ARM OVER CLAMP FOR ASSEMBLY AND WELDING

- Superior part holding
- Provides widest range of high clamping force in its class

OPTIONS:

AD001  AU001  AL001  AR000  SW42  PS1E1

ISO-9001 CERTIFIED
Quality Management System Certified

PEC02A

Patent Pending

CLAMP DIVISION
SUPERIOR DELIVERY
24 Hour

PHD is a member of the MAC Distributor Network

phd
SOLUTIONS FOR INDUSTRIAL AUTOMATION
www.phdinc.com
TO ORDER SPECIFY:
Model, Clamp Size, Bore Size, Output Shaft, Design No., Arm Rotation, and additional options if desired.

INDEX:
Ordering Data  Page 2
Benefits  Page 3
Dimensions  Pages 4 and 5
Engineering Data  Page 6
Cam Design  Page 7
Options & Kits  Pages 8 to 11
Switch Options  Pages 12 to 14
Exploded View & Parts List  Page 15

Options not listed are available on all units. Options that require 105° rotation and U-arm combinations.

- LAA - 90° Swivel Elbow, Metal
- LBB - 90° Swivel Elbow, Plastic
- M001 - Flange mounting plate
- M002 - Flange mounting cylinder body
- SWxx - Magnet switches installed
- M - Mo Switch
- A - 4-pin AC/DC Switch (Turck)
- D - 4-pin PNP DC Switch (P+F)
- J - 4-pin NPN DC Switch (Turck)

1) Magnet will be installed if cylinder switches are ordered. Units with V4 option are not available with magnet in cylinder (Swxx option).
2) All units come standard with PSxxx/PRxxx switch target.
3) Model PECxxD must be ordered for AUxxx arm options.
4) All U-arms come standard with 96° rotation. Contact PHD for units that require 105° rotation and U-arm combinations.
SERIES PEC CLAMPS

multiple output shaft options available for mounting arms on either or both sides providing clamping flexibility depending on your application requirements

cylinder mounted switches provide a low cost solution for position sensing of non-welding applications

each clamp size is available in two bore sizes, providing a variety of configurations and options to fit a wide range of clamping solutions

cam design locks clamp in closed position for the last 6° of rotation, ensuring part retention if air pressure is lost and makes initial setups easier

cam design provides widest range of high clamping force in its class

Our cam design sets us apart from typical toggles see page 7 for more info!

WELDING APPLICATION

This application depicts a typical welding application where the PEC clamps hold down the parts while the robot welds smaller parts into place. The PHD cam design provides the means to have more part variation without having to adjust for part variation.

Major Benefits

- Manual release of clamp is achieved by using common tools without removing plugs while providing contamination resistance.
- Self-locking internal threads throughout eliminate need for thread locking adhesives or additional locking components.
- Flange mounting option provides a unique alternative to typical clamp mounting configurations.
- All units are positional switch ready.

Industry Uses

- Assembly and Welding
**DIMENSIONS: SERIES PEC CLAMPS**

**PEC2x**
Note: PEC22D dimensioned

- **LETTER DIM**
  - PEC22
    - B12: 1.576 [40.0]
    - B13: 1.855 [47.1]
    - B14: 1.855 [47.1]
    - B15: 0.709 [18.0]
  - PEC23
    - B12: 1.576 [40.0]
    - B13: 1.855 [47.1]
    - B14: 1.855 [47.1]
    - B15: 0.709 [18.0]

**PEC3x**
Note: PEC33D dimensioned

- **LETTER DIM**
  - PEC33
    - P2: 1.240 [31.5]
    - B13: 1.811 [46.0]
    - B14: 1.811 [46.0]
    - B15: 0.709 [18.0]
  - PEC34
    - P2: 1.240 [31.5]
    - B13: 1.811 [46.0]
    - B14: 1.811 [46.0]
    - B15: 0.709 [18.0]
DIMENSIONS: SERIES PEC CLAMPS

PEC4x
Note: PEC44D dimensioned

<table>
<thead>
<tr>
<th>LETTER DIM</th>
<th>MODEL NUMBER</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>PEC44</td>
</tr>
<tr>
<td>B12</td>
<td>2.205 [56]</td>
</tr>
<tr>
<td>B13</td>
<td>1.102 [28]</td>
</tr>
<tr>
<td>B14</td>
<td>2.680 [68.1]</td>
</tr>
<tr>
<td>B15</td>
<td>6.10 [15.5]</td>
</tr>
<tr>
<td>P2</td>
<td>4.311 [109.5]</td>
</tr>
<tr>
<td>P3</td>
<td>3.839 [97.5]</td>
</tr>
<tr>
<td>P4</td>
<td>.748 [19.0]</td>
</tr>
</tbody>
</table>

OUTPUT SHAFT CONFIGURATIONS

PECxxD  PECxxR  PECxxL

All dimensions are reference only unless specifically tolerated.
ENGINEERING DATA: SERIES PEC CLAMPS

<table>
<thead>
<tr>
<th>SPECIFICATIONS</th>
<th>SERIES PEC</th>
</tr>
</thead>
<tbody>
<tr>
<td>PISTON SEALS</td>
<td>Carboxilated Nitrile, compression type</td>
</tr>
<tr>
<td>WORKING PRESSURE</td>
<td>40 psi min. - 100 psi max.</td>
</tr>
<tr>
<td>OPERATING TEMPERATURE</td>
<td>-20° to +180° F [-28° to +82° C]</td>
</tr>
<tr>
<td>LUBRICATION</td>
<td>Factory lubricated for life</td>
</tr>
</tbody>
</table>

**LOCKING MECHANISM**

The Series PEC Clamp incorporates a cam/roller locking mechanism that prevents the arm from opening if air pressure is lost. The lock works in a range of 6 degrees from the fully closed position.

To manually unlock the clamp, first remove air pressure, then insert a small screwdriver or hex wrench (approximately 4 mm) through the slit in the lock release cover. Press down firmly and move the cam approximately one inch to get it out of the locking area. The lock release cover is made of a durable urethane material that will reclose and form a dust cover once the screwdriver or hex wrench is removed.

**SPECIFICATIONS**

<table>
<thead>
<tr>
<th>MODEL SIZE</th>
<th>BORE</th>
<th>CLAMP TORQUE</th>
<th>MAX. HOLDING TORQUE</th>
<th>CLOSE OR OPEN TIME</th>
<th>DISPLACEMENT</th>
<th>WEIGHT</th>
<th>TYPICAL BACKLASH</th>
<th>MIN. VALVE RATING</th>
</tr>
</thead>
<tbody>
<tr>
<td>PEC22</td>
<td>25</td>
<td>125</td>
<td>87 psi [6 bar] in-lb Nm</td>
<td>663 75</td>
<td>0.6</td>
<td>1.53</td>
<td>18.3</td>
<td>1° ± .5°</td>
</tr>
<tr>
<td>PEC23</td>
<td>32</td>
<td>205</td>
<td>87 psi [6 bar] in-lb Nm</td>
<td>663 75</td>
<td>0.6</td>
<td>2.51</td>
<td>35.4</td>
<td>1° ± .5°</td>
</tr>
<tr>
<td>PEC33</td>
<td>32</td>
<td>250</td>
<td>40 psi min. - 100 psi max. in-lb Nm</td>
<td>1593 180</td>
<td>0.6</td>
<td>3.22</td>
<td>39.5</td>
<td>1° ± .5°</td>
</tr>
<tr>
<td>PEC34</td>
<td>40</td>
<td>400</td>
<td>40 psi min. - 100 psi max. in-lb Nm</td>
<td>1593 180</td>
<td>0.6</td>
<td>5.03</td>
<td>69.2</td>
<td>1° ± .5°</td>
</tr>
<tr>
<td>PEC44</td>
<td>40</td>
<td>570</td>
<td>40 psi min. - 100 psi max. in-lb Nm</td>
<td>3363 380</td>
<td>0.6</td>
<td>6.32</td>
<td>87.0</td>
<td>1° ± .5°</td>
</tr>
<tr>
<td>PEC45</td>
<td>50</td>
<td>900</td>
<td>40 psi min. - 100 psi max. in-lb Nm</td>
<td>3363 380</td>
<td>0.6</td>
<td>9.87</td>
<td>145.2</td>
<td>1° ± .5°</td>
</tr>
</tbody>
</table>

**MAXIMUM TOOLING WEIGHT**

Clamp force is clamp torque divided by the distance from clamp pivot.

Holding torque is the maximum external torque that can be applied against the arm without destroying the clamp once the clamp has entered the locking/high force region.

Maximum tooling weight is the recommended maximum additional weight at a given distance from the pivot that will provide reliability after millions of cycles.
CAM DESIGN: SERIES PEC CLAMPS

PHD's cam design maintains clamp force and locking range without the need for adjustable features. Toggle clamps require adjustable features or shims to maintain clamp force and locking feature.

CAM VS. TOGGLE COMPARISON

Example: PHD Cam vs. Toggle
Toggle clamp with 1200 in-lb [136 Nm] torque vs. PHD clamp with 900 in-lb [102 Nm] torque
Typical part variation = .04' [1 mm]
Clamp force required = 250 lb [1112 N]
Unit must stay locked during clamping
Distance from clamp pivot to hold down location = 3' [76 mm]
Force = Torque/Distance

<table>
<thead>
<tr>
<th>CLAMP ANGLE</th>
<th>PHD CAM</th>
<th>TYPICAL TOGGLE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>% OF FORCE</td>
<td>JAW IS LOCKED</td>
</tr>
<tr>
<td>0°</td>
<td>100%</td>
<td>Yes</td>
</tr>
<tr>
<td>.1°</td>
<td>100%</td>
<td>Yes</td>
</tr>
<tr>
<td>.6°</td>
<td>100%</td>
<td>Yes</td>
</tr>
<tr>
<td>1°</td>
<td>100%</td>
<td>Yes</td>
</tr>
<tr>
<td>2°</td>
<td>100%</td>
<td>Yes</td>
</tr>
<tr>
<td>4°</td>
<td>100%</td>
<td>Yes</td>
</tr>
<tr>
<td>6°</td>
<td>70%</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Shaded areas indicate values do not meet requirements for toggle designs.

CAM VS. TOGGLE COMPARISON

PEC45 VS. TOGGLE COMPARISON

PHD CAM LOCKS

TOGGLE LOCKS

PEC45
OPTIONS & KITS: SERIES PEC CLAMPS

Axxxx ARM OPTION

This option provides a clamping arm at multiple locations and orientations in both standard and blank mounting configurations. Consult PHD for alternative arm designs.

<table>
<thead>
<tr>
<th>SHAPE/LOCATION</th>
<th>ORIENTATION</th>
<th>MOUNTING STYLE</th>
</tr>
</thead>
<tbody>
<tr>
<td>D - Straight, Both Sides</td>
<td>0 - 0° Clamp</td>
<td>00 - Blank</td>
</tr>
<tr>
<td>L - Straight, Left</td>
<td>9 - 90° Clamp</td>
<td>01 - Standard Mounting</td>
</tr>
<tr>
<td>R - Straight, Right</td>
<td></td>
<td></td>
</tr>
<tr>
<td>U - U-Style, Centered</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

ARM OPTIONS - SHAPE/LOCATION

- **Double**: AD001
- **Right**: AR001
- **Left**: AL001
- **Centered**: AU001

ARM OPTIONS - ORIENTATION

- **Ax0xx - 0°**: Open/Unclamped
- **Ax9xx - 90°**: Closed/Clamped

CAUTION:
Clamps with U-Style arms in the 90° clamp position (AU9xx) and positional sensors require units to have no more than 96° rotation to prevent damage to unit.

AUxxx
OPTIONS & KITS: SERIES PEC CLAMPS

ARxxx

models + kit options

AUxxx

models + kit options

Kits include arm, arm clamp, and screws.

NOTE:
DIMENSIONS A4 THROUGH A10 NOT AVAILABLE WITH Axx00 OPTION

ARxxx

models + kit options

AUxxx

models + kit options

Kits include arm, arm clamp, and screws.

NOTE:
DIMENSIONS A4 THROUGH A10 NOT AVAILABLE WITH Axx00 OPTION

Must be ordered as: PECxxD-x-96

ARM KITS

KITS INCLUDE ARM, ARM CLAMP AND SCREWS

ARM KITS

KITS INCLUDE ARM, ARM CLAMP AND SCREWS

All dimensions are reference only unless specifically tolerated.
OPTIONS & KITS: SERIES PEC CLAMPS

M001 FLANGE MOUNTING CYLINDER BODY

This option provides an integrated flange mount to the bottom of the clamp to simplify mounting. This option is only available on PEC34 units. Consult PHD for alternative mounting options.

M002 FLANGE MOUNTING PLATE

This option provides a bolt-on mount to the bottom of the clamp to simplify mounting. This option is only available on PEC23 and PEC45 units. Consult PHD for alternative mounting options.

<table>
<thead>
<tr>
<th>LETTER</th>
<th>MODEL NUMBER</th>
</tr>
</thead>
<tbody>
<tr>
<td>DIM</td>
<td>PEC34 in</td>
</tr>
<tr>
<td>B2</td>
<td>6.889 175</td>
</tr>
<tr>
<td>B12</td>
<td>1.890 48</td>
</tr>
<tr>
<td>B14</td>
<td>2.362 60</td>
</tr>
<tr>
<td>B17</td>
<td>.492 12</td>
</tr>
<tr>
<td>B18</td>
<td>.551 14</td>
</tr>
<tr>
<td>B19</td>
<td>2.992 76</td>
</tr>
<tr>
<td>B20</td>
<td>2.441 62</td>
</tr>
<tr>
<td>B21</td>
<td>1.772 45</td>
</tr>
<tr>
<td>B22</td>
<td>.268 6.8</td>
</tr>
<tr>
<td>B23</td>
<td>1.795 45.6</td>
</tr>
<tr>
<td>B24</td>
<td>.023 .6</td>
</tr>
</tbody>
</table>

All dimensions are reference only unless specifically tolerated.
**OPTIONS & KITS: SERIES PEC CLAMPS**

**Px PORT LOCATION**
This option specifies alternate port locations for the cylinder providing flexibility and customer convenience.

**Lxx PORT FITTINGS**
LAA (metal) or LBB (plastic) option provides 90° swivel fittings for ease of air line hook up.

**V4 SEAL OPTION**
This option provides polyurethane piston seals for longer life in harsh environment applications. This option does not allow the use of magnets in the cylinder and therefore is not compatible with SWxx switch options.

---

**NOTES:**
1) NUMBERS ENCLOSED IN HEX INDICATE PORT POSITION
2) POSITIONS 2 AND 4 ARE ONLY AVAILABLE ON PEC22, PEC33, AND PEC44 UNITS

**Lxx PORT FITTINGS**

<table>
<thead>
<tr>
<th>LETTER DIM</th>
<th>MODEL NUMBER</th>
</tr>
</thead>
<tbody>
<tr>
<td>P1 in</td>
<td>PECxx mm</td>
</tr>
<tr>
<td>PF1</td>
<td>.629</td>
</tr>
<tr>
<td>PF2</td>
<td>.885</td>
</tr>
<tr>
<td>PF3</td>
<td>.472</td>
</tr>
</tbody>
</table>

**OPTION CODE | PART NUMBER**

<table>
<thead>
<tr>
<th>OPTION</th>
<th>IMPERIAL</th>
<th>METRIC</th>
</tr>
</thead>
<tbody>
<tr>
<td>LAA</td>
<td>62178-003</td>
<td>62195-005</td>
</tr>
<tr>
<td>LBB</td>
<td>71120-001</td>
<td>71121-001</td>
</tr>
</tbody>
</table>

---

All dimensions are reference only unless specifically tolerated.

(800) 624-8511
www.phdinc.com/pec
SWITCH OPTION: SERIES PEC CLAMPS

**PSxxx**

STANDARD POSITION SENSING

**PRxxx**

REVERSED POSITION SENSING

This option provides arm open and arm closed sensing by affixing an aluminum housing to the back of the clamp body. The adjustable switches sense the position of a target on the cam as the clamp opens and closes. PS positions satellite switch S02/S2 to sense open and S01/S1 to sense close. PR positions the satellite switch S01/S1 to sense open and S02/S2 to sense close. See tables and diagrams for satellite switch to quick disconnect pin number relationships.

**PS1D9**

**CONNECTOR POSITION**

1 - Parallel to output shaft
9 - Perpendicular to output shaft

- **SENSING OPTION**
  - S - Standard
  - R - Reversed

- **SWITCH HOUSING POSITION**
  - 1 - Position 1

*NOTE: Connector position 9 is not available with switch option A*

**SWITCH OPTION**

- N - No Switch
- A - 5-pin AC/DC Switch
- D - 4-pin PNP DC Switch (P + F)
- E - 4-pin PNP DC Switch (Turck)
- F - 4-pin PNP DC Switch (Efectror)
- H - 4-pin NPN DC Switch (P + F)
- J - 4-pin NPN DC Switch (Turck)

**CONNECTOR POSITION**

1 - Parallel to output shaft
9 - Perpendicular to output shaft

Includes switch housing and mounting hardware

**MATCHING CORDSETS 2 METERS LONG**

<table>
<thead>
<tr>
<th>SWITCH OPTION</th>
<th>PHD PART NUMBER</th>
<th>CORDSET PART NUMBER</th>
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</thead>
<tbody>
<tr>
<td>A</td>
<td>73317-00-02</td>
<td>KB 5T-2</td>
</tr>
<tr>
<td>D</td>
<td>65440-001-02</td>
<td>V1-G-YE2M-PVC</td>
</tr>
<tr>
<td>E</td>
<td>78039-00-02</td>
<td>RK 4.4T-2</td>
</tr>
<tr>
<td>F</td>
<td>65440-001-02</td>
<td>V1-G-YE2M-PVC</td>
</tr>
<tr>
<td>H</td>
<td>78039-00-02</td>
<td>RK 4.4T-2</td>
</tr>
<tr>
<td>J</td>
<td>65440-001-02</td>
<td>V1-G-YE2M-PVC</td>
</tr>
</tbody>
</table>

**CLOSED SENSOR**

<table>
<thead>
<tr>
<th>CLAMP</th>
<th>SWITCH SENSOR</th>
<th>SWITCH LOCATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>CLOSED</td>
<td>PS1xx S02/2</td>
<td>S01</td>
</tr>
<tr>
<td>CLOSED</td>
<td>PS1xx S01/1</td>
<td>S02</td>
</tr>
</tbody>
</table>

**OPEN SENSOR**

<table>
<thead>
<tr>
<th>CLAMP</th>
<th>SWITCH SENSOR</th>
<th>SWITCH LOCATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>CLOSED</td>
<td>PS1xx S02/2</td>
<td>S01</td>
</tr>
<tr>
<td>CLOSED</td>
<td>PS1xx S01/1</td>
<td>S02</td>
</tr>
</tbody>
</table>

**CABLE GROOVE GEOMETRY NOT SHOWN FOR CLARITY**

**POSITIONAL SENSOR MOUNTING**

<table>
<thead>
<tr>
<th>MODEL</th>
<th>KIT NO.</th>
</tr>
</thead>
<tbody>
<tr>
<td>PEC2x</td>
<td>80575</td>
</tr>
<tr>
<td>PEC3x</td>
<td>80575</td>
</tr>
<tr>
<td>PEC4x</td>
<td>80576</td>
</tr>
</tbody>
</table>

Includes switch housing and mounting hardware

All dimensions are reference only unless specifically tolerated.

(800) 624-8511  www.phdinc.com/pec  PEC02A
**SWITCH OPTION: SERIES PEC CLAMPS**

**SWITCH OPTION A** 71483-002-PEC  
Turck Part #: Ni 2-Q.6.5-ADZ32-0.16-FSB 5.4X4/S304

**SWITCH OPTION D** 71483-001-PEC  
**P + F Part #: NBN2-F581-160S6-E8-V1**  
(NPN)

**SWITCH OPTION E** 71483-003-PEC  
**Turck Part #: Ni 2-Q.6.5-0.16-BDS-2AP6X3-H1141/S34**  
(PNP)

**SWITCH OPTION F** 71483-004-PEC  
**Efector Part #: IN 5375**  
(PNP)

---

All dimensions are reference only unless specifically tolerated.

(800) 624-8511  
www.phdinc.com/pec
SWITCH OPTION: SERIES PEC CLAMPS

PEC02A

14

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SWITCH SLOT LOCATIONS

SWITCHES INSTALLED ON THIS SIDE

PEC22, PEC33, PEC44

PEC34

63549-xx CORDSET WITH FEMALE QUICK CONNECT

MODEL NO. LETTER DIM. A
63549-02 78.74 [2 m]
63549-05 196.85 [5 m]

PIN 2/4 WIRE COLOR BLACK
PIN 1 WIRE COLOR BROWN
PIN 3 WIRE COLOR BLUE
WIRE COLOR BLACK

dia. .042 [.102]

dia. .020 [.51]

dia. .072 [.183]

dia. .080 [.203]

NOTE: ALL NUMBERS IN [ ] ARE METRIC AND ARE IN mm
EXPLODED VIEW & PARTS LIST: SERIES PEC CLAMPS

*Consult PHD for cylinder assembly replacement part numbers

<table>
<thead>
<tr>
<th>KEY</th>
<th>DESCRIPTION</th>
<th>PEC22/PEC23</th>
<th>PEC33/PEC34</th>
<th>PEC44/PEC45</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Right Body</td>
<td>80509-3-1</td>
<td>78595-1-1</td>
<td>80534-1-1</td>
</tr>
<tr>
<td>2</td>
<td>Left Body</td>
<td>80510-3-1</td>
<td>78596-1-1</td>
<td>80535-1-1</td>
</tr>
<tr>
<td>3</td>
<td>Pinion Assembly</td>
<td>PEC3xO - Double</td>
<td>80511</td>
<td>78597</td>
</tr>
<tr>
<td></td>
<td></td>
<td>PEC3xL - Left</td>
<td>80512</td>
<td>78598</td>
</tr>
<tr>
<td></td>
<td></td>
<td>PEC3xR - Right</td>
<td>80513</td>
<td>78599</td>
</tr>
<tr>
<td>4</td>
<td>Cam</td>
<td>80514-03-1</td>
<td>78559-05-1</td>
<td>80539-03-1</td>
</tr>
<tr>
<td>5</td>
<td>Link</td>
<td>80515-01</td>
<td>78560-01</td>
<td>80540-01</td>
</tr>
<tr>
<td>6</td>
<td>Roller Bearing</td>
<td>80516</td>
<td>78561</td>
<td>80541</td>
</tr>
<tr>
<td>7</td>
<td>Switch Slot Cover</td>
<td>80517</td>
<td>80517</td>
<td>80542</td>
</tr>
<tr>
<td>9</td>
<td>Dowel Pin</td>
<td>17831-098</td>
<td>17831-106</td>
<td>17831-117</td>
</tr>
<tr>
<td>10</td>
<td>Dowel Pin</td>
<td>17831-049</td>
<td>17831-098</td>
<td>17831-098</td>
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<tr>
<td>11</td>
<td>Body Mounting Screws</td>
<td>59104-102</td>
<td>59104-102</td>
<td>59104-102</td>
</tr>
<tr>
<td>12</td>
<td>Switch Slot Cover Screw</td>
<td>59104-098</td>
<td>59104-098</td>
<td>59104-098</td>
</tr>
<tr>
<td>13</td>
<td>Lock Release Cover</td>
<td>78577</td>
<td>78577</td>
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</tr>
<tr>
<td>20</td>
<td>Cylinder Assembly</td>
<td>* 80521-xx-xx-xx-xxx</td>
<td>* 78601-xx-xx-xx-xxx</td>
<td>* 80546-xx-xx-xx-xxx</td>
</tr>
<tr>
<td>35</td>
<td>Cylinder Mounting Screws</td>
<td>74675-728</td>
<td>74675-729</td>
<td>74675-730</td>
</tr>
</tbody>
</table>

*Consult PHD for cylinder assembly replacement part numbers

NOTES:
1) Cylinder repair kits include all seals, retaining rings, and shock pads required to rebuild cylinder. Consult PHD for piston rod, bushing and bore plug replacements.
2) Position sensor mounting kit includes switch housing and mounting hardware.