



aerospace
climate control
electromechanical
filtration
fluid & gas handling
hydraulics
pneumatics
process control
sealing & shielding



Series XFC

Extreme Force Electric Cylinder



In-Position
Technologies
www.iptech1.com

ENGINEERING YOUR SUCCESS.

XFC Extreme Force Electric Cylinders



Introducing the XFC Series: Roller Screw Driven Cylinders

Parker is pleased to introduce a new family of high thrust electric cylinders featuring roller screw drive technology. The XFC Series further extends the feature rich and force dense offering of Parker's electric cylinder products.

The XFC Electric Cylinder is designed to provide machine builders a high force electro-mechanical solution: offering long life, minimal maintenance, low operating costs, and structural rigidity. All this, in addition to Parker's world class customer service and industry leading delivery times.

As a worldwide leader in fluid power cylinder products, Parker has combined the best of both worlds into one unique product. All the benefits of electromechanical control and cleanliness combined with the structural rigidity and durability of a traditional hydraulic tie rod cylinder.

Table of Contents

Design Features & Benefit

| | |
|--------------|--|
| 3 – 5 | Design Considerations, Advantages, Performance Characteristics and Design Features |
|--------------|--|

Product Overview

| | |
|------------|---|
| 6-7 | Performance (by Cylinder Size and Screw Lead) |
| 8 | Life |
| 9 | Speed |
| 10 | Compressive Force |
| 11 | Available Mounts |

Mounting Configurations

| | |
|----------------|-------------------------------------|
| 12 – 13 | K L M Extended Tie Rod Mount |
| 14 – 15 | J Front Flange Mount |
| 16 – 17 | C Foot Mount |
| 18 – 19 | T Rear Trunnion Mount |
| 20 | H Rear Flange Mount |
| 21 | B Rear Clevis Mount |

Design Options and Accessories

| | |
|----------------|------------------------------------|
| 22 – 23 | Rod End Options and Accessories |
| 24 – 25 | Motors, Gearheads & Adapter Plates |
| 26 – 27 | Compax3 Drive/Controller |
| 28 – 29 | Solid State Switches |

Sizing/Selection

| | |
|----------------|---|
| 30 | Application Worksheet |
| 31 | Life and Load Calculations |
| 32 | Thrust, Cylinder Orientation Calculations |
| 33 | Motor Speed and Torque Calculations |
| 34 – 35 | Ordering Information |

Other Information

| | |
|-------------------|----------------------------|
| 36 – 37 | Cylinder Safety Guidelines |
| 38 | Offer of Sale |
| 39 | Other Products |
| Back Cover | Worldwide Sales Locations |

Flexibility & Versatile Programmability

In applications where high loads are required, roller screws offer a very attractive solution:

- **Servo motors and controls feature simplified programming**
- **Electromechanical control systems provide infinite programmability**
- **Performance advantages not easily obtained by comparable fluid power technology include multiple move profiles, adjustable acceleration and deceleration, force control, and absolute positioning capabilities**

These features allow the system to easily adapt to changing application conditions and performance requirements with minimal modification.

Design Considerations

Installation

Due to the reduced number of components required for a complete system, the commissioning time required for operation is significantly reduced relative to comparable fluid power systems. This allows system builders to quickly install, troubleshoot, and test system capabilities faster and more reliably than other alternatives.

Additionally machine break-down and set-up can be accomplished with relative ease and without concern of hydraulic fluid spillage.

Environmental Considerations

With electromechanical system technology, fluid leaks, filter changes, and air bleeding are a

thing of the past. Simply mount the cylinder, plug in the cables, download a program and you are up and running in record time.

Anti-Rotation

Anti-rotation can now be achieved in XFC actuators thanks to a new design that incorporates a keying feature on the internal surface of the tubular body. This option can be configured through our standard part number structure.

Maintenance

Roller screw cylinder systems require little or no maintenance when compared to their fluid power alternatives, while still delivering long life and high performance. Series XFC cylinders are designed to be low maintenance with the factory installed full synthetic lubrication. For high duty cycle applications (>50%), oil filled cylinders are available with ports for recirculation as required.

A Look Inside the XFC Roller Screw: Technology Advantages

Planetary roller screws offer distinct benefits over traditional ball screw and lead screw mechanisms, and add features not easily attainable with hydraulic or pneumatic linear devices.

A planetary roller screw transmits rotary motion into linear motion similar to a ball or lead screw. The key difference in the roller screw design is the use of planetary rollers in place of ball bearings as the primary rolling elements.

The planetary rollers provide an increased number of contact surfaces between the external screw shaft and the internal threads of the roller nut relative to traditional ball or lead screw technology. The expanded number of contact points allow for:

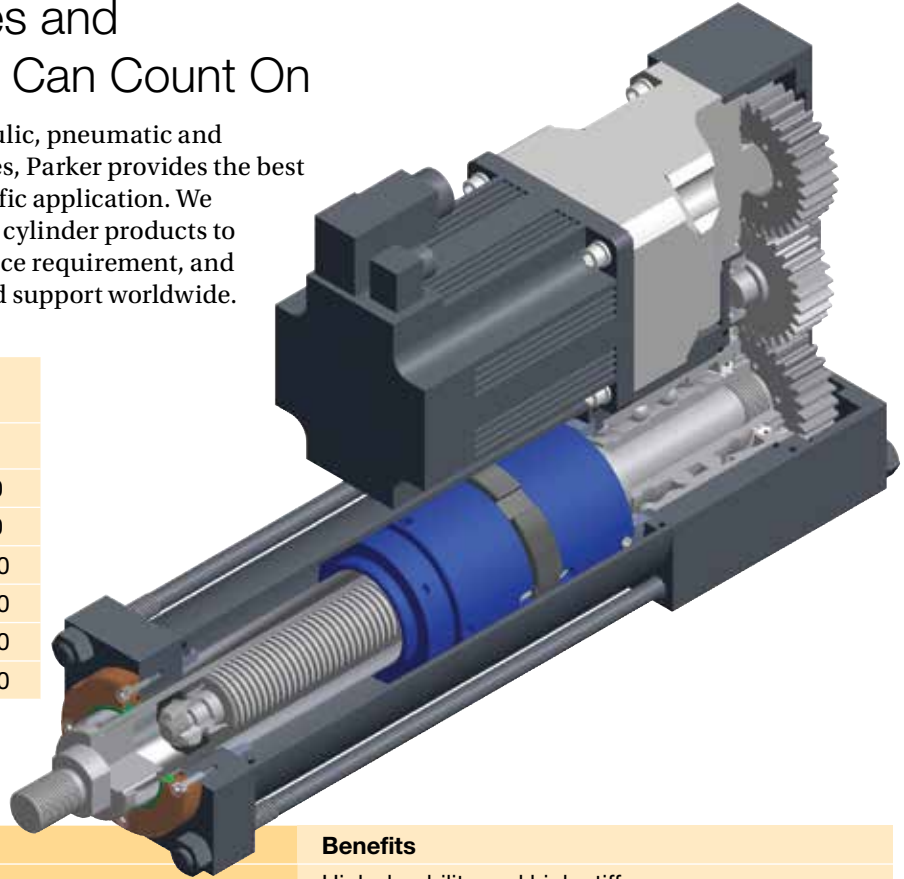
- **Enhanced thrust capacity— 5X more thrust!**
- **Enhanced load carrying capabilities**
- **Higher speeds than traditional hydraulic cylinders**
- **Greatly extended life — 10X longer life!**

XFC Design Features/Benefits

Parker Capabilities and Performance You Can Count On

As an industry leader in hydraulic, pneumatic and electromechanical technologies, Parker provides the best solutions tailored to your specific application. We have an unmatched offering of cylinder products to match virtually any performance requirement, and complimentary full service and support worldwide.

| XFC Frame Size | Continuous Thrust Force | |
|----------------|-------------------------|--------|
| | kN | lb |
| 075 | 20.0 | 4,500 |
| 090 | 33.4 | 7,500 |
| 115 | 53.4 | 12,000 |
| 140 | 80.0 | 17,500 |
| 165 | 120.0 | 26,500 |
| 190 | 178.0 | 40,000 |



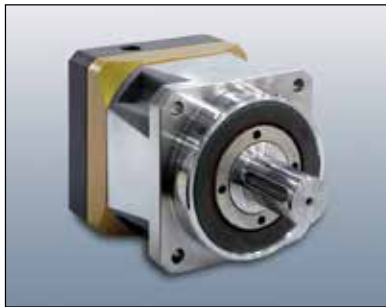
| Features | Benefits |
|--|---|
| All steel construction | High durability and high stiffness |
| Elastomeric seals throughout | Completely sealed (no gaskets used) |
| Standard metric hydraulic type tie rod construction | Structural rigidity |
| Opposed preloaded angular contact bearings | Bi-directional force capabilities |
| Roller screw drive system | Increased load, life, and shock loading capabilities compared to traditional ball screw designs |
| Inline and parallel gear drive configurations | Full transfer of thrust force |
| Speeds up to 40 in/sec | Cycle time reduction |
| Continuous thrust ratings up to 178 kN (40,000 lbs) | Hydraulic replacement capabilities |
| Parker Stealth family advanced planetary gearheads direct mount to cylinder | Standard reduction options from 3:1 to 10:1; ratios up to 100:1 available |
| Parker MPP Series brushless servo motors standard | Complete Parker system solution cylinder, gearhead, motor, drive and controls |
| Rod wiper and seal based on proven TS2000 design and composite rod bearing | Designed to survive rugged environments with minimal maintenance for the life of the cylinder |

High Performance Components Make the Ultimate Cylinder System



XFC extreme force cylinders feature heavy duty components designed specifically for industrial applications. Preferred products to accompany the XFC for long, reliable service include:

Planetary Gearheads



Parker Generation II Stealth Series provides higher radial load, increased service life and easier mounting than comparably

sized planetary gearheads. The Stealth Generation II Helical Planetary Gearheads incorporate design enhancements to provide superior performance for the most demanding high-performance applications. Generation II models are available in 60 to 142 mm and NEMA 23 to 42 frame sizes.

Brushless Servo Motors

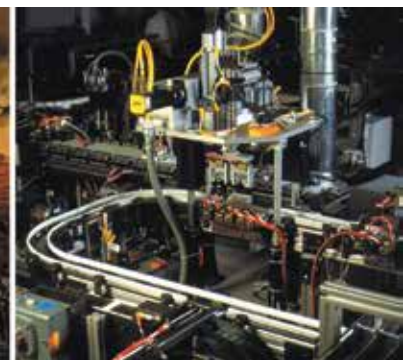


MaxPlusPlus (MPP) family of brushless servo motors is redefining performance, flexibility, and reliability. The industry's highest-performing servo motor uses eight pole segmented lamination technology, which produces more torque in a shorter package. Use MaxPlusPlus motors for higher torque applications, customized options, or when high performance is required.

Servo Drives & Controllers



With its high performance and modular design, the Compax3 family of industrial servo drives and drive/controllers offers a new level of servo performance and flexibility. Available in single- or multi-axis configurations, with numerous expansion options, all models are rated for 120-480 VAC input, continuous current output from 2.5 A (rms) to 155 A (rms), and are CE (EMC & LVD) and UL compliant.



XFC Product Overview

Performance

| XFC Frame Size | | 075 | 090 | 115 | 140 | 165 | 190 |
|---|------------------------|---------|----------|----------|----------|----------|----------|
| Continuous Thrust | kN | 20 | 34 | 54 | 80 | 120 | 178 |
| | (lbs) | (4,500) | (7,500) | (12,000) | (17,500) | (26,500) | (40,000) |
| Maximum Thrust | kN | 40 | 68 | 108 | 160 | 240 | 356 |
| | (lbs) | (9,000) | (15,000) | (24,000) | (35,000) | (53,000) | (80,000) |
| Maximum Acceleration | mm/sec ² | 19,600 | 19,600 | 19,600 | 19,600 | 19,600 | 19,600 |
| | (in/sec ²) | (773) | (773) | (773) | (773) | (773) | (773) |
| Maximum Stroke ¹⁾ | mm | 1150 | 1700 | 2,000 | 2,000 | 2,000 | 2,000 |
| | (in) | (55.12) | (66.93) | (78.75) | (78.75) | (78.75) | (78.75) |
| Recommended Maximum Stroke Length of Unsupported Cylinder ²⁾ | mm | 750 | 750 | 750 | 1,000 | 1,000 | 1,250 |
| | (in) | (29.53) | (29.53) | (29.53) | (39.37) | (39.37) | (49.21) |

1) Consult factory for non-standard stroke lengths

2) Secondary support required for longer stroke lengths (consult factory)

System Characteristics

| XFC Frame Size | | 075 | 090 | 115 | 140 | 165 | 190 |
|----------------|------|---------|---------|---------|---------|---------|---------|
| Accuracy | mm | 0.08 | 0.08 | 0.08 | 0.08 | 0.13 | 0.13 |
| | (in) | (0.003) | (0.003) | (0.003) | (0.003) | (0.005) | (0.005) |
| Repeatability | mm | 0.03 | 0.03 | 0.03 | 0.03 | 0.05 | 0.05 |
| | (in) | (0.001) | (0.001) | (0.001) | (0.001) | (0.002) | (0.002) |
| Backlash | mm | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 |
| | (in) | (0.001) | (0.001) | (0.001) | (0.001) | (0.001) | (0.001) |

Screw Characteristics

| XFC Size | Screw Diameter mm | Standard Lead ¹⁾ mm (in)/rev | Efficiency % | Ca Rating kN (lbf) | Thrust Tube Torque | Max. Speed ²⁾ mm/sec (in/sec) |
|----------|-------------------|---|--------------|--------------------|--------------------|--|
| | | | | | mN-m/N (lb-in/lbf) | |
| 075 | 21 | 5 (0.197) | 88.78 | 40.4 (9,082) | 0.889 (0.035) | 508 (20.0) |
| | | 10 (0.394) | 91.17 | 44.6 (10,026) | 1.752 (0.069) | 1016 (40.0) |
| 090 | 30 | 5 (0.197) | 87.05 | 73.6 (16,546) | 0.914 (0.036) | 356 (14.0) |
| | | 10 (0.394) | 90.38 | 74.4 (16,726) | 1.752 (0.069) | 712 (28.0) |
| 115 | 39 | 5 (0.197) | 85.18 | 103.4 (23,245) | 0.939 (0.037) | 274 (10.8) |
| | | 10 (0.394) | 89.37 | 116.5 (26,190) | 1.778 (0.070) | 548 (21.6) |
| 140 | 48 | 5 (0.197) | 82.50 | 158.5 (35,632) | 0.965 (0.038) | 222 (8.7) |
| | | 10 (0.394) | 88.34 | 171.2 (38,487) | 1.803 (0.071) | 444 (17.4) |
| 165 | 60 | 10 (0.394) | 87.05 | 238.6 (53,639) | 1.829 (0.072) | 356 (14.0) |
| | | 20 (0.787) | 90.38 | 238.6 (53,639) | 3.531 (0.139) | 712 (28.0) |
| 190 | 75 | 10 (0.394) | 85.45 | 356.5 (80,144) | 1.854 (0.073) | 284 (11.2) |
| | | 20 (0.787) | 90.97 | 356.5 (80,144) | 3.658 (0.144) | 568 (22.4) |

1) Consult factory for availability of non-standard leads

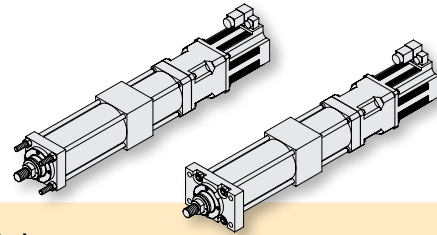
2) Speed is stroke dependant, see page 9 for speed/stroke chart

Cylinder Temperature Rating*

| | |
|--------------------|-----------------------------|
| Standard seals | -23 to 73°C (-10 to 165°F) |
| Fluorocarbon seals | -23 to 110°C (-10 to 230°F) |

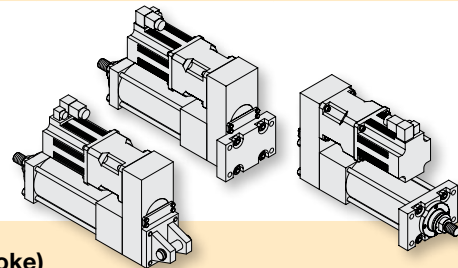
* Verify motor and gear box performance at higher temperatures.

Cylinder Weight — kg (lb)



Inline Configurations

| XFC Frame Size | Base Weight with Mount (at Zero Stroke) | | | | Weight (Per 100 mm Stroke) |
|----------------|---|-------------|-------------|--------------------|----------------------------|
| | J Front Flange | C Foot | D Trunnion | K Extended Tie Rod | |
| 075 | 9.1 (20) | 9.1 (20) | 9.5 (21) | 8.6 (19) | 1.41 (3.1) |
| 090 | 14.5 (32) | 14.1 (31) | 14.5 (32) | 14.1 (31) | 1.93 (4.3) |
| 115 | 27.7 (61) | 27.7 (61) | 28.1 (62) | 26.8 (59) | 3.08 (6.8) |
| 140 | 48.1 (106) | 47.6 (105) | 49.4 (109) | 46.7 (103) | 4.53 (10.0) |
| 165 | 103.4 (182) | 102.1 (180) | 104.3 (185) | 100.2 (175) | 7.17 (15.8) |
| 190 | 132.9 (293) | 131.5 (290) | 134.3 (296) | 127.0 (280) | 9.48 (20.9) |



Parallel Configurations

| XFC Frame Size | Base Weight with Mount (at Zero Stroke) | | | | | | Weight (Per 100 mm Stroke) |
|----------------|---|-------------|-------------|--------------------------|---------------|---------------|----------------------------|
| | J Front Flange | C Foot | D Trunnion | K, L, M Extended Tie Rod | H Rear Flange | B Rear Clevis | |
| 075 | 11.3 (25) | 10.9 (24) | 11.3 (25) | 10.9 (24) | 11.3 (25) | 11.3 (25) | 1.41 (3.1) |
| 090 | 17.7 (39) | 17.2 (38) | 17.7 (39) | 17.2 (38) | 18.1 (40) | 18.6 (41) | 1.93 (4.3) |
| 115 | 34.0 (75) | 34.0 (75) | 34.9 (77) | 33.1 (73) | 35.4 (78) | 35.4 (78) | 3.08 (6.8) |
| 140 | 59.4 (131) | 58.5 (129) | 60.3 (133) | 57.6 (127) | 61.7 (136) | 62.1 (137) | 4.53 (10.0) |
| 165 | 103.4 (228) | 102.1 (225) | 104.3 (230) | 100.2 (221) | 107.0 (236) | 110.7 (244) | 7.17 (15.8) |
| 190 | 163.7 (361) | 162.4 (358) | 170.6 (376) | 158.8 (350) | 171.5 (378) | 171.9 (379) | 9.48 (20.9) |

Note: All weights above assume oil filled lubrication

Cylinder Inertia

Inertia matching of the cylinder assembly to the motor will improve the performance of the mechanical system. The inertia ratio of the cylinder and load to the motor should be less than 10:1. A general rule for screw driven systems is 5:1.

$$I_{\text{Total}} = I_{\text{GearHead}} + \frac{(I_{\text{XFC}} + I_{\text{Mass}})}{(\text{GearHeadRatio})^2}$$

$$I_{\text{Mass}} = \text{Mass}_{\text{Load}} \text{ (kg)} \left(\frac{\text{Lead (mm)}}{3141.6} \right)^3$$

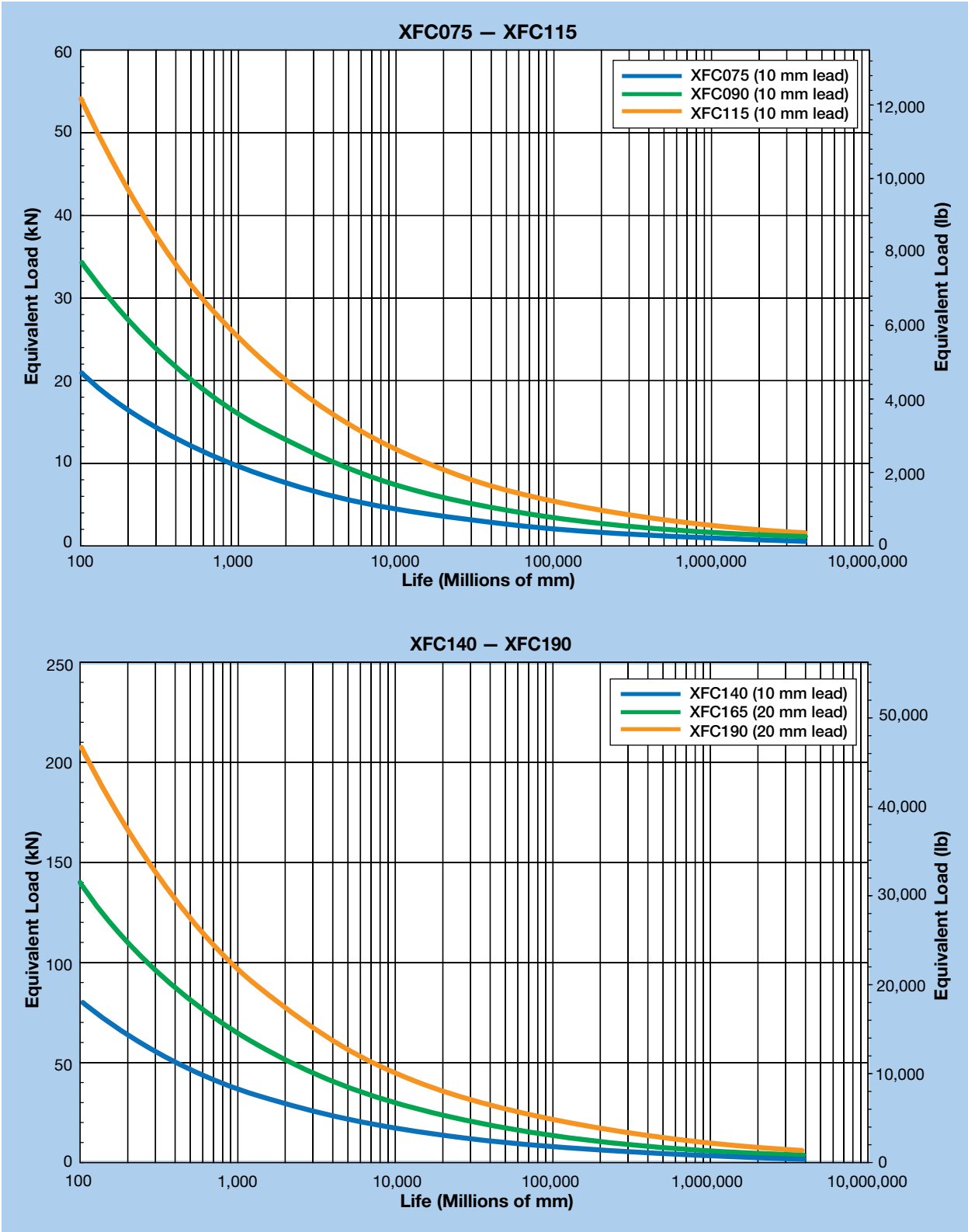
For PS Series gearhead inertia information, see:
www.parkermotion.com

XFC Inertia I (kg-m²)

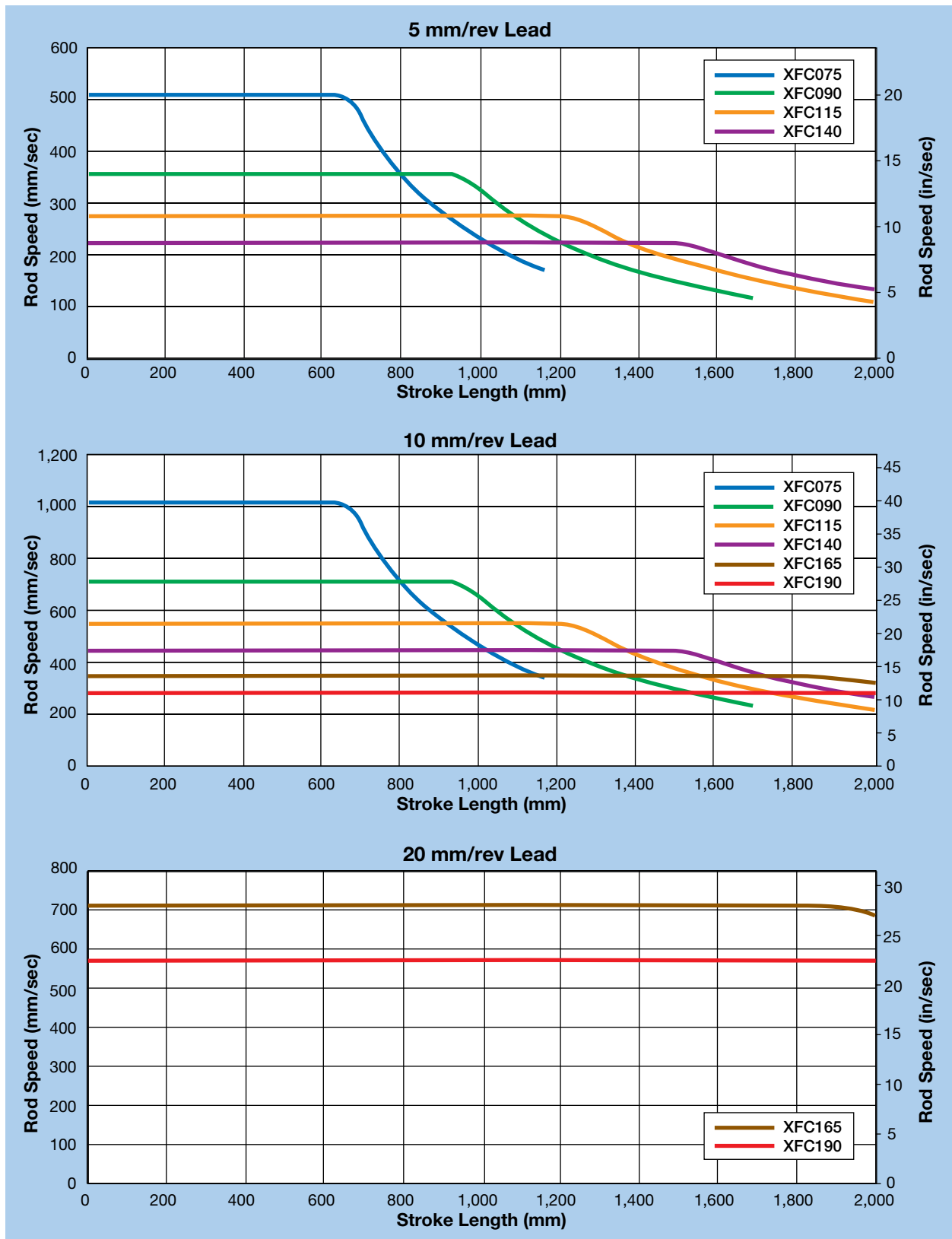
| XFC Size | Inline (Zero Stroke) | Parallel (Zero Stroke) | Stroke (Per 100 mm) |
|----------|----------------------|------------------------|---------------------|
| 075 | 0.00008903 | 0.00037951 | 0.00001499 |
| 090 | 0.00031974 | 0.00089394 | 0.00006242 |
| 115 | 0.00107620 | 0.00349671 | 0.00017800 |
| 140 | 0.00229637 | 0.00923002 | 0.00040900 |
| 165 | 0.00655544 | 0.02428162 | 0.00099900 |
| 190 | 0.02702120 | 0.05552601 | 0.00244000 |

XFC Product Overview

Life Charts



Maximum Speed Charts



XFC Product Overview

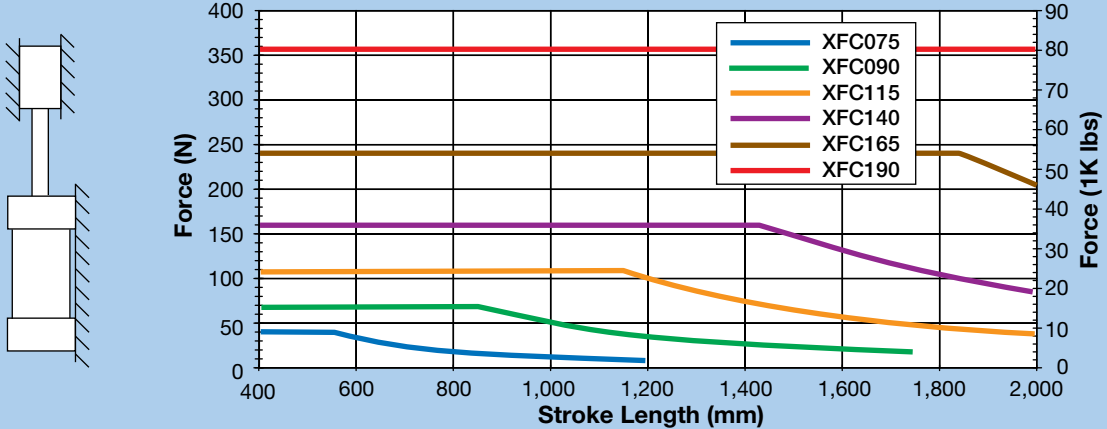
Buckling Strength Charts

The buckling strength of the cylinder is the maximum compressive load able to be exerted through the cylinder. These values are a

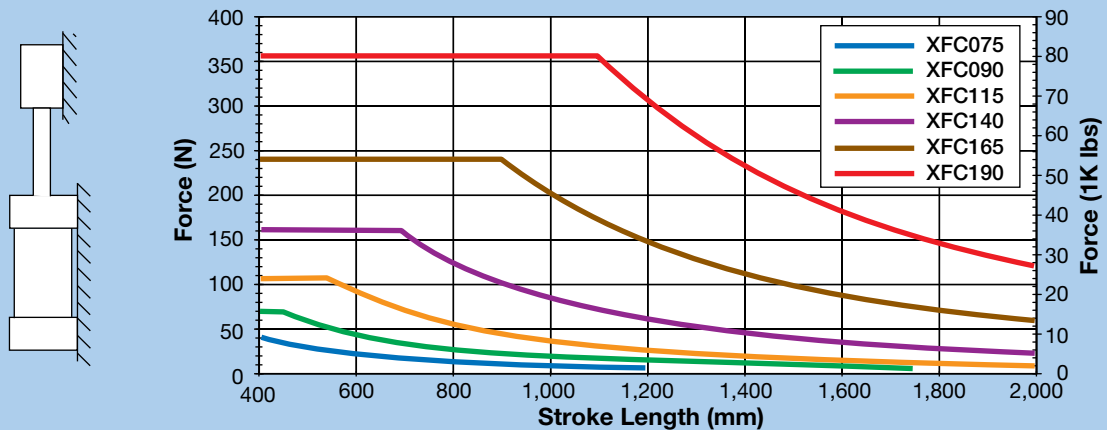
function of the screw and thrust tube size and do not account for specific motor or gearbox performance. The force value from the specific mounting

class and length of stroke should not be exceeded to ensure safe mechanical performance. Tension loads are not subject to buckling strength restrictions.

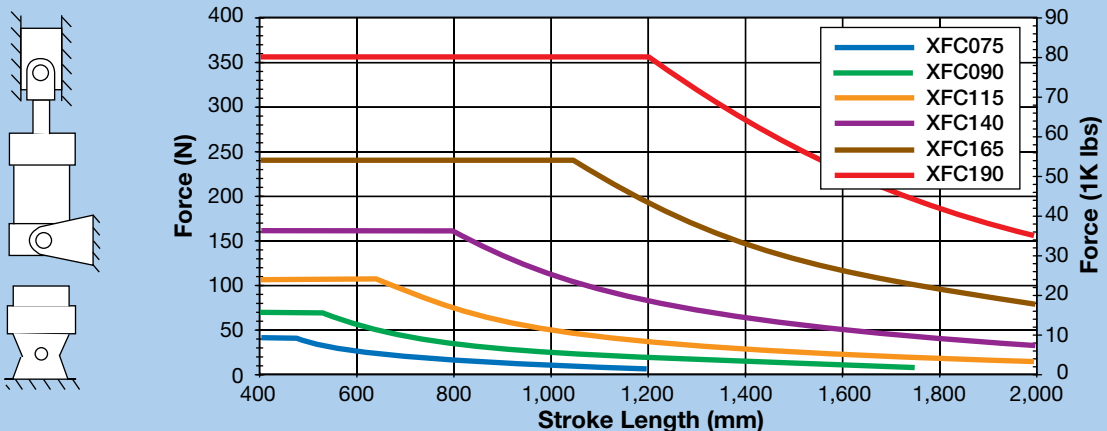
Maximum Compressive Force – Fixed Mount, Guided



Maximum Compressive Force – Fixed Mount, Not Guided



Maximum Compressive Force – Rear Pivot Mount, Guided



Available Mounts

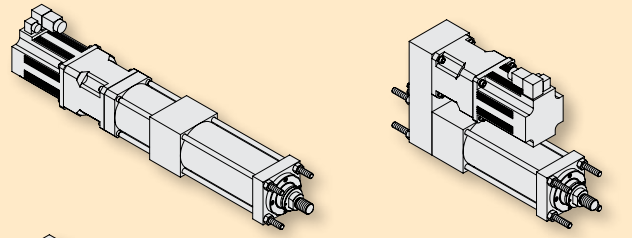
Inline

Parallel

K, L, M Extended Tie Rod Mount

Cylinders with Extended Tie Rods are suitable for straight line force applications, and are particularly useful where space is limited.

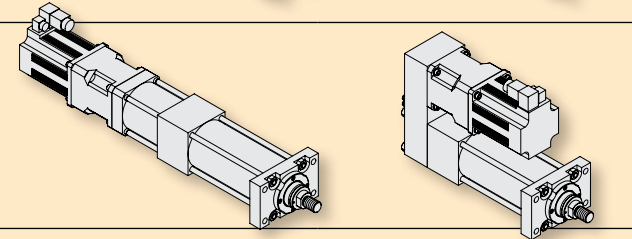
- K** Front Mount (inline and parallel)
- L** Rear Mount (parallel only)
- M** Both Front & Rear Mount (parallel only)



J Integral Front Flange Mount

These cylinders are suitable for use on straight line force transfer applications.

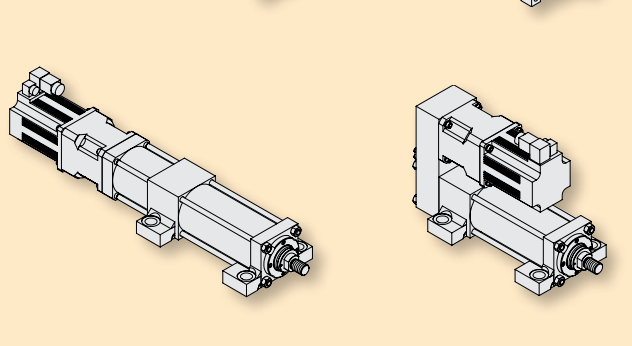
- J** Front Flange Mount (inline and parallel)



Foot Mount

Foot mounted cylinders do not absorb forces along their center line. As a result, the application of force by the cylinder produces a moment which attempts to rotate the cylinder about its mounting bolts. It is therefore very important that the cylinder be firmly secured to the mounting surface and the load should be rigidly guided to avoid side loads being applied to the cylinder bearings.

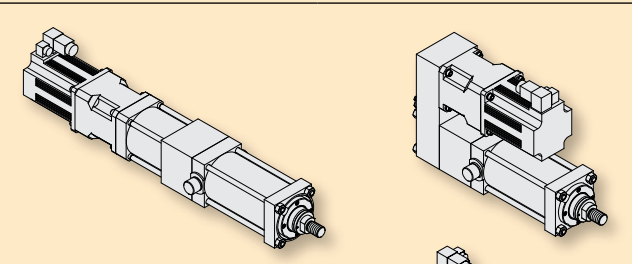
- C** Foot Mount (inline and parallel)



T Rear Trunnion Mount

Trunnion mounting is used for rotary or arc-line motion and offer flexibility when designing applications that are not confined to linear movements. Consult factory to review specific applications for stroke and configuration.

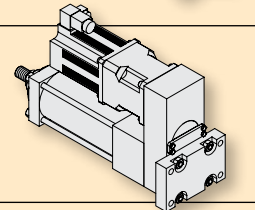
- T** Rear Trunnion Mount (inline and parallel)



H Rear Flange Mount

These cylinders are suitable for use on straight line force transfer applications.

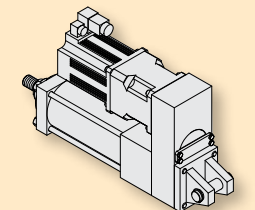
- H** Rear Flange Mount (parallel only)



B Rear Clevis Mount

Cylinders with pivot mountings, which absorb forces on their center lines, should be used where the machine member to be moved travels in a curved path. Pivot mountings may be used in tension (pull) or compression (push) applications. Cylinders using a fixed clevis may be used if the curved path of the thrust tube travels in a single plane.

- B** Rear Clevis Mount (parallel only)



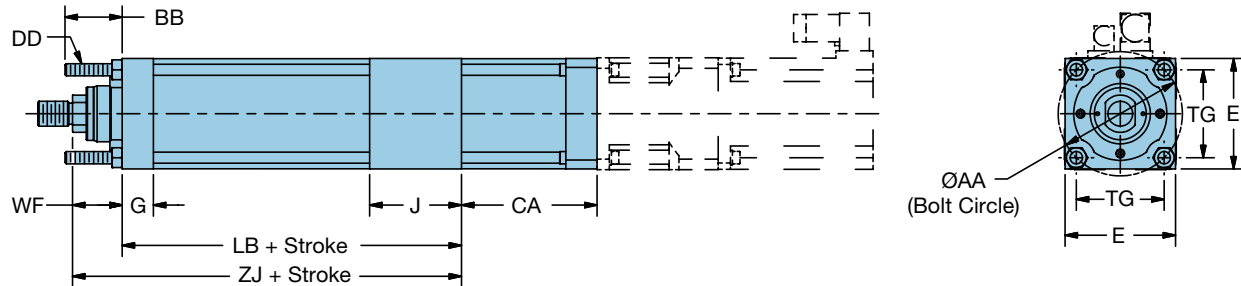
XFC Mount Options

Extended Tie Rod Mount — Inline

Order
Code



K Front Extended Tie Rods



Dimensions — mm (in)

| XFC Size | Ø AA | BB | DD | E | G | J | TG | WF | Add Stroke | |
|----------|---------------|--------------|----------|-----------------|--------------|---------------|------------------|--------------|-----------------|-----------------|
| | | | | | | | | | LB | ZJ |
| 075 | 83 (3.27) | 30 (1.18) | M8x1 | 76.2 (3.00) | 22 (0.87) | 62 (2.44) | 58.69 (2.31) | 38 (1.50) | 205.5 (8.09) | 243.5 (9.59) |
| 090 | 100 (3.94) | 35 (1.38) | M10x1.5 | 88.9 (3.50) | 25 (0.98) | 74 (2.91) | 70.71 (2.78) | 40 (1.57) | 248 (9.76) | 288 (11.34) |
| 115 | 127 (5.00) | 40 (1.57) | M12x1.25 | 114.3 (4.50) | 30 (1.18) | 91 (3.58) | 89.80 (3.54) | 45 (1.77) | 293 (11.54) | 338 (13.31) |
| 140 | 155 (6.10) | 50 (1.97) | M16x1.5 | 139.7 (5.50) | 35 (1.38) | 108 (4.25) | 109.60 (4.32) | 45 (1.77) | 348 (13.70) | 393 (15.47) |
| 165 | 185 (7.28) | 60 (2.36) | M22x1.5 | 165.1 (6.50) | 40 (1.57) | 123 (4.84) | 130.81 (5.15) | 60 (2.36) | 417 (16.42) | 477 (18.78) |
| 190 | 215 (8.46) | 75 (2.95) | M22x1.5 | 190.5 (7.50) | 50 (1.97) | 152 (5.98) | 152.03 (5.99) | 62 (2.44) | 503 (19.80) | 565 (22.24) |

Motor/Gearhead

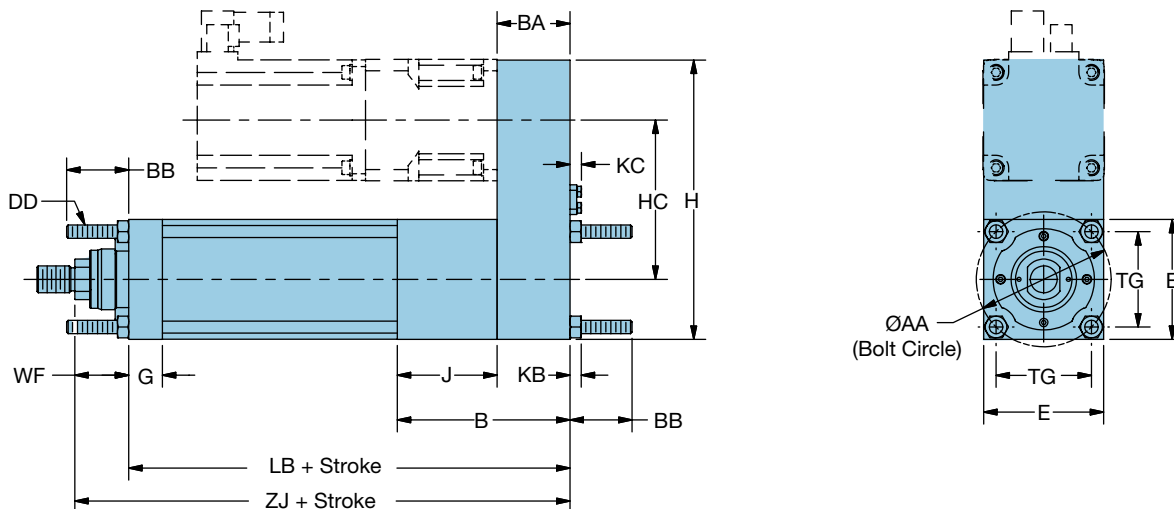
| XFC Size | Dimension CA | | | | | | | | |
|----------|--------------|------------|------------|------------|-------|------------|------------|------------|------------|
| | PS090 | PS115 | PS142 | PS180 | PS220 | MPP115 | MPP142 | MPP190 | MPP270 |
| 075 | 113 (4.45) | 115 (4.53) | — | — | — | 98 (3.86) | 109 (4.29) | — | — |
| 090 | 115 (4.53) | 117 (4.61) | — | — | — | 100 (3.94) | 111 (4.37) | — | — |
| 115 | — | 130 (5.12) | 158 (6.22) | — | — | — | 113 (4.45) | 136 (5.35) | — |
| 140 | — | — | 161 (6.34) | 190 (7.48) | — | — | — | 139 (5.47) | — |
| 165 | — | — | 164 (6.46) | 193 (7.60) | — | — | — | — | 183 (7.20) |
| 190 | — | — | — | 194 (7.64) | — | — | — | — | 214 (8.43) |

Parallel Extended Tie Rod Mount — Parallel

Order Code



- K** Front Extended Tie Rods
- L** Rear Extended Tie Rods
- M** Both Front & Rear Extended Tie Rods



Dimensions — mm (in)

| XFC Size | Ø AA | B | BA | BB | DD | E | G | H |
|----------|------------|------------|------------|-----------|----------|--------------|-----------|---------------|
| 075 | 83 (3.27) | 106 (4.17) | 44 (1.73) | 30 (1.18) | M8x1 | 76.2 (3.00) | 22 (0.87) | 174.2 (6.86) |
| 090 | 100 (3.94) | 128 (5.04) | 54 (2.13) | 35 (1.38) | M10x1.5 | 88.9 (3.50) | 25 (0.98) | 206.9 (8.15) |
| 115 | 127 (5.00) | 154 (6.06) | 63 (2.48) | 40 (1.57) | M12x1.25 | 114.3 (4.50) | 30 (1.18) | 271 (10.67) |
| 140 | 155 (6.10) | 180 (7.09) | 72 (2.83) | 50 (1.97) | M16x1.5 | 139.7 (5.50) | 35 (1.38) | 332.2 (13.08) |
| 165 | 185 (7.28) | 211 (8.31) | 88 (3.46) | 60 (2.36) | M22x1.5 | 165.1 (6.50) | 40 (1.57) | 379.1 (14.93) |
| 190 | 215 (8.46) | 252 (9.92) | 100 (3.94) | 75 (2.95) | M22x1.5 | 190.5 (7.50) | 50 (1.97) | 455.5 (17.93) |

| XFC Size | HC | J | KB | KC | TG | WF | Add Stroke | |
|----------|--------------|------------|------------|--------------|---------------|-----------|--------------|---------------|
| | | | | | | | LB | ZJ |
| 075 | 98 (3.86) | 62 (2.44) | 6.5 (0.26) | 6.93 (0.27) | 58.69 (2.31) | 38 (1.50) | 249.5 (9.82) | 287.5 (11.32) |
| 090 | 118 (4.65) | 74 (2.91) | 8 (0.31) | 8.65 (0.34) | 70.71 (2.78) | 40 (1.57) | 302 (11.89) | 342 (13.46) |
| 115 | 156 (6.14) | 91 (3.58) | 10 (0.39) | 10.15 (0.40) | 89.80 (3.54) | 45 (1.77) | 356 (14.02) | 401 (15.79) |
| 140 | 192.5 (7.58) | 108 (4.25) | 13 (0.51) | 13.65 (0.54) | 109.60 (4.32) | 45 (1.77) | 420 (16.54) | 465 (18.31) |
| 165 | 224 (8.82) | 123 (4.84) | 18 (0.71) | 13.65 (0.54) | 130.81 (5.15) | 60 (2.36) | 505 (19.88) | 565 (22.24) |
| 190 | 265 (10.43) | 152 (5.98) | 18 (0.71) | 17.18 (0.68) | 152.03 (5.99) | 62 (2.44) | 603 (23.74) | 665 (26.18) |

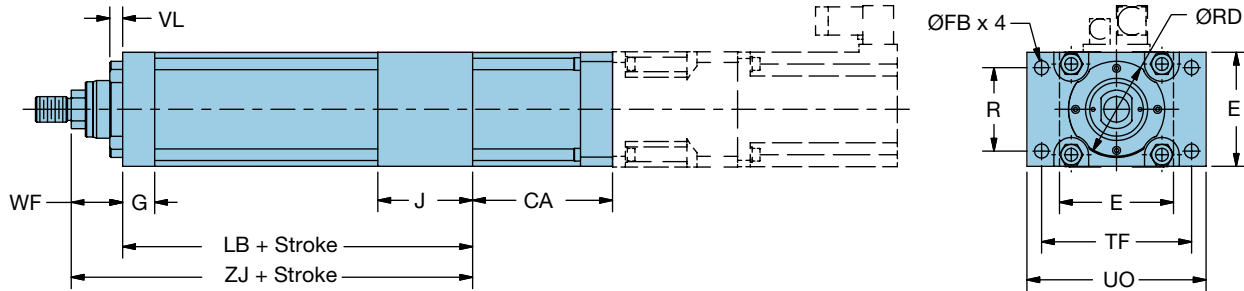
XFC Mount Options

Front Flange Mount — Inline

Order
Code



J



Dimensions — mm (in)

| XFC Size | E | Ø FB | G | J | R | Ø RD _{FB} | TF | UO | VL | WF | Add Stroke | |
|------------|-----------------|--------------|--------------|---------------|---------------|--------------------|---------------|-----------------|--------------|--------------|-----------------|-----------------|
| | | | | | | | | | | | LB | ZJ |
| 075 | 76.2 (3.00) | 9 (0.35) | 22 (0.87) | 62 (2.44) | 52 (2.05) | 65 (2.559) | 105 (4.13) | 125 (4.92) | 10 (0.39) | 38 (1.50) | 205.5 (8.09) | 243.5 (9.59) |
| 090 | 88.9 (3.50) | 11 (0.43) | 25 (0.98) | 74 (2.91) | 65 (2.56) | 75 (2.953) | 117 (4.61) | 139.7 (5.50) | 10 (0.39) | 40 (1.57) | 248 (9.76) | 288 (11.34) |
| 115 | 114.3 (4.50) | 14 (0.55) | 30 (1.18) | 91 (3.58) | 83 (3.27) | 95 (3.740) | 149 (5.87) | 175 (6.89) | 12 (0.47) | 45 (1.77) | 293 (11.54) | 338 (13.31) |
| 140 | 139.7 (5.50) | 18 (0.71) | 35 (1.38) | 108 (4.25) | 107 (4.21) | 110 (4.331) | 172 (6.77) | 210 (8.27) | 12 (0.47) | 45 (1.77) | 348 (13.70) | 393 (15.47) |
| 165 | 165.1 (6.50) | 21 (0.83) | 40 (1.57) | 123 (4.84) | 120 (4.72) | 135 (5.315) | 215 (8.46) | 260 (10.24) | 14 (0.55) | 60 (2.36) | 417 (16.42) | 477 (18.78) |
| 190 | 190.5 (7.50) | 22 (0.87) | 50 (1.97) | 152 (5.98) | 155 (6.10) | 155 (5.315) | 253 (9.96) | 300 (11.81) | 16 (0.63) | 62 (2.44) | 503 (19.80) | 565 (22.24) |

Motor/Gearhead

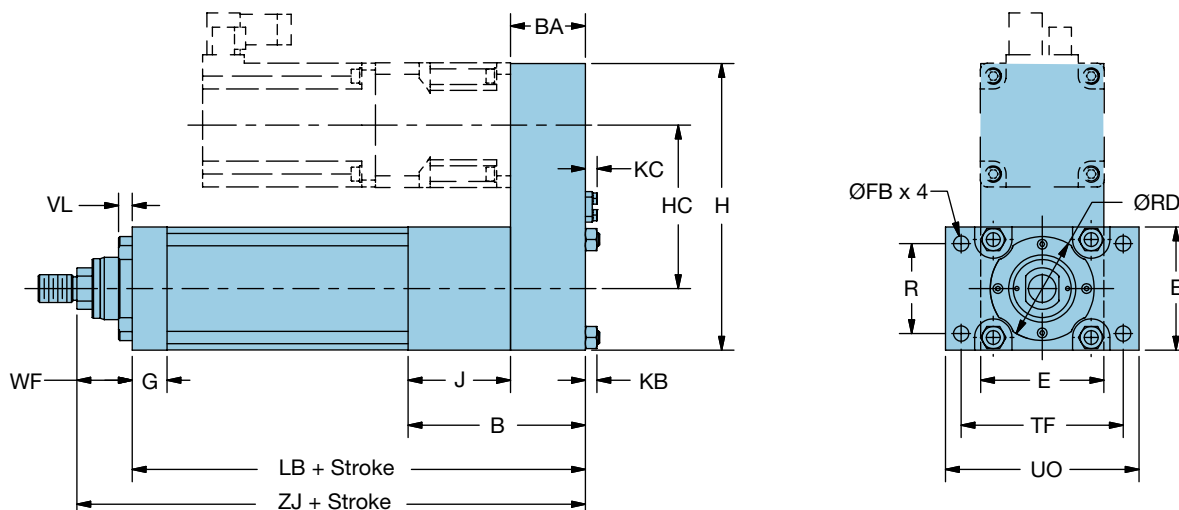
| XFC Size | Dimension CA | | | | | | | | |
|------------|--------------|------------|------------|------------|-------|------------|------------|------------|------------|
| | PS090 | PS115 | PS142 | PS180 | PS220 | MPP115 | MPP142 | MPP190 | MPP270 |
| 075 | 113 (4.45) | 115 (4.53) | — | — | — | 98 (3.86) | 109 (4.29) | — | — |
| 090 | 115 (4.53) | 117 (4.61) | — | — | — | 100 (3.94) | 111 (4.37) | — | — |
| 115 | — | 130 (5.12) | 158 (6.22) | — | — | — | 113 (4.45) | 136 (5.35) | — |
| 140 | — | — | 161 (6.34) | 190 (7.48) | — | — | — | 139 (5.47) | — |
| 165 | — | — | 164 (6.46) | 193 (7.60) | — | — | — | — | 183 (7.20) |
| 190 | — | — | — | 194 (7.64) | — | — | — | — | 214 (8.43) |

Front Flange Mount — Parallel

Order Code



J



Dimensions — mm (in)

| XFC Size | B | BA | E | Ø FB | G | H | HC | J | KB |
|----------|------------|------------|--------------|-----------|-----------|---------------|--------------|------------|------------|
| 075 | 106 (4.17) | 44 (1.73) | 76.2 (3.00) | 9 (0.35) | 22 (0.87) | 174.2 (6.86) | 98 (3.86) | 62 (2.44) | 6.5 (0.26) |
| 090 | 128 (5.04) | 54 (2.13) | 88.9 (3.50) | 11 (0.43) | 25 (0.98) | 206.9 (8.15) | 118 (4.65) | 74 (2.91) | 8 (0.31) |
| 115 | 154 (6.06) | 63 (2.48) | 114.3 (4.50) | 14 (0.55) | 30 (1.18) | 271 (10.67) | 156 (6.14) | 91 (3.58) | 10 (0.39) |
| 140 | 180 (7.09) | 72 (2.83) | 139.7 (5.50) | 18 (0.71) | 35 (1.38) | 332.2 (13.08) | 192.5 (7.58) | 108 (4.25) | 13 (0.51) |
| 165 | 211 (8.31) | 88 (3.46) | 165.1 (6.50) | 21 (0.83) | 40 (1.57) | 379.1 (14.93) | 224 (8.82) | 123 (4.84) | 18 (0.71) |
| 190 | 252 (9.92) | 100 (3.94) | 190.5 (7.50) | 22 (0.87) | 50 (1.97) | 455.5 (17.93) | 265 (10.43) | 152 (5.98) | 18 (0.71) |

| XFC Size | KC | R | Ø RD _{FB} | TF | UO | VL | WF | Add Stroke | |
|----------|--------------|------------|--------------------|------------|--------------|-----------|-----------|--------------|---------------|
| | | | | | | | | LB | ZJ |
| 075 | 6.93 (0.27) | 52 (2.05) | 65 (2.559) | 105 (4.13) | 125 (4.92) | 10 (0.39) | 38 (1.50) | 249.5 (9.82) | 287.5 (11.32) |
| 090 | 8.65 (0.34) | 65 (2.56) | 75 (2.953) | 117 (4.61) | 139.7 (5.50) | 10 (0.39) | 40 (1.57) | 302 (11.89) | 342 (13.46) |
| 115 | 10.15 (0.40) | 83 (3.27) | 95 (3.740) | 149 (5.87) | 175 (6.89) | 12 (0.47) | 45 (1.77) | 356 (14.02) | 401 (15.79) |
| 140 | 13.65 (0.54) | 107 (4.21) | 110 (4.331) | 172 (6.77) | 210 (8.27) | 12 (0.47) | 45 (1.77) | 420 (16.54) | 465 (18.31) |
| 165 | 13.65 (0.54) | 120 (4.72) | 135 (5.315) | 215 (8.46) | 260 (10.24) | 14 (0.55) | 60 (2.36) | 505 (19.88) | 565 (22.24) |
| 190 | 17.18 (0.68) | 155 (6.10) | 155 (5.315) | 253 (9.96) | 300 (11.81) | 16 (0.63) | 62 (2.44) | 603 (23.74) | 665 (26.18) |

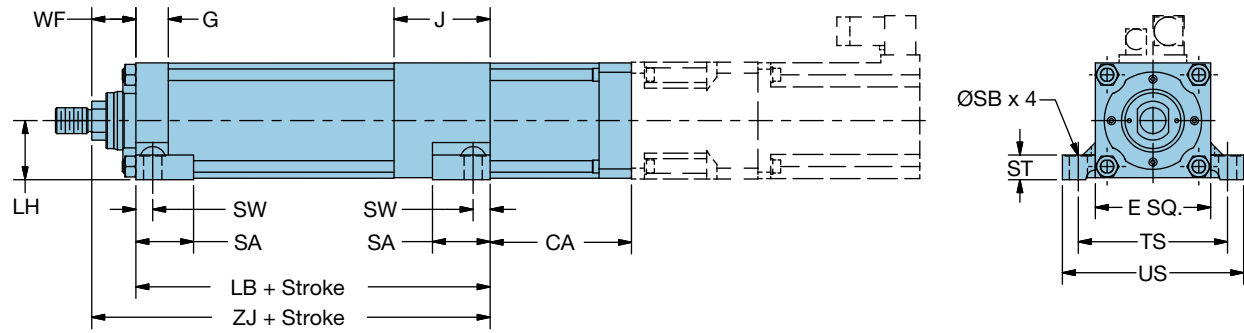
XFC Mount Options

Foot Mount — Inline

Order
Code



C



Dimensions — mm (in)

| XFC Size | | | | | | | | | | | | Add Stroke | |
|------------|-----------------|--------------|---------------|-------------------|----------------|--------------|----------------|--------------|----------------|------------------|--------------|-----------------|-----------------|
| | E | G | J | LH _{h10} | SA | ØSB | ST | SW | TS | US | WF | LB | ZJ |
| 075 | 76.2 (3.00) | 22 (0.87) | 62 (2.44) | 39 (1.535) | 33.3 (1.31) | 11 (0.43) | 12.7 (0.50) | 11 (0.43) | 97 (3.82) | 114.3 (4.50) | 38 (1.50) | 205.5 (8.09) | 243.5 (9.59) |
| 090 | 88.9 (3.50) | 25 (0.98) | 74 (2.91) | 45.5 (1.791) | 44.5 (1.75) | 14 (0.55) | 19.1 (0.75) | 13 (0.51) | 115 (4.53) | 139.7 (5.50) | 40 (1.57) | 248 (9.76) | 288 (11.34) |
| 115 | 114.3 (4.50) | 30 (1.18) | 91 (3.58) | 58 (2.283) | 57.2 (2.25) | 18 (0.71) | 25.4 (1.00) | 15 (0.59) | 155 (6.10) | 184.2 (7.25) | 45 (1.77) | 293 (11.54) | 338 (13.31) |
| 140 | 139.7 (5.50) | 35 (1.38) | 108 (4.25) | 71 (2.795) | 57.2 (2.25) | 18 (0.71) | 25.4 (1.00) | 18 (0.71) | 175 (6.89) | 209.6 (8.25) | 45 (1.77) | 348 (13.70) | 393 (15.47) |
| 165 | 165.1 (6.50) | 40 (1.57) | 123 (4.84) | 83.5 (3.287) | 73.0 (2.87) | 22 (0.87) | 31.8 (1.25) | 20 (0.79) | 210 (8.27) | 254 (10.00) | 60 (2.36) | 417 (16.42) | 477 (18.78) |
| 190 | 190.5 (7.50) | 50 (1.97) | 152 (5.98) | 96.5 (3.799) | 92.1 (3.63) | 26 (1.02) | 38.1 (1.50) | 25 (0.98) | 260 (10.24) | 304.8 (12.00) | 62 (2.44) | 503 (19.80) | 565 (22.24) |

Motor/Gearhead

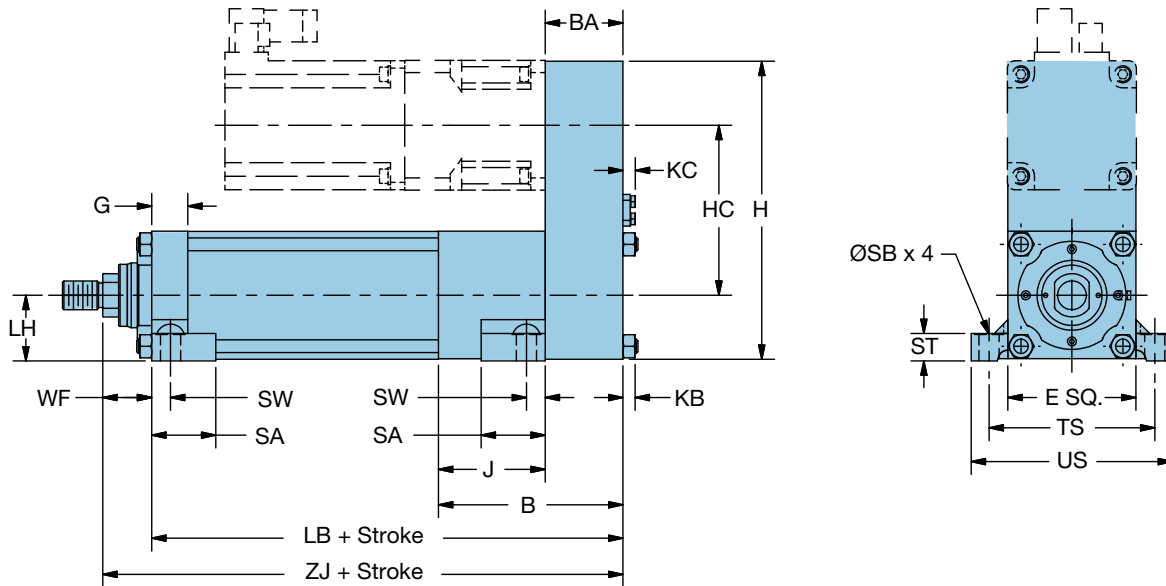
| XFC Size | Dimension CA | | | | | | | | |
|------------|--------------|------------|------------|------------|-------|------------|------------|------------|------------|
| | PS090 | PS115 | PS142 | PS180 | PS220 | MPP115 | MPP142 | MPP190 | MPP270 |
| 075 | 113 (4.45) | 115 (4.53) | — | — | — | 98 (3.86) | 109 (4.29) | — | — |
| 090 | 115 (4.53) | 117 (4.61) | — | — | — | 100 (3.94) | 111 (4.37) | — | — |
| 115 | — | 130 (5.12) | 158 (6.22) | — | — | — | 113 (4.45) | 136 (5.35) | — |
| 140 | — | — | 161 (6.34) | 190 (7.48) | — | — | — | 139 (5.47) | — |
| 165 | — | — | 164 (6.46) | 193 (7.60) | — | — | — | — | 183 (7.20) |
| 190 | — | — | — | 194 (7.64) | — | — | — | — | 214 (8.43) |

Foot Mount — Parallel

Order Code



C



Dimensions — mm (in)

| XFC Size | B | BA | E | G | H | HC | J | KB | KC |
|----------|------------|------------|--------------|-----------|---------------|--------------|------------|------------|--------------|
| 075 | 106 (4.17) | 44 (1.73) | 76.2 (3.00) | 22 (0.87) | 174.2 (6.86) | 98 (3.86) | 62 (2.44) | 6.5 (0.26) | 6.93 (0.27) |
| 090 | 128 (5.04) | 54 (2.13) | 88.9 (3.50) | 25 (0.98) | 206.9 (8.15) | 118 (4.65) | 74 (2.91) | 8 (0.31) | 8.65 (0.34) |
| 115 | 154 (6.06) | 63 (2.48) | 114.3 (4.50) | 30 (1.18) | 271 (10.67) | 156 (6.14) | 91 (3.58) | 10 (0.39) | 10.15 (0.40) |
| 140 | 180 (7.09) | 72 (2.83) | 139.7 (5.50) | 35 (1.38) | 332.2 (13.08) | 192.5 (7.58) | 108 (4.25) | 13 (0.51) | 13.65 (0.54) |
| 165 | 211 (8.31) | 88 (3.46) | 165.1 (6.50) | 40 (1.57) | 379.1 (14.93) | 224 (8.82) | 123 (4.84) | 18 (0.71) | 13.65 (0.54) |
| 190 | 252 (9.92) | 100 (3.94) | 190.5 (7.50) | 50 (1.97) | 455.5 (17.93) | 265 (10.43) | 152 (5.98) | 18 (0.71) | 17.18 (0.68) |

| XFC Size | LH _{h10} | SA | ØSB | ST | SW | TS | US | WF | Add Stroke | |
|----------|-------------------|----------------|--------------|----------------|--------------|----------------|------------------|--------------|-----------------|------------------|
| | | | | | | | | | LB | ZJ |
| 075 | 39 (1.535) | 33.3 (1.31) | 11 (0.43) | 12.7 (0.50) | 11 (0.43) | 97 (3.82) | 114.3 (4.50) | 38 (1.50) | 249.5 (9.82) | 287.5 (11.32) |
| 090 | 45.5 (1.791) | 44.5 (1.75) | 14 (0.55) | 19.1 (0.75) | 13 (0.51) | 115 (4.53) | 139.7 (5.50) | 40 (1.57) | 302 (11.89) | 342 (13.46) |
| 115 | 58 (2.283) | 57.2 (2.25) | 18 (0.71) | 25.4 (1.00) | 15 (0.59) | 155 (6.10) | 184.2 (7.25) | 45 (1.77) | 356 (14.02) | 401 (15.79) |
| 140 | 71 (2.795) | 57.2 (2.25) | 18 (0.71) | 25.4 (1.00) | 18 (0.71) | 175 (6.89) | 209.6 (8.25) | 45 (1.77) | 420 (16.54) | 465 (18.31) |
| 165 | 83.5 (3.287) | 73.0 (2.87) | 22 (0.87) | 31.8 (1.25) | 20 (0.79) | 210 (8.27) | 254 (10.00) | 60 (2.36) | 505 (19.88) | 565 (22.24) |
| 190 | 96.5 (3.799) | 92.1 (3.63) | 26 (1.02) | 38.1 (1.50) | 25 (0.98) | 260 (10.24) | 304.8 (12.00) | 62 (2.44) | 603 (23.74) | 665 (26.18) |

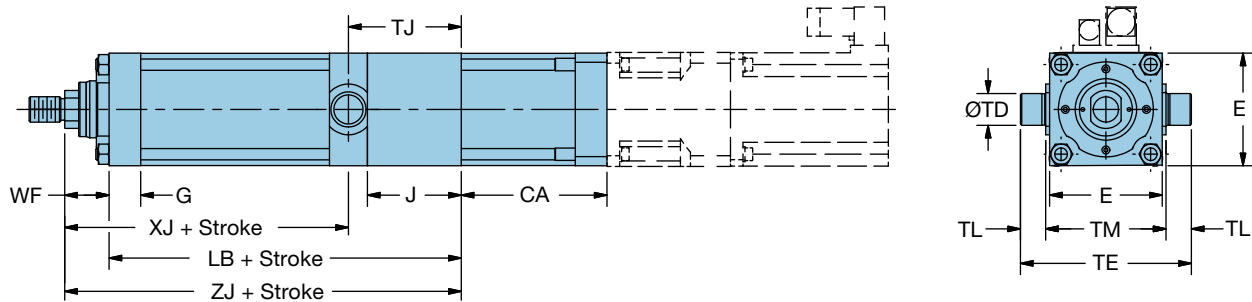
XFC Mount Options

Rear Trunnion Mount — Inline

Order
Code



T



Dimensions — mm (in)

| XFC Size | Add Stroke | | | | | | | | | | | |
|----------|-----------------|--------------|---------------|----------------|--------------------|--------------|------------------|-----------------|--------------|-----------------|----------------|-----------------|
| | E | G | J | TJ | Ø TD _{FB} | TL | TE | TM | WF | LB | XJ | ZJ |
| 075 | 76.2 (3.00) | 22 (0.87) | 62 (2.44) | 74.5 (2.93) | 20 (0.787) | 16 (0.63) | 112 (4.41) | 80 (3.15) | 38 (1.50) | 205.5 (8.09) | 169 (6.65) | 243.5 (9.59) |
| 090 | 88.9 (3.50) | 25 (0.98) | 74 (2.91) | 89 (3.50) | 25 (0.984) | 20 (0.79) | 135 (5.32) | 95 (3.74) | 40 (1.57) | 248 (9.76) | 199 (7.83) | 288 (11.34) |
| 115 | 114.3 (4.50) | 30 (1.18) | 91 (3.58) | 111 (4.37) | 32 (1.260) | 25 (0.98) | 170 (6.69) | 120 (4.72) | 45 (1.77) | 293 (11.54) | 227 (8.94) | 338 (13.31) |
| 140 | 139.7 (5.50) | 35 (1.38) | 108 (4.25) | 132 (5.20) | 40 (1.575) | 32 (1.26) | 209.4 (8.244) | 145.4 (5.72) | 45 (1.77) | 348 (13.70) | 261 (10.28) | 393 (15.47) |
| 165 | 165.1 (6.50) | 40 (1.57) | 123 (4.84) | 152 (5.98) | 50 (1.969) | 40 (1.57) | 250 (9.84) | 170 (6.69) | 60 (2.36) | 417 (16.42) | 325 (12.80) | 477 (18.78) |
| 190 | 190.5 (7.50) | 50 (1.97) | 152 (5.98) | 188 (7.40) | 63 (2.480) | 50 (1.97) | 295.4 (11.63) | 195.4 (7.69) | 62 (2.44) | 503 (19.80) | 377 (14.84) | 565 (22.24) |

Motor/Gearhead

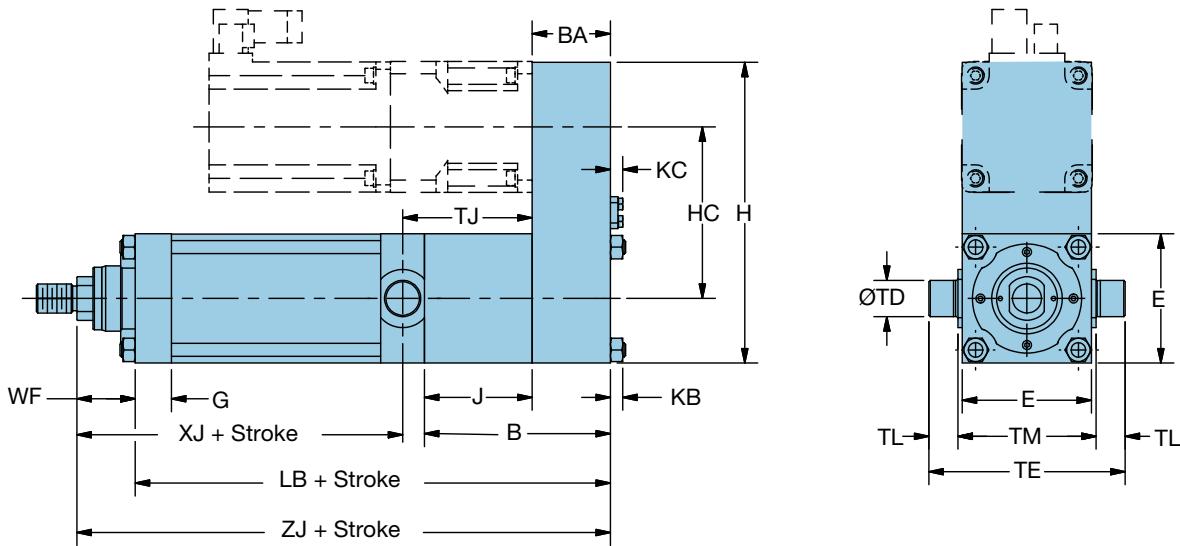
| XFC Size | Dimension CA | | | | | | | | |
|----------|--------------|------------|------------|------------|-------|------------|------------|------------|------------|
| | PS090 | PS115 | PS142 | PS180 | PS220 | MPP115 | MPP142 | MPP190 | MPP270 |
| 075 | 113 (4.45) | 115 (4.53) | — | — | — | 98 (3.86) | 109 (4.29) | — | — |
| 090 | 115 (4.53) | 117 (4.61) | — | — | — | 100 (3.94) | 111 (4.37) | — | — |
| 115 | — | 130 (5.12) | 158 (6.22) | — | — | — | 113 (4.45) | 136 (5.35) | — |
| 140 | — | — | 161 (6.34) | 190 (7.48) | — | — | — | 139 (5.47) | — |
| 165 | — | — | 164 (6.46) | 193 (7.60) | — | — | — | — | 183 (7.20) |
| 190 | — | — | — | 194 (7.64) | — | — | — | — | 214 (8.43) |

Rear Trunnion Mount — Parallel

Order Code



T



Dimensions — mm (in)

| XFC Size | B | BA | E | G | H | HC | J | KB | KC |
|----------|------------|------------|--------------|-----------|---------------|--------------|------------|------------|--------------|
| 075 | 106 (4.17) | 44 (1.73) | 76.2 (3.00) | 22 (0.87) | 174.2 (6.86) | 98 (3.86) | 62 (2.44) | 6.5 (0.26) | 6.93 (0.27) |
| 090 | 128 (5.04) | 54 (2.13) | 88.9 (3.50) | 25 (0.98) | 206.9 (8.15) | 118 (4.65) | 74 (2.91) | 8 (0.31) | 8.65 (0.34) |
| 115 | 154 (6.06) | 63 (2.48) | 114.3 (4.50) | 30 (1.18) | 271 (10.67) | 156 (6.14) | 91 (3.58) | 10 (0.39) | 10.15 (0.40) |
| 140 | 180 (7.09) | 72 (2.83) | 139.7 (5.50) | 35 (1.38) | 332.2 (13.08) | 192.5 (7.58) | 108 (4.25) | 13 (0.51) | 13.65 (0.54) |
| 165 | 211 (8.31) | 88 (3.46) | 165.1 (6.50) | 40 (1.57) | 379.1 (14.93) | 224 (8.82) | 123 (4.84) | 18 (0.71) | 13.65 (0.54) |
| 190 | 252 (9.92) | 100 (3.94) | 190.5 (7.50) | 50 (1.97) | 455.5 (17.93) | 265 (10.43) | 152 (5.98) | 18 (0.71) | 17.18 (0.68) |

| XFC Size | TJ | Ø TD _{fb} | TL | TE | TM | WF | Add Stroke | | |
|----------|----------------|--------------------|----------------|------------------|-----------------|--------------|-----------------|----------------|------------------|
| | | | | | | | LB | XJ | ZJ |
| 075 | 74.5 (2.93) | 20 (0.787) | 16 (0.63) | 112 (4.41) | 80 (3.15) | 38 (1.50) | 249.5 (9.82) | 169 (6.65) | 287.5 (11.32) |
| 090 | 89 (3.50) | 25 (0.984) | 20 (0.79) | 135 (5.32) | 95 (3.74) | 40 (1.57) | 302 (11.89) | 199 (7.83) | 342 (13.46) |
| 115 | 111 (4.37) | 32 (1.260) | 25 (0.98) | 170 (6.69) | 120 (4.72) | 45 (1.77) | 356 (14.02) | 227 (8.94) | 401 (15.79) |
| 140 | 132 (5.20) | 40 (1.575) | 32 (1.26) | 209.4 (8.244) | 145.4 (5.72) | 45 (1.77) | 420 (16.54) | 261 (10.28) | 465 (18.31) |
| 165 | 152 (5.98) | 50 (1.969) | 40 (1.57) | 250 (9.84) | 170 (6.69) | 60 (2.36) | 505 (19.88) | 325 (12.80) | 565 (22.24) |
| 190 | 155 (6.10) | 63 (2.480) | 155 (5.315) | 300 (11.81) | 253 (9.96) | 62 (2.44) | 603 (23.74) | 377 (14.84) | 665 (26.18) |

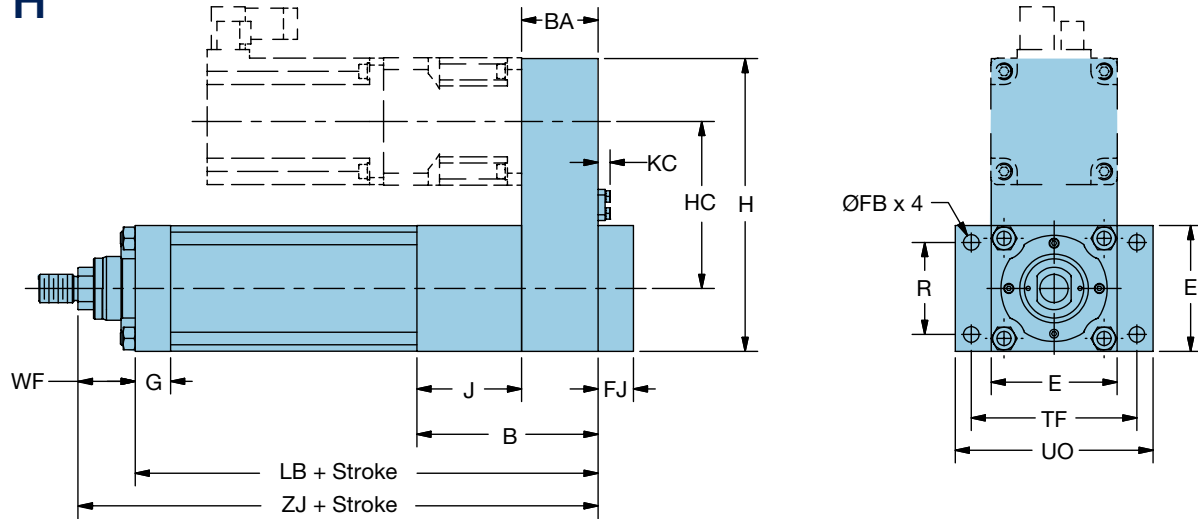
XFC Mount Options

Rear Flange Mount — Parallel Only

Order
Code



H



Dimensions — mm (in)

| XFC Size | B | BA | E | Ø FB | FJ | G | H | HC |
|------------|---------------|---------------|-----------------|--------------|--------------|--------------|------------------|-----------------|
| 075 | 106 (4.17) | 44 (1.73) | 76.2 (3.00) | 9 (0.35) | 12 (0.47) | 22 (0.87) | 174.2 (6.86) | 98 (3.86) |
| 090 | 128 (5.04) | 54 (2.13) | 88.9 (3.50) | 11 (0.43) | 14 (0.55) | 25 (0.98) | 206.9 (8.15) | 118 (4.65) |
| 115 | 154 (6.06) | 63 (2.48) | 114.3 (4.50) | 14 (0.55) | 16 (0.63) | 30 (1.18) | 271 (10.67) | 156 (6.14) |
| 140 | 180 (7.09) | 72 (2.83) | 139.7 (5.50) | 18 (0.71) | 20 (0.79) | 35 (1.38) | 332.2 (13.08) | 192.5 (7.58) |
| 165 | 211 (8.31) | 88 (3.46) | 165.1 (6.50) | 21 (0.83) | 25 (0.98) | 40 (1.57) | 379.1 (14.93) | 224 (8.82) |
| 190 | 252 (9.92) | 100 (3.94) | 190.5 (7.50) | 22 (0.87) | 30 (1.18) | 50 (1.97) | 455.5 (17.93) | 265 (10.43) |

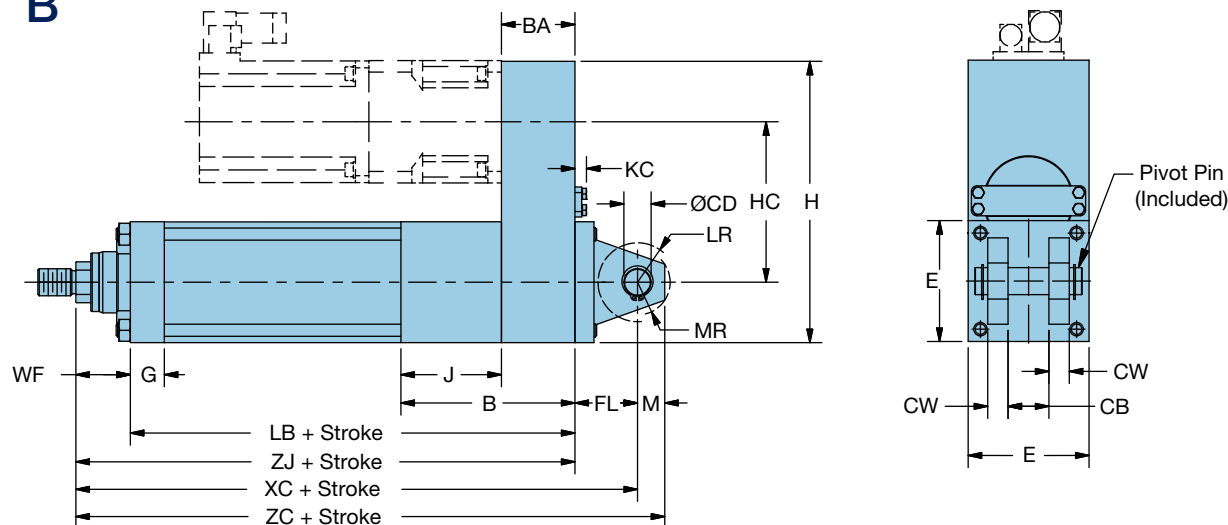
| XFC Size | J | KC | R | TF | UO | WF | Add Stroke | |
|------------|---------------|-----------------|---------------|---------------|-----------------|--------------|-----------------|------------------|
| | | | | | | | LB | ZJ |
| 075 | 62 (2.44) | 6.93 (0.27) | 52 (2.05) | 105 (4.13) | 125 (4.92) | 38 (1.50) | 249.5 (9.82) | 287.5 (11.32) |
| 090 | 74 (2.91) | 8.65 (0.34) | 65 (2.56) | 117 (4.61) | 139.7 (5.50) | 40 (1.57) | 302 (11.89) | 342 (13.46) |
| 115 | 91 (3.58) | 10.15 (0.40) | 83 (3.27) | 149 (5.87) | 175 (6.89) | 45 (1.77) | 356 (14.02) | 401 (15.79) |
| 140 | 108 (4.25) | 13.65 (0.54) | 107 (4.21) | 172 (6.77) | 210 (8.27) | 45 (1.77) | 420 (16.54) | 465 (18.31) |
| 165 | 123 (4.84) | 13.65 (0.54) | 120 (4.72) | 215 (8.46) | 260 (10.24) | 60 (2.36) | 505 (19.88) | 565 (22.24) |
| 190 | 152 (5.98) | 17.18 (0.68) | 155 (6.10) | 253 (9.96) | 300 (11.81) | 62 (2.44) | 603 (23.74) | 665 (26.18) |

Rear Clevis Mount — Parallel Only

Order Code



B



Dimensions — mm (in)

| XFC Size | B | BA | CB | Ø CD _{H9} | CW | E | FL | G | H | HC |
|------------|---------------|---------------|--------------|--------------------|--------------|-----------------|--------------|--------------|------------------|-----------------|
| 075 | 106 (4.17) | 44 (1.73) | 20 (0.79) | 14 (0.551) | 10 (0.39) | 76.2 (3.00) | 31 (1.22) | 22 (0.87) | 174.2 (6.86) | 98 (3.86) |
| 090 | 128 (5.04) | 54 (2.13) | 30 (1.18) | 20 (0.787) | 15 (0.59) | 88.9 (3.50) | 46 (1.81) | 25 (0.98) | 206.9 (8.15) | 118 (4.65) |
| 115 | 154 (6.06) | 63 (2.48) | 30 (1.18) | 20 (0.787) | 15 (0.59) | 114.3 (4.50) | 48 (1.89) | 30 (1.18) | 271 (10.67) | 156 (6.14) |
| 140 | 180 (7.09) | 72 (2.83) | 40 (1.57) | 28 (1.102) | 20 (0.79) | 139.7 (5.50) | 59 (2.32) | 35 (1.38) | 332.2 (13.08) | 192.5 (7.58) |
| 165 | 211 (8.31) | 88 (3.46) | 50 (1.97) | 36 (1.417) | 25 (0.98) | 165.1 (6.50) | 79 (3.11) | 40 (1.57) | 379.1 (14.93) | 224 (8.82) |
| 190 | 252 (9.92) | 100 (3.94) | 60 (2.36) | 45 (1.772) | 30 (1.18) | 190.5 (7.50) | 87 (3.43) | 50 (1.97) | 455.5 (17.93) | 265 (10.43) |

| XFC Size | Add Stroke | | | | | | | | | |
|------------|---------------|-----------------|--------------|--------------|--------------|--------------|-----------------|------------------|------------------|------------------|
| | J | KC | LR | M | MR | WF | LB | XC | ZC | ZJ |
| 075 | 62 (2.44) | 6.93 (0.27) | 17 (0.67) | 14 (0.55) | 17 (0.67) | 38 (1.50) | 249.5 (9.82) | 318.5 (12.54) | 332.5 (13.09) | 287.5 (11.32) |
| 090 | 74 (2.91) | 8.65 (0.34) | 29 (1.14) | 20 (0.79) | 25 (0.98) | 40 (1.57) | 302 (11.89) | 388 (15.28) | 408 (16.06) | 342 (13.46) |
| 115 | 91 (3.58) | 10.15 (0.40) | 29 (1.14) | 20 (0.79) | 25 (0.98) | 45 (1.77) | 356 (14.02) | 449 (17.68) | 469 (18.46) | 401 (15.79) |
| 140 | 108 (4.25) | 13.65 (0.54) | 34 (1.34) | 28 (1.10) | 34 (1.34) | 45 (1.77) | 420 (16.54) | 524 (20.63) | 552 (21.73) | 465 (18.31) |
| 165 | 123 (4.84) | 13.65 (0.54) | 50 (1.97) | 36 (1.42) | 45 (1.77) | 60 (2.36) | 505 (19.88) | 644 (25.35) | 680 (26.77) | 565 (22.24) |
| 190 | 152 (5.98) | 17.18 (0.68) | 53 (2.09) | 45 (1.77) | 54 (2.13) | 62 (2.44) | 603 (23.74) | 752 (29.61) | 797 (31.38) | 665 (26.18) |

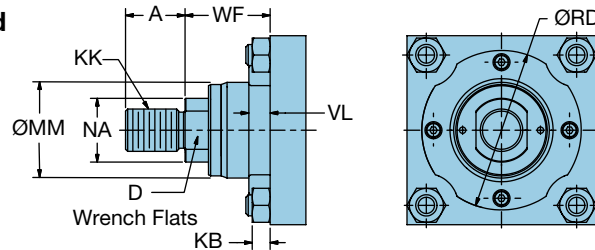
XFC Rod End Options & Accessories

Male Rod End

Order
Code



- A** Metric Thread
- B** Imperial Thread



Dimensions – mm (in)

| XFC Size | KK | | | | | | | | | |
|------------|--------------|--------------|---------------|---------|----------|---------------|--------------|-------------------|--------------|--------------|
| | A | D | KB | A | B | ØMM | NA | ØRD _{f8} | VL | WF |
| 075 | 22 (0.87) | 19 (0.75) | 6.5 (0.26) | M16x1.5 | 5/8-18 | 36 (1.42) | 24 (0.94) | 65 (2.558) | 10 (0.39) | 38 (1.50) |
| 090 | 28 (1.10) | 24 (0.94) | 8 (0.31) | M20x1.5 | 3/4-16 | 45 (1.77) | 30 (1.18) | 75 (2.952) | 10 (0.39) | 40 (1.57) |
| 115 | 36 (1.42) | 32 (1.26) | 10 (0.39) | M27x2 | 1-14 | 56 (2.20) | 40 (1.57) | 95 (3.739) | 12 (0.47) | 45 (1.77) |
| 140 | 45 (1.77) | 39 (1.54) | 13 (0.51) | M33x2 | 1 1/4-12 | 70 (2.76) | 49 (1.93) | 110 (4.329) | 12 (0.47) | 45 (1.77) |
| 165 | 56 (2.21) | 48 (1.89) | 18 (0.71) | M42x2 | 1 1/2-12 | 90 (3.54) | 60 (2.36) | 135 (5.313) | 14 (0.55) | 60 (2.36) |
| 190 | 63 (2.48) | 55 (2.17) | 18 (0.71) | M48x2 | 1 3/4-12 | 110 (4.33) | 70 (2.76) | 155 (6.101) | 16 (0.63) | 62 (2.44) |

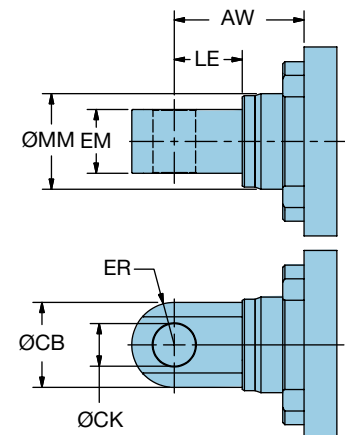
Rod Eye

Order
Code

C

Dimensions – mm (in)

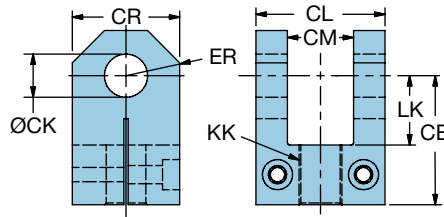
| XFC Size | AW | ØCB | ØCK _{H9} | EM _{h13} | ER _{MAX} | LE | ØMM |
|------------|---------------|---------------|-------------------|-------------------|-------------------|--------------|---------------|
| 075 | 48 (1.89) | 32 (1.26) | 14 (0.551) | 20 (0.787) | 16 (0.63) | 19 (0.75) | 36 (1.42) |
| 090 | 61 (2.40) | 40 (1.57) | 20 (0.787) | 30 (1.181) | 20 (0.79) | 32 (1.26) | 45 (1.77) |
| 115 | 66 (2.60) | 45 (1.77) | 20 (0.787) | 30 (1.181) | 23 (0.89) | 32 (1.26) | 56 (2.20) |
| 140 | 73 (2.87) | 60 (2.36) | 28 (1.102) | 40 (1.575) | 30 (1.18) | 39 (1.53) | 70 (2.76) |
| 165 | 99 (3.90) | 80 (3.15) | 36 (1.417) | 50 (1.969) | 40 (1.57) | 54 (2.13) | 90 (3.54) |
| 190 | 104 (4.09) | 100 (3.94) | 45 (1.772) | 60 (2.362) | 50 (1.97) | 57 (2.24) | 110 (4.33) |



Mounting Accessories

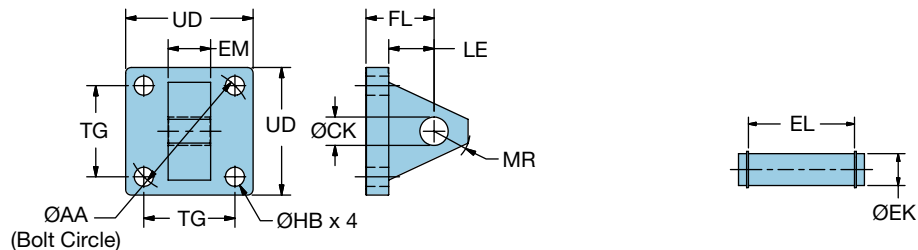


Dimensions – mm (in)



Rod Clevis

| XFC Size | Part No. | CE | CL | CM _{A16} | ØCK _{H9} | CR | LK _{MIN} | ER _{MAX} | KK | Load Rating kN (lb) |
|----------|------------|---------------|---------------|-------------------|-------------------|-----------------|-------------------|-------------------|---------|------------------------|
| 075 | 0950250075 | 41 (1.61) | 40 (1.57) | 20 (0.787) | 14 (0.551) | 30 (1.18) | 19 (0.75) | 15.53 (0.61) | M16x1.5 | 20 (4,500) |
| 090 | 0950250090 | 60 (2.36) | 60 (2.36) | 30 (1.181) | 20 (0.787) | 50 (1.97) | 32 (1.26) | 25.32 (1.00) | M20x1.5 | 34 (7,500) |
| 115 | 0950250115 | 68 (2.68) | 60 (2.36) | 30 (1.181) | 20 (0.787) | 50 (1.97) | 32 (1.26) | 25.71 (1.01) | M27x2 | 54 (12,000) |
| 140 | 0950250140 | 84 (3.31) | 83 (3.27) | 40 (1.575) | 28 (1.102) | 60 (2.36) | 39 (1.54) | 32.50 (1.28) | M33x2 | 80 (17,500) |
| 165 | 0950250165 | 110 (4.33) | 103 (4.06) | 50 (1.969) | 36 (1.417) | 76 (2.99) | 54 (2.13) | 41.04 (1.62) | M42x2 | 120 (26,500) |
| 190 | 0950250190 | 120 (4.72) | 123 (4.84) | 60 (2.362) | 45 (1.772) | 101.5 (4.00) | 57 (2.24) | 51.83 (2.04) | M48x2 | 178 (40,000) |



Clevis Bracket

| XFC Size | Part No. | Ø | | | | | | | | |
|----------|------------|---------------|------------------|--------------|--------------|----------------|-------------------|-------------------|-----------------|---------------|
| | | ØAA | CK _{H9} | EM | FL | ØHB | LE _{MIN} | MR _{MAX} | TG | UD |
| 075 | 1448100000 | 59 (2.32) | 14 (0.551) | 20 (0.79) | 29 (1.14) | 9 (0.35) | 19 (0.75) | 17 (0.67) | 41.7 (1.64) | 64 (2.52) |
| 090 | 1448110000 | 74 (2.91) | 20 (0.787) | 30 (1.18) | 48 (1.89) | 13.5 (0.53) | 32 (1.26) | 29 (1.14) | 52.3 (2.06) | 75 (2.95) |
| 115 | 1448120000 | 91 (3.58) | 20 (0.787) | 30 (1.18) | 48 (1.89) | 13.5 (0.53) | 32 (1.26) | 29 (1.14) | 64.3 (2.53) | 90 (3.54) |
| 140 | 1448130000 | 117 (4.61) | 28 (1.102) | 40 (1.58) | 59 (2.32) | 17.5 (0.69) | 39 (1.54) | 34 (1.34) | 82.7 (3.26) | 115 (4.53) |
| 165 | 1448140000 | 137 (5.39) | 36 (1.417) | 50 (1.97) | 79 (3.11) | 17.5 (0.69) | 54 (2.13) | 50 (1.97) | 96.9 (3.82) | 127 (5.00) |
| 190 | 1448150000 | 178 (7.01) | 45 (1.772) | 60 (2.36) | 87 (3.43) | 26 (1.02) | 57 (2.24) | 53 (2.09) | 125.9 (4.96) | 165 (6.50) |

Pivot Pin

| Part No. | Ø | |
|------------|------------------|---------------|
| | EK _{f8} | EL |
| 1434790000 | 14 (0.551) | 45 (1.77) |
| 1434800000 | 20 (0.787) | 66 (2.60) |
| 1434800000 | 20 (0.787) | 66 (2.60) |
| 1434810000 | 28 (1.102) | 87 (3.43) |
| 1434820000 | 36 (1.417) | 107 (4.21) |
| 1434830000 | 45 (1.772) | 129 (5.08) |

Motors, Gearheads & Adapter Plates

Motor and gearhead selection is critical to the performance of the XFC electromechanical cylinder and must be sized based on the application requirements.

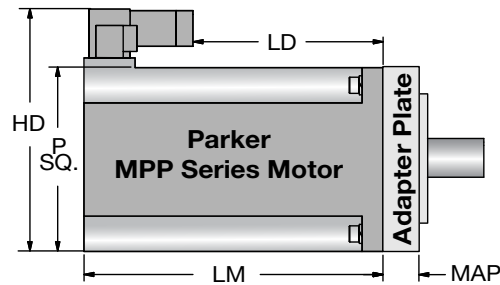
The tables below and on the next page provide information on Parker MPP motors or PS Series gearheads that are appropriate with the XFC.

A motor-only selection is typically used in high-speed/low-force applications, whereas a motor/gearhead combination is beneficial for slow speed/high force.

Standard configurations are available if a number is listed in the adapter plate columns (MAP, LAP). This number represents the adapter plate width and corresponds to the appropriate size motor and gearhead.

If the number is zero, the motor or gearhead combination is possible, but an adapter plate is not required. A dash indicates that a suitable combination is not available as a standard configuration.

Consult the factory to inquire about other options or configurations.



MPP Series Motors

Dimensions – mm (in)

| MPP Motor | | LM | LD | HD | P | MAP | | | | | | | | | | | | | | | |
|-----------|---|------------------|------------------|------------------|------------------|--------|-----|--------------|--------------|--------------|----------|--------------|--------------|--------------|--------------|-----|-----|--|--------------|--|--|
| | | | | | | Inline | | | | | Parallel | | | | | | | | | | |
| | | | | | | 075 | 090 | 115 | 140 | 165 | 190 | 075 | 090 | 115 | 140 | 165 | 190 | | | | |
| 115 | 2 | 152.4 (6.00) | 89.2 (3.51) | | | | | | | | | | | | | | | | | | |
| | 3 | 177.8 (7.00) | 115.2 (4.54) | 159.0 (6.26) | 113.0 (4.45) | 0.0 | 0.0 | | | | | 12 (0.47) | 12 (0.47) | | | | | | | | |
| | 4 | 203.2 (8.00) | 140.2 (5.52) | | | | | | | | | | | | | | | | | | |
| 142 | 2 | 172.9 (6.81) | 109.9 (4.33) | | | | | | | | | | | | | | | | | | |
| | 4 | 223.7 (8.81) | 160.8 (6.33) | 188.8 (7.43) | 142.7 (5.62) | 16 | 16 | 16 | | | | | 16 (0.63) | 16 (0.63) | | | | | | | |
| | 6 | 274.5 (10.81) | 211.9 (8.34) | | | | | | | | | | | | | | | | | | |
| | 8 | 325.3 (12.81) | 261.9 (10.31) | | | | | | | | | | | | | | | | | | |
| 190 | 4 | 224.0 (8.82) | 110.3 (4.34) | | | | | | | | | | | | | | | | | | |
| | 6 | 275.0 (10.83) | 161.3 (6.35) | 260.1 (10.24) | 184.9 (7.28) | | | 25 (0.98) | 25 (0.98) | | | | | 25 (0.98) | 25 (0.98) | | | | | | |
| | 8 | 325.3 (12.81) | 211.3 (8.32) | | | | | | | | | | | | | | | | | | |
| 270 | 6 | 293.3 (11.55) | 175.3 (6.90) | 335.9 (13.22) | 266.7 (10.50) | | | | 30 (1.18) | 30 (1.18) | | | | | | | | | 30 (1.18) | | |
| | 8 | 344.1 (13.55) | 255.5 (10.06) | | | | | | | | | | | | | | | | | | |

Note: Make sure the output torque on the motor is sufficient for the application. MPP torque information can be found at www.parkermotion.com

Motor Brake Option

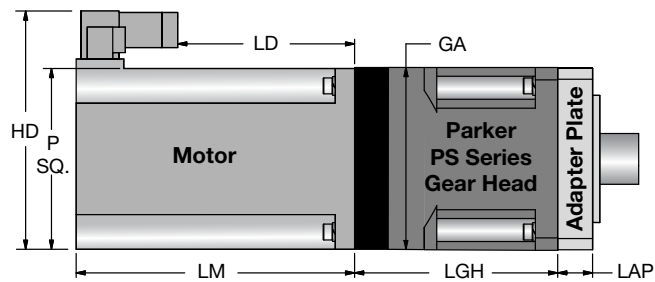
For vertical applications, a static brake should be used to resist back-driving the screw mechanism. A motor brake increases the overall length of the motor as indicated in the chart.

Brake Option Additional Motor Length

| Motor size | 092 | 100 | 115 | 142 | 190 | 270 |
|------------------------|----------------|----------------|----------------|----------------|----------------|-----------------|
| LM and LD Increase by: | 34.5 (1.36) | 48.5 (1.91) | 48.5 (1.91) | 51.6 (2.03) | 89.0 (3.50) | 127.0 (5.00) |

For specific motor holding torque, refer to MPP motor data at www.parkermotion.com

PS Series Gearheads



Dimensions – mm (in)

| Gear size | MPP Motor | | | | | | | | LAP ¹ | | | | | |
|-----------|---------------|---------------|---------------|---------------|---------------|---------------|------------|--------------|------------------|-----------|-----|-----|-----|-----|
| | Size | Length | LM | LD | HD | P | GA | LGH | 075 | 090 | 115 | 140 | 165 | 190 |
| PS90 | 092 | 1 | 127.2 (5.01) | 64.2 (2.53) | 136.4 (5.37) | 88.8 (3.50) | 90 (3.54) | 89.5 (3.52) | 19 (0.75) | 0.0 | — | — | — | — |
| | | 2 | 152.6 (6.01) | 90.2 (3.55) | | | | | | | — | — | — | — |
| | | 3 | 178.0 (7.01) | 115.2 (4.52) | | | | | | | — | — | — | — |
| | 100 | 2 | 149.1 (5.87) | 86.2 (3.39) | 143.8 (5.66) | 97.8 (3.85) | 98 (3.86) | — | | | — | — | — | |
| | | 3 | 174.5 (6.87) | 111.2 (4.38) | — | — | — | — | | | — | | | |
| | | — | — | — | — | — | — | — | | | — | | | |
| PS115 | 092 | 1 | 127.2 (5.01) | 64.2 (2.53) | 136.4 (5.37) | 88.8 (3.50) | — | — | 24 (0.94) | 22 (0.87) | 0.0 | — | — | — |
| | | 2 | 152.6 (6.01) | 90.2 (3.55) | | | | | | | | — | — | — |
| | | 3 | 178.0 (7.01) | 115.2 (4.52) | | | | | | | | — | — | — |
| | 100 | 2 | 149.1 (5.87) | 86.2 (3.39) | 143.8 (5.66) | 97.8 (3.85) | 115 (4.53) | 114.2 (4.50) | | | | — | — | — |
| | | 3 | 174.5 (6.87) | 111.2 (4.38) | — | — | — | — | | | | — | — | |
| | | — | — | — | — | — | — | — | | | | — | | |
| | 115 | 2 | 152.4 (6.00) | 89.2 (3.51) | 159.0 (6.26) | 113.0 (4.45) | — | — | | | | — | — | — |
| | | 3 | 177.8 (7.00) | 115.2 (4.54) | | | | | | | | — | — | — |
| 4 | | 203.2 (8.00) | 140.2 (5.52) | — | | | | | — | — | | | | |
| PS142 | 100 | 2 | 149.1 (5.87) | 86.2 (3.39) | 143.8 (5.66) | 97.8 (3.85) | — | — | — | — | — | | | |
| | | 3 | 174.5 (6.87) | 111.2 (4.38) | | | | | — | — | — | | | |
| | | — | — | — | | | | | — | — | — | | | |
| | 115 | 2 | 152.4 (6.00) | 89.2 (3.51) | 159.0 (6.26) | 113.0 (4.45) | 142 (5.59) | 133.7 (5.26) | — | — | — | | | |
| | | 3 | 177.8 (7.00) | 115.2 (4.54) | | | | | — | — | — | | | |
| | | 4 | 203.2 (8.00) | 140.2 (5.52) | | | | | — | — | — | | | |
| | 142 | 2 | 172.9 (6.81) | 109.9 (4.33) | 188.8 (7.43) | 142.7 (5.62) | — | — | — | — | — | | | |
| | | 4 | 223.7 (8.81) | 160.8 (6.33) | | | | | — | — | — | | | |
| 6 | | 274.5 (10.81) | 211.9 (8.34) | — | | | | | — | — | | | | |
| 8 | 325.3 (12.81) | 261.9 (10.31) | — | — | — | | | | | | | | | |
| PS180 | 115 | 2 | 152.4 (6.00) | 89.2 (3.51) | 159.0 (6.26) | 113.0 (4.45) | — | 148.5 (5.85) | — | — | — | | | |
| | | 3 | 177.8 (7.00) | 115.2 (4.54) | | | | | — | — | — | | | |
| | | 4 | 203.2 (8.00) | 140.2 (5.52) | | | | | — | — | — | | | |
| | 142 | 2 | 172.9 (6.81) | 109.9 (4.33) | 188.8 (7.43) | 142.7 (5.62) | 182 (7.17) | 151 (5.95) | — | — | — | | | |
| | | 4 | 223.7 (8.81) | 160.8 (6.33) | | | | | — | — | — | | | |
| | | 6 | 274.5 (10.81) | 211.9 (8.34) | | | | | — | — | — | | | |
| | | 8 | 325.3 (12.81) | 261.9 (10.31) | | | | | — | — | — | | | |
| | 190 | 4 | 224.0 (8.82) | 110.3 (4.34) | 260.1 (10.24) | 184.9 (7.28) | — | 192.5 (7.58) | — | — | — | | | |
| | | 6 | 275.0 (10.83) | 161.3 (6.35) | | | | | — | — | — | | | |
| | | 8 | 325.3 (12.81) | 211.3 (8.32) | | | | | — | — | — | | | |
| — | | — | — | — | | | | | — | — | | | | |
| PS220 | 190 | 4 | 224.0 (8.82) | 110.3 (4.34) | 260.1 (10.24) | 184.9 (7.28) | 220 (8.66) | 212 (8.35) | — | — | — | | | |
| | | 6 | 275.0 (10.83) | 161.3 (6.35) | | | | | — | — | — | | | |
| | | 8 | 325.3 (12.81) | 211.3 (8.32) | | | | | — | — | — | | | |
| | 270 | 6 | 293.3 (11.55) | 175.3 (6.90) | 335.9 (13.22) | 266.7 (10.50) | — | 252 (9.92) | — | — | — | | | |
| | | 8 | 344.1 (13.55) | 255.5 (10.06) | | | | | — | — | — | | | |
| | | — | — | — | | | | | — | — | — | | | |

¹ LAP dimension is required for parallel mounting only; 0.0 means no adapter plate required. Inline configurations do not require adapter plates.

Note: Make sure the output torque on the gear head is sufficient for the application. PS torque information can be found at www.parkermotion.com

Compax3 Drive/Controller



Compax3 Power Range

| Compax3 Device | Current A _{RMS} | | Supply Voltage |
|---------------------|--------------------------|---------------------------|----------------|
| | I _{cont} | I _{peak(<5s)} | |
| S025V2 | 2.5 | 5.5 | 1Ø 230/240VAC |
| S063V2 | 6.3 | 12.6 | |
| S100V2 | 10 | 20 | 3Ø 230/240VAC |
| S150V2 | 15 | 30 | |
| S038V4 ¹ | 3.8 | 9.0 | 3Ø 400/480VAC |
| S075V4 ¹ | 7.5 | 15 | |
| S150V4 ¹ | 15 | 30 | |
| S300V4 ¹ | 30 | 60 | |
| H050V4 ¹ | 50 | 75 | 3Ø 400/480VAC |
| H090V4 ¹ | 90 | 135 | |
| H125V4 ¹ | 125 | 187.5 | |
| H155V4 ¹ | 155 | 232.5 | |

¹Rated at 400 VAC

Standard Features

- Power range of 1kW...75kW
- 8 digital inputs, 4 digital outputs
- Available with ETHERNET Powerlink, and EtherCat
- RS232 / RS485 – interfaces
- 2 analog inputs (+/-10V, 14 bits)
- 2 analog outputs (+/-10V, 8 bits)
- Encoder input or output
- Motors supported:
 - Synchronous servo motors
 - Asynchronous motors
 - Linear motors
 - Torque motors
- Position sensing at the motor shaft via:
 - Resolver
 - Rotary/linear encoder
 - Sine-cosine feedback
 - Hiperface interface
 - EnDat 2.2 interface
 - Compatible with most feedback systems
- Support for SSI feedback

Extensions

- Real-time bus for axis coupling
- Scalable technology and control functions
- Integrated or external controls

Functions (summary)

- Programmable according to IEC61131-3
- Reg-related positioning, electronic gearing, dynamic positioning (motion superimposition) and torque-force control
- Cam – modular, with coupling and decoupling functions, cam switching mechanism

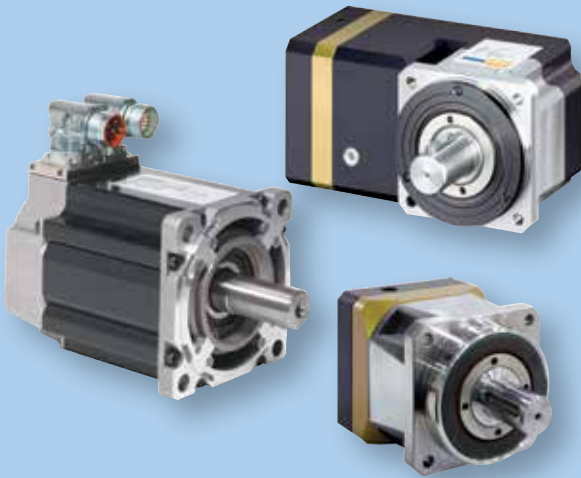
Technologies

- T10: Step/Direction and Analog Command Input
- T11: Positioning indexer
- T30: IEC61131-3 Positioning with function modules according to PLCopen
- T40: IEC61131-3 Positioning plus Cam function modules

For further information on Compax3 Drive/Controllers or assistance with sizing and selection, please consult parkermotion.com, or consult the factory

Complementary Parker Products

Parker offers HMI solutions for any application from simple push button replacement through sophisticated networking, multimedia and data logging requirements. Products range from entry level embedded displays through full Windows-based Industrial PC solutions.



Parker offers a broad family of motors with unparalleled performance, a torque range of 1.2 in-lbs to 4000 in-lbs and complete customization capabilities. For higher torque requirements, Parker's Stealth gearheads are the perfect solution.

Solid State Switches

Global Drop-In Solid State Switches



Specifications

| | |
|------------------------------------|----------------------------------|
| Switch Classification | Standard PNP or NPN |
| Type | Electronic |
| Output Function | Normally Open/Closed |
| Switch Output | PNP/NPN |
| Operating Voltage | 10 - 30VDC |
| Continuous Current | 100 mA max. |
| Response Sensitivity | 28 Gauss min. |
| Switching Frequency | 5 KHz |
| Power Consumption | 10 mA max. |
| Voltage Drop | 2.5 VDC max. |
| Ripple | 10% of Operating Voltage |
| Hysteresis | 1.5 mm max. |
| Repeatability | 0.1 mm max. |
| EMC | EN 60 947-5-2 |
| Short-circuit Protection | Yes |
| Power-up Pulse Suppression | Yes |
| Reverse Polarity Protection | Yes |
| Enclosure Rating | IP68 |
| Shock and Vibration Stress | 30g, 11 ms, 10 to 55Hz, 1 mm |
| Operating Temperature Range | -25°C to +75°C (-13°F to +167°F) |
| Housing Material | PA 12 Black |
| Connector Cable | PVC |
| Connector | PUR |

Global solid state switch outputs may be influenced by an external magnetic field. Care must be taken to avoid external magnetic field exposure.

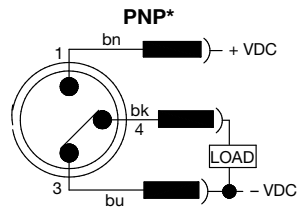
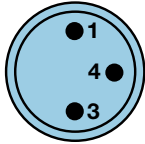
Solid State Switch Ordering Information

| | PNP* | | NPN | |
|---------------------------------------|--------------|-----------------|---------------|-----------------|
| | Nomally Open | Normally Closed | Normally Open | Normally Closed |
| 3 m Flying Leads | P8S-GPFIK | P8S-GQFIK | P8S-GNFIK | P8S-GMFIK |
| 10 m Flying Leads | P8S-GPFTX | — | P8S-GNFTX | — |
| 0.3 m Lead with 8 mm connector | P8S-GPSHX | P8S-GQSHX | P8S-GNSHX | P8S-GMSHM |
| 1 m Lead with 8 mm connector | P8S-GPSCX | — | P8S-GNSCX | — |
| Compax3 Compatible | Yes | Yes | No | No |

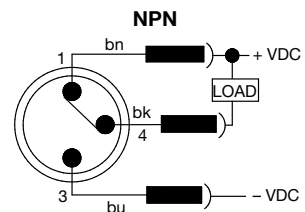
*PNP needed for Compax3 Servo Drive.

Wiring Connection

Flying Lead or 8 mm Connector (shown)

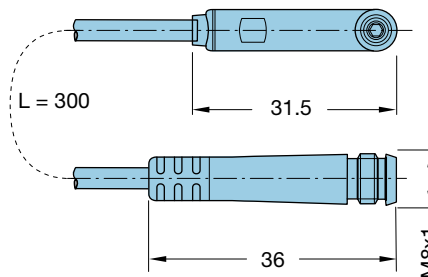
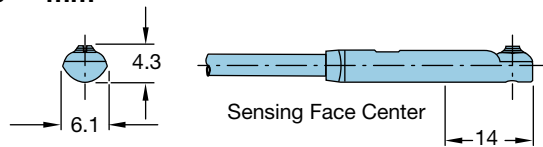


*PNP needed for Compax3 Servo Drive



| Pin | Wire | Function |
|-----|-------|--------------------------|
| 1 | Brown | Operating Voltage (+VDC) |
| 4 | Black | Output signal (N.O.) |
| 3 | Blue | -VDC |

Dimensions – mm



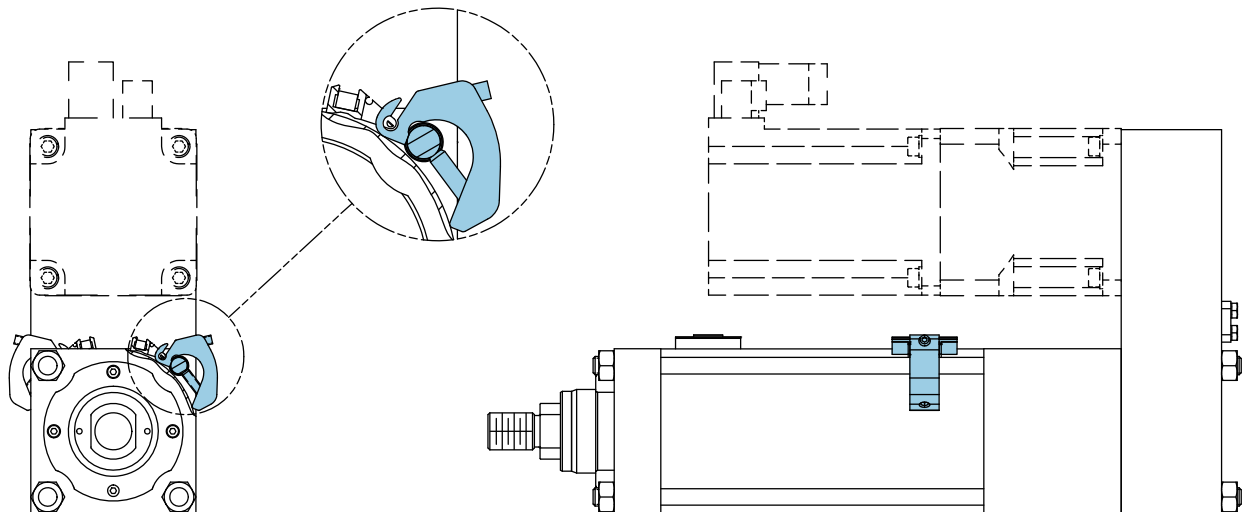
8 mm Threaded Cord Set to Flying Leads

| | |
|------------|---------|
| 086620T002 | 2 meter |
| 086620T005 | 5 meter |

Tie Rod Bracket Assembly

Global switch bracket fits XFC 075 - 115 cylinders. Global switches and bracket assemblies must be ordered separately.

| | |
|-----------|--------------------------|
| P8S-TMA0X | Tie Rod Bracket Assembly |
|-----------|--------------------------|



Life Calculations

L₁₀ life ratings are based on 90% rolling elements achieving the service life before showing signs of material failure. The service life of the cylinder can be determined by known forces exerted on the cylinder and mechanical system.

Most often, the load is not constant across the range of motion the cylinder experiences and these loading changes affect the life of the cylinder. In order to determine the loading of the cylinder, an equivalent load method is used to model loading on the system.

Life Calculations (millions of revolutions)

$$L_{10} = \left(\frac{C_a}{F_m} \right)^3$$

Life Calculations (millions of mm)

$$L_{10} = \left(\frac{C_a}{F_m} \right)^3 \times \text{Screw Lead}$$

L₁₀ = Life (Millions of Revolutions)

C_a = Basic Dynamic Load Rating (from page 6)

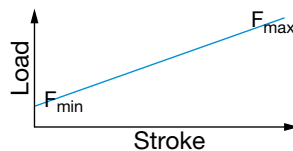
F_m = Equivalent Load (see Load Calculation below)

Please consult factory for advanced life calculations.

Equivalent Load Calculations

Simple Load Calculation

$$F_m = \frac{F_{\min} + 2F_{\max}}{3}$$



Complex Load Calculation

To model complex loads, the formula to calculate the equivalent load on the cylinder is:

$$F_m = \sqrt[3]{\frac{(F_1^3 * x_1) + (F_2^3 * x_2) + (F_3^3 * x_3) + (F_n^3 * x_n) + \dots}{(x_1 + x_2 + x_3 + x_n) + \dots}}$$

F_m = Equivalent load used for life calculations

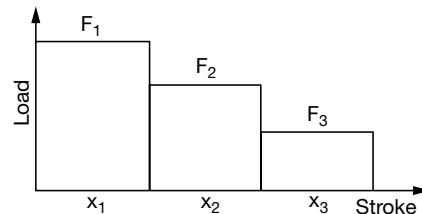
F_n = Force exerted over segment of distance x_n

x_n = Distance over which F_n is exerted

Example:

A cylinder is subjected to 5 kN over 100 mm, 10 kN over the next 100 mm and 20 kN over the next 100 mm. The equivalent load is calculated by:

$$F_m = \sqrt[3]{\frac{(5\text{kN}^3 * 100\text{mm}) + (10\text{kN}^3 * 100\text{mm}) + (20\text{kN}^3 * 100\text{mm})}{(100\text{mm} + 100\text{mm} + 100\text{mm})}}$$



XFC Cylinder Sizing

Thrust Calculations

Calculate the thrust generated by the application. Total thrust generally consists of three components:

Acceleration Thrust

$$F_a = L/g \times V/T_a$$

Thrust Due to Gravity

$$F_g = L \sin \alpha$$

(Horizontal applications do not apply.)

Thrust Due to Friction

$$F_f = \mu_s L \cos \alpha$$

$$\text{Total Thrust} = F_t = F_a + F_g + F_f$$

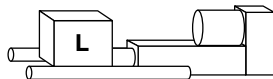
Definitions:

| | |
|----------------------|---|
| F_t | Total (maximum) Thrust Force (N, lb) |
| F_f | Friction Force (N, lb) |
| F_g | Force of Gravity (N, lb) |
| F_a | Acceleration Thrust (N, lb) |
| α | Angle of Inclination (see Angular Cylinder Orientation illustration below) |
| μ_s | Coefficient of Sliding Friction (see chart below) |
| L | Actual Weight (N, lb) |
| g | Acceleration Due to Gravity (9800 mm/sec ² , 386 in/sec ²) |
| V | Velocity (mm/sec, inch/sec) |
| T_a | Acceleration Time (sec) |
| D | Move Distance (mm, in) |
| t | Move Time (sec) |
| A | Acceleration (mm/sec ² , inch/sec ²) |

Cylinder Orientation

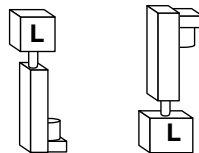
The terms used and their values depend upon the orientation of the cylinder. Refer to the illustrations and equations to determine the form of the thrust equation.

Horizontal



$$F_t = F_a + F_f$$

Vertical



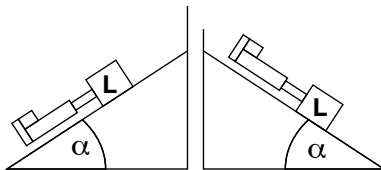
Upward

$$F_t = F_a + F_g + F_f$$

Downward

$$F_t = F_a - F_g + F_f$$

Angular



Upward

$$F_t = F_a + F_g + F_f$$

Downward

$$F_t = F_a - F_g + F_f$$

Friction Coefficients μ_s

| Material | μ _s |
|---------------------------------|----------------|
| Dry contact unless noted | |
| Steel on steel | 0.80 |
| Steel on steel (lubricated) | 0.16 |
| Aluminum on steel | 0.45 |
| Copper on steel | 0.22 |
| Brass on steel | 0.35 |
| PTFE on steel | 0.04 |

Motor Speed Calculation

$$\text{Speed} = \frac{\text{VL} \times \text{Ratio}}{\text{Lead}}$$

Where:

- Lead** Screw lead mm/rev (in/rev)
- VL** Maximum linear velocity in mm/s (in/sec)
- Ratio** Reduction ratio, if any (i.e. 3:1, Ratio = 3)
- Speed** Required motor speed in rev/sec

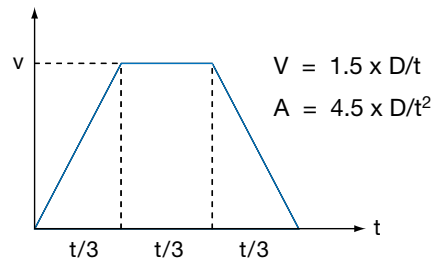
Motor Torque Calculation

$$T = \frac{\text{Thrust} \times \text{Lead}}{\eta_s \times \eta_b \times 2\pi \times \text{Ratio}}$$

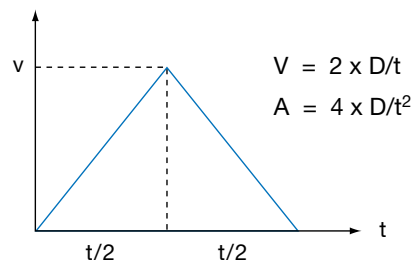
Where:

- T** Input torque required, Nm (in-lb)
- Lead** Screw lead in mm/rev (in/rev)
- Thrust** Calculated thrust value in kN (lbf)
 - $F_a + F_g + F_f$
 - F_a** (Acceleration Thrust) = Load/(9800mm/sec²) × Velocity/Acceleration Time
 - F_g** (Force of Gravity) = Load × sin α
 - F_f** (Friction Force) = μs × Load × cos α
- η_b** Gear Efficiency Coefficient:
0.95 (or 95%) for parallel driven versions
1.0 (100%) for inline versions
- η_s** Screw Efficiency Coefficient
- Ratio** Drive Ratio (if reducer is used)

Trapezoidal Motion Profile



Triangular Motion Profile



Acceleration ≤ 1 g (9.8 m/sec²)

Common Equivalent units:

| | |
|----------------|--|
| Mass | 1 kg = 2.2046 lb |
| Force | 1 kN = 224.81 lbf |
| Length | 1 mm = 0.03937 in |
| Speed | 1 mm/sec = 0.03937 in/sec |
| Torque | 1 N-m = 0.7376 lbf-ft |
| Power | 1 kW = 1.341 hp |
| Inertia | 1 kg-m ² = 23.73 lb-ft ² |

XFC Ordering Information

Ordering Information

Select an order code from each of the numbered fields to create a complete XFX model order number. Include hyphens and non-selective characters as shown in example below.

① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨ ⑩ ⑪ ⑫ ⑬ ⑭ ⑮ ⑯

Order Example: XFC 075 LA 05 J N A A N XXXX - A 03 - A09A A 1 - A

① **Series**
XFC Extreme Force Cylinder

② **Frame Size**
075 75 mm
090 90 mm
115 115 mm
165 165 mm
190 190 mm

③ **Configuration**
Inline Motor
LA Mounting Position A*
LB Mounting Position B*
LC Mounting Position C*
LD Mounting Position D*
Parallel Motor
PA Mounting Position A*
PB Mounting Position B*
PC Mounting Position C*
PD Mounting Position D*

④ **Screw Lead**
05 5 mm Lead (XFC075, 090, 115, 140)
10 10 mm Lead (XFC075, 090, 115, 140, 165, 190)
20 20 mm Lead (XFC165 & 190)

⑤ **Primary Mount**
⑥ **Secondary Mount**

Inline Motor Configuration
C Foot Mount
J Front Flange Mount
K Extended Tie Rod Mount (Front)
T Rear Trunnion Mount
N No Secondary Mount

Parallel Motor Configuration
B Rear Clevis
C Foot Mount
H Rear Flange
J Front Flange Mount
K Extended Tie Rod Mount (Front)
L Extended Tie Rod Mount (Rear)
M Extended Tie Rod Mount (Front & Rear)
T Rear Trunnion Mount
N No Secondary Mount

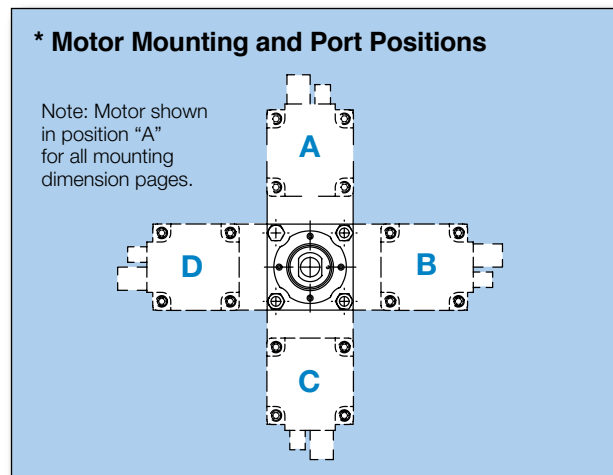
⑦ **Rod End**
A Metric Thread – Male End
B Imperial Thread – Male End
C Rod Eye
X Special

⑧ **Lubrication**
A Oil Filled Port Position A*
B Oil Filled Port Position B*
C Oil Filled Port Position C*
D Oil Filled Port Position D*
E Grease Filled (required for vertical applications)

*Refer to illustration page 34. For parallel configurations, the oil fill port position and the motor mount position cannot be the same.

⑨ **Options**
A Prepped for Limit Switches*
B Fluorocarbon Seals
C Fluorocarbon Seals and Limit Switch Ready*
N None

*Options A and C are only available with XFC 075, 090 and 115 with grease-filled lubrication



| | |
|-------------|---|
| 10 | Stroke Length – mm |
| XXXX | 50 – 2000 mm (See page 6 for max stroke by bore size. For stroke <50 or >2000 please consult factory) |

| | |
|-----------|--|
| 11 | Gearhead Frame Size ¹⁾ |
| A | PS90 Frame for Size XFC075 & 090 |
| B | PS115 Frame for Size XFC075, 090 & 115 |
| C | PS142 Frame for Size XFC115, 140 & 165 |
| D | PS180 Frame for Size XFC140, 165 & 190 |
| E | PS220 Frame for Size XFC190 |
| X | Special |
| N | No Gearhead (Motor only) |

| | |
|-----------|--------------------------|
| 12 | Gearhead Ratio |
| 00 | No Gearhead |
| 03 | Gearhead with 3:1 ratio |
| 04 | Gearhead with 4:1 ratio |
| 05 | Gearhead with 5:1 ratio |
| 07 | Gearhead with 7:1 ratio |
| 10 | Gearhead with 10:1 ratio |
| XX | Custom Gear Ratio |

| | | |
|-------------|---------------------------------------|----------------------|
| 13 | Motor Selection* ¹⁾ | |
| | 240 VAC | 460 VAC |
| A09A | MPP0921C | A09B MPP0921R |
| A09C | MPP0922D | A09D MPP0922R |
| A09E | MPP0923D | A09F MPP0923R |
| A10A | MPP1002D | A10B MPP1002R |
| A10C | MPP1003C | A10D MPP1003R |
| A11A | MPP1152D | A11B MPP1152R |
| A11C | MPP1153C | A11D MPP1153R |
| A11E | MPP1154B | A11F MPP1154P |
| A14A | MPP1422C | A14B MPP1422R |
| A14C | MPP1424C | A14D MPP1424R |
| A14E | MPP1426B | A14F MPP1426P |
| – | – | A14G MPP1428Q |
| – | – | A19A MPP1904P |
| A19B | MPP1906B | A19C MPP1906P |
| – | – | A19D MPP1908P |
| – | – | A27A MPP2706P |
| – | – | A27B MPP2708N |
| X00X | Special | X00X Special |

*Refer to page 24-25 for motor pairing options by bore size.

| | |
|-----------|--|
| 14 | Motor Feedback ²⁾ |
| A | 2000 Count Encoder (1E) |
| B | 2000 Count Encoder – Serial Interface (3E) |
| C | Single Speed Resolver (41) |
| D | Multi-Turn Absolute Encoder (6S) |
| E | Single-Turn Absolute Encoder (9S) |
| N | No Motor or Special Motor |

| | |
|-----------|-------------------------------------|
| 15 | Motor Options* ²⁾ |
| 1 | No Brake |
| 2 | 24 VDC Brake (B) |
| 3 | Shaft Seal (V) |
| 4 | 24 VDC Brake (B) and Shaft Seal (V) |
| 0 | No Motor or Special Motor |

*Brake required for vertical applications

| | |
|-----------|--|
| 16 | Revision Identifier |
| A | Standard Cylinder |
| B | Anti-rotation Option (When selecting anti-rotation option, grease filled option must also be selected [Option “E” from 8 Lubrication section]. Consult factory for rotation torque greater than stated catalog values on page 6.) |

- 1)** Includes proper mounting surface for selected gearhead and motor.
2) For customer supplied motors, not provided by Parker, select option “N” for **Motor Feedback** and “0” for **Motor Options**.

Cylinder Safety Guidelines

For Proper Selection and Use of Hydraulic, Pneumatic & Electromechanical Cylinders and their Accessories



Failure of the cylinder, its parts, its mounting, its connections to other objects, or its controls can result in:

- **Unanticipated or uncontrolled movement of the cylinder or objects connected to it.**
- **Falling of the cylinder or objects held up by it.**
- **Fluid escaping from the cylinder, potentially at high velocity.**

These events could cause death or personal injury by, for example, persons falling from high locations, being crushed or struck by heavy or fast moving objects, being pushed into dangerous equipment or situations, or slipping on escaped fluid.

Before selecting or using Parker Hannifin Corporation (the Company) cylinders or related accessories, it is important that you read, understand and follow the following safety information. Training is advised before selecting and using the Company's products.

1.0 General Instructions

1.1 Scope: This safety guide provides instructions for selecting and using (including assembling, installing, and maintaining) cylinder products. This safety guide is a supplement to and is to be used with the specific Company publications for the specific cylinder products that are being considered for use.

1.2 Fail Safe: Cylinder products can and do fail without warning for many reasons. All systems and equipment should be designed in a fail-safe mode so that if the failure of a cylinder product occurs people and property won't be endangered.

1.3 Distribution: Provide a free copy of this safety guide to each person responsible for selecting or using cylinder products. Do not select or use the Company's cylinders without thoroughly reading and understanding this safety guide as well as the specific Company publications for the products considered or selected.

1.4 User Responsibility: Due to very wide variety of cylinder applications and cylinder operating conditions, the Company does not warrant that any particular cylinder is suitable for any specific application. This safety guide does not analyze all technical parameters that must be considered in selecting a product. The electromechanical cylinders outlined in this catalog are designed to the Company's design guidelines and do not necessarily meet the design guideline of other agencies such as American Bureau of Shipping, ASME Pressure Vessel Code etc. The user, through its own analysis and testing, is solely responsible for:

- Making the final selection of the cylinders and related accessories.
- Determining if the cylinders are required to meet specific design requirements as required by the Agency(s) or industry standards covering the design of the user's equipment.
- Assuring that the user's requirements are met, OSHA requirements are met, and safety guidelines from the applicable agencies such as but not limited to ANSI are followed and that the use presents no health or safety hazards.
- Providing all appropriate health and safety warnings on the equipment on which the cylinders are used.

1.5 Additional Questions: Call the appropriate Company technical service department if you have any questions or require any additional information. See the Company publication for the product being considered or used, or call 1-847-298-2400, or go to www.parker.com, for telephone numbers of the appropriate technical service department.

2.0 Cylinder and Accessories Selection

2.1 Seals: Part of the process of selecting a cylinder is the selection of seal compounds. Before making this selection, consult the "seal information page(s)" of the publication for the series of cylinders of interest.

The application of cylinders may allow fluids such as cutting fluids, wash down fluids etc. to come in contact with the external area of the cylinder. These fluids may attack the piston rod wiper and or the primary seal and must be taken into account when selecting and specifying seal compounds.

Dynamic seals will wear. The rate of wear will depend on many operating factors. Wear can be rapid if a cylinder is misaligned or if the cylinder has been improperly serviced. The user must take seal wear into consideration in the application of cylinders.

2.2 Piston Rods: Possible consequences of piston rod failure or separation of the piston rod from the piston include, but are not limited to are:

- Piston rod and or attached load thrown off at high speed.
- High velocity fluid discharge.
- Piston rod extending when pressure is applied in the piston retract mode.

Piston rods or machine members attached to the piston rod may move suddenly and without warning as a consequence of other conditions occurring to the machine such as, but not limited to:

- Unexpected detachment of the machine member from the piston rod.
- Failure of the machine control system.

Piston rods are not normally designed to absorb bending moments or loads which are perpendicular to the axis of piston rod motion. These additional loads can cause the piston rod to fail. If these types of additional loads are expected to be imposed on the piston rod, their magnitude should be made known to our engineering department.

The cylinder user should always make sure that the piston rod is securely attached to the machine member.

The piston rod to piston and the stud to piston rod threaded connections are secured with an anaerobic adhesive. The strength of the adhesive decreases with increasing temperature. Cylinders which can be exposed to temperatures above +250°F (+121°C) are to be ordered with a non studded piston rod and a pinned piston to rod joint.

2.3 Cylinder Mountings: Some cylinder mounting configurations may have certain limitations such as but not limited to minimum stroke for side or foot mounting cylinders or pressure de-ratings for certain mounts. Carefully review the catalog for these types of restrictions.

Always mount cylinders using the largest possible high tensile alloy steel socket head cap screws that can fit in the cylinder mounting holes and torque them to the manufacturer's recommendations for their size.

3.0 Cylinder and Accessories Installation and Mounting

3.1 Installation

3.1.1 – Cleanliness is an important consideration, and cylinders are shipped with the ports plugged to protect them from contaminants entering the ports. These plugs should not be removed until the piping is to be installed. Before making the connection to the cylinder ports, piping should be thoroughly cleaned to remove all chips or burrs which might have resulted from threading or flaring operations.

3.1.2 – Cylinders operating in an environment where air drying materials are present such as fast-drying chemicals, paint, or weld splatter, or other hazardous conditions such as excessive heat, should have shields installed to prevent damage to the piston rod and piston rod seals.

3.1.3 – Proper alignment of the cylinder piston rod and its mating component on the machine should be checked in both the extended and retracted positions. Improper alignment will result in excessive rod gland and/or cylinder bore wear. On fixed mounting cylinders attaching the piston rod while the rod is retracted will help in achieving proper alignment.

3.2 Mounting Recommendations

3.2.1 – Always mount cylinders using the largest possible high tensile alloy steel socket head screws that can fit in the cylinder mounting holes and torque them to the manufacturer's recommendations for their size.

3.2.2 – Side-Mounted Cylinders – In addition to the mounting bolts, cylinders of this type should be equipped with thrust keys or dowel pins located so as to resist the major load.

3.2.3 – Tie Rod Mounting – Cylinders with tie rod mountings are recommended for applications where mounting space is limited. Nuts used for this mounting style should be torqued to the same value as the tie rods for that bore size.

3.2.4 – Flange Mount Cylinders – The controlled diameter of the rod gland extension on head end flange mount cylinders can be used as a pilot to locate the cylinders in relation to the machine. After alignment has been obtained, the flanges may be drilled for pins or dowels to prevent shifting.

3.2.5 – Trunnion Mountings – Cylinders require lubricated bearing blocks with minimum bearing clearances. Bearing blocks should be carefully aligned and rigidly mounted so the trunnions will not be subjected to bending moments. The rod end should also be pivoted with the pivot pin in line and parallel to axis of the trunnion pins.

3.2.6 – Clevis Mountings – Cylinders should be pivoted at both ends with center line of pins parallel to each other. After cylinder is mounted, be sure to check to assure that the cylinder is free to swing through its working arc without interference from other machine parts.

4.0 Cylinder and Accessories Maintenance, Troubleshooting and Replacement

4.1 Storage: At times cylinders are delivered before a customer is ready to install them and must be stored for a period of time. When storage is required the following procedures are recommended.

4.1.1 – Store the cylinders in an indoor area which has a dry, clean and noncorrosive atmosphere. Take care to protect the cylinder from both internal corrosion and external damage.

4.1.2 – Whenever possible cylinders should be stored in a vertical position (piston rod up). This will minimize corrosion due to possible condensation which could occur inside the cylinder. This will also minimize seal damage.

4.1.3 – Port protector plugs should be left in the cylinder until the time of installation.

4.1.4 – If a cylinder is stored full of hydraulic fluid, expansion of the fluid due to temperature changes must be considered. Installing a check valve with free flow out of the cylinder is one method.

4.1.5 – When cylinders are mounted on equipment that is stored outside for extended periods, exposed unpainted surfaces, e.g. piston rod, must be coated with a rust-inhibiting compound to prevent corrosion.

4.2 Cylinder Trouble Shooting

4.2.1 – External Leakage

4.2.1.1 – Rod seal leakage can generally be traced to worn or damaged seals. Examine the piston rod for dents, gouges or score marks, and replace piston rod if surface is rough.

Rod seal leakage could also be traced to bearing wear. If clearance is excessive, replace rod bearing and seal. Rod seal leakage can also be traced to seal deterioration. If seals are soft or gummy or brittle, check compatibility of seal material with lubricant used if air cylinder, or operating fluid if hydraulic cylinder. Replace with seal material, which is compatible with these fluids. If the seals are hard or have lost elasticity, it is usually due to exposure to temperatures in excess of 165°F. (+74°C). Shield the cylinder from the heat source to limit temperature to 350°F. (+177°C.) and replace with fluorocarbon seals.

4.2.1.2 – Cylinder body seal leak can generally be traced to a loose head. Torque the head to manufacturer's recommendation for that bore size.

Excessive pressure can also result in cylinder body seal leak. Determine maximum pressure to rated limits. Replace seals and retorque head as in paragraph above. Excessive pressure can also result in cylinder body seal leak. Determine if the pressure rating of the cylinder has been exceeded. If so, bring the operating pressure down to the rating of the cylinder and have the head replaced.

Pinched or extruded cylinder body seal will also result in a leak. Replace cylinder body seal and retorque as in paragraph above.

Cylinder body seal leakage due to loss of radial squeeze which shows up in the form of flat spots or due to wear on the O.D. or I.D. – Either of these are symptoms of normal wear due to high cycle rate or length of service. Replace seals as per paragraph above.

4.3 Erratic or Chatter Operation

4.3.1 – Excessive friction at rod bearing or piston bearing due to load misalignment – Correct cylinder-to-load alignment.

4.3.2 – Cylinder sized too close to load requirements – Reduce load or install larger cylinder.

4.3.3 – Erratic operation could be traced to the difference between static and kinetic friction. Install speed control valves to provide a back pressure to control the stroke.

4.4 Cylinder Modifications, Repairs, or Failed Component:

Cylinders as shipped from the factory are not to be disassembled and or modified. If cylinders require modifications, these modifications must be done at company locations or by the Company's certified facilities. The Industrial Cylinder Division Engineering Department must be notified in the event of a mechanical fracture or permanent deformation of any cylinder component (excluding seals). This includes a broken piston rod, head, mounting accessory or any other cylinder component. The notification should include all operation and application details. This information will be used to provide an engineered repair that will prevent recurrence of the failure.

It is allowed to disassemble cylinders for the purpose of replacing seals or seal assemblies. However, this work must be done by strictly following all the instructions provided with the seal kits.

Offer of Sale

The items described in this document and other documents or descriptions provided by Parker, its subsidiaries and its authorized distributors are hereby offered for sale at prices to be established by Parker Hannifin Corporation, its subsidiaries and its authorized distributors. This offer and its acceptance by any customer ("Buyer") shall be governed by all of the following Terms and Conditions. Buyer's order for any such item, when communicated to Parker, its subsidiary or an authorized distributor ("Seller") verbally or in writing, shall constitute acceptance of this offer.

1. Terms and Conditions of Sale: All descriptions, quotations, proposals, offers, acknowledgments, acceptances and sales of Seller's products are subject to and shall be governed exclusively by the terms and conditions stated herein. Buyer's acceptance of any offer to sell is limited to these terms and conditions. Any terms or conditions in addition to, or inconsistent with those stated herein, proposed by Buyer in any acceptance of an offer by Seller, are hereby objected to. No such additional, different or inconsistent terms and conditions shall become part of the contract between, Buyer and Seller unless expressly accepted in writing by Seller. Seller's acceptance of any offer to purchase by Buyer is expressly conditional upon Buyer's assent to all the terms and conditions stated herein, including any terms in addition to, or inconsistent with those contained in Buyer's offer. Acceptance of Seller's products shall in all events constitute such assent.

2. Payment: Payment shall be made by Buyer net 30 days from the date of delivery of the items purchased hereunder. Amounts not timely paid shall bear interest at the maximum rate permitted by law for each month or portion thereof that the Buyer is late in making payment. Any claims by Buyer for omissions or shortages in a shipment shall be waived unless Seller receives notice thereof within 30 days after Buyer's receipt of the shipment.

3. Delivery: Unless otherwise provided on the face hereof, delivery shall be made F.O.B. Seller's plant. Regardless of the method of delivery, however, risk of loss shall pass to Buyer upon Seller's delivery to a carrier. Any delivery dates shown are approximate only and Seller shall have no liability for any delays in delivery.

4. Warranty: Seller warrants that the items sold hereunder shall be free from defects in material or workmanship for a period of 12 months from date of shipment from Parker. THIS WARRANTY COMPRISES THE SOLE AND ENTIRE WARRANTY PERTAINING TO ITEMS PROVIDED HEREUNDER. SELLER MAKES NO OTHER WARRANTY, GUARANTEE, OR REPRESENTATION OF ANY KIND WHATSOEVER. ALL OTHER WARRANTIES, INCLUDING BUT NOT LIMITED TO, MERCHANTABILITY AND FITNESS FOR PURPOSE, WHETHER EXPRESS, IMPLIED, OR ARISING BY OPERATION OF LAW, TRADE USAGE, OR COURSE OF DEALING ARE HEREBY DISCLAIMED. NOTWITHSTANDING THE FOREGOING, THERE ARE NO WARRANTIES WHATSOEVER ON ITEMS BUILT OR ACQUIRED WHOLLY OR PARTIALLY, TO BUYER'S DESIGNS OR SPECIFICATIONS.

5. Limitation of Remedy: SELLER'S LIABILITY ARISING FROM OR IN ANY WAY CONNECTED WITH THE ITEMS SOLD OR THIS CONTRACT SHALL BE LIMITED EXCLUSIVELY TO REPAIR OR REPLACEMENT OF THE ITEMS SOLD OR REFUND OF THE PURCHASE PRICE PAID BY BUYER, AT SELLER'S SOLE OPTION. IN NO EVENT SHALL SELLER BE LIABLE FOR ANY INCIDENTAL, CONSEQUENTIAL OR SPECIAL DAMAGES OF ANY KIND OR NATURE WHATSOEVER, INCLUDING BUT NOT LIMITED TO LOST PROFITS ARISING FROM OR IN ANY WAY CONNECTED WITH THIS AGREEMENT OR ITEMS SOLD HEREUNDER, WHETHER ALLEGED TO ARISE FROM BREACH OF CONTRACT, EXPRESS OR IMPLIED WARRANTY, OR IN TORT, INCLUDING WITHOUT LIMITATION, NEGLIGENCE, FAILURE TO WARN OR STRICT LIABILITY.

6. Changes, Reschedules and Cancellations: Buyers may request to modify the designs or specifications for the items sold hereunder as well as the quantities and delivery dates thereof, or may request to cancel all or part of this order, however, no such requested modification or cancellation shall become part of the contract between Buyer and Seller unless accepted by Seller in a written amendment to this Agreement. Acceptance of any such requested modification of cancellation shall be at Seller's discretion, and shall be upon such terms and conditions as Seller may require.

7. Special Tooling: A tooling charge may be imposed for any special tooling, including without limitation, dies, fixtures, molds and patterns, acquired to manufacture items sold pursuant to this contract. Such special tooling shall be and remain Seller's property notwithstanding payment of any charges by Buyer. In no event will Buyer acquire any interest in apparatus belonging to Seller which is utilized in the manufacture of the items sold hereunder, even if such apparatus has been specially converted or adapted for such manufacture

and not withstanding any charges paid by Buyer. Unless otherwise agreed, Seller shall have the right to alter, discard or otherwise dispose of any special tooling or other property in its sole discretion at any time.

8. Buyer's Property: Any designs, tools, patterns, materials, drawings confidential information or equipment furnished by Buyer, or any other items which become Buyer's property, may be considered obsolete and may be destroyed by Seller after two (2) consecutive years have elapsed without Buyer placing an order for the items which are manufactured using such property. Seller shall not be responsible for any loss or damage to such property while it is in Seller's possession or control.

9. Taxes: Unless otherwise indicated on the face hereof, all prices and charges are exclusive of excise, sales, use, property, occupational or like taxes which may be imposed by any taxing authority upon the manufacture, sale or delivery of the items sold hereunder. If any such taxes must be paid by Seller or if Seller is liable for the collection of such tax, the amount thereof shall be in addition to the amounts for the items sold. Buyer agrees to pay all such taxes or to reimburse Seller therefore upon receipt of its invoice. If Buyer claims exemption from any sales, use or other tax imposed by any taxing authority, Buyer shall save Seller harmless from and against any such tax, together with any interest or penalties thereon which may be assessed if the items are held to be taxable.

10. Indemnity For Infringement of Intellectual Property Rights: Seller shall have no liability for infringement of any patents, trademarks, copyrights, trade dress, trade secrets or similar rights except as provided in this Part 10. Seller will defend and indemnify Buyer against allegations of infringement of U.S. patents, U.S. trademarks, copyrights, trade dress and trade secrets (hereinafter 'Intellectual Property Rights'). Seller will defend at its expense and will pay the cost of any settlement or damages awarded in an action brought against Buyer based on an allegation that an item sold pursuant to this contract infringes the Intellectual Property Rights of a third party. Seller's obligation to defend and indemnify Buyer is contingent on Buyer notifying Seller within ten (10) days after Buyer becomes aware of such allegations of infringement, and Seller having sole control over the defense of any allegations or actions including all negotiations for settlement or compromise. If an item sold hereunder is subject to a claim that it infringes the Intellectual Property Rights of a third party, Seller may, at its sole expense and option, procure for Buyer the right to continue using said item, replace or modify said item so as to make it non infringing, or offer to accept return of said item and return the purchase price less a reasonable allowance for depreciation. Notwithstanding the foregoing, Seller shall have no liability for claims of infringement based on information provided by Buyer, or directed to items delivered hereunder for which the designs are specified in whole or part by Buyer, or infringements resulting from the modification, combination or use in a system of any item sold hereunder. The foregoing provisions of this Part 10 shall constitute Seller's sole and exclusive liability and Buyer's sole and exclusive remedy for infringement of Intellectual Property Right. If a claim is based on information provided by Buyer or if the design for an item delivered hereunder is specified in whole or in part by Buyer, Buyer shall defend and indemnify Seller for all costs, expenses or judgments resulting from any claim that such item infringes any patent, trademark, copyright, trade dress, trade secret or any similar right.

11. Force Majeure: Seller does not assume the risk of and shall not be liable for delay or failure to perform any of Seller's obligations by reason of circumstances beyond the reasonable control of Seller (hereinafter 'Events of Force Majeure'). Events of Force Majeure shall include without limitation, accidents, acts of God, strikes or labor disputes, acts, laws, rules or regulations of any government or government agency, fires, floods, delays or failures in delivery of carriers or suppliers, shortages of materials and any other cause beyond Seller's control.

12. Entire Agreement/Governing Law: The terms and conditions set forth herein, together with any amendments, modifications and any different terms or conditions expressly accepted by Seller in writing, shall constitute the entire Agreement concerning the items sold, and there are no oral or other representations or agreements which pertain thereto. This Agreement shall be governed in all respects by the law of the State of Ohio. No actions arising out of the sale of the items sold hereunder of this Agreement may be brought by either party more than two (2) years after the cause of action accrues.

WARNING

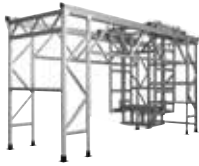
FAILURE OR IMPROPER SELECTION OR IMPROPER USE OF THE PRODUCTS AND/OR SYSTEMS DESCRIBED HEREIN OR RELATED ITEMS CAN CAUSE DEATH, PERSONAL INJURY AND PROPERTY DAMAGE.

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

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

Other Products from Parker...

Structural Automation



More than 150 metric and inch profiles, integral motion components, and accessories for unlimited and flexible configurations. Pre-machined kits or complete assemblies.

www.parker.com/ips

Electromechanical Solutions

HMI and Controllers



Superior integration and support for machine control as well as HMI hardware and software.

www.parkermotion.com

Electric Actuators



Screw, belt-driven, and linear motor actuators for the complete range of industrial applications, offering precise motion and flexibility.

www.parkermotion.com

Motors and Drives



Parker's family of innovative servo/stepper motors and drives continues to expand to meet the challenges of new technologies.

www.parkermotion.com

Gearheads



Parker offers a full line of in-line and right angle planetary gearheads, multi-drive NEMA gearheads, and integral gearmotors.

www.parkermotion.com

Pneumatic Solutions

Linear Actuator



Aluminum and steel pneumatic cylinders, guided cylinders, rodless cylinders, and short stroke thrusters from the industry leader.

www.parkermotion.com/pneu/linear

Rotary Actuators



Industry leader in the design and manufacture of pneumatic rack and pinion, and vane-style rotary actuators.

www.parker.com/pneu/rotary

Vacuum Products and Sensors



Vacuum solutions include a broad range of generators (integrated/inline), cups, and pressure sensors.

www.parker.com/pneu/vacsen

Grippers



Parallel, angular, and three jaw grippers are available in over 1,000 configurations.

www.parker.com/pneu/gripper

Airline Accessories



Airline accessories include silencers, flow controls, and mufflers to round out Parker's pneumatic solution.

www.parker.com/pneu/access

Air Control Valves



Valve technology that meets the most demanding requirements in any industrial application.

www.parker.com/pneu/valve

Air Preparation



Parker, the industry leader in air preparation, offers a complete line of products to ensure clean, dry, oil-free air.

www.parker.com/pneu/airprep

Connectors and Tubing



The most complete line of fluid connectors worldwide will meet virtually any automation application.

www.parker.com/pneu/fc

EM Sales Offices

Australia

Parker Hannifin (Australia) Pty Ltd.
9 Carrington Road
Castle Hill NSW 2154
Australia
Tel: +61 (0) 2 9634-7777
Fax: +61 (0) 2 9634 3749

Brazil

Parker Hannifin Ind. Com Ltda.
Av. Lucas Nogueira Garcez 2181
Esperança
12325-900 Jacareí, SP
Tel: 12 3954 5100
Fax: 12 3954 5262
Email: automation.brazil@parker.com

Canada

Parker Hannifin (Canada) Inc.
160 Chisholm Dr
Milton, Ontario L9T 3G9
Tel: 905-693-3000
Fax: 905-876-1958
Email: miltoncustservice@parker.com

China

Parker Hannifin Motion & Control
(Shanghai) Co., Ltd
280 Yunqiao Rd. Jin Qiao Export
Processing Zone
Shanghai 201206, China
Tel: (86-21) 50312525
Fax: (86-21) 64459717

France

Parker SSD Parvex
8 avenue du Lac
B.P. 249
F-21007 Dijon Cedex
Tel: +33 (0) 3 80 42 41 40
Fax: +33 (0) 3 80 42 41 23

Germany

Electromechanical Europe
Parker Hannifin GmbH & Co KG
Robert-Bosch-Strasse 22
D-77656 Offenburg
Germany
Tel: +49 (0) 781 509 0
Fax: +49 (0) 781 509 98176
Email: em-motion@parker.com

India

Parker Hannifin India Pvt. Ltd
Automation Group-SSD Drives Div.
133 & 151 Developed Plots Estate
Perungudi, Chennai 600 096
Tel: 044-4391-0799
Fax: 044-4391-0700

Italy

Parker Hannifin SpA
Via Gounod 1
20092 Cinsello Balsamo
Milano, Italy
Tel: +39 02 361081
Fax: +39 02 36108400
Email: em-motion@parker.com

Korea

Parker Hannifin Korea
9th Floor KAMCO Yangjae Tower
949-3 Dogok 1-dong Gangnam-gu
Seoul 135-860, Korea
Tel: 82-2-559-0454
Fax: 82-2-556-8187

Mexico

Parker Hannifin de Mexico
Eje uno Norte No.100
Parque Industrial Toluca 2000
Toluca, CP 50100 México
Tel: 52-722-275-4200
Fax: 52-722-279-0316

Singapore

Parker Hannifin Singapore Pte Ltd
11, Fourth Chin Bee Road
Singapore 619702
Tel: (65) 6887 6300
Fax: (65) 6265 5125/6261 4929

Taiwan

Parker Hannifin Taiwan Co., Ltd
No. 40, Wuchiuan 3rd Road
Wuku Industrial Park
Taipei County, Taiwan 248
ROC
Tel: 886 2 2298 8987
Fax: 886 2 2298 8982

Thailand

Parker Hannifin (Thailand) Co., Ltd.
1265 Rama 9 Road
Suanluang, Bangkok 10250
Thailand
Tel: (66) 2 186 7000
Fax: (66) 2 374 1645

UK

Parker Hannifin Ltd.
Tachbrook Park Drive
Tachbrook Park
Warwick CV34 6TU
Tel: +44 (0) 1926 317970
Fax: +44 (0) 1926 317980

USA

Parker Hannifin Electromechanical
Automation Division Main Office
5500 Business Park Drive
Rohnert Park, CA 94928 USA
Tel: 707-584-7558
800-358-9070
Fax: 707-584-8015
Email: emn_support@parker.com

Parker Hannifin Electromechanical
Automation Division
1140 Sandy Hill Road
Irwin, PA 15642
Tel: 724-861-8200
800-245-6903
Fax: 724-861-3330
Email: emn_support@parker.com

