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

Patent Pending
SERIES PEC CLAMPS

**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

---

**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.

**PATENT PENDING**

Our cam design sets us apart from typical toggles

see page 7 for more info!

**Declared Design**

enclosed design prevents particles and weld slag from entering

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

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

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

**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

**Our cam design sets us apart from typical toggles**

see page 7 for more info!
DIMENSIONS: SERIES PEC CLAMPS

PEC2x
Note: PEC22D dimensioned

PEC3x
Note: PEC33D dimensioned

All dimensions are reference only unless specifically tolerated.
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</td>
</tr>
<tr>
<td>B13</td>
<td>1.102</td>
</tr>
<tr>
<td>B14</td>
<td>2.680</td>
</tr>
<tr>
<td>B15</td>
<td>6.10</td>
</tr>
<tr>
<td>P2</td>
<td>4.311</td>
</tr>
<tr>
<td>P3</td>
<td>3.839</td>
</tr>
<tr>
<td>P4</td>
<td>.748</td>
</tr>
</tbody>
</table>

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

SPECIFICATIONS

<table>
<thead>
<tr>
<th>MODEL SIZE</th>
<th>CLAMP SIZE mm</th>
<th>CLAMP TORQUE 87 psi [6 bar] in-lb Nm</th>
<th>MAX. HOLDING TORQUE in-lb Nm</th>
<th>CLOSE OR OPEN TIME sec</th>
<th>DISPLACEMENT</th>
<th>WEIGHT lb kg</th>
<th>TYPICAL BACKLASH</th>
<th>MIN. VALVE RATING Cv</th>
</tr>
</thead>
<tbody>
<tr>
<td>PEC22</td>
<td>25</td>
<td>125 14</td>
<td>663 75</td>
<td>0.6</td>
<td>1.53 25.1 1.18</td>
<td>2.0 0.91</td>
<td>1° ± 0.5°</td>
<td>0.04</td>
</tr>
<tr>
<td>PEC23</td>
<td>32</td>
<td>205 23</td>
<td>663 75</td>
<td>0.6</td>
<td>2.51 41.1 2.16</td>
<td>2.1 0.95</td>
<td>1° ± 0.5°</td>
<td>0.06</td>
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<tr>
<td>PEC33</td>
<td>32</td>
<td>250 28</td>
<td>1593 180</td>
<td>0.6</td>
<td>3.22 52.8 2.41</td>
<td>3.2 1.45</td>
<td>1° ± 0.5°</td>
<td>0.08</td>
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<tr>
<td>PEC34</td>
<td>40</td>
<td>400 45</td>
<td>1593 180</td>
<td>0.6</td>
<td>5.03 82.4 4.22</td>
<td>3.5 1.59</td>
<td>1° ± 0.5°</td>
<td>0.13</td>
</tr>
<tr>
<td>PEC44</td>
<td>40</td>
<td>570 64</td>
<td>3363 380</td>
<td>0.6</td>
<td>6.32 103.6 5.31</td>
<td>4.9 2.22</td>
<td>1° ± 0.5°</td>
<td>0.16</td>
</tr>
<tr>
<td>PEC45</td>
<td>50</td>
<td>900 102</td>
<td>3363 380</td>
<td>0.6</td>
<td>9.87 161.7 8.86</td>
<td>5.4 2.45</td>
<td>1° ± 0.5°</td>
<td>0.25</td>
</tr>
</tbody>
</table>

**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.

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.

**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.
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.
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.

---

**ARM OPTIONS - SHAPE/LOCATION**

<table>
<thead>
<tr>
<th>SHAPE/LOCATION</th>
<th>Double</th>
<th>Right</th>
<th>Left</th>
<th>Centered</th>
</tr>
</thead>
<tbody>
<tr>
<td>AD001</td>
<td>AR001</td>
<td>AL001</td>
<td>AU001</td>
<td></td>
</tr>
</tbody>
</table>

**ARM OPTIONS - ORIENTATION**

- Open/Unclamped
- 90° Closed/Clamped

<table>
<thead>
<tr>
<th>ORIENTATION</th>
<th>Ax0xx - 0°</th>
<th>Ax9xx - 90°</th>
</tr>
</thead>
</table>

---

**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.

---

**DO!**

**DON'T!**
OPTIONS & KITS: SERIES PEC CLAMPS

ARxxx

2X Ø A9
2X A10 DOWEL HOLE
2X A11 SHCS
A12 HEX
A13 TORQUE

Blank Arm Kits

Standard Arm Kits

AUxxx

2X Ø A9
2X A10 DOWEL HOLE
2X A11 SHCS
A12 HEX
A13 TORQUE

Blank U-Style Kit

Standard U-Style Kit

NOTE:
DIMENSIONS A4 THROUGH A10 NOT AVAILABLE WITH Axx00 OPTION

**ARM KITS**

<table>
<thead>
<tr>
<th>MODEL</th>
<th>ARM, STRAIGHT BLANK (-Axx00)</th>
<th>ARM, STRAIGHT STD (-Axx01)</th>
</tr>
</thead>
<tbody>
<tr>
<td>PEC2x</td>
<td>80569-00 80569-01</td>
<td>78600-00 78600-01</td>
</tr>
<tr>
<td>PEC3x</td>
<td>78585-00 78585-01</td>
<td>80570-00 80570-01</td>
</tr>
</tbody>
</table>

KITS INCLUDE ARM, ARM CLAMP AND SCREWS

Must be ordered as: **PECxxD-x-96**

**OPTIONS & KITS: SERIES PEC CLAMPS**

2X Ø A9
2X A10 DOWEL HOLE
2X A11 SHCS
A12 HEX
A13 TORQUE

Blank Arm Kits

Standard Arm Kits

NOTE:
DIMENSIONS A4 THROUGH A10 NOT AVAILABLE WITH Axx00 OPTION

**ARM KITS**

<table>
<thead>
<tr>
<th>MODEL</th>
<th>ARM, U-STYLE BLANK (-AUx00)</th>
<th>ARM, U-STYLE STD (-AUx01)</th>
<th>96° ROTATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>PEC2x</td>
<td>80569-02 80569-03</td>
<td>78600-01 78600-02</td>
<td>985-03</td>
</tr>
<tr>
<td>PEC3x</td>
<td>78585-02 78585-03</td>
<td>80570-02 80570-03</td>
<td>985-03</td>
</tr>
</tbody>
</table>

ARM KITS INCLUDE ARM, ARM CLAMP AND SCREWS. ROTATION KITS ADD PARTS TO PISTON AND REQUIRE SOME DISASSEMBLY.
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.

**LETTER DIM** | **MODEL NUMBER**
--- | ---
**PEC34** | **PEC23 in mm**
B2 | 6.899 175
B12 | 1.890 48
B14 | 2.362 60
B17 | .492 12
B18 | .551 14
B19 | 2.992 76
B20 | 2.441 62
B21 | 1.772 45
B22 | .268 6.8
B23 | 1.795 45.6
B24 | .023 .6

**LETTER DIM** | **MODEL NUMBER**
--- | ---
**PEC23 in mm**
B2 | 6.960 176
B12 | 1.863 48
B14 | 2.345 60
B17 | .475 12
B18 | .535 14
B19 | 2.925 76
B20 | 2.375 62
B21 | 1.725 45
B22 | .266 6.8
B23 | 1.790 45.4
B24 | .023 .6

**LETTER DIM** | **MODEL NUMBER**
--- | ---
**PEC45 in mm**
B2 | 9.292 236
B12 | 2.383 58
B14 | 2.750 70
B17 | 1.169 18
B18 | .609 15
B19 | 3.500 89
B20 | 2.953 75
B21 | 1.890 48
B22 | 346 8.8
B23 | 2.108 53.5
B24 | 216 5.5

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.

**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

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.

All dimensions are reference only unless specifically tolerated.
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.

**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>80567</td>
</tr>
</tbody>
</table>

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>
</tr>
</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>

**CABLE GROOVE GEOMETRY NOT SHOWN FOR CLARITY**

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.

Italicized indicates default positions.
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

<table>
<thead>
<tr>
<th>OPTION CODE</th>
<th>SATELLITE UNCLAMPED</th>
<th>CLAMPED QUICK DISCONNECT</th>
</tr>
</thead>
<tbody>
<tr>
<td>PRxAx</td>
<td>S01</td>
<td>S02</td>
</tr>
<tr>
<td>PSvAx</td>
<td>S01</td>
<td>S02</td>
</tr>
</tbody>
</table>

4-WIRE AC/DC

SENSOR S01

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

<table>
<thead>
<tr>
<th>OPTION CODE</th>
<th>SATELLITE UNCLAMPED</th>
<th>CLAMPED QUICK DISCONNECT</th>
</tr>
</thead>
<tbody>
<tr>
<td>PSsDx</td>
<td>S2</td>
<td>S1</td>
</tr>
<tr>
<td>PRsDx</td>
<td>S1</td>
<td>S2</td>
</tr>
</tbody>
</table>

4-WIRE DC (V1 TYPE)

Senator S1

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

<table>
<thead>
<tr>
<th>OPTION CODE</th>
<th>SATELLITE UNCLAMPED</th>
<th>CLAMPED QUICK DISCONNECT</th>
</tr>
</thead>
<tbody>
<tr>
<td>PSsEx</td>
<td>S01</td>
<td>S02</td>
</tr>
<tr>
<td>PRsEx</td>
<td>S01</td>
<td>S02</td>
</tr>
</tbody>
</table>

4-WIRE DC (V1 TYPE)

Senator S1

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

<table>
<thead>
<tr>
<th>OPTION CODE</th>
<th>SATELLITE UNCLAMPED</th>
<th>CLAMPED QUICK DISCONNECT</th>
</tr>
</thead>
<tbody>
<tr>
<td>PSsFx</td>
<td>S2</td>
<td>S1</td>
</tr>
<tr>
<td>PRsFx</td>
<td>S1</td>
<td>S2</td>
</tr>
</tbody>
</table>

4-WIRE DC

Senator S1

All dimensions are reference only unless specifically tolerated.
SWITCH OPTION: SERIES PEC CLAMPS

SWITCH SLOT LOCATIONS

PEC22, PEC33, PEC44

PEC34

63549-xx CORDSET WITH FEMALE QUICK CONNECT

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

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

<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>80509-1-1</td>
<td>78595-1-1</td>
<td>80534-1-1</td>
</tr>
<tr>
<td>2</td>
<td>Left Body</td>
<td>80510-1-1</td>
<td>78596-1-1</td>
<td>80535-1-1</td>
</tr>
<tr>
<td>3</td>
<td>Pinion Assembly PECxoxD - Double PECxoxL - Left PECxoxR - Right</td>
<td>80511</td>
<td>78597</td>
<td>80536</td>
</tr>
<tr>
<td>4</td>
<td>Cam</td>
<td>80514-03-1</td>
<td>78599-00-1</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>8</td>
<td>Dowel Pin Roller-Link-Cam</td>
<td>17831-098</td>
<td>17831-106</td>
<td>17831-117</td>
</tr>
<tr>
<td>9</td>
<td>Dowel Pin Piston Rod-Cam</td>
<td>17831-049</td>
<td>17831-098</td>
<td>17831-098</td>
</tr>
<tr>
<td>10</td>
<td>Body Mounting Screws</td>
<td>59104-102</td>
<td>59104-102</td>
<td>59104-102</td>
</tr>
<tr>
<td>11</td>
<td>Switch Slot Cover</td>
<td>59104-098</td>
<td>59104-098</td>
<td>59104-098</td>
</tr>
<tr>
<td>12</td>
<td>Lock Release Cover</td>
<td>78577</td>
<td>78577</td>
<td>78577</td>
</tr>
<tr>
<td>20</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.