stroke length in decimal inches

| SIZE | MAXIMUM STROKE |         |
|------|----------------|---------|
|      | in             | mm      |
| 025  | 26.00          | 660.4   |
| 038  | 32.00          | 812.8   |
| 062  | 60.00          | 1,524.0 |
| 100  | 80.00          | 2,032.0 |

**SWITCHES (MG\_10)**

| TYPE        |          | QUICK-DISCONNECT | CODE | QUANTITY                          | LEAD LENGTH |
|-------------|----------|------------------|------|-----------------------------------|-------------|
| REED        | Form A   | QD               | RM   | After code enter quantity desired | 5 meters    |
|             |          | no               | RT   |                                   |             |
|             | Form C   | QD               | BM   |                                   |             |
|             |          | no               | BT   |                                   |             |
| HALL-EFFECT | Sinking  | QD               | KM   |                                   |             |
|             |          | no               | KT   |                                   |             |
|             | Sourcing | QD               | TM   |                                   |             |
|             |          | no               | TT   |                                   |             |
| TRIAC       | QD       | CM               |      |                                   |             |
|             | no       | CT               |      |                                   |             |

**BORE SIZE**

**025** 0.25" (6.4mm)

**038** 0.375" (9.5mm)

**062** 0.625" (16mm)

**100** 1.00" (25mm)

**FOOT MOUNT (MG\_8)**

**FM\_** Foot Mount & number required (1 or 2)

**FLOATING MOUNT (MG\_9)**

**FL** Floating Mount Bracket

# MG Service Parts Ordering - ALL Sizes

| CONFIG. CODE ORDERING                         |      |
|-----------------------------------------------|------|
| Mounting Hardware & FE conn. included         |      |
| DESCRIPTION                                   | CODE |
| Switch Kit, Reed, Form C, 5m                  | BT   |
| Switch Kit, Reed, Form C, Male Conn.          | BM   |
| Switch Kit, Reed, Form A, 5m                  | RT   |
| Switch Kit, Reed, Form A, Male Conn.          | RM   |
| Switch Kit, Triac, 5m                         | CT   |
| Switch Kit, Triac, Male Conn.                 | CM   |
| Switch Kit, Hall-effect, Sinking, 5m          | KT   |
| Switch Kit, Hall-effect, Sinking, Male Conn.  | KM   |
| Switch Kit, Hall-effect, Sourcing, 5m         | TT   |
| Switch Kit, Hall-effect, Sourcing, Male Conn. | TM   |

NOTE: When kit is ordered female connector & all mounting hardware is included



## Switch Ordering NOTES:

To order field retrofit switch and hardware kits for all Tolomatic actuators: SW (Then the model and bore size, and type of switch required)

**Example: SWMGC062RT**

(Hardware and Form A Reed switch with 5 meter lead for 0.625" bore Mag coupled cylinder)

| SIZE                              | 025       | 038       | 062       | 100       |
|-----------------------------------|-----------|-----------|-----------|-----------|
| <b>Floating Mount Kit</b>         | 2402-9005 | 2403-9005 | 2406-9005 | 2410-9005 |
| <b>Foot Mount Kit<sup>1</sup></b> | 2402-9011 | 2402-9011 | 2402-9011 | 2410-9011 |



## Service Parts Ordering NOTES:

**1** Foot Mount Kit contains two (2) brackets.

\_ = numeric entry required

# MGS Ordering - ALL Sizes

MODEL, BORE, STROKE      OPTIONS

MGS 062 SK28.250 LB SL2 BM2

| MODEL |                   |
|-------|-------------------|
| MGS   | Mag coupled slide |

| BORE SIZE |                |
|-----------|----------------|
| 038       | 0.375" (9.5mm) |
| 062       | 0.625" (16mm)  |
| 100       | 1.00" (25mm)   |

# STROKE LENGTH

SK\_ \_ \_ Enter desired stroke length in decimal inches

## MAXIMUM STROKE

|      | MG_   |         |
|------|-------|---------|
| SIZE | in    | mm      |
| 038  | 30.00 | 762.0   |
| 062  | 37.00 | 939.8   |
| 100  | 55.00 | 1,397.0 |

| BEARING SELECTION |                         |
|-------------------|-------------------------|
| SB                | Sintered Bronze Bearing |
| LB                | Linear Ball Bearings    |

| PROXIMITY SENSOR (MG_12) |                                      |
|--------------------------|--------------------------------------|
| NP_                      | Sinking type proximity sensor (NPN)  |
| PN_                      | Sourcing type proximity sensor (PNP) |

| SHOCK ABSORBERS (MG_13) |                           |
|-------------------------|---------------------------|
| SL_                     | Light duty shock absorber |
| SH_                     | Heavy duty shock absorber |

| SWITCHES (MG_10) |          |                  |      |                                   |
|------------------|----------|------------------|------|-----------------------------------|
| TYPE             |          | QUICK-DISCONNECT | CODE | QUANTITY                          |
| REED             | Form A   | QD               | RM   | After code enter quantity desired |
|                  |          | no               | RT   |                                   |
| HALL-EFFECT      | Form C   | QD               | BM   |                                   |
|                  |          | no               | BT   |                                   |
|                  | Sinking  | QD               | KM   |                                   |
|                  |          | no               | KT   |                                   |
| HALL-EFFECT      | Sourcing | QD               | TM   |                                   |
|                  |          | no               | TT   |                                   |
| TRIAC            |          | QD               | CM   | 5 meters                          |
|                  |          | no               | CT   |                                   |

## MGS Service Parts Ordering - ALL Sizes

| CONFIG. CODE ORDERING                         |      |
|-----------------------------------------------|------|
| Mounting Hardware & FE conn. included         |      |
| DESCRIPTION                                   | CODE |
| Switch Kit, Reed, Form C, 5m                  | BT   |
| Switch Kit, Reed, Form C, Male Conn.          | BM   |
| Switch Kit, Reed, Form A, 5m                  | RT   |
| Switch Kit, Reed, Form A, Male Conn.          | RM   |
| Switch Kit, Triac, 5m                         | CT   |
| Switch Kit, Triac, Male Conn.                 | CM   |
| Switch Kit, Hall-effect, Sinking, 5m          | KT   |
| Switch Kit, Hall-effect, Sinking, Male Conn.  | KM   |
| Switch Kit, Hall-effect, Sourcing, 5m         | TT   |
| Switch Kit, Hall-effect, Sourcing, Male Conn. | TM   |

NOTE: When kit is ordered female connector & all mounting hardware is included

| SIZE                          | 038       | 062       | 100       |
|-------------------------------|-----------|-----------|-----------|
| Shock Absorbers Light Duty    | 2403-1062 | 2406-1063 | 0910-1479 |
| Shock Absorbers Heavy Duty    | 0605-1006 | 2406-1062 | 0910-1480 |
| NPN Sinking Proximity Sensor  | 2410-1048 | 2410-1048 | 2410-1048 |
| PNP Sourcing Proximity Sensor | 2410-1053 | 2410-1053 | 2410-1053 |
| Switch Rail                   | 2403-8888 | 2406-8888 | 2410-8888 |
| Magnet                        | 2410-9020 | 2410-9020 | 2410-9020 |

### Switch Ordering NOTES:

To order field retrofit switch and hardware kits for all Tolomatic actuators: SW (Then the model and bore size, and type of switch required)

**Example: SWMGS062RT**

(Hardware and Form A Reed switch with 5 meter lead for 0.625" bore Mag coupled slide)

# CC CABLE CYLINDER

## RODLESS CYLINDER

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# CABLE CYLINDER

## ENDURANCE TECHNOLOGY<sup>SM</sup>

Endurance Technology features are designed for maximum durability to provide extended service life.

Tolomatic invented the first ever rodless cylinder in 1956 - the cable cylinder. First designed into the bagger/sealer used in the flour industry the cable cylinder continues to power applications in the 21st century. Built-to-order in stroke lengths up to 282 inches.

### HIGH STRENGTH TUBE

- High-strength, lightweight, black anodized aluminum or steel
- Creates chamber for pneumatic or hydraulic pressure and protects piston



### STEEL CLEVIS

- High strength material resists deformation
- Cable adjustment points
- Threaded holes for load attachment

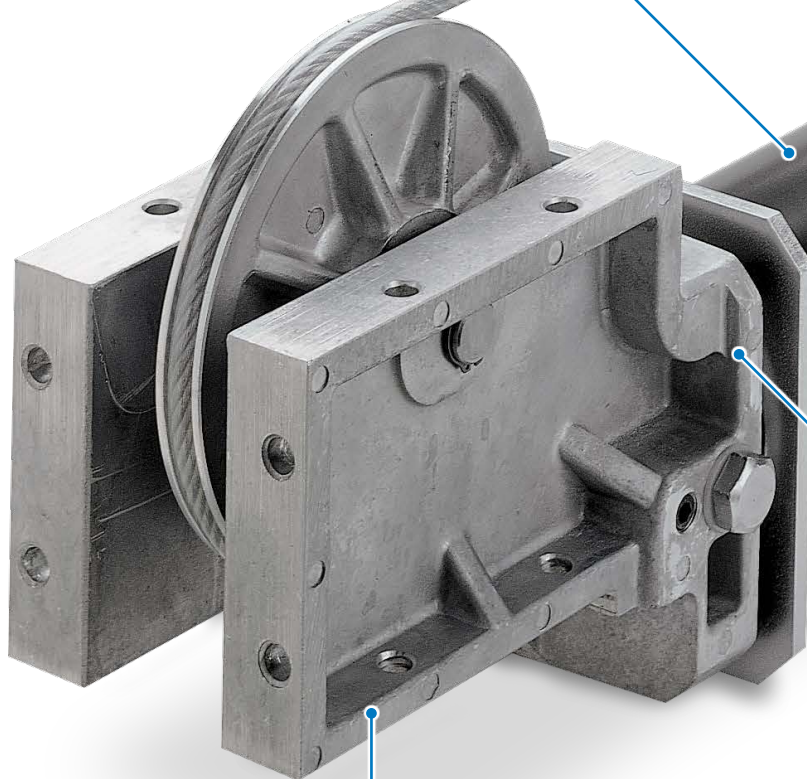
The Tolomatic double-acting cable cylinder is a versatile space saver, available in all 9 bore sizes. Enjoy cost savings over conventional rod cylinders in strokes over four feet without experiencing rod buckle.

These cylinders can be isolated from any work area with extended cable lengths and achieve strokes of up to 60 feet in length.

### DOUBLE ACTING CABLE CYLINDER

### PORTING CHOICES

- Choose from 2 or 3 port heads



### DIE CAST HEAD ASSEMBLY

- High-strength, lightweight anodized aluminum
- Protects piston and creates chamber for pneumatic or hydraulic pressure

### LOCATE REMOTELY

- Cylinder can be located away from work area. Useful in harsh environments and if space/weight are limited

### ALUMINUM PISTON

- High-strength, lightweight aluminum
- Pulls the cables when actuated by pneumatic or hydraulic pressure



### UNIQUE GLAND SEALS

- Tight seal for cables to pass through
- Easy installation
- Snap In/Out cable seals or encapsulated gland seals depending on bore size



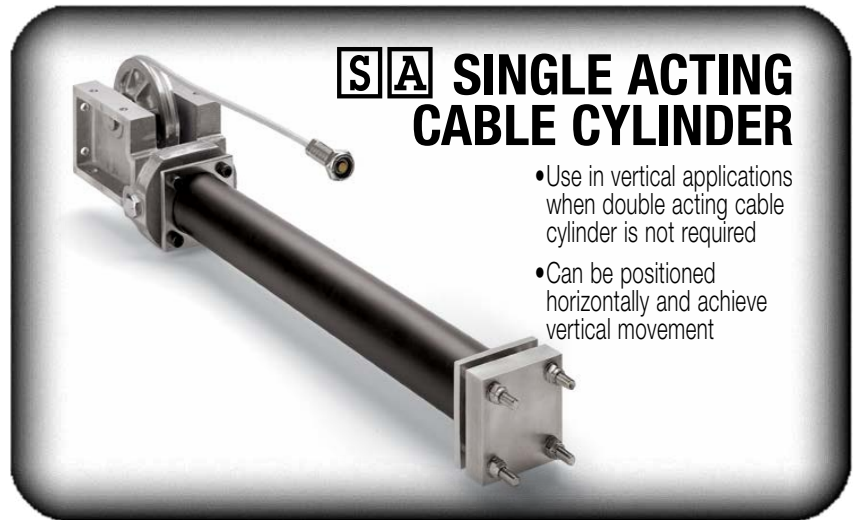


# TOLOMATIC...THE RODLESS CYLINDER LEADER



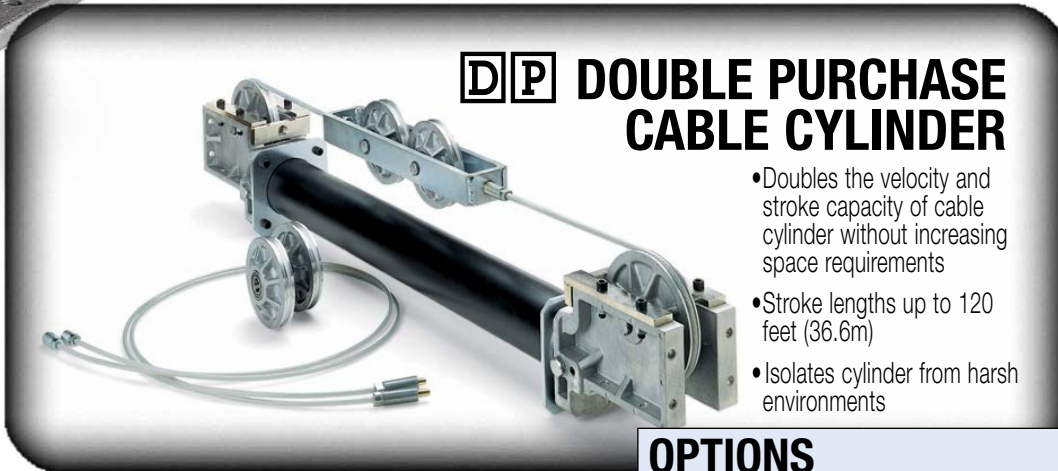
## MIL SPEC CABLES

- Field proven to provide millions of cycles of uninterrupted service
- Nylon jacketed aircraft cables manufactured under Mil Spec. MIL-W-83420D



## SA SINGLE ACTING CABLE CYLINDER

- Use in vertical applications when double acting cable cylinder is not required
- Can be positioned horizontally and achieve vertical movement



## DP DOUBLE PURCHASE CABLE CYLINDER

- Doubles the velocity and stroke capacity of cable cylinder without increasing space requirements
- Stroke lengths up to 120 feet (36.6m)
- Isolates cylinder from harsh environments



## TC TRACK CABLE CYLINDER

- Guides and supports load
- Precision linear ball bearings on hardened ground steel shafts

## OPTIONS



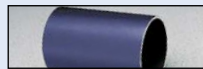
### AUTO TENSIONER

- Maintains proper cable tension
- Maximizes service life of both cable and seals



### CALIPER DISC BRAKE HM HN

- Best mounting choice in most applications



### STEEL TUBE

- For extra strength & use in harsh environments



### 3 PORTED HEAD

- For convenient air connection



### SWITCHES

- Available in Reed and Triac
- 15ft. cable with flying leads; available with quick-disconnect couplers



### SEALS OF VITON® MATERIAL V

- Long lasting seal option
- High temperature applications



### EXTRA CABLE XA XB

- To remotely locate cable cylinder

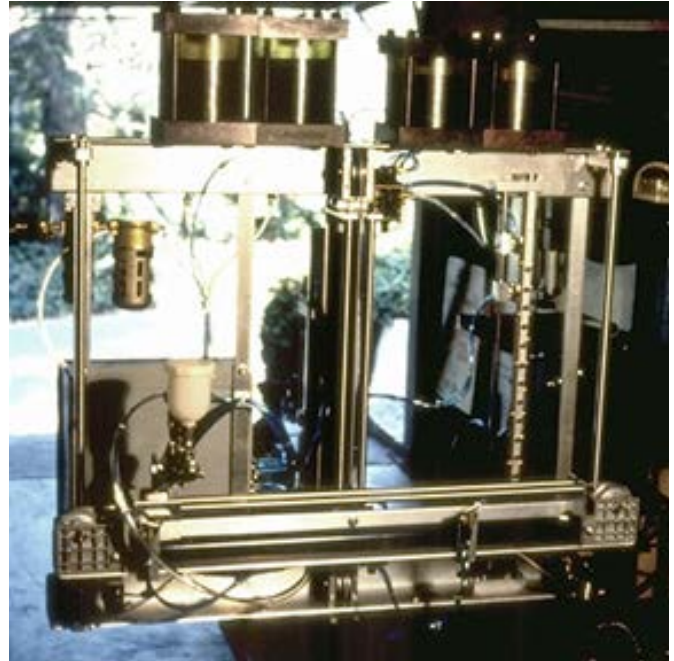
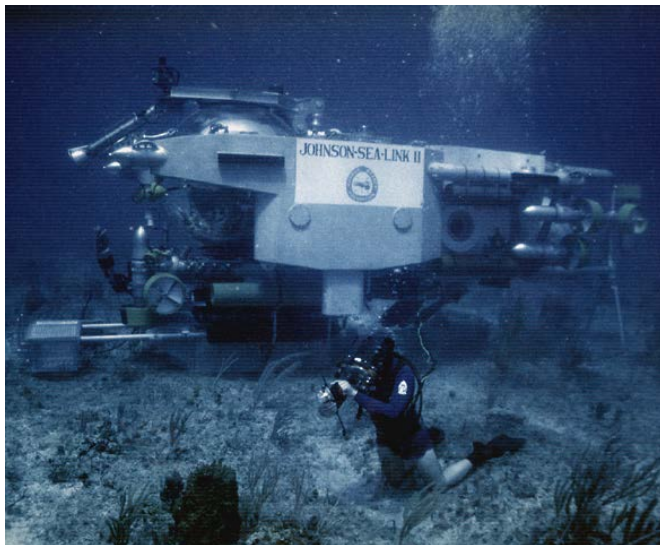
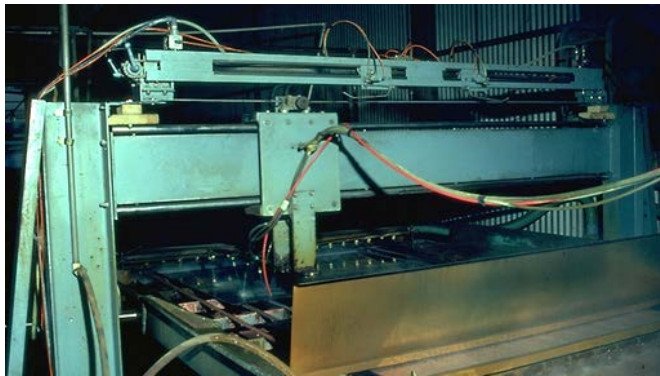
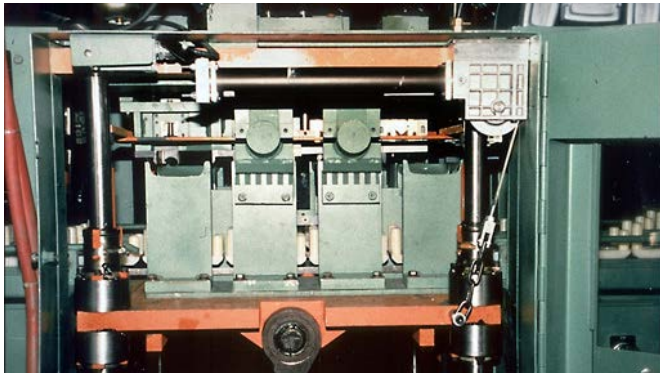


# CC Cable Cylinder

## APPLICATIONS

Tolomatic invented the first ever rodless cylinder in 1956 - the cable cylinder. First designed into the bagger/sealer used in the flour industry the cable cylinder continues to power applications in the 21st century. The cable cylinder has been a key component in the following industries:

- Packaging
- Automotive
- Food & Beverage
- Material Handling & Conveying
- Plastic Injection Molding
- Metal Processing
- Paper and Textiles
- Medical
- Electronics
- Printing
- Many Others

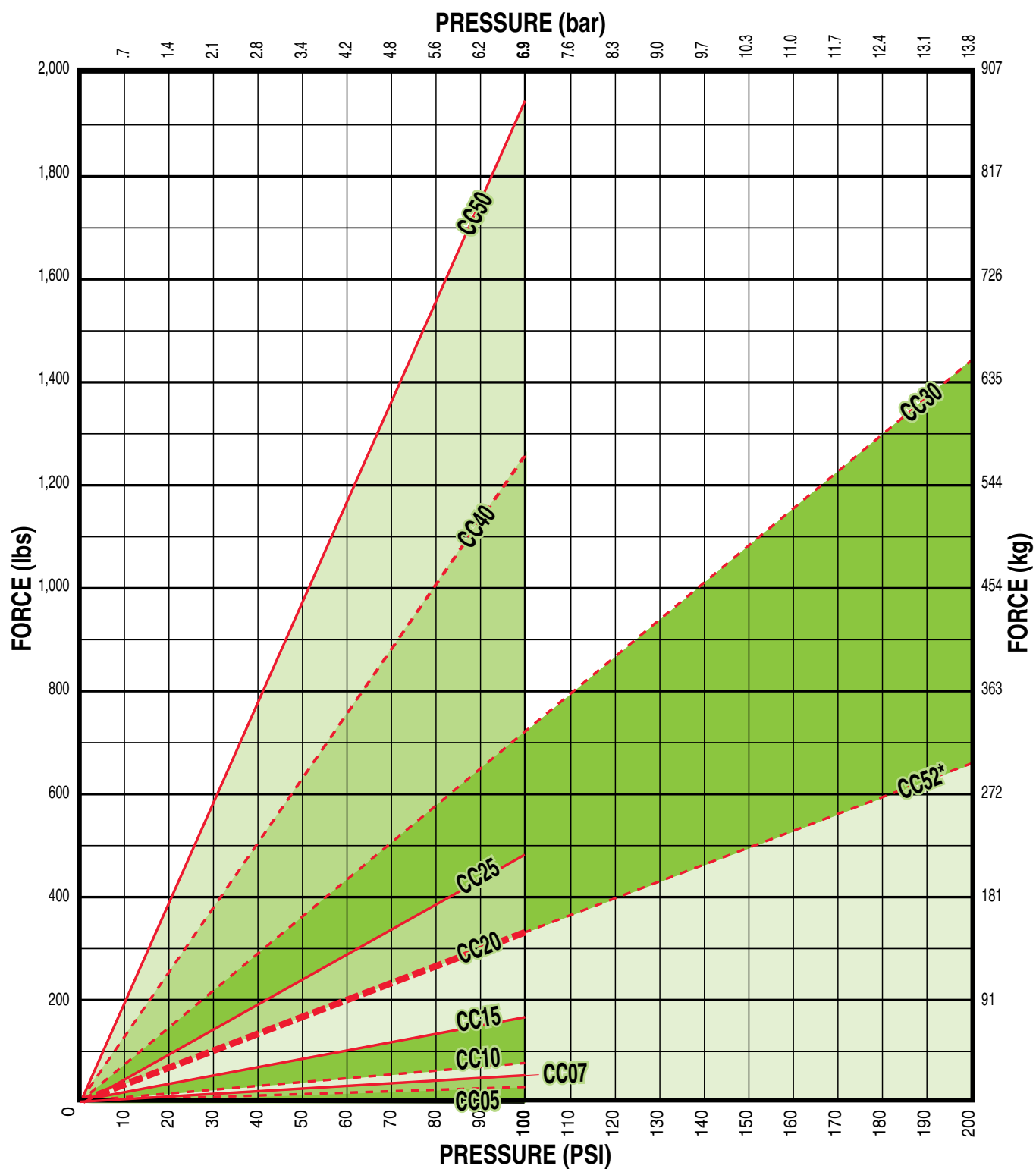




# CC Cable Cylinder

## PERFORMANCE

### CABLE CYLINDER THEORETICAL FORCE VS PRESSURE



\*CC52 up to 500 psi

# CC Double Acting Cable Cylinder - All Sizes

## FEATURES AND OPTIONS



### ORDER CODES

**CC05, CC07, CC10  
CC15, CC20, CC25, CC30  
CC40, CC52, CC50**  
inch (U.S. Standard)

The Tolomatic double-acting cable cylinder is a versatile space saver, available in all 9 bore sizes. Enjoy cost savings over conventional rod cylinders in strokes over four feet without experiencing rod buckle.

These cylinders can be isolated from any work area with extended cable lengths. Contact Tolomatic to achieve strokes of up to 60 feet in length.

| CC OPTIONS                            | Order Code  | Page  | CC05 | CC07 | CC10 | CC15 | CC20 | CC25 | CC30 | CC40 | CC52 | CC50 |
|---------------------------------------|-------------|-------|------|------|------|------|------|------|------|------|------|------|
| Auto Tensioner w/ one 1" Stroke Unit  | HI, HJ      | cc_22 | –    | OP   | OP   | OP   | OP   | OP   | OP   | OP   | OP   | –    |
| Auto Tensioner w/ two 1" Stroke Units | HI, HJ      | cc_22 | –    | OP   | OP   | OP   | OP   | OP   | OP   | OP   | OP   | –    |
| Auto Tensioner w/ one 2" Stroke Unit  | HK, HL      | cc_22 | –    | –    | –    | –    | OP   | OP   | OP   | OP   | OP   | OP   |
| Auto Tensioner w/ two 2" Stroke Units | HK, HL      | cc_22 | –    | –    | –    | –    | OP   | OP   | OP   | OP   | OP   | OP   |
| Caliper Disc Brake                    | HM, HN      | cc_25 | –    | –    | –    | OP   | OP   | OP   | OP   | OP   | OP   | OP   |
| Switches (DC Reed & Triac)            | (several)   | cc_28 | OP   | OP   | OP   | OP   | OP   | OP   | OP   | OP   | OP   | OP   |
| Aluminum Tube                         |             |       | ST   | ST   | ST   | ST   | ST   | ST   | ST   | ST   | ST   | ST   |
| Steel Tube (Switches NOT available)   | S           |       | –    | –    | OP   | OP   | OP   | OP   | OP   | OP   | OP   | OP   |
| Seals of Viton® Material              | V           |       | –    | OP   | OP   | OP   | OP   | OP   | OP   | OP   | OP   | OP   |
| 3 Ported Heads                        | HG          |       | OP   | OP   | OP   | OP   | OP   | OP   | OP   | OP   | OP   | OP   |
| <b>MORE INFORMATION</b>               | <b>Page</b> |       |      |      |      |      |      |      |      |      |      |      |
| Application Guidelines                | cc_36       |       | ST   | ST   | ST   | ST   | ST   | ST   | ST   | ST   | ST   | ST   |
| Cushion Needle Adjustment             | cc_38       |       | –    | ST   | ST   | ST   | ST   | ST   | ST   | ST   | ST   | ST   |
| Ordering                              | cc_40       |       | ST   | ST   | ST   | ST   | ST   | ST   | ST   | ST   | ST   | ST   |
| Selection                             | cc_30       |       | ST   | ST   | ST   | ST   | ST   | ST   | ST   | ST   | ST   | ST   |
| Caliper Disc Brake Option Selection   | cc_32       |       | –    | –    | –    | OP   | OP   | OP   | OP   | OP   | OP   | OP   |
| <b>STANDARD FEATURE</b>               | <b>Page</b> |       |      |      |      |      |      |      |      |      |      |      |
| Fixed Orifice Cushions                | cc_38       |       | –    | ST   | ST   | –    | –    | –    | –    | –    | –    | –    |
| Adjustable Cushions                   | cc_38       |       | –    | –    | –    | ST   | ST   | ST   | ST   | ST   | ST   | ST   |
| Single Ported Head                    |             |       | ST   | ST   | ST   | ST   | ST   | ST   | ST   | ST   | ST   | ST   |

– = Not Available

OP = Optional

ST = Standard

# Double Acting Cable Cylinder - CC05, CC07, CC10

## OVERALL UNIT SPECIFICATIONS

|                           |       | CC05      | CC07  | CC10  |
|---------------------------|-------|-----------|-------|-------|
| BORE SIZE                 | in    | 0.50      | 0.75  | 1.00  |
| MAX STROKE                | in    | 54        | 138   | 282   |
|                           | mm    | 1372      | 3505  | 7163  |
| BASE WEIGHT               | Alum. | lb        | 1.38  | 1.38  |
|                           |       | kg        | 0.63  | 0.63  |
|                           | Steel | lb        | NA    | 1.49  |
|                           |       | kg        | NA    | 0.68  |
| WEIGHT PER UNIT OF STROKE | Alum. | lb per in | 0.011 | 0.034 |
|                           |       | g per mm  | 0.197 | 0.606 |
|                           | Steel | lb per in | NA    | 0.125 |
|                           |       | g per mm  | NA    | 2.244 |
| MAX PRESSURE              | PSI   | 100       | 100   | 100   |
|                           | bar   | 6.9       | 6.9   | 6.9   |
| MAX TEMP                  | °F    | 140       | 140   | 140   |
|                           | °C    | 60        | 60    | 60    |
| MAX FORCE OUTPUT          | lb    | 19.4      | 43.5  | 77.9  |
|                           | N     | 86.3      | 193.5 | 346.5 |

## TUBING SPECIFICATIONS

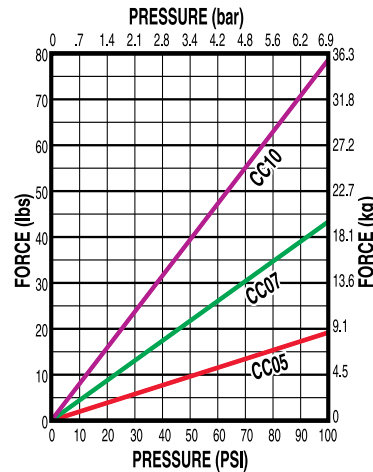
|                   |       | CC05   | CC07  | CC10          |
|-------------------|-------|--------|-------|---------------|
| DEAD LENGTH*      | in    | 1.11   | 1.18  | 1.31          |
|                   | mm    | 28.2   | 30    | 33.3          |
| WALL THICKNESS    | in    | 0.0937 | 0.125 | 0.125         |
|                   | mm    | 2.38   | 3.175 | 3.175         |
| MATERIAL          |       | Alum.  | Alum. | Alum or Steel |
| TUBE SUPPORT SPAN | Alum. | in     | 60    | 72            |
|                   |       | mm     | 1524  | 1829          |
|                   | Steel | in     | NA    | 78            |
|                   |       | mm     | NA    | 1981          |

\*Add to stroke length to determine overall length

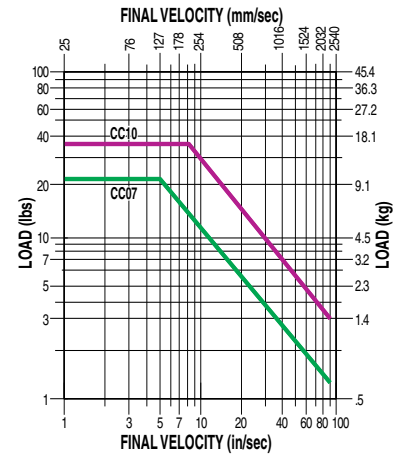
## CABLE SPECIFICATIONS

|                      |       | CC05   | CC07   | CC10   |
|----------------------|-------|--------|--------|--------|
| WIRE DIA             | in    | 0.0468 | 0.0468 | 0.0468 |
|                      | mm    | 1.189  | 1.189  | 1.189  |
| NYLON O.D.           | in    | 0.0937 | 0.0937 | 0.0937 |
|                      | mm    | 2.38   | 2.38   | 2.38   |
| STRAND CONFIGURATION |       | 7 x 7  | 7 x 7  | 7 x 7  |
| TENSILE STRENGTH     | lb    | 270    | 270    | 270    |
|                      | kg    | 122.47 | 122.47 | 122.47 |
| PROOF-LOAD TORQUE    | in-lb | 15     | 15     | 15     |
|                      | N-m   | 1.69   | 1.69   | 1.69   |
| PRETENSIONING TORQUE | in-lb | 2.5    | 2.5    | 2.5    |
|                      | N-m   | 0.28   | 0.28   | 0.28   |

## THEORETICAL FORCE vs PRESSURE

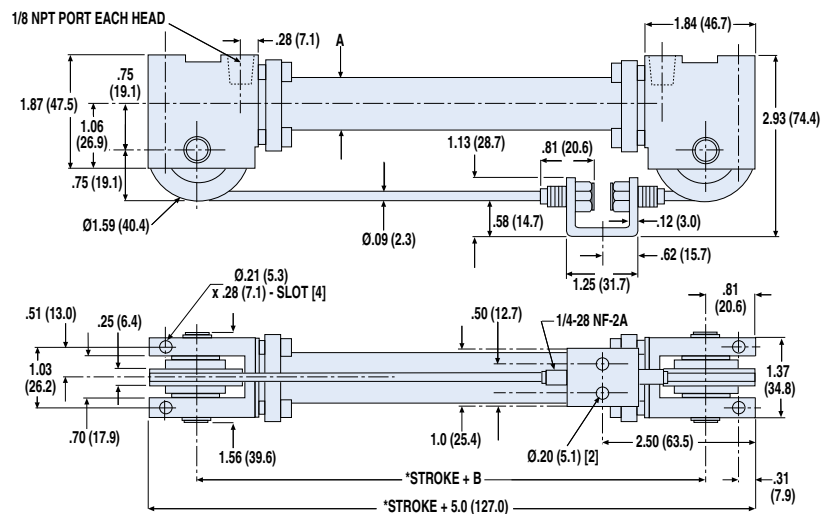


## CUSHION DATA



NOTE: The CC05 cylinder does not have cushions.

## DIMENSIONS



\*If M option (magnet) is ordered add 1.62" (41.2mm) to the overall length

|   | CC05        | CC07         | CC10         |
|---|-------------|--------------|--------------|
| A | 0.63 (16.0) | 0.100 (25.4) | 0.125 (31.8) |
| B | 3.38 (85.8) | 3.43 (87.1)  | 3.43 (87.1)  |





# Double Acting Cable Cylinder - cc15

## OVERALL UNIT SPECIFICATIONS

| CC15                      |       |                 |
|---------------------------|-------|-----------------|
| BORE SIZE                 | in    | 1.50            |
| MAX STROKE                | in    | 280             |
|                           | mm    | 7112            |
| BASE WEIGHT               | Alum. | lb 5.12         |
|                           |       | kg 2.32         |
|                           | Steel | lb 5.27         |
|                           |       | kg 2.39         |
| WEIGHT PER UNIT OF STROKE | Alum. | lb per in 0.063 |
|                           |       | g per mm 1.1259 |
|                           | Steel | lb per in 0.181 |
|                           |       | g per mm 3.2322 |
| MAX PRESSURE              | PSI   | 100             |
|                           | bar   | 6.9             |
| MAX TEMP                  | °F    | 140             |
|                           | °C    | 60              |
| MAX FORCE OUTPUT          | lb    | 174             |
|                           | N     | 774.0           |

## TUBING SPECIFICATIONS

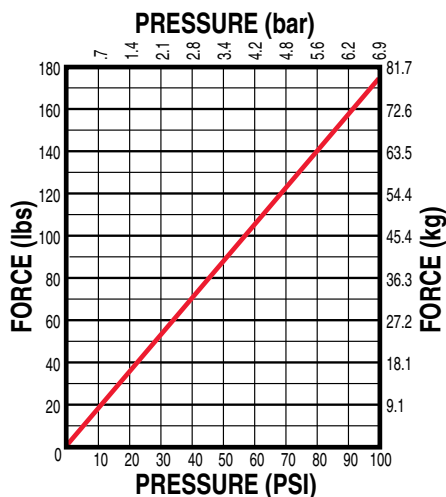
| CC15              |       |                |
|-------------------|-------|----------------|
| DEAD LENGTH*      | in    | 3.40           |
|                   | mm    | 86.4           |
| WALL THICKNESS    | in    | 0.125          |
|                   | mm    | 3.175          |
| MATERIAL          |       | Alum. or Steel |
| TUBE SUPPORT SPAN | Alum. | in 84          |
|                   |       | mm 2134        |
|                   | Steel | in 90          |
|                   |       | mm 2286        |

\*Add to stroke length to determine overall length

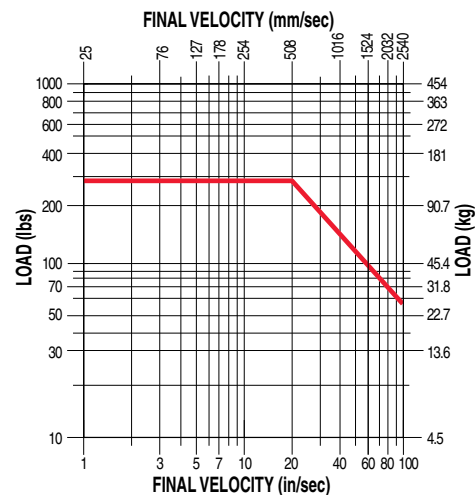
## CABLE SPECIFICATIONS

| CC15                 |       |        |
|----------------------|-------|--------|
| WIRE DIA             | in    | 0.0937 |
|                      | mm    | 2.380  |
| NYLON O.D.           | in    | 0.187  |
|                      | mm    | 4.750  |
| STRAND CONFIGURATION |       | 7 x 7  |
| TENSILE STRENGTH     | lb    | 920    |
|                      | kg    | 417.30 |
| PROOF-LOAD TORQUE    | in-lb | 45     |
|                      | N-m   | 5.08   |
| PRETENSIONING TORQUE | in-lb | 8      |
|                      | N-m   | 0.90   |

## THEORETICAL FORCE vs PRESSURE

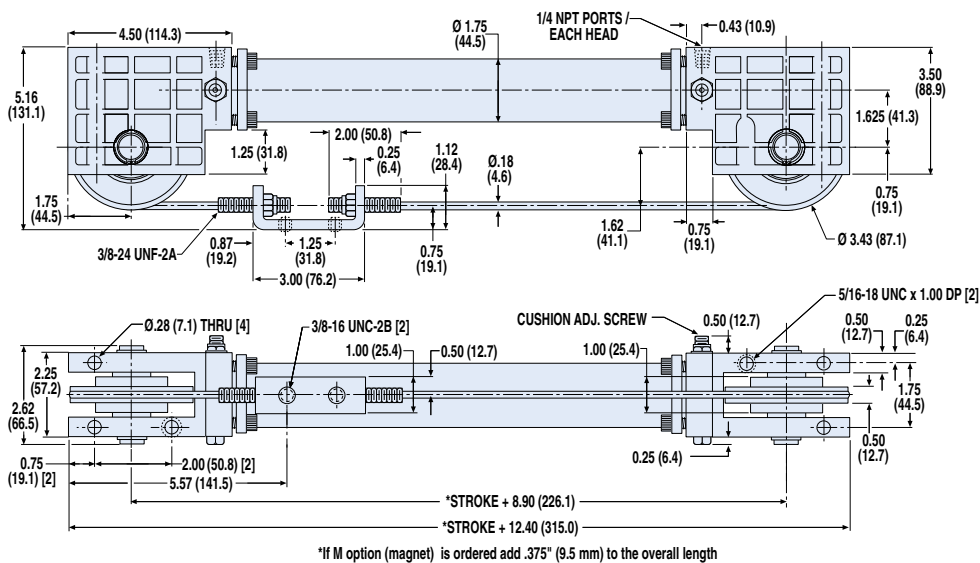


## CUSHION DATA



CC15

## DIMENSIONS



Dimensions in inches, in parentheses ( ) dimensions in millimeters



# Double Acting Cable Cylinder - CC20, CC25

## OVERALL UNIT SPECIFICATIONS

|                           |           | CC20  | CC25  |
|---------------------------|-----------|-------|-------|
| BORE SIZE                 | in        | 2.00  | 2.50  |
| MAX STROKE                | in        | 281   | 281   |
|                           | mm        | 7137  | 7137  |
| BASE WEIGHT               | lb        | 12.44 | 12.9  |
|                           | kg        | 5.64  | 5.85  |
|                           | lb        | 12.9  | 13.48 |
|                           | kg        | 5.85  | 6.11  |
| WEIGHT PER UNIT OF STROKE | lb per in | 0.083 | 0.103 |
|                           | g per mm  | 1.482 | 1.839 |
|                           | lb per in | 0.236 | 0.292 |
|                           | g per mm  | 4.214 | 5.214 |
| MAX PRESSURE              | PSI       | 200   | 200   |
|                           | bar       | 13.8  | 13.8  |
| MAX TEMP                  | °F        | 140   | 140   |
|                           | °C        | 60    | 60    |
| MAX FORCE OUTPUT          | lb        | 618   | 972   |
|                           | N         | 2749  | 4324  |

## TUBING SPECIFICATIONS

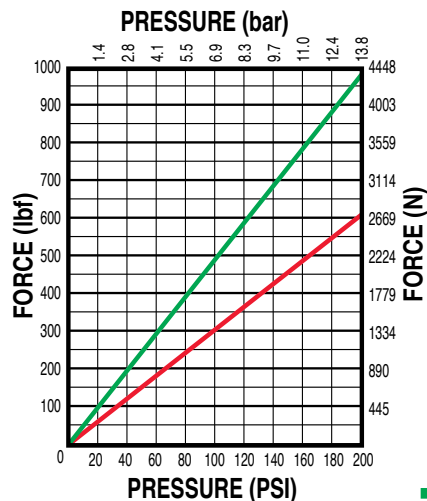
|                   |    | CC20          | CC25          |
|-------------------|----|---------------|---------------|
| DEAD LENGTH*      | in | 3.00          | 3.00          |
|                   | mm | 76.2          | 76.2          |
| WALL THICKNESS    | in | 0.125         | 0.125         |
|                   | mm | 3.175         | 3.175         |
| MATERIAL          |    | Alum or Steel | Alum or Steel |
| TUBE SUPPORT SPAN | in | 90            | 96            |
|                   | mm | 2286          | 2438          |
|                   | in | 96            | 108           |
|                   | mm | 2438          | 2743          |

\*Add to stroke length to determine overall length

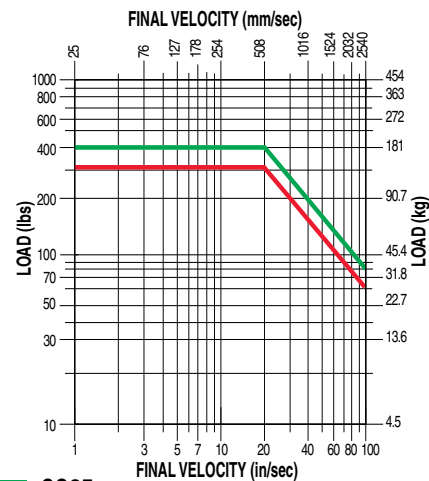
## CABLE SPECIFICATIONS

|                      |       | CC20   | CC25   |
|----------------------|-------|--------|--------|
| WIRE DIA             | in    | 0.125  | 0.125  |
|                      | mm    | 3.175  | 3.175  |
| NYLON O.D.           | in    | 0.250  | 0.250  |
|                      | mm    | 6.350  | 6.350  |
| STRAND CONFIGURATION |       | 7 x 19 | 7 x 19 |
| TENSILE STRENGTH     | lb    | 2000   | 2000   |
|                      | kg    | 907.18 | 907.18 |
| PROOF-LOAD TORQUE    | in-lb | 115    | 115    |
|                      | N-m   | 12.99  | 12.99  |
| PRETENSIONING TORQUE | in-lb | 46.0   | 73.0   |
|                      | N-m   | 5.20   | 8.25   |

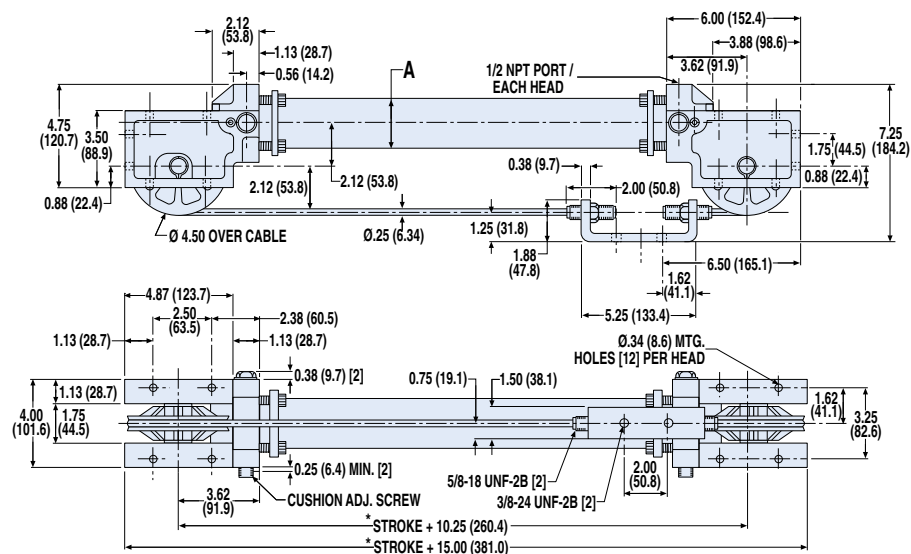
## THEORETICAL FORCE vs PRESSURE



## CUSHION DATA



## DIMENSIONS



\*If M option (magnet) is ordered add 0.375" (9.5 mm) to the overall length



# Double Acting Cable Cylinder - CC30, CC40, CC52

## OVERALL UNIT SPECIFICATIONS

|                           |       | CC30      | CC40   | CC52   |
|---------------------------|-------|-----------|--------|--------|
| BORE SIZE                 | in    | 3.00      | 4.00   | 2.00   |
| MAX STROKE                | in    | 280       | 279    | 280    |
|                           | mm    | 7112      | 7087   | 7112   |
| BASE WEIGHT               | Alum. | lb        | 18.69  | 20.75  |
|                           |       | kg        | 8.48   | 9.41   |
|                           | Steel | lb        | 19.45  | 22.09  |
|                           |       | kg        | 8.82   | 10.02  |
| WEIGHT PER UNIT OF STROKE | Alum. | lb per in | 0.12   | 0.159  |
|                           |       | g per mm  | 2.143  | 2.839  |
|                           | Steel | lb per in | 0.334  | 0.459  |
|                           |       | g per mm  | 5.965  | 8.197  |
| MAX PRESSURE              | PSI   | 200       | 100    | 500    |
|                           | bar   | 13.8      | 6.9    | 34.5   |
| MAX TEMP                  | °F    | 140       | 140    | 140    |
|                           | °C    | 60        | 60     | 60     |
| MAX FORCE OUTPUT          | lb    | 1398.4    | 1248.9 | 1532.4 |
|                           | N     | 6220      | 5555   | 6816   |

## TUBING SPECIFICATIONS

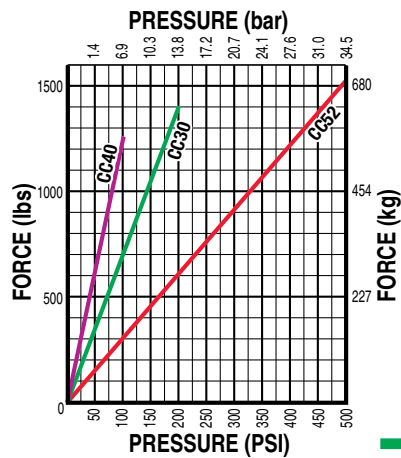
|                   |               | CC30          | CC40          | CC52          |
|-------------------|---------------|---------------|---------------|---------------|
| DEAD LENGTH*      | in            | 3.50          | 4.50          | 3.00          |
|                   | mm            | 88.9          | 114.3         | 76.2          |
| WALL THICKNESS    | in            | 0.125         | 0.125         | 0.125         |
|                   | mm            | 3.175         | 3.175         | 3.175         |
| MATERIAL          | Alum or Steel | Alum or Steel | Alum or Steel | Alum or Steel |
|                   | Alum.         | in            | 102           | 108           |
| TUBE SUPPORT SPAN | mm            | 2591          | 2743          | 2438          |
|                   | Steel         | in            | 120           | 132           |
|                   | mm            | 3048          | 3353          | 2438          |

\*Add to stroke length to determine overall length

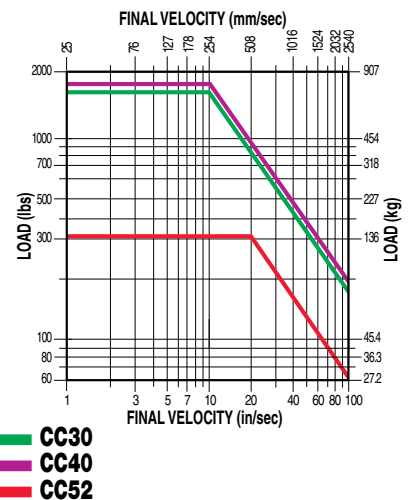
## CABLE SPECIFICATIONS

|                      |       | CC30   | CC40   | CC52   |
|----------------------|-------|--------|--------|--------|
| WIRE DIA             | in    | 0.187  | 0.187  | 0.187  |
|                      | mm    | 4.750  | 4.750  | 4.750  |
| NYLON O.D.           | in    | 0.312  | 0.312  | 0.312  |
|                      | mm    | 7.925  | 7.925  | 7.925  |
| STRAND CONFIGURATION |       | 7 x 19 | 7 x 19 | 7 x 19 |
| TENSILE STRENGTH     | lb    | 4200   | 4200   | 4200   |
|                      | kg    | 1905   | 1905   | 1905   |
| PROOF-LOAD TORQUE    | in-lb | 210    | 210    | 210    |
|                      | N-m   | 23.73  | 23.73  | 23.73  |
| PRETENSIONING TORQUE | in-lb | 105    | 187.5  | 115    |
|                      | N-m   | 11.86  | 21.19  | 12.99  |

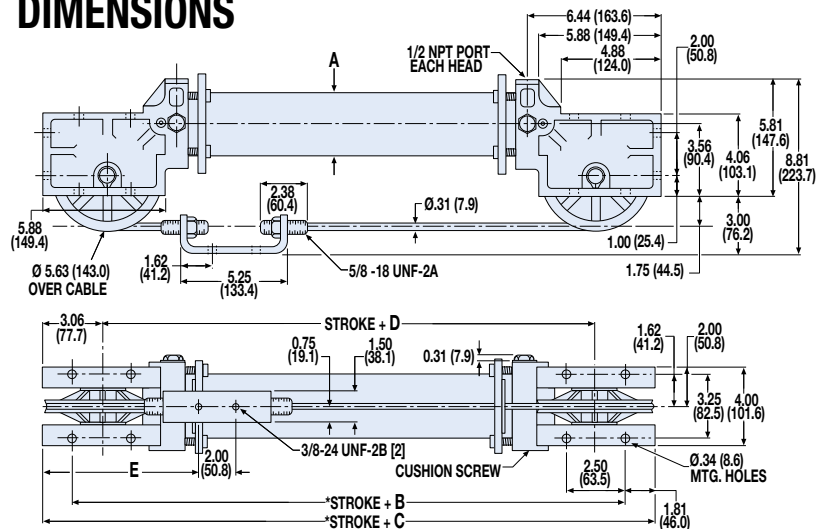
## THEORETICAL FORCE vs PRESSURE



## CUSHION DATA



## DIMENSIONS



|   | CC30          | CC40          | CC52          |
|---|---------------|---------------|---------------|
| A | Ø3.25 (82.6)  | Ø4.25 (108.0) | Ø2.25 (57.2)  |
| B | 13.87 (352.3) | 14.87 (377.7) | 13.87 (352.3) |
| C | 17.50 (444.5) | 18.50 (469.9) | 17.50 (444.5) |
| D | 11.38 (289.1) | 12.38 (314.5) | 11.38 (289.1) |
| E | 7.75 (196.9)  | 8.25 (209.6)  | 7.75 (196.9)  |

\*If M option (magnet) is ordered add .375" (9.5 mm) to the overall length

Dimensions in inches, in parentheses ( ) dimensions in millimeters



# Double Acting Cable Cylinder - cc50

## OVERALL UNIT SPECIFICATIONS

|                           |           | CC50  |
|---------------------------|-----------|-------|
| BORE SIZE                 | in        | 5.00  |
| MAX STROKE                | in        | 134   |
|                           | mm        | 3404  |
| BASE WEIGHT               | lb        | 30.75 |
|                           | kg        | 13.95 |
| WEIGHT PER UNIT OF STROKE | lb per in | 0.202 |
|                           | g per mm  | 3.786 |
| MAX PRESSURE              | PSI       | 100   |
|                           | bar       | 6.9   |
| MAX TEMP                  | °F        | 140   |
|                           | °C        | 60    |
| MAX FORCE OUTPUT          | lb        | 1919  |
|                           | N         | 8536  |

## TUBING SPECIFICATIONS

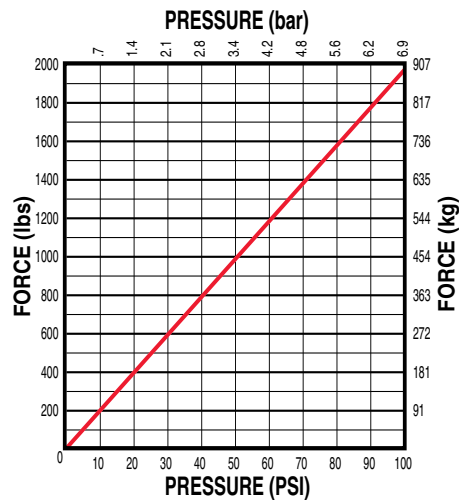
|                   |    | CC50  |
|-------------------|----|-------|
| DEAD LENGTH*      | in | 6.00  |
|                   | mm | 152.4 |
| WALL THICKNESS    | in | 0.125 |
|                   | mm | 3.175 |
| MATERIAL          |    | Alum. |
| TUBE SUPPORT SPAN | in | 166.8 |
|                   | mm | 4237  |

\*Add to stroke length to determine overall length

## CABLE SPECIFICATIONS

|                      |       | CC50    |
|----------------------|-------|---------|
| WIRE DIA             | in    | 0.25    |
|                      | mm    | 6.350   |
| NYLON O.D.           | in    | 0.375   |
|                      | mm    | 9.525   |
| STRAND CONFIGURATION |       | 7 x 19  |
| TENSILE STRENGTH     | lb    | 7000    |
|                      | kg    | 3175.13 |
| PROOF-LOAD TORQUE    | in-lb | 325     |
|                      | N-m   | 36.72   |
| PRETENSIONING TORQUE | in-lb | 180     |
|                      | N-m   | 20.34   |

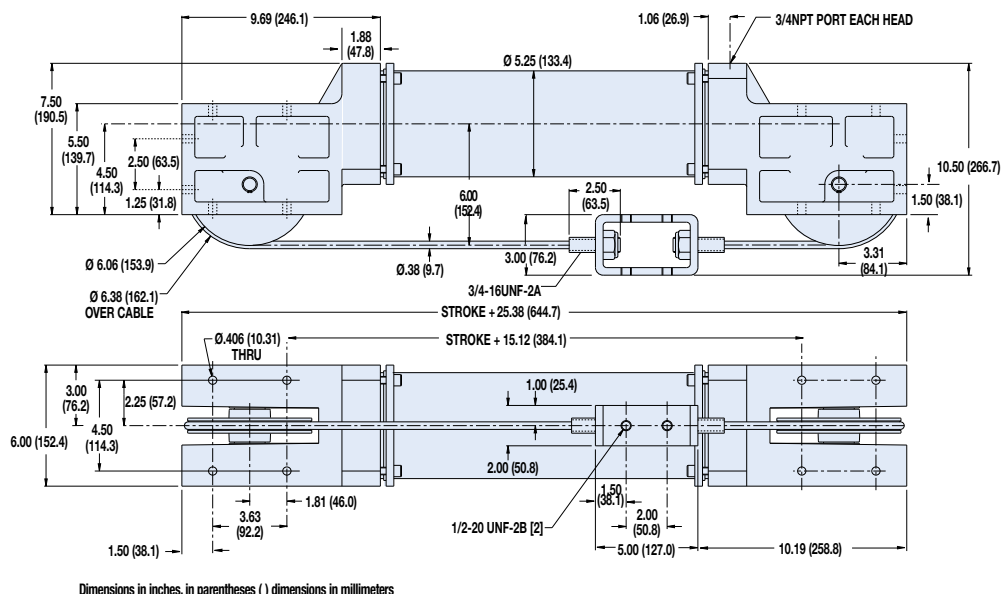
## THEORETICAL FORCE vs PRESSURE



**NOTE:** The CC50 cylinder does not have cushions.

**CC50**

## DIMENSIONS

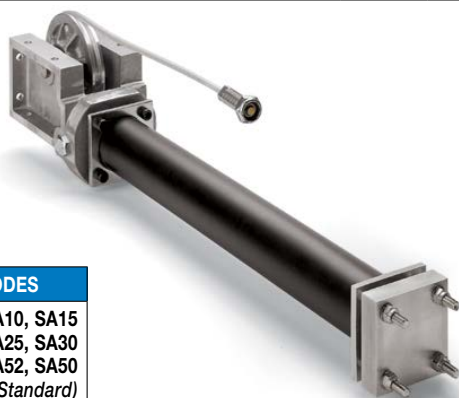


Dimensions in inches, in parentheses ( ) dimensions in millimeters



# SA Single Acting Cable Cylinder - All Sizes

## FEATURES AND OPTIONS



### ORDER CODES

**SA07, SA10, SA15**  
**SA20, SA25, SA30**  
**SA40, SA52, SA50**  
*inch (U.S. Standard)*

When a standard double-acting cable cylinder is not necessary in vertical applications, Tolomatic single-acting cable cylinders provide a cost savings advantage. Ideal for vertical lifting applications, these cylinders may be positioned horizontally and still achieve a vertical movement. Tolomatic single-acting cylinders are available in 8 bore sizes ranging from 3/4-inch to 5 inches with optional switches.

| SA OPTIONS                          | Order Code  | Page  | SA07 | SA10 | SA15 | SA20 | SA25 | SA30 | SA40 | SA52 | SA50 |
|-------------------------------------|-------------|-------|------|------|------|------|------|------|------|------|------|
| Switches (DC Reed & Triac)          | (several)   | CC_28 | OP   | OP   | OP   | OP   | OP   | OP   | OP   | OP   | OP   |
| Aluminum Tube                       |             |       | ST   | ST   | ST   | ST   | ST   | ST   | ST   | ST   | ST   |
| Steel Tube (Switches NOT available) | S           |       | –    | OP   | OP   | OP   | OP   | OP   | OP   | OP   | OP   |
| Seals of Viton® Material            | V           |       | OP   | OP   | OP   | OP   | OP   | OP   | OP   | OP   | OP   |
| 3 Ported Heads                      | HG          |       | OP   | OP   | OP   | OP   | OP   | OP   | OP   | OP   | OP   |
| <b>MORE INFORMATION</b>             | <b>Page</b> |       |      |      |      |      |      |      |      |      |      |
| Application Guidelines              | CC_36       |       | ST   | ST   | ST   | ST   | ST   | ST   | ST   | ST   | ST   |
| Cushion Needle Adjustment           | CC_38       |       | ST   | ST   | ST   | ST   | ST   | ST   | ST   | ST   | ST   |
| Ordering                            | CC_40       |       | ST   | ST   | ST   | ST   | ST   | ST   | ST   | ST   | ST   |
| Selection                           | CC_30       |       | ST   | ST   | ST   | ST   | ST   | ST   | ST   | ST   | ST   |
| <b>STANDARD FEATURE</b>             | <b>Page</b> |       |      |      |      |      |      |      |      |      |      |
| Fixed Orifice Cushions              | CC_38       |       | ST   | ST   | –    | –    | –    | –    | –    | –    | –    |
| Adjustable Cushions                 | CC_38       |       | –    | –    | ST   | ST   | ST   | ST   | ST   | ST   | ST   |
| Single Ported Head                  |             |       | ST   | ST   | ST   | ST   | ST   | ST   | ST   | ST   | ST   |

– = Not Available

OP = Optional

ST = Standard



**NOTE:** See corresponding CC (double acting cable cylinder) for performance, tubing and cable specifications Page CC\_7 to Page CC\_11



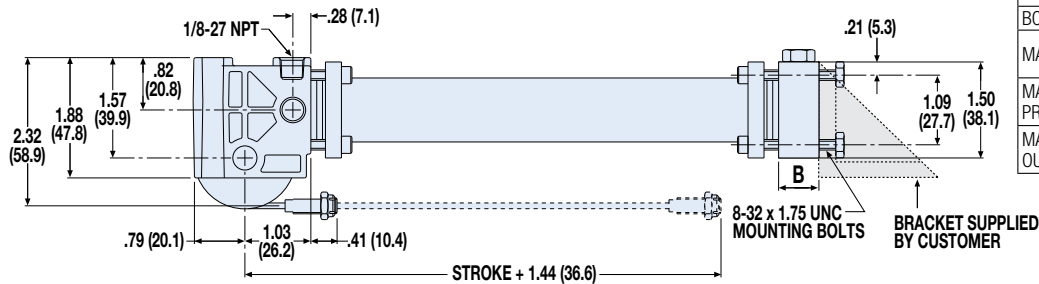
# Single Acting Cable Cylinder - SA07, SA10, SA15

3D CAD AVAILABLE AT  
WWW.TOLOMATIC.COM



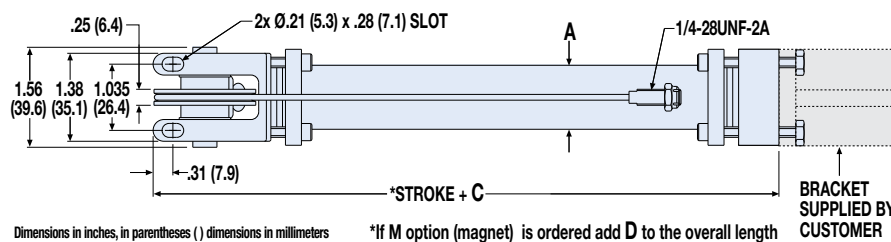
## SA07, SA10

### DIMENSIONS



| OVERALL UNIT SPECIFICATIONS |     |       |       |
|-----------------------------|-----|-------|-------|
|                             |     | SA07  | SA10  |
| BORE SIZE                   | in  | 0.75  | 1.00  |
|                             | mm  | 19.0  | 25.4  |
| MAX STROKE                  | in  | 138   | 282   |
|                             | mm  | 3505  | 7163  |
| MAX PRESSURE                | PSI | 100   | 100   |
|                             | bar | 6.9   | 6.9   |
| MAX FORCE OUTPUT            | lb  | 43.5  | 77.9  |
|                             | N   | 193.5 | 346.5 |

NOTE: Additional specifications  
Page CC\_7



|   | SA07          | SA10          |
|---|---------------|---------------|
| A | Ø 1.00 (25.4) | Ø 1.25 (31.8) |
| B | 0.50 (12.7)   | 0.63 (16.0)   |
| C | 3.62 (92.0)   | 3.81 (96.8)   |
| D | 1.46 (37.1)   | 1.62 (41.2)   |

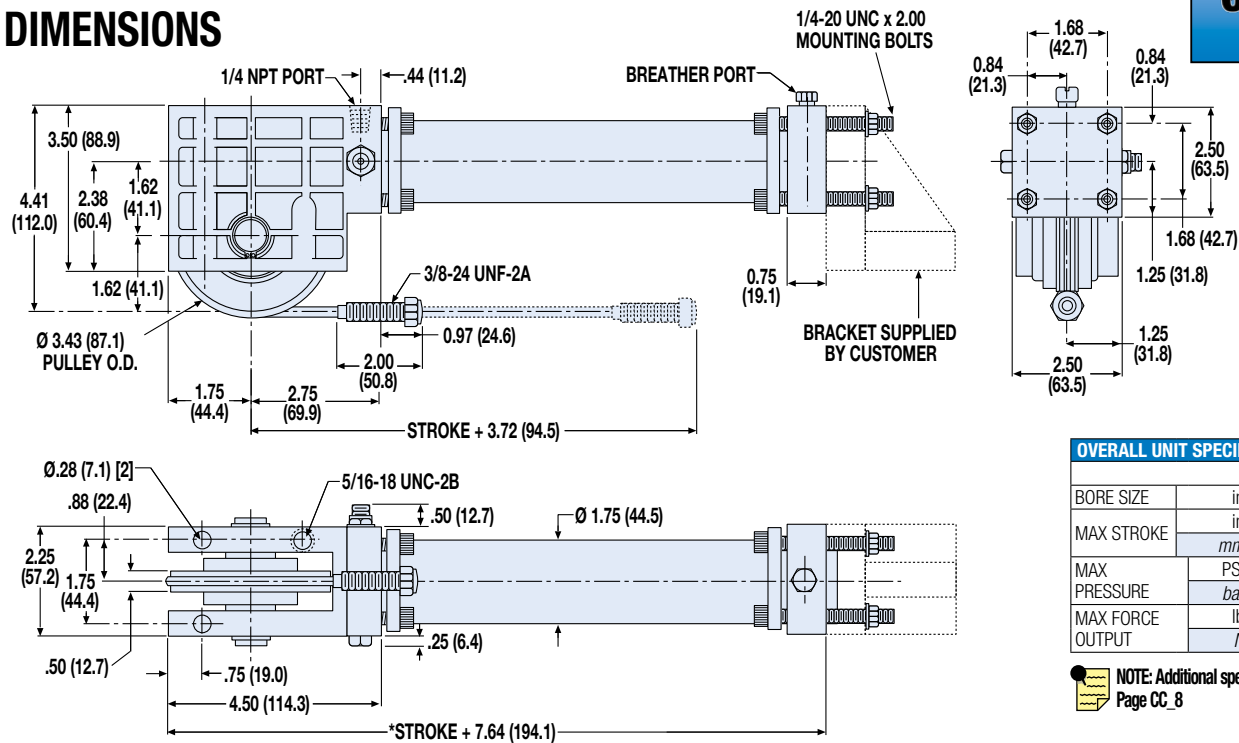
Dimensions in inches, in parentheses ( ) dimensions in millimeters

\*If M option (magnet) is ordered add D to the overall length

BRACKET SUPPLIED BY CUSTOMER

## SA15

### DIMENSIONS



| OVERALL UNIT SPECIFICATIONS |     |       |  |
|-----------------------------|-----|-------|--|
|                             |     | SA15  |  |
| BORE SIZE                   | in  | 1.50  |  |
|                             | mm  | 38.1  |  |
| MAX STROKE                  | in  | 280   |  |
|                             | mm  | 7112  |  |
| MAX PRESSURE                | PSI | 100   |  |
|                             | bar | 6.9   |  |
| MAX FORCE OUTPUT            | lb  | 174   |  |
|                             | N   | 774.0 |  |

NOTE: Additional specifications  
Page CC\_8

Dimensions in inches, in parentheses ( ) dimensions in millimeters

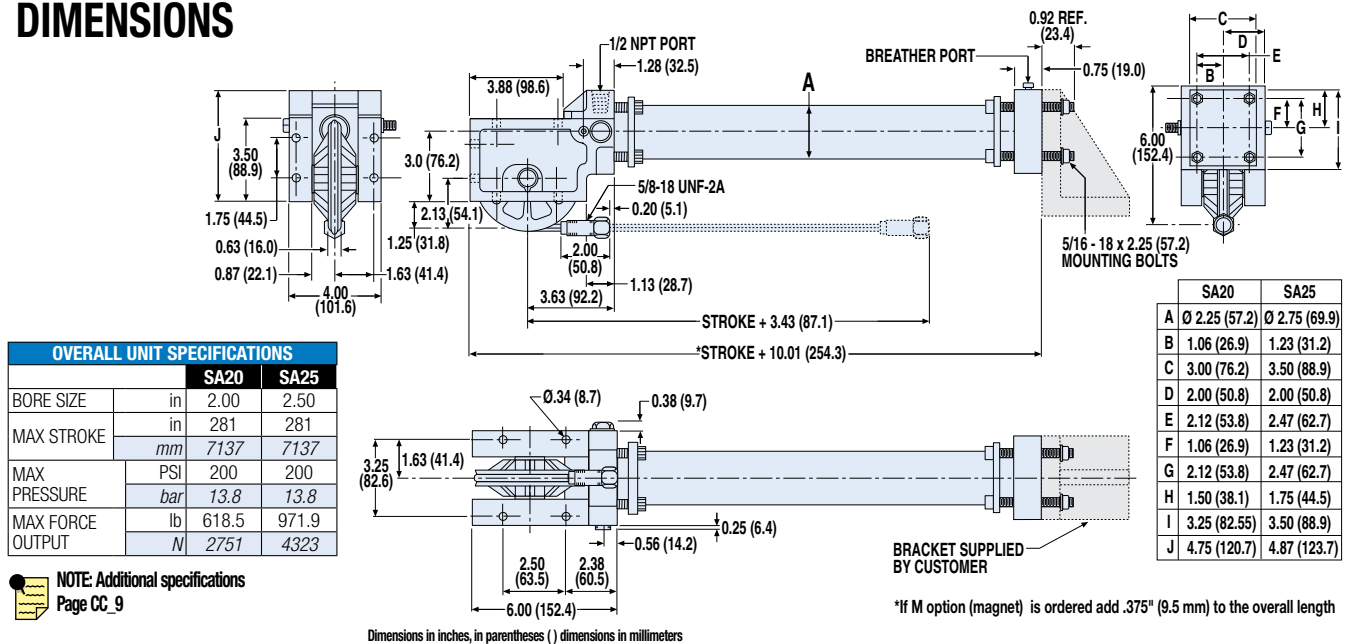
\*If M option (magnet) is ordered add .375" (9.5 mm) to the overall length

# Single Acting Cable Cylinder - SA20, SA25, SA30, SA40, SA52



## SA20, SA25

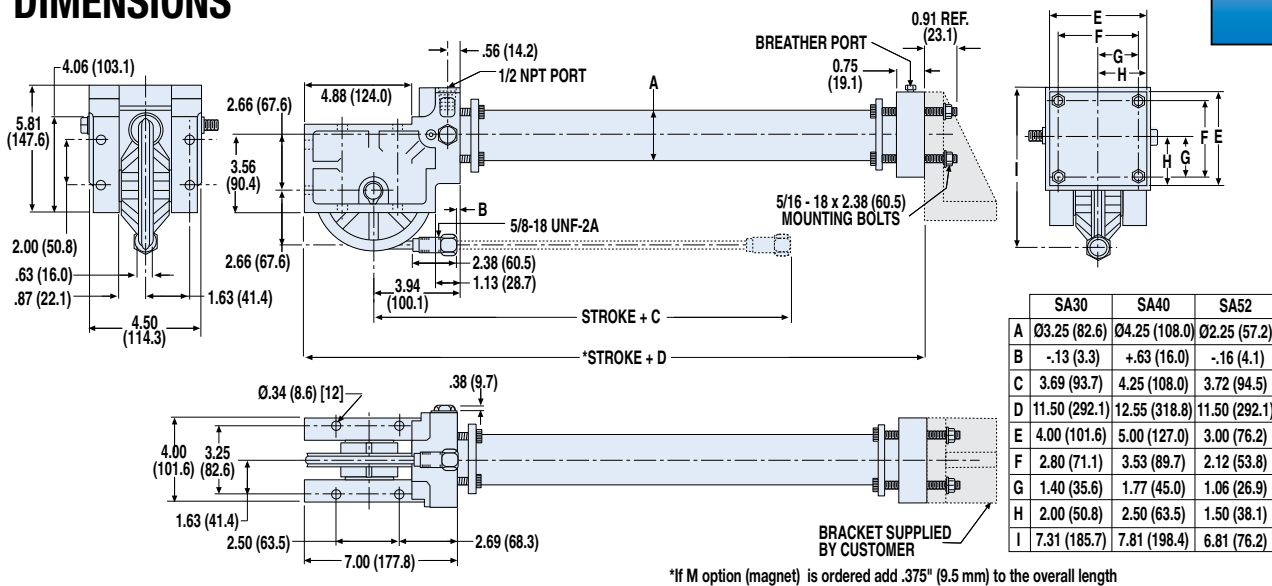
### DIMENSIONS



## SA30, SA40, SA52



### DIMENSIONS

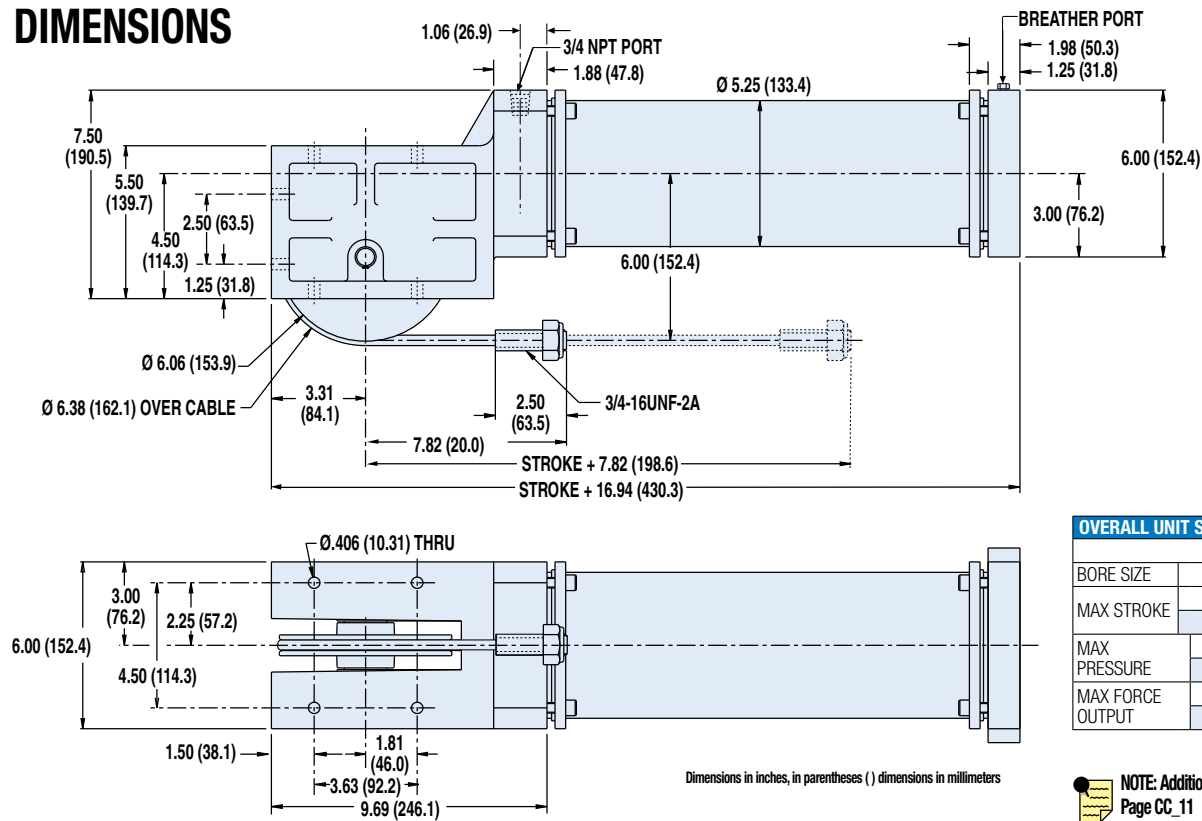


# Single Acting Cable Cylinder - SA50



SA50

## DIMENSIONS



### OVERALL UNIT SPECIFICATIONS

|              |     | SA50 |
|--------------|-----|------|
| BORE SIZE    | in  | 5.00 |
| MAX STROKE   | in  | 134  |
|              | mm  | 3404 |
| MAX PRESSURE | PSI | 100  |
|              | bar | 6.9  |
| MAX FORCE    | lb  | 1919 |
| OUTPUT       | N   | 8536 |

NOTE: Additional specifications  
Page CC\_11

# Double Purchase Cable Cylinder - All Sizes

## FEATURES AND OPTIONS



### ORDER CODES

**DP15, DP20, DP25  
DP30, DP40, DP52**  
inch (U.S. Standard)

The Tolomatic double purchase cable cylinder doubles the velocity and stroke capacity of double-acting cylinders without increasing space requirements. Available in 5 bore sizes, these cylinders can extend stroke lengths up to 120 feet with considerable cost-saving advantages and they can be placed away from hostile environments.

 **NOTE:** Pulleys and cables used on double purchase cable cylinders are always from the next smaller model size.

 **NOTE:** For double purchase applications, select a bore size that will accommodate twice the load force.

| DP OPTIONS                            | Order Code  | Page  | DP15 | DP20 | DP25 | DP30 | DP40 | DP52 |
|---------------------------------------|-------------|-------|------|------|------|------|------|------|
| Auto Tensioner w/ one 1" Stroke Unit  | HI, HJ      | cc_22 | OP   | OP   | OP   | OP   | OP   | OP   |
| Auto Tensioner w/ two 1" Stroke Units | HI, HJ      | cc_22 | OP   | OP   | OP   | OP   | OP   | OP   |
| Auto Tensioner w/ one 2" Stroke Unit  | HK, HL      | cc_22 | –    | OP   | OP   | OP   | OP   | OP   |
| Auto Tensioner w/ two 2" Stroke Units | HK, HL      | cc_22 | –    | OP   | OP   | OP   | OP   | OP   |
| Caliper Disc Brake                    | HM, HN      | cc_25 | OP   | OP   | OP   | OP   | OP   | OP   |
| Switches (DC Reed & Triac)            | (several)   | cc_28 | OP   | OP   | OP   | OP   | OP   | OP   |
| Aluminum Tube                         |             |       | ST   | ST   | ST   | ST   | ST   | ST   |
| Steel Tube (Switches NOT available)   | S           |       | OP   | OP   | OP   | OP   | OP   | OP   |
| Seals of Viton® Material              | V           |       | OP   | OP   | OP   | OP   | OP   | OP   |
| 3 Ported Heads                        | HG          |       | OP   | OP   | OP   | OP   | OP   | OP   |
| <b>MORE INFORMATION</b>               | <b>Page</b> |       |      |      |      |      |      |      |
| Application Guidelines                | cc_36       |       | ST   | ST   | ST   | ST   | ST   | ST   |
| Cushion Needle Adjustment             | cc_38       |       | ST   | ST   | ST   | ST   | ST   | ST   |
| Ordering                              | cc_40       |       | ST   | ST   | ST   | ST   | ST   | ST   |
| Selection                             | cc_30       |       | ST   | ST   | ST   | ST   | ST   | ST   |
| Caliper Disc Brake Option Selection   | cc_32       |       | OP   | OP   | OP   | OP   | OP   | OP   |
| <b>STANDARD FEATURE</b>               | <b>Page</b> |       |      |      |      |      |      |      |
| Fixed Orifice Cushions                | cc_38       |       | –    | –    | –    | –    | –    | –    |
| Adjustable Cushions                   | cc_38       |       | ST   | ST   | ST   | ST   | ST   | ST   |
| Single Ported Head                    |             |       | ST   | ST   | ST   | ST   | ST   | ST   |

– = Not Available

OP = Optional

ST = Standard

 **NOTE:** See corresponding CC (double acting cable cylinder) for performance, tubing and cable specifications Page CC\_8 to Page CC\_10

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**CAD**



**2D**

| OVERALL UNIT SPECIFICATIONS |     |       |
|-----------------------------|-----|-------|
|                             |     | DP15  |
| BORE SIZE                   | in  | 1.50  |
| MAX STROKE                  | in  | 280   |
|                             | mm  | 7112  |
| MAX PRESSURE                | PSI | 100   |
|                             | bar | 6.9   |
| MAX FORCE OUTPUT            | lb  | 174   |
|                             | N   | 774.0 |

| OVERALL UNIT SPECIFICATIONS |     |       |       |
|-----------------------------|-----|-------|-------|
|                             |     | DP20  | DP25  |
| BORE SIZE                   | in  | 2.00  | 2.50  |
| MAX STROKE                  |     | 281   | 281   |
|                             | mm  | 7137  | 7137  |
| MAX PRESSURE                | PSI | 100   | 100   |
|                             | bar | 6.9   | 6.9   |
| MAX FORCE OUTPUT            | lb  | 618.5 | 971.9 |
|                             | N   | 2751  | 4323  |

|   | DP20          | DP25          |
|---|---------------|---------------|
| A | Ø 2.25 (57.2) | Ø 2.75 (69.9) |

cc\_17

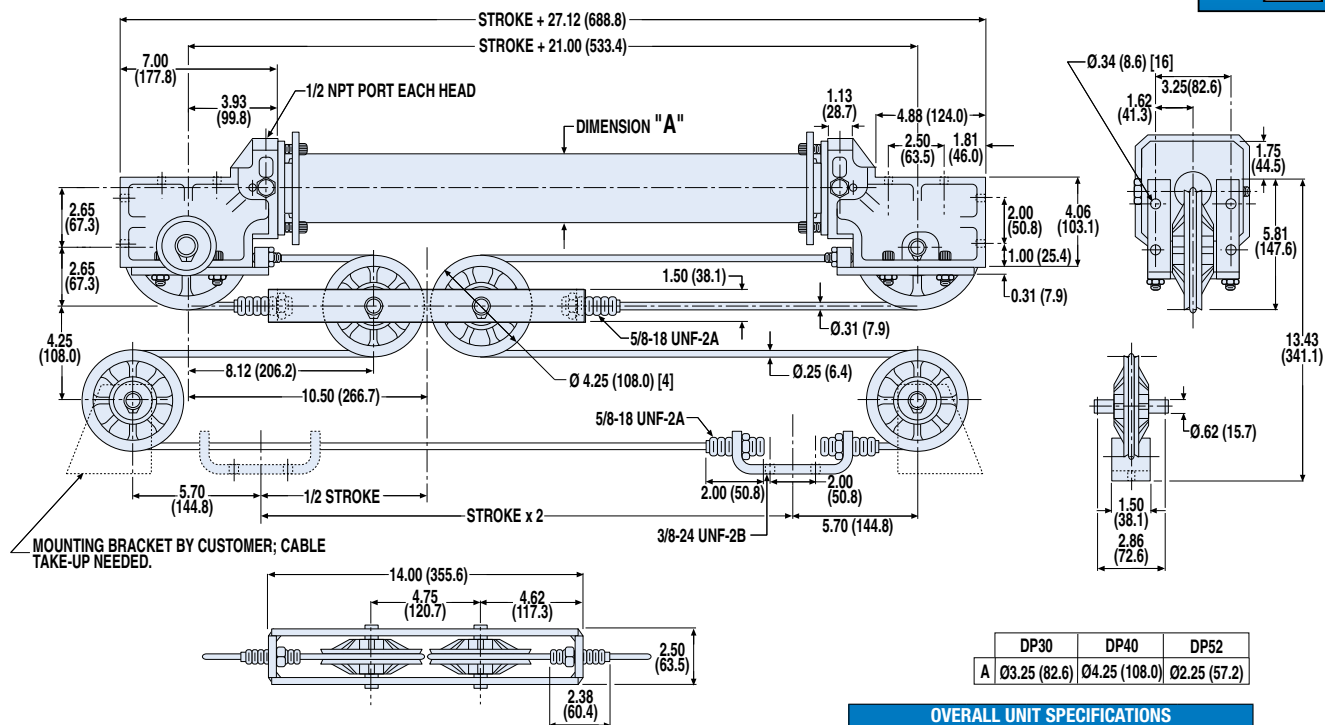


# Double Purchase Cable Cylinder - DP30, DP40, DP52

DP30, DP40, DP52



## DIMENSIONS



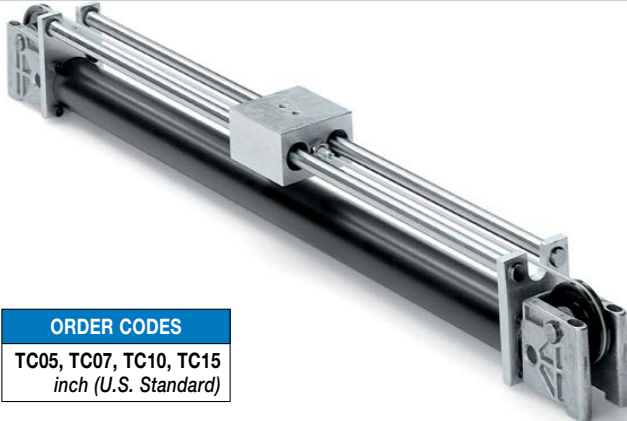
|   | DP30         | DP40          | DP52         |
|---|--------------|---------------|--------------|
| A | Ø3.25 (82.6) | Ø4.25 (108.0) | Ø2.25 (57.2) |

| OVERALL UNIT SPECIFICATIONS |           |        |        |
|-----------------------------|-----------|--------|--------|
|                             | DP30      | DP40   | DP52   |
| BORE SIZE                   | in 3.00   | 4.00   | 2.50   |
| MAX STROKE                  | in 280    | 279    | 280    |
|                             | mm 7112   | 7087   | 7112   |
| MAX PRESSURE                | PSI 200   | 100    | 500    |
|                             | bar 13.8  | 6.9    | 34.5   |
| MAX FORCE                   | lb 1398.4 | 1248.9 | 1532.4 |
| OUTPUT                      | N 6220    | 5555   | 6816   |

**NOTE:** Additional specifications  
Page CC\_10

# TC Track Cable Cylinder - All Sizes

## FEATURES AND OPTIONS



### ORDER CODES

**TC05, TC07, TC10, TC15**  
inch (U.S. Standard)

Tolomatic track cable cylinders provide a pre-packaged, pre-engineered guide and support system for greater bearing surface and larger load capacities.

An aluminum bearing block guides and supports loads on precision linear ball bearings with hardened ground steel shafts. Available in 4 bore sizes with automatic tensioners and caliper disc brake options on selected models.

| TC OPTIONS                            | Order Code | Page  | TC05 | TC07 | TC10 | TC15 |
|---------------------------------------|------------|-------|------|------|------|------|
| Auto Tensioner w/ one 1" Stroke Unit  | HI, HJ     | cc_22 | –    | OP   | OP   | OP   |
| Auto Tensioner w/ two 1" Stroke Units | HI, HJ     | cc_22 | –    | OP   | OP   | OP   |
| Caliper Disc Brake                    | HM, HN     | cc_25 | –    | –    | –    | OP   |
| Switches (DC Reed & Triac)            | (several)  | cc_28 | OP   | OP   | OP   | OP   |
| Aluminum Tube                         |            |       | ST   | ST   | ST   | ST   |
| Steel Tube (Switches NOT available)   | S          |       | –    | –    | OP   | OP   |
| Seals of Viton® Material              | V          |       | –    | OP   | OP   | OP   |
| 3 Ported Heads                        | HG         |       | OP   | OP   | OP   | OP   |
| MORE INFORMATION                      | Page       |       |      |      |      |      |
| Application Guidelines                | cc_36      |       | ST   | ST   | ST   | ST   |
| Cushion Needle Adjustment             | cc_38      |       | –    | ST   | ST   | ST   |
| Ordering                              | cc_40      |       | ST   | ST   | ST   | ST   |
| Selection                             | cc_30      |       | ST   | ST   | ST   | ST   |
| Caliper Disc Brake Option Selection   | cc_32      |       | –    | –    | –    | OP   |
| STANDARD FEATURE                      | Page       |       |      |      |      |      |
| Fixed Orifice Cushions                | cc_38      |       | –    | ST   | ST   | –    |
| Adjustable Cushions                   | cc_38      |       | –    | –    | –    | ST   |
| Single Ported Head                    |            |       | ST   | ST   | ST   | ST   |

– = Not Available

OP = Optional

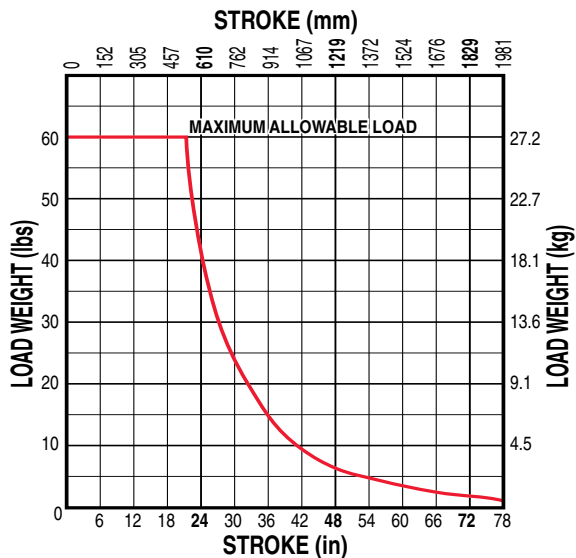
ST = Standard



**NOTE:** See corresponding CC (double acting cable cylinder) for performance, tubing and cable specifications Page CC\_7 to Page CC\_8

# TC Track Cable Cylinder - TC05, TC07, TC10

## LOAD WEIGHT vs STROKE TC05, TC07, TC10 (3/8" Dia. Rods at 0.30" Deflection)



**NOTE:** Rod deflection must not exceed .30 inches

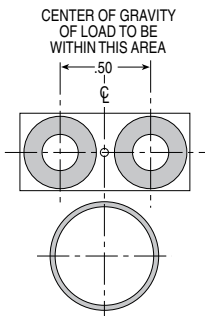
| OVERALL UNIT SPECIFICATIONS |     |        |        |        |
|-----------------------------|-----|--------|--------|--------|
|                             |     | TC05   | TC07   | TC10   |
| BORE SIZE                   | in  | 0.50   | 0.75   | 1.00   |
| MAX STROKE                  | in  | 67.00  | 78.00  | 78.00  |
|                             | mm  | 1701.8 | 1981.2 | 1981.2 |
| MAX PRESSURE                | PSI | 100    | 100    | 100    |
|                             | bar | 6.9    | 6.9    | 6.9    |
| MAX FORCE OUTPUT            | lb  | 19.4   | 43.5   | 77.9   |
|                             | N   | 86.3   | 193.5  | 346.5  |

**NOTE:** Additional specifications  
Page CC 7

**NOTE:** Moderate bending moments are acceptable, so long as the moment load does not exceed 190 inch-pounds.

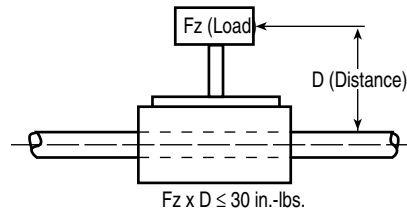
The diagrams at right, illustrate how this is calculated.

## LOAD DISTRIBUTION

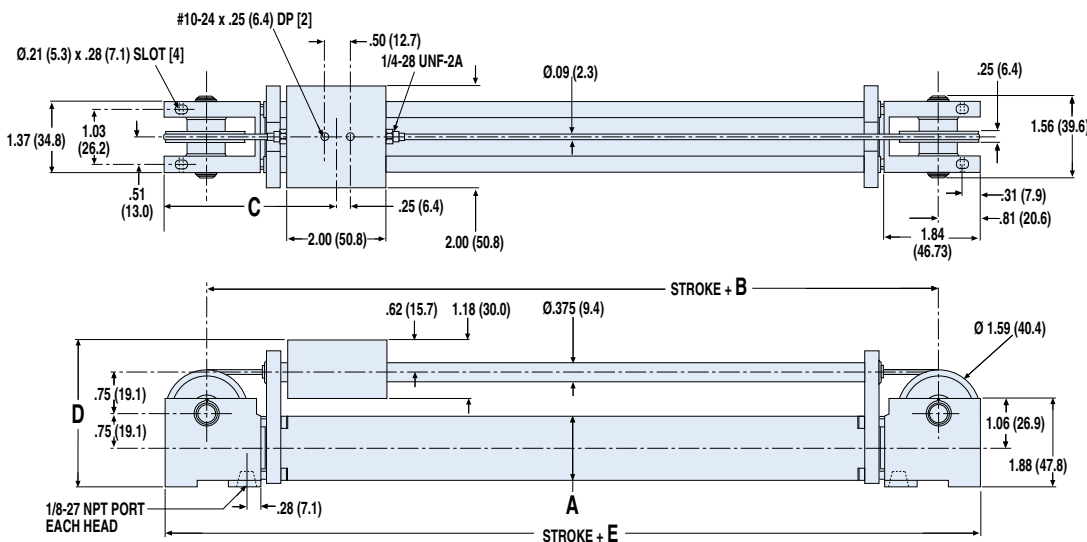


**NOTE:** Moderate bending moments are acceptable. The moment load must not exceed 30 inch-pounds for the 1/2", 3/4" and 1-inch bore cylinders.

The diagrams, illustrate how this is calculated.



## DIMENSIONS



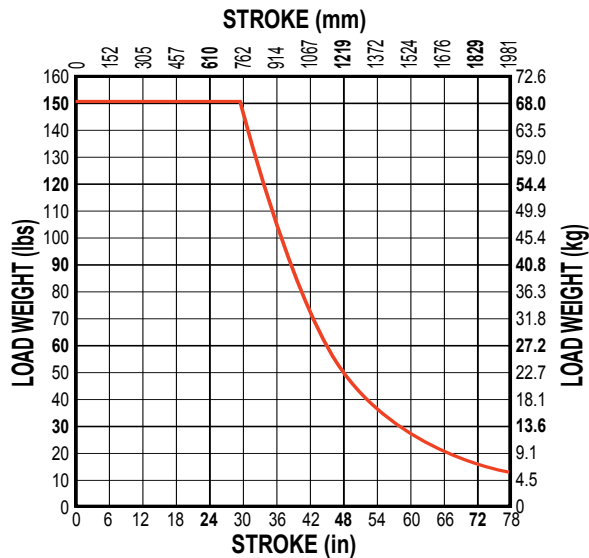
|           | TC05   | TC07   | TC10   |
|-----------|--------|--------|--------|
| <b>A</b>  | 0.625  | 1.000  | 1.250  |
| <b>mm</b> | 15.88  | 25.40  | 31.75  |
| <b>B</b>  | 5.260  | 5.326  | 5.322  |
| <b>mm</b> | 133.60 | 135.28 | 135.18 |
| <b>C</b>  | 3.44   | 3.46   | 3.48   |
| <b>mm</b> | 87.4   | 87.9   | 88.4   |
| <b>D</b>  | 2.93   | 2.96   | 2.93   |
| <b>mm</b> | 74.4   | 75.2   | 74.4   |
| <b>E</b>  | 6.870  | 6.936  | 6.932  |
| <b>mm</b> | 174.50 | 176.17 | 176.07 |



Dimensions in inches, in parentheses ( ) dimensions in millimeters

# TC Track Cable Cylinder - TC15

## LOAD WEIGHT vs STROKE TC15 (5/8" Dia. Rods at 0.30" Deflection)

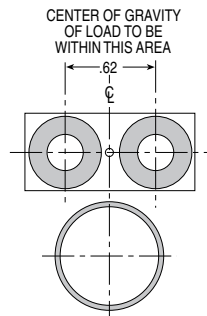


**NOTE:** Rod deflection must not exceed .30 inches

| OVERALL UNIT SPECIFICATIONS |     | TC15   |
|-----------------------------|-----|--------|
| BORE SIZE                   | in  | 1.50   |
| MAX STROKE                  | in  | 78     |
|                             | mm  | 1981.2 |
| MAX PRESSURE                | PSI | 100    |
|                             | bar | 6.9    |
| MAX FORCE OUTPUT            | lb  | 174    |
|                             | N   | 774.0  |

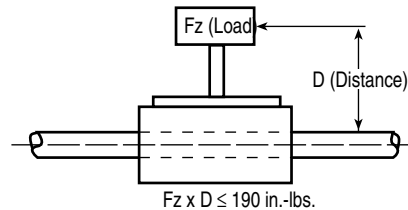
**NOTE:** Additional specifications  
Page CC\_8

## LOAD DISTRIBUTION

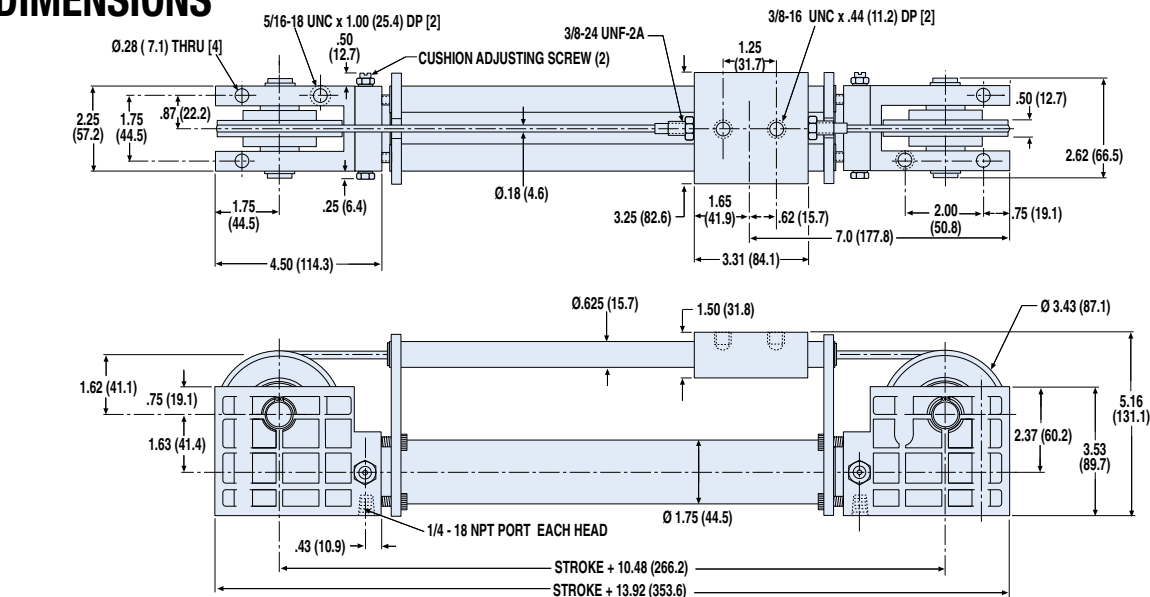


**NOTE:** Moderate bending moments are acceptable. The moment load must not exceed 190 inch-pounds for the 1-1/2 bore cylinder.

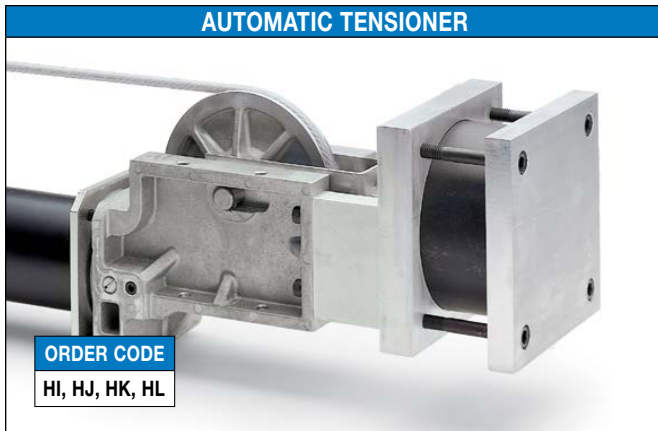
The diagrams, illustrate how this is calculated.



## DIMENSIONS



# CC Automatic Tensioner - All Sizes



Automatic tensioners are required when a cylinder's stroke length is beyond the maximum stroke length for full manual cable adjustment for that bore size. The AT unit keeps the cable rigid and ensures maximum service life of both the cable and gland seals. AT units are also recommended for vertical lifting or severe, high-cyclic applications.

The standard automatic tensioner unit has a 1-inch stroke, providing 2 inches of cable take-up. A 2-inch stroke AT unit may be installed on a cylinder, providing 4 inches of cable take-up. Refer to the tables below for tensioner stroke options on available bore sizes.

## MAXIMUM STROKE LENGTHS FOR CYLINDERS WITH AUTO TENSIONERS

**NOTE:** A cable cylinder should be completely proof-loaded and pre-tensioned with either the Torque Method or the Field Method in order for the auto tensioner to achieve the maximum stroke lengths shown in

the table below. (For more information on proof-loading and pre-tensioning, please see page cc\_36)

| STROKE OPTIONS                          | STROKE LENGTHS IN INCHES BASED ON CYLINDER'S MAXIMUM OPERATING PRESSURE |       |       |       |       |       |       |       |       |       |
|-----------------------------------------|-------------------------------------------------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
|                                         | CC05                                                                    | CC07  | CC10  | CC15  | CC20  | CC25  | CC30  | CC40  | CC50  | CC52  |
| Auto Tensioner with one 1" stroke unit  | NA                                                                      | 134.4 | 134.4 | 361.2 | 260.4 | 159.6 | 243.6 | 134.4 | NA    | 266.8 |
| Auto Tensioner with two 1" stroke units | NA                                                                      | 252.0 | 252.0 | 579.6 | 369.6 | 266.8 | 344.4 | 193.2 | NA    | 327.6 |
| Auto Tensioner with one 2" stroke unit  | NA                                                                      | NA    | NA    | NA    | 369.6 | 266.8 | 344.4 | 193.2 | 468.0 | 327.6 |
| Auto Tensioner with two 2" stroke units | NA                                                                      | NA    | NA    | NA    | 524.4 | 322.8 | 487.2 | 277.2 | 714.0 | 472.8 |

Above Dimensions in inches

| STROKE OPTIONS | STROKE LENGTHS IN METERS BASED ON CYLINDER'S MAXIMUM OPERATING PRESSURE |      |       |      |       |        |       |        |      |      |
|----------------|-------------------------------------------------------------------------|------|-------|------|-------|--------|-------|--------|------|------|
|                | CC05                                                                    | CC07 | CC10  | CC15 | CC20  | CC25   | CC30  | CC40   | CC50 | CC52 |
| NA 3.41        | 3.41                                                                    | 9.17 | 6.61  | 4.05 | 6.19  | 3.41   | NA    | 6.78NA | 6.40 | 6.40 |
| 14.72          | 9.39                                                                    | 6.78 | 8.75  | 4.91 | NA    | 8.32NA | NA    | NA     | NA   | 9.39 |
| 6.78           | 8.75                                                                    | 4.91 | 11.89 | 8.32 |       |        |       |        |      |      |
| NA NA          | NA                                                                      | NA   | 13.32 | 8.20 | 12.37 | 7.04   | 18.14 | 12.01  |      |      |

Above Dimensions in METERS

**NOTE:** Tube couplers are required on cable cylinders with strokes over 280 inches (7.11m).

Maximum stroke lengths in the above table can be extended by using the percentage of the pressure differential between the cylinder's actual operating pressure and the maximum operating pressure.

Example: If the cylinder selected is a CC15  
(1 1/2-inch bore) with one 1-inch stroke AT unit:

Actual PSI: 80  
Max. PSI: 100  
Differential: 20%  
 $20\% \times 361.2 \text{ in. (maximum stroke)} = 72.24 \text{ in.}$   
 $72.24 \text{ in.} + 361.2 \text{ in.} = 433.44 \text{ in. (36.12 feet)}$

All AT units should be plumbed with a separate, regulated non-fluctuating pressure source which is a set percentage of the actual cylinder operating pressure. These are listed in the table at the right.

**NOTE:** When using an AT unit in an application where the cylinder is loaded in only one direction, it is recommended to have the AT unit located so the load direction of travel is away from the AT unit. On vertical applications, the AT unit should be located on the bottom.

### AUTO TENSIONER PRESSURE SETTINGS FOR MODEL % OF LOAD PRESSURE

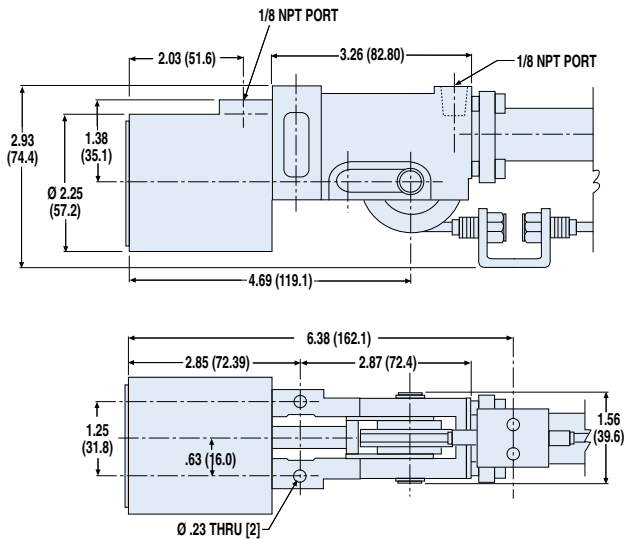


# CC Automatic Tensioner - CC07, CC10, CC15, CC20, CC25

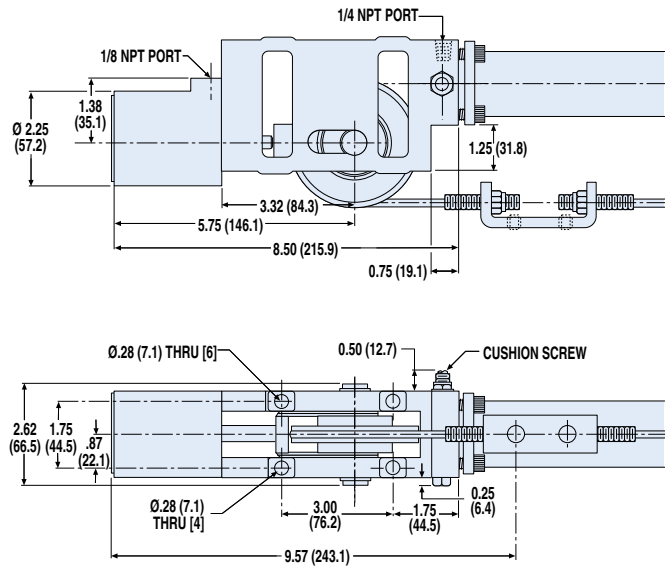


## DIMENSIONS

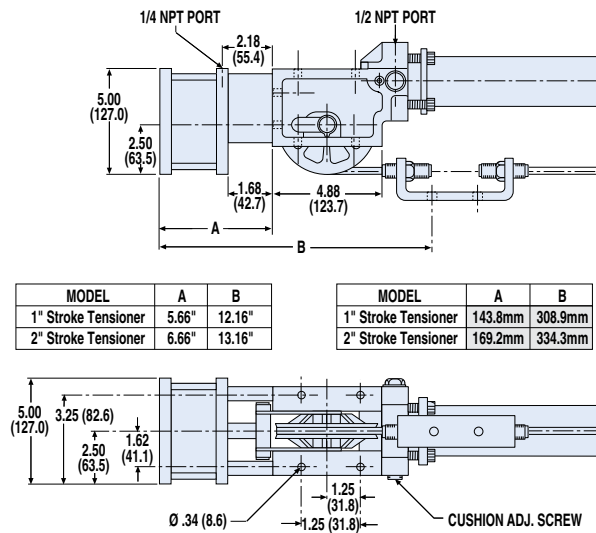
### AT FOR CC07, CC10



### AT FOR CC15



### AT FOR CC20, CC25



Dimensions in inches, in parentheses ( ) dimensions in millimeters

| SPACE AND WEIGHT REQUIREMENTS |                   |              |
|-------------------------------|-------------------|--------------|
| MODEL                         | DEAD LENGTH (in)* | WEIGHT (lbs) |
| CC07                          | 8.87              | 1.06         |
| CC10                          | 8.87              | 1.06         |
| CC15                          | 16.41             | 2.76         |
| CC20                          | 20.66             | 8.41         |
| CC25                          | 20.66             | 8.41         |

\*Add dead length to stroke length to determine overall cylinder length

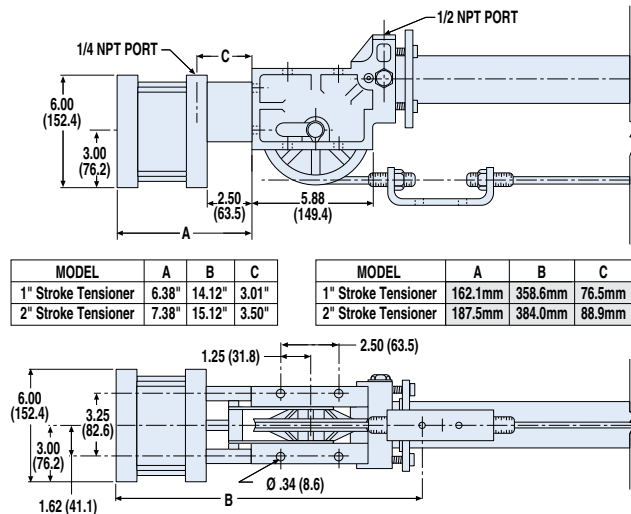
| SPACE AND WEIGHT REQUIREMENTS |                   |             |
|-------------------------------|-------------------|-------------|
| MODEL                         | DEAD LENGTH (mm)* | WEIGHT (kg) |
| CC07                          | 225               | 0.48        |
| CC10                          | 225               | 0.48        |
| CC15                          | 417               | 1.25        |
| CC20                          | 525               | 3.81        |
| CC25                          | 525               | 3.81        |

# CC Automatic Tensioner - CC30, CC40, CC52, CC50

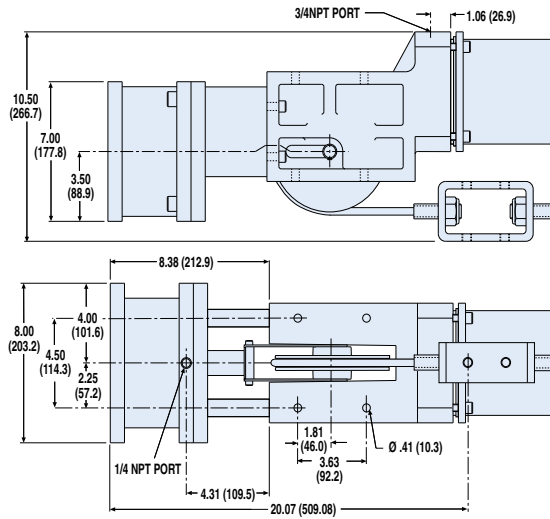


## DIMENSIONS

### AT FOR CC30, CC40, CC52



### AT FOR CC50



Dimensions in inches, in parentheses ( ) dimensions in millimeters

| SPACE AND WEIGHT REQUIREMENTS |                   |              |
|-------------------------------|-------------------|--------------|
| MODEL                         | DEAD LENGTH (in)* | WEIGHT (lbs) |
| CC30                          | 23.88             | 14.36        |
| CC40                          | 24.88             | 14.36        |
| CC52                          | 23.88             | 14.36        |
| CC50                          | 33.75             | 23.68        |

\*Add dead length to stroke length to determine overall cylinder length

| SPACE AND WEIGHT REQUIREMENTS |                   |             |
|-------------------------------|-------------------|-------------|
| MODEL                         | DEAD LENGTH (mm)* | WEIGHT (kg) |
| CC30                          | 607               | 6.51        |
| CC40                          | 632               | 6.51        |
| CC52                          | 607               | 6.51        |
| CC50                          | 857               | 10.74       |

# CC Cylinder/Brake Combinations - All Sizes

## CALIPER DISC BRAKE



ORDER CODE

HM, HN

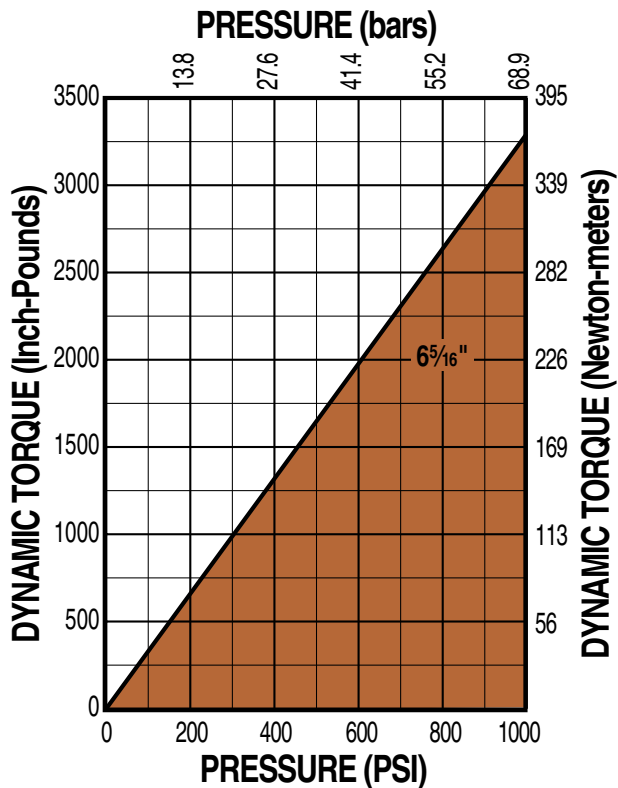
Caliper disc brakes can be used to add holding force in horizontal applications and aid in deceleration at the end of stroke. Caliper disc brakes must be used with an automatic tensioner to function properly. See page CC\_32 for selection information and braking formulae.

NOTE: Tolomatic's H20DARC is used on all available models. See part numbers below:

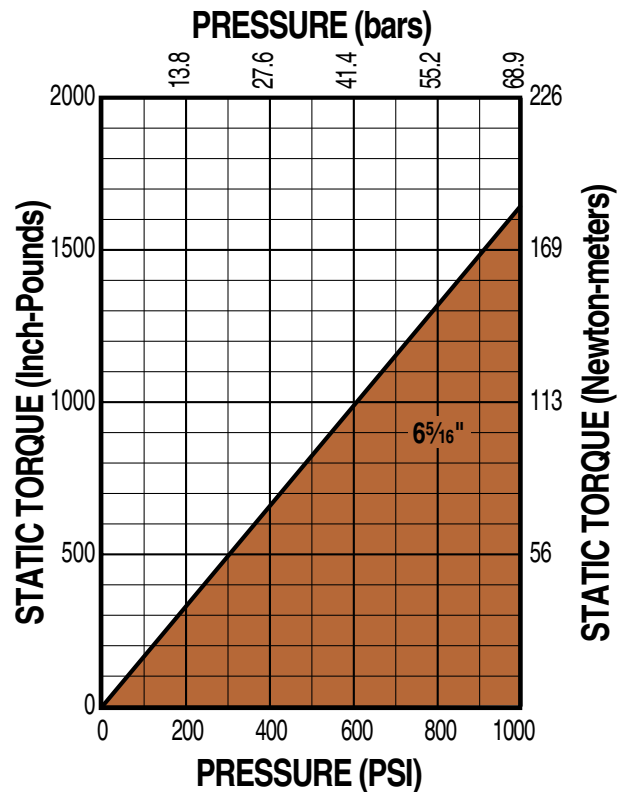
|                | CC15      | CC20      | CC25      | CC30      | CC40      | CC52      |
|----------------|-----------|-----------|-----------|-----------|-----------|-----------|
| Brake Number   | 0728-0010 | 0728-0010 | 0728-0010 | 0728-0010 | 0728-0010 | 0728-0010 |
| Disc & Hub No. | 0801-0008 | 0801-0010 | 0801-0010 | 0801-0010 | 0801-0010 | 0801-0010 |

See catalog 9900-4009 for detailed information on brakes and discs.

## DYNAMIC TORQUE H-20 BRAKE with 6-5/16" DISC (FOR CC15, CC20, CC25, CC30, CC40, CC52)



## STATIC TORQUE H-20 BRAKE with 6-5/16" DISC (FOR CC15, CC20, CC25, CC30, CC40, CC52)

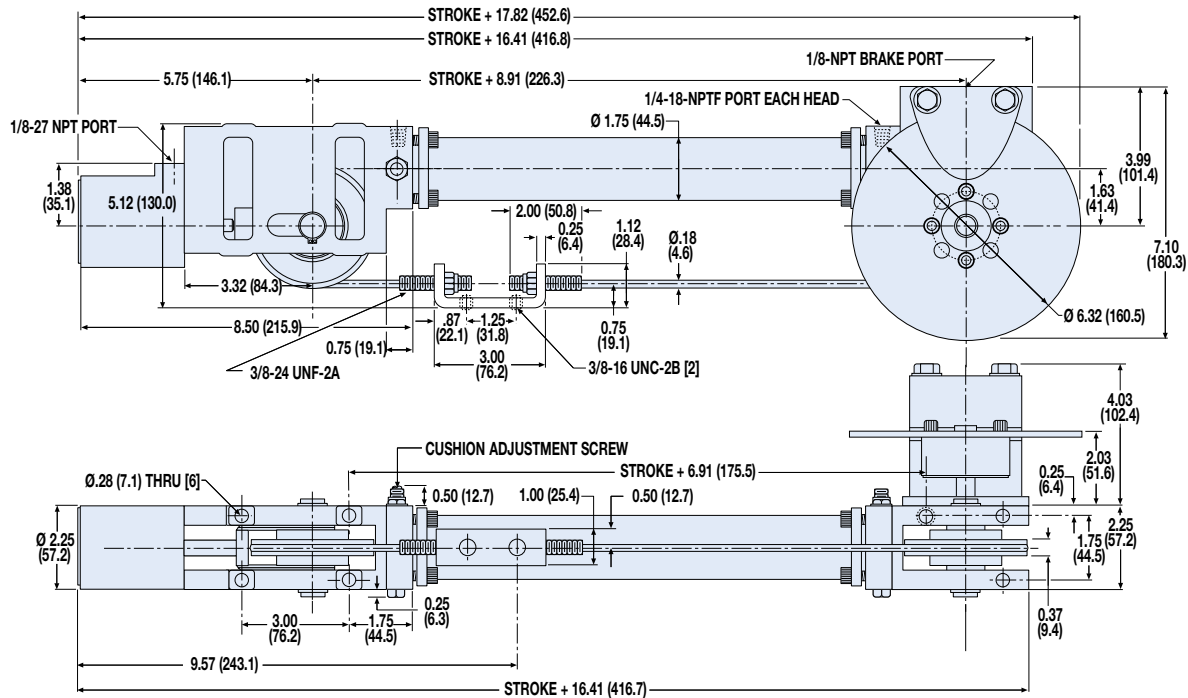


# CC Cylinder/Brake Combinations - CC15, CC20, CC25

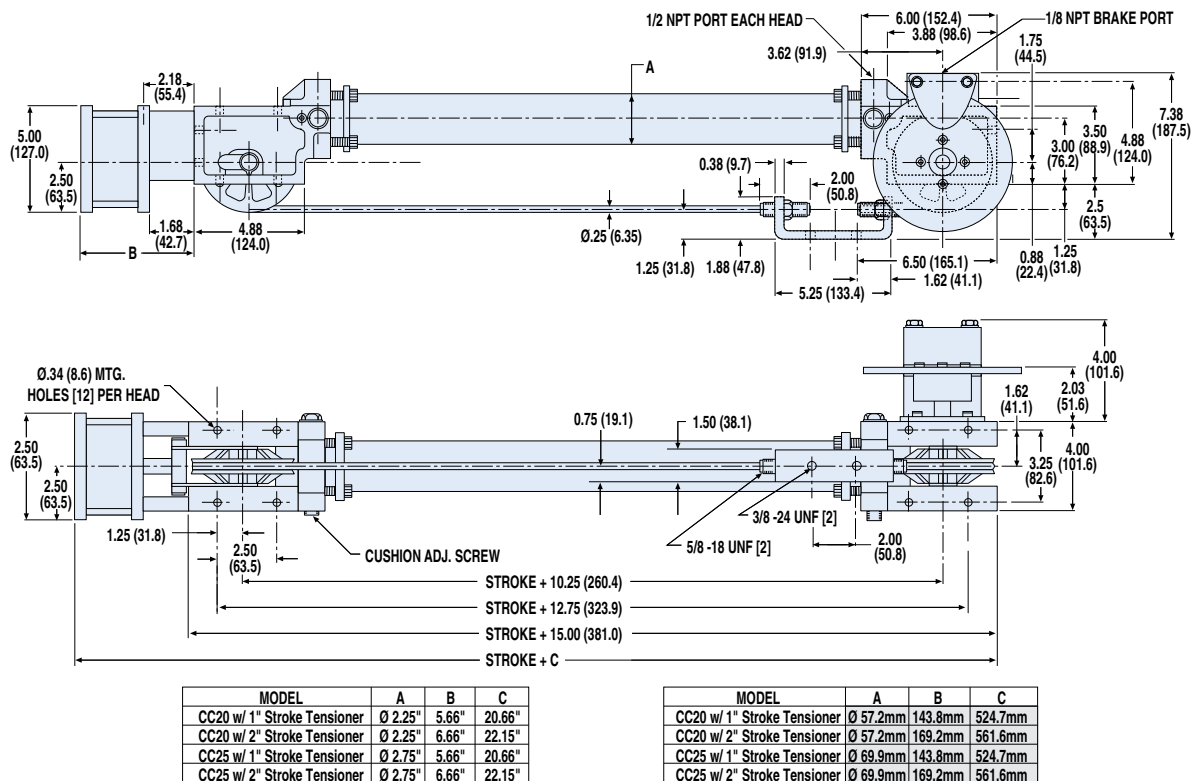


## DIMENSIONS

### CYLINDER/ BRAKE COMBINATION FOR CC15



### CYLINDER/ BRAKE COMBINATION FOR CC20, CC25



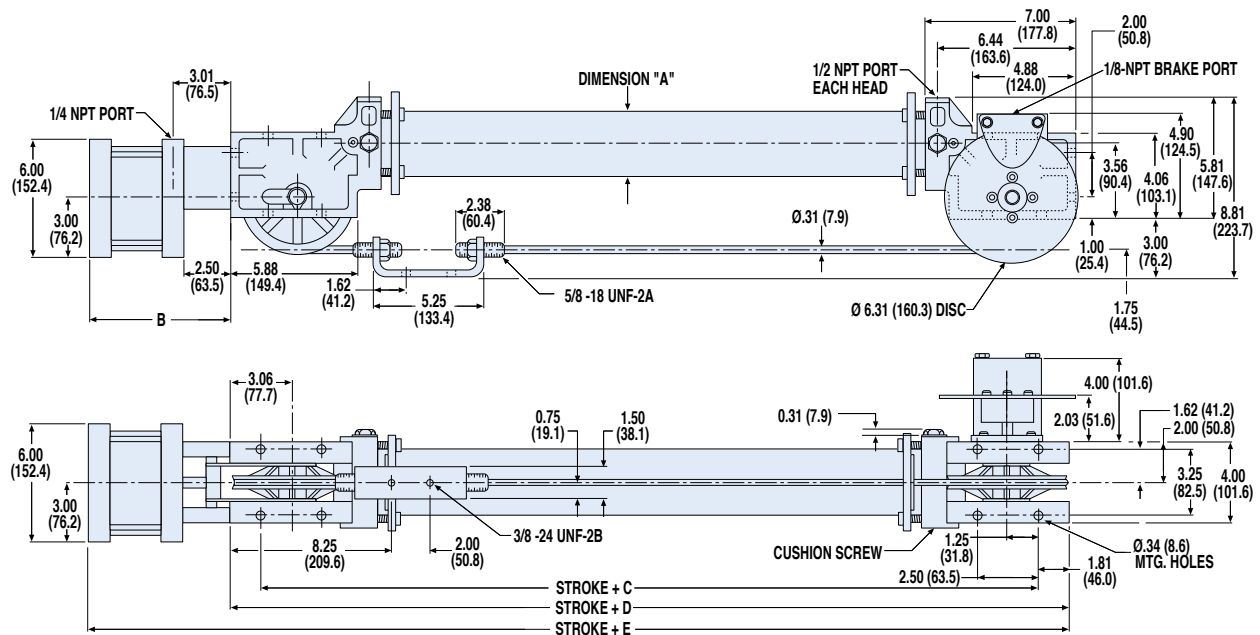
Dimensions in inches, in parentheses ( ) dimensions in millimeters

# CC Cylinder/Brake Combinations - CC30, CC40, CC52



## DIMENSIONS

### CYLINDER/ BRAKE COMBINATION FOR CC30, CC40, CC52



| MODEL                       | A       | B     | C      | D      | E      |
|-----------------------------|---------|-------|--------|--------|--------|
| CC30 w/ 1" Stroke Tensioner | Ø 3.25" | 6.38" | 13.87" | 17.50" | 23.89" |
| CC30 w/ 2" Stroke Tensioner | Ø 3.25" | 7.38" | 13.87" | 17.50" | 24.89" |
| CC40 w/ 1" Stroke Tensioner | Ø 4.25" | 6.38" | 14.87" | 18.50" | 24.89" |
| CC40 w/ 2" Stroke Tensioner | Ø 4.25" | 7.38" | 14.87" | 18.50" | 25.88" |
| CC52 w/ 1" Stroke Tensioner | Ø 2.25" | 6.38" | 13.87" | 17.50" | 23.89" |
| CC52 w/ 2" Stroke Tensioner | Ø 2.25" | 7.38" | 13.87" | 17.50" | 24.09" |

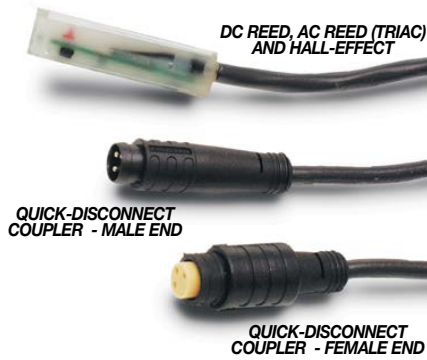
| MODEL                       | A         | B       | C       | D       | E       |
|-----------------------------|-----------|---------|---------|---------|---------|
| CC30 w/ 1" Stroke Tensioner | Ø 82.6mm  | 162.1mm | 352.3mm | 444.5mm | 609.1mm |
| CC30 w/ 2" Stroke Tensioner | Ø 82.6mm  | 187.5mm | 352.3mm | 444.5mm | 634.5mm |
| CC40 w/ 1" Stroke Tensioner | Ø 108.0mm | 162.1mm | 357.4mm | 469.9mm | 634.5mm |
| CC40 w/ 2" Stroke Tensioner | Ø 108.0mm | 187.5mm | 357.4mm | 469.9mm | 634.5mm |
| CC52 w/ 1" Stroke Tensioner | Ø 57.2mm  | 162.1mm | 352.3mm | 444.5mm | 609.1mm |
| CC52 w/ 2" Stroke Tensioner | Ø 57.2mm  | 187.5mm | 352.3mm | 444.5mm | 634.5mm |

Dimensions in inches, in parentheses ( ) dimensions in millimeters



# CC, SA, DP, TC Switches - All Sizes

## SWITCHES



There are 10 sensing choices: DC reed, form A (open) or form C (open or closed); AC reed (Triac, open); Hall-effect, sourcing, PNP (open); Hall-effect, sinking, NPN (open); each with either flying leads or QD (quick disconnect). Commonly used to send analog signals to PLC (programmable logic controllers), TLL, CMOS circuit or other controller device. These switches are activated by the actuator's magnet.

Switches contain reverse polarity protection. QD cables are shielded; shield should be terminated at flying lead end.

If necessary to remove factory installed switches, be sure to reinstall on the same side of actuator with scored face of switch toward internal magnet.

## SPECIFICATIONS

|                              |                                     | REED DC                                                                           |                                     |           |                          | REED AC                    |  |
|------------------------------|-------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------|-----------|--------------------------|----------------------------|--|
| ORDER CODE                   | RT                                  | RM                                                                                | BT                                  | BM        | CT                       | CM                         |  |
| LEAD                         | 5m                                  | QD*                                                                               | 5m                                  | QD*       | 5m                       | QD*                        |  |
| CABLE SHIELDING              | Unshielded                          | Shielded†                                                                         | Unshielded                          | Shielded† | Unshielded               | Shielded†                  |  |
| SWITCHING LOGIC              | "A" Normally Open                   |                                                                                   | "C" Normally Open or Closed         |           | Triac Normally Open      |                            |  |
| MECHANICAL CONTACTS          | Single-Pole Single-Throw            |                                                                                   | Single-Pole Double-Throw            |           | Single-Pole Single-Throw |                            |  |
| COIL DIRECT                  | Yes                                 |                                                                                   | Yes                                 |           | Yes                      |                            |  |
| POWER LED                    | None                                |                                                                                   | None                                |           | None                     |                            |  |
| SIGNAL LED                   | Red                                 |  |                                     |           |                          |                            |  |
| OPERATING VOLTAGE            | 200 Vdc max.                        |                                                                                   | 120 Vdc max.                        |           | 120 Vac max.             |                            |  |
| OUTPUT RATING                | —                                   |                                                                                   |                                     |           | —                        |                            |  |
| OPERATING TIME               | 0 .6msec max.<br>(including bounce) |                                                                                   | 0 .7msec max.<br>(including bounce) |           | —                        |                            |  |
| OPERATING TEMPERATURE        | -40°F [-40°C] to 158°F [70°C]       |                                                                                   |                                     |           |                          |                            |  |
| RELEASE TIME                 | 1 .0msec. max.                      |                                                                                   |                                     |           | —                        |                            |  |
| ON TRIP POINT                | —                                   |                                                                                   |                                     |           | —                        |                            |  |
| OFF TRIP POINT               | —                                   |                                                                                   |                                     |           | —                        |                            |  |
| **POWER RATING (WATTS)       | 10 .0 <sup>s</sup>                  |                                                                                   | 3 .0 <sup>s§</sup>                  |           | 10 .                     |                            |  |
| VOLTAGE DROP                 | 2 .6V typical at 100 mA             |                                                                                   | NA                                  |           | —                        |                            |  |
| RESISTANCE                   | 0 . Ω Initial (Max .                |                                                                                   |                                     |           | —                        |                            |  |
| CURRENT CONSUMPTION          | —                                   |                                                                                   |                                     |           | 1 Amp at<br>86°F [30°C]  | 0 .5Amp at<br>140°F [60°C] |  |
| FREQUENCY                    | —                                   |                                                                                   |                                     |           | 47 - 63 Hz               |                            |  |
| CABLE MIN.<br>BEND<br>RADIUS | STATIC                              | 0 .630" [16mm]                                                                    |                                     |           |                          |                            |  |
|                              | DYNAMIC                             | Not Recommended                                                                   |                                     |           |                          |                            |  |

**CAUTION: DO NOT OVER TIGHTEN SWITCH HARDWARE WHEN INSTALLING!**

**\*\* WARNING:** Do not exceed power rating (Watt = Voltage X Amperage). Permanent damage to sensor will occur.

\*QD = Quick Disconnect; Male coupler is located 6" [152mm] from sensor, Female coupler to flying lead distance is 197" [5m] also see Cable Shielding specification above

**REPLACEMENT OF QD SWITCHES MANUFACTURED BEFORE JULY 1, 1997:** It will be necessary to replace or rewire the female end coupler.



**Reed Switch Life Expectancy:** Up to 200,000,000 cycles (depending on load current, duty cycle and environmental conditions)

†Shielded from the female quick disconnect coupler to the flying leads. Shield should be terminated at flying lead end.

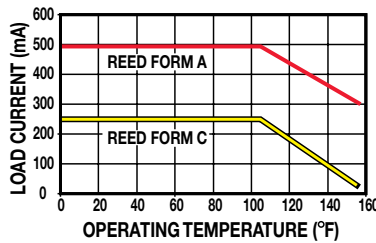
<sup>s</sup> Maximum current 500mA (not to exceed 10VA) Refer to Temperature vs. Current graph and Voltage Derating graph

<sup>ss</sup> Maximum current 250mA (not to exceed 3VA) Refer to Temperature vs. Current graph and Voltage Derating graph

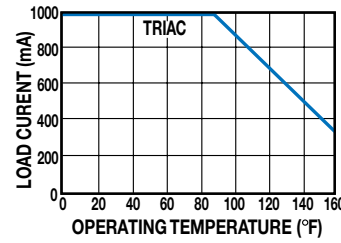
# CC, SA, DP, TC Switches - All Sizes

## PERFORMANCE

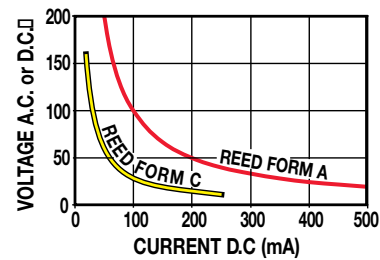
TEMP. vs CURRENT, DC REED



TEMP. vs CURRENT, AC REED

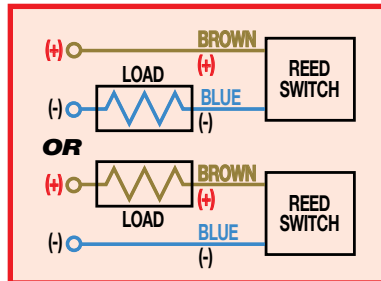


VOLTAGE DERATING, DC REED

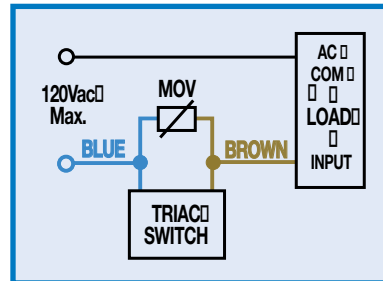


## WIRING DIAGRAMS

**R T** & **R M** DC REED, FORM A



**C T** & **C M** AC REED, TRIAC

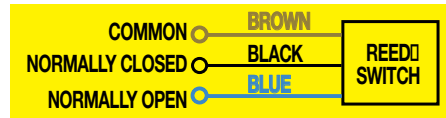


## INSTALLATION INFORMATION

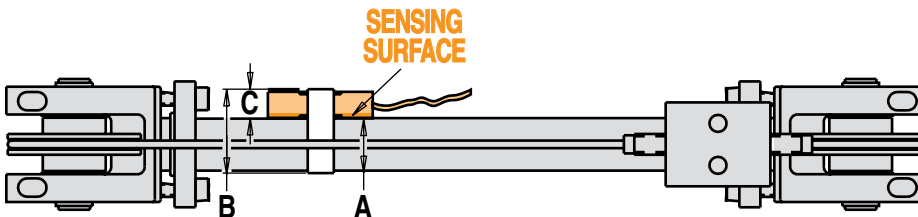
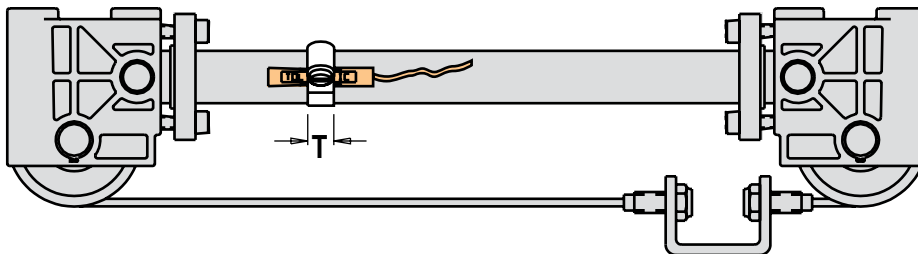


**⚠** THE NOTCHED FACE OF THE SWITCH INDICATES THE SENSING SURFACE AND MUST FACE THE MAGNET.

**B T** & **B M** DC REED, FORM C



## DIMENSIONS



**NOTE: HALL-EFFECT SWITCHES ARE NOT AVAILABLE FOR CABLE CYLINDERS**  
**SWITCHES ARE NOT AVAILABLE FOR CABLE CYLINDERS WITH STEEL TUBE**  
**DEAD LENGTH WILL INCREASE ON MOST MODELS, SEE BELOW**

|                                                       | MODEL | CCM05 | CCM07 SAM07 | CCM10 SAM10 | CCM15 SAM15 | CCM20 SAM20 | CCM52 SAM52 | CCM25 SAM25 | CCM30 SAM30 | CCM40 SAM40 | CCM50 |
|-------------------------------------------------------|-------|-------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------|
|                                                       | BORE  | 0.50" | 0.75"       | 1.00"       | 1.50"       | 2.00"       | 2.00"       | 2.50"       | 3.00"       | 4.00"       | 5.00" |
| SPACE REQUIREMENTS - ADD DEAD LENGTH TO STROKE LENGTH | IN.   | 1.62  | 1.62        | 1.62        | 0.375       | 0.375       | 0.375       | 0.375       | 0.375       | 0.375       | 0     |
|                                                       | MM    | 41.2  | 41.2        | 41.2        | 9.5         | 9.5         | 9.5         | 9.5         | 9.5         | 9.5         | 0     |

| MODEL | BORE | A*   | B    | C    | T    |
|-------|------|------|------|------|------|
| CCM05 | 0.50 | 0.81 | 1.09 | 0.35 | 0.31 |
| CCM07 | 0.75 | 0.81 | 1.09 | 0.35 | 0.31 |
| CCM10 | 1.00 | 1.12 | 1.65 | 0.35 | 0.31 |
| CCM15 | 1.50 | 1.56 | 2.15 | 0.35 | 0.31 |
| CCM20 | 2.00 | 2.08 | 2.65 | 0.35 | 0.31 |
| CCM52 | 2.00 | 2.08 | 2.65 | 0.35 | 0.31 |
| CCM25 | 2.50 | 2.75 | 3.15 | 0.35 | 0.31 |
| CCM30 | 3.00 | 3.25 | 3.65 | 0.35 | 0.31 |
| CCM40 | 4.00 | 4.25 | 4.65 | 0.35 | 0.56 |
| CCM50 | 5.00 | 5.25 | 5.65 | 0.35 | 0.56 |

Above dimensions in inches  
 \*Inside Dimension ±.06"

| MODEL | BORE  | A*     | B      | C    | T     |
|-------|-------|--------|--------|------|-------|
| CCM05 | 0.50" | 20.57  | 27.69  | 8.76 | 7.87  |
| CCM07 | 0.75" | 20.57  | 27.69  | 8.76 | 7.87  |
| CCM10 | 1.00" | 28.45  | 41.91  | 8.76 | 7.87  |
| CCM15 | 1.50" | 39.62  | 54.61  | 8.76 | 7.87  |
| CCM20 | 2.00" | 52.83  | 67.31  | 8.76 | 7.87  |
| CCM52 | 2.00" | 52.83  | 67.31  | 8.76 | 7.87  |
| CCM25 | 2.50" | 69.85  | 80.01  | 8.76 | 7.87  |
| CCM30 | 3.00" | 82.55  | 92.71  | 8.76 | 7.87  |
| CCM40 | 4.00" | 107.95 | 118.11 | 8.76 | 14.22 |
| CCM50 | 5.00" | 133.35 | 143.51 | 8.76 | 14.22 |

Above dimensions in millimeters  
 \*Inside Dimension ±1.5mm

# CC: Cable Cylinder Selection Guidelines - All Sizes

## EXTERNAL LOAD GUIDANCE AND SUPPORT

The process of selecting a cable cylinder for a given application can be complex. **It is highly recommended that you contact Tolomatic or a Tolomatic Distributor for assistance in selecting the best actuator for your application.** The following overview of the selection guidelines are for educational purposes only.

### 1 COMPILE APPLICATION REQUIREMENTS

To determine the appropriate Cable Cylinder for an application, compile the following information:

- Available pressure (PSI)
- Weight of load (lbs. or kgs.)
- Orientation of load (lbs. or kgs.)
- Velocity of load (in./sec. or mm/sec.)
- Stroke length (in. or mm)

### 2 SELECT CYLINDER SIZE

- Consult the Theoretical Force vs. Pressure charts.
- Cross-reference the load force (or load weight if force is not known) and the available operating pressure. If the intersection falls below the diagonal line, and if moments do not exceed maximum values listed for that model (see Step 3), the actuator will accommodate the application. If the intersection is above the diagonal line, a larger cylinder bore size should be considered.

NOTE: Additional force may be required to obtain the necessary acceleration for vertical or horizontal loads.

### 3 DETERMINE INTERNAL CUSHION CAPACITY

- Consult the Cushion Data chart for the model selected. The velocities listed on the cushion charts are final or cushion impact velocities. On applications where the internal cushions or bumpers are to be used, be sure the actual, final or impact velocity is known. If the velocity is not known, use of limit switches with valve deceleration circuits or shock absorbers should be considered. Cross-reference the final velocity and weight of the load. If the intersection is below the diagonal lines, the internal cushions on the actuator may be used. If the point falls above the dashed diagonal line or if the velocity is not known, use deceleration circuits, external shock absorbers or select a larger cylinder with greater cushion capacity. On high-cyclic applications, use of external stops is strongly recommended.

NOTE: The 1/2-inch and 5-inch cable cylinders and all sizes of magnetically coupled cylinders do not have internal cushions.

The 1/2-inch cable cylinder can handle only very light inertial loads (5 pounds or less). Heavier loads require external stops or shock absorbers.

### 4 DETERMINE THE MAXIMUM STROKE LENGTHS FOR

### FULL MANUAL CABLE ADJUSTMENT (CC ONLY)

Once you have selected the proper bore size for your application and determined the cylinder's cushion capacity, you need to determine the physical stroke length limitation of the cylinder. Refer to the table below to find the bore size selected and its maximum stroke length.

NOTE: Maximum recommended stroke length for full manual cable adjustment is the maximum stroke length at which the cables can be properly proof-loaded, pretensioned and maintained at the required tension by manually adjusting the clevis terminal lock nuts. Maximum stroke length is based on the cylinder's maximum pressure rating.

If the stroke length for your application falls within the maximum stroke length for full manual cable adjustment, your model selection is complete. (Refer to graph on page cc\_31.)

IMPORTANT NOTE: Once a cylinder is installed in an application, but before putting it into service, the cables must be proof-loaded and pretensioned for proper operation. Refer to Application Guidelines on page cc\_36 for proof-loading and pretensioning methods.

If your stroke length is beyond the maximum stroke lengths shown, you have two options available.

1. Increase the maximum stroke length of the selected cylinder size by the percentage of the pressure differential between the cylinder's actual operating pressure and the cylinder's maximum rated operating pressure.

Example: If the cylinder selected is a CC15 (1½ - inch bore):

Actual PSI: 80

Max. PSI: 100

Differential: 20%

20% x 126 in. (maximum stroke) = 25.2 in.

25.2 + 126 = 151.2 in. (12.6 feet)

2. If your required stroke length is still more than the increased stroke length determined from option "1.", an automatic tensioner (AT) or multiple tensioners may be required.

For maximum stroke lengths when using auto tensioners, refer to the chart on page cc\_22.

NOTE: When using auto tensioners, the cylinder's cables must be proof-loaded and pretensioned before pressure is applied to the AT unit. Refer to Application Guidelines on page cc\_36 for proper proof-loading and pretensioning methods.

Auto tensioners are strongly recommended for vertical lifting applications and severe, high-cyclic applications even when the cylinder's stroke is within the maximum stroke length at full manual cable adjustment.

### 5 CONSIDER OPTIONS

Available options for cable cylinders include:

- Auto Tensioner
- Caliper Disc Brake
- Switches (DC Reed & Triac)
- Steel Tube (*Switches NOT available*)
- Seals of Viton® Material
- 3 Ported Heads

# CC: Cable Cylinder Selection Example

The procedure for selection of cable cylinder and magnetically coupled cylinder are very similar. For illustrative purposes, charts for the CC10 model are used in this example.

## 1 COMPILE APPLICATION REQUIREMENTS

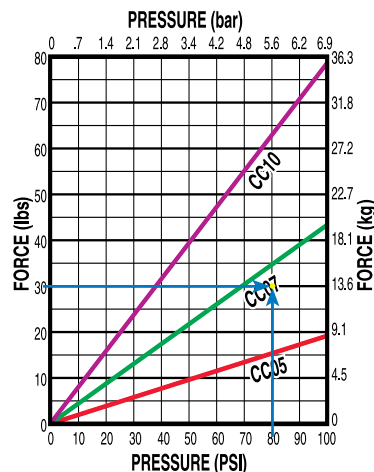
- Available pressure 80 psi
- Weight of load 30 lbs.
- Orientation of load horiz.
- Final velocity\* of load 10" per sec
- Stroke length 68"

\*2x average velocity, see page CC\_38

## 2 SELECT CYLINDER SIZE

- Consult the Theoretical Force vs. Pressure charts.
- Cross-reference the load force and the available operating pressure. In this example a CC07 would accommodate this load at the available PSI.

### THEORETICAL FORCE vs PRESSURE

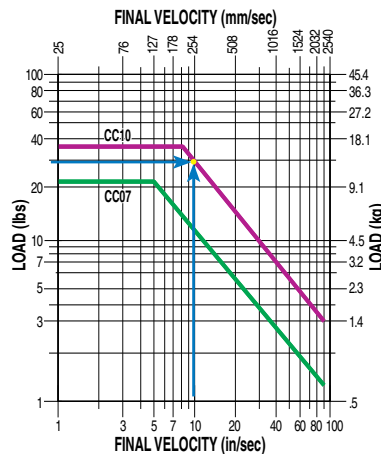


## 3 DETERMINE INTERNAL CUSHION CAPACITY

- Consult the Cushion Data Chart for the model selected.

In this example the calculated value for the final velocity and the load intersect at the line for the internal cushions capacity. Thus the CC10 will work for this application.

### CUSHION DATA



## 4 DETERMINE THE MAXIMUM STROKE LENGTHS FOR FULL MANUAL CABLE ADJUSTMENT (CC ONLY)

- Consult the chart at right.

In our example we are using 80 PSI, the chart indicates a maximum of 100 PSI, so we can calculate the maximum stroke length with manual adjustment:

$$1.20 \times 20.4" = 24.48"$$

Our stroke length is 68" so it will require the automatic tensioner option.

## 5 CONSIDER OPTIONS

This application will use Form C dc Reed switches to signal other units in this automated system.

The final configured string will appear as follows:

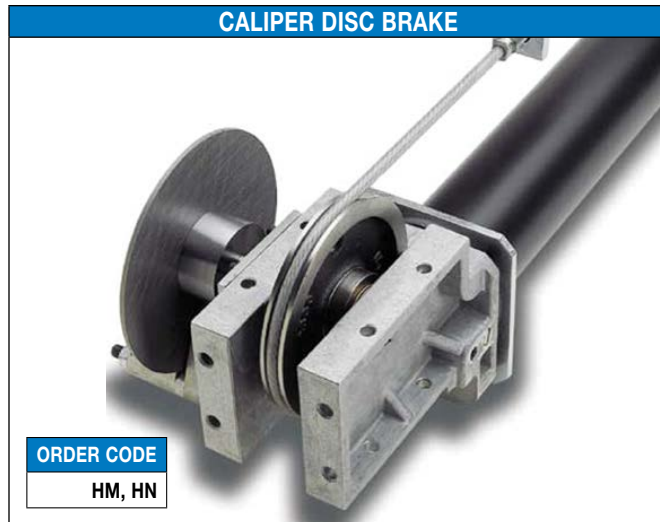
**CCM10SK68.000HIBM2**

### CC MAXIMUM STROKE LENGTHS

For Full Manual Cable Adjustment

|      | BORE | MAX PRESSURE |       | MAX STROKE |        |
|------|------|--------------|-------|------------|--------|
|      |      | in           | PSI   | in         | mm     |
| CC05 | 0.50 | 100          | 6.89  | 20.40      | 518.2  |
| CC07 | 0.75 | 100          | 6.89  | 20.40      | 518.2  |
| CC10 | 1.00 | 100          | 6.89  | 20.40      | 518.2  |
| CC15 | 1.50 | 100          | 6.89  | 126.00     | 3200.4 |
| CC20 | 2.00 | 200          | 13.79 | 159.60     | 4053.8 |
| CC25 | 2.50 | 200          | 13.79 | 100.80     | 2560.3 |
| CC30 | 3.00 | 200          | 13.79 | 151.20     | 3840.5 |
| CC40 | 4.00 | 200          | 13.79 | 84.00      | 2133.6 |
| CC50 | 5.00 | 100          | 6.89  | 222.00     | 5638.8 |
| CC52 | 2.00 | 500          | 34.47 | 134.40     | 3413.8 |

# CC: Caliper Disc Brake for Cable Cylinder Selection Guidelines



## DETERMINE THE LOAD CONFIGURATION AND THE HOLDING CAPACITY OF THE BRAKE

The following steps will help determine the adequate stopping time and distance for the cable cylinder equipped with a caliper disc brake under various conditions and loads.

1. Select the bore size of the cable cylinder based on load to be moved.  
Determine load pressure. Set regulator at 25% above load pressure ( $P_c$ ).

2. Calculate the unbalanced cylinder force ( $F_c$ ) **only** if pressure is applied when braking. If pressure is removed prior to braking, go on to 3.

$$F_c = P_c \times A_c$$

3. Calculate the tangential braking force required. This is ( $F_{tr}$ ) when pressure is removed prior to braking, or ( $F_{ta}$ ) when pressure is still applied when braking. Refer to illustrations in Figure 1.

Carefully note conditions:

$$F_{tr} = W \left[ \left( \frac{a}{g} - \sin \theta \right) - (f \cos \theta) \right], \text{ Horizontal or Load rising}$$

$$F_{tr} = W \left[ \left( \frac{a}{g} + \sin \theta \right) - (f \cos \theta) \right], \text{ Load falling}$$

$$F_{ta} = F_c + W \left( \frac{a}{g} - f \right), \text{ Horizontal loads}$$

$$= F_c + W \left[ \left( \frac{a}{g} - \sin \theta \right) - (f \cos \theta) \right], \text{ Incline load rising}$$

$$= F_c + W \left( \frac{a}{g} - 1 \right), \text{ Vertical load rising}$$

In the above expressions (a) can be calculated from:

$$a = \frac{V^2}{2S} \text{ or } \frac{V}{T}, \text{ In./Sec.}^2$$

4. Calculate the tension required in brake side cable at the time of braking.

$$L_{tr} = \frac{F_{tr}}{0.369}, \text{ lbs.; Pressure removed while braking}$$

$$L_{ta} = \frac{F_{ta}}{0.369}, \text{ lbs.; Pressure applied while braking}$$

### NOMENCLATURE

|                                                                                             |                                                                                                                |
|---------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------|
| $a$ = Deceleration, in/sec <sup>2</sup>                                                     | $V$ = Velocity of load, in/sec.                                                                                |
| $g$ = Deceleration due to gravity = 386.4 in/sec <sup>2</sup>                               | $W$ = Weight of load, lbs.                                                                                     |
| $f^*$ = Coefficient of friction of sliding load                                             | $W_e$ = Equivalent Load, lbs.                                                                                  |
| $f_c$ = Coefficient of friction between cable and sheave                                    | $W_e = W (\sin \theta + f \cos \theta)$                                                                        |
| $F_c$ = Unbalanced cylinder force, lbs.                                                     | $\theta$ = Angle of inclination<br>( $\theta = 0^\circ$ for horizontal)<br>( $\theta = 90^\circ$ for vertical) |
| $F_{ta}$ = Tangential braking force required with pressure still applied when braking, lbs. | $R_s$ = Root radius of sheave groove, inches                                                                   |
| $F_{tr}$ = Tangential braking force required with pressure removed prior to braking, lbs.   | $P_c$ = Load Pressure, PSI                                                                                     |
| $L_{tr}$ = Tension in cable of brake side half while braking with pressure removed, lbs.    | $A_c$ = Area of cable cylinder bore, in <sup>2</sup>                                                           |
| $L_{ta}$ = Tension in cable of brake side half while braking with pressure applied, lbs.    | $P_t$ = Load Pressure, PSI                                                                                     |
| $L_{trm}$ = Maximum tension in cable with pressure removed while braking, lbs.              | $A_t$ = Area of tensioner cylinder, in <sup>2</sup>                                                            |
| $L_{tam}$ = Maximum tension in cable with pressure applied while braking, lbs.              | $P_{ba}$ = Brake pressure setting. Pressure applied while braking, PSI                                         |
| $S$ = Stopping distance, inches                                                             | $P_{br}$ = Brake pressure setting. Pressure removed while braking, PSI                                         |
| $T$ = Stopping time, seconds                                                                |                                                                                                                |

*\*Customer must precisely determine coefficient of friction (f), if this value is used.*



# CC: Caliper Disc Brake for Cable Cylinder Selection Guidelines

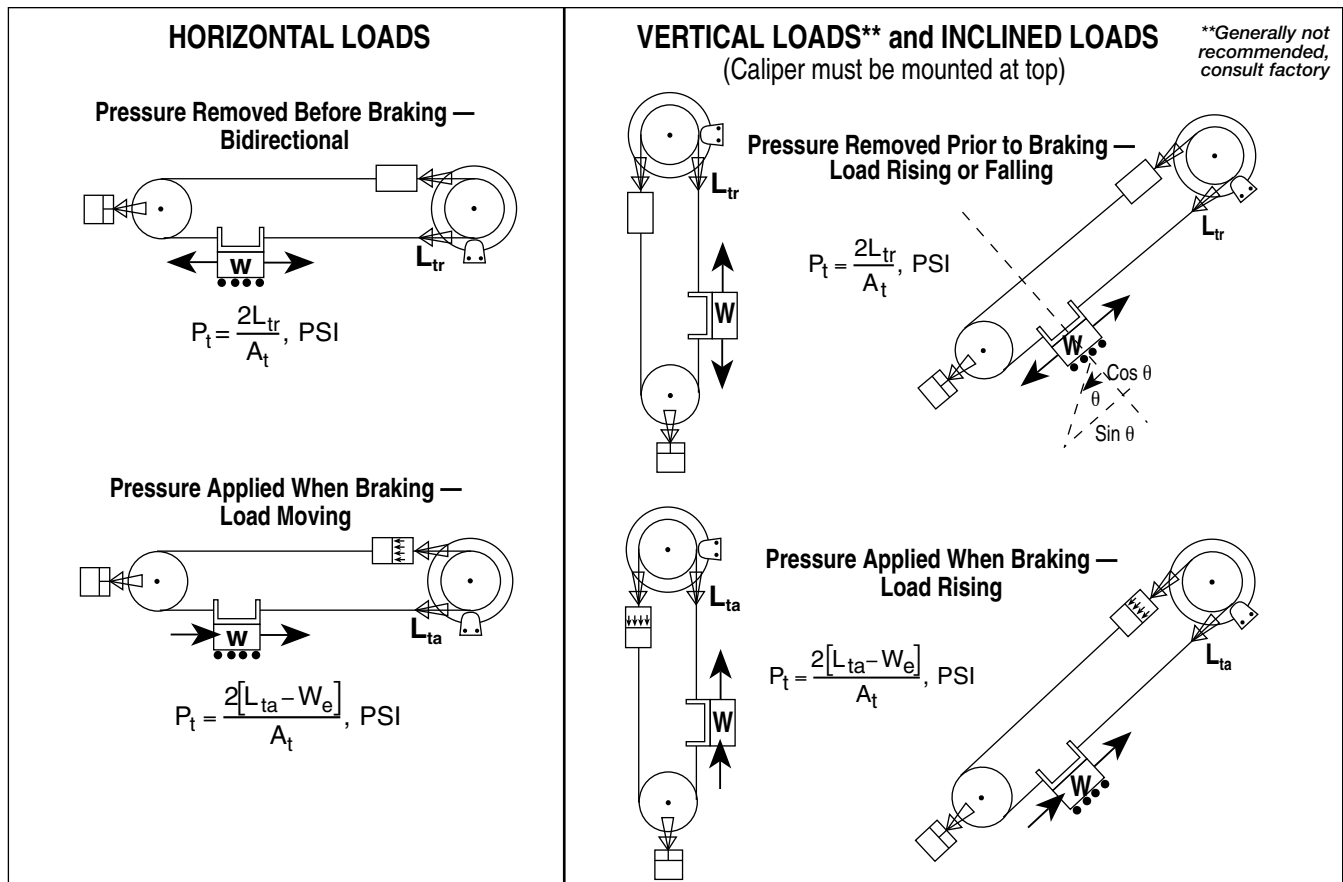


Figure 1

**5.** Calculate tensioner pressure setting, ( $P_t$ ) based on type of load configuration. See Figure 1 and Table 1

**6.** Calculate maximum tension in the cable with **pressure removed** prior to braking ( $L_{trm}$ ) or with **pressure applied** when braking ( $L_{tam}$ ).

Horizontal Loads:

$L_{trm} = L_{tr} + W_e$ , lbs.; Pressure removed prior to braking bidirectional

$L_{tam} = L_{ta}$ , lbs.; Pressure applied when braking and load moving toward caliper

$L_{tam} = L_{ta} + 2W_e$ , lbs.; Pressure applied when braking and load moving away from caliper.

Vertical or Inclined Loads:

$L_{trm} = L_{tr} + W_e$ , lbs.; Pressure removed prior to braking and load rising or falling

$L_{tam} = L_{ta}$ , lbs.; Pressure still applied when braking and load rising

**7.** Carefully check that ( $L_{trm}$ ) or ( $L_{tam}$ ) does not exceed 60% of the cable tensile strength\*. If they exceed the 60% figure, either stopping time or stopping distance has to be increased. Repeat steps 1 - 7.

**8.** Calculate the brake operating pressure. See Table 1

$P_{br} = .113 [L_{tr} R_s]$ , PSI; Pressure removed prior to braking

$P_{ba} = .113 [L_{ta} R_s]$ , PSI; Pressure still applied when braking

**9.** If pressure is removed prior to braking, check to see if brake can hold the load if application is either vertical or inclined.

The brake can hold the load if:

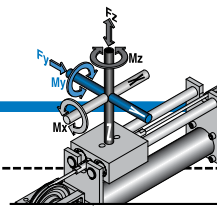
$$.369 L_{tr} \geq W_e$$

\*Refer to Cable Specifications in the double-acting cable cylinder section of this catalog for cable tensile strengths.

Table 1

|      | $A_t$ , in <sup>2</sup> | $R_s$ , in. | $A_c$ , in <sup>2</sup> |
|------|-------------------------|-------------|-------------------------|
| CC07 | 2.30                    |             |                         |
| CC10 | 2.30                    |             |                         |
| CC15 | 2.30                    | 1.531       | 1.767                   |
| CC20 | 11.96                   | 2.00        | 3.142                   |
| CC25 | 11.96                   | 2.00        | 4.909                   |
| CC30 | 16.20                   | 2.50        | 7.069                   |
| CC40 | 16.20                   | 2.50        | 12.566                  |
| CC52 | 16.20                   | 2.50        | 3.142                   |
| CC50 | 27.05                   |             |                         |

# Application Data Worksheet



## STROKE LENGTH

☐ inch (S) ☒ millimeters  
(U.S. Standard) (Metric)

## AVAILABLE AIR PRESSURE

☐ PSI ☐ bar  
(U.S. Standard) (Metric)

## REQUIRED THRUST FORCE

☐ lbf ☐ N  
(U.S. Standard) (Metric)

## LOAD

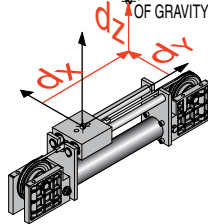
☐ lb ☐ kg  
(U.S. Standard) (Metric)

## LOAD CENTER OF GRAVITY DISTANCE TO CARRIER CENTER

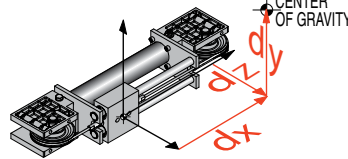
☐ inch ☐ millimeters  
(U.S. Standard) (Metric)

## ORIENTATION

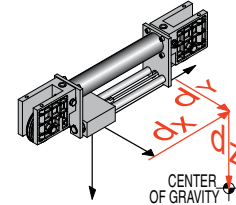
### ☐ Horizontal



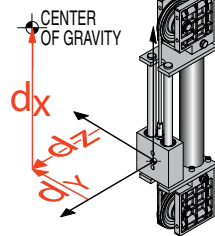
### ☐ Side



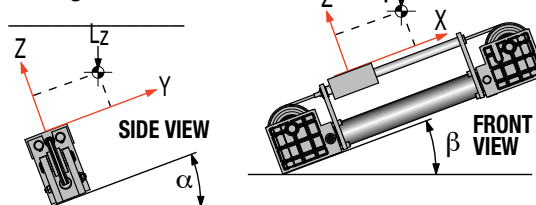
### ☐ Horizontal Down



### ☐ Vertical



### ☐ Angled $\alpha$



## OTHER ISSUES: (i.e.

Environment,  
Temperature,  
Contamination, etc.)

## FORCES APPLIED TO CARRIER

☐ lbf ☐ N  
(U.S. Standard) (Metric)

$F_z$  \_\_\_\_\_  
 $F_y$  \_\_\_\_\_

## BENDING MOMENTS APPLIED TO CARRIER

☐ in-lbs ☐ N-m  
(U.S. Standard) (Metric)

$M_x$  \_\_\_\_\_  
 $M_y$  \_\_\_\_\_  
 $M_z$  \_\_\_\_\_

## FINAL VELOCITY

☐ in/sec ☐ mm/sec  
(U.S. Standard) (Metric)

## MOVE TIME sec.

## NO. OF CYCLES

☐ per minute ☐ per hour

## Contact information:



Fax (1-763-478-8080) or call Tolomatic (1-800-328-2174) with the above information. We will provide any assistance needed to determine the proper actuator.

# TC: Track Cable Cylinder Selection Guidelines - All Sizes

## PROVIDING LOAD GUIDANCE AND SUPPORT

### 1 COMPILE APPLICATION REQUIREMENTS

To determine the appropriate Track Cable Cylinder for an application, compile the following information:

- Available pressure (PSI)
- Weight of load (lbs. or kgs.)
- Orientation of load (Vertical, Horizontal, Incline or Remote)
- Velocity of load (in./sec. or mm/sec.)
- Stroke length (in. or mm)

### 2 SELECT CYLINDER SIZE

- Consult the Theoretical Force vs. Pressure charts.
- Cross-reference the load force (or load weight if force is not known) and the available operating pressure. If the intersection falls below the diagonal line, and if moments do not exceed maximum values listed for that model (see Step 3), the actuator will accommodate the application. If the intersection is above the

diagonal line, a larger cylinder bore size should be considered.

NOTE: Additional force may be required to obtain the necessary acceleration for vertical or horizontal loads.

### 3 KEEP UNDER MAXIMUM STROKE LENGTH

There are specific maximum stroke lengths for each model.  
TC05: 67.00"  
TC07: 78.00"  
TC10: 78.00"  
TC15: 282.59"

### 4 DETERMINE NATURE OF LOAD AND THE EFFECT OF BENDING MOMENTS

If the actuator will guide and support a load located directly over the center of carrier, bending moments will not be a factor in the actuator selection. Track Cable Cylinders perform best that way. See the Bending Moments Formulae below if your application requires the load to be away from center of the carrier.

### 5 DETERMINE THE BEARING ROD LOAD CAPACITY

Determine whether the Load Weight and Stroke Length will be within the load capacity for the bearing rods.

Cross reference the load weight and stroke on the Load Weight vs. Stroke chart for the selected bore size. (Page cc\_20, cc\_21) If the intersection falls within the curve, the cylinder will accommodate the application requirements. If the intersection falls outside the curve, consult the chart of a larger bore size that will accommodate the required load weight and stroke for your application.

The weight on the bearing rods causes them to bend or deflect slightly over their length. This deflection is increased for longer rods and/or higher weights on the bearing block. For proper operation, rod deflection must not exceed .30 of an inch.

### 6 DETERMINE INTERNAL CUSHION CAPACITY

- Consult the Cushion Data chart (Cushion Data for Track Cable Cylinders page cc\_7 to cc\_11) for the model selected. The velocities listed on the cushion charts are final or cushion impact velocities. On applications where internal cushions are to be used, be sure the actual, final or impact velocity is known. If the velocity is not known, use of limit switches with valve deceleration circuits or shock absorbers should be considered.

## BENDING MOMENTS

### Loading Equation Data

| MODEL | BORE SIZE | A (in.) | D (in.) | F (lbs.) | G (lbs.) |
|-------|-----------|---------|---------|----------|----------|
| TC05  | 1/2"      | 1.09    | 1.0     | 14.00    | -        |
| TC07  | 3/4"      | 1.09    | 1.0     | 14.00    | -        |
| TC10  | 1"        | 1.09    | 1.0     | 14.00    | -        |
| TC15  | 1-1/2"    | 1.68    | 2.31    | 90.00    | -        |

### Loading Equation Key

A = Distance between shaft centers.

B = Distance from load center to center of nearest shaft (in.); determined by application.

L = Load per shaft (lbs.).

W = Payload weight (lbs.).

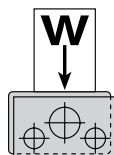
D = Axial distance between center of bearings (in.).

F = Max. bearing sliding load (linear bearings) (lbs.)

G = Max. bearing sliding load (sintered bronze bearings) (lbs.)

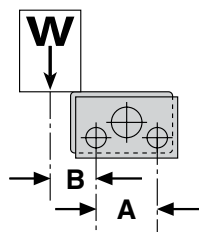
#### "L" MOMENT

$$L = \frac{W}{2}$$



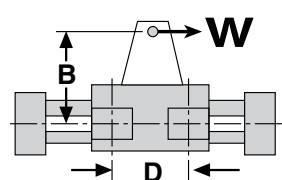
#### "M<sub>x</sub>" MOMENT

$$L = \frac{WB}{A}$$



#### "M<sub>y</sub>" / "M<sub>z</sub>" MOMENT

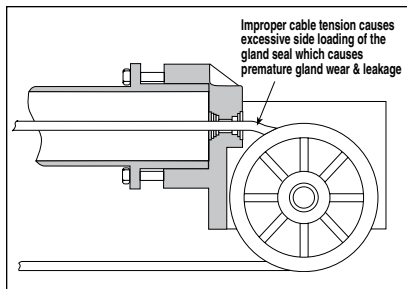
$$F \text{ or } G = 2L = \frac{WB}{D}$$



# CC Cable Cylinder Application Guidelines - All Sizes

## 1 PROOF-LOADING AND PRETENSIONING CABLES

Once installed, but before putting in service, the cables on the cylinder should be proof-loaded and pretensioned to ensure that they are rigid for the maximum service life of the cylinder.



Proof-loading and pretensioning involve removing the two types of stretch in the cable by adjusting the clevis terminal lock nuts.

- Proof-loading – When cables are manufactured, individual wires and strands are laid in position but left slightly loose. When subjected to proof-loading the wires align themselves, tighten and constructional stretch in the cable is eliminated.
- Pretensioning— Elastic stretch in cable is inherent in the wire itself. It is removed when subjected to pretensioning.

There are two ways to proof-load and pretension a cylinder's cables — The Torque Method or The Field Method. These two methods are explained at right. Either method may be used.

All cables should be checked periodically from a preventative maintenance standpoint. When installing new cable assemblies proof-load and pretension using these same methods.

## THE TORQUE METHOD

1. Tighten the clevis terminal lock nuts equally with a torque wrench to the values listed under Proof-loading torque in the Proof-loading, Pretensioning table below.
2. Let tightened nuts sit for 30 seconds.
3. Loosen the lock nuts to remove tension (but tight enough to eliminate any slack).
4. Re-torque clevis terminal lock nuts equally with a torque wrench to the total preten-sioning figures listed in the table below.

| PROOF-LOADING AND PRETENSIONING TORQUE OF CABLES |                      |           |                      |           |                                      |          |                            |           |
|--------------------------------------------------|----------------------|-----------|----------------------|-----------|--------------------------------------|----------|----------------------------|-----------|
| CC Model                                         | Proof-loading Torque |           | Pretensioning Torque |           | Starting Torque of Nuts on Terminals |          | Total Pretensioning Torque |           |
| CC05                                             | 15 in.-lbs.          | 1.69 N-m  | 2.5 in.-lbs.         | 0.28 N-m  | 10 in.-lbs.                          | 1.13 N-m | 12.5 in.-lbs.              | 1.41 N-m  |
| CC07                                             | 15 in.-lbs.          | 1.69 N-m  | 2.5 in.-lbs.         | 0.28 N-m  | 10 in.-lbs.                          | 1.13 N-m | 12.5 in.-lbs.              | 1.41 N-m  |
| CC10                                             | 15 in.-lbs.          | 1.69 N-m  | 2.5 in.-lbs.         | 0.28 N-m  | 10 in.-lbs.                          | 1.13 N-m | 12.5 in.-lbs.              | 1.41 N-m  |
| CC15                                             | 45 in.-lbs.          | 5.08 N-m  | 8.0 in.-lbs.         | 0.90 N-m  | 20 in.-lbs.                          | 2.26 N-m | 28.8 in.-lbs.              | 3.25 N-m  |
| CC20                                             | 115 in.-lbs.         | 12.99 N-m | 46.0 in.-lbs.        | 5.20 N-m  | 25 in.-lbs.                          | 2.82 N-m | 71.0 in.-lbs.              | 8.02 N-m  |
| CC25                                             | 115 in.-lbs.         | 12.99 N-m | 73.0 in.-lbs.        | 8.25 N-m  | 25 in.-lbs.                          | 2.82 N-m | 98.0 in.-lbs.              | 11.07 N-m |
| CC30                                             | 210 in.-lbs.         | 23.73 N-m | 105.0 in.-lbs.       | 11.86 N-m | 25 in.-lbs.                          | 2.82 N-m | 130.0 in.-lbs.             | 14.69 N-m |
| CC40                                             | 210 in.-lbs.         | 23.73 N-m | 187.5 in.-lbs.       | 21.19 N-m | 25 in.-lbs.                          | 2.82 N-m | 212.5 in.-lbs.             | 24.01 N-m |
| CC50                                             | 325 in.-lbs.         | 36.72 N-m | 180.0 in.-lbs.       | 20.34 N-m | 30 in.-lbs.                          | 3.39 N-m | 210.0 in.-lbs.             | 23.73 N-m |
| CC52                                             | 210 in.-lbs.         | 23.73 N-m | 115.0 in.-lbs.       | 12.99 N-m | 25 in.-lbs.                          | 2.82 N-m | 140.0 in.-lbs.             | 15.82 N-m |

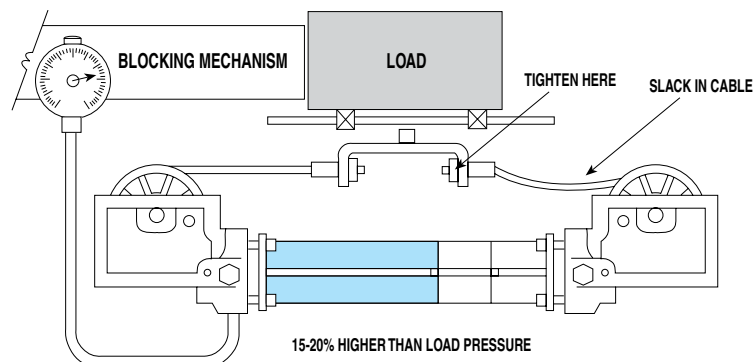
## THE FIELD METHOD

The Field Method simplifies Proof-loading and Pretensioning the cable cylinder by combining the two processes.

1. Block the load some distance from the end of stroke to keep the piston from bottoming.
2. Apply a pressure that is 15% to 20% higher than the actual load pressure.

**NOTE:** Load pressure is defined as the pressure required to move the load. When the load is stopped externally, before the piston bottoms, the relief valve or regulator setting becomes the load pressure.

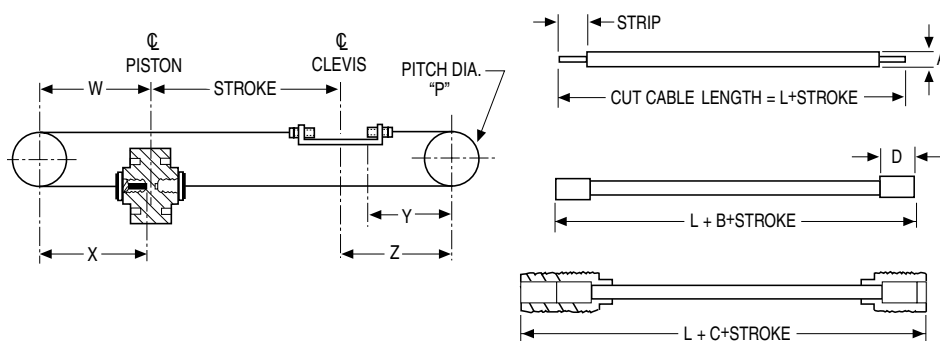
3. Upon pressurizing, one cable will become tight while the other will become slack. Manually adjust out the slack with a wrench on the clevis terminal lock nut.
4. Release the pressure, block the load on the other side and repeat steps 1 through 3. When these steps are done, turn down the regulator pressure to the normal operating pressure and remove the block.



# CC Cable Cylinder Application Guidelines - All Sizes

## 2 DETERMINING SPECIAL CABLE LENGTHS

When an application requires a specialized cable length, use the dimensional table and illustrations to determine the proper cable length.



| MODEL | P     |       | W     |       | X     |       | Y     |       | Z     |       | STRIP  |      | A     |     | B     |      | C     |      | D     |      | L(std) + Stroke |       |
|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|--------|------|-------|-----|-------|------|-------|------|-------|------|-----------------|-------|
|       | in.   | mm.   | in.   | mm.   | in.   | mm.   | in.   | mm.   | in.   | mm.   | in.    | mm.  | in.   | mm. | in.   | mm.  | in.   | mm.  | in.   | mm.  | in.             | mm.   |
| CC05  | 1.500 | 38.1  | 1.687 | 42.8  | 1.350 | 34.3  | 1.406 | 35.7  | 1.687 | 42.8  | 0.328  | 8.3  | 0.093 | 2.4 | 0.234 | 5.9  | 0.375 | 9.5  | 0.437 | 11.1 | 4.68            | 118.9 |
| CC07  | 1.500 | 38.1  | 1.687 | 42.8  | 1.350 | 34.3  | 1.406 | 35.7  | 1.687 | 42.8  | 0.328  | 8.3  | 0.093 | 2.4 | 0.234 | 5.9  | 0.375 | 9.5  | 0.437 | 11.1 | 4.68            | 118.9 |
| CC10  | 1.500 | 38.1  | 1.687 | 42.8  | 1.350 | 34.3  | 1.406 | 35.7  | 1.687 | 42.8  | 0.328  | 8.3  | 0.093 | 2.4 | 0.234 | 5.9  | 0.375 | 9.5  | 0.437 | 11.1 | 4.68            | 118.9 |
| CC15  | 3.250 | 82.6  | 4.452 | 113.1 | 4.325 | 109.9 | 3.725 | 94.6  | 4.452 | 113.1 | 0.468  | 11.9 | 0.187 | 4.7 | 0.343 | 8.7  | 0.420 | 10.7 | 0.828 | 21.0 | 12.50           | 317.5 |
| CC20  | 4.250 | 108.0 | 5.125 | 130.2 | 4.688 | 119.1 | 3.426 | 87.0  | 5.125 | 130.2 | 0.620  | 15.7 | 0.250 | 6.4 | 0.641 | 16.3 | 0.540 | 13.7 | 1.060 | 26.9 | 14.25           | 362.0 |
| CC25  | 4.250 | 108.0 | 5.125 | 130.2 | 4.688 | 119.1 | 3.426 | 87.0  | 5.125 | 130.2 | 0.620  | 15.7 | 0.250 | 6.4 | 0.641 | 16.3 | 0.540 | 13.7 | 1.060 | 26.9 | 14.25           | 362.0 |
| CC30  | 5.312 | 134.9 | 5.687 | 144.4 | 5.000 | 127.0 | 3.601 | 91.5  | 5.687 | 144.4 | 0.844  | 21.4 | 0.312 | 7.9 | 0.500 | 12.7 | 0.195 | 5.0  | 1.100 | 27.9 | 17.00           | 431.8 |
| CC40  | 5.312 | 134.9 | 6.187 | 157.1 | 5.000 | 127.0 | 4.315 | 109.6 | 6.187 | 157.1 | 0.844  | 21.4 | 0.312 | 7.9 | 0.500 | 12.7 | 0.195 | 5.0  | 1.100 | 27.9 | 17.50           | 444.5 |
| *CC50 | 6.000 | 152.4 | 9.370 | 238.0 | 8.630 | 219.2 | 7.820 | 198.6 | 9.370 | 238.0 | *1.300 | 33.0 | 0.375 | 9.5 | 1.000 | 25.4 | 0.500 | 12.7 | 1.930 | 49.0 | *25.05          | 636.3 |
| CC52  | 5.312 | 134.9 | 5.702 | 144.8 | 5.000 | 127.0 | 3.850 | 97.8  | 5.702 | 144.8 | 0.844  | 21.4 | 0.312 | 7.9 | 0.500 | 12.7 | 0.195 | 5.0  | 1.100 | 27.9 | 17.00           | 431.8 |

\*For CC50, Orders shipped prior to Oct. 31, 2017 are STRIP 1.180 in [30.0 mm] and L(std) 24.55 in [623.6 mm]

## 3 LUBRICATION GUIDELINES

All Tolomatic cable cylinders require internal lubrication unless specified. To ensure maximum cylinder life, the following guidelines should be followed.

### • Filtration

We recommend the use of dry, filtered air in our products. "Filtered air" means a level of 10 Micron or less. "Dry" means air should be free of appreciable amounts of moisture. Regular maintenance of installed filters will generally keep excess moisture in check.

### • External Lubricators

**External lubrication should be utilized for maximum service life of pneumatic cable cylinders.**

Lubrication must be maintained in a constant supply or the results will be a dry cylinder prone to premature wear.

Oil lubricators, (mist or drop) should supply a minimum of 1 drop per 20 standard cubic feet per minute to the cylinder. As a rule of thumb, double that rate if water in the system is suspected. Demanding conditions may require more lubricant.

We recommend a **non-detergent, 20cP @ 140°F** 10-weight lubricant. Optimum conditions for standard cylinder operation are **+32° to +125°F (+0° to 51.6°C)**.

### • Sanitary environments

Oil mist lubricators must dispense "Food Grade" lubricants to the air supply. Use fluids with ORAL **LD50 toxicity ratings of 35 or higher** such as **Multitherm® PG-1 or equivalent**. Demanding conditions can require a review of the application.



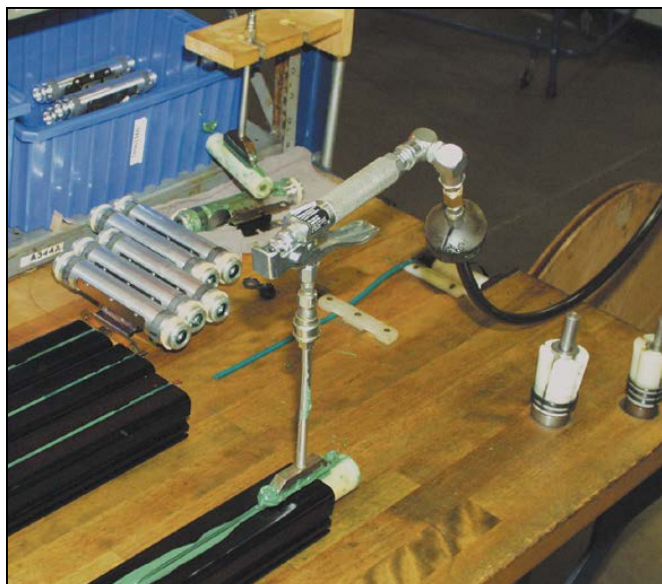
# Application Guidelines

The following conditional statements are intended as general guidelines for use of Tolomatic actuators. Since all applications have their own specific operating requirements, consult Tolomatic, Inc. or your local Tolomatic distributor if an application is unconventional or if questions arise regarding the selection process.

## CUSHION NEEDLE ADJUSTMENT (BC2, BC3, BC4, CC, SA, DP, TC ONLY)



Adjust the cushion needles in the cylinder heads carefully to obtain a smooth, hesitation free deceleration for your particular application. If there are questions on proper adjustment, please consult Tolomatic, Inc.



## LUBRICATION GUIDELINES

All Tolomatic actuators (except Cable Cylinders) are prelubricated at the factory. To ensure maximum actuator life, the following guidelines should be followed.

### • Filtration

We recommend the use of dry, filtered air in our products. "Filtered air" means a level of 10 Micron or less. "Dry" means air should be free of appreciable amounts of moisture. Regular maintenance of installed

filters will generally keep excess moisture in check.

### • External Lubricators (optional)

The factory prelubrication of Tolomatic actuators will provide optimal performance without the use of external lubrication. However, external lubricators can further extend service life of pneumatic actuators if the supply is kept constant.

Oil lubricators, (mist or drop) should supply a minimum of 1 drop per 20 standard cubic feet per minute to the

cylinder. As a rule of thumb, double that rate if water in the system is suspected. Demanding conditions may require more lubricant.

If lubricators are used, we recommend a non-detergent, 20cP @ 140°F 10-weight lubricant. Optimum conditions for standard cylinder operation are +32° to +150°F (+0° to 65 .5°C)

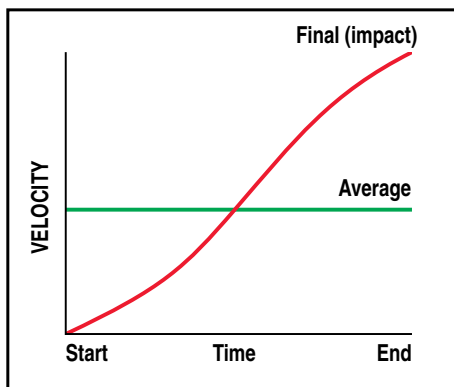
NOTE: Use of external lubricators may wash away the factory installed lubrication. External lubricants must be maintained in a constant supply or the results will be a dry actuator prone to premature wear.

### • Sanitary Environments

Oil mist lubricators must dispense "Food Grade" lubricants to the air supply. Use fluids with ORAL LD50 toxicity ratings of 35 or higher such as Multitherm® PG-1 or equivalent. Demanding conditions can require a review of the application.

## FINAL VELOCITY CALCULATION

Velocity calculations for all rodless cylinders need to differentiate between final velocity and average velocity. For example: Stroking a 100-inch BC3 model in one second yields an average velocity of 100 inches per second. To properly determine the inertial forces for cushioning, it is important to know the



final (or impact) velocity. Rodless cylinders accelerate and decelerate at each end of the stroke. Therefore this acceleration must be considered (see diagram).

If final (or impact) velocity cannot be calculated directly, a reasonable guideline is to use 2 x average velocity.

# CC, SA, DP, TC Service Parts Ordering - ALL Sizes

## CABLE ASSEMBLIES<sup>1</sup> AND REPAIR KITS<sup>2</sup> PART NUMBERS

Find the appropriate part number for the specific model and specify that part number with your stroke length when ordering.

| MODEL     | CABLE ASSY. | REPAIR KITS |
|-----------|-------------|-------------|
| CC05      | CACC05      | RKCC05      |
| TC05      | CATC05      | RKTC05      |
| CCM05     | CACCM05     | RKCCM05     |
| TCM05     | CATCM05     | RKTCM05     |
| CC07      | CACC07      | RKCC07      |
| SA07      | CASA07      | RKSA07      |
| TC07      | CATC07      | RKTC07      |
| CCM07     | CACCM07     | RKCCM07     |
| SAM07     | CASAM07     | RKSAM07     |
| TCM07     | CATCM07     | RKTCM07     |
| CC10      | CACC10      | RKCC10      |
| SA10      | CASA10      | RKSA10      |
| TC10      | CATC10      | RKTC10      |
| CCM10     | CACCM10     | RKCCM10     |
| SAM10     | CASAM10     | RKSAM10     |
| TCM10     | CATCM15     | RKTCM10     |
| CC15      | CACC15      | RKCC15      |
| DP15      | CADP15      | RKDP15      |
| SA15      | CASA15      | RKSA15      |
| TC15      | CATC15      | RKTC15      |
| CCM15     | CACCM15     | RKCCM15     |
| DPM15     | CADPM15     | RKDPM15     |
| SAM15     | CASAM15     | RKSAM15     |
| TCM15     | CATCM15     | RKTCM15     |
| CC20      | CACC20      | RKCC20      |
| DP20      | CADP20      | RKDP20      |
| SA20      | CASA20      | RKSA20      |
| CCM20     | CACCM20     | RKCCM20     |
| DPM20     | CADPM20     | RKDPM20     |
| SAM20     | CASAM20     | RKSAM20     |
| CC25      | CACC25      | RKCC25      |
| DP25      | CADP25      | RKDP25      |
| SA25      | CASA25      | RKSA25      |
| CCM25     | CACCM25     | RKCCM25     |
| DPM25     | CADPM25     | RKDPM25     |
| SAM25     | CASAM52     | RKSAM25     |
| CC52      | CACC52      | RKCC52      |
| DP52      | CADP52      | RKDP52      |
| SA52      | CASA52      | RKSA52      |
| CCM52     | CACCM52     | RKCCM52     |
| DPM52     | CADPM52     | RKDPM52     |
| SAM52     | CASAM52     | RKSAM52     |
| CC30      | CACC30      | RKCC30      |
| DP30      | CADP30      | RKDP30      |
| SA30      | CASA30      | RKSA30      |
| CCM30     | CACCM30     | RKCCM30     |
| DPM30     | CADPM30     | RKDPM30     |
| SAM30     | CASAM30     | RKSAM30     |
| CC40      | CACC40      | RKCC40      |
| DP40      | CADP40      | RKDP40      |
| SA40      | CASA40      | RKSA40      |
| CCM40     | CACCM40     | RKCCM40     |
| DPM40     | CADPM40     | RKDPM40     |
| SAM40     | CASAM40     | RKSAM40     |
| CC50(ALL) | CACC50      | RKCC50      |
| SA50(ALL) | CASA50      | RKSA50      |

## CONFIGURED REPAIR KIT<sup>2</sup> ORDERING EXAMPLE:

| OPTION | MODEL, BORE | STROKE  |
|--------|-------------|---------|
| RK     | CCVM 07     | SK 42.5 |

Where **RK** is the Repair Kit code, **CCVM** is the Cable Cylinder Code with seals of Viton<sup>®</sup> material, 07 is the .75" bore and **SK 42.5** indicates a stroke length of 42.5 inches.



### Service Parts Ordering NOTES:

- 1 Cable Assemblies contain: one Cable Assembly (specify stroke).
- 2 Repair Kits contain: two Cable Assemblies (specify stroke) and all wearable seals required to rebuild the cylinder.

## SWITCH ORDERING

| CONFIG. CODE ORDERING                 |      |
|---------------------------------------|------|
| Mounting Hardware & FE conn. included |      |
| DESCRIPTION                           | CODE |
| Switch Kit, Reed, Form C, 5m          | BT   |
| Switch Kit, Reed, Form C, Male Conn.  | BM   |
| Switch Kit, Reed, Form A, 5m          | RT   |
| Switch Kit, Reed, Form A, Male Conn.  | RM   |
| Switch Kit, Triac, 5m                 | CT   |
| Switch Kit, Triac, Male Conn.         | CM   |

NOTE: When kit is ordered female connector & all mounting hardware is included



### Switch Ordering NOTES:

To order field retrofit switch and hardware kits for all Tolomatic actuators: SW (Then the model and bore size, and type of switch required)

#### Example: SWCCM15RT

(Hardware and Form A Reed switch with 5 meter lead for 1.5" bore cable cylinder)

# Cable Cylinder Ordering - CC, SA, DP, TC - All Sizes

## MODEL, BORE, STROKE

CC V M 15 SK 125 . 250

### MODEL

|           |                                |
|-----------|--------------------------------|
| <b>CC</b> | Double Acting Cable Cylinder   |
| <b>SA</b> | Single Acting Cable Cylinder   |
| <b>DP</b> | Double Purchase Cable Cylinder |
| <b>TC</b> | Track Cable Cylinder           |

### SEALS

**V** Seals of Viton® material

### TUBING

- S** Steel Tube
- ✗ Not available for 05, 07 or 50 size
  - ✗ Switches cannot be used with steel tubing

### SWITCH MAGNET

- M** Internally Mounted Magnet
- 📖 Required for use with switches
  - 📖 Magnet will increase dead length of CC, SA & DP actuator (see page CC\_29)

### BORE SIZE

|           |              |           |                        |
|-----------|--------------|-----------|------------------------|
| <b>05</b> | 0.50" (16mm) | <b>25</b> | 2.50" (63mm)           |
| <b>07</b> | 0.75" (19mm) | <b>30</b> | 3.00" (76mm)           |
| <b>10</b> | 1.00" (25mm) | <b>40</b> | 4.00" (100mm)          |
| <b>12</b> | 1.25" (32mm) | <b>50</b> | 5.00" (127mm)          |
| <b>15</b> | 1.50" (40mm) | <b>52</b> | 2.00" [500 PSI] (50mm) |
| <b>20</b> | 2.00" (50mm) |           |                        |

## OPTIONS

END #1 HJ END #2 HG RT 2 XA . X B .

### STROKE LENGTH

**SK** \_\_\_ Enter desired stroke length in decimal inches

📖 NOTE: Strokes over 281" (7137mm) require Tube Couplers. Consult Tolomatic for lead time. Max. stroke length varies by model and bore size, see dimensions page for specification.

### HEAD OPTIONS (CC\_22 & CC\_25)

Single-ported heads are standard on all cylinders.  
Enter head options for [END #1, right end] and/or [END #2, left end] of the cylinder

- standard single port head
- <sup>1,3</sup>**HG** 3-ported head
  - HI** 1" auto tensioner assembly
  - <sup>3</sup>**HJ** 1" auto tensioner assembly with 3-ported head
  - HK** 2" auto tensioner assembly
  - <sup>3</sup>**HL** 2" auto tensioner assembly with 3-ported head
  - <sup>2</sup>**HM** caliper disc brake assembly
  - <sup>2,3</sup>**HN** caliper disc brake assembly with 3-ported head

<sup>1</sup>Only head option available for single-acting cylinders

<sup>2</sup>Autotensioner assembly required on one end of the cylinder

<sup>3</sup>Cushions are removed on all 3-ported heads

### SWITCHES (CC\_28)

| TYPE  |        | QUICK-DISCONNECT | CODE      | QUANTITY                          | LEAD LENGTH |
|-------|--------|------------------|-----------|-----------------------------------|-------------|
| REED  | Form A | QD               | <b>RM</b> | After code enter quantity desired | 5 meters    |
|       |        | no               | <b>RT</b> |                                   |             |
|       | Form C | QD               | <b>BM</b> |                                   |             |
|       |        | no               | <b>BT</b> |                                   |             |
| TRIAC | QD     | <b>CM</b>        |           |                                   |             |
|       | no     | <b>CT</b>        |           |                                   |             |

### EXTRA CABLE

- XA** for extra beyond standard in inches  
**XB** for extra beyond standard in inches

📖 Not all codes listed are compatible with all options. Contact Tolomatic with any questions.

# PB, PB2 ROD CYLINDER SLIDES



## CONTENTS

|                                  |       |
|----------------------------------|-------|
| PB Features .....                | PB_2  |
| PB & PB2 Performance .....       | PB_3  |
| PB Performance .....             | PB_4  |
| PB Specifications .....          | PB_6  |
| PB Dimensions .....              | PB_6  |
| Applications .....               | PB_8  |
| PB2 Features .....               | PB_9  |
| PB2 Performance .....            | PB_10 |
| PB2 Specifications .....         | PB_11 |
| PB2 Dimensions .....             | PB_12 |
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| Application Data Worksheet ..... | PB_16 |
| Selection Guidelines .....       | PB_17 |
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ABT

MXP

BC2

BC3

BC4

LS

MG

CC

PB

ENGR



# PB POWER-BLOCK

## ENDURANCE TECHNOLOGY<sup>SM</sup>

Endurance Technology features are designed for maximum durability to provide extended service life.

The Power Block rod cylinder slide features two precision steel guide rods with composite bearings to provide positive support of the load. The Power Block withstands heavy side loads making it a great choice for conveyor line stops and load lifting applications. Built-to-order in stroke lengths up to 3 inches.

### DURABLE BEARING

#### COMPOSITE BEARINGS

- Thin profile allows use of oversize guide rods
- Best choice for impact use or high contaminant environments



### DOVETAIL SLOTS

- For easy switch mounting

### INTERNAL BUMPER

- Made of urethane composite to prolong cylinder life and reduce noise



### NICKEL-PLATED SHAFTS

- Shafts up to 0.625" diameter

### DURABLE DESIGN

- Tough, lightweight extruded aluminum in a low profile package

### MOUNTING FLEXIBILITY

- Threaded holes for base or side mounting



### PLATED STEEL TOOLING PLATE

- Threaded bolt thru holes for tooling plate mounting

## OPTIONS



### STOP COLLAR / BUMPER KIT

- Includes 2 stop collars and 1/4" thick polyurethane external bumpers to help absorb impact shock



### DUAL TOOLING PLATE

- Added flexibility for many applications



### SWITCHES

- Available in Reed, Hall-effect and Triac
- 15ft. cable with flying leads; available with quick-disconnect couplers

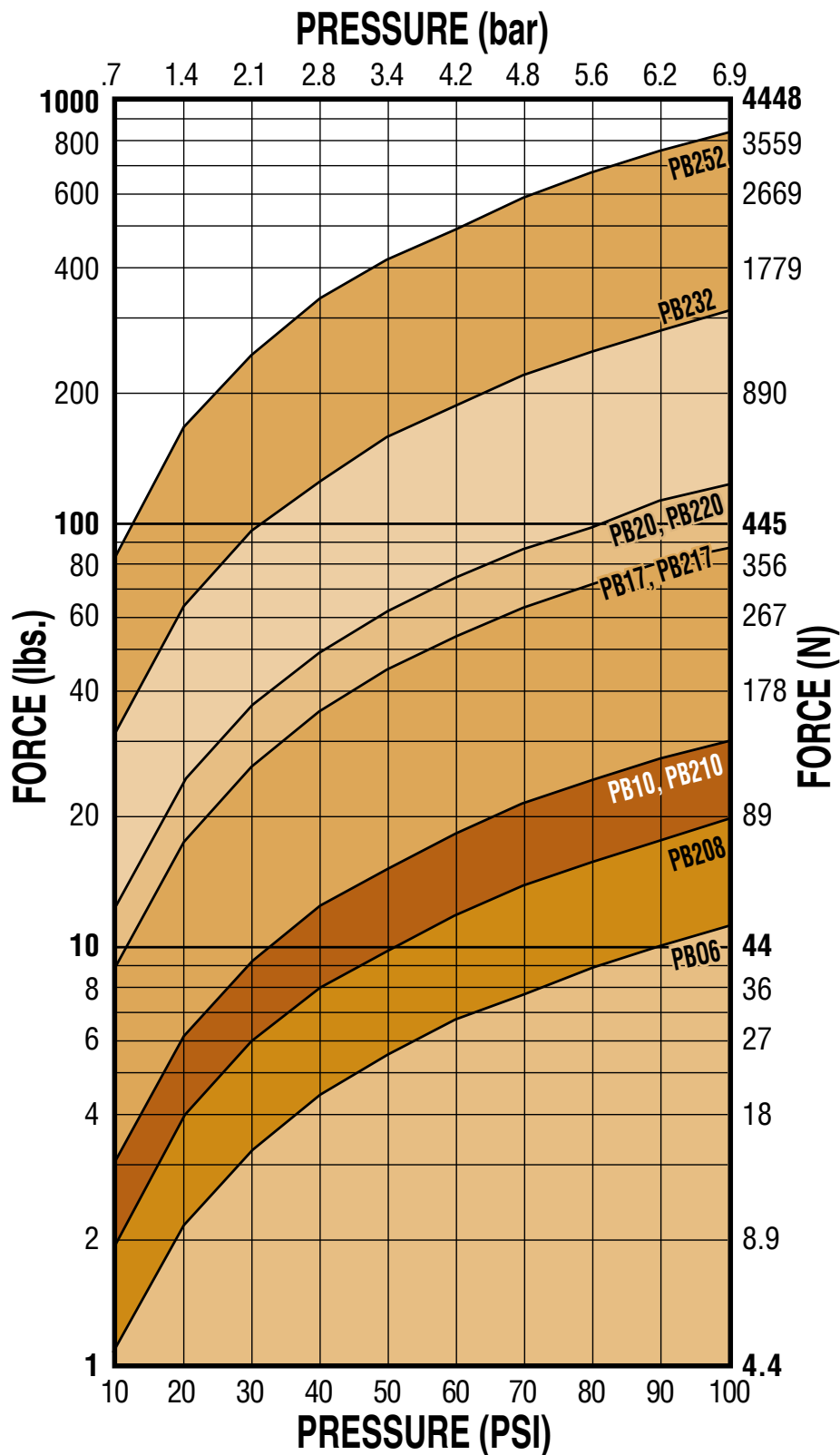




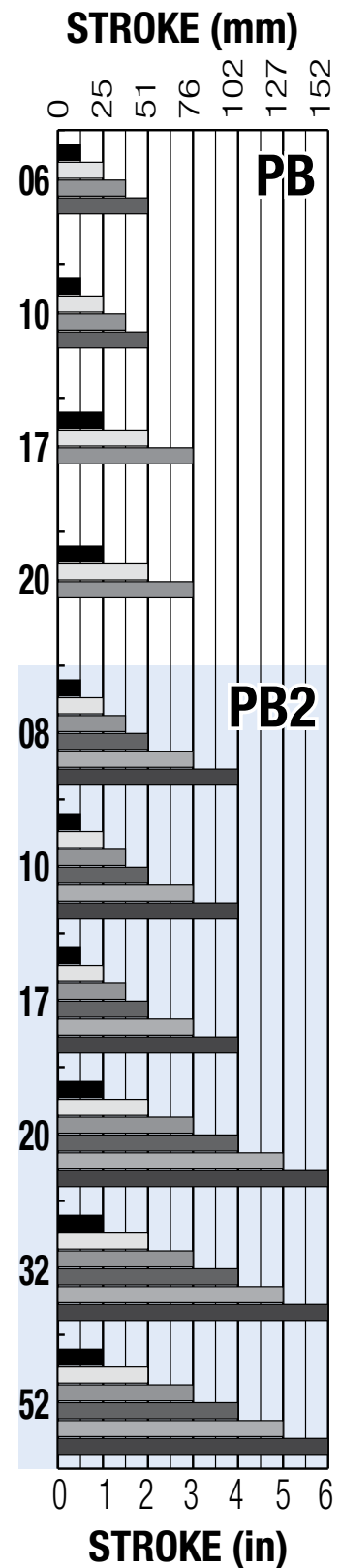
# PB & PB2 Rod Cylinder Slides - All Sizes

## PERFORMANCE

### THEORETICAL FORCE vs PRESSURE



### STROKE LENGTHS



ABT

MXP

BCZ

BC3

BC4

LS

MG

CC

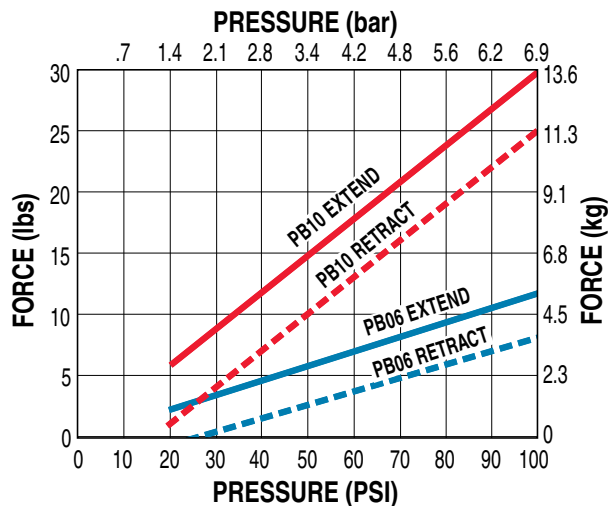
PB

ENGR

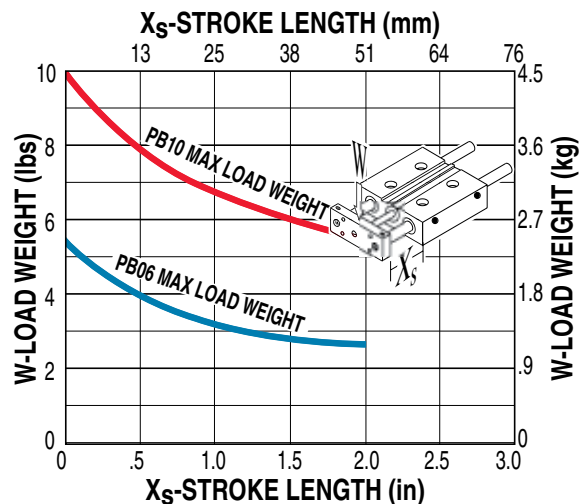
# PB Power-Block Rod Cylinder Slide - 06, 10 Sizes

## PERFORMANCE

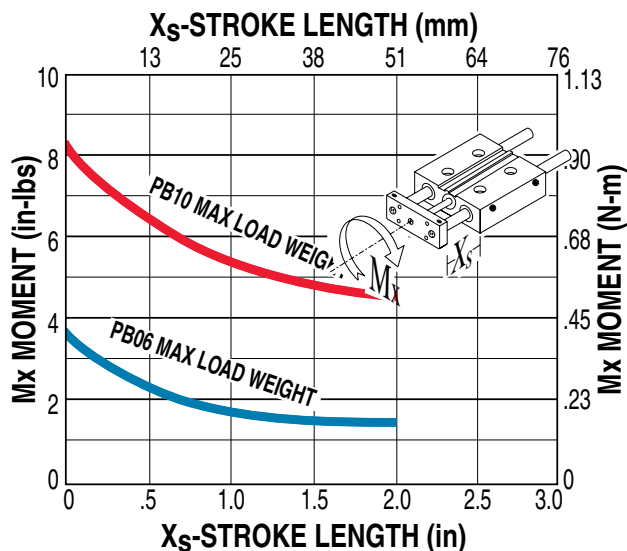
### THEORETICAL FORCE vs PRESSURE



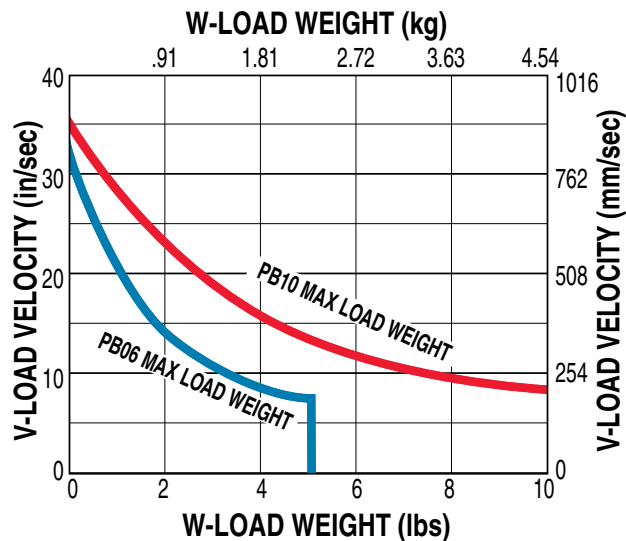
### MAX. LOAD WEIGHT vs STROKE LENGTH



### BENDING MOMENTS



### LOAD WEIGHT vs VELOCITY (USING INTERNAL BUMPERS)



#### FORCE VS. PRESSURE

Force vs Pressure performance data applies to models with composite bearings.

#### MAX. LOAD WEIGHT vs STROKE LENGTH

Do not exceed Max. Load curve. Max. Load for composite bearings is based on 200 million linear inches of travel.

#### BENDING MOMENTS

Max. Moment for composite bearings is based on 200 million linear inches of travel.

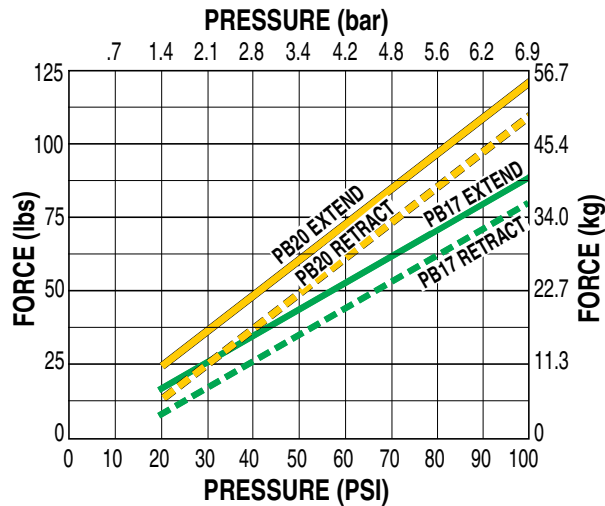
#### LOAD VS VELOCITY

Do not exceed Max. Load curve. Max. Load for Power-Block is based on 200 million linear inches of travel.

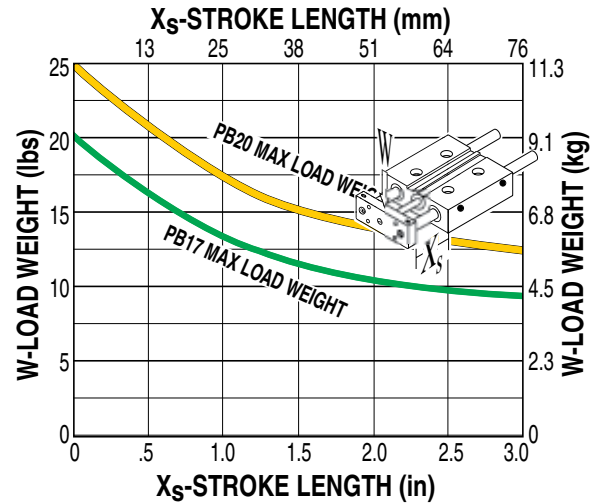
# PB Power-Block Rod Cylinder Slide - 17, 20 Sizes

## PERFORMANCE

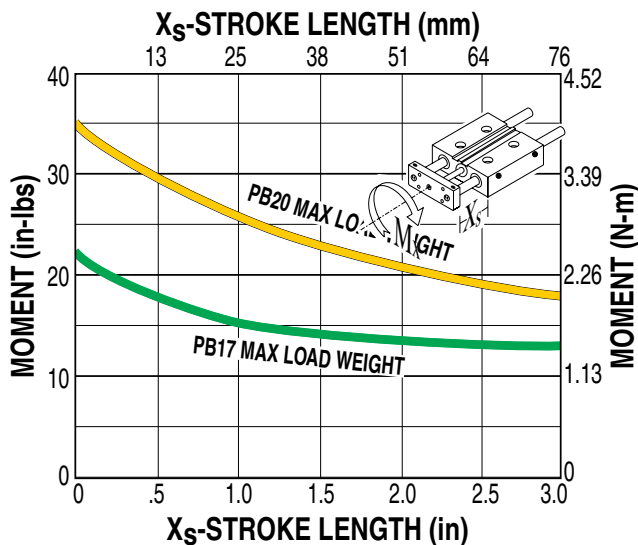
### THEORETICAL FORCE vs PRESSURE



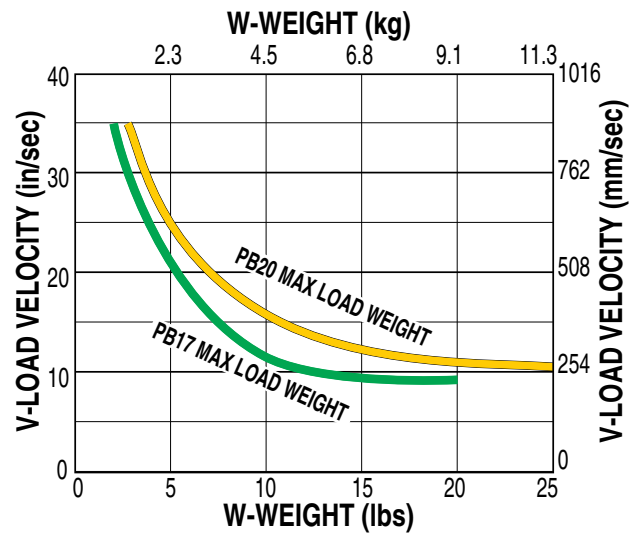
### MAX. LOAD WEIGHT vs STROKE LENGTH



### BENDING MOMENTS



### LOAD WEIGHT vs VELOCITY (USING INTERNAL BUMPERS)



#### FORCE VS. PRESSURE

Force vs Pressure performance data applies to models with composite bearings.

#### MAX. LOAD WEIGHT vs STROKE LENGTH

Do not exceed Max. Load curve. Max. Load for composite bearings is based on 200 million linear inches of travel.

#### BENDING MOMENTS

Max. Moment for composite bearings is based on 200 million linear inches of travel.

#### LOAD VS VELOCITY

Do not exceed Max. Load curve. Max. Load for Power-Block is based on 200 million linear inches of travel.

# PB Power-Block Rod Cylinder Slide - All Sizes

## SPECIFICATIONS

|    | BORE SIZE |      | WEIGHT |     |                    |      | STROKE LENGTH      |                | MAX. PRESSURE |       | TEMPERATURE RANGE |          |
|----|-----------|------|--------|-----|--------------------|------|--------------------|----------------|---------------|-------|-------------------|----------|
|    |           |      | BASE   |     | PER UNIT OF STROKE |      |                    |                |               |       |                   |          |
|    | in        | mm   | lbs    | kg  | lbs                | kg   | in                 | mm             | PSI           | bar   | °F                | °C       |
| 06 | 0.375     | 9.5  | 0.26   | 0.1 | 0.18               | 0.08 | 0.5, 1.0, 1.5, 2.0 | 13, 25, 38, 51 | 100           | 6.895 | 20 to 140         | -7 to 60 |
| 10 | 0.625     | 16.0 | 0.53   | 0.2 | 0.30               | 0.14 |                    |                |               |       |                   |          |
| 17 | 1.062     | 27.0 | 1.08   | 0.5 | 0.57               | 0.26 | 1.0, 2.0, 3.0      | 25, 51, 76     |               |       |                   |          |
| 20 | 1.250     | 31.8 | 1.56   | 0.7 | 0.88               | 0.40 |                    |                |               |       |                   |          |

**PB**



**ORDER CODES**

PB06, PB10, PB17, PB20  
inch (U.S. Standard)

| PB OPTIONS             | Page  |
|------------------------|-------|
| Stop Collar/Bumper     | PB_6  |
| Dual Tooling Plate     | PB_6  |
| Switches               | PB_14 |
| MORE INFORMATION       | Page  |
| Application Guidelines | PB_18 |
| Ordering               | PB_20 |
| Selection              | PB_17 |

**OPTIONS**



**STOP COLLAR / BUMPER KIT**

- Includes 2 stop collars and 1/4" thick polyurethane external bumpers to help absorb impact shock



**DUAL TOOLING PLATE**

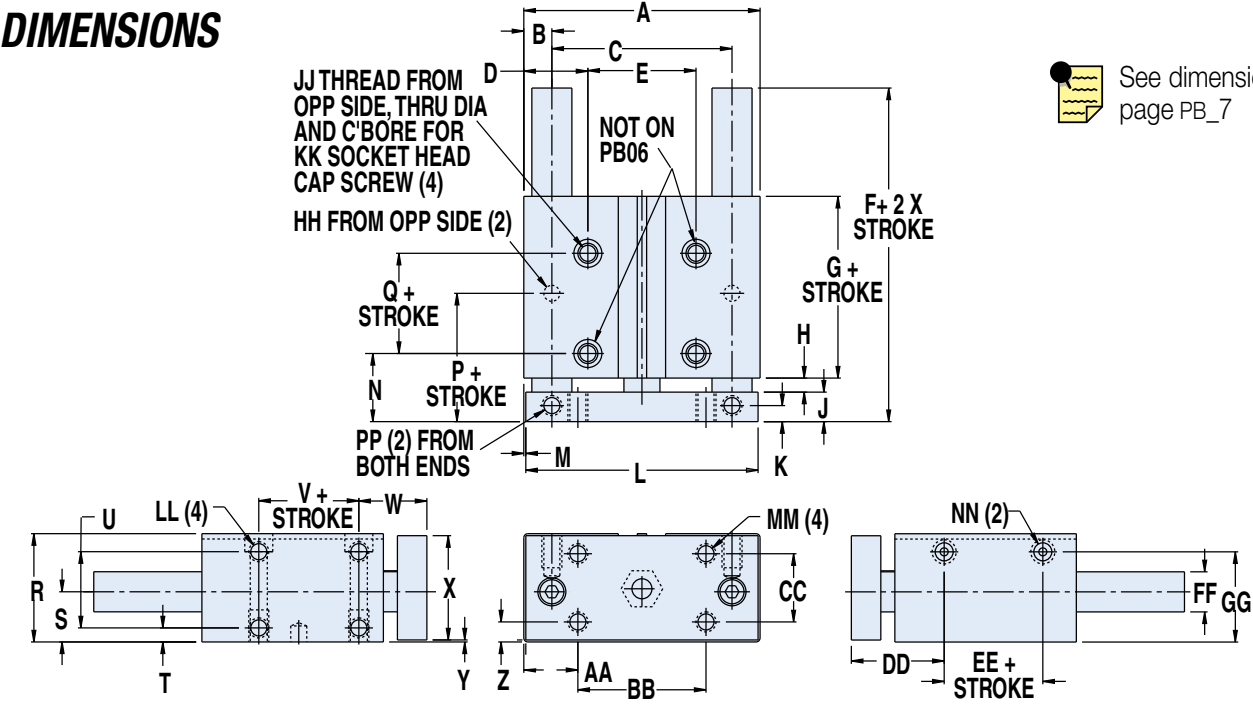
- Added flexibility for many applications



**SWITCHES**

- Available in Reed, Hall-effect and Triac
- 15ft. cable with flying leads; available with quick-disconnect couplers

## DIMENSIONS



# PB Power-Block Rod Cylinder Slide - All Sizes

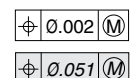
## DIMENSIONS



See drawing  
page PB\_6

|             | PB06                    |                     | PB10                    |                     | PB17                     |                     | PB20                        |                     |
|-------------|-------------------------|---------------------|-------------------------|---------------------|--------------------------|---------------------|-----------------------------|---------------------|
|             | in                      | mm                  | in                      | mm                  | in                       | mm                  | in                          | mm                  |
| <b>BORE</b> | 0.375                   | 9.5                 | 0.625                   | 16.0                | 1.013                    | 27.0                | 1.25                        | 31.8                |
| <b>A</b>    | 1.688                   | 42.9                | 2.250                   | 57.2                | 3.125                    | 79.4                | 3.688                       | 93.7                |
| <b>B</b>    | 0.219                   | 5.6                 | 0.297                   | 7.5                 | 0.375                    | 9.5                 | 0.438                       | 11.1                |
| <b>C</b>    | 1.250                   | 31.8                | 1.656                   | 42.1                | 2.375                    | 60.3                | 2.813                       | 71.5                |
| <b>D</b>    | 0.500                   | 12.7                | 0.656                   | 16.7                | 0.844                    | 21.4                | 1.000                       | 25.4                |
| <b>E</b>    | 0.688                   | 17.5                | 0.938                   | 23.8                | 1.438                    | 36.5                | 1.688                       | 42.9                |
| <b>F</b>    | 2.370                   | 60.2                | 2.853                   | 72.5                | 3.070                    | 78.0                | 3.198                       | 81.2                |
| <b>G</b>    | 1.375                   | 34.9                | 1.672                   | 42.5                | 1.781                    | 45.2                | 1.833                       | 46.6                |
| <b>H</b>    | 0.156                   | 4.0                 | 0.219                   | 5.6                 | 0.188                    | 4.8                 | 0.219                       | 5.6                 |
| <b>J</b>    | 0.273                   | 6.9                 | 0.335                   | 8.5                 | 0.460                    | 11.7                | 0.460                       | 11.7                |
| <b>K</b>    | 0.125                   | 3.2                 | 0.156                   | 4.0                 | 0.250                    | 6.4                 | 0.250                       | 6.4                 |
| <b>L</b>    | 1.625                   | 41.3                | 2.188                   | 55.6                | 3.063                    | 77.8                | 3.625                       | 92.1                |
| <b>M</b>    | 0.031                   | 0.8                 | 0.031                   | 0.8                 | 0.031                    | 0.8                 | 0.031                       | 0.8                 |
| <b>N</b>    | 0.688                   | 17.5                | 0.875                   | 22.2                | 1.063                    | 27.0                | 1.063                       | 27.0                |
| <b>P</b>    | 0.688                   | 17.5                | 1.063                   | 27.0                | 0.656                    | 16.7                | 1.000                       | 25.4                |
| <b>Q</b>    | 0.500                   | 12.7                | 0.625                   | 15.9                | 0.563                    | 14.3                | 0.563                       | 14.3                |
| <b>R</b>    | 0.891                   | 22.6                | 1.063                   | 27.0                | 1.484                    | 37.7                | 1.688                       | 42.9                |
| <b>S</b>    | 0.406                   | 10.3                | 0.500                   | 12.7                | 0.609                    | 15.5                | 0.781                       | 19.8                |
| <b>T</b>    | 0.125                   | 3.2                 | 0.141                   | 3.6                 | 0.156                    | 4.0                 | 0.219                       | 5.6                 |
| <b>U</b>    | 0.594                   | 15.1                | 0.750                   | 19.1                | 1.125                    | 28.6                | 1.188                       | 30.2                |
| <b>V</b>    | 0.500                   | 12.7                | 0.625                   | 15.9                | 0.563                    | 14.3                | 0.563                       | 14.3                |
| <b>W</b>    | 0.688                   | 17.5                | 0.875                   | 22.2                | 1.063                    | 27.0                | 1.063                       | 27.0                |
| <b>X</b>    | 0.828                   | 21.0                | 1.000                   | 25.4                | 1.422                    | 36.1                | 1.623                       | 41.2                |
| <b>Y</b>    | 0.031                   | 0.8                 | 0.031                   | 0.8                 | 0.031                    | 0.8                 | 0.031                       | 0.8                 |
| <b>Z</b>    | 0.156                   | 4.0                 | 0.188                   | 4.8                 | 0.219                    | 5.6                 | 0.313                       | 8.0                 |
| <b>AA</b>   | 0.469                   | 11.9                | 0.500                   | 12.7                | 0.688                    | 17.5                | 0.844                       | 21.4                |
| <b>BB</b>   | 0.750                   | 19.1                | 1.250                   | 31.8                | 1.750                    | 44.5                | 2.000                       | 50.8                |
| <b>CC</b>   | 0.563                   | 14.3                | 0.688                   | 17.5                | 1.000                    | 25.4                | 1.063                       | 27.0                |
| <b>DD</b>   | 0.913                   | 23.2                | 1.281                   | 32.5                | 1.429                    | 36.3                | 1.449                       | 36.8                |
| <b>EE</b>   | 0.466                   | 11.8                | 0.450                   | 11.4                | 0.500                    | 12.7                | 0.540                       | 13.7                |
| <b>FF</b>   | 0.250                   | 6.4                 | 0.375                   | 9.5                 | 0.500                    | 12.7                | 0.625                       | 15.9                |
| <b>GG</b>   | 0.734                   | 18.6                | 0.875                   | 22.2                | 1.203                    | 30.6                | 1.406                       | 35.7                |
| <b>HH*</b>  | .1875/.1865<br>X .22 DP | 4.8/4.7 x<br>5.6 DP | .1875/.1865<br>X .22 DP | 4.8/4.7 x<br>5.6 DP | .2500/.2490<br>X .25 DP  | 6.4/6.3 x 6.4<br>DP | 2500/.2490 X<br>.25 DP      | 6.4/6.3 x 6.4<br>DP |
| <b>JJ</b>   | 6-32 X .38" (9.5) DP    |                     | 8-32 X .38" (9.5) DP    |                     | 1/4-20 X .25" (6.4) DP   |                     | 5/16-18UNC X .50 (12.7)" DP |                     |
| <b>KK</b>   | #4                      |                     | #6                      |                     | #10                      |                     | 1/4                         |                     |
| <b>LL</b>   | 6-32 X .25" (6.4) DP    |                     | 8-32 X .38" (9.5) DP    |                     | 10-24 X .44" (11.2) DP   |                     | 5/16-18 X .50" (12.7) DP    |                     |
| <b>MM</b>   | 6-32 THRU               |                     | 8-32 THRU               |                     | 10-24 THRU               |                     | 5/16-18 THRU                |                     |
| <b>NN</b>   | 10-32 UNF               |                     | 10-32 UNF               |                     | 1/8-27 NPT               |                     | 1/8-27 NPT                  |                     |
| <b>PP</b>   | 6-32UNC X .22" (5.6) DP |                     | 8-32UNC X .28" (7.1) DP |                     | 10-24UNC X .34" (8.6) DP |                     | 5/16-18UNC X .38" (9.7) DP  |                     |

\*Dowel Pins



ABT

MXP

BCZ

BC3

BC4

LS

MG

CC

PB

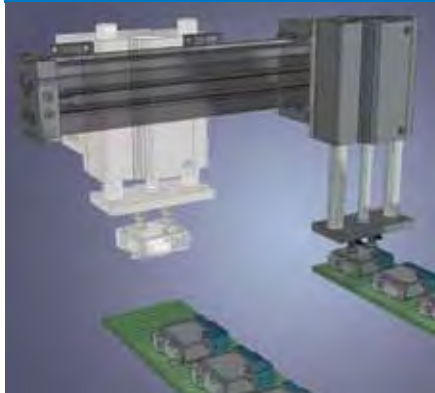
ENGR



# PB & PB2 Rod Cylinder Slides - All Sizes

## APPLICATIONS

### Material Handling



A pick and place application for moving product between conveyors.

#### **Customer Challenge:**

A manufacturer of consumer electronic equipment needed a method to move finished product from one conveyor to another quickly without damage or waste.

#### **Application**

##### **Requirements:**

- Fast response, throughput of 20 products per minute
- Consistent positioning
- End-of-stroke adjustment to accommodate varying product lines

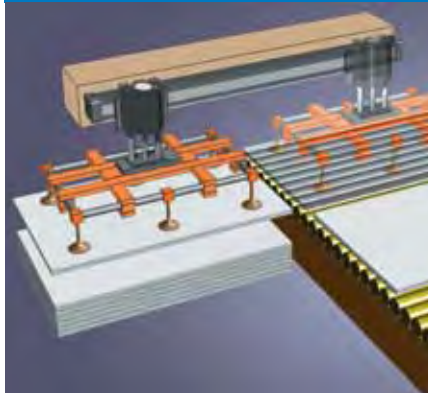
#### **Tolomatic Solution:**

This side mounted BC3D Band Cylinder with dual 180° option provides the motion along the X axis and support for the PB2 rod cylinder slide which provides the Y axis motion. In this application dual vacuum cups are used, however they are often replaced with a gripper unit with custom tooled fingers for product that does not present a smooth flat surface.

#### **Result:**

This continuing customer is pleased with the durability, price and delivery that the BC3 and PB2 actuators manufactured by Tolomatic provide.

### Material Handling



Vacuumized sheet transfer application.

#### **Customer Challenge:**

A manufacturer of battery chargers needed a method of taking sheet metal off of pallets and placing onto the assembly line. Speed is critical and end-of-stroke position must be consistent, thus, Tolomatic pneumatic products were chosen for this system.

#### **Application**

##### **Requirements:**

- Fast response, 1 part must be reoriented and moved each 3 seconds
- Movement from end-of-stroke to end-of-stroke with consistent positioning
- Low cost
- End-of-stroke adjustment

#### **Tolomatic Solution:**

This application uses a Tolomatic PB2 Rod Cylinder Slide, attached to a BC3 Band Cylinder with adjustable shocks. This actuator assembly moves the vacuum grid attachment that holds the sheet metal.

#### **Result:**

The BC3 and PB2 has long-lasting durability for reliable performance at the required speed. This continuing customer is pleased with the price and delivery that Tolomatic provides.

# PB2 POWER-BLOCK 2

## ENDURANCE TECHNOLOGY<sup>SM</sup>

Endurance Technology features are designed for maximum durability to provide extended service life.

The Power Block 2 rod cylinder slide features two precision steel guide rods with linear ball or composite bearings to provide positive support of the load. The Power Block 2 withstands heavy side loads making it a great choice for conveyor line stops and load lifting applications. Built-to-order in stroke lengths up to 6 inches.

### INTERNAL BUMPERS

- Made of urethane composite to prolong cylinder life and reduce noise



### PISTON MAGNET

- Piston magnet is a standard feature allowing sensor mounting whenever required

### LARGE SHAFTS

- Shafts up to 1.25" diameter

### DURABLE BEARING OPTIONS

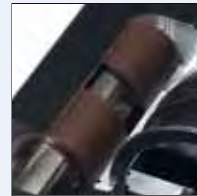
#### LINEAR BALL BEARINGS

- Low friction, long life
- Best tooling plate accuracy



#### COMPOSITE BEARINGS

- Thin profile allows use of oversize guide rods
- Best choice for impact use or high contaminant environments



### DURABLE DESIGN

- Tough, lightweight extruded aluminum in a low profile package

### PLATED STEEL TOOLING PLATE

- Threaded bolt thru holes for tooling plate mounting

### MOUNTING FLEXIBILITY

- T-slots and threaded holes for base mounting



## OPTIONS



### SWITCHES

- Available in Reed, Hall-effect and Triac
- 15ft. cable with flying leads; available with quick-disconnect couplers

**5 DAYS**  
**BUILT-TO-ORDER**

ABT

MXP

BCZ

BC3

BC4

LS

MG

CC

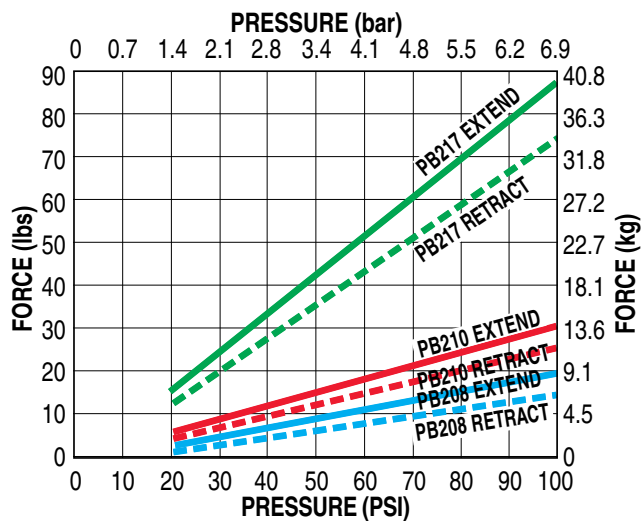
PB

ENGR

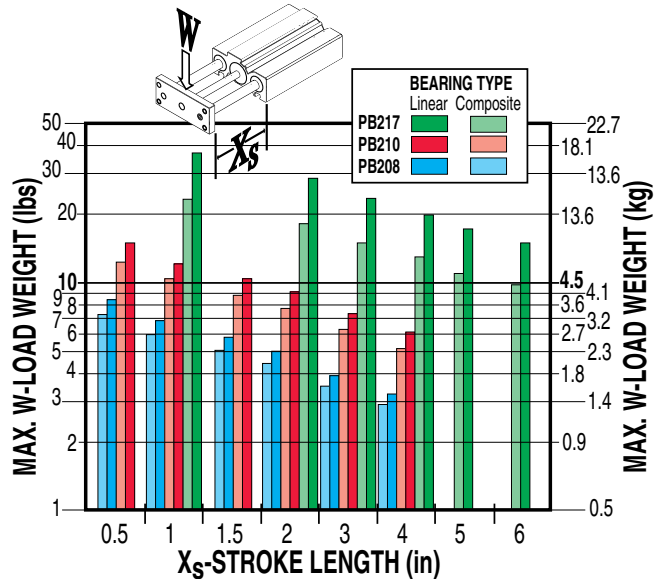
# PB2 Power-Block2 Rod Cylinder Slide - 08, 10, 17 Sizes

## PERFORMANCE

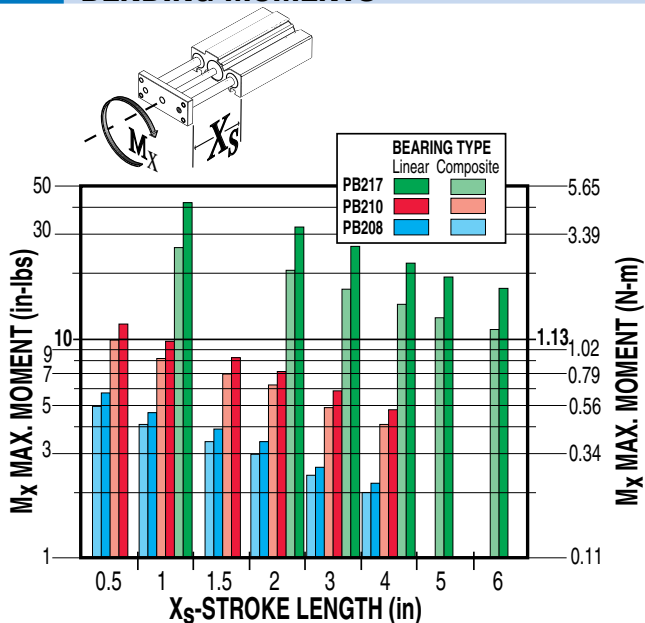
### THEORETICAL FORCE vs PRESSURE



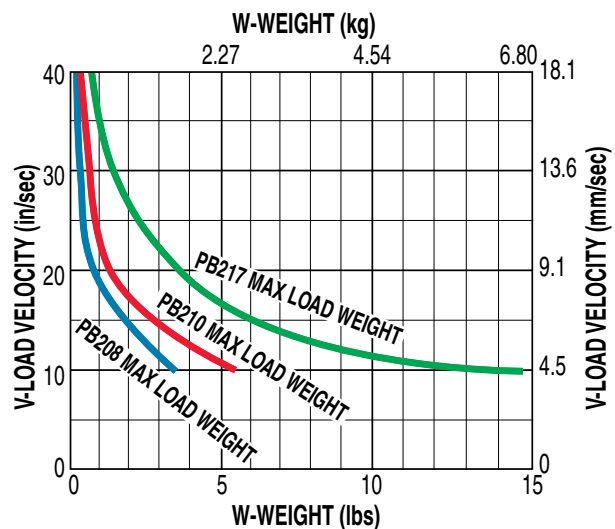
### MAX. LOAD WEIGHT vs STROKE LENGTH



### BENDING MOMENTS



### LOAD WEIGHT vs VELOCITY (USING INTERNAL BUMPERS)



#### FORCE VS. PRESSURE

Force vs Pressure performance data applies to models with composite bearings.

#### MAX. LOAD WEIGHT vs STROKE LENGTH

Do not exceed Max. Load curve. Max. Load for composite bearings is based on 200 million linear inches of travel.

#### BENDING MOMENTS

Max. Moment for composite bearings is based on 200 million linear inches of travel.

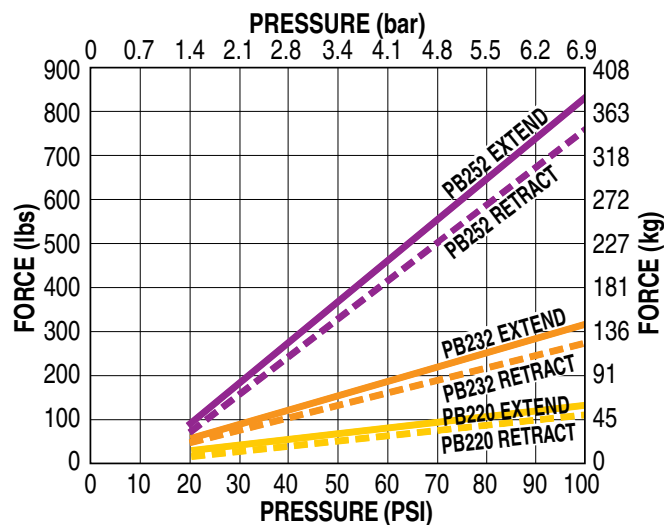
#### LOAD VS VELOCITY

Do not exceed Max. Load curve. Max. Load for Power-Block is based on 200 million linear inches of travel.

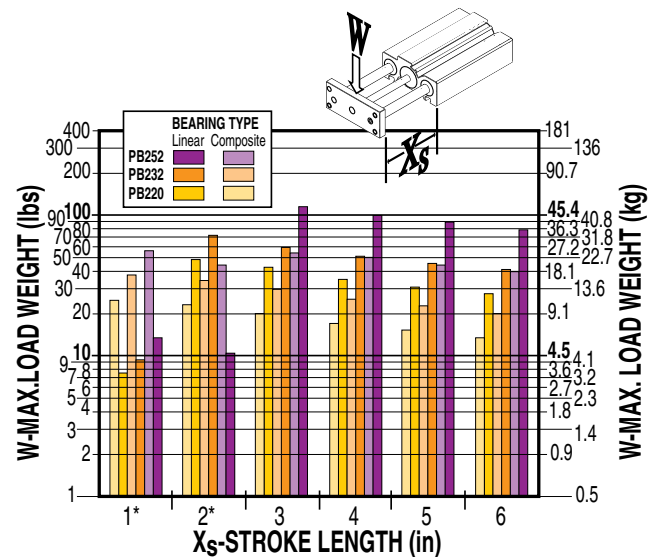
# PB2 Power-Block2 Rod Cylinder Slide - 20, 32, 52 Sizes

## PERFORMANCE

### THEORETICAL FORCE vs PRESSURE

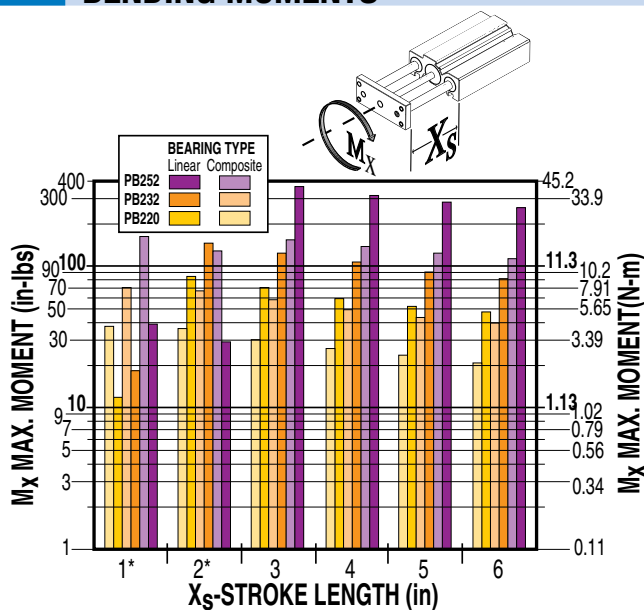


### MAX. LOAD WEIGHT vs STROKE LENGTH



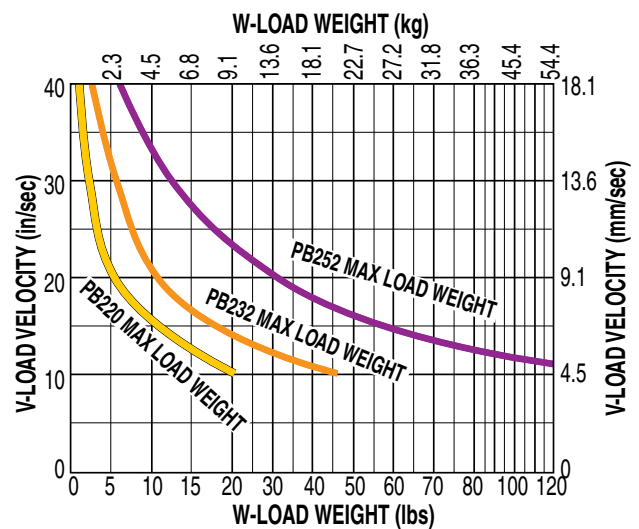
\*PB220, PB232 and PB252 - 1" Stroke and PB252 - 2" Stroke are units with one set of bearings.

### BENDING MOMENTS



\*PB220, PB232 and PB252 - 1" Stroke and PB252 - 2" Stroke are units with one set of bearings.

### LOAD WEIGHT vs VELOCITY (USING INTERNAL BUMPERS)



### FORCE VS. PRESSURE

Force vs Pressure performance data applies to models with composite bearings.

### MAX. LOAD WEIGHT vs STROKE LENGTH

Do not exceed Max. Load curve. Max. Load for composite bearings is based on 200 million linear inches of travel.

### BENDING MOMENTS

Max. Moment for composite bearings is based on 200 million linear inches of travel.

### LOAD VS VELOCITY

Do not exceed Max. Load curve. Max. Load for Power-Block is based on 200 million linear inches of travel.

# PB2 Power-Block2 Rod Cylinder Slide - All Sizes

## SPECIFICATIONS

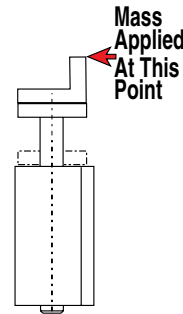
LB = Linear Bearing

CB = Composite Bearing

| SIZE            |              | 08                           |      | 10   |      | 17   |      | 20                           |      | 32   |      | 52    |       |       |
|-----------------|--------------|------------------------------|------|------|------|------|------|------------------------------|------|------|------|-------|-------|-------|
| BEARING         |              | LB                           | CB   | LB   | CB   | LB   | CB   | LB                           | CB   | LB   | CB   | LB    | CB    |       |
| BORE SIZE       | in           | 0.50                         |      | 0.63 |      | 1.06 |      | 1.25                         |      | 2.00 |      | 3.25  |       |       |
|                 | mm           | 12.7                         |      | 15.9 |      | 27.0 |      | 31.8                         |      | 50.8 |      | 82.6  |       |       |
| STROKE & WEIGHT | 0.5" (13mm)  | lbs                          | 0.62 | 0.65 | 0.86 | 0.90 | NA   |                              |      |      |      |       |       |       |
|                 |              | kg                           | 0.28 | 0.29 | 0.39 | 0.41 |      |                              |      |      |      |       |       |       |
|                 | 1.0" (25mm)  | lbs                          | 0.70 | 0.75 | 0.97 | 1.03 | 1.97 | 2.32                         | 2.79 | 3.32 | 4.85 | 5.59  | 10.92 | 11.74 |
|                 |              | kg                           | 0.32 | 0.34 | 0.44 | 0.47 | 0.89 | 1.05                         | 1.27 | 1.51 | 2.20 | 2.54  | 4.95  | 5.33  |
|                 | 1.5" (38mm)  | lbs                          | 0.78 | 0.85 | 1.08 | 1.17 | NA   |                              |      |      |      |       |       |       |
|                 |              | kg                           | 0.35 | 0.39 | 0.49 | 0.53 |      |                              |      |      |      |       |       |       |
|                 | 2.0" (51mm)  | lbs                          | 0.86 | 0.95 | 1.19 | 1.30 | 2.38 | 2.88                         | 3.87 | 4.36 | 6.43 | 6.95  | 12.57 | 13.63 |
|                 |              | kg                           | 0.39 | 0.43 | 0.54 | 0.59 | 1.08 | 1.31                         | 1.76 | 1.98 | 2.92 | 3.15  | 5.70  | 6.18  |
|                 | 3.0" (76mm)  | lbs                          | 1.03 | 1.16 | 1.42 | 1.57 | 2.80 | 3.43                         | 4.49 | 5.14 | 5.48 | 8.03  | 15.71 | 16.57 |
|                 |              | kg                           | 0.47 | 0.53 | 0.64 | 0.71 | 1.27 | 1.56                         | 2.04 | 2.33 | 2.49 | 3.64  | 7.13  | 7.52  |
|                 | 4.0" (102mm) | lbs                          | 1.20 | 1.35 | 1.64 | 1.84 | 3.21 | 3.40                         | 5.11 | 5.92 | 8.20 | 9.12  | 17.36 | 18.46 |
|                 |              | kg                           | 0.54 | 0.61 | 0.74 | 0.83 | 1.46 | 1.54                         | 2.32 | 2.69 | 3.72 | 4.14  | 7.87  | 8.37  |
|                 | 5.0" (127mm) | lbs                          | NA   |      |      |      | 3.63 | 4.54                         | 5.72 | 6.71 | 9.08 | 10.20 | 19.00 | 20.36 |
|                 |              | kg                           |      |      |      |      | 1.65 | 2.06                         | 2.59 | 3.04 | 4.12 | 4.63  | 8.62  | 9.24  |
|                 | 6.0" (152mm) | lbs                          | NA   |      |      |      | 4.04 | 5.09                         | 6.34 | 7.49 | 9.97 | 11.28 | 20.64 | 22.25 |
|                 |              | kg                           |      |      |      |      | 1.83 | 2.31                         | 2.88 | 3.40 | 4.52 | 5.12  | 9.36  | 10.09 |
| STROKE LENGTH   | in           | 0.5, 1.0, 1.5, 2.0, 3.0, 4.0 |      |      |      |      |      | 1.0, 2.0, 3.0, 4.0, 5.0, 6.0 |      |      |      |       |       |       |
|                 | mm           | 13, 25, 38, 51, 76, 102      |      |      |      |      |      | 25, 51, 76, 102, 127, 152    |      |      |      |       |       |       |
| MAX. PRESSURE   | PSI          | 100                          |      |      |      |      |      |                              |      |      |      |       |       |       |
|                 | bar          | 6.895                        |      |      |      |      |      |                              |      |      |      |       |       |       |
| TEMP. RANGE     | °F           | 20 to 140                    |      |      |      |      |      |                              |      |      |      |       |       |       |
|                 | °C           | -7 to 60                     |      |      |      |      |      |                              |      |      |      |       |       |       |

## IMPACT LOADING

(Composite Bearings ONLY)



$$KE = \frac{1}{2} \frac{W}{g} v^2$$

KE = Energy

w = Weight in Lbs.

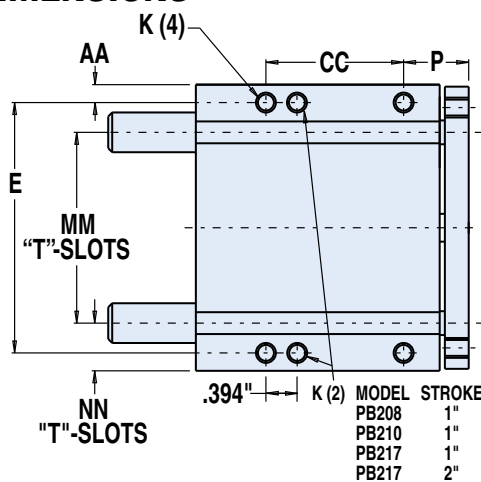
g = 32.2 Ft./sec.<sup>2</sup>  
(gravitational constant)

v = Ft./sec. (velocity)

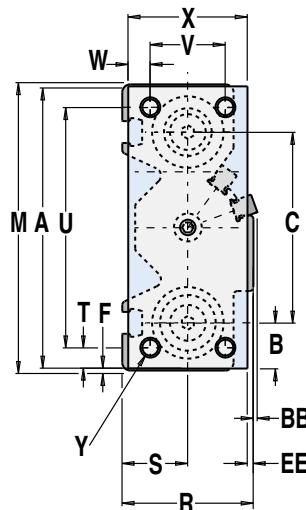
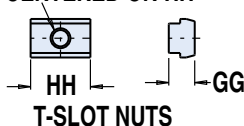
In applications such as conveyor stops impact loading may be a factor. The table below gives the maximum KE energy for each of the PB2 models. Use the above equation to determine the KE for your application. Your result should not exceed the maximum KE for the PB2 model you select.

|    | BORE SIZE |      | MAX. "KE" |       |
|----|-----------|------|-----------|-------|
|    | in        | mm   | in-lbs    | N-m   |
| 08 | 0.500     | 12.7 | 1.08      | 0.12  |
| 10 | 0.625     | 15.9 | 5.64      | 0.64  |
| 17 | 1.063     | 27.0 | 17.88     | 2.02  |
| 20 | 1.250     | 31.8 | 40.80     | 4.61  |
| 32 | 2.000     | 50.8 | 129.60    | 14.64 |
| 52 | 3.250     | 82.6 | 285.60    | 32.27 |

## DIMENSIONS



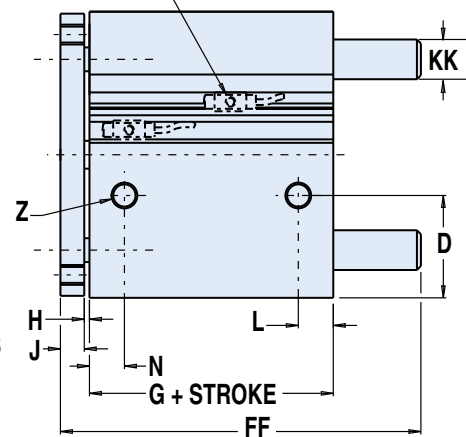
JJ TAPPED HOLE THRU  
CENTERED ON HH



OPTIONAL  
SWITCH



See dimensions  
page PB\_13





# PB2 Power-Block2 Rod Cylinder Slide - All Sizes

## DIMENSIONS



See drawing  
page PB\_12

ABT

MXP

BCZ

BC3

BC4

LS

MG

CC

PB

ENGR

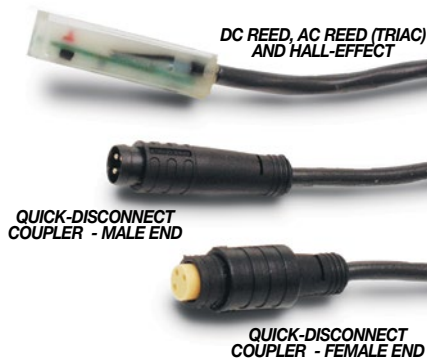
LB = Linear  
Bearing

CB = Composite  
Bearing

| Size                                   | 08              |       | 10               |       | 17                |        | 20                   |        | 32                  |        | 52                  |        |        |
|----------------------------------------|-----------------|-------|------------------|-------|-------------------|--------|----------------------|--------|---------------------|--------|---------------------|--------|--------|
| Bore                                   | 0.500 (12.7)    |       | 0.625 (15.9)     |       | 1.125 (27.0)      |        | 1.250 (31.8)         |        | 2.000 (50.8)        |        | 3.250 (82.6)        |        |        |
| A                                      | 2.190           | 55.6  | 2.380            | 60.5  | 3.380             | 85.9   | 4.440                | 112.8  | 5.440               | 138.2  | 7.280               | 184.9  |        |
| B                                      | 0.33            | 8.4   | 0.39             | 9.9   | 0.55              | 14.0   | 0.72                 | 18.3   | 0.81                | 20.6   | 0.89                | 22.6   |        |
| C                                      | 1.53            | 38.9  | 1.59             | 40.5  | 2.28              | 57.9   | 3.00                 | 76.2   | 3.81                | 96.9   | 5.50                | 139.7  |        |
| D                                      | 1.120           | 28.4  | 1.220            | 31.0  | 1.200             | 30.5   | 1.610                | 40.9   | 1.670               | 42.4   | 2.110               | 53.6   |        |
| E                                      | 1.969           | 50.0  | 2.126            | 54.0  | 2.992             | 76.0   | 3.937                | 100.0  | 4.882               | 124.0  | 6.535               | 166.0  |        |
| F                                      | 0.031           | 0.8   | 0.031            | 0.8   | 0.047             | 1.2    | 0.031                | 0.8    | 0.031               | 0.8    | 0.047               | 1.2    |        |
| G                                      | 1.738           | 44.1  | 1.795            | 45.6  | 1.881             | 47.8   | 1.834                | 46.6   | 2.297               | 58.3   | 2.693               | 68.4   |        |
| H                                      | 0.063           | 1.6   | 0.063            | 1.6   | 0.063             | 1.6    | 0.082                | 2.1    | 0.063               | 1.6    | 0.063               | 1.6    |        |
| J                                      | 0.38            | 9.7   | 0.38             | 9.7   | 0.38              | 9.7    | 0.38                 | 9.7    | 0.50                | 12.7   | 0.63                | 16.0   |        |
| K                                      | #8-32x.34DP (4) |       | #10-24x.38DP (4) |       | 1/4-20x.44 DP (4) |        | 5/16-18 x .44 DP (4) |        | 3/8-16 x .56 DP (4) |        | 1/2-13 x .75 DP (4) |        |        |
| L                                      | 0.60            | 15.2  | 0.55             | 14.0  | 0.52              | 13.2   | 0.53                 | 13.5   | 0.58                | 14.7   | 0.69                | 17.5   |        |
| M                                      | 2.25            | 57.2  | 2.44             | 62.0  | 3.47              | 88.1   | 4.50                 | 114.3  | 5.50                | 139.7  | 7.37                | 187.2  |        |
| N                                      | 0.47            | 11.9  | 0.50             | 12.7  | 0.52              | 13.2   | 0.53                 | 13.5   | 0.58                | 14.7   | 0.69                | 17.5   |        |
| P                                      | 0.87            | 22.0  | 0.91             | 23.0  | 0.95              | 24.0   | 1.02                 | 26.0   | 1.14                | 29.0   | 1.54                | 39.0   |        |
| R                                      | 1.11            | 28.2  | 1.33             | 33.8  | 1.72              | 43.7   | 2.06                 | 52.3   | 2.48                | 63.0   | 3.77                | 95.8   |        |
| S                                      | 0.52            | 13.2  | 0.67             | 17.0  | 0.83              | 21.1   | 1.03                 | 26.2   | 1.23                | 31.2   | 1.89                | 48.0   |        |
| T                                      | 0.15            | 3.8   | 0.16             | 4.1   | 0.31              | 7.9    | 0.33                 | 8.4    | 0.36                | 9.1    | 0.49                | 12.4   |        |
| U                                      | 1.890           | 48.01 | 2.047            | 51.99 | 2.756             | 70.00  | 3.780                | 96.01  | 4.724               | 119.99 | 6.299               | 159.99 |        |
| V                                      | 0.551           | 14.00 | 0.630            | 16.00 | 1.024             | 26.01  | 1.181                | 30.00  | 1.575               | 40.01  | 2.362               | 59.99  |        |
| W                                      | 0.16            | 4.1   | 0.19             | 4.8   | 0.24              | 6.1    | 0.35                 | 8.9    | 0.37                | 9.4    | 0.57                | 14.5   |        |
| X                                      | 0.88            | 22.4  | 1.00             | 25.4  | 1.50              | 38.1   | 1.88                 | 47.8   | 2.38                | 60.5   | 3.50                | 88.9   |        |
| Y                                      | #8-32 Thru (4)  |       | #10-24 Thru (4)  |       | 1/4-20 Thru (4)   |        | 5/16-18 Thru (4)     |        | 3/8-16 Thru (4)     |        | 1/2-13 Thru (4)     |        |        |
| Z                                      | 10-32UNF (2)    |       | 10-32UNF (2)     |       | 1/8 NPT (2)       |        | 1/8-27 NPT (2)       |        | 1/4-18 NPT (2)      |        | 3/8-18 NPT (2)      |        |        |
| AA                                     | 0.14            | 3.6   | 0.16             | 4.1   | 0.24              | 6.1    | 0.28                 | 7.1    | 0.31                | 7.9    | 0.42                | 10.7   |        |
| BB                                     | 0.05            | 1.3   | 0.08             | 2.0   | 0.18              | 4.6    | 0.06                 | 1.5    | -                   | -      | -                   | -      |        |
| CC - STROKE LENGTH                     | 0.5             | 0.591 | 15.01            | 0.669 | 16.99             | NA     |                      |        |                     |        |                     |        |        |
|                                        | 1.0             | 1.378 | 35.00            | 1.457 | 37.01             | 1.575  | 40.01                | 1.181  | 30.00               | 1.378  | 35.00               | 1.575  | 40.01  |
|                                        | 1.5             | 1.772 | 45.01            | 1.850 | 46.99             | NA     |                      |        |                     |        |                     |        |        |
|                                        | 2.0             | 2.165 | 54.99            | 2.244 | 57.00             | 2.362  | 59.99                | 2.165  | 54.99               | 2.362  | 59.99               | 2.559  | 65.00  |
|                                        | 3.0             | 3.150 | 80.01            | 3.228 | 81.99             | 3.346  | 84.99                | 3.150  | 80.01               | 3.346  | 84.99               | 3.543  | 89.99  |
|                                        | 4.0             | 4.134 | 105.00           | 4.213 | 107.01            | 4.331  | 110.01               | 4.134  | 105.00              | 4.331  | 110.01              | 4.528  | 115.01 |
|                                        | 5.0             | NA    |                  |       |                   | 5.315  | 135.00               | 5.118  | 130.00              | 5.315  | 135.00              | 5.512  | 140.00 |
| 6.0                                    | NA              |       |                  |       | 6.299             | 159.99 | 6.102                | 154.99 | 6.299               | 159.99 | 6.496               | 165.00 |        |
| EE                                     | 0.08            | 2.0   | 0.17             | 4.3   | 0.08              | 2.0    | 0.09                 | 2.3    | 0.03                | 0.8    | 0.12                | 3.0    |        |
| FF - Linear Bearing / Stroke Length    | 0.5             | 2.67  | 67.8             | 2.86  | 72.6              | NA     |                      |        |                     |        |                     |        |        |
|                                        | 1.0             | 3.17  | 80.5             | 3.36  | 85.3              | 4.14   | 105.2                | 3.17   | 80.5                | 3.43   | 87.1                | 4.19   | 106.4  |
|                                        | 1.5             | 3.67  | 93.2             | 3.86  | 98.0              | NA     |                      |        |                     |        |                     |        |        |
|                                        | 2.0             | 4.17  | 105.9            | 4.36  | 110.7             | 5.14   | 130.6                | 5.67   | 144.0               | 6.06   | 153.9               | 5.19   | 131.8  |
|                                        | 3.0             | 5.17  | 131.3            | 5.36  | 136.1             | 6.14   | 156.0                | 6.67   | 169.4               | 7.06   | 179.3               | 8.44   | 214.4  |
|                                        | 4.0             | 6.17  | 156.7            | 6.36  | 161.5             | 7.14   | 181.4                | 7.67   | 194.8               | 8.06   | 204.7               | 9.44   | 239.8  |
|                                        | 5.0             | NA    |                  |       |                   | 8.14   | 206.8                | 8.67   | 220.2               | 9.06   | 230.1               | 10.44  | 265.2  |
| 6.0                                    | NA              |       |                  |       | 9.14              | 232.2  | 9.67                 | 245.6  | 10.06               | 255.5  | 11.44               | 290.6  |        |
| FF - Composite Bearing / Stroke Length | 0.5             | 2.67  | 67.8             | 2.86  | 72.6              | NA     |                      |        |                     |        |                     |        |        |
|                                        | 1.0             | 3.17  | 80.5             | 3.36  | 85.3              | 4.14   | 105.2                | 3.92   | 99.6                | 4.43   | 112.5               | 4.94   | 125.5  |
|                                        | 1.5             | 3.67  | 93.2             | 3.86  | 98.0              | NA     |                      |        |                     |        |                     |        |        |
|                                        | 2.0             | 4.17  | 105.9            | 4.36  | 110.7             | 5.14   | 130.6                | 5.67   | 144.0               | 6.06   | 153.9               | 5.94   | 150.9  |
|                                        | 3.0             | 5.17  | 131.3            | 5.36  | 136.1             | 6.14   | 156.0                | 6.67   | 169.4               | 7.06   | 179.3               | 8.44   | 214.4  |
|                                        | 4.0             | 6.17  | 156.7            | 6.36  | 161.5             | 7.14   | 181.4                | 7.67   | 194.8               | 8.06   | 204.7               | 9.44   | 239.8  |
|                                        | 5.0             | NA    |                  |       |                   | 8.14   | 206.8                | 8.67   | 220.2               | 9.06   | 230.1               | 10.44  | 265.2  |
| 6.0                                    | NA              |       |                  |       | 9.14              | 232.2  | 9.67                 | 245.6  | 10.06               | 255.5  | 11.44               | 290.6  |        |
| GG                                     | 0.22            | 5.6   | 0.22             | 5.6   | 0.25              | 6.4    | 0.25                 | 6.4    | 0.41                | 10.4   | 0.41                | 10.4   |        |
| HH                                     | 0.66            | 16.8  | 0.66             | 16.8  | 0.75              | 19.1   | 0.75                 | 19.1   | 0.94                | 23.9   | 0.94                | 23.9   |        |
| JJ                                     | 10-24           |       | 10-24            |       | 1/4-20            |        | 1/4-20               |        | 5/16-18             |        | 5/16-18             |        |        |
| KK - Shaft Ø                           | LB              | 0.250 | 6.35             | 0.375 | 9.53              | 0.500  | 12.70                | 0.625  | 15.88               | 0.750  | 19.05               | 1.000  | 25.40  |
|                                        | CB              | 0.375 | 9.53             | 0.500 | 12.70             | 0.750  | 19.05                | 0.875  | 22.23               | 1.000  | 25.40               | 1.250  | 31.75  |
| MM                                     | 0.781           | 19.8  | 1.438            | 36.5  | 2.125             | 54.0   | 3.000                | 76.2   | 3.625               | 92.1   | 5.188               | 131.8  |        |
| NN                                     | 0.73            | 18.5  | 0.50             | 12.7  | 0.67              | 17.0   | 0.75                 | 19.1   | 0.94                | 23.9   | 1.09                | 27.7   |        |

# PB & PB2 Switches - All Sizes

## SWITCHES



There are 10 sensing choices: DC reed, form A (open) or form C (open or closed); AC reed (Triac, open); Hall-effect, sourcing, PNP (open); Hall-effect, sinking, NPN (open); each with either flying leads or QD (quick disconnect). Commonly used to send analog signals to PLC (programmable logic controllers), TLL, CMOS circuit or other controller device. These switches are activated by the actuator's magnet.

Switches contain reverse polarity protection. QD cables are shielded; shield should be terminated at flying lead end.

If necessary to remove factory installed switches, be sure to reinstall on the same of side of actuator with scored face of switch toward internal magnet.

## SPECIFICATIONS

|                              |                                     | REED DC                                                                           |                                     |           |                          | REED AC                    |                                      | HALL-EFFECT DC |                                                                                     |           |  |
|------------------------------|-------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------|-----------|--------------------------|----------------------------|--------------------------------------|----------------|-------------------------------------------------------------------------------------|-----------|--|
| ORDER CODE                   | RT                                  | RM                                                                                | BT                                  | BM        | CT                       | CM                         | TT                                   | TM             | KT                                                                                  | KM        |  |
| LEAD                         | 5m                                  | QD*                                                                               | 5m                                  | QD*       | 5m                       | QD*                        | 5m                                   | QD*            | 5m                                                                                  | QD*       |  |
| CABLE SHIELDING              | Unshielded                          | Shielded†                                                                         | Unshielded                          | Shielded† | Unshielded               | Shielded†                  | Unshielded                           | Shielded†      | Unshielded                                                                          | Shielded† |  |
| SWITCHING LOGIC              | "A" Normally Open                   |                                                                                   | "C" Normally Open or Closed         |           | Triac Normally Open      |                            | PNP (Sourcing) Normally Open         |                | NPN (Sinking) Normally Open                                                         |           |  |
| MECHANICAL CONTACTS          | Single-Pole Single-Throw            |                                                                                   | Single-Pole Double-Throw            |           | Single-Pole Single-Throw |                            | NO, These Are Solid State Components |                |                                                                                     |           |  |
| COIL DIRECT                  | Yes                                 |                                                                                   | Yes                                 |           | Yes                      |                            | —                                    |                |                                                                                     |           |  |
| POWER LED                    | None                                |  |                                     | None      |                          | None                       |                                      | None           |  |           |  |
| SIGNAL LED                   | Red                                 |                                                                                   |                                     |           |                          |                            |                                      | Red            |                                                                                     |           |  |
| OPERATING VOLTAGE            | 200 Vdc max.                        |                                                                                   | 120 Vdc max.                        |           | 120 Vac max.             |                            | 5 - 25 Vdc                           |                |                                                                                     |           |  |
| OUTPUT RATING                | —                                   |                                                                                   |                                     |           | —                        |                            | 25 Vdc, 200mA dc                     |                |                                                                                     |           |  |
| OPERATING TIME               | 0.6 msec max.<br>(including bounce) |                                                                                   | 0.7 msec max.<br>(including bounce) |           | —                        |                            | < 10 micro sec.                      |                |                                                                                     |           |  |
| OPERATING TEMPERATURE        | -40°F [-40°C] to 158°F [70°C]       |                                                                                   |                                     |           |                          |                            | 0°F [-18°C] to 150°F [66°C]          |                |                                                                                     |           |  |
| RELEASE TIME                 | 1.0 msec. max.                      |                                                                                   |                                     |           | —                        |                            | —                                    |                |                                                                                     |           |  |
| ON TRIP POINT                | —                                   |                                                                                   |                                     |           | —                        |                            | 150 Gauss maximum                    |                |                                                                                     |           |  |
| OFF TRIP POINT               | —                                   |                                                                                   |                                     |           | —                        |                            | 40 Gauss minimum                     |                |                                                                                     |           |  |
| **POWER RATING (WATTS)       | 10.0 §                              |                                                                                   | 3.0 §§                              |           | 10.0                     |                            | 5.0                                  |                |                                                                                     |           |  |
| VOLTAGE DROP                 | 2.6 V typical at 100 mA             |                                                                                   | NA                                  |           | —                        |                            | —                                    |                |                                                                                     |           |  |
| RESISTANCE                   | 0.1 Ω Initial (Max.)                |                                                                                   |                                     |           | —                        |                            | —                                    |                |                                                                                     |           |  |
| CURRENT CONSUMPTION          | —                                   |                                                                                   |                                     |           | 1 Amp at<br>86°F [30°C]  | 0.5 Amp at<br>140°F [60°C] | 200 mA at 25 Vdc                     |                |                                                                                     |           |  |
| FREQUENCY                    | —                                   |                                                                                   |                                     |           | 47 - 63 Hz               |                            | —                                    |                |                                                                                     |           |  |
| CABLE MIN.<br>BEND<br>RADIUS | STATIC                              | 0.630" [16mm]                                                                     |                                     |           |                          |                            |                                      |                |                                                                                     |           |  |
|                              | DYNAMIC                             | Not Recommended                                                                   |                                     |           |                          |                            |                                      |                |                                                                                     |           |  |

**CAUTION: DO NOT OVER TIGHTEN SWITCH HARDWARE WHEN INSTALLING!**

**\*\* WARNING:** Do not exceed power rating (Watt = Voltage X Amperage). Permanent damage to sensor will occur.

\*QD = Quick Disconnect; Male coupler is located 6" [152mm] from sensor, Female coupler to flying lead distance is 197" [5m] also see Cable Shielding specification above

**REPLACEMENT OF QD SWITCHES MANUFACTURED BEFORE JULY 1, 1997:** It will be necessary to replace or rewire the female end coupler.



**Reed Switch Life Expectancy:** Up to 200,000,000 cycles (depending on load current, duty cycle and environmental conditions)

†Shielded from the female quick disconnect coupler to the flying leads. Shield should be terminated at flying lead end.

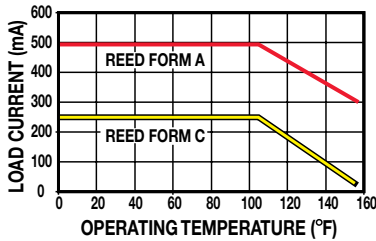
§ Maximum current 500mA (not to exceed 10VA) Refer to Temperature vs. Current graph and Voltage Derating graph

§§ Maximum current 250mA (not to exceed 3VA) Refer to Temperature vs. Current graph and Voltage Derating graph

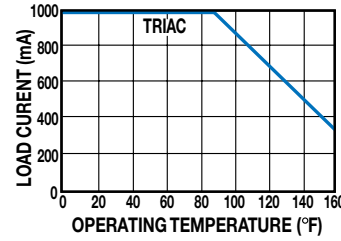
# PB & PB2 Switches - All Sizes

## PERFORMANCE

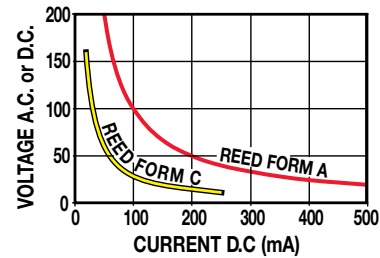
TEMP. vs CURRENT, DC REED



TEMP. vs CURRENT, AC REED

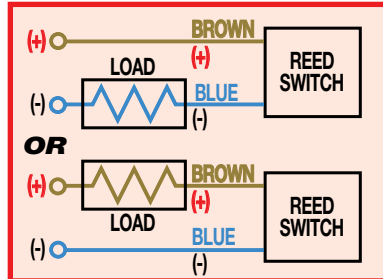


VOLTAGE DERATING, DC REED

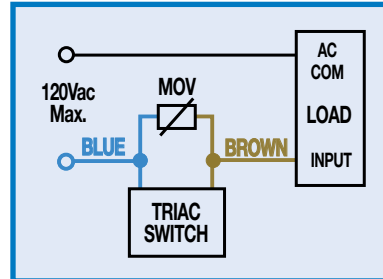


## WIRING DIAGRAMS

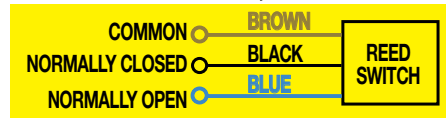
**R T** & **R M** DC REED, FORM A



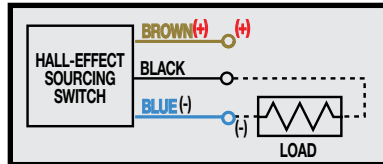
**C T** & **C M** AC REED, TRIAC



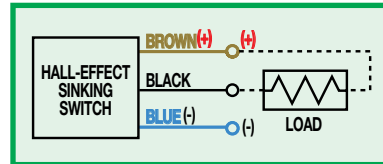
**B T** & **B M** DC REED, FORM C



**T T** & **T M** HALL-EFFECT, SOURCING, PNP



**K T** & **K M** HALL-EFFECT, SINKING, NPN



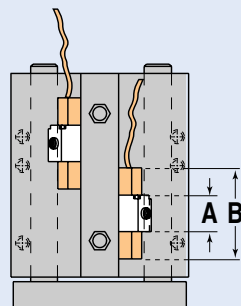
## INSTALLATION INFORMATION



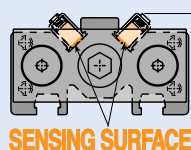
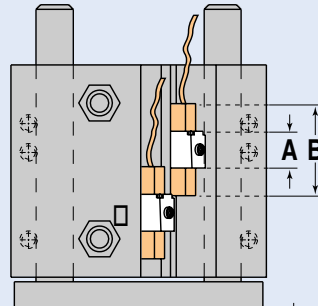
**⚠** THE NOTCHED FACE OF THE SWITCH INDICATES THE SENSING SURFACE AND MUST FACE TOWARD THE MAGNET.

## DIMENSIONS

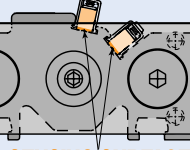
PB208, PB210



PB217, PB220□  
PB232, PB252



SENSING SURFACE



SENSING SURFACE

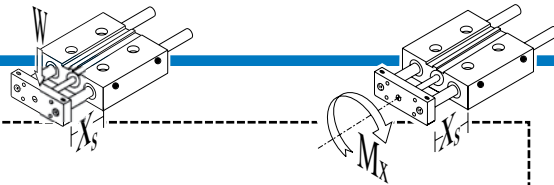
| MODEL | BORE  | A    | B    | C    |
|-------|-------|------|------|------|
| PB208 | 0.500 | 0.50 | 1.25 | 0.25 |
| PB210 | 0.625 | 0.50 | 1.25 | 0.26 |
| PB217 | 1.063 | 0.50 | 1.25 | 0.52 |
| PB220 | 1.250 | 0.50 | 1.25 | 0.48 |
| PB232 | 2.000 | 0.50 | 1.25 | 0.64 |
| PB252 | 3.000 | 0.50 | 1.25 | 0.85 |

Dimensions in inches

| MODEL | BORE  | A     | B     | C     |
|-------|-------|-------|-------|-------|
| PB208 | 12.70 | 12.70 | 31.75 | 6.35  |
| PB210 | 15.88 | 12.70 | 31.75 | 6.60  |
| PB217 | 27.00 | 12.70 | 31.75 | 13.21 |
| PB220 | 31.75 | 12.70 | 31.75 | 12.19 |
| PB232 | 50.80 | 12.70 | 31.75 | 16.26 |
| PB252 | 76.20 | 12.70 | 31.75 | 21.59 |

Dimensions in millimeters

# Application Data Worksheet



## STROKE LENGTH \_\_\_\_\_

☐ inch (S.K.) ☐ millimeters  
(U.S. Standard) (Metric)

## AVAILABLE AIR PRESSURE \_\_\_\_\_

☐ PSI ☐ bar  
(U.S. Standard) (Metric)

## REQUIRED THRUST FORCE \_\_\_\_\_

☐ lbf ☐ N  
(U.S. Standard) (Metric)

## LOAD \_\_\_\_\_

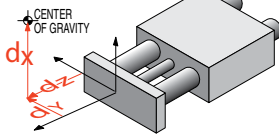
☐ lb ☐ kg  
(U.S. Standard) (Metric)

## LOAD CENTER OF GRAVITY DISTANCE TO TOOLING PLATE CENTER

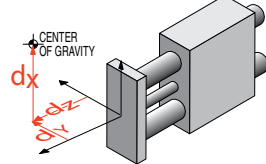
☐ inch ☐ millimeters  
(U.S. Standard) (Metric)

## ORIENTATION

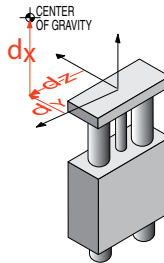
☐ Horizontal



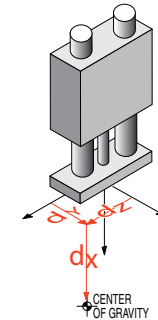
☐ Horizontal Side



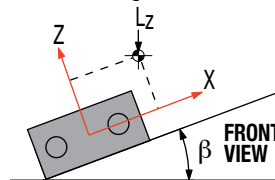
☐ Vertical



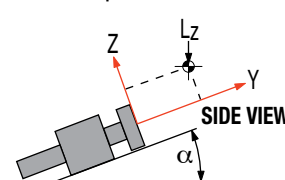
☐ Vertical Down



☐ Angled  $\alpha$  \_\_\_\_\_



$\beta$  \_\_\_\_\_



## OTHER ISSUES:

(i.e. Environment,  
Temperature,  
Contamination, etc.)

Contact information: \_\_\_\_\_

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



Fax (1-763-478-8080) or call Tolomatic (1-800-328-2174) with the above information.  
We will provide any assistance needed to determine the proper actuator.

# Rod Cylinder Slide Selection Guidelines - PB & PB2 - All Sizes

## PROVIDING LOAD GUIDANCE AND SUPPORT

The process of selecting a load bearing actuator for a given application can be complex. **It is highly recommended that you contact Tolomatic or a Tolomatic Distributor for assistance in selecting the best actuator for your application.** The following overview of the selection guidelines are for educational purposes only.

### 1 COMPILE APPLICATION REQUIREMENTS

To determine the appropriate Tolomatic rod cylinder slide for an application, compile the following information:

- Available pressure (PSI)
- Weight of load (lbs. or kgs.)
- Orientation of load (lbs. or kgs.)
- Velocity of load (in./sec. or mm/sec.)
- Stroke length (in. or mm)

Use the Application Data Worksheet on page PB\_16

### 2 SELECT ROD CYLINDER SLIDE SIZE

- Consult the Theoretical Force vs. Pressure graphs

NOTE: Graphs for PB are on pages PB\_4 to 5 and PB2 are on pages PB\_10 to 11.

- Cross-reference the load force (or load weight if force is not known) and the available operating pressure. If the intersection falls below the diagonal line, and if moments do not exceed maximum values listed for that model (see Step 4) the Tolomatic rod cylinder slide will accommodate the application. If the intersection is above the diagonal line, a

larger rod cylinder slide bore size should be considered.

NOTE: Additional force may be required to obtain the necessary acceleration for vertical or horizontal loads.

### 3 DETERMINE EFFECT OF LOAD VS. EXTENDED LENGTH

- Consult the Max. Load Weight vs Stroke Length Chart for the Tolomatic rod cylinder slides.
- Cross-reference the load weight and the extended length. If the intersection falls below the maximum load line, and if moments do not exceed maximum values listed for that model (see Step 4), the rod cylinder slide will accommodate the application. If the intersection is above the diagonal line, a larger rod cylinder slide bore size should be considered.

### 4 DETERMINE NATURE OF LOAD AND THE EFFECT OF BENDING MOMENTS

If the rod cylinder slide will guide and support a load located directly on center of the tooling plate, bending moments will not be a factor in the rod cylinder slide selection.

NOTE: the maximum load weight "W" must not exceed the capacity limits of the rod cylinder slide selected.

- Bending Moments

For off center or side loads, determine the distance from the center of mass of the load to the center of the tooling plate. This measurement is needed to calculate the torque for bending moments.

Should the resulting maximum bending moment exceed figures indicated on the chart, a larger rod cylinder slide should be considered.

### 5 DETERMINE INTERNAL BUMPER CAPACITY [POWER-BLOCK2 ONLY]

- Consult the Load vs Velocity Data Chart for the Power-Block model selected. The velocities listed on the charts are final or bumper impact velocities.
- Cross-reference the final velocity and weight of the load. If the intersection is below the diagonal lines, the internal bumpers on the Power-Block2 may be used. If the point falls above the dashed diagonal line or if the velocity is not known, select a larger rod cylinder slide. On high-cyclic applications, use of external stops is strongly recommended.

### 6 CONSIDER OPTIONS

- Switches— dc Reed, Hall-effect, or ac Triac - (All Models)
- Bumpers and Stop Collars - (Power-Block)
- Dual Tooling Plate (Power-Block)

ABT

IXP

BC2

BC3

BC4

LS

MG

CC

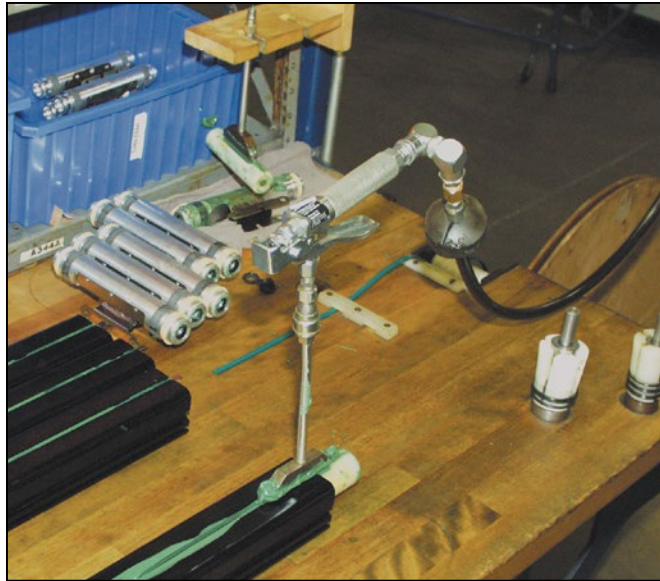
PB

ENGR



# Application Guidelines

The following conditional statements are intended as general guidelines for use of Tolomatic actuators. Since all applications have their own specific operating requirements, consult Tolomatic, Inc. or your local Tolomatic distributor if an application is unconventional or if questions arise regarding the selection process.



## LUBRICATION GUIDELINES

All Tolomatic actuators (except Cable Cylinders) are prelubricated at the factory. To ensure maximum actuator life, the following guidelines should be followed.

- **Filtration**

We recommend the use of dry, filtered air in our products. "Filtered air" means a level of 10 Micron or less. "Dry" means air should be free of appreciable amounts of moisture. Regular maintenance of installed

filters will generally keep excess moisture in check.

- **External Lubricators (optional)**

The factory prelubrication of Tolomatic actuators will provide optimal performance without the use of external lubrication. However, external lubricators can further extend service life of pneumatic actuators if the supply is kept constant.

Oil lubricators, (mist or drop) should supply a minimum of 1 drop per 20 standard cubic feet per minute to the

cylinder. As a rule of thumb, double that rate if water in the system is suspected. Demanding conditions may require more lubricant.

If lubricators are used, we recommend a non-detergent, 20cP @ 140°F 10-weight lubricant. Optimum conditions for standard cylinder operation are +32° to +150°F (+0° to 65.5°C).

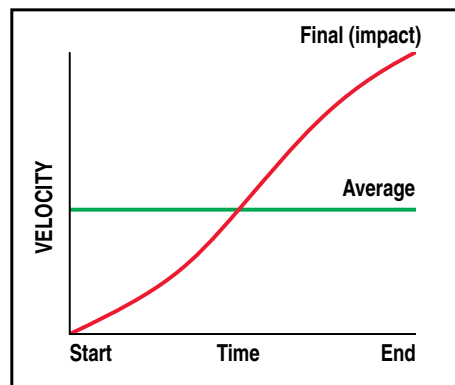
NOTE: Use of external lubricators may wash away the factory installed lubrication. External lubricants must be maintained in a constant supply or the results will be a dry actuator prone to premature wear.

- **Sanitary Environments**

Oil mist lubricators must dispense "Food Grade" lubricants to the air supply. Use fluids with ORAL LD50 toxicity ratings of 35 or higher such as Multitherm® PG-1 or equivalent. Demanding conditions can require a review of the application.

## FINAL VELOCITY CALCULATION

Velocity calculations for all rodless cylinders need to differentiate between final velocity and average velocity. For example: Stroking a 100-inch BC3 model in one second yields an average velocity of 100 inches per second. To properly determine the inertial forces for cushioning, it is important to know the



final (or impact) velocity. Rodless cylinders accelerate and decelerate at each end of the stroke. Therefore this acceleration must be considered (see diagram).

If final (or impact) velocity cannot be calculated directly, a reasonable guideline is to use 2 x average velocity.

# PB & PB2 Service Parts Ordering - ALL Sizes

| PB: Power-Block Rod Cylinder Slide<br>SIZE | Inch (U.S. Standard) |           |           |           |
|--------------------------------------------|----------------------|-----------|-----------|-----------|
|                                            | 06                   | 10        | 17        | 20        |
| Reed Switch Magnet <sup>1</sup>            | 2506-9003            | 2510-9003 | 2517-9003 | 2520-9003 |
| Hall-effect Switch Magnet <sup>1</sup>     | 2506-9004            | 2510-9004 | 2517-9004 | 2520-9004 |
| BP: Stop Collar / Bumper Kit <sup>2</sup>  | 2506-9002            | 2510-9002 | 2517-9002 | 2520-9002 |

| PB2: Power-Block2 Rod Cylinder Slide<br>SIZE | Inch (U.S. Standard) |           |           |           |           |           |
|----------------------------------------------|----------------------|-----------|-----------|-----------|-----------|-----------|
|                                              | 08                   | 10        | 17        | 20        | 32        | 52        |
| TN: T-Nuts                                   | 3410-1013            | 3410-1013 | 3415-1013 | 3415-1013 | 3420-1013 | 3420-1013 |

| CONFIG. CODE ORDERING                         |      |
|-----------------------------------------------|------|
| Mounting Hardware & FE conn. included         |      |
| DESCRIPTION                                   | CODE |
| Switch Kit, Reed, Form C, 5m                  | BT   |
| Switch Kit, Reed, Form C, Male Conn.          | BM   |
| Switch Kit, Reed, Form A, 5m                  | RT   |
| Switch Kit, Reed, Form A, Male Conn.          | RM   |
| Switch Kit, Triac, 5m                         | CT   |
| Switch Kit, Triac, Male Conn.                 | CM   |
| Switch Kit, Hall-effect, Sinking, 5m          | KT   |
| Switch Kit, Hall-effect, Sinking, Male Conn.  | KM   |
| Switch Kit, Hall-effect, Sourcing, 5m         | TT   |
| Switch Kit, Hall-effect, Sourcing, Male Conn. | TM   |

NOTE: When kit is ordered female connector & all mounting hardware is included



## Service Parts Ordering NOTES:

- 1 One Each
- 2 Kit includes: 2 (two) stop collars and 2 (two) 1/4" thick polyurethane external bumpers to help absorb impact shock



## Switch Ordering NOTES:

To order field retrofit switch and hardware kits for all Tolomatic actuators: SW (Then the model and bore size, and type of switch required)

### Example: SWPB10RT

(Hardware and Form A Reed switch with 5 meter lead for 0.625" bore PB Rod Cylinder Slide)



Replacing an existing switch on an actuator manufactured AFTER 7-1-1997

Order using **PART NUMBER** in table above



Replacing an existing switch on an actuator manufactured BEFORE 7-1-1997

Order using **CONFIGURATOR CODE** in table above

If replacing a quick-disconnect switch on an actuator manufactured BEFORE 7-1-1997 it will also be necessary to replace or require the female-end coupler with the in-line splice (see page PB\_13)

# PB & PB2 Ordering - All Sizes

## MODEL, BORE, STROKE, BEARING

## OPTIONS

P B 2 0 S K 3 0 D P B P B M 2

### MODEL & MOUNTING

**PB** Power Block Rod  
Cylinder Slide-  
inch (U.S. Standard)

**PB2** Power Block2 Rod  
Cylinder Slide-  
inch (U.S. Standard)

### PB BORE SIZE

**06** 0.38" (10mm)  
**10** 0.63" (16mm)  
**17** 1.13" (27mm)  
**20** 1.25" (32mm)

### PB2 BORE SIZE

**08** 0.50" (13mm)  
**10** 0.63" (16mm)  
**17** 1.13" (27mm)  
**20** 1.25" (32mm)  
**32** 2.00" (51mm)  
**52** 3.25" (83mm)

### STROKE LENGTH

**SK** Enter desired stroke length from the code number in the table below

| STROKE LENGTH       | ORDER CODE |    |    |    |     |    |    |    |    |    |
|---------------------|------------|----|----|----|-----|----|----|----|----|----|
|                     | PB         |    |    |    | PB2 |    |    |    |    |    |
|                     | 06         | 10 | 17 | 20 | 08  | 10 | 17 | 20 | 32 | 52 |
| <b>0.5" (13mm)</b>  | 05         | 05 |    |    | 05  | 05 |    |    |    |    |
| <b>1.0" (25mm)</b>  | 10         | 10 | 10 | 10 | 10  | 10 | 10 | 10 | 10 | 10 |
| <b>1.5" (38mm)</b>  | 15         | 15 |    |    | 15  | 15 |    |    |    |    |
| <b>2.0" (51mm)</b>  | 20         | 20 | 20 | 20 | 20  | 20 | 20 | 20 | 20 | 20 |
| <b>3.0" (76mm)</b>  |            |    | 30 | 30 | 30  | 30 | 30 | 30 | 30 | 30 |
| <b>4.0" (102mm)</b> |            |    |    |    | 40  | 40 | 40 | 40 | 40 | 40 |
| <b>5.0" (127mm)</b> |            |    |    |    |     |    | 50 | 50 | 50 | 50 |
| <b>6.0" (152mm)</b> |            |    |    |    |     |    | 60 | 60 | 60 | 60 |

### BEARING TYPE

#### PB

Composite Bearings  
- NO Entry Required

#### PB2

**LB** Linear Bearings  
**CB** Composite Bearings

### SWITCHES (PB\_14)

(Quantity desired follows ordering code)

**RM** Reed Switch (Form A) with 5-meter lead/QD (Quick-disconnect)  
**RT** Reed Switch (Form A) with 5-m lead  
**BM** Reed Switch (Form C) with 5-meter lead/QD  
**BT** Reed Switch (Form C) with 5-m lead  
**\*KM** Hall-effect Sinking Switch with 5-meter lead/QD  
**\*KT** Hall-effect Sinking Switch w/ 5-m lead  
**\*TM** Hall-effect Sourcing Switch with 5-meter lead/QD  
**\*TT** Hall-effect Sourcing Switch with 5-meter lead  
**CM** TRIAC Switch with 5-meter lead/QD  
**CT** TRIAC Switch with 5-meter lead  
**\*MDR** Dual Magnet (Reed, Hall-effect, Triac)

\*⊗ Not available for 05 size

### STOP COLLARS/BUMPERS (PB ONLY)

**BP** For Bumpers/Stop Collars

### DUAL TOOLING PLATE (PB ONLY)

**DP** For Dual Tooling Plate

### T-NUTS (PB2 ONLY)

**TN** For T-Nuts, indicate number required

 **Not all codes listed are compatible with all options. Contact Tolomatic with any questions.**



# ENGINEERING RESOURCES



## CONTENTS

|                                  |        |
|----------------------------------|--------|
| Glossary .....                   | ENGR_2 |
| Conversion Tables .....          | ENGR_7 |
| Terms / Conditions of Sale ..... | ENGR_9 |



# Glossary

## A

### ACCELERATION

The change in velocity as a function of time. Acceleration usually refers to increasing velocity, and deceleration to decreasing velocity.

### ACCURACY

A measure of the difference between expected position and actual position.

### ACTUATOR

A mechanism for moving or controlling something indirectly instead of by hand.

### ADJUSTABLE SHOCK ABSORBERS

Used on BC2 and BC3 band cylinders to decelerate heavy loads at high velocities. Tolomatic offers light and heavy duty shock absorbers. The sizing and selection software will automatically choose the correct either light duty or heavy duty as required. When shock absorbers are used on the cylinder internal cushions are not operational. Note: Shock absorber is most effective when stopping load at its center of gravity.

### AMBIENT TEMPERATURE

The temperature of the cooling medium, usually air, immediately surrounding the motor or another device.

### ANODIZING

Protective treatment for aluminum that involves subjecting the metal to electrolytic action in a chemical bath, to create a protective film of aluminum oxide with a very smooth finish. The process is similar to that of hardcoating, but the latter involves

the use of a different, more complex chemical bath and results in a thicker, rougher, extremely brittle coating of aluminum oxide.

### AUXILIARY CARRIER

An option for band cylinders or linear slides that increases the load capacity of the cylinder as well as increasing the capacity of bending moment about the Y axis. Note: internal cushion will not work when auxiliary carrier ordered without piston, it will be necessary to add external shock absorbers.

### AVERAGE VELOCITY

Velocity calculations for all rodless cylinders need to differentiate between final velocity and average velocity. For example: Cycling a 100 inch BC3 model in one direction in one second yields an average velocity of 100 inches per second. To properly determine the inertia forces for cushioning, it is important to know the final (or impact) velocity. Rodless cylinders accelerate and decelerate at each end of the stroke. Therefore this acceleration must be considered. If final velocity cannot be calculated directly, a reasonable guideline is to use 2X average velocity.

### AXIAL LOADING

A load with a force directed along an axis, such as a shaft.

## B

### BALL BEARING

A bearing where the journal turns upon loose, hardened

steel balls that roll easily in a race.

### BAND CYLINDER

A the name for a rodless cylinder using Tolomatic's unique band retention system. Band cylinders feature a central slot. A band-type cylinder uses a bracket directly mounted to the cylinder piston to transmit force. The bracket passes between two bands which then seal the cylinder. The inner sealing band creates a tight metal to metal seal with the internal diameter of the cylinder bore. An outer dust band keeps dust and grit away from the sealing band. Elastomer strips provide a positive, non-magnetic lock. Tolomatic models include: BC2, BC3, BC4

### BAR

The SI Metric unit of pressure equal to one million Dynes per square centimeter. The bar is used to measure both pneumatic and hydraulic pressure. One Bar is equal to 14.5038 pounds per square inch. It is also nearly equivalent to one atmosphere of pressure.

### BASE MOUNT

Base mounting linear slides may be accomplished by fastening directly to "T" slot nuts provided in the base of the slide or by using the base mounting.

### BC2 BAND CYLINDER

The second generation of the original band cylinder, introduced in 1986.

### BC3 BAND CYLINDER

This band cylinder, introduced in 1995, incorporates a ball bearing system in the carrier for high performance.

### BC4 BAND CYLINDER

Introduced in 1996, the BC4 is an economical choice for supported loads.

### BENDING MOMENT

Equivalent torque produced by a force displaced by a known distance from the carriage.

### BREAKAWAY

The minimum amount of force or pressure required to cause the initial movement of a given device such as a cable cylinder piston, a brake piston, or a rotary actuator through a full stroke.

### BRITISH THERMAL UNIT (BTU)

The amount of heat required to raise the temperature of one pound of water by one degree Fahrenheit.

### BUNA-N

A widely used copolymer (artificial rubber) used for making seals. Buna-N seals should never be used with automotive brake fluid.

## C

### CABLE

A wire rope made of twisted strands of material. In the case of cable cylinders, cables are made of strands of galvanized steel which are twisted together in bundles of seven strands each. These bundles, in turn, are twisted around each other. The resulting cable is coated with an extruded nylon covering.

ABT

MXP

BC2

BC3

BC4

LS

MG

CC

PB

ENGR



# Glossary

## CABLE ASSEMBLY

A sub-assembly consisting of the cable ferrules, terminals and gland seals.

## CABLE CYLINDER

A rodless cylinder using cables to transmit force from a piston.

## CABLE CYLINDER REPAIR KIT

A sub-assembly consisting of two cable assemblies and the internal seals (two piston seals, two cushion seals and two tube-sealing O-rings) required to keep a cable cylinder operational.

## CALIPER DISC BRAKE

A form of brake, used to retard, stop or hold action. The brake is called a “caliper” because it is mounted over a rotating disc to which it applies a friction member (puck) to slow, stop or hold the disc.

## CARRIER

Attached to band cylinder or linear slide with bearing system the carrier supports and moves the load. Tolomatic options include: Auxiliary carrier, Dual 180 carrier (BC3 only), Long Carrier (BC4 only).

## CENTER OF GRAVITY

(Center of Mass) The point at which the entire weight of a body may be considered as concentrated so that if supported at this point the body would remain in equilibrium in any position.

## CLEVIS

The name given to the U-shaped cable connecting bracket on a Tolomatic cable cylinder.

## COEFFICIENT OF FRICTION

The measurement of friction of one object sliding across another. Symbolized by the Greek letter Mu ( $\mu$ ) it is defined as the tangent of the angle of repose of a static body. The coefficient is expressed in decimal values (clean iron on clean iron is 1.0, while metal on solid rubber may range from 1.0 up to 4.0). When objects are wet, the coefficient of friction decreases.

## CONFIGURATOR

Name given to the software that uses the configuration string to give instructions to the factory with correct specifications to create your built-to-order actuator.

## CONFIGURATOR STRING

A series of code letters and numbers that Tolomatic uses to create built-to-order actuators.

## CONSTRAINT

Guided and supported in a particular direction, through the use of an external guidance and bearing system.

## CUSHION

A means of slowing down a cylinder piston at the end of its stroke by using an exhaust port with an orifice small enough to restrict the velocity at which the pressure fluid is exhausted.

## CUSTOM PRODUCTS

These products don't resemble any of the products seen in the Tolomatic catalogs. Tell us your performance requirements, we can build a custom product for you.

## CYCLE

- 1) A sequence of operations that is repeated regularly.
- 2) The time it takes for one such sequence to occur.

## CYCLE RATE

The total number of times a complete motion is made from start and return to start in a specific period of time.

## D

### DEAD LENGTH

Dead length is the part of the band cylinder or linear slide required for mounting and mechanisms. The overall length of a band cylinder or linear slide is the stroke length plus the dead length.

### DECELERATION

The opposite of acceleration. Deceleration means diminished velocity or slowing down.

### DEFLECTION

A measurement of the amount of bend under the weight of a load, such as that to which a load-supporting rod or cable is subject.

### DIE-CAST

A metal-forming process similar to injection-molding for plastic. In Die-Casting, molten metal (usually aluminum) is injected into a mold under pressure.

### DOUBLE-ACTING CABLE CYLINDER

Cable cylinder that applies equal force in two directions.

### DOUBLE-PURCHASE CABLE CYLINDER

Cable cylinder that uses additional cable and pulleys to double the velocity and

stroke of cable cylinders.

## DUAL 180 CARRIER

Option for the BC3 that gives greater bending moments without using a larger actuator.

## DUAL MAGNET

Option for BC2 with two magnets, one on each side of the carrier.

## DUST BAND

Part of Tolomatic's unique band retention system, the external band.

## E

### EXTERNAL CUSHIONS

Shock absorbers of some sort used to decelerate the load on a rodless cylinder in cases where the load is too heavy to make use of the cylinder's internal cushions.

### EXTERNAL STOPS

Stops used on the outside of a vane-type rotary actuator to limit the rotation of the unit short of the unit's full cycle.

## F

### FINAL VELOCITY

Velocity calculations for all rodless cylinders need to differentiate between final velocity and average velocity. For example: Cycling a 100 inch BC3 model in one direction in one second yields an average velocity of 100 inches per second. To properly determine the inertia forces for cushioning, it is important to know the final (or impact) velocity. Rodless cylinders accelerate and decelerate at each

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end of the stroke. Therefore this acceleration must be considered. If final velocity cannot be calculated directly, a reasonable guideline is to use 2X average velocity.

## **FLOATING MOUNT (BAND CYLINDERS, MAGNETICALLY COUPLED CYLINDERS)**

An option for use in applications where the load is not guided and supported by the Tolomatic actuator, or when compensating for nonparallelism.

## **FOOT MOUNT**

A mounting plate that attaches a cylinder head to mount the cylinder to a flat surface at a 90° angle.

## **FORCE**

An agency or influence that if applied to a free body results chiefly in an acceleration of the body and sometimes in elastic deformation and other effects.

## **4 PORTED HEAD**

The BC2 features standard 3 ported heads but can be ordered with an additional 4th port in the underside of the head for additional mounting flexibility.

## **FRICTION**

Resistance to relative motion between two bodies in contact, such as steel sliding on steel.

## **H**

### **HALL-EFFECT D.C. SWITCH**

A magnetically-controlled transistor switch controlling DC power. It has no moving parts and theoretically unlimited contact life.

## **HEAD**

A metal component mounted at each end of a rodless pneumatic cylinder. With a cable cylinder, the head has a pulley, ports, mounting holes and provides sealing. On a Band Cylinder, the head provides tube sealing, fluid ports and mounting holes.

## **HUB**

A means of attaching a sprocket, pulley or disc to a shaft.

## **INCH-POUND**

A unit of measure of torque. It is derived from a given force in pounds acting at a given radius in inches (pounds multiplied by inches = inch-pounds). An inch-pound is 1/12th of a foot-pound. Inch-pounds may be converted to the SI Metric equivalent of Newton-meters by multiplying them by 0.1129848. Newton-meters may be converted to inch-pounds by multiplying them by 8.850748.

## **INERTIA**

A measure of an object's resistance to a change in velocity. The larger an object's inertia, the larger the torque required to accelerate or decelerate it. Inertia is a function of an object's mass and shape.

## **K**

### **KEY**

A demountable machine part, which, when assembled into a keyseat, provides a positive means for transmitting

torque between two other machine parts.

## **KEYWAY**

An axially-located groove in the length of a shaft along which a key may be located.

## **KINETIC ENERGY**

The ability to do work based on motion. It is found by multiplying half the mass by the square of the velocity.

## **L**

### **LIMIT SWITCH**

A switch that is actuated by some part or motion of a machine or equipment to alter the electrical circuit associated with it.

## **LINEAR SLIDE**

A rodless cylinder using the same unique band retention system as the band cylinder. The Linear Slide uses a wider extrusion with steel shafts and bearings for additional load support. Tolomatic model: LS

## **LOAD**

A mass or weight supported by the carrier (rodless cylinders) or tooling plate (rod cylinder slides).

## **LONG CARRIER**

An option available for the BC4 the long carrier increases the My and Mz moment load capacity. It also gives a larger mounting surface and virtually eliminates chatter for vertical cantilever loads.

## **M**

### **MAGNETICALLY COUPLED ACTUATOR**

Rodless cylinder and slides featuring a magnetic couple

between the piston and moving carrier.

## **MAGNETIC COUPLING FORCE**

The force created between the piston magnets and the moving carrier (measured in pounds).

## **MODIFIED STANDARD PRODUCTS**

Tolomatic can easily accommodate your special needs. Our standard products are often customized with extra mounting holes, different materials and other requests. This can often be done within our normal 5 day production time. We welcome modifications as well as completely new custom products.

## **N**

### **NEEDLE BEARING**

A type of roller bearing where the journal turns on small-diameter, hardened needle-like rollers which roll easily in a metal race.

## **O**

### **O-RING**

A ring of synthetic rubber with a circular cross-section, used as a gasket or seal.

## **P**

### **PARALLEL PORT**

Metric versions of the BC2, BC3, BC4 and LS have the choice of parallel port and taper port.

## **PISTON**

A sliding component moved by fluid pressure. It usually consists of a short, solid metal cylinder within a cylindrical vessel in which it moves back and forth.

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## PORT

In pneumatic units, the area to make connection to air lines that supply power to the actuator. In electrical units: a connecting unit between a data link and a device.

## POUNDS PER SQUARE INCH OR PSI

A measurement of pressure in the U.S. customary system. By way of comparison, the weight of the atmosphere (one atmosphere) is 14.7 pounds per square inch, at sea level. It is used to express pressure in both pneumatic and hydraulic-powered systems. In the SI Metric system, pressure is measured in Bars. To convert PSI to Bars, take the PSI figure and multiply it by 0.0689476.

## PRESSURE

The force or thrust exerted over a surface divided by its area. In the U.S. customary system, pressure is expressed as Pounds per Square Inch (PSI). In the SI Metric system, it is expressed in Bars.

## PROXIMITY SENSOR

An LED-equipped device for sensing end-of-stroke on cylinder slides. Proximity sensors supply either a sourcing signal or a sinking signal to a device such as a programmable logic controller.

## PULLEY

A sheave or small wheel with a grooved rim used with a cable cylinder to change the direction and point of application of the pulling force

generated by the cylinder's piston.

## Q

### QUAD RING

A sealing ring of synthetic rubber which has 4 sealing lobes and is capable of sealing in two directions.

## R

### REED SWITCH

Tolomatic's Form A Reed Switch is an LED-equipped 0.5 ampere switch consisting of ferromagnetic blades brought into contact when a magnet passes nearby. Reed switches are used for signaling position only.

### RELATIVE HUMIDITY

A ratio that indicates the amount of water vapor in the air. It is usually expressed as a percentage. At any temperature, it is the amount of water vapor in the air, divided by the amount that would be present at saturation.

### RMS (ROOT MEAN SQUARE)

An industry-accepted standard for measuring the smoothness of a surface finish. Under a microscope, all surface finishes have peaks and valleys. The more peaks and valleys, the rougher the finish and the higher the RMS value. The smaller the RMS number, the smoother the finish.

### ROCKWELL

Industry-accepted standard for definition of hardness.

### ROD CYLINDER

A cylinder using a rod at-

tached to its piston to transmit force. Tolomatic models include: RCS and PB2.

### RODLESS CYLINDER

An actuator that contains the stroke within the cylinder itself. Tolomatic models include: BC2, BC3, BC4, LS, MG, MGS, CC, SA, DP, and TC.

### ROLLER BEARING

An anti-friction device consisting of a journal which rests on free-rolling, hardened cylinders in a race.

## S

### SCHEMATIC

A diagram of a circuit in which symbols illustrate circuit components.

### SEAL

An object used to retain air pressure, water, hydraulic fluid or oil in a vessel. In the Tolomatic product line, seals are made of an elastomer, which is any of a variety of synthetic rubber compounds.

### SEALING BAND

The stainless steel strap which is part of Tolomatic's unique band retention system, the internal band.

### SHIELDING

The practice of confining the electrical field around a conductor to the primary insulation of the cable by putting a conducting layer over and/or under the cable insulation. (External shielding is a conducting layer on the outside of the cable insulation. Strand or internal shielding is a conducting layer over the wire insulation.)

## SHOCK ABSORBERS

A self contained hydraulic device commonly used on rodless cylinders, rodless slides and rod cylinder slides to decelerate heavy loads at high velocities.

## SIGNAL

The event, phenomenon, or electrical quantity that conveys information from one point to another.

## SINGLE-ACTING CABLE CYLINDER

Cable cylinder that applies force in one direction and uses gravity (generally) to return to home position.

## SINGLE END PORTING

Single end porting simplifies air hook up, allows running air lines to just one end of the actuator. Unless otherwise specified single end porting is factory installed on the right side of the actuator. Available for the BC3 and BC4.

## SNAP-IN SEAL®

A unique method of installing seals in cable cylinder heads without using tools. It includes a plastic washer, which, when pulled into a cable cylinder head cable port, snaps into a groove and holds the seal arrangement in place.

## SOLID STATE DEVICES

Electronic components that control electron flow through solid materials (e.g., transistors, diodes, or integrated circuits).

## STROKE LENGTH

Stroke length is the distance

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that the carrier and its load will move on the band cylinder or linear slide.

## **SURGE**

A transient variation in the current or potential at a point in the circuit.

## **SWITCH MAGNETS**

Located on the carrier or piston magnets are needed for switches to sense position of carrier. On the BC3 and BC4 the switch magnet is a standard feature, attached to the piston. On the BC2 and LS the switch magnet is only included if switch is ordered. Magnets are easily inserted into carrier for field retrofitting.

## **SWITCH MAGNETS (DUAL)**

The BC2 optionally can have dual switch magnets, one on each side of the carrier.

## **SWITCHES**

For signaling position Tolomatic has 5 different switches available. These switches are available with a 5 meter lead, or with a quick-disconnect connector and 5 meter lead.

## **SYSTEM**

A collection of units combined to work as a larger integrated unit having the capabilities of all of the separate units.

## **T**

### **T-NUTS**

For intermediate support, tube support brackets can be mounted to the BC2, BC3, and BC4 models. For the

BC3 and BC4 the T-Nuts, that are needed for the brackets, must also be ordered.

## **TAPER PORT**

Metric versions of the BC2, BC3, BC4 and LS have the choice of parallel port and taper port.

## **TENSILE STRENGTH**

The greatest longitudinal stress a substance can bear without permanent deformation.

## **TERMINAL**

A threaded device attached to the end of a cable cylinder assembly for convenience in making connections and adjustments. One terminal is attached to the piston, while the other is attached to the bracket (clevis).

## **TOLERANCE**

A specified allowance for error from a desired or measured quantity.

## **TORQUE**

A force that produces rotation. A turning or twisting force. (From the Latin *torquere* - to twist. Also the root word for torture.)

## **TRACK CABLE CYLINDER**

A cable cylinder with hardened ground shafts and a guided carrier within linear bearings, giving the cylinder the ability to guide and support moderate work loads.

## **TRIAC AC REED SWITCH**

These switches are designed for signaling end-of-stroke position to devices such as programmable controllers. They can be used to operate

ac relays and solenoids if a protection circuit is used and if current and voltage limits are observed.

## **TUBE DEFLECTION**

Due to the nature of loads and aluminum extrusions tube deflection will occur if cylinder (linear slide) is supported only on the ends without tube supports at recommended intervals along length of cylinder.

## **TUBE SUPPORTS**

Optional accessory for band cylinders and linear slides (base mount) to prevent tube deflection.

## **U**

### **U-CUP**

A synthetic rubber component with lips along its inner and outer circumferences giving a cross-section the appearance of the letter "U". When under pressure, the lips flare out, providing a tight seal in one direction and minimal drag from the non-pressurized side.

## **UNITS**

U.S. customary: A system of weights and measures based on the pound and inches. Metric: A decimal system of weights and measures based on the kilogram and meter.

## **V**

### **VALUE**

A number that represents a computed or assigned quantity; or, a number contained in a data table or data file word.

## **VITON®**

A DuPont Chemical Co. trademark for a fluorocarbon rubber used in high temperature applications. At Tolomatic, Viton® is used for seals in high temperature situations and for brakes designed to be operated with non-flammable hydraulic fluids such as phosphate-ester.

## **VOLT**

Unit of electromotive force. It is the difference of potential required to make a current of one ampere flow through a resistance of one ohm.

## **VOLTAGE**

The term most often used in place of electromotive force, potential, potential difference, or voltage drop. It describes the electric pressure that exists between two points and is capable of producing a flow or current when a closed circuit is connected between the two points.

## **VOLTAGE RATING**

The maximum voltage at which a given device may be safely maintained during continuous use in a normal manner. It is also called working voltage.

## **W**

### **WATT**

A unit of power or a rate of doing work. The power dissipated by a one ohm resistor with one ampere of current is one watt.



# Conversion Tables

To convert from A to B, multiply by entry in table

| LENGTH | B  |         |         |         |       |       |        |
|--------|----|---------|---------|---------|-------|-------|--------|
|        | in | ft      | yd      | mm      | cm    | m     |        |
| A      | in | 1       | 0.0833  | 0.028   | 25.4  | 2.54  | 0.0254 |
|        | ft | 12      | 1       | 0.333   | 304.8 | 30.48 | 0.3048 |
|        | yd | 36      | 3       | 1       | 914.4 | 91.44 | 0.914  |
|        | mm | 0.03937 | 0.00328 | 0.00109 | 1     | 0.1   | 0.001  |
|        | cm | 0.3937  | 0.03281 | 0.0109  | 10    | 1     | 0.01   |
|        | m  | 39.37   | 3.281   | 1.09    | 1000  | 100   | 1      |

| MASS | B     |       |         |                        |                        |         |
|------|-------|-------|---------|------------------------|------------------------|---------|
|      | gm    | kg    | slug    | lb(m)                  | oz(m)                  |         |
| A    | gm    | 1     | 0.001   | $6.852 \times 10^{-5}$ | $2.205 \times 10^{-3}$ | 0.03527 |
|      | kg    | 1000  | 1       | $6.852 \times 10^{-2}$ | 2.205                  | 35.274  |
|      | slug  | 14590 | 14.59   | 1                      | 32.2                   | 514.72  |
|      | lb(m) | 453.6 | 0.45359 | 0.0311                 | 1                      | 16      |
|      | oz(m) | 28.35 | 0.02835 | $1.94 \times 10^{-3}$  | 0.0625                 | 1       |

| PRESSURE | B        |          |          |                  |                  |               |                 |          |
|----------|----------|----------|----------|------------------|------------------|---------------|-----------------|----------|
|          | atm      | bar      | millibar | lbs/sqr ft (PSF) | lbs/sqr in (PSI) | N/sqr m (NSM) | N/sqr mm (NSMM) |          |
| A        | atm      | 1        | 1.01325  | 1013.25          | 2,116.22         | 14.6454       | 101,325         | 0.101325 |
|          | bar      | 0.986923 | 1        | 1000             | 2088.54          | 14.5037       | 100,000         | 0.1      |
|          | millibar | 0.000987 | 0.001    | 1                | 2.08854          | 0.014504      | 100             | 0.0001   |
|          | PSF      | 0.000473 | 0.000479 | 0.478803         | 1                | 0.006944      | 47.88           | 0.000048 |
|          | PSI      | 0.068046 | 0.068948 | 68.94757         | 144              | 1             | 6,894.757       | 0.006895 |
|          | NSM      | 0.00001  | 0.00001  | 0.01             | 0.020885         | 0.000145      | 1               | 0.000001 |
|          | NSMM     | 98,692   | 10       | 10,000           | 20885.43         | 145.0377      | 1,000,000       | 1        |

| FORCE | B     |                        |         |                     |                       |                       |         |
|-------|-------|------------------------|---------|---------------------|-----------------------|-----------------------|---------|
|       | lb(f) | N                      | dyne    | oz(f)               | kg(f)                 | gm(f)                 |         |
| A     | lb(f) | 1                      | 4.4482  | $4.448 \times 10^5$ | 16                    | 0.45359               | 453.6   |
|       | N     | 0.22481                | 1       | 100,000             | 3.5967                | 0.10197               | 101.97  |
|       | dyne  | $2.248 \times 10^{-6}$ | 0.00001 | 1                   | $3.59 \times 10^{-5}$ | $1.02 \times 10^{-6}$ | 0.00102 |
|       | oz(f) | 0.0625                 | 0.27801 | $2.78 \times 10^4$  | 1                     | 0.02835               | 28.35   |
|       | kg(f) | 2.205                  | 9.80665 | 980,665             | 35.274                | 1                     | 1000    |
|       | gm(f) | $2.205 \times 10^{-3}$ | 0.0098  | 980.665             | 0.03527               | 0.001                 | 1       |

| POWER | B                 |       |                       |                       |                       |                      |      |
|-------|-------------------|-------|-----------------------|-----------------------|-----------------------|----------------------|------|
|       | Watts             | KW    | hp (US customary)     | hp (Metric)           | ft-lb/s               | in-lb/s              |      |
| A     | Watts             | 1     | $1 \times 10^{-3}$    | $1.34 \times 10^{-3}$ | $1.36 \times 10^{-3}$ | 0.74                 | 8.88 |
|       | kw                | 1000  | 1                     | 1.34                  | 1.36                  | 738                  | 8880 |
|       | hp (US customary) | 746   | 0.746                 | 1                     | 1.01                  | 550                  | 6600 |
|       | hp (Metric)       | 736   | 0.736                 | 0.986                 | 1                     | 543                  | 6516 |
|       | ft-lb/s           | 1.36  | $1.36 \times 10^{-3}$ | $1.82 \times 10^{-3}$ | $1.84 \times 10^{-3}$ | 1                    | 12   |
|       | in-lb/s           | 0.113 | $1.13 \times 10^{-4}$ | $1.52 \times 10^{-4}$ | $1.53 \times 10^{-4}$ | $8.3 \times 10^{-2}$ | 1    |

| ABBREVIATED TERMS |                    |
|-------------------|--------------------|
| atm               | = atmosphere (STD) |
| C                 | = Celsius          |
| cm                | = centimeter       |
| F                 | = Fahrenheit       |
| ft                | = foot             |
| g                 | = gravity          |
| gm                | = gram             |
| gm(f)             | = gram force       |
| hp                | = horse power      |
| in                | = inch             |
| kg                | = kilogram         |
| kg(f)             | = kilogram force   |
| kw                | = Kilowatt         |
| lb(f)             | = pound force      |
| lb(m)             | = pound mass       |
| min               | = minute           |
| mm                | = millimeter       |
| m                 | = meter            |
| N                 | = Newton           |
| oz(f)             | = ounce force      |
| oz(m)             | = ounce mass       |
| rad               | = radians          |
| rpm               | = revs per minute  |
| rps               | = revs per second  |
| s                 | = seconds          |
| sqr               | = square           |

ABT

MXP

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# Conversion Tables

To convert from A to B, multiply by entry in table

| TORQUE |         | B                       |                          |                          |                           |                          |                          |                          |                          |
|--------|---------|-------------------------|--------------------------|--------------------------|---------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
|        |         | dyne-cm                 | gm-cm                    | oz-in                    | kg-cm                     | lb-in                    | N-m                      | lb/ft                    | kg/m                     |
| A      | dyne-cm | 1                       | 1.019 x 10 <sup>-2</sup> | 1.416 x 10 <sup>-5</sup> | 1.0197 x 10 <sup>-6</sup> | 8.850 x 10 <sup>-7</sup> | 10 <sup>-7</sup>         | 7.375 x 10 <sup>-6</sup> | 1.019 x 10 <sup>-6</sup> |
|        | gm-cm   | 980.665                 | 1                        | 1.388 x 10 <sup>-2</sup> | .001                      | 8.679 x 10 <sup>-4</sup> | 9.806 x 10 <sup>-5</sup> | 7.233 x 10 <sup>-5</sup> | 10 <sup>-5</sup>         |
|        | oz-in   | 7.061 x 10 <sup>4</sup> | 72.007                   | 1                        | 7.200 x 10 <sup>-2</sup>  | 6.25 x 10 <sup>-2</sup>  | 7.061 x 10 <sup>-3</sup> | 5.208 x 10 <sup>-3</sup> | 7.200 x 10 <sup>-4</sup> |
|        | kg-cm   | 9.806 x 10 <sup>5</sup> | 1000                     | 13.877                   | 1                         | 0.8679                   | 9.806 x 10 <sup>-2</sup> | 7.233 x 10 <sup>-2</sup> | 0.001                    |
|        | lb-in   | 1.129 x 10 <sup>6</sup> | 1.152 x 10 <sup>3</sup>  | 16                       | 1.152                     | 1                        | 0.112                    | 8.333 x 10 <sup>-2</sup> | 1.152 x 10 <sup>-2</sup> |
|        | N-m     | 10 <sup>7</sup>         | 1.019 x 10 <sup>4</sup>  | 141.612                  | 10.197                    | 8.85                     | 1                        | 0.737                    | 0.102                    |
|        | lb-ft   | 1.355 x 10 <sup>7</sup> | 1.382 x 10 <sup>4</sup>  | 192                      | 13.825                    | 12                       | 1.355                    | 1                        | 0.138                    |
|        | kg-m    | 9.806 x 10 <sup>7</sup> | 105                      | 1.388 x 10 <sup>3</sup>  | 100                       | 86.796                   | 9.806                    | 7.233                    | 1                        |

| INERTIA<br>(ROTARY) |                      |  NOTE: Mass inertia = $\frac{\text{wt. inertia}}{g}$ |                         |                         |                         | B                        |                         |                         |                          |                         |                                                |
|---------------------|----------------------|---------------------------------------------------------------------------------------------------------------------------------------|-------------------------|-------------------------|-------------------------|--------------------------|-------------------------|-------------------------|--------------------------|-------------------------|------------------------------------------------|
|                     |                      | gm-cm <sup>2</sup>                                                                                                                    | oz-in <sup>2</sup>      | gm-cm-s <sup>2</sup>    | kg-cm <sup>2</sup>      | lb-in <sup>2</sup>       | oz-in-s <sup>2</sup>    | lb-ft <sup>2</sup>      | kg-cm-s <sup>2</sup>     | lb-in-s <sup>2</sup>    | lb-ft-s <sup>2</sup> or slug-ft-s <sup>2</sup> |
| A                   | gm-cm <sup>2</sup>   | 1                                                                                                                                     | 5.46 x 10 <sup>-2</sup> | 1.01 x 10 <sup>-3</sup> | 38,992                  | 3.417 x 10 <sup>-4</sup> | 1.41 x 10 <sup>-5</sup> | 2.37 x 10 <sup>-6</sup> | 1.01 x 10 <sup>-4</sup>  | 8.85 x 10 <sup>-7</sup> | 7.37 x 10 <sup>-4</sup>                        |
|                     | oz-in <sup>2</sup>   | 182.9                                                                                                                                 | 1                       | 0.186                   | 0.182                   | 0.0625                   | 2.59 x 10 <sup>-2</sup> | 4.34 x 10 <sup>-4</sup> | 1.86 x 10 <sup>-4</sup>  | 1.61 x 10 <sup>-4</sup> | 1.34 x 10 <sup>-5</sup>                        |
|                     | gm-cm-s <sup>2</sup> | 980.6                                                                                                                                 | 5.36                    | 1                       | 0.9806                  | 0.335                    | 1.38 x 10 <sup>-2</sup> | 2.32 x 10 <sup>-3</sup> | 38,992                   | 8.67 x 10 <sup>-4</sup> | 7.23 x 10 <sup>-5</sup>                        |
|                     | kg-cm <sup>2</sup>   | 1,000                                                                                                                                 | 5.46                    | 1.019                   | 1                       | 0.3417                   | 1.41 x 10 <sup>-2</sup> | 2.37 x 10 <sup>-3</sup> | 1.019 x 10 <sup>-3</sup> | 8.85 x 10 <sup>-4</sup> | 7.37 x 10 <sup>-5</sup>                        |
|                     | lb-in <sup>2</sup>   | 2.92 x 10 <sup>3</sup>                                                                                                                | 16                      | 2.984                   | 2.925                   | 1                        | 4.14 x 10 <sup>-2</sup> | 6.94 x 10 <sup>-3</sup> | 2.96 x 10 <sup>-3</sup>  | 2.59 x 10 <sup>-3</sup> | 2.15 x 10 <sup>-4</sup>                        |
|                     | oz-in-s <sup>2</sup> | 7.06 x 10 <sup>4</sup>                                                                                                                | 386.08                  | 72                      | 70.615                  | 24.13                    | 1                       | 0.1675                  | 7.20 x 10 <sup>-2</sup>  | 6.25 x 10 <sup>-2</sup> | 5.20 x 10 <sup>-3</sup>                        |
|                     | lb-ft <sup>2</sup>   | 4.21 x 10 <sup>5</sup>                                                                                                                | 2,304                   | 429.71                  | 421.4                   | 144                      | 5.967                   | 1                       | 0.4297                   | 0.3729                  | 3.10 x 10 <sup>-2</sup>                        |
|                     | kg-cm-s <sup>2</sup> | 9.8 x 10 <sup>5</sup>                                                                                                                 | 5.36 x 10 <sup>3</sup>  | 1,000                   | 980.66                  | 335.1                    | 13.887                  | 2.327                   | 1                        | 0.8679                  | 7.23 x 10 <sup>-2</sup>                        |
|                     | lb-in-s <sup>2</sup> | 1.129 x 10 <sup>4</sup>                                                                                                               | 6.177 x 10 <sup>3</sup> | 1.152 x 10 <sup>3</sup> | 1.129 x 10 <sup>3</sup> | 386.08                   | 16                      | 2.681                   | 1.152                    | 1                       | 8.33 x 10 <sup>-2</sup>                        |
|                     | lb-ft-s <sup>2</sup> | 1.355 x 10 <sup>7</sup>                                                                                                               | 7.41 x 10 <sup>4</sup>  | 1.38 x 10 <sup>4</sup>  | 1.35 x 10 <sup>4</sup>  | 4.63 x 10 <sup>3</sup>   | 192                     | 32.17                   | 13.825                   | 12                      | 1                                              |

| ANGULAR VELOCITY |       | B     |                       |       |                       |
|------------------|-------|-------|-----------------------|-------|-----------------------|
|                  |       | deg/s | rad/s                 | rpm   | rps                   |
| A                | deg/s | 1     | $1.75 \times 10^{-2}$ | 0.167 | $2.78 \times 10^{-3}$ |
|                  | rad/s | 57.3  | 1                     | 9.55  | 0.159                 |
|                  | rpm   | 6     | 0.105                 | 1     | $1.67 \times 10^{-2}$ |
|                  | rps   | 360   | 6.28                  | 60    | 1                     |

## TEMPERATURE

$$^{\circ}\text{F} = (1.8 \times ^{\circ}\text{C}) + 32$$

$$^{\circ}\text{C} = .555 \times (^{\circ}\text{F} - 32)$$

| LINEAR VELOCITY |        | B      |        |        |                       |        |                       |
|-----------------|--------|--------|--------|--------|-----------------------|--------|-----------------------|
|                 |        | in/min | ft/min | in/sec | ft/sec                | mm/sec | m/sec                 |
| A               | in/min | 1      | 0.0833 | 0.0167 | $1.39 \times 10^{-3}$ | 0.42   | $4.2 \times 10^{-4}$  |
|                 | ft/min | 12     | 1      | 0.2    | 0.0167                | 5.08   | $5.08 \times 10^{-3}$ |
|                 | in/sec | 60     | 5      | 1      | 0.083                 | 25.4   | 0.0254                |
|                 | ft/sec | 720    | 60     | 12     | 1                     | 304.8  | 0.3048                |
|                 | cm/sec | 23.62  | 1.97   | 0.3937 | 0.0328                | 10     | 0.01                  |
|                 | m/sec  | 2362.2 | 196.9  | 39.37  | 3.281                 | 1000   | 1                     |

## GRAVITY

(Acceleration Constant)

$$g = 386 \text{ in/sec}^2 = 32.2 \text{ ft/sec}^2 = 9.8 \text{ m/sec}^2$$

# Terms / Conditions of Sale

**1. ORDER ACCEPTANCE.** All orders or services are subject to acceptance in Minnesota by the written approval of an authorized official of Tolomatic, Inc. Any such order shall be subject to these Terms and Conditions of Sale, and acceptance shall be conditioned on Purchaser's assent to such conditions. Purchaser's assent shall be deemed given unless Purchaser shall expressly notify Tolomatic, Inc. in writing to the contrary within five (5) days after receipt of acknowledgment to confirmation of an order.

**2. CANCELLATION AND CHANGES.** No order accepted by Tolomatic, Inc. may be modified in any manner by Purchaser unless agreed to in writing, by an authorized official of Tolomatic, Inc. Order cancellations, including reductions to order quantities, and changes shall be governed by the following:

- a. Any standard product order scheduled for shipment within five (5) working days of purchaser's request to cancel or modify will be shipped as previously acknowledged and purchaser agrees to accept shipment and payment responsibility, in full, at the price agreed upon.
- b. "Customer Special" orders scheduled for shipment within twenty (20) working days of purchaser's request to cancel or modify will be shipped as previously acknowledged and purchaser agrees to accept shipment and payment responsibility, in full, at the price agreed upon.
- c. All work in connection with "Customer Special" orders, not covered under Paragraph b, will be stopped immediately upon notification, and purchaser agrees to reimburse Tolomatic, Inc. for all work-in-process and any materials or supplies used, or for which commitments have been made by Tolomatic, Inc. in connection therewith.

**3. QUOTATIONS AND PRICES.** Written quotations automatically expire 30 calendar days from the date issued unless terminated sooner by written notice. (Verbal quotations expire, unless accepted in writing, the same day.)

All published prices and discounts are subject to change without notice. In the event of a net price change, the price of product(s) on order will be the price in effect on the date of order acknowledgment.

Any addition to an outstanding order will be accepted at prices in effect when the addition is made.

**4. MINIMUM BILLING.** Orders amounting to less than \$35.00 net will be billed at \$35.00

**5. TAXES.** Any Manufacturer's Tax, Retailers Occupation Tax, Use Tax, Sales Tax, Excise Tax, Duty, Customer, Inspection or Testing Fee, or any other tax, fee or charge of any nature whatsoever, imposed by any government authority, on or measured by any transactions between Tolomatic, Inc. and Purchaser shall be paid by the Purchaser in addition to the prices quoted or involved. In the event Tolomatic, Inc. shall be required to pay any such tax, fee or charge, Purchaser shall reimburse therefore.

**6. TERMS OF PAYMENT.** Net invoice amount is due within 30 days from date of invoice subject to credit approval. A 2% per month service charge shall apply to all invoices not paid within 30 days. All clerical errors are subject to correction. Any invoice in not paid within 60 days will subject that account to an immediate shipping hold.

**7. F.O.B. POINT.** All sales are F.O.B. Tolomatic, Inc.'s facility in Hamel, Minnesota, unless quoted otherwise.

**8. DELIVERY.** Delivery of product(s) by Tolomatic, Inc. to a carrier shall constitute delivery to Purchaser, and regardless of freight payment, title and all risk or loss or damage in transit shall pass to Purchaser at that time.

Should shipment be held beyond scheduled date, upon request of Purchaser, product will be billed and Purchaser agrees to accept any charges for warehousing, trucking and other expenses as may be incident to such delay.

Great care is taken by Tolomatic, Inc. in crating its product. Tolomatic, Inc. cannot be held responsible for breakage after having received "In Good Order" receipts from the transporting carrier. All claims for loss and damage must be made by Purchaser to the carrier within 14 days from receipt of goods. Tolomatic, Inc. will assist insofar as practical in securing satisfactory adjustment of such claims wherever possible.

Claims for shortages or other errors must be made, in writing, within ten (10) days to Tolomatic, Inc. and any additional expense of the method or route of shipment specified by Purchaser shall be borne by the Purchaser.

**9. SHIPPING SCHEDULES.** All quoted shipping schedules are approximate and will depend upon prompt receipt from Purchaser of confirming copy of Purchase Order. Dimensional drawings and specifications submitted by Tolomatic, Inc. to Purchaser for approval must be returned to Tolomatic, Inc. within 10 working days, with approval granted, and any exceptions noted, in order to avoid delay in manufacturing schedules.

Orders which include penalty clauses for failure to meet shipping schedules will not be acceptable, except in those cases specifically approved in writing by the General Manager of Tolomatic, Inc.

Tolomatic, Inc. shall not be liable for damage as a result of any delay due to any cause beyond Tolomatic, Inc.'s reasonable control, including, without limitation, an Act of Nature; act of Purchaser; embargo, or other government act, regulation or request; fire; accident; strike; slow down; war; riot; flood; delay in transportation; and inability to obtain necessary labor, materials or manufacturing facilities. In the event of any such delay, the date of delivery shall be extended for a period equal to the time loss by reason of the delay. The acceptance of the product when delivered shall constitute a waiver of all claims for damages caused by any such delays.

**10. RETURN OF PRODUCT.** No product may be returned without first obtaining a Return Goods Authorization form and confirming memorandum from Tolomatic, Inc. Product, if accepted for credit, shall be subject to a minimum service charge of 35% of the invoice price and all transportation charges shall be prepaid by the Purchaser; however, assembled products classified as "special," such as Cable Cylinders and other products which have been modified or built as "Customer Specials," are not returnable to Tolomatic, Inc.

**11. WARRANTY.** Tolomatic, Inc., WARRANTS PRODUCT MANUFACTURED BY IT TO BE FREE FROM DEFECTS IN MATERIAL AND WORKMANSHIP FOR A PERIOD OF

ONE YEAR FROM DATE OF SHIPMENT BY Tolomatic, Inc. IF WITHIN SUCH PERIOD ANY SUCH PRODUCT SHALL BE PROVED TO Tolomatic, Inc.'s SATISFACTION TO BE SO DEFECTIVE, SUCH PRODUCT SHALL EITHER BE REPAIRED OR REPLACED AT Tolomatic, Inc.'s OPTION.

THIS WARRANTY SHALL NOT APPLY:

- a. TO PRODUCT NOT MANUFACTURED BY Tolomatic, Inc. WITH RESPECT TO PRODUCT NOT MANUFACTURED BY Tolomatic, Inc. THE WARRANTY OBLIGATIONS OF Tolomatic, Inc. SHALL IN ALL RESPECTS CONFORM AND BE LIMITED TO THE WARRANTY ACTUALLY EXTENDED TO Tolomatic, Inc. BY ITS SUPPLIER.
- b. TO PRODUCT WHICH SHALL HAVE BEEN REPAIRED OR ALTERED BY PARTIES OTHER THAN Tolomatic, Inc. SO AS, IN Tolomatic, Inc.'s JUDGMENT, TO AFFECT THE SAME ADVERSELY, OR
- c. TO PRODUCT WHICH SHALL HAVE BEEN SUBJECT TO NEGLIGENCE, ACCIDENT, OR DAMAGE BY CIRCUMSTANCES BEYOND THE CONTROL OF Tolomatic, Inc. OR TO IMPROPER OPERATION MAINTENANCE OR STORAGE, OR TO OTHER THAN NORMAL USE AND SERVICE.

THE FOREGOING WARRANTIES ARE EXCLUSIVE AND IN LIEU OF ALL OTHER EXPRESS AND IMPLIED WARRANTIES WHATSOEVER, INCLUDING BUT NOT LIMITED TO IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, Tolomatic, Inc. SHALL NOT BE SUBJECT TO ANY OTHER OBLIGATIONS OR LIABILITIES WHATSOEVER WITH RESPECT TO PRODUCT MANUFACTURED OR SUPPLIED BY Tolomatic, Inc. OR SERVICE RENDERED BY IT.

**12. CONSEQUENTIAL DAMAGE.** Tolomatic, Inc. shall not, under any circumstances, be liable for consequential damages.

**13. SERVICE CHARGES.** Should the Purchaser request the service of any erector, demonstrator or service man (except as specifically provided for and included in the price of the product) such service will be rendered at the rate outlined in the schedule of field service charges in effect at the date of request.

ABT

IMXP

BC2

BC3

BC4

LS

MG

CC

PB

ENGR

# The Tolomatic Difference Expect More From the Industry Leader:



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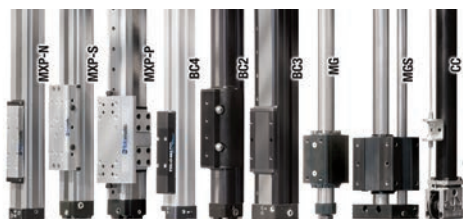
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# Tolomatic

EXCELLENCE IN MOTION®

COMPANY WITH  
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CERTIFIED BY DNV GL  
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Certified site: Hamel, MN

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