

# Solutions for the Tube Bending Industry

*Rugged design and long life for industrial tube bending and fabricating applications*



**Automotive:**  
*brake lines, fuel lines, AC lines  
coolant lines, exhaust pipe*

**Nylon Tube Heat  
Set Forming**

**HVAC**

**Aerospace**

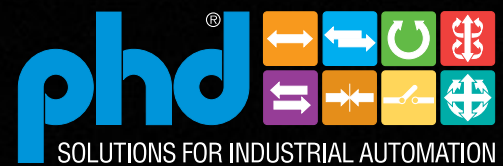
**Small Engine**

**Outdoor/Office  
Furniture**

TUBEBEND18



PHD is a member of the  
MAC Distributor Network



[www.phdinc.com](http://www.phdinc.com)

# Reduce downtime and increase production throughout the plant.

## The Price Alternative

**phd**<sup>®</sup>  
**OPTIMAX**<sup>®</sup>

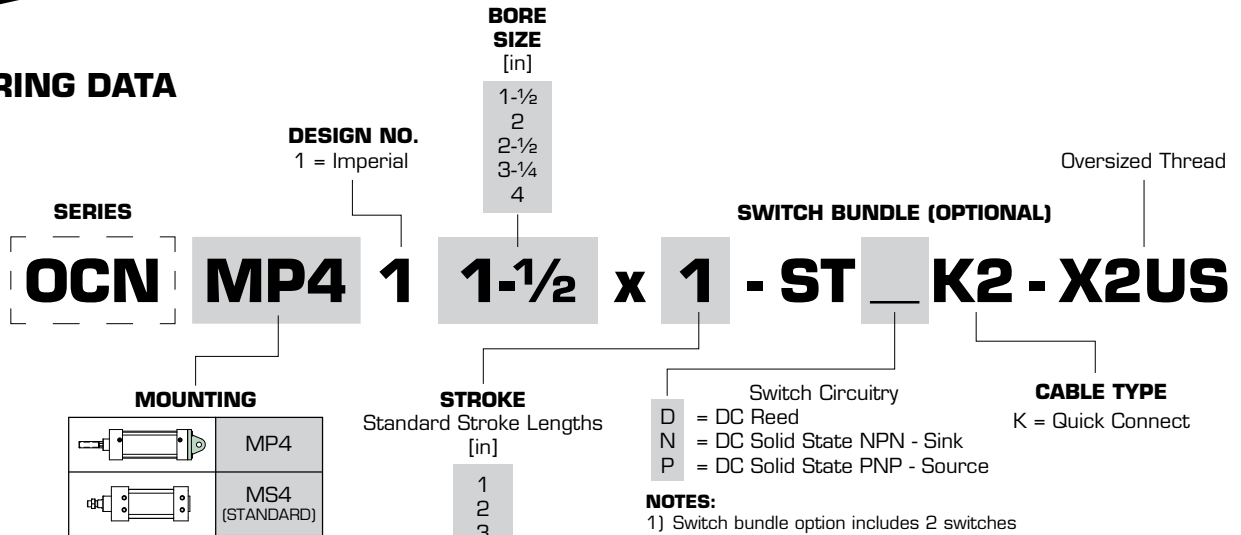
## Series OCN NFPA Large Bore Cylinders for Tube Bending

- MP4 mounting and oversized rod thread
- Standard magnetic piston and cushions on each end
- Bore sizes from 1-1/2" to 4" diameter
- Up to 24" of standard stroke length
- Standard cushions on both ends

**phd** *Unlimited*<sup>®</sup>  
UNIQUE  
SOLUTIONS



## ORDERING DATA



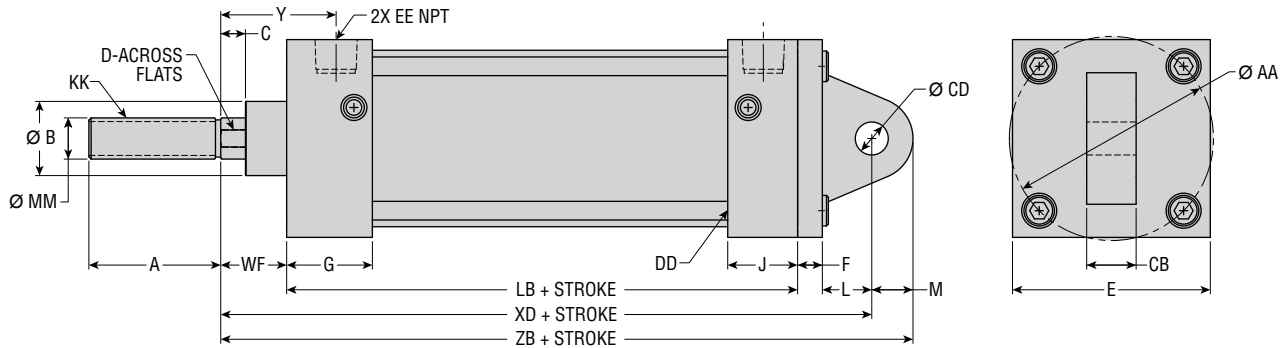
| Specifications | OCN Bore Size (in) |   |       |         |   |
|----------------|--------------------|---|-------|---------|---|
|                | 1-1/2              | 2 | 2-1/2 | 3-1/4   | 4 |
| Port Size      | 3/8 NPT            |   |       | 1/2 NPT |   |
| Seals          | Urethane           |   |       |         |   |
| Pressure       | 20 psi to 150 psi  |   |       |         |   |
| Temperature    | 32°F to 140°F      |   |       |         |   |
| Velocity       | 2"/sec to 20"/sec  |   |       |         |   |

\*2"-4" BORE ONLY

### NOTES:

- 1) Switch bundle option includes 2 switches
- 2) Switch bundle available with actuator only
- 3) Switches available in quick connect only
- 4) Magnets standard for switch sensing
- 5) Switches are not weld field resistant
- 6) See standard OCN literature for MS4 and other mounting dimensions

## DIMENSIONS



| BORE   | MM    | KK            | A     | AA    | B     | C     | CB     | CD    | D     | DD      | E     | EE    | F     | G     | J     |
|--------|-------|---------------|-------|-------|-------|-------|--------|-------|-------|---------|-------|-------|-------|-------|-------|
| 1-1/2" | 0.625 | 5/8-18 UNF-2A | 2.000 | 2.020 | 1.125 | 0.375 | 0.7500 | 0.500 | 0.563 | 1/4-28  | 2.000 | 0.375 | 0.375 | 1.260 | 1.100 |
| 2"     | 0.625 | 5/8-18 UNF-2A | 2.000 | 2.600 | 1.125 | 0.375 | 0.7500 | 0.500 | 0.563 | 5/16-24 | 2.500 | 0.375 | 0.375 | 1.260 | 1.060 |
| 2-1/2" | 0.625 | 5/8-18 UNF-2A | 2.000 | 3.100 | 1.125 | 0.375 | 0.7500 | 0.500 | 0.563 | 5/16-24 | 3.000 | 0.375 | 0.375 | 1.300 | 1.060 |
| 3-1/4" | 1.000 | 1-14 UNS-2A   | 2.000 | 3.900 | 1.500 | 0.500 | 1.2500 | 0.750 | 0.875 | 3/8-24  | 3.750 | 0.500 | 0.625 | 1.570 | 1.180 |
| 4"     | 1.000 | 1-14 UNS-2A   | 2.000 | 4.700 | 1.500 | 0.500 | 1.2500 | 0.750 | 0.875 | 3/8-24  | 4.500 | 0.500 | 0.625 | 1.570 | 1.180 |

| BORE   | L     | LB    | M     | WF    | XD    | Y     | ZB    |
|--------|-------|-------|-------|-------|-------|-------|-------|
| 1-1/2" | 0.750 | 3.625 | 0.625 | 1.000 | 5.750 | 1.710 | 4.750 |
| 2"     | 0.750 | 3.625 | 0.625 | 1.000 | 5.750 | 1.710 | 4.750 |
| 2-1/2" | 0.750 | 3.750 | 0.625 | 1.000 | 5.750 | 1.750 | 4.875 |
| 3-1/4" | 1.250 | 4.250 | 0.875 | 1.375 | 7.500 | 2.340 | 5.828 |
| 4"     | 1.250 | 4.250 | 0.875 | 1.375 | 7.500 | 2.340 | 5.828 |

ALL DIMENSIONS ARE REFERENCE ONLY UNLESS SPECIFICALLY TOLERANCED.  
ALL DIMENSIONS ARE INCHES.

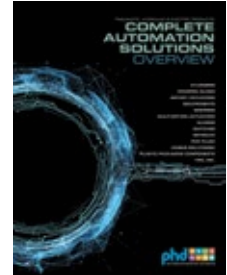
**CYLINDERS • SLIDES • CLAMPS**  
**ROTARY ACTUATORS • ESCAPEMENTS**

We have a full line of components: cylinders, escapements, grippers, slides, rotary actuators, clamps, multi-motion actuators, and proximity switches and sensors to provide the motion you require. With millions of component variations, we can help move, turn, slide, lift, grip, reach, rotate, and clamp almost anything to increase your productivity.

Our components are completely modular. Using either bolt direct units or transition plates, our actuators can be combined to create millions of application variations.

If an application requires a modified component, our PHD Unlimited team is ready to help. We welcome special requests for unique products, regardless of quantity or frequency of order. Ask for the Unique Solutions brochure for more information.

The products, supported by our strong commitment to delivery, service, and quality, have made us a leader in the modular automation industry.



For more information, request the PHD overview brochure.



**Series CV  
Cylinder**

Conforms to ISO 6431 and VDMA 24562 specifications  
 Available in eight bore sizes



**Series CRS  
Cylinder**

Compact size is ideal for applications where length is critical  
 High force, long life, and short stroke lengths ranging from 1/4" to 7" [5 to 175 mm]



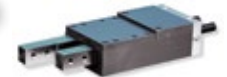
**Tom Thumb®  
Cylinders**

Known for their durability and NFPA versatility  
 Multi-position, cleanroom, and non-rotating rod designs are available



**Series ECV  
Electric Cylinder**

Electromechanical rod style actuator with an ISO/VDMA mounting interface  
 Ball screw version available in 3 sizes with travels up to 1000 mm  
 Lead screw version available in 5 sizes with travels up to 750 mm



**Series 160  
Double Rod  
Escapement**

Two fixtured, squared shafts with internally sequenced strokes work with your tooling to isolate a single part for continuation  
 Available with switches



**Series SD  
Thruster Slide**

Exceptional performance and low price  
 Available in a variety of sizes  
 Streamlined, thruster style with up to 28" of travel



**Series SE Slide**

Rugged, precise linear motion with minimum deflection  
 Offer many options, high performance and exceptional value



**Series SFM  
Saddle Slide**

Multiple midstops  
 Space saving rodless slide design  
 Lowest deflection and highest moment capacity combination in the industry



**Series RIS  
Rotary Actuator**

Eliminates external air lines  
 Hollow pinion manifold  
 Available in 3 sizes with single and dual bore styles



**Series RA  
Rotary Actuator**

Retains zero backlash  
 5 sizes and 6 standard rotations  
 Oversize sealed ball bearings, large pinion shafts for heavy load stability and high load stopping ability



**PNC Number  
Cruncher®**

**Total Clamp Force:**  
 9000 to 15000 lb  
 [40 to 60 kN]  
 Stamp IDs into parts  
 High clamp force at 70 psi [4.8 bar]  
 Operates in less than 0.24 seconds  
 Eliminates part changing downtime



**Series PB/PC  
Swing Arm Clamp**

**Grip Force:**  
 51 to 223 lb  
 [226 to 992 N]  
 Rotates clamp arm into position before clamping with linear motion  
 Ideal for part holding or transfer, Series PB/PC features simple design and compact size for low weight, long life, and high clamp force



**Series PEC  
Toggle Clamp**

**Clamp Torque:**  
 125 to 900 in-lb  
 [14 to 102 Nm]  
 Superior part holding for assembly and welding applications  
 Clamps and locks over last six degrees of rotation



**Series GRV  
Angular Gripper**

**Grip Force:**  
 2.0 to 28 lb [10 to 159 N]  
**Minimum Distance:**  
 0.322 to 0.594 in  
 [8.2 to 15.1 mm]  
 Compact, flexible design provides large moment capacities and long tooling lengths  
 Double acting for use in both internal and external gripping applications



**Series GRA  
Parallel Gripper**

**Grip Force:**  
 2.55 to 27.7 lb [11 to 123 N]  
**Nominal Jaw Travel:**  
 0.158 to 0.512 in  
 [4 to 13 mm]  
 Compact design for large moment capacities and longer tooling  
 Fully supported hardened steel jaws for long life, minimal wear and high moment capability