For Special Applications

Custom cylinders are often designed to meet the specific needs of a project or application. Eaton’s cylinder specialists have extensive experience in the interpretation of requirements, design and construction. Eaton has the capability to design, manufacture and deliver custom cylinders to meet special specifications. Custom cylinders to meet special application requirements can be designed and built to meet the needs of a particular application or project.

To order C-271-_ and C-272-_ as an assembly, use part no. C-275-_.

Hydraulic or pneumatic cylinders can be designed to meet specific user requirements. Eaton’s cylinder specialists can design cylinders to meet the needs of a particular application.

Eaton’s philosophy calls upon every member of Eaton to respond to the needs of our customers and to consistently meet the needs of our customers. Eaton’s policy is to design, manufacture and deliver hydraulic and pneumatic cylinders to meet the needs of our customers. Eaton’s commitment to quality is to provide close lateral alignment, high tensile strength, high quality, and permanently lubricated construction.

To order C-271-_ and C-272-_ as an assembly, use part no. C-275-_.

To order C-271-_ and C-272-_ as an assembly, use part no. C-275-_.
For Special Applications

Custom cylinders are available

with options such as

• Oversized rods

• Welded construction

• Field-Mate

• Power Port

• Mounting accessories

• Aluminum end caps and threads

• TSAVER cylinders

• Special application

specifications. These cylinders are often

used in highly customized applications

such as agricultural, aerospace, and

energy sector. Eaton has over 30 years of

experience in the design and manufacture

of custom cylinder products.

For Special Applications

Eaton builds a vast array of cylinders and

specialty fluid power products. Twenty

different designs with over 5000

configurations are produced on any given

day. Eaton’s engineers are skilled at

interpreting requirements on any desired line

of cylinders. Eaton’s capabilities include

custom design, machining, welding,

molding, and assembly. Eaton’s full line of

cylinder products and options fit

problem-solving needs for a variety of

applications, including:

• Rolled steel

• Aluminum

• Stainless steel

• Non-ferrous metals

• Special alloys

Our capabilities include:

• Oversized rods

• Welded construction

• Field-Mate

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• Special alloys
Eaton Hydro-Line standard cylinders can be completely and accurately identified with a model number that encodes construction specifications. To develop the model number for ordering a cylinder, see the following example:

To order standard SAE #12 ports on 3¼”, 4” and 5” bore, use T.
† To order oversize SAE #16 ports on 3¼”, 4” and 5” bore, use S.
‡ Consider specifying pinning the piston to the piston rod for temperatures over 250˚ F.

**Sample Model Code**

N5 KD - 3.25 X 8.00 - N - 1.38 - 2 - T - H - R - 1 - 1 - X

<table>
<thead>
<tr>
<th>FEATURE</th>
<th>DESCRIPTION</th>
<th>SYMBOL</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Model Series</td>
<td>Hydraulh high pressure, Air heavy duty, Air heavy duty prelubricated</td>
</tr>
<tr>
<td>2</td>
<td>Mounting, Style</td>
<td>Side lugs, MS2, Side tapped, MS4, Cap fixed clevis, MP1, Cap spherical bearing, CE, Cap detachable clevis, MP2, Side end lugs, MS7, Head rectangular flange, MF1, Head rectangular, ME5, Center-line lugs, MS3, Head square flange, MF5, No mount, K</td>
</tr>
<tr>
<td>3</td>
<td>Double Rod</td>
<td>Include ONLY for double-rod cylinder</td>
</tr>
<tr>
<td>4</td>
<td>Bore</td>
<td>Specify in inches (2 position decimal)</td>
</tr>
<tr>
<td>5</td>
<td>Stroke</td>
<td>Specify in inches (2 position decimal)</td>
</tr>
<tr>
<td>6</td>
<td>Cushions</td>
<td>Noncushioned, B, Cushioned both ends, A, Cushioned head end, H, Cushioned cap end, C</td>
</tr>
<tr>
<td>7</td>
<td>Rod Diameter</td>
<td>Specify in inches (2 position decimal)</td>
</tr>
<tr>
<td>8</td>
<td>Rod End Style</td>
<td>Male, large, Male, large, extended, 1X, Male, small (standard), 2, Male, small, extended, 2X, Male modified, 2M, Female, 4, Female modified, 4M, Plain end, 5, Male, full rod diameter, 6, Male, for rod end coupling, 10, Modified, M</td>
</tr>
</tbody>
</table>

**How to Order**
1. Quantity
2. Model number
3. Special modifications if required
4. Completed Application Data Sheet(s) (page 8) if required.
5. Required ship date

**Port Locations**
Port location 5 is on the center of the back face of the end cap.
EATON Hydro-Line

N5 Series
Standard Design Options

Metallic Rod Scrapers
A Metallic Rod Scraper provides increased rod seal life by removing abrasive contamination from the rod in severe applications.

Rod Boots
A rod boot surrounds the piston rod with an external, expandable cover to protect the rod surface from external contamination. Requires additional rod length which is determined by the cylinder stroke.

Low Breakaway Piston
A low breakaway piston reduces running friction and metal-to-metal contact by utilizing a bronze-filled Teflon wearband and a bi-directional, O-ring energized, bronze-filled Teflon piston seal.

Special Rod Ends
Modifications of standard rod ends or completely special rod end styles are available to meet unique rod end connection requirements. (See page 35.)

Special Ports
Metric, BSP, Manifold and other porting options are available to meet specific requirements. (See page 26.)

Extra Heavy Chrome Tubes and Rods
Added wear and corrosion resistance are available by specifying Extra Heavy Chrome (.002" to .003" thick).

Electronic Feedback
A complete line of precision cylinder position sensing and feedback devices are available. These packaged cylinder systems can handle virtually any application requiring feedback throughout the cylinder stroke — pneumatic or hydraulic, large or small bore, long or short strokes, with or without velocity monitoring — with resolutions of ± 0.001" or better. (See the Hydro-Line Systems Catalog.)

Stainless Steel Piston Rods
Piston rods in 300 and 400 series, 17-4 PH and others are available for those applications requiring increased corrosion resistance.

Air Bleeders
'1/8' NPTF bleeders are located in the tube or in the head and cap when specified. SAE #2 bleeders located in the head and cap are also available when specified. All bleeders may be located in positions 1, 2, 3 or 4.

Wearbands
Wearbands fitted to the piston and/or rod cartridge eliminate metal-to-metal contact on the piston/tube I.D. and the cartridge/rod O.D. Bronze-filled Teflon wearband material reduces friction and wear in applications where side-load is present.

Special Coating and Painting
Cylinders can be prepared with a primer coat, epoxy, lacquer or enamel paint finish coatings to customer specifications. Synergistic, Nitrocarburizing and other material treatments are also available for special applications.

Plating
Electroless Nickel, Cadmium and other plating finishes are available for corrosive, washdown, pharmaceutical and other applications.

Special Materials
Bronze rod cartridges, brass, aluminum and composite tubing, complete stainless steel cylinders or other special materials are available to meet most unique material requirements.
**N5 Series Cylinder Types**

**Single/Double Acting Cylinders**

Standard N5 Series cylinders are double acting, with fluid power driving the piston in both directions. Single acting cylinders have fluid power driving the piston in one direction, relying on either the load or an external force to return the piston after the pressure is released.

**Back-to-back Cylinders**

Back-to-back cylinders are two single rod cylinders mounted together at the caps. Combinations of positions are possible through various combinations of piston actuation. Consult Eaton for maximum operating pressure.

**Multiple Position Cylinders**

Multiple position cylinders are similar to tandem cylinders (except that the piston and rod assemblies are not connected) in that the output force is increased. Additionally, they may act as a precision multiple positioning device by actuating each cylinder successively or independently. Consult Eaton for maximum operating pressure.

**Tandem Cylinders**

Tandem cylinders consist of two cylinders interconnected (piston and rod assemblies are connected). Pressure can act on two effective piston areas allowing the cylinder to be used as a force multiplier. This type of cylinder can also be used in air/oil systems to provide smooth, metered flow because of equal volumes in one chamber of both cylinders. Consult Eaton for maximum operating pressure.

**Double End Cylinders Back-to-Back**

Double end cylinders mounted back-to-back have common piston rod and tie rods and the same stroke length. Consult Eaton for maximum operating pressure.

Note: Front cylinder stroke is $\frac{1}{4}''$ longer at front cylinder when strokes are the same.

Note: Cylinder length is $\frac{1}{4}''$ longer on one cylinder.
N5 Series Cylinder Types

Spring Return/Extend Cylinders

Spring return/extend cylinders provide thrust in one direction only (can be either direction). One port is used for pressure to act against the load while the inactive port is vented. An internal spring is used to return the cylinder to its normal position.

Electronic Feedback Cylinders

These cylinders integrate position sensing and control valves to produce a complete servoactuator package. Eaton’s unique HLT In-Cylinder magnetostrictive feedback sensor provides a compact, robust package. External magnetostrictive (with protective covers) or internally mounted linear potentiometer transducers provide additional options. Valve, manifold blocks and a variety of servocontrol valves may be added to yield a complete control solution.

Adjustable Stroke Cylinders

Adjustable stroke cylinders are furnished with a stroke adjusting screw in the cap end of the cylinder. Adjusting this screw in or out limits the retract stroke to the precise length desired.

Non-rotating Cylinders

Non-rotating cylinders are furnished with internal guide rods which prevent piston rod rotation throughout the stroke. Rotational torque and stroke length determine the amount and diameter of the guide rods.

Pumping Units

Pumping units consist of a standard hydraulic cylinder coupled with a volume displacing lance cylinder via tie-bars. Special seals and lance surface treatments are available to provide compatibility with resins and chemicals used in the pumping process. Single and double ended designs are available.
Eaton Application Data Sheet

Company Name: ___________________________  Distributor Name: ___________________________
Contact: ______________________  Phone Number: ______________________
Fax Number: ______________________

Model Numbering System

<table>
<thead>
<tr>
<th>QUANTITY</th>
<th>MODEL/SERIES MOUNT</th>
<th>BORE</th>
<th>STROKE</th>
<th>CUSHION</th>
<th>ROD DIAMETER</th>
<th>ROD END STYLE</th>
<th>SEALS</th>
<th>PORT LOCATION</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Model/Style

<table>
<thead>
<tr>
<th>DOUBLE END</th>
<th>ADDITIONAL ROD LENGTH</th>
<th>NEEDLE LOCATION</th>
<th>KEYPLATE</th>
<th>4-FLAT</th>
<th>BLEEDERS</th>
<th>BRONZE BUSHING</th>
<th>DRAIN-BACK</th>
<th>IND. SWITCH</th>
<th>MODEL PREFIX</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Stop Tube Length

<table>
<thead>
<tr>
<th>TRUNNION XI DIMENSION</th>
<th>STAINLESS STEEL ROD TYPE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

WHAT IS THE OPERATING ENVIRONMENT?

<table>
<thead>
<tr>
<th>FLUID MEDIA</th>
<th>OPERATING PRESSURE</th>
<th>TEMPERATURE AT CYLINDER</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air</td>
<td>Minimum _____ psi</td>
<td>Minimum _____ °F</td>
</tr>
<tr>
<td>Oil</td>
<td>Typical _____ psi</td>
<td>Typical _____ °F</td>
</tr>
<tr>
<td>Other</td>
<td>Maximum _____ psi</td>
<td>Maximum _____ °F</td>
</tr>
<tr>
<td>Fluid Type</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

WHAT IS MOUNTING?

<table>
<thead>
<tr>
<th>ATTITUDE</th>
<th>ROD END CONNECTION</th>
<th>KNOWN SIDE LOAD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vertical</td>
<td>Degrees from Vertical</td>
<td>Firmly Guided</td>
</tr>
<tr>
<td>Rod Up</td>
<td>Rod Up</td>
<td>Supported _____ lbs.</td>
</tr>
<tr>
<td>Rod Down</td>
<td>Rod Down</td>
<td>Unsupported _____ lbs.</td>
</tr>
</tbody>
</table>

WHAT ENVIRONMENTAL CONDITIONS IS THE CYLINDER SUBJECT TO?

| STANDARD FACTORY | CORROSIVE WASHDOWN | CHEMICAL? | OUTDOORS | OTHER |

WHAT IS THE PRESENT CYLINDER TYPE AND MODEL NUMBER?

WHAT IS THE PRESENT PROBLEM?

WHAT INDUSTRY IS THE CYLINDER USED IN?

WHAT TYPE OF MACHINE IS THE CYLINDER USED ON?

WHAT IS THE CYLINDER NAME THE APPLICATION?

APPLICATION SKETCH:

DESCRIPTION OF APPLICATION OR SPECIAL REQUIREMENT:

PREPARED BY: ______________________  DATE: ______________________
REVIEWED BY: ______________________  DATE: ______________________
CUSTOMER DRAWING NUMBER: __________  REVISION DATES: __________
HYDRO-LINE QUOTE NUMBER: __________

Please fill in all available information above. Refer to the Hydro-Line Model Numbering System on Pages 2.

Side- and Center-line Mountings
These mounts should be keyed or pinned to prevent shifting during operation. Keys or pins must be strong enough to resist the full thrust of the cylinder. The lugs on A and H mounts are large enough to accommodate dowel pins. Extended key plates for stock and custom cylinder models are available when specified. Pin or key the head whenever possible. Do not pin or key both ends. Cylinders become longer when pressure is applied and tube will tend to buckle.

The alignment and center-line height on the E mount are maintained by accurately machined surfaces on the head and cap which are held against the mounting surface by the end lugs.

End and Intermediate Pivot Mountings
Trunnion and pivot pins are designed to carry shear loads only. Trunnion and pivot bearings must fit closely for the entire length of the pin. Hold the trunnion bearings rigidly and in accurate alignment.

End Mountings
The head and cap rectangular mounts G and P should be used for hydraulic applications to avoid excessive deflection which occurs on the F and R mountings.

Refer to the chart on page 13 for pressure ratings for F mounts in push and R mounts in pull.

The G, P, J and S mounts are usable in both push and pull at full rated hydraulic pressures as shown on page 27.

Piston Securing Methods
Piston to rod joints are threaded, anaerobically sealed and secured, and staked (single rod ends).

Under normal operating conditions, additional securing is not necessary. However, in applications where: 1) temperatures exceed 250°F, 2) pressure spike or impact shock is present, or 3) a piston previously detached, the piston should be pinned; this must be specified when ordering. Consult factory for other securing methods.

Double Rod Cylinders
Double rod cylinders are available in all mountings except C, CS, DC, N, P, R, S and W. Use the basic dimensional information on page 17 combined with dimensions in the drawings on pages 11-19.

Mounting Accessories
See pages 28-32 for mounting accessories.

** NFPA mounting dimensions are available on all cylinders 1 1/2" - 8" bore. For larger cylinders, see pages 11-19 for mounting dimensions.
N5 Series
Mounting Dimensions
1½”-8” bore cylinders

MAXIMUM OPERATING PRESSURES IN PSI FOR F MOUNTING IN PUSH

<table>
<thead>
<tr>
<th>CYLINDER BORE</th>
<th>STANDARD ROD 2:1 PISTON ROD</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Heavy Duty</td>
</tr>
<tr>
<td>5 &amp; 6</td>
<td>1440</td>
</tr>
<tr>
<td>7</td>
<td>1040</td>
</tr>
<tr>
<td>8</td>
<td>800</td>
</tr>
</tbody>
</table>

MAXIMUM OPERATING PRESSURES IN PSI FOR R MOUNTING IN PULL

<table>
<thead>
<tr>
<th>CYLINDER BORE</th>
<th>STANDARD ROD 2:1 PISTON ROD</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Heavy Duty</td>
</tr>
<tr>
<td>5 &amp; 6</td>
<td>1800</td>
</tr>
<tr>
<td>7</td>
<td>1300</td>
</tr>
<tr>
<td>8</td>
<td>1000</td>
</tr>
</tbody>
</table>

Note
When pressure must exceed the limitations above for mountings F and R, specify J or S mounting. (Up to a maximum of 3000 psi heavy duty, 5000 psi nonshock).
N5 Series
Mounting Dimensions

1½”-8” bore cylinders

Note
Use the chart below for the cartridge retainer plate dimensions for the bore and rod combinations listed. See page 13 for all other mounting dimensions.

<table>
<thead>
<tr>
<th>BORE</th>
<th>ROD DIAG.</th>
<th>F</th>
<th>RA</th>
<th>RM</th>
<th>V</th>
</tr>
</thead>
<tbody>
<tr>
<td>1½</td>
<td>⅜</td>
<td>11/32</td>
<td>-</td>
<td>2</td>
<td>9/32</td>
</tr>
<tr>
<td></td>
<td>1 ⅛</td>
<td>-</td>
<td>2.44</td>
<td>⅜</td>
<td>-</td>
</tr>
<tr>
<td>2</td>
<td>1⅜</td>
<td>19/32</td>
<td>-</td>
<td>2</td>
<td>¾</td>
</tr>
<tr>
<td></td>
<td>1⅝</td>
<td>-</td>
<td>2.94</td>
<td>¾</td>
<td>-</td>
</tr>
<tr>
<td>2⅛</td>
<td>1⅝</td>
<td>19/32</td>
<td>-</td>
<td>3</td>
<td>¾</td>
</tr>
<tr>
<td></td>
<td>1⅞</td>
<td>-</td>
<td>3.44</td>
<td>¾</td>
<td>-</td>
</tr>
<tr>
<td>3⅛</td>
<td>2⅛</td>
<td>19/32</td>
<td>-</td>
<td>3</td>
<td>¾</td>
</tr>
<tr>
<td></td>
<td>2⅜</td>
<td>-</td>
<td>4</td>
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# N5 Series Mounting Dimensions

## End Mountings

(See important application data on pages 20-23.)

## N5 Series Mounting Dimensions

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Dimensions shown in blue are mounting dimensions.

- Oversize rods affect dimensions in blue-shaded areas. See pages 36-37 for these dimensions.
- Use screws 1/16” smaller than mounting holes.
- Port dimensions for standard ports only. Consult Eaton for flange, manifold and special ports.
- Note - Additional port information on page 26.

### N5S – Cap Square Flange Mount (NFPA Style MF6)

### N5J – Head Square Flange Mount (NFPA Style MF5)

### N5K (No Mount), N5L (NFPA Style MX1), N5K (NFPA Style MX2), N5M (NFPA Style MX3) – Tie Rods Extended Mounts

- **K** – No Mount
- **L** – Both tie rods extended
- **N** – Cap end tie rods extended
- **M** – Head end tie rods extended

**Note:** Mounting styles L and M use filler plate at the head end when cylinder has circular retainer.

- Use FH dimension in place of F dimension.
- Use screws 1/16” smaller than mounting holes.
- Port dimensions for standard ports only. Consult Eaton for flange, manifold and special ports.
- Overall length dimensions that require addition of stroke may vary from dimensions shown, due to manufacturing tolerances.
N5 Series
Mounting Dimensions
1½”-8” bore cylinders

N5B – Side Tapped Mount (NFPA Style MS4)

Note
See page 17 for double rod cylinder mounting dimensions.

N5A – Side Lugs Mount (NFPA Style MS2)

Note
See page 17 for double rod cylinder mounting dimensions.

N5H – Center-Line Lugs Mount (NFPA Style MS3)

Note
See page 17 for double rod cylinder mounting dimensions.

Note
Port at Position 3 not available on 1½”, 2”, 2½”, 3½” and 4” bore.

N5E – Side End Lugs (NFPA Style MS7)

Note
Bottoms of heads and caps are mounting surfaces. Lugs hold cylinders against mounting surface.
### N5 Series Mounting Dimensions

Side- and Center-line Mountings

(See important application data on pages 20-23)

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**N5 – Extended Key Plate – Available when specified**

- **Note**
  - To order, specify extended key plate after the N5 series and mounting style (Example: N5A with extended key plate).

- **Dimensions shown in blue are mounting dimensions.**
  - Oversize rods affect dimensions in blue-shaded areas. See pages 36-37 for these dimensions.
  - **Add stroke to all starred dimensions.**
  - **Refer to page 27.**
  - **Note -** Overall length dimensions that require addition of stroke may vary from dimensions shown, due to manufacturing tolerances.

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**CYLINDER DIMENSIONS**

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- **Use FH dimension in place of F dimension and VB dimension in place of V dimension.**
- **Use screws 1/8” smaller than mounting holes.**
- **Port dimensions for standard ports only. Consult Eaton for flange, manifold and special ports.**

---

**Note**

- Overall length dimensions that require addition of stroke may vary from dimensions shown, due to manufacturing tolerances.
N5 Series
Mounting Dimensions

1 1/8”-8” bore cylinders

1 1/8”-5” bores have one-piece trunnion.
N5C – Cap Fixed Clevis Mount (NFPA Style MP1)

6”-8” bores have split trunnion.
N5DC – Cap Detachable Clevis Mount (NFPA Style MP2)

MAXIMUM OPERATING PRESSURE

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**N5 Series Mounting Dimensions**

Pivot Mountings and Double Rod Cylinders (continued)

(See important application data on pages 20-23.)

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</tr>
<tr>
<td>CB</td>
<td>3/16</td>
<td>1/4</td>
<td>1/4</td>
<td>1/2</td>
<td>1/4</td>
<td>1/2</td>
<td>1/4</td>
<td>1/2</td>
</tr>
<tr>
<td>CC</td>
<td>1 1/2-20</td>
<td>1 1/2-20</td>
<td>1 1/2-20</td>
<td>1 1/2-20</td>
<td>1 1/2-20</td>
<td>1 1/2-20</td>
<td>1 1/2-20</td>
<td>1 1/2-20</td>
</tr>
<tr>
<td>CD</td>
<td>1 1/2</td>
<td>1/4</td>
<td>1/4</td>
<td>1/2</td>
<td>1/4</td>
<td>1/2</td>
<td>1/4</td>
<td>1/2</td>
</tr>
<tr>
<td>CW</td>
<td>13/64</td>
<td>1/4</td>
<td>1/4</td>
<td>1/2</td>
<td>1/4</td>
<td>1/2</td>
<td>1/4</td>
<td>1/2</td>
</tr>
<tr>
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<td>1/2</td>
<td>1/2</td>
<td>1/2</td>
<td>1/2</td>
<td>1/2</td>
<td>1/2</td>
<td>1/2</td>
</tr>
<tr>
<td>E</td>
<td>1 1/2</td>
<td>1/4</td>
<td>1/4</td>
<td>1/2</td>
<td>1/4</td>
<td>1/2</td>
<td>1/4</td>
<td>1/2</td>
</tr>
<tr>
<td>EE</td>
<td>1 1/2</td>
<td>1/4</td>
<td>1/4</td>
<td>1/2</td>
<td>1/4</td>
<td>1/2</td>
<td>1/4</td>
<td>1/2</td>
</tr>
</tbody>
</table>

---

**Note**

- N5HD has mounting dimensions identical to N5AD.
- Add D for double end after the N5 series and mounting style. (Example: N5AD)

---

**Dimensions shown in blue are mounting dimensions.**

Note- Additional port information on pg 26.

Oversize rods affect dimensions in blue-shaded areas. See pages 36-37 for these dimensions.

Note- Refer to page 27.

Note- Overall length dimensions that require addition of stroke may vary from dimensions shown, due to manufacturing tolerances.

Add stroke to all starred dimensions.

Use FH dimension in place of F dimension and VB dimension in place of V dimension.

Plus 2x stroke.

Port dimensions for standard ports only. Consult Eaton for flange, manifold and special ports.

---

**EATON Hydro-Line Industrial Tie Rod Cylinders N5/AN5/LAN5 H-CY1G-TM002-E September 2003**

17
N5 Series
Mounting Dimensions
10”, 20”, 24” and 30” bore cylinders

Note
Tie rod nuts will extend past the end cap K thickness on the end opposite flange mounting.

Available in 10”, 12” and 14” bores only.
Over 14” bore, use J or S mount.

N5G – Head Rectangular Mount
N5P – Cap Rectangular Mount

N5S – Cap Square Mount

N5H – Center-line Lugs Mount

N5W – Cap Trunnion Mount

N5J – Head Square Mount

N5U – Head Trunnion Mount
N5 Series
Mounting Dimensions

All Mountings
(See important application data on pages 20-23.)

For trunnion dimensions over 14” bore, consult factory.

† Maximum width of mating part.

N5C – Cap Fixed Clevis Mount

CYLINDER DIMENSIONS

<table>
<thead>
<tr>
<th>BORE</th>
<th>10</th>
<th>12</th>
<th>14</th>
<th>16</th>
<th>18</th>
<th>20</th>
<th>24</th>
<th>30</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>4 1/2</td>
<td>5 1/2</td>
<td>7</td>
<td>8</td>
<td>9</td>
<td>10</td>
<td>11</td>
<td>14</td>
</tr>
<tr>
<td>AC</td>
<td>5 1/4</td>
<td>6 1/4</td>
<td>6 1/2</td>
<td>6 1/2</td>
<td>6 1/4</td>
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<td>4 1/16</td>
<td>4 1/4</td>
<td>4 1/4</td>
<td>4 1/4</td>
</tr>
<tr>
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<td>1 1/2</td>
<td>1 1/2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>–</td>
</tr>
<tr>
<td>AF</td>
<td>3 1/8</td>
<td>4 1/8</td>
<td>5 1/4</td>
<td>6 1/2</td>
<td>7 1/4</td>
<td>8</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>B* .001</td>
<td>5 1/4</td>
<td>6 1/4</td>
<td>8</td>
<td>10</td>
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<td>12</td>
<td>15</td>
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<td>4</td>
<td>5</td>
<td>5 1/2</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>CB†</td>
<td>4</td>
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<td>6</td>
<td>7</td>
<td>8</td>
<td>9</td>
<td>10</td>
<td>12</td>
</tr>
<tr>
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<td>6 1/12</td>
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<td>8 1/12</td>
<td>9 1/12</td>
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<td>–</td>
</tr>
<tr>
<td>CD</td>
<td>3 3/16</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>6 1/2</td>
<td>7 1/2</td>
<td>9</td>
<td>11</td>
</tr>
<tr>
<td>CW</td>
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<td>3</td>
<td>3 1/4</td>
<td>4</td>
<td>4 1/4</td>
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<td>6</td>
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<td>12 1/8</td>
<td>14 1/8</td>
<td>17 1/8</td>
<td>19 1/8</td>
<td>22</td>
<td>23 1/8</td>
<td>31</td>
<td>37 1/2</td>
</tr>
<tr>
<td>EB</td>
<td>17 1/8</td>
<td>19 1/8</td>
<td>21 1/8</td>
<td>21 1/8</td>
<td>22</td>
<td>24 1/2</td>
<td>31</td>
<td>37 1/2</td>
</tr>
<tr>
<td>EE</td>
<td>SEE PAGE 22</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Dimensions shown in blue are mounting dimensions.
Oversize rods affect dimensions in blue-shaded areas. See pages 36-37 for these dimensions.
† Add stroke to all starred dimensions.
† Maximum width of mating part.
† Use screws 1/16” smaller than mounting holes.

Note- Overall length dimensions that require addition of stroke may vary from dimensions shown, due to manufacturing tolerances.
• Port dimensions for standard ports only. Consult Eaton for flange, manifold and special ports.

Dimensions shown in blue are mounting dimensions.
Oversize rods affect dimensions in blue-shaded areas. See pages 36-37 for these dimensions.
† Add stroke to all starred dimensions.
† Maximum width of mating part.
† Use screws 1/16” smaller than mounting holes.
Note- Overall length dimensions that require addition of stroke may vary from dimensions shown, due to manufacturing tolerances.
• Port dimensions for standard ports only. Consult Eaton for flange, manifold and special ports.
### Tie Rod Information

#### 10", 20", 24" AND 30" BORE

<table>
<thead>
<tr>
<th>DIM</th>
<th>10</th>
<th>12</th>
<th>14</th>
<th>16</th>
<th>18</th>
<th>20</th>
<th>24</th>
<th>30</th>
</tr>
</thead>
<tbody>
<tr>
<td>RD</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>6.050</td>
<td>7.911</td>
</tr>
</tbody>
</table>

**TIE ROD THREAD**

| 10", 12" and 16" bores | 14", 18" and 20" bores | 24" and 30" bores |

**RA**

**RB**

**RC**

**RD**

*Note*
The interchangeability of the 10", 20", 24" and 30" bores with other cylinder brands has not been established by the NFPA. The above dimensions are Eaton Hydro-Line standards.

### Technical Data

**Rod Size and Stop tube selection**

- **D = 4S**
  - Unsupported Rod End
  - **D = S**
  - Supported Rod End
  - **D = \( \frac{1}{2}S \)**
  - Firmly Guided Rod End
  - **D = 4S**
  - Unsupported Rod End

- **D = S**
  - Supported Rod End

- **D = \( \frac{1}{2}S \)**
  - Firmly Guided Rod End
**Technical Data**

**Rod Size Selection**

Standard rod sizes are normally suitable for all applications except for long stroke or high thrust applications. Proper selection of minimum rod size may be determined by the following steps:

1. If you know the bore size and operating pressure, thrust can be determined. Refer to the graph in the next column.

2. Select from illustrations on page 20 the type of mounting needed, and determine the length of D with the piston rod in the fully extended position.

3. Find the value of D at the bottom of the graph and follow its line vertically until it intercepts the horizontal line, which represents the maximum push thrust to be applied to your cylinder. The intersection of these two lines will fall within a stripe representing the minimum recommended piston rod diameter for your needs.

**Stop Tubes**

Stop tubes are located between the piston and the rod shoulder on the head end of the cylinder. Bearing loading is reduced by separating the piston and the rod bushing. Bearing wear and tendency to buckle is reduced.

To determine if a stop tube is required and the length of stop tube needed, use the following procedure:

Determine the value of D with the piston rod in the fully extended position. If the value of D is under 40", no stop tube is needed. If D is greater than 40", one inch of stop tube is recommended for each 10", or fraction thereof, beyond 40".

**Special Note**

When specifying stroke and stop tube lengths, please include net working stroke plus stop tube length.
Below are cylinder sizes and their standard rod diameters (to the left). Consult bulletins for rods larger than standard.

<table>
<thead>
<tr>
<th>Bore Size in inches</th>
<th>Piston Rod Dia. in inches</th>
<th>Piston Rod Area sq. in.</th>
<th>Pressures of Operating Medium – Air or Hydraulic</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/4</td>
<td>1/4</td>
<td>0.31</td>
<td>16 19 25 31 62 78 155 233 310 465 620 890</td>
</tr>
<tr>
<td>1</td>
<td>2 &amp; 2 1/2</td>
<td>0.79</td>
<td>75 89 119 149 298 373 745 1,118 1,490 2,235 2,987 4,470</td>
</tr>
<tr>
<td>1/2</td>
<td>1/4</td>
<td>1.49</td>
<td>121 145 193 241 482 603 1,025 1,608 2,410 3,615 4,820 7,320</td>
</tr>
<tr>
<td>5/8</td>
<td>2</td>
<td>3.14</td>
<td>157 188 251 314 628 785 1,570 2,355 3,340 4,710 6,280 9,420</td>
</tr>
<tr>
<td>3/4</td>
<td>2</td>
<td>4.91</td>
<td>246 296 393 491 982 1,228 2,465 3,683 4,910 7,365 9,420</td>
</tr>
<tr>
<td>7/8</td>
<td>2</td>
<td>7.07</td>
<td>354 424 566 707 1,414 1,768 3,535 5,303 7,070 10,605 14,140 21,210</td>
</tr>
<tr>
<td>1</td>
<td>3/4</td>
<td>8.62</td>
<td>691 757 962 1,924 2,405 4,810 7,215 9,620 14,390 21,240</td>
</tr>
<tr>
<td>1 1/4</td>
<td>1/4</td>
<td>1.96</td>
<td>225 269 351 491 982 1,228 2,465 3,683 4,910 7,365 9,420</td>
</tr>
<tr>
<td>1 1/2</td>
<td>2</td>
<td>3.14</td>
<td>157 188 251 314 628 785 1,570 2,355 3,340 4,710 6,280 9,420</td>
</tr>
<tr>
<td>1 1/8</td>
<td>2</td>
<td>4.91</td>
<td>246 296 393 491 982 1,228 2,465 3,683 4,910 7,365 9,420</td>
</tr>
<tr>
<td>1 1/4</td>
<td>2</td>
<td>3.14</td>
<td>157 188 251 314 628 785 1,570 2,355 3,340 4,710 6,280 9,420</td>
</tr>
<tr>
<td>1 1/8</td>
<td>2</td>
<td>4.91</td>
<td>246 296 393 491 982 1,228 2,465 3,683 4,910 7,365 9,420</td>
</tr>
<tr>
<td>1 1/4</td>
<td>2</td>
<td>3.14</td>
<td>157 188 251 314 628 785 1,570 2,355 3,340 4,710 6,280 9,420</td>
</tr>
<tr>
<td>1 1/8</td>
<td>2</td>
<td>4.91</td>
<td>246 296 393 491 982 1,228 2,465 3,683 4,910 7,365 9,420</td>
</tr>
<tr>
<td>1 1/4</td>
<td>2</td>
<td>3.14</td>
<td>157 188 251 314 628 785 1,570 2,355 3,340 4,710 6,280 9,420</td>
</tr>
<tr>
<td>1 1/8</td>
<td>2</td>
<td>4.91</td>
<td>246 296 393 491 982 1,228 2,465 3,683 4,910 7,365 9,420</td>
</tr>
</tbody>
</table>

Note
Bore Dimensions Are 0.030" Larger Than NOMINAL.
### Technical Data

**Pressure-Thrust Consumption-Flow Charts (Continued)**

#### PIPE SIZE CHART FOR HYDRAULIC CYLINDERS AND SYSTEMS

<table>
<thead>
<tr>
<th>Standard Weight Pipe</th>
<th>Oil Flow Gallons Per Minute And Friction Pressure Drop Pounds Per Square Inch Per Foot Length Of Pipe</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Pipe Size</strong></td>
<td><strong>Inside Diameter</strong></td>
</tr>
<tr>
<td>1/2</td>
<td>.622</td>
</tr>
<tr>
<td>3/4</td>
<td>.824</td>
</tr>
<tr>
<td>1</td>
<td>1.049</td>
</tr>
<tr>
<td>11/4</td>
<td>1.380</td>
</tr>
<tr>
<td>11/2</td>
<td>1.610</td>
</tr>
<tr>
<td>2</td>
<td>2.067</td>
</tr>
</tbody>
</table>

The pressure drop shown in the above table is for ordinary wrought iron pipe. For smooth, new wrought iron pipes, multiply the values shown by .7; for very smooth, straight tubing, multiply the values shown by .54. Pressure drop is the same regardless of operating pressure. Avoid large pressure drops in low pressure systems. Please note that oil flows through large pipes at a high velocity (up to 30 ft/sec) with small pressure loss. The pressure drop shown is for hydraulic oil with approximately 225 SSU at 100°F under average operating conditions. The values also apply to water. In order to accommodate large pump volumes without severe pressure drops, all Eaton hydraulic cylinders are available with oversize ports with welded half pipe couplings or flange fitting.

#### Equivalent Length of Straight Pipe In Feet For Various Fitting

<table>
<thead>
<tr>
<th>Standard Weight Pipe</th>
<th>Equivalent Length of Straight Pipe In Feet For Various Fitting</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Cylinders &amp; 2-3-Way Valves</td>
</tr>
<tr>
<td><strong>Pipe Size</strong></td>
<td><strong>Inside Diameter</strong></td>
</tr>
<tr>
<td>1/2</td>
<td>.622</td>
</tr>
<tr>
<td>3/4</td>
<td>.824</td>
</tr>
<tr>
<td>1</td>
<td>1.049</td>
</tr>
<tr>
<td>11/4</td>
<td>1.380</td>
</tr>
<tr>
<td>11/2</td>
<td>1.610</td>
</tr>
<tr>
<td>2</td>
<td>2.067</td>
</tr>
</tbody>
</table>

* Inside diameter and areas shown are standard pipe. For tubing or extra heavy and double extra heavy pipe, use I.D. in table closest to your pipe or tubing I.D.
Technical Data

Cushion Formulas and Factors

Cushions are recommended when piston speed is in excess of 20-25 feet per minute. Cushions decelerate the piston and rod assembly at the end of the stroke, lessening the noise and shock and increasing cylinder life. Heavy loads attached to the piston and rod assembly should be stopped by external means, such as shock absorbers, springs, decelerating valves, etc.

Use the information below, along with the examples on page 25 to determine if standard cushioning is sufficient for your application.

**FORCE FACTOR TERMINOLOGY**

<table>
<thead>
<tr>
<th>TERM USED</th>
<th>EXPLANATION</th>
<th>UNITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>W</td>
<td>Weight of the load</td>
<td>pounds</td>
</tr>
<tr>
<td>Ab</td>
<td>Bore area</td>
<td>square inches</td>
</tr>
<tr>
<td>Ah</td>
<td>Ab less rod area</td>
<td>square inches</td>
</tr>
<tr>
<td>Acc</td>
<td>Ab less cap plunger cross-sectional area</td>
<td>square inches</td>
</tr>
<tr>
<td>Ahc</td>
<td>Ab less head plunger cross-sectional area</td>
<td>square inches</td>
</tr>
<tr>
<td>a</td>
<td>Force factor</td>
<td>—</td>
</tr>
<tr>
<td>s</td>
<td>Acceleration or deceleration distance</td>
<td>inches</td>
</tr>
<tr>
<td>u</td>
<td>Coefficient of friction of load's motion</td>
<td>Horizontal = .15; Vertical = 0</td>
</tr>
<tr>
<td>v</td>
<td>Velocity</td>
<td>inches per second (ips)</td>
</tr>
<tr>
<td>Facc</td>
<td>Force needed to accelerate a weight</td>
<td>pounds</td>
</tr>
<tr>
<td>Fdec</td>
<td>Force needed to decelerate a weight</td>
<td>pounds</td>
</tr>
<tr>
<td>Ff</td>
<td>Friction force due to load motion</td>
<td>pounds</td>
</tr>
<tr>
<td>Fp</td>
<td>Driving pressure force</td>
<td>pounds</td>
</tr>
<tr>
<td>Ft</td>
<td>Total cushioning force</td>
<td>pounds</td>
</tr>
<tr>
<td>Pp</td>
<td>Pump pressure</td>
<td>pounds per square inch (psi)</td>
</tr>
<tr>
<td>Pc</td>
<td>Contained cushioning pressure</td>
<td>pounds per square inch (psi)</td>
</tr>
</tbody>
</table>

**GENERAL FORMULAS**

- For horizontal motion, use the general formula:
  \[ F_{acc} = \frac{W \times \Delta t}{s} \]

- For vertical motion, decelerating downward or accelerating upward:
  \[ F_{acc} = \frac{(W \times \Delta t)}{s} + W \]

- For vertical motion, decelerating upward or accelerating downward:
  \[ F_{acc} = \frac{(W \times \Delta t)}{s} - W \]

- Frictional force:
  \[ F_f = u \times W \]

- Total cushioning force:
  \[ F_t = F_{acc} \text{ or } F_{dec} + F_p + F_f \]
  \[ (\pm F_f \text{ if load accelerating, } - F_f \text{ if load decelerating}) \]

- Contained pressure:
  \[ P_c = \frac{F_t}{A_{hc}} \text{ or } \frac{F_t}{A_{hc}} \]

---

**FORCE FACTOR CHART**

Force Factors \( a = v^2 \times 0.001294 \)

<table>
<thead>
<tr>
<th>PISTON VELOCITY</th>
<th>VELOCITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>.00129</td>
</tr>
<tr>
<td>2</td>
<td>.00518</td>
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<tr>
<td>3</td>
<td>.0117</td>
</tr>
<tr>
<td>4</td>
<td>.0208</td>
</tr>
<tr>
<td>5</td>
<td>.0324</td>
</tr>
<tr>
<td>6</td>
<td>.0466</td>
</tr>
<tr>
<td>7</td>
<td>.0635</td>
</tr>
<tr>
<td>8</td>
<td>.0829</td>
</tr>
<tr>
<td>9</td>
<td>.105</td>
</tr>
<tr>
<td>10</td>
<td>.129</td>
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<td>11</td>
<td>.157</td>
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<td>12</td>
<td>.186</td>
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<td>13</td>
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<td>.518</td>
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<td>21</td>
<td>.571</td>
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<td>22</td>
<td>.627</td>
</tr>
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<td>23</td>
<td>.685</td>
</tr>
<tr>
<td>24</td>
<td>.746</td>
</tr>
<tr>
<td>25</td>
<td>.809</td>
</tr>
</tbody>
</table>

---

**Cushion Formulas and Factors**

- The force factors shown are used to determine the forces required to accelerate or decelerate a weight through a given distance, \( s \) (Refer to Force Factor Chart).
- If the motion of the load is horizontal, use the general formula:
  \[ F_{acc} = \frac{W \times \Delta t}{s} - W \]
- If the motion of the load is vertical and is being decelerated downward or accelerated upward, use the general formula:
  \[ F_{acc} = \frac{(W \times \Delta t)}{s} - W \]
- Friction due to load motion affects \( F_t \). Add \( F_f \) to \( F_t \) if the load is accelerating.
- Subtract \( F_f \) from \( F_t \) if the load is decelerating.
- Cylinder friction is negligible.

Note

The contained cushioning pressure must not exceed 5000 psi. If the standard cushion results in a too high pressure, then a longer cushion spud must be specified.
Technical Data
How to Calculate Your Cushion Requirements

HYDRAULIC EXAMPLES

Example A
Horizontal deceleration

N5 series cylinder, 3\(\frac{3}{4}\)" bore, 1\(\frac{3}{8}\)" rod (standard), cushioning at cap.

A weight of 3000 lbs., moving at 25 ips, and driven by a pump pressure of 1000 psi should stopped in 1\(\frac{1}{4}\)". Assume the coefficient of friction to be .15.

1. \(F_f = \mu \times W\)  
\[F_f = 0.15 \times 3000 \text{ lbs.}\]  
\[F_f = 450 \text{ lbs.}\]

2. \(F_p = A_h \times P_p\)  
\[A_h = 8.45 \text{ sq. in.} - \text{1.49 sq. in.}\]  
\[A_h = 6.96 \text{ sq. in.}\]  
\[F_p = 6.96 \text{ sq. in.} \times 1000 \text{ psi}\]  
\[F_p = 6960 \text{ lbs.}\]

3. \(F_{dec} = W \times \frac{a}{s}\)  
\[F_{dec} = 3000 \text{ lbs.} \times \frac{0.809/1.25 \text{ in.}}{1.25 \text{ in.}}\]  
\[F_{dec} = 1942 \text{ lbs.}\]

4. \(F_t = F_{dec} + F_p - F_f\)  
\[F_t = 1942 + 6960 - 450\]  
\[F_t = 8452 \text{ lbs.}\]

5. \(P_c = \frac{F_t}{A_{hc}}\)  
\[P_c = \frac{8452 \text{ lbs.}}{22.07 \text{ sq. in.}}\]  
\[P_c = 384.49 \text{ psi}\]

This figure does not exceed the pressure capability of the cylinder, therefore, the standard cushion is acceptable.

Example B
Vertical deceleration

N5 series cylinder, 6" bore, 2\(\frac{3}{4}\)" rod (standard), cushioning at head.

The cylinder is mounted vertical rod down, with a 2000 lb. load attached to the rod end. Pump pressure is 750 psi, the load is moving at 40 ips, and must be stopped in 1\(\frac{3}{8}\)". There is no load friction.

1. \(F_p = P_p \times A_h\)  
\[F_p = 750 \text{ psi} \times 28.56 \text{ sq. in.}\]  
\[F_p = 21420 \text{ lbs.}\]

2. \(F_{dec} = (W \times \frac{a}{s}) + W\)  
\[F_{dec} = (2000 \text{ lbs.} \times 2.07/1.375) + 2000 \text{ lbs.}\]  
\[F_{dec} = 5011 \text{ lbs.}\]

3. \(F_t = F_p + F_{dec}\)  
\[F_t = 21420 + 5011\]  
\[F_t = 26431 \text{ lbs.}\]

4. \(P_c = \frac{F_t}{A_{hc}}\)  
\[P_c = \frac{26431 \text{ lbs.}}{22.07 \text{ sq. in.}}\]  
\[P_c = 1200.00 \text{ psi}\]

This does not exceed the pressure capability of the cylinder, therefore, the standard cushion is acceptable.

Note
If your calculations show you need a longer cushion than standard, longer cushions are available in \(\frac{1}{4}\) inch increments.

STANDARD CUSHION INFORMATION N5 SERIES

<table>
<thead>
<tr>
<th>Bore Size</th>
<th>Rod Dia.</th>
<th>Cushion Length (in.)</th>
<th>Effective Cushion Area (in.(^2))</th>
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Port Data

Ports
Standard ports for N5 are SAE straight thread. AN5 and LAN5 standard ports are NPTF.

Optional and Oversize Ports
The chart to the right lists port sizes. Larger welded half-pipe coupling ports are available in some sizes; please contact Eaton. For oversize ports where short restrictions in dash pot areas cannot be allowed, specify “full flow porting.”

Port, Cushion Adjustment, Ball Check Locations
Standard port locations are at #1, with optional locations at #2, 3, 4 or 5 furnished when specified, except where H, U or W mounts interfere at #2 and #4. Ports at #3 in B and the cap end of E mountings need special construction. Note possible piping interference with mounting screws in A cylinders ported at Pos. 2 and 4. Mounting holes are counterbored to allow access to them with piping in place.

In the end view shown, standard position of cushion adjustment is above port location #2 in location C3; ball check above port location #4 at C8 when ports are at position #1. On H, the head on G, U and the cap on P, W cushion adjustments are on the right side of port location #3 at C5, and checks are on the left side at C6. Locations 1 through 4 indicate possible port positions. Number 1 is standard. Optional location #5 is available on cap end centerline. Locations C1 through C8 indicate possible cushion adjustment positions. When ports are at position #1, C3 is standard needle location.

<table>
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<th>Cylinder Bore Dia. (inches)</th>
<th>Rod Diameter (inches)</th>
<th>SAE*</th>
<th>NPTF</th>
<th>** 4-Bolt SAE</th>
<th>Manifold ***</th>
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* Fitting hex may interfere with mountings S, R and P. Consult factory for additional information.

** Flanges may overhang head and caps. Consult factory for additional information.

*** Manifold dimension is for flow passage diameter.
N5 Series Hydraulic Pressure Ratings

<table>
<thead>
<tr>
<th>Cylinder Bore (inches)</th>
<th>Piston Rod Diameters (inches)</th>
<th>Pressure Ratings (psi)</th>
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<td>Oversize</td>
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</tr>
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<td>2 1/2</td>
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N5 Series cylinders comply with NFPA specifications and ANSI B93.15-1981 mounting dimensions are standard.

Rod Cartridge Retainers Simplify Cartridge Removal

Cylinders with the following bore and rod combinations use circular retainers which permit removal of rod cartridge without disassembling the cylinder:
- 2 1/2" bore with 1" rod
- 3 1/4" bore with 1 3/8" rod
- 4" bore and larger with all rod diameters

Refer to Engineering File number 188 for alternate removable cartridge constructions.

Cylinders use above retainer construction on the following bore and rod combinations:
- 1 1/2" bore with 5/8" and 1" rods
- 2 1/2" bore with 1 3/8" and 1 3/4" rods
- 2" bore with 1" and 1 3/8" rods
- 3 1/4" bore with 1 3/8" and 2" rods
Typical Mounting Accessories
For Standard Rod Diameters
Style #2

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<thead>
<tr>
<th>Bore</th>
<th>A</th>
<th>B</th>
<th>Stroke</th>
<th>Eye Bracket Standard</th>
<th>Swivel</th>
<th>Female Clevis</th>
<th>Pivot Pin</th>
<th>Female Eye</th>
<th>C°</th>
<th>D°</th>
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For mounting dimensions over 12” bore, consult Eaton.

---

Type of Mounting Accessories
For Standard Rod Diameters
Style #2

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<th>Bore</th>
<th>C</th>
<th>B</th>
<th>Stroke</th>
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<th>Pivot Pin</th>
<th>Female Eye</th>
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<th>D°</th>
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For mounting dimensions over 12” bore, consult Eaton.
Cylinder Mounting Accessories

Pivot Pin

1. Pivot pins are furnished with clevis mounted cylinders.
2. Pivot pins must be ordered as a separate item if used with female eye, female clevis, standard eye bracket and clevis bracket. They are included only with swivel eye bracket.
3. CL = (2 x CW) + CB

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Female Eye

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Cylinder Mounting Accessories (continued)

**Spherical Rod Eye**

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<th>KK</th>
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**Female Clevis**

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## Mounting Accessories

### Swivel Eye Bracket
**Standard Eye Bracket**
(Includes spacers to allow swivel action up to 7° and to make dimensions interchangeable with standard eye bracket.)

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*To assure precision fit-up, pivot pins machined to special tolerances are furnished with all swivel eye brackets, unless otherwise specified.

**Dimensions F and FL reflect revised NFPA standards. Part numbers with suffix letter X are affected.

### Clevis Bracket

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<td>2(^{1/2})</td>
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<td>6(^{1/16})</td>
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</table>
Self-Aligned Coupler

Lateral movement (on push only) and radial movement provide precision alignment between cylinder and machine. Couplers preset with proper clearances and completely lubricated at factory before shipping.

![Self-aligning Coupler Diagram]

Note
When ordering oversize and 2:1 rod cylinders, specify modification to suit standard rod diameter’s coupler.

<table>
<thead>
<tr>
<th>Part No.</th>
<th>Rod Dia.</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>F</th>
<th>G</th>
<th>H</th>
<th>J</th>
<th>K</th>
<th>KK</th>
<th>Max. Pull At Yield</th>
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<td>750,010</td>
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▲ Four 1/32" diameter x 1/32" deep spanner holes instead of flats.
### Table of Contents

<table>
<thead>
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<tbody>
<tr>
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</table>

### Industrial Tie Rod Cylinders

**Technical Manual**

**September 2003**

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#### For Special Applications

- Eaton’s Hydro-Line offers many applications and special functions.
- Customized solutions with special features are available upon request.

#### Industrial Tie Rod Cylinders

The industrial tie rod cylinder is fabricated from superior materials and is designed to meet the most demanding conditions. It is a cylinder designed to take full load (i.e., to be used as an assembly for fast and easy assembly and servicing).

#### Mounting Accessories

- The two-piece steel coupling is manufactured from high-quality steel.
- Custom cylinders to meet special application requirements can be designed.

#### Cylinder Mounting Accessories

- Weld-plate mounting.
- Quick connect fitting.
Eaton
Commitment to
superior services, the first
time and every time, that
produces and delivers defect-
free products and
installations. Eaton’s sales,
engineering and manufacturing
groups have the
knowledge and resources to
solve your application
demands. Eaton’s
standard products have
been designed to meet
application requirements,
however, sometimes a
special cylinder is often required to meet
specific needs.

For Special Applications
Custom Cylinders

Eaton can supply
special cylinders and
special cylinders to
meet customer
specifications.

• Application simulation in
• Tie rod, threaded and bolt-
• Operating mediums rang-
• Operating pressures to
• Cylinder construction
• Ed cylinder construction
• Gen, or from standard
• Including from shop air to

Field-Mate

1000 psi nominal hydraulic
• N5 – 3000 psi nominal hydraulic
• AN5 – to 250 psi very heavy-duty
• NFPA interchangeable

HM, HW, SM or special cylinders.
Incorporate cylinder position
sensing and feedback throughout the
stroke. Available in N5, R5, A5, Q5,
and other series. The cylinders are
inter-changeable with
standard NFPA
specifications ISO 6020/2 and
EN 837/1. Eaton’s cylinders are
made of steel, but
they are also
available in aluminum
or bronze.

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or bronze.
**Key Features**

- Unitized, threadless cartridge
- Self-centering cushions are sculptured to allow the rod to move freely.
- Rod wiper is available on N5 for special damping and extrusion. The balldropped lip-type rod wipers, cast iron self-centering cushions are preferred for fast breakaway and Caps for closer tolerances, yet minimum pressure rating.
- NPTF ports standard on all AN5 features and are compatible with virtually any fitting. Super design to prevent damage to female thread.

**Rod End Styles**

- STD.
- CC
- KK
- A V or VB depending on mount

**Specifications**

- Rod Dia. MM A
- Rod Dia. MM B
- Rod Dia. MM C
- Rod Dia. MM D
- Rod Dia. MM E
- Rod Dia. MM F
- Rod Dia. MM G
- Rod Dia. MM H
- Rod Dia. MM I
- Rod Dia. MM J
- Rod Dia. MM K
- Rod Dia. MM L

**Pressure Ratings**

- 2
- 2X
- 1
- 1X
- 4
- 5
- 6
- 10

**Overrun Rod Information**

- The overrun rod has no overrun, the piston rod length is 2” to 500” we recommended for use with lightweight cylinders. The overrun rod is recommended for use with lightweight cylinders. The overrun rod is recommended for use with lightweight cylinders. The overrun rod is recommended for use with lightweight cylinders.
Custom Cylinders

For Special Applications
Eaton offers a complete line of standard and special application cylinders designed to meet custom requirements. Eaton’s Custom Cylinders are often required to meet custom specifications. These custom cylinders are often used in applications where standard cylinders cannot meet the unique performance characteristics required by the application. Eaton’s Custom Cylinders are designed and manufactured to meet your individual needs.

For more information on Eaton’s Custom Cylinders, contact your Eaton Distributor or Eaton Process Hydraulics, 14615 Lone Oak Road, Decatur, AL 35601, USA. Fax: 256 351-1264. Tel: 256 350-2339.

Eaton’s Sales, Engineering and Manufacturing groups have the experience and capability to design and manufacture custom cylinders to meet your requirements.

Eaton would appreciate an opportunity to meet with you to discuss how Eaton can help you improve productivity. Our sales, engineering, and manufacturing departments can work with your company to develop a solution that meets your needs. Contact Eaton today to learn how we can help you improve productivity.

Screw capacities include:
• EATON Phillips head screws
• EATON Machine screws

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