

PennEngineering®

BLIND SELF-CLINCHING FASTENERS



The catalogue



SELF-CLINCHING BLIND FASTENERS

PEM® brand self-clinching blind fasteners provide permanently mounted blind threads in metal sheets as thin as .040" / 1 mm.

- Provides barrier to protect threads against foreign matter.
- Protects circuits from intrusion of extra long screws.

PEM blind fasteners employ the proved PEM self-clinching design and are easily installed in properly sized holes. Shanks of PEM fasteners act as their own pilots. PEM blind fasteners can be installed with any standard press applying squeezing forces between parallel surfaces. Installation is inexpensive and requires no previous skills or experience.

PEM self-clinching blind fasteners are available in thread sizes from #4-40 through 1/4-20 / M3 through M6 in carbon or stainless steel.

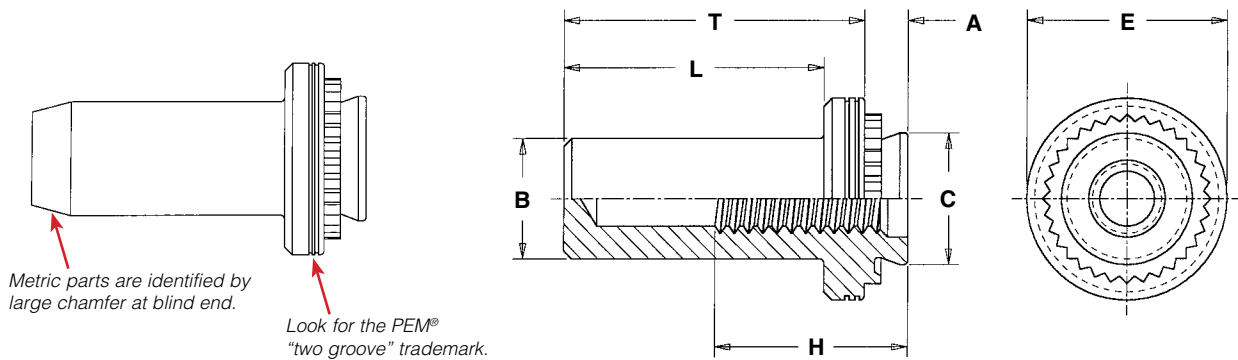


PART NUMBER DESIGNATION

| | | | | | | |
|--------------------|---|----------|---------------------|----------|---|---|
| B | S | - | 832 | - | 2 | ZI |
| ↓ | ↓ | | ↓ | | ↓ | ↓ |
| Type: Blind Nut | Fastener Material Code: S = Stainless steel None = Heat-treated carbon steel | | Thread Size Code | | Shank Code For Min. Sheet Thickness | Finish Code: ZI on steel nuts. None on stainless steel nuts. |



DIMENSIONAL DATA



All dimensions are in inches.

| UNIFIED | Thread Size | Type | | Thread Code | Shank Code | A (Shank) Max. | Min. Sheet Thickness | Hole Size in Sheet + .003 - .000 | Barrel Diameter B Max. | Shank Diameter C Max. | E ± .010 | Min. Depth Full Threads H | L Max. | T ± .010 | Min. Dist. Hole C/L to Edge |
|------------------|------------------|-------------------|-----------------|-------------|------------|----------------|----------------------|----------------------------------|------------------------|-----------------------|----------|---------------------------|--------|----------|-----------------------------|
| | | Fastener Material | | | | | | | | | | | | | |
| | | Steel | Stainless Steel | | | | | | | | | | | | |
| | .112-40 (#4-40) | B | BS | 440 | 1 | .040 | .040 | .166 | .150 | .165 | .250 | .210 | .335 | .380 | .19 |
| | | | | | 2 | .056 | .056 | | | | | | | | |
| | .138-32 (#6-32) | B | BS | 632 | 1 | .040 | .040 | .1875 | .169 | .187 | .280 | .230 | .335 | .380 | .22 |
| | | | | | 2 | .056 | .056 | | | | | | | | |
| | .164-32 (#8-32) | B | BS | 832 | 1 | .040 | .040 | .213 | .204 | .212 | .310 | .280 | .385 | .440 | .27 |
| | | | | | 2 | .056 | .056 | | | | | | | | |
| | .190-32 (#10-32) | B | BS | 032 | 1 | .040 | .040 | .250 | .235 | .249 | .340 | .280 | .385 | .440 | .28 |
| 2 | | | | | .056 | .056 | | | | | | | | | |
| .250-20 (1/4-20) | B | BS | 0420 | 1 | .056 | .056 | .344 | .305 | .343 | .430 | .310 | .500 | .560 | .34 | |
| | | | | 2 | .090 | .090 | | | | | | | | | |

All dimensions are in millimeters.

| METRIC | Thread Size x Pitch | Type | | Thread Code | Shank Code | A (Shank) Max. | Min. Sheet Thickness | Hole Size in Sheet + 0.08 | Barrel Diameter B Max. | Shank Diameter C Max. | E ± 0.25 | Min. Depth Full Threads H | L Max. | T ± 0.25 | Min. Dist. Hole C/L to Edge |
|--------|---------------------|-------------------|-----------------|-------------|------------|----------------|----------------------|---------------------------|------------------------|-----------------------|----------|---------------------------|--------|----------|-----------------------------|
| | | Fastener Material | | | | | | | | | | | | | |
| | | Steel | Stainless Steel | | | | | | | | | | | | |
| | M3 x 0.5 | B | BS | M3 | 1 | 1 | 1 | 4.25 | 3.84 | 4.22 | 6.35 | 5.3 | 8.5 | 9.6 | 4.8 |
| | | | | | 2 | 1.4 | 1.4 | | | | | | | | |
| | M4 x 0.7 | B | BS | M4 | 1 | 1 | 1 | 5.4 | 5.2 | 5.38 | 7.95 | 7.1 | 9.8 | 11.2 | 6.9 |
| | | | | | 2 | 1.4 | 1.4 | | | | | | | | |
| | M5 x 0.8 | B | BS | M5 | 1 | 1 | 1 | 6.4 | 6.02 | 6.38 | 8.75 | 7.1 | 9.8 | 11.2 | 7.1 |
| | | | | | 2 | 1.4 | 1.4 | | | | | | | | |
| | M6 x 1 | B | BS | M6 | 1 | 1.4 | 1.4 | 8.75 | 7.8 | 8.72 | 11.1 | 7.8 | 12.7 | 14.3 | 8.6 |
| 2 | | | | | 2.3 | 2.3 | | | | | | | | | |

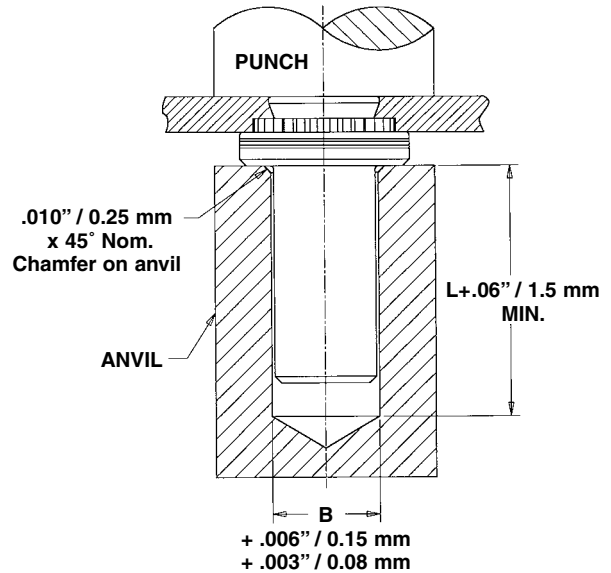
MATERIAL AND FINISH SPECIFICATIONS

| | Threads | Fastener Materials | | Standard Finishes | | For Use in Sheet Hardness: (1) | |
|-------------------------------|--|---------------------------|----------------------------|--|--|--------------------------------|-------------------------|
| Type | Internal, ANSI B1.1, 2B / ANSI / ASME B1.13M, 6H | Heat-Treated Carbon Steel | 300 Series Stainless Steel | Passivated and/or Tested Per ASTM A380 | Zinc Per ASTM B 633 SC1 (5µm), Type III, Colorless | HRB 80 / HB 150 or less | HRB 70 / HB 125 or less |
| B | • | • | | | • | • | |
| BS | • | | • | • | | | • |
| Part Number Code For Finishes | | | | None | ZI | | |

(1) HRB - Hardness Rockwell "B" Scale. HB - Hardness Brinell.

INSTALLATION

1. Prepare properly sized mounting hole in the sheet. Do not perform any secondary operations such as deburring.
2. Place the barrel of the fastener into the anvil hole and place the mounting hole over the shank of the fastener.
3. With the punch and anvil surfaces parallel, apply squeezing force until the flange contacts the mounting sheet. Examples of installation forces are shown below. The sketch at the right indicates suggested tooling for applying these forces.



PEMSERTER® PRESSES

For best results we recommend using a PEMSERTER® press for installation of PEM Type B and BS fasteners. For more information on our line of presses call 1-800-523-5321 or check our web site.

PERFORMANCE DATA⁽¹⁾

| UNIFIED | Thread Code | Shank Code | Sheet Thickness (in.) | Test Sheet Material | | | | | |
|---------|-------------|------------|-----------------------|---------------------|----------------|-----------------------|---------------------|----------------|-----------------------|
| | | | | 5052-H34 Aluminum | | | Cold-Rolled Steel | | |
| | | | | Installation (lbs.) | Pushout (lbs.) | Torque-out (in. lbs.) | Installation (lbs.) | Pushout (lbs.) | Torque-out (in. lbs.) |
| | | | | | | | | | |
| | 440 | 1 | .040 | 1600 | 90 | 10 | 2500 | 125 | 13 |
| | | 2 | .056 | 2000 | 170 | 13 | 3500 | 230 | 18 |
| | 632 | 1 | .040 | 1800 | 95 | 17 | 3000 | 130 | 18 |
| | | 2 | .056 | 2800 | 190 | 22 | 4000 | 260 | 28 |
| | 832 | 1 | .040 | 2000 | 105 | 23 | 3500 | 135 | 30 |
| | | 2 | .056 | 3000 | 220 | 35 | 5000 | 285 | 45 |
| | 032 | 1 | .040 | 2100 | 110 | 32 | 4000 | 140 | 35 |
| | | 2 | .056 | 3500 | 190 | 50 | 5000 | 250 | 60 |
| | 0420 | 1 | .056 | 4000 | 315 | 90 | 6000 | 400 | 105 |
| | | 2 | .090 | | | | | | |

| METRIC | Thread Code | Shank Code | Sheet Thickness (mm) | Test Sheet Material | | | | | |
|--------|-------------|------------|----------------------|---------------------|-------------|------------------|-------------------|-------------|------------------|
| | | | | 5052-H34 Aluminum | | | Cold-Rolled Steel | | |
| | | | | Installation (kN) | Pushout (N) | Torque-out (N•m) | Installation (kN) | Pushout (N) | Torque-out (N•m) |
| | | | | | | | | | |
| | M3 | 1 | 1 | 7.1 | 400 | 1.15 | 11.1 | 550 | 1.5 |
| | | 2 | 1.4 | 9 | 750 | 1.47 | 14 | 1010 | 2.05 |
| | M4 | 1 | 1 | 8.9 | 470 | 2.6 | 15.6 | 600 | 3.4 |
| | | 2 | 1.4 | 12.5 | 970 | 4 | 20 | 1250 | 5.1 |
| | M5 | 1 | 1 | 9.3 | 480 | 3.6 | 17.8 | 620 | 4 |
| | | 2 | 1.4 | 14 | 845 | 5.7 | 25 | 1112 | 6.8 |
| | M6 | 1 | 1.4 | 17.8 | 1400 | 10.2 | 25.7 | 1760 | 11.9 |
| | | 2 | 2.3 | | | | | | |

(1) The values reported are averages when all installation specifications and procedures are followed. Variations in mounting hole size, sheet material and installation procedure will affect this data. Performance testing of this product in your application is recommended. We will be happy to provide samples for this purpose.

RoHS compliance information can be found on our website.

Specifications subject to change without notice.
Check our website for the most current version of this bulletin.

PennEngineering®



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Visit our PEMNET™ Resource Center at www.pemnet.com

CAGE-46384



RIGHT ANGLE

CLINCH

FASTENERS

BULLETIN

The *edge* you've been waiting for™



RA 1005

Revised 606

PEM® R'ANGLE® RIGHT ANGLE CLINCH FASTENER – TYPES RAA™ AND RAS™

Self-clinching PEM® R'ANGLE® fasteners provide you with strong right angle attachment points in sheets as thin as .040" / 1 mm.

R'ANGLE fasteners are cost-effective replacements for:

- *bent edge tabs*
- *bent center tabs*
- *bent flanges*
- *angle brackets*
- *tack welds*
- *loose hardware*

Simply press this fastener into a properly sized rectangular mounting hole. It is held permanently in the sheet or panel using the same high-performance, self-clinching technology that our products have employed since 1942.

Now you can securely attach another sheet or component perpendicular to the sheet in which the R'ANGLE fastener is installed. For Type RAA, attachment is easily made using thread forming screws resulting in a thread fit which resists vibration and has excellent torque resistance.* Type RAS fasteners are threaded and attachment is simply made using a standard screw. For either type, the holding power of the fastener is unaffected by the repeated removal and reinstallation of the screw.

PEM® R'ANGLE fasteners provide many advantages over bent tabs and flanges, including:

- *more predictable designs*
- *material savings*
- *tighter design control*
- *improved shielding characteristics*
- *reduction of loose hardware*
- *fewer assembly steps*
- *unmarred panel surfaces*

* As thread forming screws do not generate metal residue, they are widely used in electrical and electronic assemblies.



Type RAA (Aluminum) For
Thread-forming Screws

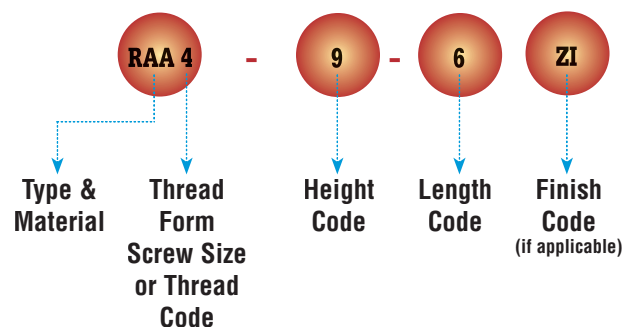
Patented



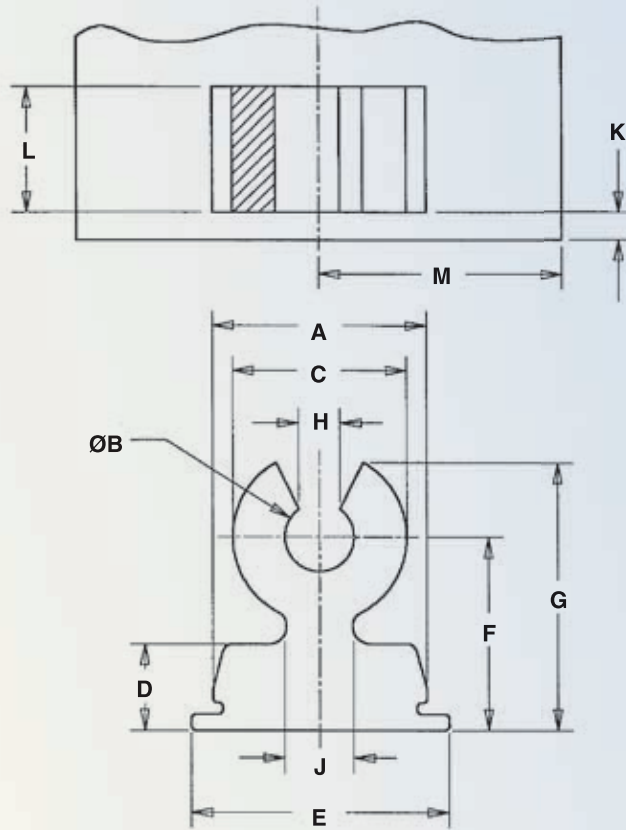
Type RAS (Steel)
Threaded



Part Number Designation



TYPE RAA - ALUMINUM SELF-TAPPING RIGHT ANGLE FASTENER



Metric part can be identified by flat top



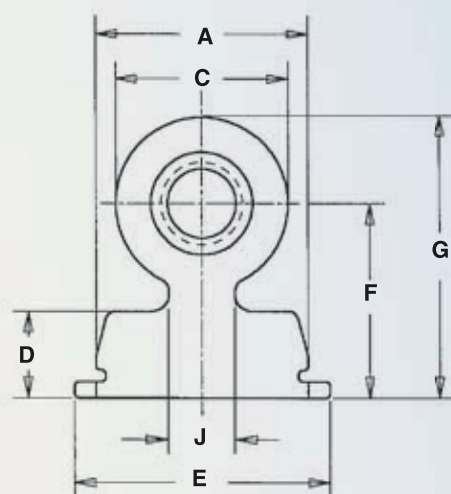
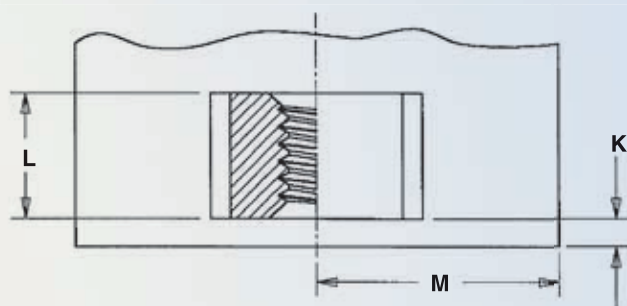
All dimensions are in inches.

| UNIFIED | Thread Form Screw Size | Type | Material | Screw Size Code | Height Code | Length Code | Length L $\pm .003$ | Min. Sheet Thickness | Hole Size In Sheet $+ .002$ $- .001$ | A $\pm .003$ | $\varnothing B$ $\pm .004$ | C Nom. | D Nom. | E $\pm .006$ | Height F $\pm .006$ | G Nom. | H $\pm .007$ | J Nom. | Min. Part Face to Edge K | Min. Dist. Hole C/L To Edge M |
|---------|------------------------|------|----------|-----------------|-------------|-------------|---------------------|----------------------|--------------------------------------|--------------|----------------------------|--------|--------|--------------|---------------------|--------|--------------|--------|--------------------------|-------------------------------|
| | #4-40 | RA | A | 4 | 9 | 6 | .183 | .040 | .312 x .187 | .308 | .100 | .250 | .125 | .368 | .281 | .389 | .054 | .096 | .040 | .35 |
| | | | | | | 8 | .246 | | | | | | | | | | | | | .36 |
| | #6-32 | RA | A | 6 | 10 | 8 | .246 | .040 | .375 x .250 | .371 | .123 | .300 | .125 | .431 | .312 | .442 | .066 | .141 | .040 | .50 |
| | | | | | | 10 | .308 | | | | | | | | | | | | | .55 |
| | #8-32 | RA | A | 8 | 12 | 9 | .277 | .040 | .406 x .281 | .402 | .145 | .350 | .125 | .462 | .375 | .525 | .078 | .157 | .040 | .58 |
| | | | | | | 12 | .371 | | | | | | | | | | | | | .65 |

All dimensions are in millimeters.

| METRIC | Thread Form Screw Size | Type | Material | Screw Size Code | Height Code | Length Code | Length L ± 0.08 | Min. Sheet Thickness | Hole Size In Sheet $+0.05$ -0.03 | A ± 0.08 | $\varnothing B$ ± 0.1 | C Nom. | D Nom. | E ± 0.15 | Height F ± 0.15 | G Nom. | H ± 0.18 | J Nom. | Min. Part Face to Edge K | Min. Dist. Hole C/L To Edge M |
|--------|------------------------|------|----------|-----------------|-------------|-------------|---------------------|----------------------|------------------------------------|--------------|---------------------------|--------|--------|--------------|---------------------|--------|--------------|--------|--------------------------|-------------------------------|
| | M3 x 0.5 | RA | A | M3 | 7 | 4 | 3.9 | 1 | 8 x 4 | 7.9 | 2.77 | 6.35 | 3.18 | 9.42 | 7 | 9.27 | 1.5 | 2.87 | 1.02 | 9.1 |
| | | | | | | 6 | 5.9 | | 8 x 6 | | | | | | | | | | | 10.7 |
| | M4 x 0.7 | RA | A | M4 | 9 | 7 | 6.9 | 1 | 10 x 7 | 9.9 | 3.68 | 8.89 | 3.18 | 11.43 | 9 | 12.19 | 1.97 | 4.06 | 1.02 | 14.7 |
| | | | | | | 9 | 8.9 | | 10 x 9 | | | | | | | | | | | 16.3 |

TYPE RAS - STEEL THREADED RIGHT ANGLE FASTENER



Metric part can be identified by flat top



All dimensions are in inches.

| UNIFIED | Thread Size | Type | Material | Thread Code | Height Code | Length Code | Length L ±.003 | Min. Sheet Thickness | Hole Size In Sheet +.002 -.001 | A ±.003 | C Nom. | D Nom. | E ±.006 | Height F ±.006 | G Nom. | J Nom. | Min. Part Face to Edge K | Min. Dist. Hole C/L To Edge M |
|---------|--------------------|------|----------|-------------|-------------|-------------|-------------------|----------------------|--------------------------------------|------------|-----------|-----------|------------|-------------------|-----------|-----------|--------------------------|-------------------------------|
| | .112-40 (#4-40) | RA | S | 440 | 9 | 4 | .121 | .040 | .312 x .125 | .308 | .250 | .125 | .370 | .281 | .406 | .096 | .040 | .30 |
| | | | | | | 6 | .183 | | .312 x .187 | | | | | | | | | .35 |
| | | | | | | 8 | .246 | | .312 x .250 | | | | | | | | | .43 |
| | .138-32 (#6-32) | RA | S | 632 | 10 | 4 | .121 | .040 | .375 x .125 | .371 | .300 | .125 | .433 | .312 | .462 | .141 | .040 | .35 |
| | | | | | | 8 | .246 | | .375 x .250 | | | | | | | | | .50 |
| | | | | | | 10 | .308 | | .375 x .312 | | | | | | | | | .55 |
| | .164-32 (#8-32) | RA | S | 832 | 12 | 6 | .183 | .040 | .406 x .187 | .402 | .350 | .125 | .464 | .375 | .550 | .157 | .040 | .40 |
| | | | | | | 9 | .277 | | .406 x .281 | | | | | | | | | .58 |
| | | | | | | 12 | .371 | | .406 x .375 | | | | | | | | | .65 |

All dimensions are in millimeters.

| METRIC | Thread Size x Pitch | Type | Material | Thread Code | Height Code | Length Code | Length L ±0.08 | Min. Sheet Thickness | Hole Size In Sheet +0.05 -.0.03 | A ±0.08 | C Nom. | D Nom. | E ±0.15 | Height F ±0.15 | G Nom. | J Nom. | Min. Part Face to Edge K | Min. Dist. Hole C/L To Edge M |
|--------|---------------------|------|----------|-------------|-------------|-------------|-------------------|----------------------|---------------------------------------|------------|-----------|-----------|------------|-------------------|-----------|-----------|--------------------------|-------------------------------|
| | M3 x 0.5 | RA | S | M3 | 7 | 3 | 2.9 | 1 | 8 x 3 | 7.9 | 6.35 | 3.18 | 9.47 | 7 | 9.78 | 2.87 | 1.02 | 7.6 |
| | | | | | | 4 | 3.9 | | 8 x 4 | | | | | | | | | 9.1 |
| | | | | | | 6 | 5.9 | | 8 x 6 | | | | | | | | | 10.7 |
| | M4 x 0.7 | RA | S | M4 | 9 | 4 | 3.9 | 1 | 10 x 4 | 9.9 | 8.89 | 3.18 | 11.48 | 9 | 13.21 | 4.06 | 1.02 | 10 |
| | | | | | | 7 | 6.9 | | 10 x 7 | | | | | | | | | 14.7 |
| | | | | | | 9 | 8.9 | | 10 x 9 | | | | | | | | | 16.3 |

MATERIAL & FINISH SPECIFICATIONS

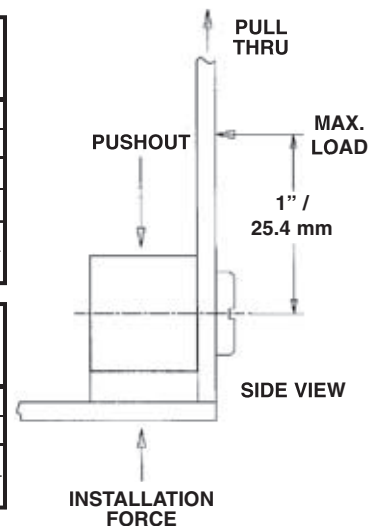
| | Threads | Fastener Materials | | Standard Finishes | | For Use In Sheet Hardness: | |
|--------------------------------|--|--------------------|----------------|--|---------|--------------------------------------|--------------------------------------|
| Type | Internal, ANSI B1.1, 2B ANSI/ASME B1.13M, 6H | 6061-T6 Aluminum | Sintered Steel | Zinc Per ASTM B 633 SC1 (5µm), Type III, Colorless | Natural | 45 or Less on the Rockwell "B" scale | 60 or Less on the Rockwell "B" scale |
| RAA | | • | | | • | • | |
| RAS | • | | • | • | | | • |
| Part Number Codes for Finishes | | | | ZI | None | | |

PERFORMANCE DATA⁽¹⁾

Type RAA

| UNIFIED | Screw Size Code | Height Code | Length Code | Thread Forming Torque (in. lbs.) | Max. Rec. Tightening Torque (in. lbs.) | Test Sheet Material | Installation (lbs.) | Pushout (lbs.) | Max. Load (lbs.) (2) | Pull Thru (lbs.) |
|---------|-----------------|-------------|-------------|----------------------------------|--|---------------------|---------------------|----------------|----------------------|------------------|
| | 4 | 9 | 6 | 3 | 6 | 5052-H34 Aluminum | 1800 | 140 | 8 | 80 |
| | | | 8 | 4 | 10 | | 1800 | 180 | 13 | 80 |
| | 6 | 10 | 8 | 5.5 | 11 | 5052-H34 Aluminum | 2500 | 175 | 12 | 85 |
| | | | 10 | 5.5 | 17 | | 2500 | 235 | 16 | 85 |
| | 8 | 12 | 9 | 6.5 | 18 | 5052-H34 Aluminum | 3100 | 205 | 13 | 105 |
| | | | 12 | 8.0 | 20 | | 3100 | 255 | 21 | 105 |

| METRIC | Screw Size Code | Height Code | Length Code | Thread Forming Torque (N•m) | Max. Rec. Tightening Torque (N•m) | Test Sheet Material | Installation (kN) | Pushout (N) | Max. Load (N) (2) | Pull Thru (N) |
|--------|-----------------|-------------|-------------|-----------------------------|-----------------------------------|---------------------|-------------------|-------------|-------------------|---------------|
| | M3 | 7 | 4 | .17 | .56 | 5052-H34 Aluminum | 7.1 | 556 | 27 | 356 |
| | | | 6 | .23 | 1.02 | | 7.1 | 756 | 44 | 356 |
| | M4 | 9 | 7 | .56 | 2.26 | 5052-H34 Aluminum | 13.3 | 890 | 76 | 423 |
| | | | 9 | .56 | 2.83 | | 13.3 | 1045 | 107 | 423 |



Type RAS

| UNIFIED | Thread Code | Height Code | Length Code | Test Sheet Material | | | | | | | | | |
|---------|--|---------------------|----------------|----------------------|------------------|--|---------------------|----------------|----------------------|------------------|-----|-----|----|
| | | | | 5052-H34 Aluminum | | | | | Cold-rolled Steel | | | | |
| | Max. Rec. Tightening Torque (in. lbs.) | Installation (lbs.) | Pushout (lbs.) | Max. Load (lbs.) (2) | Pull Thru (lbs.) | Max. Rec. Tightening Torque (in. lbs.) | Installation (lbs.) | Pushout (lbs.) | Max. Load (lbs.) (2) | Pull Thru (lbs.) | | | |
| | 440 | 9 | 4 | 13 | 1800 | 100 | 7 | 80 | 16 | 2400 | 180 | 9 | 80 |
| | | | 6 | 17 | 1800 | 145 | 8 | 80 | 17 | 2400 | 260 | 9 | 80 |
| 8 | | | 17 | 2100 | 180 | 13 | 80 | 17 | 3000 | 315 | 15 | 80 | |
| 632 | 10 | 4 | 20 | 2000 | 100 | 7 | 85 | 20 | 2500 | 190 | 9 | 85 | |
| | | 8 | 21 | 2500 | 190 | 12 | 85 | 26 | 3200 | 335 | 16 | 85 | |
| | | 10 | 21 | 2800 | 230 | 16 | 85 | 26 | 4000 | 385 | 20 | 85 | |
| 832 | 12 | 6 | 20 | 2400 | 140 | 15 | 100 | 27 | 3200 | 260 | 11 | 100 | |
| | | 9 | 23 | 3300 | 195 | 16 | 100 | 29 | 4200 | 345 | 20 | 100 | |
| | | 12 | 30 | 3500 | 260 | 20 | 100 | 35 | 4700 | 420 | 27 | 100 | |

| METRIC | Thread Code | Height Code | Length Code | Test Sheet Material | | | | | | | | | |
|--------|-----------------------------------|-------------------|-------------|---------------------|---------------|-----------------------------------|-------------------|-------------|-------------------|---------------|------|-----|-----|
| | | | | 5052-H34 Aluminum | | | | | Cold-rolled Steel | | | | |
| | Max. Rec. Tightening Torque (N•m) | Installation (kN) | Pushout (N) | Max. Load (N) (2) | Pull Thru (N) | Max. Rec. Tightening Torque (N•m) | Installation (kN) | Pushout (N) | Max. Load (N) (2) | Pull Thru (N) | | | |
| | M3 | 7 | 3 | 1.47 | 8 | 423 | 36 | 356 | 2.26 | 10.7 | 778 | 40 | 356 |
| | | | 4 | 1.92 | 8 | 534 | 36 | 356 | 2.71 | 10.7 | 1001 | 40 | 356 |
| 6 | | | 2.15 | 9.3 | 756 | 58 | 356 | 2.71 | 13.3 | 1312 | 67 | 356 | |
| M4 | 9 | 4 | 2.15 | 8.9 | 556 | 53 | 423 | 3.28 | 11.6 | 956 | 44 | 423 | |
| | | 7 | 2.6 | 13.3 | 890 | 76 | 423 | 4.07 | 16 | 1512 | 80 | 423 | |
| | | 9 | 2.83 | 13.3 | 1112 | 93 | 423 | 4.52 | 18.7 | 1846 | 116 | 423 | |

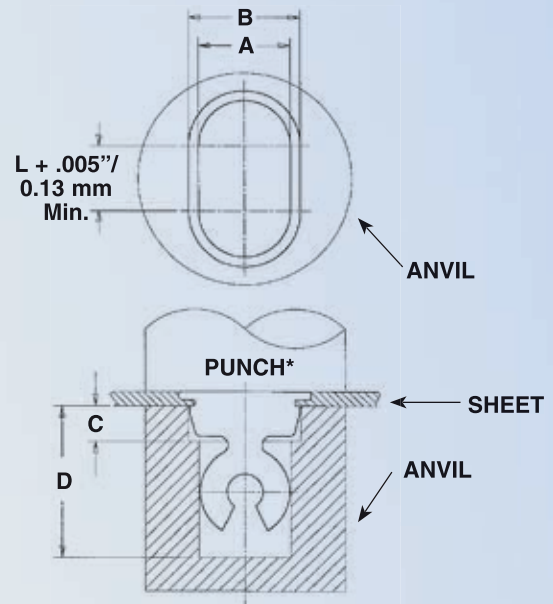
(1) The installation, pushout, and side-load values reported are averages when all installation specifications and procedures are followed. Variations in mounting hole size, sheet material and installation procedure will affect this data. Performance testing of this product in your application is recommended. We will be happy to provide samples for this purpose.

(2) 1" / 25.4 mm from screw centerline.

INSTALLATION

1. Punch a properly sized rectangular mounting hole in the sheet. Do not perform any secondary operations such as deburring.
2. Place the fastener through the mounting hole and into the anvil as shown in the drawing to the right.
3. With the punch and anvil surfaces parallel, apply a squeezing force until the bottom of the fastener becomes flush with the sheet.

* NOTE: The punch must be large enough to cover the entire base of the fastener to ensure proper installation.

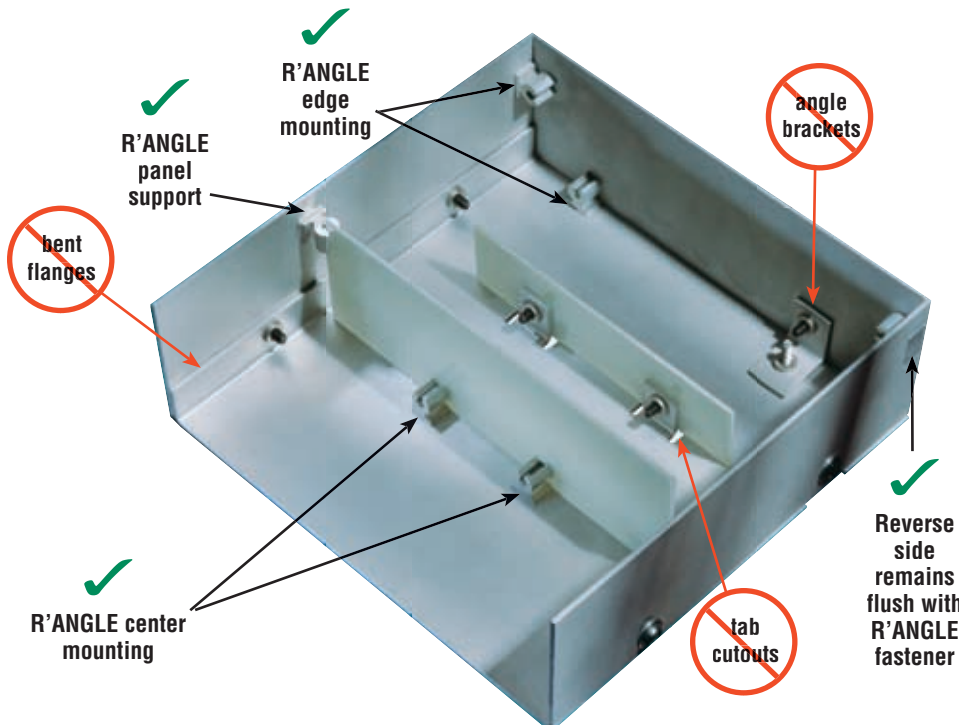


Installation tooling is available from Penn Engineering.

Anvil Dimensions

| UNIFIED | Screw or Thread Size Code | Anvil Dimensions (in.) | | | | Anvil Part Number |
|---------|---------------------------|------------------------|---------|---------|--------|-------------------|
| | | A ±.001 | B ±.001 | C ±.005 | D Min. | |
| | 4 / 440 | .257 | .313 | .100 | .425 | 8002711 |
| | 6 / 632 | .307 | .376 | .100 | .500 | 8002712 |
| | 8 / 832 | .357 | .407 | .100 | .575 | 8003642 |

| METRIC | Screw or Thread Size Code | Anvil Dimensions (mm) | | | | Anvil Part Number |
|--------|---------------------------|-----------------------|---------|--------|--------|-------------------|
| | | A ±0.03 | B ±0.03 | C ±0.1 | D Min. | |
| | M3 | 6.53 | 8.02 | 2.54 | 10.8 | 8002713 |
| | M4 | 9.07 | 10.03 | 2.54 | 12.7 | 8002714 |



For mounting to P.C. Boards using conventional surface mount techniques, see ReelFast™ SMT R'ANGLE Fasteners in PEM® Bulletin SMT.



RoHS compliance information can be found on our website.

Specifications subject to change without notice. Check our website for the most current version of this bulletin.

PennEngineering®



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CAGE-46384



BULLETIN

Fasteners

For Use in

Stainless

Steel Sheets



SS

707

Revised 108

FASTENERS FOR USE IN STAINLESS STEEL SHEETS

One of the very basics of self-clinching is that the fastener must be harder than the host sheet. Only then will the fastener perform as intended. This is particularly challenging when installing fasteners into stainless steel sheets.

Therefore we have developed this line of specially hardened stainless steel fasteners. When pressed in they become an integral part of the sheet. They allow the use of stainless steel sheet to satisfy applications, which require lighter, stronger designs that must perform in challenging environments. Effectively eliminate welding and reduce loose hardware.

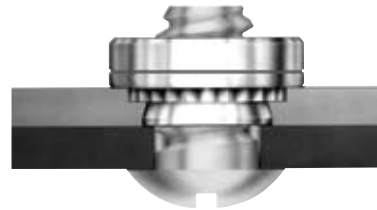
PEM self-clinching nuts provide strong load-bearing threads in stainless sheets as thin as .030"/0.8mm. When properly installed the nuts mount permanently in the sheets with one side completely flush within the panel. PEM type SP nuts also provide significant corrosion resistant properties for the most demanding conditions.

PEM self-clinching flush-head studs can be mounted in stainless sheets as thin as .040"/1mm. These studs offer convenient attachment points and achieve excellent performance values. Type FHP studs have high corrosion resistance. You can select either the FH4 or FHP types depending on the level of corrosion resistance that you require.

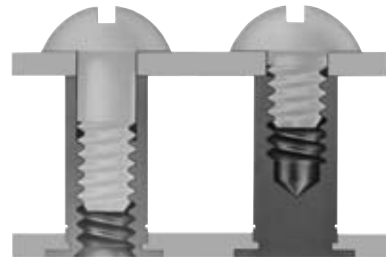
PEM self-clinching standoffs provide a permanently mounted fastener that can be used for mounting, stacking or spacing components to or from stainless steel panels. Pressed into stainless sheets as thin as .040"/1.02mm these fasteners are available as Type SO4 (blind) or Type BSO4 (through hole) types.

PEM self-clinching panel fasteners provide "tool only" access to your stainless steel assemblies.

Fasteners made from precipitation hardened grade stainless are particularly useful in applications such as outdoor equipment, medical devices and chemical and food processing equipment or anywhere corrosive element exposure is possible.



Type SP nuts with single ring



Type SO4 Standoffs

Type BSO4 Standoffs



Type FH4 and FHP studs



Type PFC4 Panel Fasteners

SpotFast™ Fasteners For Stainless Sheets

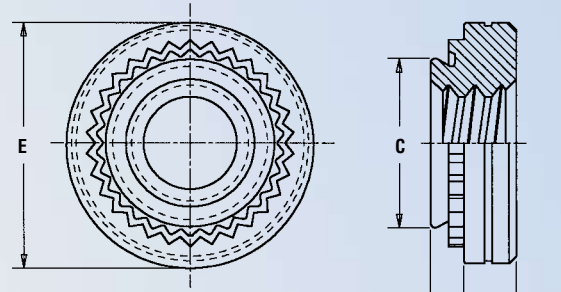
NEW!

Allows permanent joining of two stainless steel sheets. The fastener installs smooth with the top sheet, and flush or sub-flush with the bottom sheet. See PEM® Bulletin SFP for more information.



TYPE SP™ PEM 300® SELF-CLINCHING NUTS

- After installation, reverse side of sheet remains flush and smooth.
- For use in sheets of HRB 90 or less.
- Corrosion resistance similar to 300 series stainless steel.



All dimensions are in inches.

| UNIFIED | Thread Size | Type | Thread Code | Shank Code | A (Shank) Max. | Sheet Thickness | Hole Size In Sheet +.003-.000 (2) | C Max. | E ±.010 | T ±.010 | Min. Dist. Hole C/L To Edge (1) |
|---------|------------------|------|-------------|------------|----------------|-----------------|-----------------------------------|--------|---------|---------|---------------------------------|
| | .112-40 (#4-40) | SP | 440 | 0 | .030 | .030 - .039 | .166 | .165 | .25 | .07 | .19 |
| | | | | 1 | .038 | .040 - .055 | | | | | |
| | | | | 2 | .054 | .056 Min. | | | | | |
| | .138-32 (#6-32) | SP | 632 | 0 | .030 | .030 - .039 | .1875 | .187 | .28 | .07 | .22 |
| | | | | 1 | .038 | .040 - .055 | | | | | |
| | | | | 2 | .054 | .056 Min. | | | | | |
| | .164-32 (#8-32) | SP | 832 | 0 | .030 | .030 - .039 | .213 | .212 | .31 | .09 | .27 |
| | | | | 1 | .038 | .040 - .055 | | | | | |
| | | | | 2 | .054 | .056 Min. | | | | | |
| | .190-32 (#10-32) | SP | 032 | 0 | .030 | .030 - .039 | .250 | .249 | .34 | .09 | .28 |
| | | | | 1 | .038 | .040 - .055 | | | | | |
| | | | | 2 | .054 | .056 Min. | | | | | |
| | .250-20 (1/4-20) | SP | 0420 | 1 | .054 | .056 Min. | .344 | .343 | .44 | .17 | .34 |

All dimensions are in millimeters.

| METRIC | Thread Size x Pitch | Type | Thread Code | Shank Code | A (Shank) Max. | Sheet Thickness | Hole Size In Sheet +0.08 (2) | C Max. | E ±0.25 | T ±0.25 | Min. Dist. Hole C/L To Edge (1) |
|--------|---------------------|------|-------------|------------|----------------|-----------------|------------------------------|--------|---------|---------|---------------------------------|
| | M3 x 0.5 | SP | M3 | 0 | 0.77 | 0.8 - 1 | 4.22 | 4.2 | 6.3 | 1.5 | 4.8 |
| | | | | 1 | 0.97 | 1.01 - 1.39 | | | | | |
| | | | | 2 | 1.38 | 1.4 Min. | | | | | |
| | M4 x 0.7 | SP | M4 | 0 | 0.77 | 0.8 - 1 | 5.41 | 5.39 | 7.9 | 2 | 6.9 |
| | | | | 1 | 0.97 | 1.01 - 1.39 | | | | | |
| | | | | 2 | 1.38 | 1.4 Min. | | | | | |
| | M5 x 0.8 | SP | M5 | 0 | 0.77 | 0.8 - 1 | 6.35 | 6.33 | 8.7 | 2 | 7.1 |
| | | | | 1 | 0.97 | 1.01 - 1.39 | | | | | |
| | | | | 2 | 1.38 | 1.4 Min. | | | | | |
| | M6 x 1 | SP | M6 | 1 | 1.38 | 1.4 Min. | 8.75 | 8.73 | 11.1 | 4.1 | 8.6 |

- (1) To minimize sheet distortion and maximize product performance, use a centerline-to-edge value greater or equal to the value specified.
- (2) Hole punch diameter must be maintained at +.001" / .025mm over mounting hole diameter. Hole punch should be kept sharp to minimize local work hardening around hole. Fasteners should be installed in the punch side of the hole.

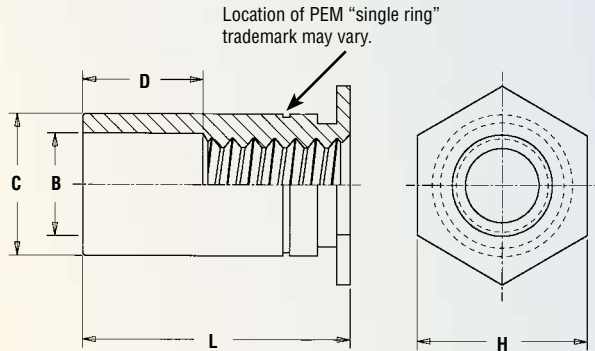
TYPE SO4™ THRU-HOLE THREADED STANDOFFS

- Installed with heads flush with one surface of the mounting sheet.
- Available unthreaded for spacing multi-panel assemblies.
- For use in sheets of HRB 88 or less.

GENERAL DIMENSIONAL DATA

All dimensions are in inches.

| UNIFIED | Thread Code | Min. Sheet Thickness | Hole Size In Sheet +.003 -.000 | B Counter-Bore Dia. ±.005 | C +.000 -.005 | H Nom. | Min. Dist. Hole C/L To Edge ⁽¹⁾ |
|---------|-------------|----------------------|--------------------------------------|------------------------------|---------------------|-----------|--|
| | 440 | .040 | .166 | .125 | .165 | .187 | .23 |
| | 6440 | .040 | .213 | .125 | .212 | .250 | .28 |
| | 632 | .040 | .213 | .156 | .212 | .250 | .28 |
| | 8632 | .050 | .281 | .156 | .280 | .312 | .33 |
| | 832 | .050 | .281 | .188 | .280 | .312 | .33 |
| | 032 | .050 | .281 | .203 | .280 | .312 | .33 |



Clinching profile may vary.

All dimensions are in millimeters.

| METRIC | Thread Code | Min. Sheet Thickness | Hole Size In Sheet +0.08 | B Counter-Bore Dia. ±0.13 | C -0.13 | H Nom. | Min. Dist. Hole C/L To Edge ⁽¹⁾ |
|--------|-------------|----------------------|-----------------------------|------------------------------|------------|-----------|--|
| | M3 | 1.02 | 4.22 | 3.25 | 4.2 | 4.8 | 6 |
| | 3.5M3 | 1.02 | 5.41 | 3.25 | 5.39 | 6.4 | 7.1 |
| | M3.5 | 1.02 | 5.41 | 3.9 | 5.39 | 6.4 | 7.1 |
| | M4 | 1.27 | 7.14 | 4.8 | 7.12 | 7.9 | 8.4 |
| | M5 | 1.27 | 7.14 | 5.35 | 7.12 | 7.9 | 8.4 |

THREAD SIZE AND LENGTH SELECTION DATA

All dimensions are in inches.

| UNIFIED | Thread Size | Type | Thread Code | Length "L" +.002 -.005 (Length Code in 32nds of an inch) | | | | | | | | | | | | | | | |
|-------------------|---------------------|------|---------------------|--|------|------|------|------|------|------|------|------|------|------|------|------|------|------|-------|
| | | | | .125 | .187 | .250 | .312 | .375 | .437 | .500 | .562 | .625 | .687 | .750 | .812 | .875 | .937 | 1.00 | 1.062 |
| | .112-40 (#4-40) | S04 | 440 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 | 24 | NA | NA | NA | NA | NA |
| | | | 6440 ⁽²⁾ | | | | | | | | | | | | | | | | |
| | .138-32 (#6-32) | S04 | 632 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 | 24 | 26 | 28 | 30 | 32 | 34 |
| | | | 8632 ⁽²⁾ | | | | | | | | | | | | | | | | |
| | .164-32 (#8-32) | S04 | 832 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 | 24 | 26 | 28 | 30 | 32 | 34 |
| | | | 032 | | | | | | | | | | | | | | | | |
| | .190-32 (#10-32) | | | | | | | | | | | | | | | | | | |
| D Dimension ±.010 | | | None | | | | | | | | | | | | | | | | |

All dimensions are in millimeters.

| METRIC | Thread Size x Pitch | Type | Thread Code | Length "L" +0.05 -0.13 (Length Code in millimeters) | | | | | | | | | | | | |
|--------|----------------------|------|-------------|--|------|---|---|----|----|----|----|----|----|----|----|--|
| | M3 x 0.5 | S04 | M3 | 3 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | NA | NA | NA | |
| | 3.5M3 ⁽²⁾ | | | | | | | | | | | | | | | |
| | M3.5 x 0.6 | S04 | M3.5 | 3 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 | 25 | |
| | M4 x 0.7 | | M4 | | | | | | | | | | | | | |
| | M5 x 0.8 | | M5 | | | | | | | | | | | | | |
| | D Dimension ±0.25 | | | | None | | | 4 | | | 8 | | | 11 | | |

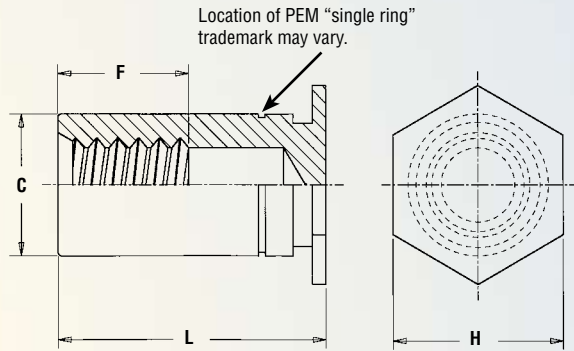
(1) To minimize sheet distortion and maximize product performance, use a centerline-to-edge value greater or equal to the value specified.

(2) Standoffs with thread codes 6440, 8632, and 3.5M3 offer greater wall thickness for thread sizes 440, 632, and M3 respectively.

NA Not Available.

TYPE BS04™ BLIND THREADED STANDOFFS

- Ideal for stacking or spacing.
- Installed with heads flush with one surface of the mounting sheet.
- Outer sheet surface is not only flush, but closed as well.
- For use in sheets of HRB 88 or less.



GENERAL DIMENSIONAL DATA

All dimensions are in inches.

| UNIFIED | Thread Code | Min. Sheet Thickness | Hole Size In Sheet +.003 -.000 | C +.000 -.005 | H Nom. | Min. Dist. Hole C/L To Edge(1) |
|---------|-------------|----------------------|--------------------------------------|---------------------|-----------|--------------------------------------|
| | 440 | .040 | .166 | .165 | .187 | .23 |
| | 6440 | .040 | .213 | .212 | .250 | .28 |
| | 632 | .040 | .213 | .212 | .250 | .28 |
| | 8632 | .050 | .281 | .280 | .312 | .33 |
| | 832 | .050 | .281 | .280 | .312 | .33 |
| | 032 | .050 | .281 | .280 | .312 | .33 |

All dimensions are in millimeters.

| METRIC | Thread Code | Min. Sheet Thickness | Hole Size In Sheet +0.08 | C -0.13 | H Nom. | Min. Dist. Hole C/L To Edge(1) |
|--------|-------------|----------------------|-----------------------------|------------|-----------|--------------------------------------|
| | M3 | 1.02 | 4.22 | 4.2 | 4.8 | 6 |
| | 3.5M3 | 1.02 | 5.41 | 5.39 | 6.4 | 7.1 |
| | M3.5 | 1.02 | 5.41 | 5.39 | 6.4 | 7.1 |
| | M4 | 1.27 | 7.14 | 7.12 | 7.9 | 8.4 |
| | M5 | 1.27 | 7.14 | 7.12 | 7.9 | 8.4 |

THREAD SIZE AND LENGTH SELECTION DATA

All dimensions are in inches.

| UNIFIED | Thread Size | Type | Thread Code | Length "L" +.002 -.005 (Length Code in 32nds of an inch) | | | | | | | | | | | | |
|------------------|---------------------|------|-------------|--|------|------|------|------|------|------|------|------|------|------|------|-------|
| | | | | .312 | .375 | .437 | .500 | .562 | .625 | .687 | .750 | .812 | .875 | .937 | 1.00 | 1.062 |
| | | | | | | | | | | | | | | | | |
| | .112-40 (#4-40) | BS04 | 440 | 10 | 12 | 14 | 16 | 18 | 20 | 22 | 24 | 26 | 28 | 30 | 32 | 34 |
| | | | 6440(2) | | | | | | | | | | | | | |
| | .138-32 (#6-32) | BS04 | 632 | 10 | 12 | 14 | 16 | 18 | 20 | 22 | 24 | 26 | 28 | 30 | 32 | 34 |
| | | | 8632(2) | | | | | | | | | | | | | |
| | .164-32 (#8-32) | BS04 | 832 | 10 | 12 | 14 | 16 | 18 | 20 | 22 | 24 | 26 | 28 | 30 | 32 | 34 |
| | | | 032 | | | | | | | | | | | | | |
| | .190-32 (#10-32) | | | | | | | | | | | | | | | |
| F Dimension Min. | | | | .156 | | .187 | | .250 | | | .375 | | | | | |

All dimensions are in millimeters.

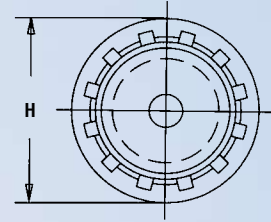
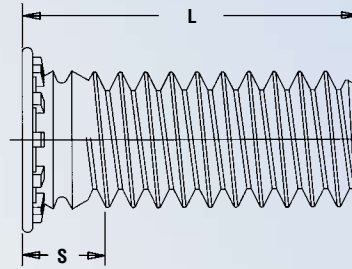
| METRIC | Thread Size x Pitch | Type | Thread Code | Length "L" +0.05 -0.13 (Length Code in millimeters) | | | | | | | | | | | | |
|------------------|---------------------|------|-------------|---|---|----|----|----|----|-----|----|----|-----|--|--|--|
| | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| | M3 x 0.5 | BS04 | M3 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 | 25 | | | |
| | | | 3.5M3(2) | | | | | | | | | | | | | |
| | M3.5 x 0.6 | BS04 | M3.5 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 | 25 | | | |
| | | | M4 | | | | | | | | | | | | | |
| | M4 x 0.7 | | | | | | | | | | | | | | | |
| | M5 x 0.8 | | | | | | | | | | | | | | | |
| F Dimension Min. | | | | 3.2 | | 4 | | 5 | | 6.5 | | | 9.5 | | | |

(1) To minimize sheet distortion and maximize product performance, use a centerline-to-edge value greater or equal to the value specified.

(2) Standoffs with thread codes 6440, 8632, and 3.5M3 offer greater wall thickness for thread sizes 440, 632, and M3 respectively.

TYPE FH4™ AND FHP™ FLUSH-HEAD STUDS

- Permanent installation into stainless steel sheets as thin as .040" / 1 mm.
- For use in sheets of HRB 92 or less.



unthreaded length

All dimensions are in inches.

| UNIFIED | Thread Size | Type | | Thread Code | Length Code "L" ±.015 (Length code in 16ths of an inch) | | | | | | | | | | Sheet Thickness | Hole Size in Sheet +.003 -.000 | Max. Hole in Attach. Parts | H ±.015 | S Max. | Min. Dist. Hole C/L to Edge |
|---------|---------------------|------|-----|-------------|--|-----------------|-----------------|------|------|------------------|------------------|------------------|------|------------------|-----------------|--------------------------------------|----------------------------|------------|-----------|-----------------------------|
| | | | | | .250 | .312 | .375 | .500 | .625 | .750 | .875 | 1.00 | 1.25 | 1.50 | | | | | | |
| | .112-40 (#4-40) | FH4 | FHP | 440 | 4 | 5 | 6 | 8 | 10 | 12 ^{NS} | 14 ^{NS} | 16 ^{NS} | NA | NA | .040-.095 | .112 | .135 | .176 | .085 | .219 |
| | .138-32 (#6-32) | FH4 | FHP | 632 | 4 | 5 | 6 | 8 | 10 | 12 | 14 | 16 | 20 | 24 ^{NS} | .040-.095 | .138 | .160 | .206 | .090 | .250 |
| | .164-32 (#8-32) | FH4 | FHP | 832 | 4 | 5 | 6 | 8 | 10 | 12 | 14 | 16 | 20 | 24 ^{NS} | .040-.095 | .164 | .185 | .237 | .090 | .281 |
| | .190-32 (#10-32) | FH4 | FHP | 032 | NA | 5 ^{NS} | 6 | 8 | 10 | 12 | 14 | 16 | 20 | 24 | .040-.095 | .190 | .210 | .256 | .100 | .281 |
| | .250-20 (1/4-20) | FH4 | NA | 0420 | NA | NA | 6 ^{NS} | 8 | 10 | 12 | 14 | 16 | 20 | 24 | .062-.117 | .250 | .270 | .337 | .135 | .312 |

All dimensions are in millimeters.

| METRIC | Thread Size x Pitch | Type | | Thread Code | Length Code "L" ±0.4 (Length Code in millimeters) | | | | | | | | | | Sheet Thick-ness | Hole Size in Sheet +0.08 | Max. Hole in Attach. parts | H ±0.4 | S Max. | Min. Dist. Hole C/L to Edge |
|--------|---------------------|------|-----|-------------|--|-----------------|----|----|----|----|------------------|------------------|------------------|------------------|------------------|--------------------------|----------------------------|--------|--------|-----------------------------|
| | M3 x 0.5 | FH4 | FHP | M3 | 6 ^{NS} | 8 | 10 | 12 | 15 | 18 | 20 ^{NS} | 25 ^{NS} | NA | NA | 1 - 2.4 | 3 | 3.6 | 4.6 | 2.1 | 5.6 |
| | M4 x 0.7 | FH4 | FHP | M4 | 6 ^{NS} | 8 | 10 | 12 | 15 | 18 | 20 | 25 | 30 ^{NS} | 35 ^{NS} | 1 - 2.4 | 4 | 4.6 | 5.9 | 2.4 | 7.2 |
| | M5 x 0.8 | FH4 | FHP | M5 | NA | 8 ^{NS} | 10 | 12 | 15 | 18 | 20 | 25 | 30 ^{NS} | 35 ^{NS} | 1 - 2.4 | 5 | 5.6 | 6.5 | 2.7 | 7.2 |
| | M6 x 1 | FH4 | NA | M6 | NA | NA | 10 | 12 | 15 | 18 | 20 | 25 | 30 | 35 | 1.6 - 3 | 6 | 6.6 | 8.2 | 3 | 7.9 |
| | | | | | | | | | | | | | | | | | | | | |

NS Not Stocked, available on special order.

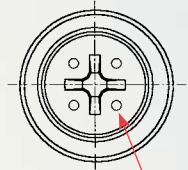
NA Not Available.

TYPE PFC4™ PANEL FASTENERS

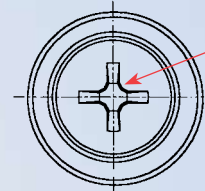
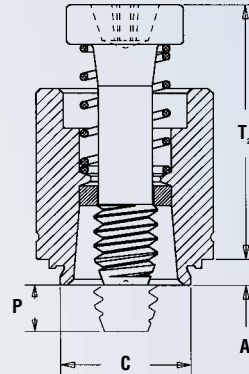
- Meets UL 1950 “service area access” requirements.
- Assorted screw lengths for most applications.
- For use in sheets of HRB 88 or less.



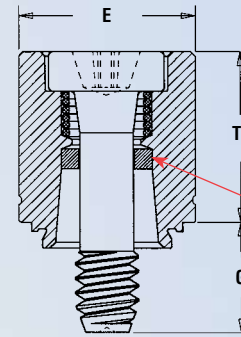
US
Patented.



Four dimples on head designates metric thread.



Driver size.



PEM Trademark Blue plastic retaining ring

All dimensions are in inches.

| UNIFIED | Thread Size | Type | Thread Code | Screw Length Code | A (Shank) Max. | Min. Sheet Thickness | Hole Size In Sheet + .003 - .000 | C Max. | E ± .010 | G ± .016 | P ± .025 | T ₁ Max. | T ₂ Nom. | Driver Size | Min. Dist. Hole C/L To Edge (1) |
|---------|------------------|------|-------------|-------------------|----------------|----------------------|----------------------------------|--------|----------|----------|----------|---------------------|---------------------|-------------|---------------------------------|
| | .112-40 (#4-40) | PFC4 | 440 | 40 | .060 | .060 | .265 | .264 | .344 | .250 | .000 | .370 | .540 | #1 | .25 |
| | | | | 62 | | | | | | .375 | .125 | | | | |
| | .138-32 (#6-32) | PFC4 | 632 | 40 | .060 | .060 | .281 | .280 | .375 | .250 | .000 | .380 | .540 | #2 | .28 |
| | | | | 62 | | | | | | .375 | .125 | | | | |
| | | | | 84 ^{NS} | | | | | | .500 | .250 | | | | |
| | .164-32 (#8-32) | PFC4 | 832 | 50 | .060 | .060 | .312 | .311 | .406 | .312 | .000 | .480 | .705 | #2 | .31 |
| | | | | 72 | | | | | | .437 | .125 | | | | |
| | | | | 94 | | | | | | .562 | .250 | | | | |
| | .190-32 (#10-32) | PFC4 | 032 | 50 | .060 | .060 | .344 | .343 | .437 | .312 | .000 | .490 | .705 | #2 | .34 |
| | | | | 72 | | | | | | .437 | .125 | | | | |
| | | | | 94 | | | | | | .562 | .250 | | | | |

All dimensions are in millimeters.

| METRIC | Thread Size x Pitch | Type | Thread Code | Screw Length Code | A (Shank) Max. | Min. Sheet Thickness | Hole Size In Sheet + 0.08 | C Max. | E ± 0.25 | G ± 0.4 | P ± 0.64 | T ₁ Max. | T ₂ Nom. | Driver Size | Min. Dist. Hole C/L To Edge (1) |
|--------|---------------------|------|-------------|-------------------|----------------|----------------------|---------------------------|--------|----------|---------|----------|---------------------|---------------------|-------------|---------------------------------|
| | M3 x 0.5 | PFC4 | M3 | 40 | 1.53 | 1.53 | 6.73 | 6.71 | 8.74 | 6.4 | 0 | 9.4 | 13.72 | #1 | 6.35 |
| | | | | 62 ^{NS} | | | | | | 9.5 | 3.2 | | | | |
| | M4 x 0.7 | PFC4 | M4 | 50 | 1.53 | 1.53 | 7.92 | 7.9 | 10.31 | 7.9 | 0 | 12.19 | 17.91 | #2 | 7.87 |
| | | | | 72 ^{NS} | | | | | | 11.1 | 3.2 | | | | |
| | | | | 94 ^{NS} | | | | | | 14.3 | 6.4 | | | | |
| | M5 x 0.8 | PFC4 | M5 | 50 | 1.53 | 1.53 | 8.74 | 8.72 | 11.1 | 7.9 | 0 | 12.45 | 17.91 | #2 | 8.63 |
| | | | | 72 | | | | | | 11.1 | 3.2 | | | | |
| | | | | 94 ^{NS} | | | | | | 14.3 | 6.4 | | | | |

(1) To minimize sheet distortion and maximize product performance, use a centerline-to-edge value greater or equal to the value specified.
NS Not Stocked, available on special order.

MATERIAL & FINISH SPECIFICATIONS

| Type | Threads | | Fastener Materials | | | Finish | For Use in Sheet Hardness ⁽¹⁾ | | | Corrosion Resistance | Magnetic |
|------------|---|---|---|----------------------------|----------------|--|--|-------------------------|-------------------------|----------------------|----------|
| | Internal, ANSI B1.1 2B/ANSI/ASME B1.13M, 6H | External, ANSI B1.1 2A/ANSI/ASME B1.13M, 6g | Precipitation Hardening Grade Stainless Steel | 400 Series Stainless Steel | A286 Stainless | Passivated and/or Tested per ASTM A380 | HRB 92 / HB 202 or less | HRB 90 / HB 192 or less | HRB 88 / HB 183 or less | | |
| SP Stamped | • | | | | • | • | | • | | Excellent | No |
| SP Grooved | • | | • | | | • | | • | | Good | Yes |
| S04 | • | | | • | | • | | | • | Fair | Yes |
| BS04 | • | | | • | | • | | | • | Fair | Yes |
| FH4 | | • | | • | | • | • | | | Fair | Yes |
| FHP | | • | | | • | • | • | | | Excellent | No |
| PFC4 | | • | | • | | • | | | • | Fair | Yes |

(1) HRB - Hardness Rockwell "B" Scale. HB - Hardness Brinell.

INSTALLATION

Installation Requirements

1. Sheet hardness must be less than the specified limit for that fastener (see Material & Finish Specifications chart).
2. Hole punch should be kept sharp to minimize work hardening around hole.
3. Fastener should be installed in punch side of hole.
4. Fastener should not be installed near bends or other highly cold worked areas where sheet hardness may be greater than the limit for the fastener.

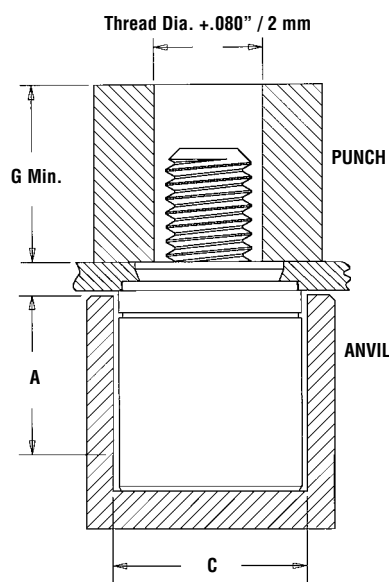
Type PFC4

1. Punch or drill properly sized mounting hole in sheet. Do not perform any secondary operations such as deburring.
2. Place fastener into the anvil hole and place the mounting hole over the shank of the fastener.
3. With punch and anvil surfaces parallel, apply squeezing force until the shoulder of the retainer comes in contact with the sheet material.

Anvil Dimensions

| UNIFIED | Thread Code | Anvil Dimensions (in.) | | Anvil Part Number | Punch Part Number |
|---------|-------------|------------------------|------------|-------------------|-------------------|
| | | A ±.002 | C ±.002 | | |
| | 440 | .345 | .358 | 975200027 | 975200060 |
| | 632 | .345 | .390 | 975201243 | 975200061 |
| | 832 | .435 | .421 | 975200029 | 975200062 |
| | 032 | .435 | .452 | 975201244 | 975200064 |

| METRIC | Thread Code | Anvil Dimensions (mm) | | Anvil Part Number | Punch Part Number |
|--------|-------------|-----------------------|------------|-------------------|-------------------|
| | | A ±0.05 | C ±0.05 | | |
| | M3 | 8.76 | 9.09 | 975200027 | 975200060 |
| | M4 | 11.05 | 10.69 | 975200029 | 975200062 |
| | M5 | 11.05 | 11.48 | 975201244 | 975200064 |



INSTALLATION (continued)

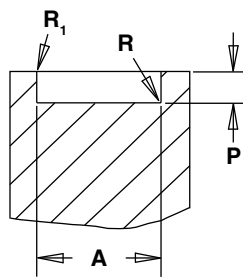
Type SP⁽¹⁾ - Identified With Stamp

1. Punch or drill properly sized mounting hole in sheet. Do not perform any secondary operations such as deburring.
2. Place fastener into the recommended counterbored anvil hole and place the mounting hole over the shank of the fastener as shown in diagram.
3. With punch and anvil surfaces parallel, apply squeezing force until the head of the nut comes into contact with the sheet material.

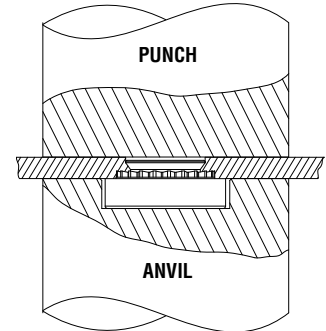
| UNIFIED | Thread Code | Anvil Dimensions (in.) | | | | Anvil Part No. |
|---------|-------------|------------------------|---------------------|-----------|-------------------------|----------------|
| | | A ±.002 | P +.000 -.001 | R Max. | R ₁ +.005 | |
| | 440 | .255 | .064 | .010 | .005 | 8012821 |
| | 632 | .286 | .064 | .010 | .005 | 8012822 |
| | 832 | .317 | .082 | .010 | .005 | 8012823 |
| | 032 | .348 | .082 | .010 | .005 | 8012824 |
| | 0420 | .443 | .163 | .010 | .005 | 8012825 |

| METRIC | Thread Code | Anvil Dimensions (mm) | | | | Anvil Part No. |
|--------|-------------|-----------------------|------------|-----------|-------------------------|----------------|
| | | A ±0.05 | P -0.03 | R Max. | R ₁ +0.13 | |
| | M3 | 6.48 | 1.63 | 0.25 | 0.13 | 8012821 |
| | M3.5 | 7.26 | 1.63 | 0.25 | 0.13 | 8012822 |
| | M4 | 8.05 | 2.08 | 0.25 | 0.13 | 8012823 |
| | M5 | 8.84 | 2.08 | 0.25 | 0.13 | 8012824 |
| | M6 | 11.25 | 4.14 | 0.25 | 0.13 | 8012825 |

RECOMMENDED COUNTERBORED INSTALLATION ANVIL



Identified With Stamp



(1) To meet the published performance data, we recommend using the installation punch and anvil shown. Deviations from recommended installation tooling may result in sheet distortion and reduced performance.

NOTE: Variations in hole preparation, installation tooling, installation force, and sheet material type, thickness, and hardness will affect both performance and tooling life.

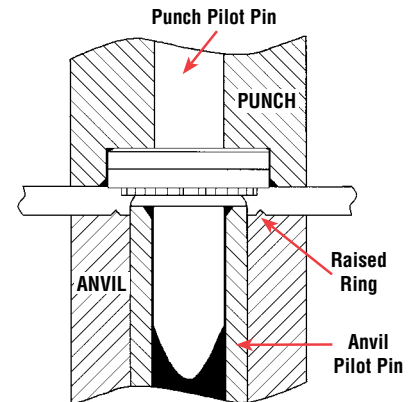
Type SP⁽¹⁾ - Identified With Single Ring

A special punch with a pilot pin to align the nut and a special anvil with a pilot pin to align the sheet and a raised ring is required to create a proper installation. The raised ring acts as a second displacer of the stainless sheet material, thereby ensuring proper installation.

1. Punch or drill properly sized mounting hole in sheet. Do not perform any secondary operations such as deburring.
2. Place sheet on raised ring anvil.
3. Place fastener in hole.
4. With punch and anvil surfaces parallel, apply squeezing force until the head of the nut comes into contact with the sheet material.

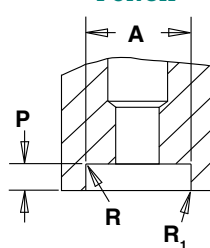


Identified with single ring



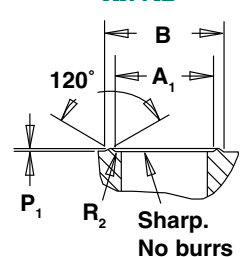
| UNIFIED | Thread Code | Punch Dimensions (in.) | | | | Punch Part No. |
|---------|-------------|------------------------|------------|-----------|-------------------------|----------------|
| | | A ±.002 | P ±.001 | R Max. | R ₁ +.005 | |
| | 440 | .255 | .066 | .010 | .005 | 8002691 |
| | 632 | .286 | .066 | .010 | .005 | 8002692 |
| | 832 | .317 | .089 | .010 | .005 | 8002693 |
| | 032 | .348 | .089 | .010 | .005 | 8002694 |
| | 0420 | — | — | — | — | (3) |

RECOMMENDED COUNTERBORED INSTALLATION PUNCH



| UNIFIED | Thread Code | Anvil Dimensions (in.) | | | | Anvil Part No. |
|---------|-------------|-------------------------|-----------|------------------------------------|------------------------|----------------|
| | | A ₁ ±.002 | B Nom. | P ₁ (2) +.001 - .000 | R ₂ Max. | |
| | 440 | .199 | .261 | .009 | .003 | 8002687 |
| | 632 | .218 | .280 | .009 | .003 | 8002688 |
| | 832 | .243 | .305 | .009 | .003 | 8002689 |
| | 032 | .288 | .350 | .009 | .003 | 8002690 |
| | 0420 | — | — | — | — | (3) |

RECOMMENDED RAISED RING INSTALLATION ANVIL



| METRIC | Thread Code | Punch Dimensions (mm) | | | | Punch Part No. |
|--------|-------------|-----------------------|------------|-----------|-------------------------|----------------|
| | | A ±0.05 | P ±0.03 | R Max. | R ₁ +0.13 | |
| | M3 | 6.48 | 1.42 | 0.25 | 0.13 | 8002695 |
| | M3.5 | 7.26 | 1.42 | 0.25 | 0.13 | 8002696 |
| | M4 | 8.05 | 1.93 | 0.25 | 0.13 | 8002697 |
| | M5 | 8.84 | 1.93 | 0.25 | 0.13 | 8002698 |
| | M6 | — | — | — | — | (3) |

| METRIC | Thread Code | Anvil Dimensions (mm) | | | | Anvil Part No. |
|--------|-------------|-------------------------|-----------|-----------------------------|------------------------|----------------|
| | | A ₁ ±0.05 | B Nom. | P ₁ (2) +0.03 | R ₂ Max. | |
| | M3 | 5.05 | 6.63 | .23 | .08 | 8002687 |
| | M3.5 | 5.54 | 7.11 | .23 | .08 | 8002688 |
| | M4 | 6.17 | 7.75 | .23 | .08 | 8002689 |
| | M5 | 7.34 | 7.75 | .23 | .08 | 8002690 |
| | M6 | — | — | — | — | (3) |

(1) To meet the published performance data, we recommend using the installation punch and anvil shown. Deviations from recommended installation tooling may result in sheet distortion and reduced performance.

(2) We recommend replacing installation anvil when the height of the "P₁" dimension is reduced to .005" / 0.13mm due to wear. Reductions in performance may occur as the height of the protrusion wears.

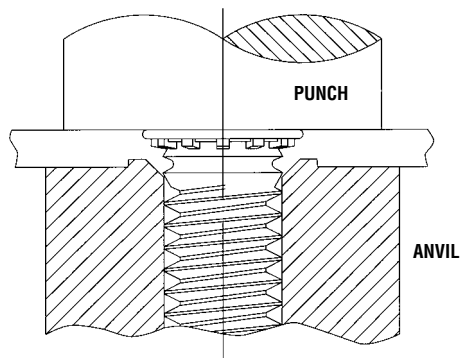
(3) Special installation tooling for #0420 and M6 thread sizes is not required.

NOTE: Variations in hole preparation, installation tooling, installation force, and sheet material type, thickness, and hardness will affect both performance and tooling life.

INSTALLATION (continued)

Type FH4 and FHP

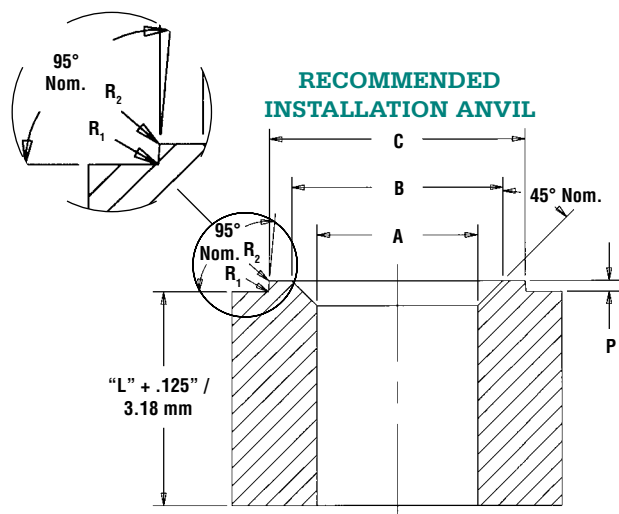
1. Punch or drill properly sized mounting hole in sheet. Do not perform any secondary operations such as deburring.
2. Place fastener into the anvil hole and place the mounting hole over the shank of the fastener.
3. With punch and anvil surfaces parallel, apply squeezing force until head of fastener is flush with sheet. A special anvil with a raised ring is required to create a proper installation. The raised ring acts as a second displacer of the stainless sheet material, thereby ensuring that the annular groove of the stud is filled.



Anvil Dimensions⁽¹⁾

| UNIFIED | Thread Code | Anvil Dimensions (in.) | | | | | | Anvil Part No. |
|---------|-------------|------------------------|------------|------------|------------|------------------------|------------------------|----------------|
| | | A +.003 - .000 | B ±.002 | C ±.002 | P ±.001 | R ₁ Max. | R ₂ Max. | |
| | | | | | | | | |
| | 440 | .113 | .144 | .174 | .010 | .003 | .005 | 8001645 |
| | 632 | .140 | .170 | .200 | .010 | .003 | .005 | 8001644 |
| | 832 | .166 | .202 | .236 | .010 | .003 | .005 | 8001643 |
| | 032 | .191 | .235 | .275 | .010 | .003 | .005 | 8001642 |
| | 0420 | .252 | .324 | .360 | .020 | .003 | .005 | 8002535 |

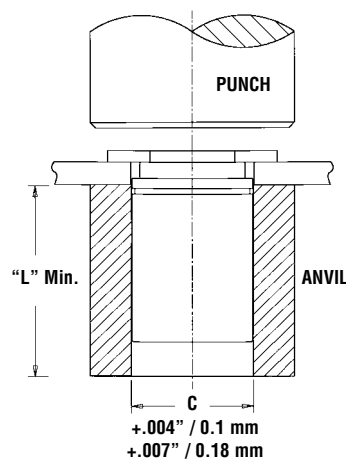
| METRIC | Thread Code | Anvil Dimensions (mm) | | | | | | Anvil Part No. |
|--------|-------------|-----------------------|------------|------------|------------|------------------------|------------------------|----------------|
| | | A +0.08 | B ±0.05 | C ±0.05 | P ±.025 | R ₁ Max. | R ₂ Max. | |
| | | | | | | | | |
| | M3 | 3.05 | 3.81 | 4.57 | 0.25 | 0.08 | 0.13 | 8001678 |
| | M4 | 4.04 | 4.95 | 5.82 | 0.25 | 0.08 | 0.13 | 8001677 |
| | M5 | 5.08 | 6.15 | 7.16 | 0.25 | 0.08 | 0.13 | 8001676 |
| | M6 | 6.05 | 7.87 | 8.79 | 0.51 | 0.08 | 0.13 | 8002536 |



- (1) We recommend replacing installation anvil when the height of the "P" dimension is reduced to .005" / 0.13 mm due to wear. Reductions in performance may occur as the height of the protrusion wears. Variations in hole preparation, installation force, and sheet material type, thickness, and hardness will affect both performance and tooling life.

Types S04 and BS04

1. Punch or drill properly sized round mounting hole in sheet. Do not perform any secondary operations such as deburring.
2. Insert standoff through mounting hole of sheet and into anvil as shown in drawing.
3. With punch and anvil surfaces parallel, apply only enough squeezing force to embed the standoff's head flush in the sheet.



PERFORMANCE DATA⁽¹⁾

| | Part Number | Max. Nut Tightening Torque (in. lbs.) | Max. Rec. Tightening Torque For Mating Screw (in. lbs.) | Test Sheet Material – 300 Series Stainless Steel | | | |
|---------|---------------|---------------------------------------|---|--|----------------|-----------------------|------------------|
| | | | | Installation (lbs.) | Pushout (lbs.) | Torque-out (in. lbs.) | Pull Thru (lbs.) |
| UNIFIED | SP-440-0 | — | — | 8000 | 130 | 14 | — |
| | SP-440-1 | — | — | 9000 | 165 | 17 | — |
| | SP-440-2 | — | — | 10000 | 290 | 18 | — |
| | SP-632-0 | — | — | 8500 | 140 | 18 | — |
| | SP-632-1 | — | — | 9500 | 170 | 24 | — |
| | SP-632-2 | — | — | 10500 | 340 | 28 | — |
| | SP-832-0 | — | — | 9000 | 145 | 30 | — |
| | SP-832-1 | — | — | 10000 | 180 | 37 | — |
| | SP-832-2 | — | — | 11000 | 360 | 45 | — |
| | SP-032-0 | — | — | 9500 | 180 | 35 | — |
| | SP-032-1 | — | — | 10500 | 230 | 45 | — |
| | SP-032-2 | — | — | 11500 | 400 | 60 | — |
| | SP-0420-1 | — | — | 13500 | 450 | 150 | — |
| | SO4/BSO4-440 | — | 4.75 | 5500 | 360 | 17 | 600 |
| | SO4/BSO4-6440 | — | 4.75 | 9500 | 647 | 17 | 680 |
| | SO4/BSO4-632 | — | 8.75 | 9500 | 647 | 30 | 680 |
| | SO4/BSO4-8632 | — | 8.75 | 10500 | 900 | 30 | 1392 |
| | SO4/BSO4-832 | — | 18 | 10500 | 900 | 53 | 1517 |
| | SO4/BSO4-032 | — | 32 | 10500 | 900 | 71 | 1368 |
| | FH4-440-L | 6 | — | 9000 | 450 | 16 | 800 |
| | FH4-632-L | 11 | — | 9500 | 540 | 27 | 1350 |
| | FH4-832-L | 21 | — | 11200 | 780 | 58 | 1800 |
| | FH4-032-L | 33 | — | 12000 | 1050 | 95 | 2250 |
| | FH4-0420-L | 70 | — | 23000 | 1600 | 156 | 3900 |
| | FHP-632-L | 11 | — | 9500 | 670 | 19.5 | 940 |
| | FHP-832-L | 21 | — | 11200 | 785 | 37.5 | 1415 |
| | PFC4-440 | — | — | 9100 | 350 | — | — |
| | PFC4-632 | — | — | 10300 | 400 | — | — |
| | PFC4-832 | — | — | 10800 | 450 | — | — |
| | PFC4-032 | — | — | 11800 | 550 | — | — |

| | Part Number | Max. Nut Tightening Torque (N•m) | Max. Rec. Tightening Torque For Mating Screw (N•m) | Test Sheet Material – 300 Series Stainless Steel | | | |
|--------|----------------|----------------------------------|--|--|-------------|------------------|---------------|
| | | | | Installation (kN) | Pushout (N) | Torque-out (N•m) | Pull Thru (N) |
| METRIC | SP-M3-0 | — | — | 35.6 | 575 | 1.58 | — |
| | SP-M3-1 | — | — | 40 | 725 | 1.92 | — |
| | SP-M3-2 | — | — | 44.5 | 1290 | 2.03 | — |
| | SP-M4-0 | — | — | 40 | 645 | 3.38 | — |
| | SP-M4-1 | — | — | 44.5 | 800 | 4.18 | — |
| | SP-M4-2 | — | — | 49 | 1600 | 5.08 | — |
| | SP-M5-0 | — | — | 42.3 | 800 | 3.95 | — |
| | SP-M5-1 | — | — | 46.7 | 1025 | 5.08 | — |
| | SP-M5-2 | — | — | 51.2 | 1775 | 6.77 | — |
| | SP-M6-1 | — | — | 60 | 2000 | 17 | — |
| | SO4/BSO4-M3 | — | 0.55 | 24.5 | 1493 | 2.36 | 2650 |
| | SO4/BSO4-3.5M3 | — | 0.55 | 42.3 | 2877 | 2.36 | 3025 |
| | SO4/BSO4-M3.5 | — | 0.91 | 42.3 | 2877 | 3.06 | 3025 |
| | SO4/BSO4-M4 | — | 2 | 46.7 | 4003 | 6.34 | 6458 |
| | SO4/BSO4-M5 | — | 3.6 | 46.7 | 4003 | 8.89 | 6226 |
| | FH4-M3-L | .9 | — | 40 | 2220 | 1.8 | 3500 |
| | FH4-M4-L | 2.1 | — | 50 | 3210 | 6.5 | 8000 |
| | FH4-M5-L | 4.3 | — | 53 | 3575 | 10.7 | 10000 |
| | FH4-M6-L | 7.2 | — | 71 | 4200 | 15.9 | 14900 |
| | FHP-M5-L | 1.3 | — | 53 | 3890 | 7.35 | 7320 |
| | PFC4-M3 | — | — | 40.5 | 1557 | — | — |
| | PFC4-M4 | — | — | 48 | 2002 | — | — |
| | PFC4-M5 | — | — | 52.5 | 2447 | — | — |

(1) The installation and pushout values reported are averages when all installation specifications and procedures are followed. Variations in mounting hole size, sheet material and installation force will affect this data. Performance testing of this product in your application is recommended. We will be happy to provide samples for this purpose.

INSTALLATION INTO STAINLESS STEEL SHEETS DO'S AND DON'TS

“Do’s”

select the proper fastener material to meet corrosion requirements.

make certain that hole punch is kept sharp to minimize work hardening around hole.

provide mounting hole of specified size for each fastener.

make certain that shank (or pilot) is within hole before applying installation force.

apply squeezing force between parallel surfaces.

utilize recommended installation tooling when installing fasteners.

apply sufficient force to totally embed clinching ring around entire circumference and to bring shoulder squarely in contact with sheet. For some fasteners, installation will be complete when the head is flush with the panel surface.

“Don’ts”

attempt to install a 300 series stainless steel fastener into a stainless steel sheet.

deburr mounting holes on either side of sheet before installing fasteners – deburring will remove metal required for clinching fastener into sheet.

install fastener closer to edge of sheet than minimum edge distance – unless a special fixture is used to restrict bulging of sheet edge.

over-squeeze. It will crush the head, distort threads, and buckle the sheet. Be certain to determine optimum installation force by test prior to production runs.

attempt to insert fastener with a hammer blow – under any circumstances. A hammer blow won't permit the sheet metal to flow and develop an interlock with the fastener's contour.

install screw in the head side of fastener. Install from opposite side so that the fastener load is toward sheet. The clinching force is designed only to hold the fastener during handling and to resist torque during assembly.



To be sure that you are getting genuine PEM® brand self-clinching fasteners, look for the “single ring”, “dimple”, or “SP” stamp trademark. On actual parts, location of ring on fastener may be different than shown in photo.

RoHS compliance information can be found on our website.

Specifications subject to change without notice.

Check our website for the most current version of this bulletin.

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FLOATING* SELF-CLINCHING FASTENERS

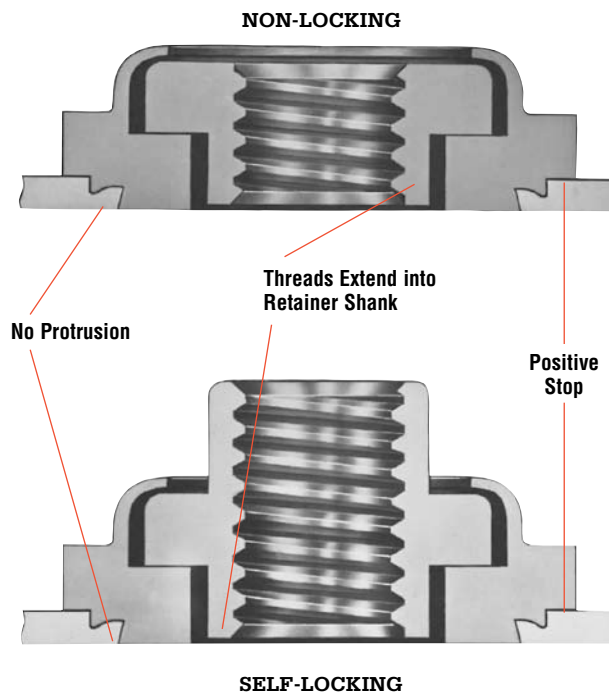
Locking and Non-locking Threads

These fasteners provide load-bearing threads in thin sheets and permit up to .030" / 0.76 mm adjustment for mating hole misalignment.

The self-clinching feature offers fast and simple assembly. The fasteners are squeezed into punched or drilled holes using any standard press. The sheet remains flush on one side, and the fastener is permanently locked in place.

Extra strength and support in assembly is obtained by the threads of the floating nut extending fully into the retainer shank (a unique PEM feature). A self-locking version of the fastener is also offered. Uniformity of locking torque is equivalent to NASM25027 specifications.

** Many PEM Type AS and AC self-clinching floating fasteners correspond to sizes in US NASM45938/11 specifications. Consult our Marketing department for a complete Military Specification and National Aerospace Standards Reference Guide (Bulletin NASM) or check our web site.*



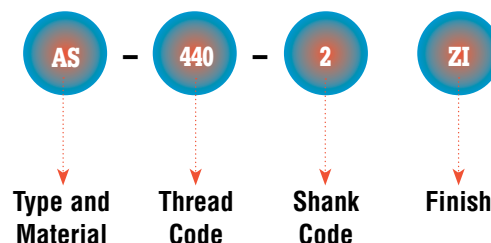
Double squares are a registered trademark

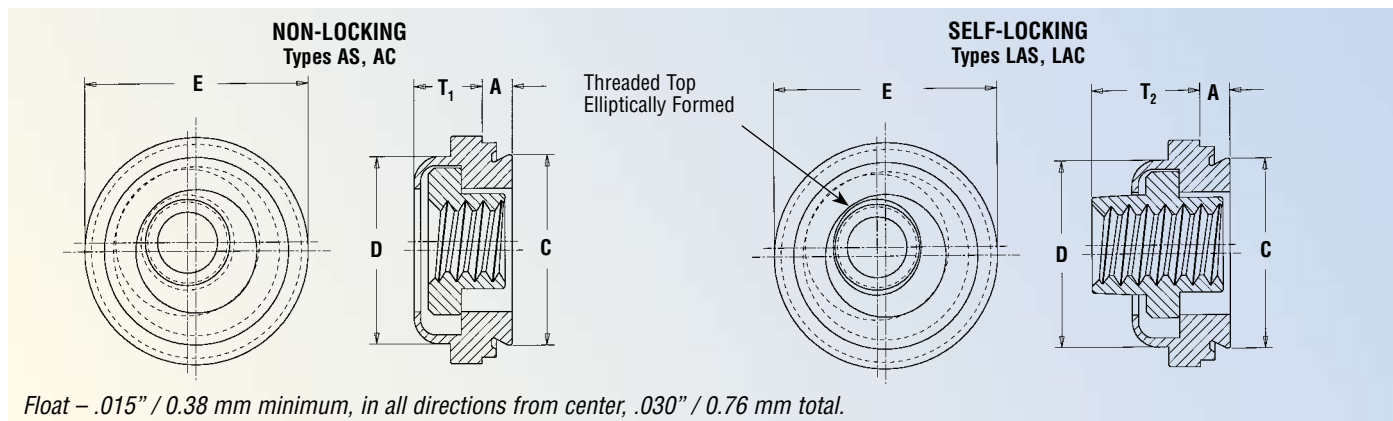
Always look for the square insert in a square retainer to be sure you are getting PEM brand fasteners and the best in self-clinching performance.

Bottom view (same for both type fasteners)



Part Number Designation





All dimensions are in inches.

| UNIFIED | Thread Size | Type | | | | Thread Code | Shank Code | A (Shank) Max. | Min. Sheet Thickness | Hole Size in Sheet + .003 - .000 | C Max. | D Max. | E ± .015 | T ₁ Max. | T ₂ Max. | Min. Dist. Hole C/L To Edge |
|------------------|-----------------|-------------------|-----------------|-------------------|-----------------|-------------|--------------|----------------|----------------------|----------------------------------|--------|--------|----------|---------------------|---------------------|-----------------------------|
| | | Non-Locking | | Self-Locking | | | | | | | | | | | | |
| | | Fastener Material | | Fastener Material | | | | | | | | | | | | |
| | | Steel | Stainless Steel | Steel | Stainless Steel | | | | | | | | | | | |
| | .112-40 (#4-40) | AS | AC | LAS | LAC | 440 | 1 2 | .038 .054 | .038 .054 | .290 | .289 | .290 | .360 | .130 | .190 | .30 |
| .138-32 (#6-32) | AS | AC | LAS | LAC | 632 | 1 2 | .038 .054 | .038 .054 | .328 | .327 | .335 | .390 | .130 | .200 | .32 | |
| .164-32 (#8-32) | AS | AC | LAS | LAC | 832 | 1 2 | .038 .054 | .038 .054 | .368 | .367 | .365 | .440 | .130 | .210 | .34 | |
| .190-24 (#10-24) | AS | AC | LAS | LAC | 024 | 1 2 | .038 .054 | .038 .054 | .406 | .405 | .405 | .470 | .170 | .270 | .36 | |
| .190-32 (#10-32) | AS | AC | LAS | LAC | 032 | 1 2 | .038 .054 | .038 .054 | .406 | .405 | .405 | .470 | .170 | .270 | .36 | |
| .250-20 (1/4-20) | AS | AC | LAS | LAC | 0420 | 2 | .054 | .054 | .515 | .514 | .510 | .600 | .210 | .310 | .42 | |
| .250-28 (1/4-28) | AS | AC | LAS | LAC | 0428 | 2 | .054 | .054 | .515 | .514 | .510 | .600 | .210 | .310 | .42 | |

All dimensions are in millimeters.

| METRIC | Thread Size x Pitch | Type | | | | Thread Code | Shank Code | A (Shank) Max. | Min. Sheet Thickness | Hole Size in Sheet + 0.08 | C Max. | D Max. | E ± 0.4 | T ₁ Max. | T ₂ Max. | Min. Dist. Hole C/L To Edge |
|----------|---------------------|-------------------|-----------------|-------------------|-----------------|-------------|------------|----------------|----------------------|---------------------------|--------|--------|---------|---------------------|---------------------|-----------------------------|
| | | Non-Locking | | Self-Locking | | | | | | | | | | | | |
| | | Fastener Material | | Fastener Material | | | | | | | | | | | | |
| | | Steel | Stainless Steel | Steel | Stainless Steel | | | | | | | | | | | |
| | M3 X 0.5 | AS | AC | LAS | LAC | M3 | 1 | 0.97 | 0.97 | 7.37 | 7.35 | 7.37 | 9.14 | 3.31 | 4.83 | 7.62 |
| | | | | | | 2 | 1.38 | 1.38 | | | | | | | | |
| M4 X 0.7 | AS | AC | LAS | LAC | M4 | 1 | 0.97 | 0.97 | 9.35 | 9.33 | 9.28 | 11.18 | 3.31 | 5.34 | 8.64 | |
| | | | | | | 2 | 1.38 | 1.38 | | | | | | | | |
| M5 X 0.8 | AS | AC | LAS | LAC | M5 | 1 | 0.97 | 0.97 | 10.31 | 10.29 | 10.29 | 11.94 | 4.32 | 6.86 | 9.14 | |
| | | | | | | 2 | 1.38 | 1.38 | | | | | | | | |
| M6 X 1 | AS | AC | LAS | LAC | M6 | 2 | 1.38 | 1.38 | 13.08 | 13.06 | 12.96 | 15.24 | 5.34 | 7.88 | 10.67 | |

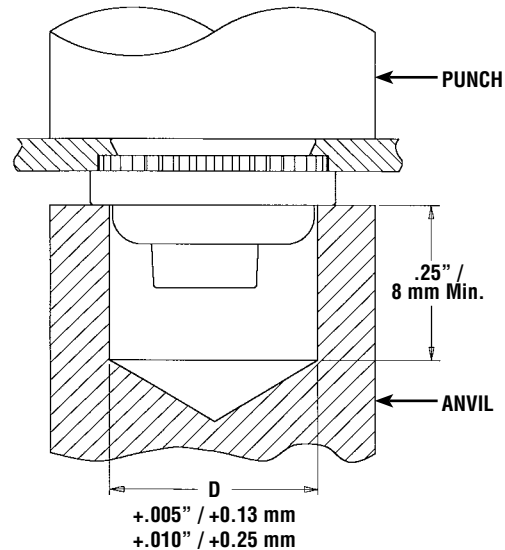
MATERIAL & FINISH SPECIFICATIONS

| | Threads | | Fastener Materials | | | | Standard Finishes | | | | | Optional Finish | | For Use In (1) |
|--------------------------------|---|--|---------------------------|----------------------------|--------------|----------------------------|---|--|---|--|--------------------------|--|--|--|
| | | | Retainer | | Nut | | Retainer & Nut | Retainer & Nut | Retainer | Retainer | Nut | Retainer | Nut | |
| Type | Non-locking, Internal ANSI B1.1, 2B/ ANSI/ASME B1.13M, 6H | Self-locking, Internal ANSI B1.1, 3B/ ANSI/ASME B1.13M, 6H | Heat-Treated Carbon Steel | 300 Series Stainless Steel | Carbon Steel | 300 Series Stainless Steel | Zinc per ASTM B 633 SC1 (5µm) Type III, Colorless | Passivated and/or tested per ASTM A380 | Zinc per ASTM B 633 SC1 (5µm) Type III, Colorless | Passivated and/or tested per ASTM A380 | Black Dry-film Lubricant | Passivated and/or tested per ASTM A380 | Black Dry-film Lubricant per MIL-PRF-46010 over Cadmium Chromate Prime | Sheet Hardness HRB 70 / HB 125 or Less |
| AS | • | | • | | • | | • | | | | | | | • |
| AC | • | | | • | | • | | • | | | | | | • |
| LAS | | • | • | | | • | | | • | | • | | | • |
| LAC | | • | | • | | • | | | | • | • | | • | • |
| Part number codes for finishes | | | | | | | ZI | None | MD | | | F | | |

(1) HRB - Hardness Rockwell "B" Scale. HB - Hardness Brinell.

INSTALLATION

1. Punch or drill the properly sized mounting hole in sheet. Do not perform any secondary operations such as deburring.
2. Place fastener into the anvil hole and place the mounting hole over the shank of the fastener.
3. With the punch and anvil surfaces parallel, apply sufficient squeezing force until flange contacts mounting sheet. Sketch at right shows suggested tooling for applying these forces. Installation force and performance data shown below.



PERFORMANCE DATA⁽¹⁾

| UNIFIED | Thread Code | Shank Code | Test Sheet Material | | | | | | | | |
|---------|-------------|------------|---------------------|-------------------------|--------------------------------|---------------------|-------------------------|--------------------------------|---------------------|-------------------------|--------------------------------|
| | | | 2024-T3 Aluminum | | | 5052-H34 Aluminum | | | Cold-Rolled Steel | | |
| | | | Installation (lbs.) | Retainer Pushout (lbs.) | Retainer Torque-out (in. lbs.) | Installation (lbs.) | Retainer Pushout (lbs.) | Retainer Torque-out (in. lbs.) | Installation (lbs.) | Retainer Pushout (lbs.) | Retainer Torque-out (in. lbs.) |
| | | | | | | | | | | | |
| | 440 | 1 | 3000 | 220 | 65 | 1500 | 215 | 65 | 3000 | 300 | 85 |
| | | 2 | | 225 | 150 | 2000 | 225 | 80 | | | 150 |
| | 632 | 1 | 3000 | 235 | 110 | 2000 | 240 | 140 | 3000 | 300 | 150 |
| | | 2 | | 275 | 150 | | 250 | 150 | | | 175 |
| | 832 | 1 | 3000 | 240 | 110 | 2000 | 250 | 140 | 3000 | 300 | 150 |
| | | 2 | | 300 | 150 | | 265 | 150 | | 400 | 200 |
| | 032 | 1 | 3500 | 300 | 150 | 2000 | 300 | 150 | 3500 | 400 | 150 |
| | | 2 | | | 200 | | 350 | 175 | | 450 | 200 |
| | 0420 | 2 | 5000 | 300 | 325 | 3000 | 400 | 325 | 5000 | 500 | 325 |
| | 0428 | | | | | | | | | | |

| METRIC | Thread Code | Shank Code | Test Sheet Material | | | | | | | | |
|--------|-------------|------------|---------------------|-------------|---------------------------|-------------------|-------------|---------------------------|-------------------|-------------|---------------------------|
| | | | 2024-T3 Aluminum | | | 5052-H34 Aluminum | | | Cold-Rolled Steel | | |
| | | | Installation (kN) | Pushout (N) | Retainer Torque-out (N•m) | Installation (kN) | Pushout (N) | Retainer Torque-out (N•m) | Installation (kN) | Pushout (N) | Retainer Torque-out (N•m) |
| | | | | | | | | | | | |
| | M3 | 1 | 13.3 | 978 | 7.3 | 6.7 | 956 | 7.3 | 13.3 | 1334 | 9.6 |
| | | 2 | 13.3 | 1000 | 16.9 | 8.9 | 1000 | 9 | 13.3 | 1334 | 16.9 |
| | M4 | 1 | 13.3 | 1067 | 12.4 | 8.9 | 1112 | 15.8 | 13.3 | 1334 | 16.9 |
| | | 2 | 15.6 | 1334 | 16.9 | 8.9 | 1178 | 16.9 | 13.3 | 1779 | 22.6 |
| | M5 | 1 | 15.6 | 1334 | 16.9 | 8.9 | 1334 | 16.9 | 15.6 | 1779 | 16.9 |
| | | 2 | 16.6 | 1334 | 22.6 | 8.9 | 1556 | 19.7 | 15.6 | 2001 | 22.6 |
| | M6 | 2 | 22.2 | 1334 | 36.7 | 13.3 | 1779 | 36.7 | 22.2 | 2224 | 36.7 |

(1) The installation, pushout and retainer torque-out values reported are averages when all installation specifications and procedures are followed. Variations in mounting hole size, sheet material and installation procedure will affect this data. Performance testing of this product in your application is recommended. We will be happy to provide samples for this purpose.

RoHS compliance information can be found on our website.

Specifications subject to change without notice.
Check our website for the most current version of this bulletin.

PennEngineering®



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CAGE-46384



BULLETIN

CONCEALED-HEAD

SELF-CLINCHING

STUDS &

STANDOFFS



CH 1106

PEM® CONCEALED-HEAD STUDS* AND STANDOFFS

These studs and standoffs ensure permanent mounting in metal sheets as thin as .062 in. / 1.6 mm.

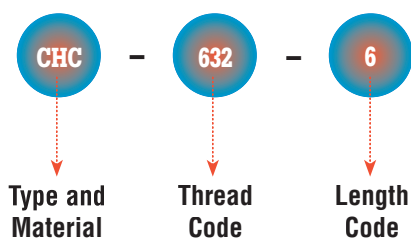
The fastener head is locked securely in a blind, milled hole and is able to handle substantial loads. The concealed-head feature allows the side of the sheet opposite installation to remain smooth.

Sheet preparation only requires a milled blind hole to the recommended minimum depth. Center-cutting end mills for hole preparation are available from PennEngineering. Installation of the concealed-head studs and standoffs is simple using a hollow punch and solid anvil. Place the head of the fastener in the hole and insert using any standard press. Displaced sheet metal flows smoothly around the head into the undercut.

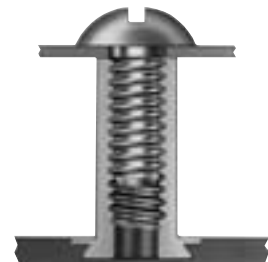
* Some PEM® self-clinching concealed-head studs meet NASM63540 specifications. For a complete Military Specification and National Aerospace Standards Reference Guide (Bulletin NASM) consult our Marketing Department or check our web site.



Part Number Designation

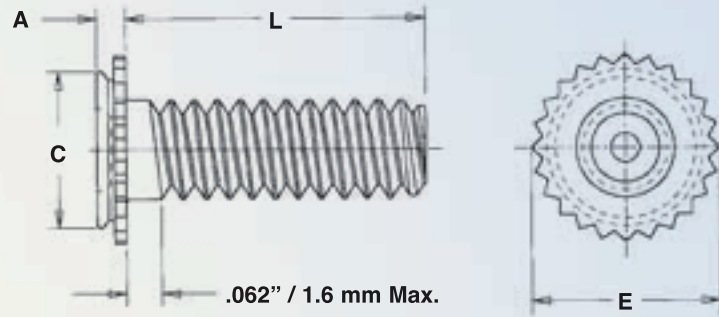


Concealed-head Stud



Concealed-head Standoff

ALUMINUM AND STAINLESS STEEL STUDS TYPES CHA, CFHA, CHC, CFHC



All dimensions are in inches.

| UNIFIED | Thread Size | Type | | Thread Code | Length Code "L" ±.015 (Length code is in 16ths of an inch) | | | | | | Min. Sheet Thickness | Blind Mounting Hole Dia. +.003 -.000 | Min. Depth of Blind Hole (1) | A Max. | E ±.010 | C Max. | Min. Dist. Hole C/L To Edge | Max. Hole in Attached Parts |
|--------------------|---------------------|--------------------|-------------------|-------------|---|-----------------|------|------------------|------------------|------|----------------------|--|------------------------------|--------|---------|--------|-----------------------------|-----------------------------|
| | | Fastener Material | | | .250 | .375 | .500 | .625 | .750 | 1.00 | | | | | | | | |
| | | Aluminum | Stainless Steel | | | | | | | | | | | | | | | |
| | .112-40 (#4-40) | CHA ^{NS} | CHC | 440 | 4 | 6 | 8 | 10 ^{NS} | 12 ^{NS} | NA | .062 | .172 | .043 | .043 | .205 | .171 | .156 | .135 |
| | | CFHA | CFHC | | | | | | | | .093 | | .075 | .075 | | | | |
| | .138-32 (#6-32) | CHA ^{NS} | CHC | 632 | 4 | 6 | 8 | 10 | 12 | 16 | .062 | .213 | .043 | .043 | .250 | .212 | .188 | .160 |
| | | CFHA | CFHC | | | | | | | | .093 | | .075 | .075 | | | | |
| | .164-32 (#8-32) | CHA ^{NS} | CHC | 832 | 4 | 6 | 8 | 10 | 12 | 16 | .062 | .290 | .043 | .043 | .328 | .289 | .219 | .185 |
| | | CFHA ^{NS} | CFHC | | | | | | | | .093 | | .075 | .075 | | | | |
| | .190-32 (#10-32) | CHA ^{NS} | CHC ^{NS} | 032 | NA | 6 ^{NS} | 8 | 10 | 12 | 16 | .062 | .312 | .043 | .043 | .350 | .311 | .250 | .210 |
| CFHA ^{NS} | | CFHC | .093 | | | | | | | | .075 | | .075 | | | | | |

All dimensions are in millimeters.

| METRIC | Thread Size x Pitch | Type | | Thread Code | Length Code "L" ±0.4 (Length code is in millimeters) | | | | | | | Min. Sheet Thickness | Blind Mounting Hole Dia. +0.08 | Min. Depth of Blind Hole (1) | A Max. | E ±0.25 | C Max. | Min. Dist. Hole C/L To Edge | Max. Hole In Attached Parts |
|--------|---------------------|-------------------|-----------------|------------------|---|----|----|----|----|----|----|----------------------|--------------------------------|------------------------------|--------|---------|--------|-----------------------------|-----------------------------|
| | | Fastener Material | | | | | | | | | | | | | | | | | |
| | | Aluminum | Stainless Steel | | | | | | | | | | | | | | | | |
| | M3 X 0.5 | CHA ^{NS} | CHC | M3 | 6 | 8 | 10 | 12 | 16 | 20 | NA | 1.6 | 4.37 | 1.1 | 1.1 | 5.21 | 4.35 | 4 | 3.6 |
| | | CFHA | CFHC | | | | | | | | | 2.4 | | 1.91 | 1.91 | | | | |
| | M4 X 0.7 | CHA ^{NS} | CHC | M4 | 6 | 8 | 10 | 12 | 16 | 20 | 25 | 1.6 | 7.37 | 1.1 | 1.1 | 8.33 | 7.35 | 5.6 | 4.6 |
| | | CFHA | CFHC | | | | | | | | | 2.4 | | 1.91 | 1.91 | | | | |
| | M5 X 0.8 | CHA | CHC | M5 ^{NS} | NA | NA | 10 | 12 | 16 | 20 | 25 | 1.6 | 7.93 | 1.1 | 1.1 | 8.89 | 7.9 | 6.4 | 5.6 |
| | | CFHA | CFHC | | | | | | | | | 2.4 | | 1.91 | 1.91 | | | | |

(1) Blind holes may be deeper than minimums except where sheet material is at or near minimum thickness.

Fasteners should always be installed so the flange is flush with the surface of the sheet.

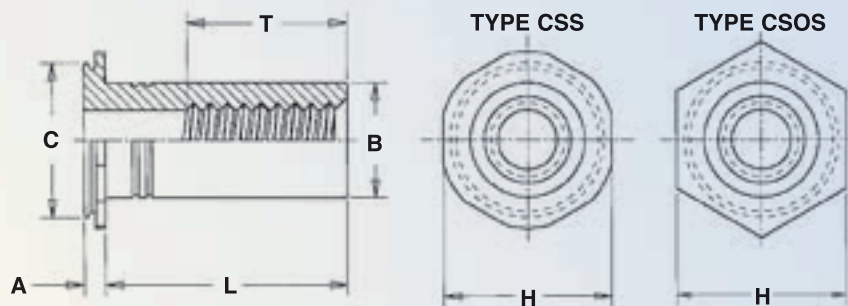
NS Not stocked. Available on special order.

NA Not available.

Look for the PEM
dimple trademark.



STAINLESS STEEL STANDOFFS TYPES CSS, CSOS



All dimensions are in inches.

| UNIFIED | Thread Size | Type | Thread Code | Length Code "L" (Length code is in 16ths of an inch) +.002 -.005 | | | | | | | Min. Sheet Thickness | Blind Mounting Hole Dia. +.003 -.000 | Min. Depth of Blind Hole (1) | Min. Depth Full Thread T (2) | A Max. | B Max. (4) | C Max. | H Nom. | Min. Dist. Hole C/L To Edge | |
|---------------------|---------------------|--------------------|-------------------|--|------------------|------------------|------------------|------------------|---------------------------------|---------------------------------|---------------------------------|--|------------------------------|------------------------------|--------|------------|--------|--------|-----------------------------|------|
| | | Fastener Material | | | | | | | | | | | | | | | | | | |
| | | Stainless Steel | | | | | | | | | | | | | | | | | | |
| | .112-40 (#4-40) | CSS | 440 | 3 ⁽²⁾ | 4 | 5 | 6 | 8 ⁽³⁾ | 10 ^{NS} ₍₃₎ | 12 ^{NS} ₍₃₎ | 16 ^{NS} ₍₃₎ | .062 | .213 | .043 | .188 | .043 | .165 | .212 | .250 | .188 |
| | | CSOS | | | | | | | | | | | | .093 | | .075 | | | | |
| | .138-32 (#6-32) | CSS | 632 | 3 ⁽²⁾ | 4 ⁽²⁾ | 5 | 6 | 8 ⁽³⁾ | 10 ⁽³⁾ | 12 ⁽³⁾ | 16 ^{NS} ₍₃₎ | .062 | .290 | .043 | .250 | .043 | .213 | .289 | .312 | .219 |
| | | CSOS | | | | | | | | | | | | .093 | | .075 | | | | |
| | .164-32 (#8-32) | CSS | 832 ^{NS} | 3 ⁽²⁾ | 4 ⁽²⁾ | 5 | 6 | 8 ⁽³⁾ | 10 ⁽³⁾ | 12 ⁽³⁾ | 16 ⁽³⁾ | .062 | .312 | .043 | .250 | .043 | .245 | .311 | .344 | .250 |
| | | CSOS | | | | | | | | | | | | .093 | | .075 | | | | |
| | .190-32 (#10-32) | CSS | 032 ^{NS} | 3 ⁽²⁾ | 4 ⁽²⁾ | 5 ⁽²⁾ | 6 ⁽²⁾ | 8 | 10 ⁽³⁾ | 12 ⁽³⁾ | 16 ⁽³⁾ | .062 | .344 | .043 | .375 | .043 | .290 | .343 | .375 | .281 |
| CSOS | | | | | | | | | | | | .093 | | .075 | | | | | | |
| .250-20 (1/4-20) | CSS | 0420 ^{NS} | 3 ⁽²⁾ | 4 ⁽²⁾ | 5 ⁽²⁾ | 6 ⁽²⁾ | 8 | 10 | 12 ⁽³⁾ | 16 ⁽³⁾ | .062 | .390 | .043 | .375 | .043 | .354 | .389 | .438 | .375 | |
| | CSOS | | | | | | | | | | | | .093 | | .075 | | | | | |

All dimensions are in millimeters.

| METRIC | Thread Size x Pitch | Type | Thread Code | Length Code "L" (Length code is in millimeters) +0.05 - 0.13 | | | | | | | | Min. Sheet Thickness | Blind Mounting Hole Diameter +0.08 | Min. Depth of Blind Hole (1) | Min. Depth Full Thread T (2) | A Max. | B Max. (4) | C Max. | H Nom. | Min. Dist. Hole C/L To Edge |
|--------|---------------------|-------------------|------------------|--|------------------|------------------|-------------------|---------------------------------|---------------------------------|---------------------------------|---------------------------------|----------------------|------------------------------------|------------------------------|------------------------------|--------|------------|--------|--------|-----------------------------|
| | | Fastener Material | | | | | | | | | | | | | | | | | | |
| | | Stainless Steel | | | | | | | | | | | | | | | | | | |
| | M3 X 0.5 | CSS | M3 | 4 ⁽²⁾ | 6 ⁽²⁾ | 8 ⁽⁵⁾ | 10 ⁽³⁾ | 12 ^{NS} ₍₃₎ | 16 ^{NS} ₍₃₎ | 20 ^{NS} ₍₃₎ | 25 ^{NS} ₍₃₎ | 1.6 | 5.41 | 1.1 | 5 | 1.1 | 4.2 | 5.39 | 6.35 | 4.8 |
| | | CSOS | | | | | | | | | | 2.4 | | 1.91 | | 1.91 | | | | |
| | M4 X 0.7 | CSS | M4 | 4 ^{NS} ₍₂₎ | 6 ⁽²⁾ | 8 | 10 ⁽⁵⁾ | 12 ⁽³⁾ | 16 ⁽³⁾ | 20 ^{NS} ₍₃₎ | 25 ^{NS} ₍₃₎ | 1.6 | 7.92 | 1.1 | 6.5 | 1.1 | 6.23 | 7.9 | 8.74 | 6.4 |
| | | CSOS | | | | | | | | | | 2.4 | | 1.91 | | 1.91 | | | | |
| | M5 X 0.8 | CSS | M5 ^{NS} | 4 ⁽²⁾ | 6 ⁽²⁾ | 8 ⁽²⁾ | 10 | 12 | 16 ⁽³⁾ | 20 ⁽³⁾ | 25 ⁽³⁾ | 1.6 | 8.74 | 1.1 | 9.6 | 1.1 | 7.37 | 8.72 | 9.53 | 7.2 |
| | | CSOS | | | | | | | | | | 2.4 | | 1.91 | | 1.91 | | | | |
| | M6 X 1 | CSOS | M6 ^{NS} | 4 ⁽²⁾ | 6 ⁽²⁾ | 8 ⁽²⁾ | 10 | 12 | 16 ⁽³⁾ | 20 ⁽³⁾ | 25 ⁽³⁾ | 2.4 | 9.9 | 1.91 | 9.6 | 1.91 | 9 | 9.89 | 11.11 | 9.5 |

- (1) Blind mounting holes may be deeper than minimums except where sheet material is at or near minimum thickness. Fasteners should always be installed so the flange is flush with the surface of the sheet.
 - (2) For shorter standoff lengths, when "L" is less than "T", minimum thread depth will be equal to "L". Screws with lengths exceeding "L" should not be used for they may cause "jacking-out" of standoff from the sheet.
 - (3) Type CSS and CSOS are blind at hex end.
 - (4) If standoff is used as a bushing, the hole in attached part must not exceed "B" plus .020" / 0.51 mm.
 - (5) Type CSOS is blind at hex end.
- NS Not stocked. Available on special order.

Look for the
PEM two groove
trademark.



PERFORMANCE DATA⁽¹⁾

| UNIFIED | Type | Thread Code | Max. Tightening Torque (in. lbs.) | Test Sheet Material | | | |
|----------------------|--------------------------|-------------|-----------------------------------|---------------------|----------------|---------------------|----------------|
| | | | | Cold-rolled Steel | | 5052-H34 Aluminum | |
| | | | | Installation (lbs.) | Pullout (lbs.) | Installation (lbs.) | Pullout (lbs.) |
| | Concealed-head Standoffs | | | | | | |
| | CSS | 440 | 4.75 | 4,000 | 300 | 2,800 | 200 |
| | | 632 | 8.75 | 4,500 | 350 | 3,000 | 240 |
| | | 832 | 18 | 4,800 | 400 | 4,000 | 270 |
| | | 032 | 32 | 5,500 | 450 | 5,000 | 290 |
| | CSOS | 440 | 3.8 | 4,300 | 330 | 2,900 | 220 |
| | | 632 | 7 | 5,000 | 360 | 3,200 | 240 |
| 832 | | 14.4 | 5,300 | 440 | 4,000 | 300 | |
| 032 | | 25.6 | 6,000 | 600 | 5,000 | 400 | |
| 0420 | | 64 | 6,500 | 650 | 5,500 | 430 | |
| Concealed-head Studs | | | | | | | |
| CHC | 440 | 4.75 | 1,800 | 240 | 1,400 | 130 | |
| | 632 | 9 | 2,500 | 260 | 1,800 | 160 | |
| | 832 | 18 | 4,000 | 270 | 2,800 | 180 | |
| | 032 | 32 | 5,000 | 290 | 4,000 | 210 | |
| CFHC | 440 | 4.75 | 2,000 | 240 | 1,500 | 200 | |
| | 632 | 9 | 2,700 | 350 | 2,500 | 260 | |
| | 832 | 18 | 3,300 | 440 | 3,000 | 310 | |
| | 032 | 32 | 4,000 | 680 | 3,500 | 360 | |
| CHA | 440 | 2.85 | (2) | (2) | 1,400 | 125 | |
| | 632 | 5.4 | (2) | (2) | 1,800 | 135 | |
| | 832 | 10.8 | (2) | (2) | 2,800 | 145 | |
| | 032 | 19.2 | (2) | (2) | 4,000 | 170 | |
| CFHA | 440 | 2.85 | (2) | (2) | 1,500 | 190 | |
| | 632 | 5.4 | (2) | (2) | 2,500 | 220 | |
| | 832 | 10.8 | (2) | (2) | 3,000 | 240 | |
| | 032 | 19.2 | (2) | (2) | 3,500 | 300 | |

| METRIC | Type | Thread Code | Max. Tightening Torque (N•m) | Test Sheet Material | | | |
|----------------------|--------------------------|-------------|------------------------------|---------------------|-------------|-------------------|-------------|
| | | | | Cold-rolled steel | | 5052-H34 Aluminum | |
| | | | | Installation (kN) | Pullout (N) | Installation (kN) | Pullout (N) |
| | Concealed-head Standoffs | | | | | | |
| | CSS | M3 | .55 | 17.8 | 1330 | 12.5 | 890 |
| | | M4 | 2 | 21.3 | 1775 | 17.8 | 1200 |
| | | M5 | 3.6 | 24.5 | 2000 | 22.2 | 1290 |
| | CSOS | M3 | .44 | 19.2 | 1465 | 12.9 | 975 |
| | | M4 | 1.6 | 23.6 | 1955 | 17.8 | 1335 |
| | | M5 | 2.9 | 26.7 | 2665 | 22.2 | 1775 |
| M6 | | 7.2 | 28.9 | 2860 | 24.4 | 1915 | |
| Concealed-head Studs | | | | | | | |
| CHC | M3 | 0.5 | 8 | 1065 | 6.2 | 575 | |
| | M4 | 2 | 17.8 | 1200 | 12.5 | 800 | |
| | M5 | 3.6 | 22.2 | 1290 | 17.8 | 930 | |
| CFHC | M3 | 0.5 | 8.9 | 1065 | 6.7 | 890 | |
| | M4 | 2 | 14.7 | 1955 | 13.3 | 1375 | |
| | M5 | 3.6 | 17.8 | 3020 | 15.6 | 1600 | |
| CHA | M3 | 0.3 | (2) | (2) | 6.2 | 555 | |
| | M4 | 1.2 | (2) | (2) | 12.5 | 645 | |
| | M5 | 2.16 | (2) | (2) | 17.8 | 755 | |
| CFHA | M3 | 0.3 | (2) | (2) | 6.7 | 845 | |
| | M4 | 1.2 | (2) | (2) | 13.3 | 1065 | |
| | M5 | 2.16 | (2) | (2) | 15.6 | 1330 | |

- (1) The installation and pullout values reported are averages when all installation specifications and procedures are followed. Variations in mounting hole size, sheet material and installation procedure will affect this data. Performance testing of this product in your application is recommended. We will be happy to provide samples for this purpose.
- (2) Not applicable.

MATERIAL & FINISH SPECIFICATIONS

| Type | Threads | | Fastener Materials | | Finish | | For Use In Sheet Hardness | |
|------|---|--|---------------------|-------------------------------|-----------|---|--|--|
| | External ANSI B1.1 2A / ANSI / ASME B1.13M, 6g | Internal, ANSI B1.1 2B / ANSI / ASME B1.13M, 6H | 2024-T4 Aluminum | 300 Series Stainless Steel | No Finish | Passivated and/or tested per ASTM A380 | 70 or Less on the Rockwell "B" Scale | 50 or Less on the Rockwell "B" Scale |
| CHA | • | | • | | • | | | • |
| CFHA | • | | • | | • | | | • |
| CHC | • | | | • | | • | • | |
| CFHC | • | | | • | | • | • | |
| CSS | | • | | • | | • | • | |
| CSOS | | • | | • | | • | • | |

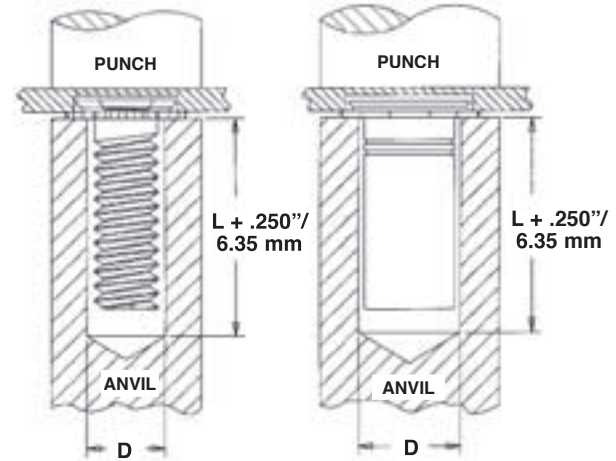
INSTALLATION

1. Mill a blind hole to the correct minimum depth.*
2. Place fastener into anvil hole.
3. Place the sheet over the shank of the fastener.
4. With punch and anvil surfaces parallel, apply squeezing force until flange is flush with mounting sheet.

*End mills available from PennEngineering. See chart below. Fasteners may be installed into through holes.

Types CFHA, CFHC, CHC, CHA
Concealed-head studs

Types CSOS, CSS
Concealed-head standoffs



ANVIL "D" DIMENSIONS

All dimensions are in inches. (+.003 -.000)

| Type | Thread Code | | | | |
|--------------|-------------|------|------|------|------|
| | 440 | 632 | 832 | 032 | 0420 |
| CHA CHC | .127 | .152 | .179 | .205 | — |
| CFHA CFHC | .127 | .152 | .179 | .205 | — |
| CSS CSOS | .170 | .218 | .250 | .295 | .358 |

All dimensions are in millimeters. (+0.08)

| Type | Thread Code | | | |
|--------------|-------------|------|-----|------|
| | M3 | M4 | M5 | M6 |
| CHA CHC | 3.4 | 4.4 | 5.4 | — |
| CFHA CFHC | 3.4 | 4.4 | 5.4 | — |
| CSS CSOS | 4.33 | 6.36 | 7.5 | 9.13 |

END MILL DESIGNATIONS

Double-ended, two-flute H.S.S. center-cutting end mills are available from stock.

PennEngineering does not manufacture center-cutting end mills, but we do keep a supply in stock for your convenience.

| Thread Code | Fastener Type | Required Size End Mill | PEM Part No. |
|-------------|----------------------------|------------------------|--------------|
| 440, M3 | CFHC, CHC, CFHA, CHA Studs | .172" | CHM-172 |
| | CSOS, CSS Standoffs | .213" | CHM-213 |
| 632 | CFHC, CHC, CFHA, CHA Studs | .213" | CHM-213 |
| | CSOS, CSS Standoffs | .290" | CHM-290 |
| 832, M4 | CFHC, CHC, CFHA, CHA Studs | .290" | CHM-290 |
| | CSOS, CSS Standoffs | .312" | CHM-312 |
| 032, M5 | CFHC, CHC, CFHA, CHA Studs | .312" | CHM-312 |
| | CSOS, CSS Standoffs | .344" | CHM-344 |
| 0420, M6 | CSOS Standoffs | .390" | CHM-390 |

RoHS compliance information can be found on our website.

Specifications subject to change without notice.
Check our website for the most current version of this bulletin.

PennEngineering®



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Asia/Pacific: Singapore • E-mail: singapore@pemnet.com • Tel: +65-6-745-0660 • Fax: +65-6-745-2400
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CAGE-46384

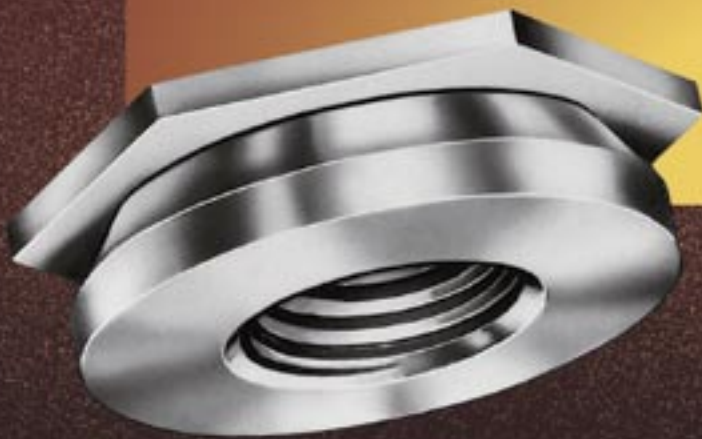


FLUSH

SELF-CLINCHING

FASTENERS

BULLETIN



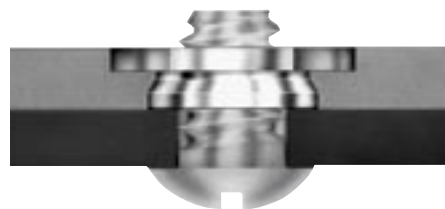
PEMSERT® SELF-CLINCHING FLUSH FASTENERS

PEMSERT self-clinching flush nuts are designed to be completely flush in sheets as thin as .060 in. / 1.5 mm.

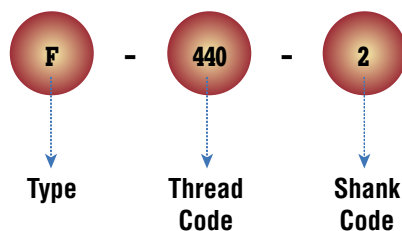
These fasteners are ideal for applications where a thin sheet requires load-bearing threads but still must remain smooth, with no protrusions on either surface. The PEM flush nut can be installed easily by squeezing it into a round, punched or drilled hole in metal sheets. When the fastener is installed, both the top and the bottom of the sheet remain smooth, enhancing the functional and cosmetic qualities of the entire assembly. PEMSERT self-clinching flush nuts can be installed in metal sheets before bending and forming. This can provide strong threads in places which would be inaccessible for installation after chassis are formed.

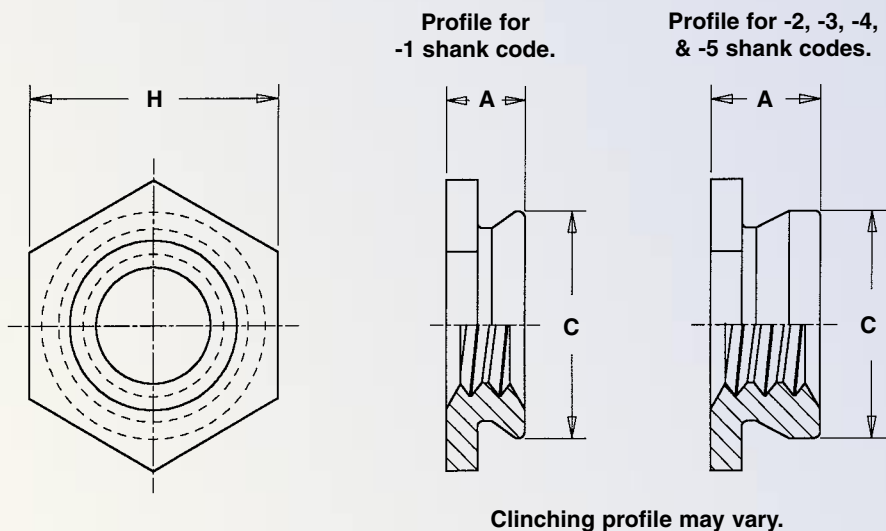
PEM flush fasteners are strong too. The hexagonal head along with the proven PEM self-clinching design ensures high axial and torsional strength and PEMSERT Type F fasteners meet US NASM45938/4 specifications.*

**To meet national aerospace standards and to obtain testing documentation, product must be ordered to NASM45938/4 specifications. Consult our Marketing department for a complete Military Specification and National Aerospace Standards Reference Guide (Bulletin NASM) or check our web site.*



Part Number Designation





All dimensions are in inches.

| UNIFIED | Thread Size | Type | Thread Code | Shank Code | A (Shank) Max. | Sheet Thickness | Hole Size In Sheet +.003 -.000 | C Max. | H Nom. | Min. Dist. Hole C/L To Edge |
|---------|------------------|------|-------------|------------|----------------|-----------------|--------------------------------|--------|--------|-----------------------------|
| | .086-56 (#2-56) | F | 256 | 1 | .060 | .060-.090 | .172 | .171 | .188 | .23 |
| | | | | 2 | .090 | .091-UP | | | | |
| | .112-40 (#4-40) | F | 440 | 1 | .060 | .060-.090 | .172 | .171 | .188 | .23 |
| | | | | 2 | .090 | .091-UP | | | | |
| | .138-32 (#6-32) | F | 632 | 1 | .060 | .060-.090 | .213 | .212 | .250 | .27 |
| | | | | 2 | .090 | .091-UP | | | | |
| | .164-32 (#8-32) | F | 832 | 1 | .060 | .060-.090 | .290 | .289 | .312 | .28 |
| | | | | 2 | .090 | .091-UP | | | | |
| | .190-32 (#10-32) | F | 032 | 1 | .060 | .060-.090 | .312 | .311 | .343 | .31 |
| | | | | 2 | .090 | .091-UP | | | | |
| | .250-20 (1/4-20) | F | 0420 | 3 | .120 | .125-.155 | .344 | .343 | .375 | .34 |
| | | | | 4 | .151 | .156-.186 | | | | |
| | | | | 5 | .182 | .187-UP | | | | |

All dimensions are in millimeters.

| METRIC | Thread Size x Pitch | Type | Thread Code | Shank Code | A (Shank) Max. | Sheet Thickness | Hole Size In Sheet +0.08 | C Max. | H Nom. | Min. Dist. Hole C/L To Edge |
|--------|---------------------|------|------------------|-----------------|----------------|-----------------|--------------------------|--------|--------|-----------------------------|
| | M2 x 0.4 | F | M2 ^{NS} | 1 | 1.53 | 1.53-2.3 | 4.37 | 4.35 | 4.8 | 6 |
| | | | | 2 | 2.3 | 2.32-UP | | | | |
| | M2.5 x 0.45 | F | M2.5 | 1 | 1.53 | 1.53-2.3 | 4.37 | 4.35 | 4.8 | 6 |
| | | | | 2 | 2.3 | 2.32-UP | | | | |
| | M3 x 0.5 | F | M3 | 1 | 1.53 | 1.53-2.3 | 4.37 | 4.35 | 4.8 | 6 |
| | | | | 2 | 2.3 | 2.32-UP | | | | |
| | M4 x 0.7 | F | M4 | 1 | 1.53 | 1.53-2.3 | 7.37 | 7.35 | 7.9 | 7.2 |
| | | | | 2 | 2.3 | 2.32-UP | | | | |
| | M5 x 0.8 | F | M5 | 1 | 1.53 | 1.53-2.3 | 7.92 | 7.9 | 8.7 | 8 |
| | | | | 2 | 2.3 | 2.32-UP | | | | |
| | M6 x 1 | F | M6 | 3 | 3.05 | 3.18-3.94 | 8.74 | 8.72 | 9.5 | 8.8 |
| | | | | 4 | 3.84 | 3.96-4.72 | | | | |
| | | | | 5 ^{NS} | 4.63 | 4.75-UP | | | | |

(NS) Not stocked. Available on special order.

FASTENER MATERIAL: 300 Series Stainless Steel.

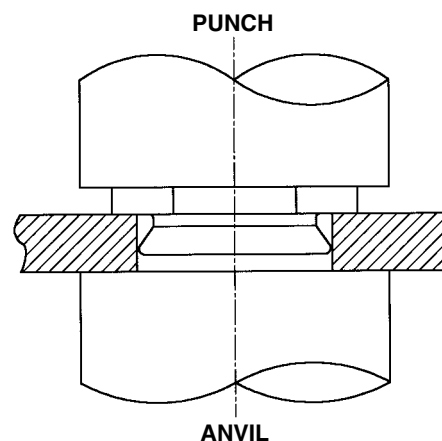
FINISH: Passivated and/or tested per ASTM A380.

FOR USE IN SHEET HARDNESS: 70 or less on the Rockwell "B" Scale.

THREADS: Internal, ANSI B1.1, 2B / ANSI / ASME B1.13M, 6H.

INSTALLATION

1. Punch or drill properly sized round mounting hole in sheet. Do not perform any secondary operations such as deburring.
2. Place shank of fastener into mounting hole, preferably the punch side.
3. With punch and anvil surfaces parallel, apply sufficient squeezing force only to embed hexagonal head flush in sheet. The metal displaced by the head flows evenly and smoothly around the back-tapered shank of the fastener, securely locking it into place with high pullout resistance while at the same time, the embedded hexagonal head provides high torque resistance.



PERFORMANCE DATA⁽¹⁾

| UNIFIED | Thread Code | Shank Code | Axial Tensile Strength (lbs.) | Max. Screw ⁽²⁾ Tightening Torque (in. lbs.) | Test Sheet Material | | | |
|---------|-------------|------------|-------------------------------|--|---------------------|----------------|---------------------|----------------|
| | | | | | 5052-H34 Aluminum | | Cold-rolled Steel | |
| | | | | | Installation (lbs.) | Pushout (lbs.) | Installation (lbs.) | Pushout (lbs.) |
| | | | | | | | | |
| | 256 | 1 | 130 | 1.50 | 2000 | 200 | 3000 | 200 |
| | | 2 | | | | | | |
| | 440 | 1 | 165 | 2.50 | 2000 | 200 | 3000 | 200 |
| | | 2 | | | | | | |
| | 632 | 1 | 190 | 3.50 | 2000 | 200 | 3000 | 200 |
| | | 2 | | | | | | |
| | 832 | 1 | 230 | 5.25 | 2000 | 240 | 4000 | 240 |
| | | 2 | | | | | | |
| | 032 | 1 | 280 | 7.50 | 2500 | 240 | 4000 | 240 |
| | | 2 | | | | | | |
| | 0420 | 3 | 1035 | 36 | 3500 | 640 | 4500 | 840 |
| | | 4 | | | | | | |
| | | 5 | | | | | | |

| METRIC | Thread Code | Shank Code | Axial Tensile Strength (kN) | Max. Screw ⁽²⁾ Tightening Torque (N•m) | Test Sheet Material | | | |
|--------|-------------|------------|-----------------------------|---|---------------------|-------------|-------------------|-------------|
| | | | | | 5052-H34 Aluminum | | Cold-rolled Steel | |
| | | | | | Installation (kN) | Pushout (N) | Installation (kN) | Pushout (N) |
| | | | | | | | | |
| | M2 | 1 | 0.57 | 0.16 | 8.9 | 890 | 13.3 | 890 |
| | | 2 | | | | | | |
| | M2.5 | 1 | 0.68 | 0.23 | 8.9 | 890 | 13.3 | 890 |
| | | 2 | | | | | | |
| | M3 | 1 | 0.85 | 0.36 | 8.9 | 890 | 13.3 | 890 |
| | | 2 | | | | | | |
| | M4 | 1 | 1 | 0.58 | 8.9 | 1068 | 17.8 | 1068 |
| | | 2 | | | | | | |
| | M5 | 1 | 1.3 | 0.88 | 11.1 | 1068 | 17.8 | 1068 |
| | | 2 | | | | | | |
| | M6 | 3 | 4.5 | 3.7 | 15.6 | 2847 | 20 | 3736 |
| | | 4 | | | | | | |
| | | 5 | | | | | | |

(1) The installation and pushout values reported are averages when all installation specifications and procedures are followed. Variations in mounting hole size, sheet material and installation procedure will affect this data. Performance testing of this product in your application is recommended. We will be happy to provide samples for this purpose.

(2) Head may bend and/or fail if screw is over-torqued beyond these values.

RoHS compliance information can be found on our website.

Specifications subject to change without notice.
Check our website for the most current version of this bulletin.

PennEngineering®



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Shanghai, China • E-mail: china@pemnet.com • Tel: +86-21-5868-3688 • Fax: +86-21-5868-3988

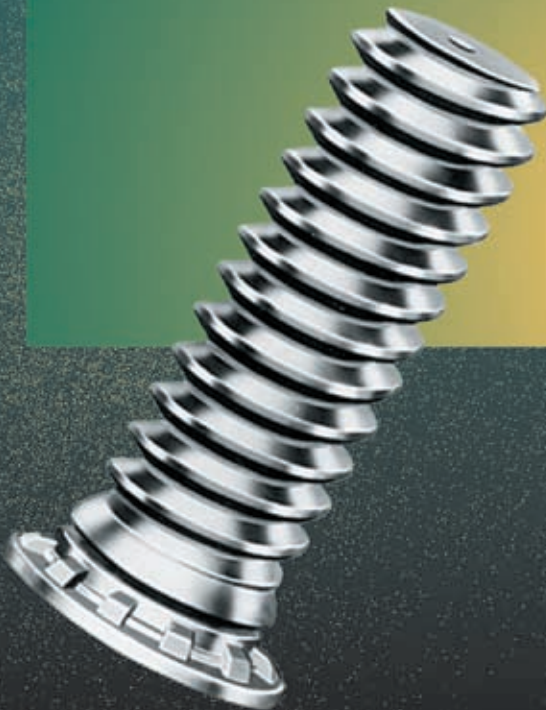
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CAGE-46384



BULLETIN

SELF-CLINCHING
STUDS AND
PINS



FH 306

Revised 606

SELF-CLINCHING STUDS AND PINS

FH (flush-head) Studs are installed by placing them in punched or drilled holes in the sheets and squeezing into place with any standard press. The squeezing action embeds the head of the stud into the sheet. The metal displaced by the head flows smoothly and evenly around the ribs and into the annular groove – creating a flush-head assembly and securely locking the stud into the sheet with high torque-out and pushout resistances. (See page FH-4). Also available unthreaded on special order. (See page FH-5)

TFH (non-flush) Studs are for sheets as thin as .020 inches / 0.51 mm. They may also be used in thicker sheets where flush head studs are not required. TFH studs are installed in the sheets in the same manner as flush-head studs; however, different punches and anvils are required. When installed, the TFH stud will be securely locked into the thin sheet with ample torque-out and pushout resistances. The stud head will not be flush but will project above the sheet surface approximately .025 in. / 0.64 mm. (See page FH-6)

HFH (high-strength) Studs replace weld studs with easier installation at lower costs. The large stud head which projects above the sheet material distributes the axial tightening force over a large area thereby improving pull through resistance. (See page FH-7)

HFHB (BUSBAR®) Studs are ideal for applications which demand superior electrical/mechanical attachment points. Phosphor bronze studs offer twice the conductivity of carbon steel studs. (See page FH-7)

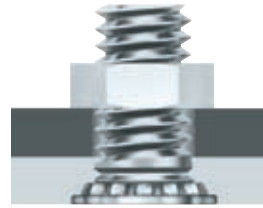
FHL (low-displacement head) Studs install closer to the edge of a sheet than standard studs without causing that edge to bulge. Depending on thread size, Type FHL studs can be installed from 25% to 50% closer to the edge of a sheet than standard self-clinching studs. (See page FH-8)

FH4 & FHP (flush-head) Studs for Stainless Steel are designed to provide strong threads in stainless steel sheets as thin as .040" / 1 mm. Type FHP studs have high corrosion resistance. Both types are designed for use in stainless steel sheets with a hardness of 92 or less on the Rockwell "B" scale. (See page FH-9)

TPS (flush-head) Pilot Pins satisfy a wide range of positioning, pivot, and alignment applications. The chamfered end makes mating hole location easy. (See page FH-10)

HFE (high-strength) Studs are designed with an enlarged head diameter to provide high-strength in sheets as thin as .040" / 1 mm. (See page FH-11)

Dog Point and Anti Cross-Thread Options
(See page FH-12)



Flush-head Studs.



Thin Sheet Studs.



High-strength Studs.

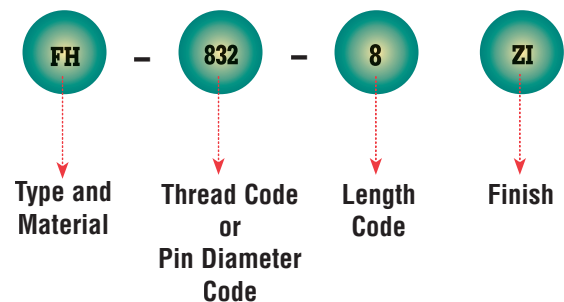


Low-displacement Head Studs.



Flush-head Pins.

Part Number Designation



PEM® Self-clinching Stud Selector Guide

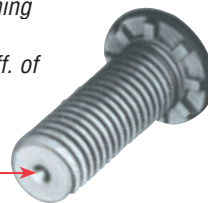
| PEM Stud Type | Page No. | Application Requires: | | | | | | | | | |
|---------------|----------|-----------------------|---------------|---|------------------------------|--------------------------------------|---------------------------------------|------------------------------|---------------------------|-------------------------------------|----------------|
| | | Flush-head | High-strength | Sheet thickness as thin as .020" / 0.51mm | High electrical conductivity | Mounting into stainless steel sheets | Compatibility with aluminum anodizing | Limited corrosion resistance | High corrosion resistance | Reduced centerline-to-edge distance | Unthreaded pin |
| FH | 4 | • | | | | | | | | | (1) |
| FHA | 4 | • | | | | | • | | • | | (1) |
| FHL | 8 | • | | | | | | | | • | |
| FHLS | 8 | • | | | | | | | • | • | |
| FHS | 4 | • | | | | | | | • | | (1) |
| FH4 | 9 | • | | | | • | | • | | | |
| FHP | 9 | • | | | | • | | | • | | |
| HFH | 7 | | • | | | | | | | | |
| HFHB | 7 | | | | • | | | | | | |
| HFHS | 7 | | • | | | | | | • | | |
| TFH | 6 | | | • | | | | | | | |
| TFHS | 6 | | | • | | | | | • | | |
| TPS | 10 | • | | | | | | | • | | • |
| HFE | 11 | | • | | | | | | | | |

Standard product features shown above. Studs can also be custom designed to meet your exact application requirements.

(1) Also available unthreaded on special order. See page FH-5.

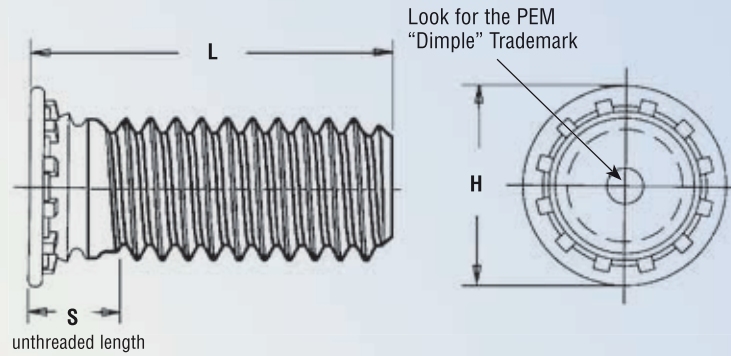
To be sure that you are getting genuine PEM® brand self-clinching studs, look for the "dimple" trademark. (Reg. Pat. & T.M. Off. of the U.S. and other countries.)

The Trademark for
Quality



TYPE FH/FHS/FHA

- Flush-head for sheet thickness of .040" / 1 mm and greater.



All dimensions are in inches.

| UNIFIED | Thread Size | Type | | | Thread Code | Length Code "L" ±.015 (Length Code in 16ths of an inch) | | | | | | | | | | Min. Sheet Thickness (1) | Hole Size in Sheet +.003 -0.000 | Max. Hole in Attach. Parts | H ± .015 | S Max. | Min. Dist. Hole C/L to Edge |
|-------------------|------------------|-------------------|-----------------|-------------------|-------------|--|-----------------|-----------------|------|------|------------------|------------------|------------------|------|------------------|--------------------------|---------------------------------|----------------------------|----------|--------|-----------------------------|
| | | Fastener Material | | | | | | | | | | | | | | | | | | | |
| | | Steel | Stainless Steel | Alu-minum | | .250 | .312 | .375 | .500 | .625 | .750 | .875 | 1.00 | 1.25 | 1.50 | | | | | | |
| | .086-56 (#2-56) | FH | FHS | NA | 256 | 4 | 5 | 6 | 8 | 10 | 12 ^{NS} | NA | NA | NA | NA | .040 | .085 | .105 | .144 | .075 | .187 |
| | .112-40 (#4-40) | FH | FHS | FHA | 440 | 4 | 5 | 6 | 8 | 10 | 12 | 14 ^{NS} | 16 ^{NS} | NA | NA | .040 | .111 | .135 | .176 | .085 | .219 |
| | .138-32 (#6-32) | FH | FHS | FHA | 632 | 4 | 5 | 6 | 8 | 10 | 12 | 14 | 16 | 20 | 24 ^{NS} | .040 | .137 | .160 | .206 | .090 | .250 |
| | .164-32 (#8-32) | FH | FHS | FHA | 832 | 4 | 5 | 6 | 8 | 10 | 12 | 14 | 16 | 20 | 24 ^{NS} | .040 | .163 | .185 | .237 | .090 | .281 |
| | .190-24 (#10-24) | FH | FHS | FHA ^{NS} | 024 | NA | 5 ^{NS} | 6 | 8 | 10 | 12 | 14 | 16 | 20 | 24 ^{NS} | .040 | .189 | .210 | .256 | .100 | .281 |
| | .190-32 (#10-32) | FH | FHS | FHA | 032 | NA | 5 ^{NS} | 6 | 8 | 10 | 12 | 14 | 16 | 20 | 24 | .040 | .189 | .210 | .256 | .100 | .281 |
| | .250-20 (1/4-20) | FH | FHS | FHA | 0420 | NA | NA | 6 ^{NS} | 8 | 10 | 12 | 14 | 16 | 20 | 24 | .062 | .249 | .270 | .337 | .135 | .312 |
| .313-18 (5/16-18) | FH | FHS | NA | 0518 | NA | NA | NA | 8 ^{NS} | 10 | 12 | 14 | 16 | 20 | 24 | .093 | .311 | .333 | .376 | .160 | .375 | |

All dimensions are in millimeters.

| METRIC | Thread Size x Pitch | Type | | | Thread Code | Length Code "L" ±0.4 (Length Code in millimeters) | | | | | | | | | | Min. Sheet Thickness (1) | Hole Size in Sheet +0.08 | Max. Hole in Attach. Parts | H ± 0.4 | S Max. | Min. Dist. Hole C/L to Edge |
|--------|---------------------|-------------------|-----------------|-------------------|--------------------|--|-----------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|--------------------------|--------------------------|----------------------------|---------|--------|-----------------------------|
| | | Fastener Material | | | | | | | | | | | | | | | | | | | |
| | | Steel | Stainless Steel | Alu-minum | | | | | | | | | | | | | | | | | |
| | M2.5x0.45 | FH | FHS | FHA | M2.5 | 6 ^{NS} | 8 ^{NS} | 10 ^{NS} | 12 ^{NS} | 15 ^{NS} | 18 ^{NS} | NA | NA | NA | NA | 1 | 2.5 | 3.1 | 4.1 | 1.95 | 5.4 |
| | M3x0.5 | FH | FHS | FHA | M3 | 6 ^{NS} | 8 | 10 | 12 | 15 | 18 | 20 ^{NS} | 25 ^{NS} | NA | NA | 1 | 3 | 3.6 | 4.6 | 2.1 | 5.6 |
| | M3.5x0.6 | FH | FHS | FHA | M3.5 ^{NS} | 6 | 8 | 10 | 12 | 15 | 18 | 20 | 25 | 30 | NA | 1 | 3.5 | 4.1 | 5.3 | 2.25 | 6.4 |
| | M4x0.7 | FH | FHS | FHA | M4 | 6 ^{NS} | 8 | 10 | 12 | 15 | 18 | 20 | 25 | 30 ^{NS} | 35 ^{NS} | 1 | 4 | 4.6 | 5.9 | 2.4 | 7.2 |
| | M5x0.8 | FH | FHS | FHA | M5 | NA | 8 ^{NS} | 10 | 12 | 15 | 18 | 20 | 25 | 30 ^{NS} | 35 ^{NS} | 1 | 5 | 5.6 | 6.5 | 2.7 | 7.2 |
| | M6x1 | FH | FHS | FHA ^{NS} | M6 | NA | NA | 10 | 12 | 15 | 18 | 20 | 25 | 30 | 35 | 1.6 | 6 | 6.6 | 8.2 | 3 | 7.9 |
| | M8x1.25 | FH | FHS | NA | M8 | NA | NA | NA | 12 ^{NS} | 15 | 18 | 20 | 25 | 30 | 35 | 2.4 | 8 | 8.6 | 9.6 | 3.7 | 9.6 |

NS Not Stocked, available on special order.

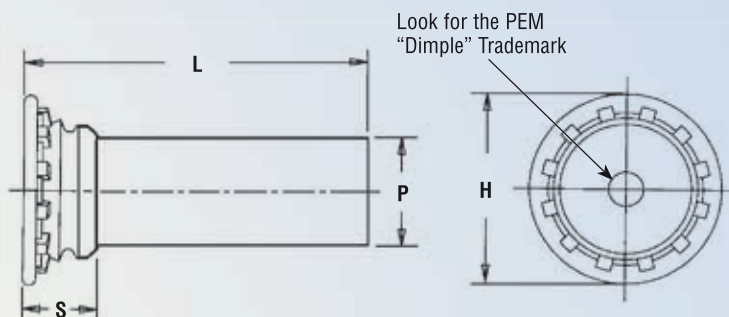
NA Not Available.

(1) See page FH-13 for installation tool requirements.

TYPE FH/FHN/FHS/FHA UNTHREADED STUDS

- Flush-head for sheet thickness of .040" / 1 mm and greater.

PEM® unthreaded studs are only available on special order. See page FH-10 for standard diameter pins.



All dimensions are in inches.

| | (1) Nominal Pin Diameter P±.002 | Type | | | Pin Dia. Code | Length Code “L” ±.015 (Length Code in 16ths of an inch) | | | | | | | | | | Min. Sheet Thick- ness | Hole Size in Sheet +.003 -.000 | H ± .015 | S Max. (3) | Min. Dist. Hole C/L to Edge | |
|---------|--|-------------------|--------------------|---------------|---------------------|--|------|------|------|------|------|------|------|------|------|---------------------------------|--|-------------|------------------|---|-----|
| | | Fastener Material | | | | .250 | .312 | .375 | .500 | .625 | .750 | .875 | 1.00 | 1.25 | 1.50 | | | | | | |
| | | Steel (2) | Stainless Steel | Alu- minum | | | | | | | | | | | | | | | | | |
| UNIFIED | .073 | FH | FHN | FHS | FHA | 073 | 4 | 5 | 6 | 8 | 10 | NA | NA | NA | NA | .040 | .085 | .15 | .075 | .19 | |
| | .084 | FH | FHN | FHS | FHA | 084 | 4 | 5 | 6 | 8 | 10 | 12 | NA | NA | NA | NA | .040 | .099 | .16 | .085 | .22 |
| | .094 | FH | FHN | FHS | FHA | 094 | 4 | 5 | 6 | 8 | 10 | 12 | NA | NA | NA | NA | .040 | .111 | .18 | .085 | .22 |
| | .103 | FH | FHN | FHS | FHA | 103 | 4 | 5 | 6 | 8 | 10 | 12 | NA | NA | NA | NA | .040 | .118 | .18 | .085 | .22 |
| | .106 | FH | FHN | FHS | FHA | 106 | 4 | 5 | 6 | 8 | 10 | 12 | 14 | 16 | 20 | NA | .040 | .125 | .19 | .090 | .22 |
| | .116 | FH | FHN | FHS | FHA | 116 | 4 | 5 | 6 | 8 | 10 | 12 | 14 | 16 | 20 | NA | .040 | .137 | .21 | .090 | .25 |
| | .120 | FH | FHN | FHS | FHA | 120 | 4 | 5 | 6 | 8 | 10 | 12 | 14 | 16 | 20 | 24 | .040 | .137 | .21 | .090 | .25 |
| | .137 | FH | FHN | FHS | FHA | 137 | 4 | 5 | 6 | 8 | 10 | 12 | 14 | 16 | 20 | 24 | .040 | .157 | .23 | .090 | .28 |
| | .141 | FH | FHN | FHS | FHA | 141 | 4 | 5 | 6 | 8 | 10 | 12 | 14 | 16 | 20 | 24 | .040 | .163 | .24 | .090 | .28 |
| | .160 | FH | FHN | FHS | FHA | 160 | 4 | 5 | 6 | 8 | 10 | 12 | 14 | 16 | 20 | 24 | .040 | .189 | .26 | .100 | .28 |
| | .167 | FH | FHN | FHS | FHA | 167 | NA | 5 | 6 | 8 | 10 | 12 | 14 | 16 | 20 | 24 | .040 | .189 | .26 | .100 | .28 |
| | .173 | FH | FHN | FHS | FHA | 173 | NA | 5 | 6 | 8 | 10 | 12 | 14 | 16 | 20 | 24 | .040 | .197 | .26 | .100 | .28 |
| | .207 | FH | FHN | FHS | FHA | 207 | NA | 5 | 6 | 8 | 10 | 12 | 14 | 16 | 20 | 24 | .062 | .236 | .32 | .135 | .31 |
| | .215 | FH | FHN | FHS | FHA | 215 | NA | NA | NA | 8 | 10 | 12 | 14 | 16 | 20 | 24 | .062 | .250 | .34 | .135 | .31 |
| | .223 | FH | FHN | FHS | FHA | 223 | NA | NA | NA | 8 | 10 | 12 | 14 | 16 | 20 | 24 | .062 | .250 | .34 | .135 | .31 |
| | .273 | FH | FHN | FHS | FHA | 273 | NA | NA | NA | 8 | 10 | 12 | 14 | 16 | 20 | 24 | .093 | .312 | .38 | .160 | .38 |
| | .281 | FH | FHN | FHS | FHA | 281 | NA | NA | NA | 8 | 10 | 12 | 14 | 16 | 20 | 24 | .093 | .312 | .38 | .160 | .38 |

All dimensions are in millimeters.

| METRIC | (1) Nominal Pin Diameter P±0.05 | Type | | | Pin Dia. Code | Length Code "L" ±0.4 (Length Code in millimeters) | | | | | | | | | | | Min. Sheet Thickness | Hole Size in Sheet +0.08 | H ± 0.4 | S Max. (3) | Min. Dist. Hole C/L to Edge |
|--------|---------------------------------------|-------------------|-----------------|---------------|---------------|--|---|----|----|----|----|----|----|----|----|----|----------------------|-----------------------------|------------|---------------|--------------------------------|
| | | Fastener Material | | | | | | | | | | | | | | | | | | | |
| | | Steel (2) | Stainless Steel | Alu- minum | | | | | | | | | | | | | | | | | |
| | 3 | FH | FHN | FHS | FHA | 3 mm | 6 | 8 | 10 | 12 | 15 | 18 | 20 | 25 | 30 | NA | 1 | 3.5 | 5.3 | 2.3 | 6.4 |
| 4 | FH | FHN | FHS | FHA | 4 mm | NA | 8 | 10 | 12 | 15 | 18 | 20 | 25 | 30 | 35 | 1 | 4.1 | 6 | 2.3 | 7.1 | |
| 5 | FH | FHN | FHS | FHA | 5 mm | NA | 8 | 10 | 12 | 15 | 18 | 20 | 25 | 30 | 35 | 1 | 5.5 | 7.5 | 2.55 | 7.6 | |

(1) Other pin diameters can be specified.

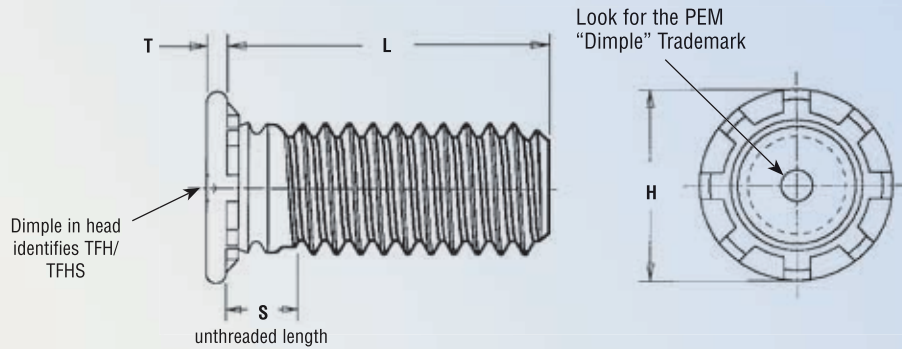
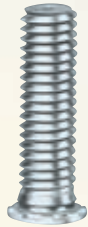
(2) See chart on page FH-13 for details.

(3) Pin diameter may exceed max. in this region.

NA Not Available.

TYPE TFH/TFHS

- Non-flush for sheets as thin as .020" / 0.51 mm.



All dimensions are in inches.

| UNIFIED | Thread Size | Type | | Thread Code | Length Code "L" ±.015 (Length Code in 16ths of an inch) | | | | | | | | | Min. Sheet Thickness (1) | Hole Size in Sheet +.003 -0.000 | Max. Hole in Attach. Parts | H ±.015 | S Max. | T Max. | Min. Dist. Hole C/L to Edge |
|------------------|-------------|-------------------|-------------------|-----------------|--|-----------------|-----------------|------------------|------------------|------------------|------------------|------------------|------------------|--------------------------|---------------------------------|----------------------------|---------|--------|--------|-----------------------------|
| | | Fastener Material | | | | | | | | | | | | | | | | | | |
| | | Steel | Stainless Steel | | | | | | | | | | | | | | | | | |
| | .250 | .312 | .375 | .500 | .625 | .750 | .875 | 1.00 | 1.25 | 1.50 | | | | | | | | | | |
| .086-56 (#2-56) | TFH | TFHS | 256 | 4 ^{NS} | 5 ^{NS} | 6 ^{NS} | 8 ^{NS} | 10 ^{NS} | 12 ^{NS} | NA | NA | NA | NA | .020 | .085 | .105 | .141 | .070 | .025 | .187 |
| .112-40 (#4-40) | TFH | TFHS | 440 | 4 | 5 | 6 | 8 | 10 | 12 | 14 ^{NS} | NA | NA | NA | .020 | .111 | .135 | .176 | .070 | .025 | .219 |
| .138-32 (#6-32) | TFH | TFHS | 632 | 4 | 5 | 6 | 8 | 10 | 12 | 14 ^{NS} | 16 ^{NS} | 20 ^{NS} | 24 ^{NS} | .020 | .137 | .160 | .203 | .070 | .025 | .250 |
| .164-32 (#8-32) | TFH | TFHS | 832 | 4 | 5 | 6 | 8 | 10 | 12 | 14 ^{NS} | 16 ^{NS} | 20 ^{NS} | 24 ^{NS} | .020 | .163 | .185 | .234 | .070 | .025 | .281 |
| .190-24 (#10-24) | TFH | TFHS | 024 ^{NS} | NA | 5 | 6 | 8 | 10 | 12 | 14 | 16 | 20 | 24 | .020 | .189 | .210 | .250 | .090 | .025 | .281 |
| .190-32 (#10-32) | TFH | TFHS | 032 | NA | 5 ^{NS} | 6 ^{NS} | 8 | 10 | 12 | 14 | 16 ^{NS} | 20 ^{NS} | 24 ^{NS} | .020 | .189 | .210 | .250 | .090 | .025 | .281 |

All dimensions are in millimeters.

| METRIC | Thread Size x Pitch | Type | | Thread Code | Length Code "L" ±0.4 (Length Code in millimeters) | | | | | | | | | Min. Sheet Thickness (1) | Hole Size in Sheet +0.08 | Max. Hole in Attach. Parts | H ±0.4 | S Max. | T Max. | Min. Dist. Hole C/L to Edge |
|--------|---------------------|-------------------|-----------------|-------------|--|----|----|----|----|------------------|------------------|------------------|------------------|--------------------------|--------------------------|----------------------------|--------|--------|--------|-----------------------------|
| | | Fastener Material | | | | | | | | | | | | | | | | | | |
| | | Steel | Stainless Steel | | | | | | | | | | | | | | | | | |
| | M3x0.5 | TFH | TFHS | M3 | 6 | 8 | 10 | 12 | 15 | 18 | 20 ^{NS} | 25 ^{NS} | NA | NA | 0.51 | 3 | 3.6 | 4.5 | 1.8 | 0.64 |
| M4x0.7 | TFH | TFHS | M4 | NA | 8 ^{NS} | 10 | 12 | 15 | 18 | 20 ^{NS} | 25 ^{NS} | 30 ^{NS} | 35 ^{NS} | 0.51 | 4 | 4.6 | 5.8 | 1.8 | 0.64 | 7.2 |
| M5x0.8 | TFH | TFHS | M5 | NA | 8 ^{NS} | 10 | 12 | 15 | 18 | 20 ^{NS} | 25 ^{NS} | 30 ^{NS} | 35 ^{NS} | 0.51 | 5 | 5.6 | 6.4 | 2.3 | 0.64 | 7.2 |

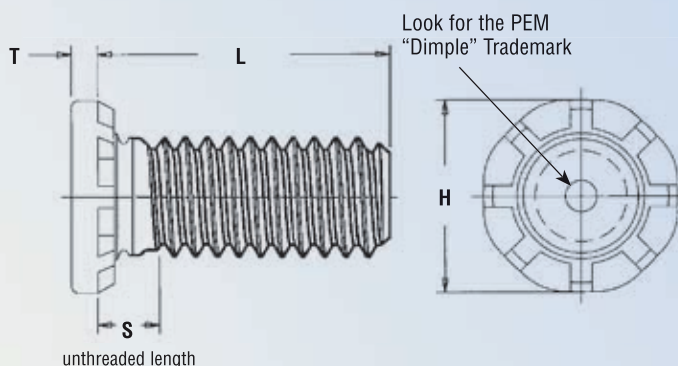
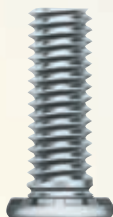
NS Not Stocked, available on special order.

NA Not Available.

(1) See page FH-13 for installation tool requirements.

TYPE HFH/HFHS/HFHB

- For high-strength applications in sheets as thin as .050" / 1.3 mm.
- Type HFHB for superior electrical/mechanical attachment in copper.



All dimensions are in inches.

| UNIFIED | Thread Size | Type | | | Thread Code | Length Code "L" ±.015 (Length Code in 16ths of an inch) | | | | | | | Min. Sheet Thickness | Hole Size in Sheet +.005 -.000 | Max. Hole in Attach. Parts | H ±.01 | S Max. | T Max. | Min. Dist. Hole C/L to Edge |
|----------------------|---------------------|-------------------|-----------------|---------------------|-------------|--|------|------|------|------|------|------|----------------------|--------------------------------------|----------------------------|-----------|-----------|-----------|-----------------------------------|
| | | Fastener Material | | | | | | | | | | | | | | | | | |
| | | Steel | Stainless Steel | Phosphor Bronze (1) | | | | | | | | | | | | | | | |
| | .190-32 (#10-32) | HFH | HFHS | HFHB | 032 | .500 | .750 | 1.00 | 1.25 | 1.50 | 1.75 | 2.00 | .050 | .190 | .250 | .300 | .105 | .040 | .415 |
| | .250-20 (1/4-20) | HFH | HFHS | HFHB | 0420 | .500 | .750 | 1.00 | 1.25 | 1.50 | 1.75 | 2.00 | .060 | .250 | .312 | .380 | .125 | .050 | .460 |
| .313-18 (5/16-18) | HFH | HFHS | HFHB | 0518 | .500 | .750 | 1.00 | 1.25 | 1.50 | 1.75 | 2.00 | .075 | .312 | .375 | .480 | .140 | .070 | .500 | |
| .375-16 (3/8-16) | HFH | HFHS | HFHB | 0616 | .500 | .750 | 1.00 | 1.25 | 1.50 | 1.75 | 2.00 | .090 | .375 | .437 | .580 | .155 | .085 | .530 | |

Tensile strength: HFH - 120 ksi / HFHS - 75 ksi / HFHB - 60 ksi

All dimensions are in millimeters.

| METRIC | Thread Size x Pitch | Type | | | Thread Code | Length code "L" ±0.4 (Length Code in millimeters) | | | | | | | Min. Sheet Thickness | Hole Size in Sheet +0.13 | Max. Hole in Attach. Parts | H ±0.25 | S Max. | T Max. | Min. Dist. Hole C/L to Edge |
|---------|---------------------|-------------------|--------------------|--------------------|------------------|--|------------------|------------------|------------------|------------------|------------------|------------------|----------------------|--------------------------|----------------------------|---------|--------|--------|-----------------------------|
| | | Fastener Material | | | | | | | | | | | | | | | | | |
| | | Steel | Stainless Steel | Phosphor Bronze(1) | | | | | | | | | | | | | | | |
| | M5x0.8 | HFH | HFHS | HFHB | M5 | 15 ^{NS} | 20 | 25 ^{NS} | 30 | 35 ^{NS} | 40 ^{NS} | 50 ^{NS} | 1.3 | 5 | 6.5 | 7.8 | 2.7 | 1.14 | 10.7 |
| | M6x1 | HFH | HFHS | HFHB | M6 | 15* | 20 | 25 ^{NS} | 30 | 35 ^{NS} | 40 ^{NS} | 50 ^{NS} | 1.5 | 6 | 7.5 | 9.4 | 2.8 | 1.27 | 11.5 |
| M8x1.25 | HFH | HFHS | HFHB | M8 | 15 ^{NS} | 20 | 25 ^{NS} | 30 | 35 ^{NS} | 40 ^{NS} | 50 ^{NS} | 2 | 8 | 9.5 | 12.5 | 3.5 | 1.78 | 12.7 | |
| M10x1.5 | HFH | HFHS | HFHB ^{NS} | M10 | 15 ^{NS} | 20 | 25 ^{NS} | 30 | 35 ^{NS} | 40 ^{NS} | 50 ^{NS} | 2.3 | 10 | 11.5 | 15.7 | 4.1 | 2.29 | 13.7 | |

Tensile strength: HFH - 900 MPa / HFHS - 515 MPa / HFHB - 415 MPa

NS Not Stocked, available on special order.

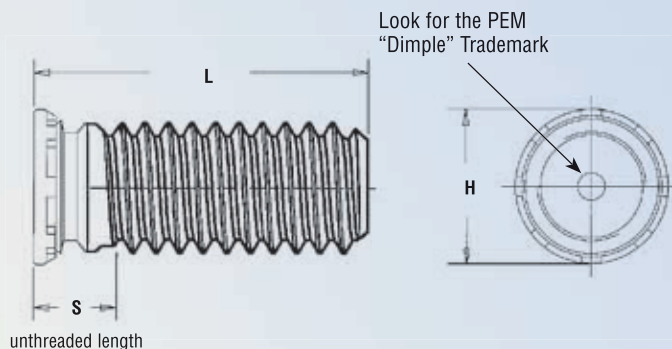
NA Not Available.

(1) The electrical resistance (tested at 10 amps DC) between phosphor bronze studs and copper busbars is below 104 μ ohms and 62 μ ohms for the #10-32 / M5 and 3/8-16 / M10 thread sizes respectively, after repeated thermal and mechanical cycling. Consult our Marketing department for complete electrical resistance test data for type HFHB studs installed in copper.

* Type HFHB-M6-15 is only available on special order.

TYPE FHL/FHLS™

- Installs closer to the edge of a sheet than standard studs with out causing that edge to bulge.
- Flush-head for sheet thickness .040" / 1 mm and greater.



All dimensions are in inches.

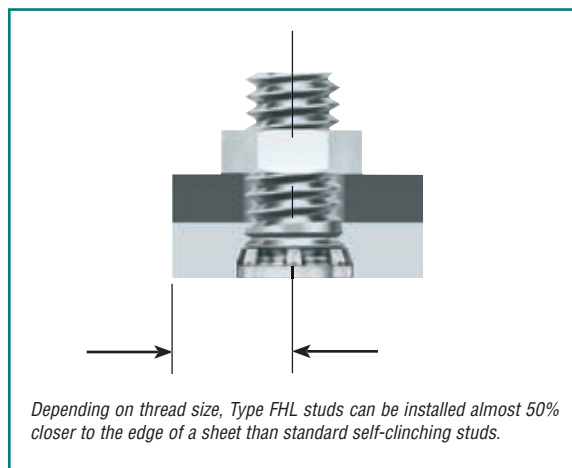
| UNIFIED | Thread Size | Type | | Thread Code | Length Code "L" ±.015 (Length Code in 16ths of an inch) | | | | | | | | | | Min. Sheet Thickness (1) | Hole Size in Sheet +.003 -.000 | Max. Hole in Attach. Parts | H ±.015 | S Max. | Min. Dist. Hole C/L to Edge |
|------------------|-----------------|-------------------|-----------------|-------------|--|------|------|------|------|------|------|------|------|------|--------------------------|--------------------------------|----------------------------|---------|--------|-----------------------------|
| | | Fastener Material | | | | | | | | | | | | | | | | | | |
| | | Steel | Stainless Steel | | | | | | | | | | | | | | | | | |
| | .086-56 (#2-56) | FHL | FHLS | 256 | .250 | .312 | .375 | .500 | .625 | .750 | .875 | 1.00 | 1.25 | 1.50 | | | | | | |
| | .112-40 (#4-40) | FHL | FHLS | 440 | 4 | 5 | 6 | 8 | 10 | 12 | 14 | 16 | 20 | 24 | | | | | | |
| | .138-32 (#6-32) | FHL | FHLS | 632 | 4 | 5 | 6 | 8 | 10 | 12 | 14 | 16 | 20 | 24 | | | | | | |
| .164-32 (#8-32) | FHL | FHLS | 832 | 4 | 5 | 6 | 8 | 10 | 12 | 14 | 16 | 20 | 24 | | | | | | | |
| .190-32 (#10-32) | FHL | FHLS | 032 | NA | 5 | 6 | 8 | 10 | 12 | 14 | 16 | 20 | 24 | | | | | | | |

All dimensions are in millimeters.

| METRIC | Thread Size x Pitch | Type | | Thread Code | Length Code "L" ±0.4 (Length Code in millimeters) | | | | | | | | | | Min. Sheet Thickness (1) | Hole Size in Sheet +0.08 | Max. Hole in Attach. Parts | H ±0.4 | S Max. | Min. Dist. Hole C/L to Edge |
|----------|---------------------|-------------------|-----------------|-------------|--|----|----|----|----|----|----|----|----|----|--------------------------|--------------------------|----------------------------|--------|--------|-----------------------------|
| | | Fastener Material | | | | | | | | | | | | | | | | | | |
| | | Steel | Stainless Steel | | | | | | | | | | | | | | | | | |
| | M2.5x0.45 | FHL | FHLS | M2.5 | 6 | 8 | 10 | 12 | 15 | 18 | NA | NA | NA | NA | 1 | 2.5 | 2.9 | 3.15 | 2.1 | 2.8 |
| | M3x0.5 | FHL | FHLS | M3 | 6 | 8 | 10 | 12 | 15 | 18 | 20 | 25 | NA | NA | 1 | 3 | 3.4 | 3.65 | 2.1 | 3.3 |
| M3.5x0.6 | FHL | FHLS | M3.5 | 6 | 8 | 10 | 12 | 15 | 18 | 20 | 25 | 30 | NA | 1 | 3.5 | 3.9 | 4.15 | 2.3 | 3.8 | |
| M4x0.7 | FHL | FHLS | M4 | 6 | 8 | 10 | 12 | 15 | 18 | 20 | 25 | 30 | 35 | 1 | 4 | 4.4 | 4.65 | 2.4 | 4.3 | |
| M5x0.8 | FHL | FHLS | M5 | NA | 8 | 10 | 12 | 15 | 18 | 20 | 25 | 30 | 35 | 1 | 5 | 5.4 | 5.9 | 2.7 | 5.6 | |

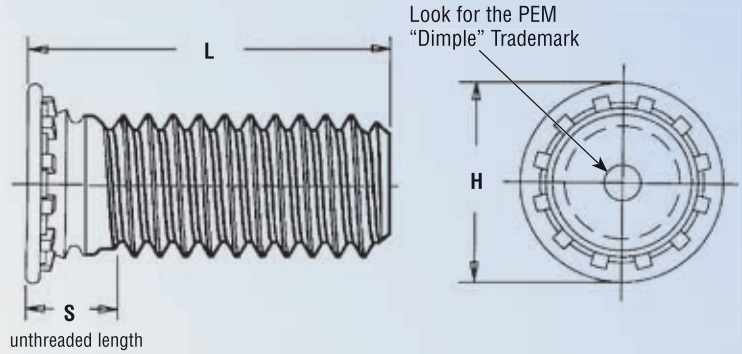
NA Not Available.

(1) See page FH-15 for installation tool requirements.



TYPES FH4™ AND FHP™

- Permanent installation into stainless steel sheets as thin as .040" / 1 mm.
- For use in sheet hardness of 92 or less on the Rockwell "B" scale.
- Type FHP is high corrosion resistant and ideal for medical, foodservice, and marine applications.



All dimensions are in inches.

| UNIFIED | Thread Size | Type | | Thread Code | Length Code "L" ±.015 (Length code in 16ths of an inch) | | | | | | | | | | Sheet Thick- ness | Hole Size in Sheet +.003 -.000 | Max. Hole in Attach. Parts | H ±.015 | S Max. | Min. Dist. Hole C/L to Edge |
|---------|---------------------|------|-----|-------------|--|-----------------|-----------------|------|------|------------------|------------------|------------------|------|------------------|----------------------|--------------------------------------|-------------------------------|------------|-----------|--------------------------------|
| | | | | | .250 | .312 | .375 | .500 | .625 | .750 | .875 | 1.00 | 1.25 | 1.50 | | | | | | |
| | .112-40 (#4-40) | FH4 | FHP | 440 | 4 | 5 | 6 | 8 | 10 | 12 ^{NS} | 14 ^{NS} | 16 ^{NS} | NA | NA | .040-.095 | .111 | .135 | .176 | .085 | .219 |
| | .138-32 (#6-32) | FH4 | FHP | 632 | 4 | 5 | 6 | 8 | 10 | 12 | 14 | 16 | 20 | 24 ^{NS} | .040-.095 | .137 | .160 | .206 | .090 | .250 |
| | .164-32 (#8-32) | FH4 | FHP | 832 | 4 | 5 | 6 | 8 | 10 | 12 | 14 | 16 | 20 | 24 ^{NS} | .040-.095 | .163 | .185 | .237 | .090 | .281 |
| | .190-32 (#10-32) | FH4 | FHP | 032 | NA | 5 ^{NS} | 6 | 8 | 10 | 12 | 14 | 16 | 20 | 24 | .040-.095 | .189 | .210 | .256 | .100 | .281 |
| | .250-20 (1/4-20) | FH4 | NA | 0420 | NA | NA | 6 ^{NS} | 8 | 10 | 12 | 14 | 16 | 20 | 24 | .062-.117 | .249 | .270 | .337 | .135 | .312 |

All dimensions are in millimeters.

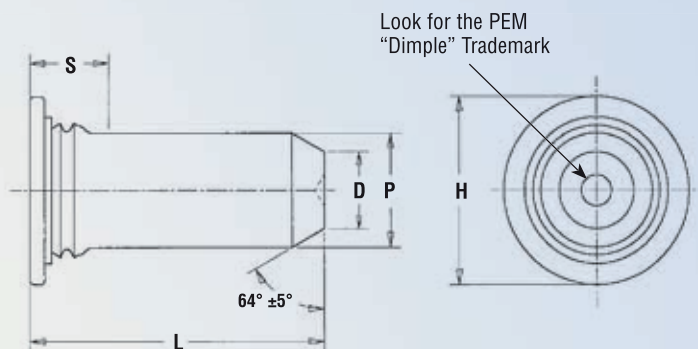
| METRIC | Thread Size x Pitch | Type | | Thread Code | Length Code "L" ±0.4 (Length Code in millimeters) | | | | | | | | | | Sheet Thick-ness | Hole Size in Sheet +0.08 | Max. Hole in Attach. parts | H ±0.4 | S Max. | Min. Dist. Hole C/L to Edge |
|--------|---------------------|------|-----|-------------|--|-----------------|----|----|----|----|------------------|------------------|------------------|------------------|------------------|--------------------------|----------------------------|--------|--------|-----------------------------|
| | M3 x 0.5 | FH4 | FHP | M3 | 6 ^{NS} | 8 | 10 | 12 | 15 | 18 | 20 ^{NS} | 25 ^{NS} | NA | NA | 1 - 2.4 | 3 | 3.6 | 4.6 | 2.1 | 5.6 |
| | M4 x 0.7 | FH4 | FHP | M4 | 6 ^{NS} | 8 | 10 | 12 | 15 | 18 | 20 | 25 | 30 ^{NS} | 35 ^{NS} | 1 - 2.4 | 4 | 4.6 | 5.9 | 2.4 | 7.2 |
| | M5 x 0.8 | FH4 | FHP | M5 | NA | 8 ^{NS} | 10 | 12 | 15 | 18 | 20 | 25 | 30 ^{NS} | 35 ^{NS} | 1 - 2.4 | 5 | 5.6 | 6.5 | 2.7 | 7.2 |
| | M6 x 1 | FH4 | NA | M6 | NA | NA | 10 | 12 | 15 | 18 | 20 | 25 | 30 | 35 | 1.6 - 3 | 6 | 6.6 | 8.2 | 3 | 7.9 |
| | | | | | | | | | | | | | | | | | | | | |

NS Not Stocked, available on special order.

NA Not Available.

TYPE TPS™

- Flush-mounted, self-clinching pilot pins.
- Satisfies a wide range of positioning, pivot, and alignment applications.
- Chamfered end makes mating hole location easy.



All dimensions are in inches.

| UNIFIED | Pin Diameter P ±.002 | Type | Pin Diameter Code | Length Code "L" ± .015 (Length Code in 16ths of an inch) | | | | | Min. Sheet Thickness | Hole Size in Sheet +.003 -.000 | D ±.006 | H ±.015 | S Max. (1) | Min. Distance Hole C/L to Edge |
|---------|-------------------------|------|----------------------|---|------|------|------|------|-------------------------|--------------------------------------|------------|------------|------------------|--------------------------------------|
| | | | | .375 | .500 | .625 | .750 | 1.00 | | | | | | |
| | .125 | TPS | 125 | 6 | 8 | 10 | 12 | NA | .040 | .144 | .090 | .205 | .090 | .250 |
| | .187 | TPS | 187 | 6 | 8 | 10 | 12 | 16 | .040 | .205 | .132 | .270 | .090 | .280 |
| | .250 | TPS | 250 | NA | 8 | 10 | 12 | 16 | .040 | .272 | .177 | .335 | .090 | .310 |

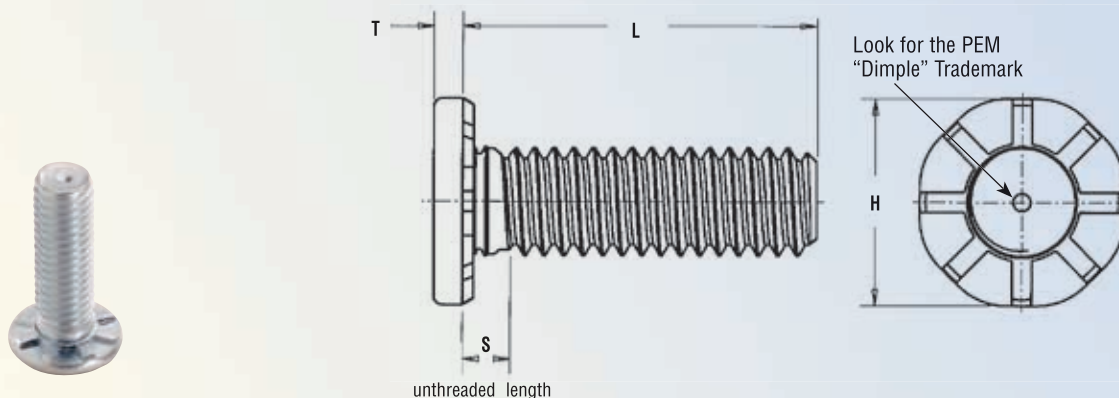
All dimensions are in millimeters.

| METRIC | Pin Diameter P ±0.05 | Type | Pin Diameter Code | Length Code "L" ± 0.4 (Length Code in millimeters) | | | | | Min. Sheet Thickness | Hole Size in Sheet +0.08 | D ±0.15 | H ±0.4 | S Max. (1) | Min. Distance Hole C/L to Edge |
|--------|-------------------------|------|----------------------|---|----|----|----|----|-------------------------|--------------------------------|------------|-----------|------------------|--------------------------------------|
| | | | | | | | | | | | | | | |
| | 3 | TPS | 3mm | 8 | 10 | 12 | 16 | NA | 1 | 3.5 | 2.05 | 5.2 | 2.29 | 6.4 |
| | 4 | TPS | 4mm | 8 | 10 | 12 | 16 | NA | 1 | 4.5 | 2.82 | 6.12 | 2.29 | 7.1 |
| | 5 | TPS | 5mm | NA | 10 | 12 | 16 | 20 | 1 | 5.5 | 3.53 | 7.19 | 2.29 | 7.6 |
| | 6 | TPS | 6mm | NA | NA | 12 | 16 | 20 | 1 | 6.5 | 4.24 | 8.13 | 2.29 | 7.9 |

(1) Pin diameter may exceed max. in this region.
NA Not Available.

TYPE HFE™

- Enlarged head diameter provides high-strength in sheets as thin as .040" / 1 mm.



All dimensions are in inches.

| UNIFIED | Thread Code | Type | Thread Code | Length Code "L" ±.015 (Length Code in 16ths of an inch) | | | | | | | Min. Sheet Thickness (1) | Hole Size In Sheet +.005 -.000 | H ±.01 | S Max. | T Max. | Max. Hole In Attached Parts | Min. Dist. Hole C/L To Edge |
|---------|----------------------|------|-------------|--|------|------|------|------------------|------------------|------------------|--------------------------|--------------------------------------|-----------|-----------|-----------|-----------------------------|-----------------------------|
| | | | | .500 | .750 | 1.00 | 1.25 | 1.50 | 1.75 | 2.00 | | | | | | | |
| | .190-32 (#10-32) | HFE | 032 | 8 ^{NS} | 12 | 16 | 20 | 24 ^{NS} | 28 ^{NS} | 32 ^{NS} | .040 | .190 | .357 | .102 | .048 | .280 | .360 |
| | .250-20 (1/4-20) | HFE | 0420 | 8 ^{NS} | 12 | 16 | 20 | 24 ^{NS} | 28 ^{NS} | 32 ^{NS} | .040 | .250 | .462 | .118 | .060 | .340 | .470 |
| | .313-18 (5/16-18) | HFE | 0518 | 8 ^{NS} | 12 | 16 | 20 | 24 | 28 ^{NS} | 32 ^{NS} | .060 | .312 | .586 | .133 | .083 | .402 | .560 |

Thread strength: 120 ksi

All dimensions are in millimeters.

| METRIC | Thread Code x Pitch | Type | Thread Code | Length Code "L" ±0.4 (Length Code in Millimeters) | | | | | | | Min. Sheet Thickness (1) | Hole Size In Sheet +0.13 | H ±0.25 | S Max. | T Max. | Max. Hole In Attached Parts | Min. Dist. Hole C/L To Edge |
|--------|---------------------|------|-------------|--|----|------------------|----|------------------|------------------|------------------|--------------------------|--------------------------|---------|--------|--------|-----------------------------|-----------------------------|
| | M5 x 0.8 | HFE | M5 | 15 ^{NS} | 20 | 25 ^{NS} | 30 | 35 ^{NS} | 40 ^{NS} | 50 ^{NS} | 1 | 5 | 9.6 | 2.6 | 1.35 | 7.3 | 10 |
| | M6 x 1 | HFE | M6 | 15 ^{NS} | 20 | 25 ^{NS} | 30 | 35 ^{NS} | 40 ^{NS} | 50 ^{NS} | 1 | 6 | 11.35 | 2.8 | 1.52 | 8.3 | 11.5 |
| | M8 x 1.25 | HFE | M8 | 15 ^{NS} | 20 | 25 ^{NS} | 30 | 35 ^{NS} | 40 ^{NS} | 50 ^{NS} | 1.5 | 8 | 15.3 | 3.3 | 2.13 | 10.3 | 14.5 |
| | | | | | | | | | | | | | | | | | |

Thread strength: 900 MPa

NS Not Stocked, available on special order.

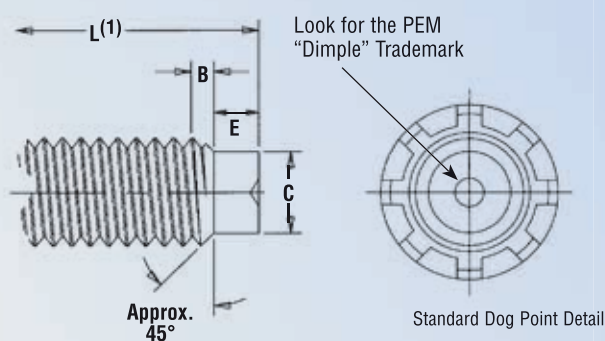
(1) See page FH-17 for installation tool requirements.

Dog Point And Anti Cross-Threading Options For Studs

PEM® AUTOSPEC® dog point lead-in option for studs allows quick location of the mating fastener during assembly and protects the first thread of the stud during nut engagement. This feature is available on Types FH, HFE, and HFE studs.



Dog Point Stud



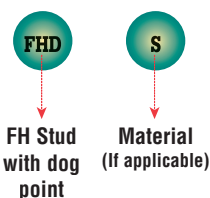
All dimensions are in inches.

| UNIFIED | Thread Size | C ±.005 (2) | E ±.010 | B Nom. Transitional Length to Full Thread |
|---------|----------------------|-------------------|------------|--|
| | .138-32 (#6-32) | .086 | .050 | .098 |
| | .164-32 (#8-32) | .111 | .055 | .099 |
| | .190-24 (#10-24) | .124 | .065 | .127 |
| | .190-32 (#10-32) | .138 | .065 | .098 |
| | .250-20 (1/4-20) | .173 | .085 | .149 |
| | .250-28 (1/4-28) | .192 | .085 | .110 |
| | .313-18 (5/16-18) | .228 | .105 | .164 |
| | .313-24 (5/16-24) | .246 | .105 | .127 |
| | .375-16 (3/8-16) | .282 | .125 | .182 |
| | .375-24 (3/8-24) | .309 | .125 | .126 |

All dimensions are in millimeters.

| METRIC | Thread Size x Pitch | C ±0.13 (2) | E ±0.25 | B Nom. Transitional Length to Full Thread |
|--------|------------------------|-------------------|------------|--|
| | M3.5 x 0.6 | 2.4 | 1.27 | 1.88 |
| | M4 x 0.7 | 2.79 | 1.4 | 2.26 |
| | M5 x 0.8 | 3.66 | 1.78 | 2.48 |
| | M6 x 1 | 4.37 | 2.03 | 3.05 |
| | M8 x 1.25 | 6.05 | 2.67 | 3.73 |
| | M10 x 1.5 | 7.72 | 3.43 | 4.37 |

Type Designation

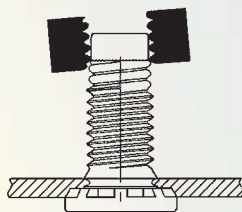


PennEngineering is a licensee of MATHread® Anti Cross-Threading Technology. This unique design allows the threads to self-align and drive easily with reduced effort. This helps speed assembly, reduce or eliminate failures, repairs, scrap, downtime, and warranty service associated with thread damage. This option is available on most types of PEM studs.

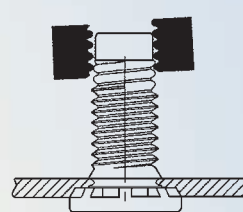


Anti Cross-Thread Feature

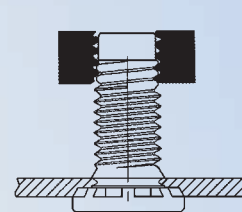
Here's how it works:



Misaligned Axis
The anti cross-threading design offers users the benefit of self-aligning, anti cross-threading threads.



Threads Cam
As the threads come into contact, the patented anti cross-thread begins to cam over the female thread.



Threads Drive Normally
The anti cross-threads promote alignment of the two thread helices. The fasteners drive easily with reduced effort.

(1) For "L" refer to type FH, HFE, or HFE lengths.

(2) Maximum dog point diameter is .003" / 0.08 mm less than minimum minor diameter of 2B or 6H nut threads.

If required, studs are supplied with raw material and plating certifications as required by automotive industry standards.

MATHread is a registered trademark of MATHread inc.

MATERIAL & FINISH SPECIFICATIONS

| | Threads (1) | Fastener Materials | | | | | | | Standard Finishes | | | Optional Finish (2) | For use in Sheet Hardness: | | | | | |
|--------------------------------|---|---------------------------|--------------|----------------------------|---------------------------------|------------------------------|---|----------------------------|-------------------|--|--|---|--------------------------------------|--------------------------------------|--------------------------------------|--------------------------------------|--------------------------------------|--------------------------------------|
| Type | External, ANSI B1.1, 2A ANSI/ASME B1.13M 6g | Heat-Treated Carbon Steel | Carbon Steel | 300 Series Stainless Steel | 2024-T4 Aluminum (Plain Finish) | CDA #510 Phosphor Bronze (3) | Precipitation Hardening Grade Stainless Steel | 400 Series Stainless Steel | No Finish (4) (5) | Zinc Per ASTM B 633 SC1 (5µm), Type III, Colorless | Passivated and/or Tested Per ASTM A380 | Zinc Per ASTM B 633 SC1 (5µm) Type II, Yellow | 50 or less on the Rockwell "B" Scale | 55 or less on the Rockwell "B" Scale | 70 or less on the Rockwell "B" Scale | 80 or less on the Rockwell "B" Scale | 85 or less on the Rockwell "B" Scale | 92 or less on the Rockwell "B" Scale |
| FH | • | • | | | | | | | | • | | • | | | | • | | |
| FHS | • | | | • | | | | | | | • | | | | • | | | |
| FHA | • | | | | • | | | | • | | | | • | | | | | |
| FHN | • | | • | | | | | | | • | | • | • | | | | | |
| FH4 | • | | | | | | | • | | | • | | | | | | | • |
| FHP | • | | | | | | • | | | | • | | | | | | | • |
| FHL | • | • | | | | | | | | • | | | | | | • | | |
| FHLS | • | | | • | | | | | | | • | | | | • | | | |
| TFH | • | • | | | | | | | | • | | • | | | | • | | |
| TFHS | • | | | • | | | | | | | • | | | | • | | | |
| HFH | • | • | | | | | | | | • | | • | | | | | • | |
| HFHB | • | | | | | • | | | • | | | | | • | | | | |
| HFHS | • | | | • | | | | | | | • | | | | • | | | |
| TPS | | | | • | | | | | | | • | | | | • | | | |
| HFE | • | • | | | | | | | | • | | • | | | | | • | |
| Part Number Codes for Finishes | | | | | | | | | X | ZI | None | ZC | | | | | | |

- (1) For plated studs, Class 2A/6g, the maximum major and pitch diameter, after plating, may equal basic sizes and be gauged to Class 3A/4h. Per ANSI B1.1, Section 8, Table 3A and ANSI B1.13M, Section 8, paragraph 8.2.
- (2) Special order with additional charge.
- (3) Material properties – yield strength: 50,000 psi (345 MPa), tensile strength: 63,000 psi (434 MPa).
- (4) Part numbers for aluminum studs have no plating suffix.
- (5) "X" suffix studs may have pitch diameters and major diameters below 2A "Basic", per ANSI B1.1, Section 7, and B1.13M, Section 8 to allow for minimum of 0.0002" of plating.

INSTALLATION

For Types FH, FHS, FHA, FHL, FHLS, TFH, TFHS, HFH, HFHB, HFHS and HFE studs

PEM brand self-clinching studs are installed by placing them in punched or drilled holes in the sheet material and squeezing them into place with any standard press.

All that is required is a flat or recessed punch and a plain anvil having a hole to clear the thread diameter so that force is applied between the top of the stud head and underside of the sheet material. The squeezing action forces the ribs of the stud into the sheet, displacing sheet material, causing it to fill the annular groove under the head of the stud.

The following information provides specifics with regard to stud installation.

All dimensions are in inches.

| UNIFIED | Thread Code | Anvil Dimensions | |
|---------|-------------|------------------|-------------|
| | | A | C |
| | 256 | .110-.114 | .087-.090 |
| | 440 | .136-.140 | .113-.116 |
| | 632 | .162-.166 | .139-.142 |
| | 832 | .188-.192 | .165-.168 |
| | 024 & 032 | .216-.220 | .191-.194 |
| | 0420 | .295-.300 | .250-.253 |
| | 0518 | .334-.338 | .3125-.3155 |
| | 0616 | — | .375-.378 |

All dimensions are in millimeters.

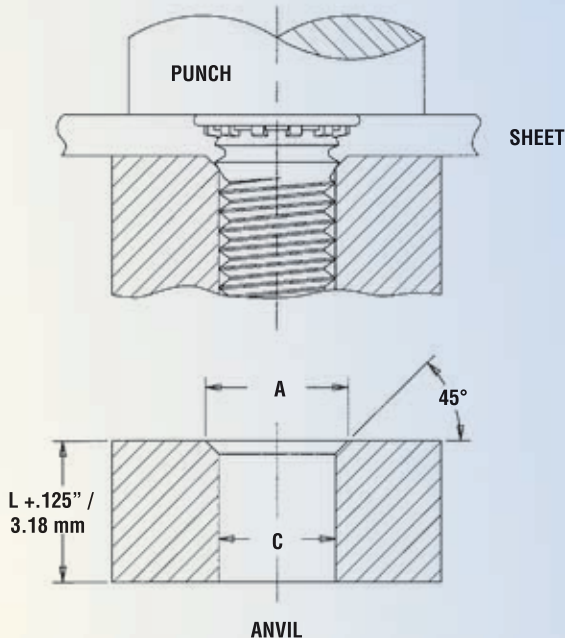
| METRIC | Thread Code | Anvil Dimensions | |
|--------|-------------|------------------|----------|
| | | A + 0.1 | C + 0.08 |
| | M2.5 | 3.1 | 2.53 |
| | M3 | 3.6 | 3.03 |
| | M3.5 | 4.1 | 3.53 |
| | M4 | 4.6 | 4.03 |
| | M5 | 5.6 | 5.03 |
| | M6 | 6.6 | 6.03 |
| | M8 | 8.6 | 8.03 |
| | M10 | — | 10.03 |

INSTALLATION (Continued)

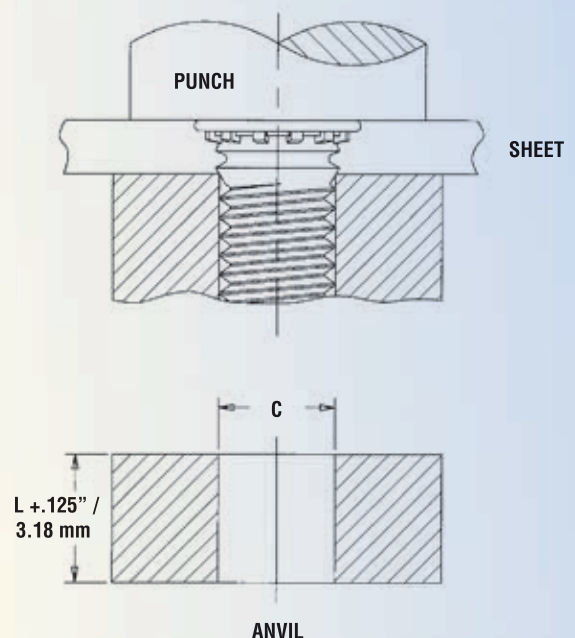
Type FH/FHN/FHS/FHA (Flush) Threaded and Unthreaded Studs

The illustrations below indicate suggested tooling for applying installation forces. Note that for sheets .060" / 1.51 mm and thicker, the anvil requires only a straight thru hole to accommodate the stud. For sheets less than .060" / 1.51 mm, the hole requires a countersink with dimension A at the top to provide for metal flow around the shank of the stud.

Tooling for sheet thicknesses less than .060" / 1.51 mm with #2 thru #10 / M3 thru M5 thread sizes and less than .093" / 2.4 mm for 1/4" / M6 threads.



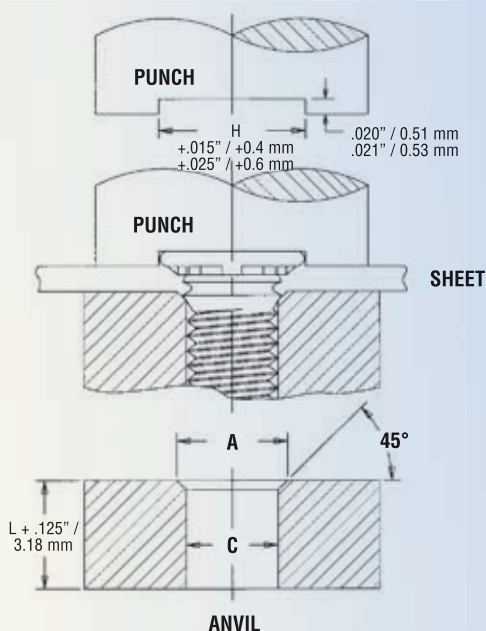
Tooling for sheet thicknesses .060" / 1.51 mm and greater with #2 thru #10 / M3 thru M5 thread sizes and .093" / 2.41 mm and greater for 1/4" and 5/16" / M6 and M8 threads.



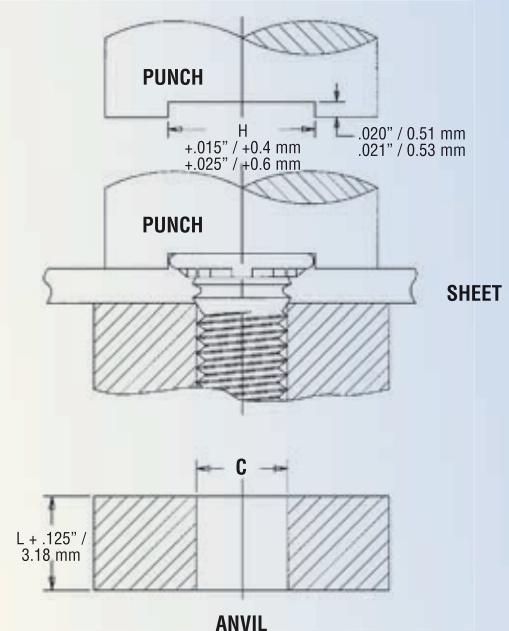
Type TFH/TFHS (Non-Flush) Studs

The illustrations below indicate suggested tooling for type TFH studs. Note that for sheets .030" / 0.76 mm and thicker, the anvil requires only a straight thru hole to accommodate the stud. For sheets less than .030" / 0.76 mm down to .020" / 0.51 mm, the hole requires a countersink with dimension A at the top to provide for metal flow around the shank of the stud. The standard punch design below provides clearance for the stud head and reduces chances of over squeezing the head of the stud into the sheet metal. When installed, the stud head is not flush but will protrude approximately .025" / 0.64 mm.

Tooling for sheet thicknesses less than .030" / 0.76 mm down to .020" / 0.51 mm.



Tooling for sheet thicknesses .030" / 0.76 mm and greater.

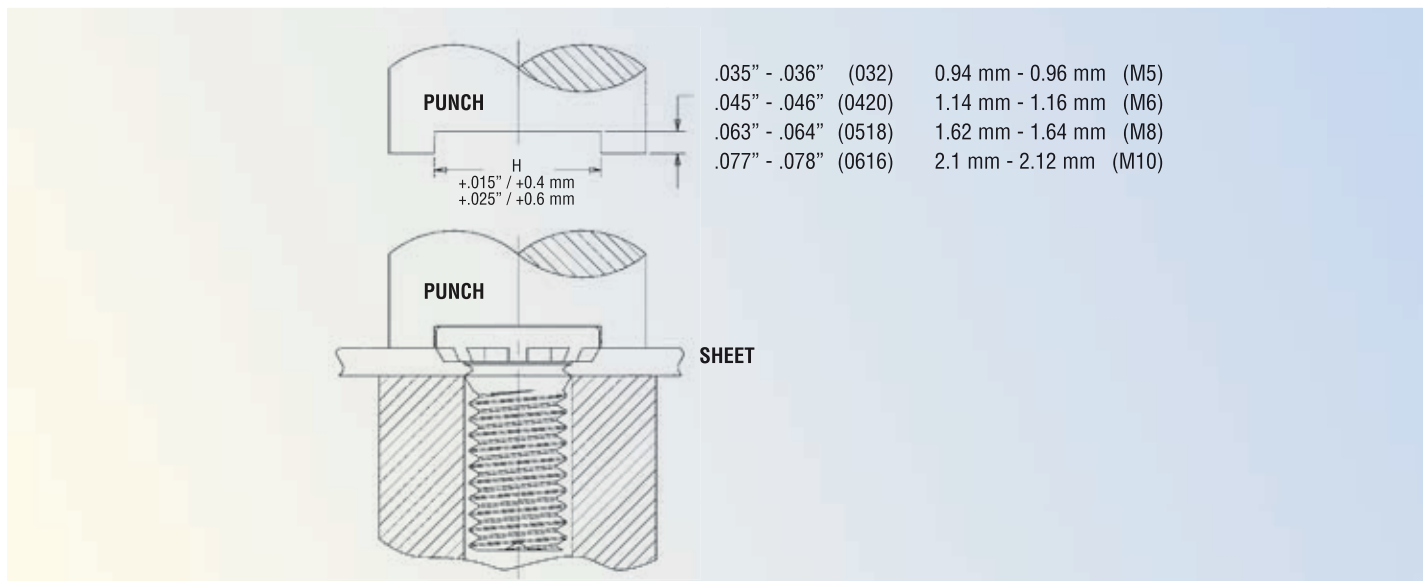


INSTALLATION (Continued)

Type HFH/HFHB/HFHS Studs

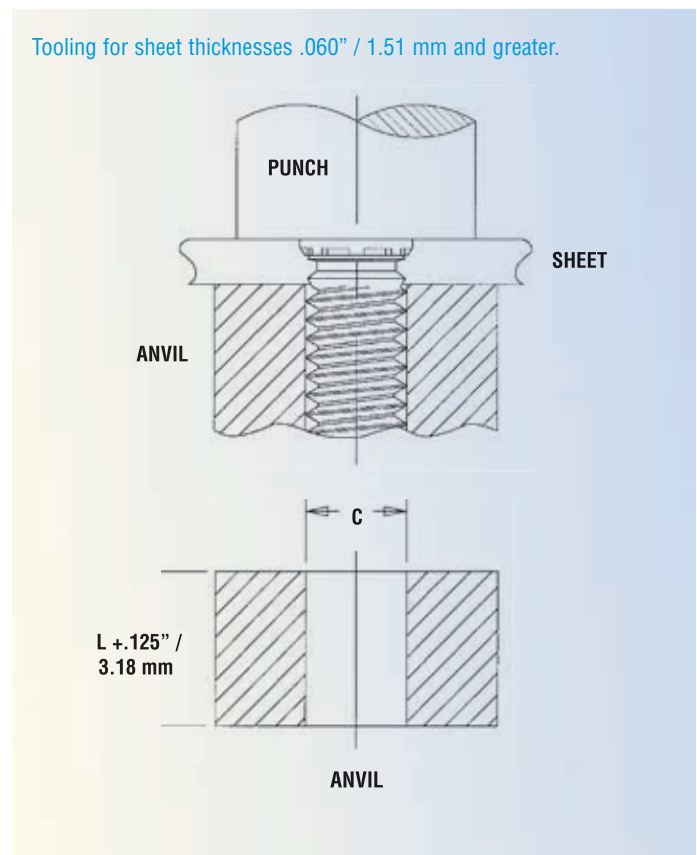
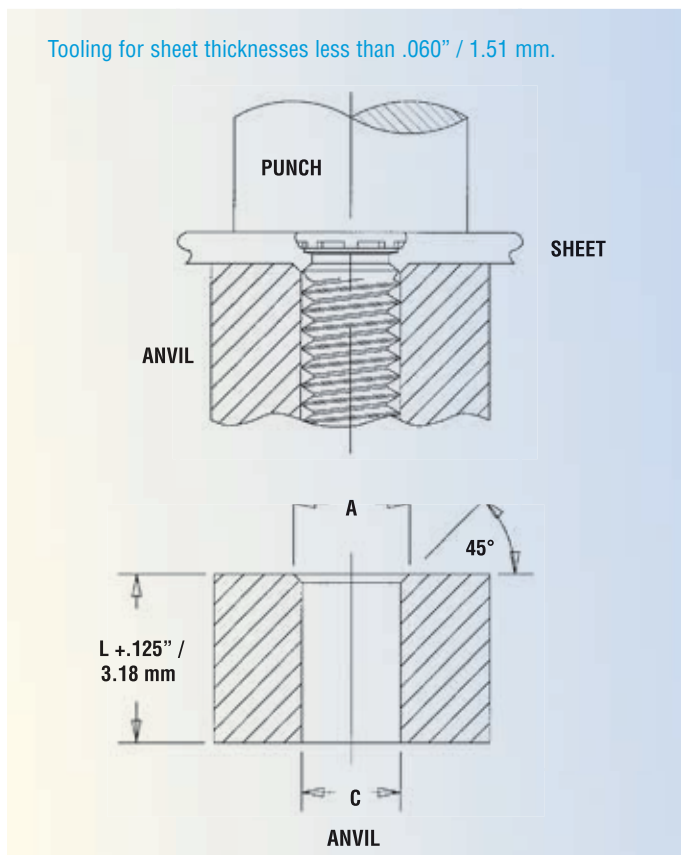
Apply squeezing force on the punch sufficient only to embed the ribs on the head of the stud into the sheet.

The illustration below indicates suggested tooling for Type HFH self-clinching studs. The standard punch design provides clearance for the stud head and reduces chances of over squeezing.



Type FHL/FHLS Studs

The illustrations below indicate suggested tooling for applying installation forces. Note that for sheets .060" / 1.51 mm and thicker, the anvil requires only a straight thru hole to accommodate the stud. For sheets less than .060" / 1.51 mm, the hole requires a countersink with dimension A at the top to provide for metal flow around the shank of the stud.



INSTALLATION (Continued)

Type FH4 and FHP Self-Clinching Studs for Stainless Steel

For Type FH4 studs, a special anvil with a raised ring is required to create a proper installation. The raised ring acts as a second displacer of the stainless sheet material, thereby ensuring that the annular groove is filled. We do not recommend the use of FH4 studs in sheet thicknesses greater than .095" / 2.41 mm.

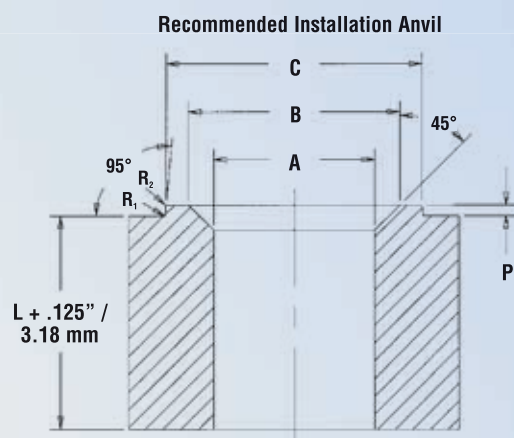
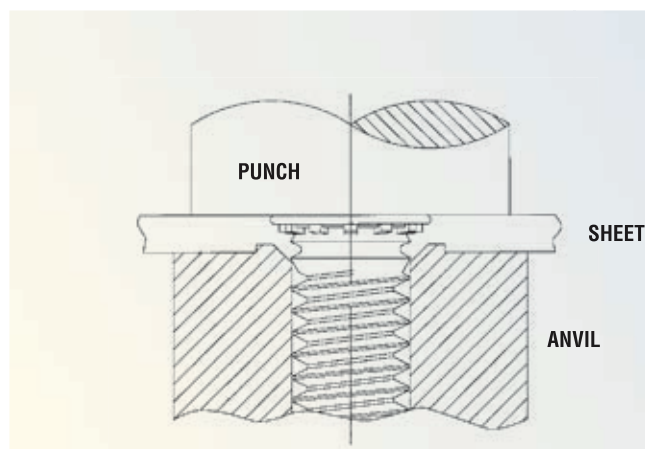
The special anvils are available from PEM stock or can be machined from suitable tool steel. A hardness of Rc55 minimum is required to provide long anvil life. We recommend measuring the "P" dimension every 5000 installations to ensure that the anvil remains within specification.

All dimensions are in inches.

| UNIFIED | Thread Code | Anvil Dimensions | | | | | | Anvil Part No. |
|---------|-------------|-------------------|------------|------------|------------|------------------------|------------------------|----------------|
| | | A +.003 - .000 | B ±.002 | C ±.002 | P ±.001 | R ₁ Max. | R ₂ Max. | |
| | 440 | .113 | .144 | .174 | .010 | .003 | .005 | 8001645 |
| | 632 | .140 | .170 | .200 | .010 | .003 | .005 | 8001644 |
| | 832 | .166 | .202 | .236 | .010 | .003 | .005 | 8001643 |
| | 032 | .191 | .235 | .275 | .010 | .003 | .005 | 8001642 |
| | 0420 | .252 | .324 | .360 | .020 | .003 | .005 | 8002535 |

All dimensions are in millimeters.

| METRIC | Thread Code | Anvil Dimensions | | | | | | Anvil Part No. |
|--------|-------------|------------------|------------|------------|-------------|------------------------|------------------------|----------------|
| | | A +0.08 | B ±0.05 | C ±0.05 | P ±0.025 | R ₁ Max. | R ₂ Max. | |
| | M3 | 3.05 | 3.81 | 4.57 | 0.25 | 0.08 | 0.13 | 8001678 |
| | M4 | 4.04 | 4.95 | 5.82 | 0.25 | 0.08 | 0.13 | 8001677 |
| | M5 | 5.08 | 6.15 | 7.16 | 0.25 | 0.08 | 0.13 | 8001676 |
| | M6 | 6.05 | 7.87 | 8.79 | 0.51 | 0.08 | 0.13 | 8002536 |



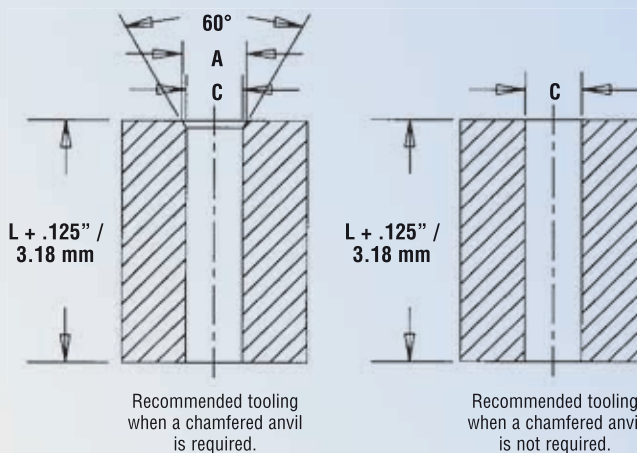
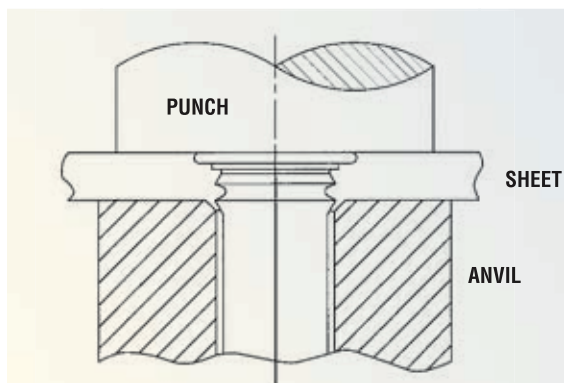
Type TPS Flush-Mounted, Self-Clinching Pilot Pins

All dimensions are in inches.

| UNIFIED | Pin Dia. Code | Test Sheet Thickness | Anvil Dimensions | |
|---------|---------------|----------------------|------------------|---------|
| | | | A ±.002 | C ±.002 |
| | 125 | .040 - .060 | .160 | .130 |
| | | Over .060 | (1) | |
| | 187 | .040 - .065 | .220 | .192 |
| | | Over .065 | (1) | |
| | 250 | .040 - .075 | .285 | .255 |
| | | Over .075 | (1) | |

All dimensions are in millimeters.

| METRIC | Pin Dia. Code | Test Sheet Thickness | Anvil Dimensions | |
|--------|---------------|----------------------|------------------|---------|
| | | | A ±0.05 | C ±0.05 |
| | 3mm | 1 - 1.7 | 3.88 | 3.11 |
| | | Over 1.7 | (1) | |
| | 4mm | 1 - 1.7 | 4.88 | 4.11 |
| | | Over 1.7 | (1) | |
| | 5mm | 1 - 1.8 | 5.89 | 5.13 |
| | | Over 1.8 | (1) | |
| | 6mm | 1 - 1.9 | 6.89 | 6.12 |
| | | Over 1.9 | (1) | |



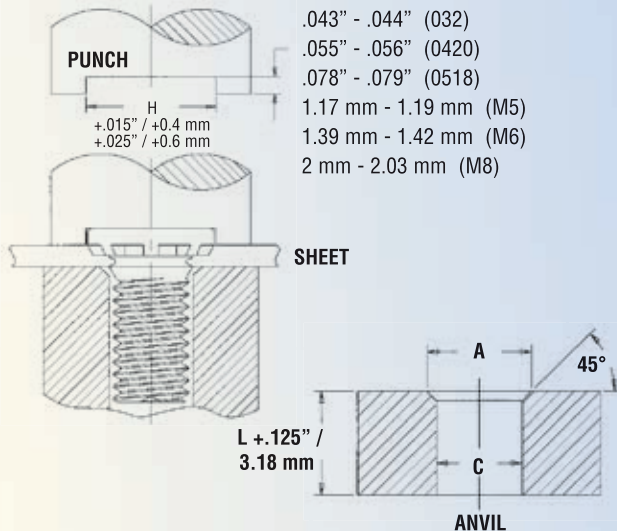
(1) Chamfered anvil not required.

INSTALLATION (Continued)

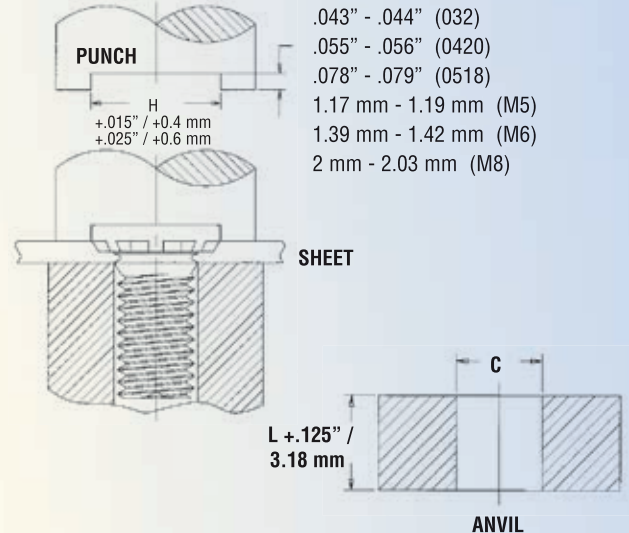
Type HFE Studs

The illustrations below indicate suggested tooling for applying installation forces. Note that for sheets .060" / 1.51 mm and thicker, the anvil requires only a straight thru hole to accommodate the stud. For sheets less than .060" / 1.51 mm to less than .075" / 1.9 mm, the hole requires a countersink with dimension A at the top to provide for metal flow around the shank of the stud.

Tooling for sheet thicknesses less than .060" / 1.51 mm with #10 / M5 and 1/4" / M6 thread sizes and less than .075" / 1.9 mm with 5/16" / M8 threads.



Tooling for sheet thicknesses .060" / 1.51 mm and greater with #10 / M5 and 1/4" / M6 thread sizes and .075" / 1.9 mm and greater with 5/16" / M8 threads.



Other Considerations

Installation Equipment

For best results we recommend using a PEMSERTER® press for either manual or automatic installation of PEM® FH, FHS, FHA, FHL, FHLS, FH4, TFH, TFHS, HFH, HFHB, HFHS and TPS fasteners. To further reduce costs, the PEMSERTER In-die system allows you install PEM brand studs during the stamping process. This eliminates secondary insertion operations and improves quality. For more information on our line of presses call 1-800-523-5321 (USA only).

Thread Mask

PEM® Blu-Coat™ thread mask is available for applications where hardware is installed prior to painting. During assembly, the threads of the mating hardware will remove paint, electro deposited automotive under coatings, and weld spatter upon application of torque. PEM studs can be specially ordered with thread mask applied.



PERFORMANCE DATA

The pushout, torque-out, and pull thru values reported here pertain only to the holding power of the stud to the sheet into which it is installed. These values in no way pertain to the axial strength of the threads, allowable tightening torque or design loading of an assembly. The values reported are anticipated **destructive averages** when all installation specifications and procedures are followed. When properly installed, PEM self-clinching studs should perform better than the values given here.

Type FH and FHS Flush-Head Studs

| UNIFIED | Thread Code | Max. Nut Tightening Torque (in. lbs.) ⁽¹⁾ | Type | Test Sheet Thickness and Material | Sheet Hardness HRB | Installation (lbs.) | Pushout (lbs.) | Torque-out (in. lbs.) | Pull Thru (lbs.) |
|---------|-------------|--|------|-----------------------------------|--------------------|---------------------|----------------|-----------------------|------------------|
| | 256 | 2.3 | FH | .062" Aluminum | 29 | 2000 | 100 | 5 | 425 |
| | | | FHS | .062" Aluminum | 29 | 2000 | 100 | 4.5 | 300 |
| | | | FH | .060" Steel | 59 | 2500 | 180 | 5 | 425 |
| | | | FHS | .060" Steel | 59 | 2500 | 180 | 4.5 | 300 |
| | 440 | 5 | FH | .064" Aluminum | 29 | 3800 | 170 | 10 | 650 |
| | | | FHS | .064" Aluminum | 29 | 3200 | 170 | 8 | 500 |
| | | | FH | .060" Steel | 59 | 4300 | 275 | 10 | 650 |
| | | | FHS | .060" Steel | 59 | 4700 | 275 | 8 | 500 |
| | 632 | 9 | FH | .064" Aluminum | 29 | 3800 | 180 | 17 | 850 |
| | | | FHS | .064" Aluminum | 29 | 3500 | 180 | 16 | 775 |
| | | | FH | .060" Steel | 59 | 4700 | 300 | 20 | 850 |
| | | | FHS | .060" Steel | 59 | 5000 | 300 | 16 | 775 |
| | 832 | 17 | FH | .064" Aluminum | 29 | 4800 | 220 | 28 | 1000 |
| | | | FHS | .064" Aluminum | 29 | 4500 | 220 | 28 | 940 |
| | | | FH | .060" Steel | 59 | 6800 | 375 | 40 | 1270 |
| | | | FHS | .060" Steel | 59 | 5500 | 375 | 28 | 1130 |
| | 032 | 27 | FH | .064" Aluminum | 29 | 5500 | 270 | 30 | 1220 |
| | | | FHS | .064" Aluminum | 29 | 5500 | 270 | 30 | 1220 |
| | 024 | 24 | FH | .060" Steel | 59 | 7500 | 450 | 60 | 1410 |
| | | | FHS | .060" Steel | 59 | 6800 | 450 | 50 | 1410 |
| | 0420 | 58 | FH | .093" Aluminum | 28 | 6500 | 310 | 65 | 2300 |
| | | | FHS | .093" Aluminum | 28 | 6500 | 310 | 65 | 2100 |
| | | | FH | .088" Steel | 46 | 9500 | 575 | 100 | 2550 |
| | | | FHS | .088" Steel | 46 | 10000 | 575 | 100 | 2550 |
| | 0518 | 120 | FH | .093" Aluminum | 28 | 6500 | 430 | 100 | 2260 |
| | | | FHS | .093" Aluminum | 28 | 6700 | 430 | 100 | 2260 |
| | | | FH | .093" Steel | 46 | 10000 | 650 | 175 | 3475 |
| | | | FHS | .093" Steel | 46 | 11200 | 650 | 175 | 3120 |

| METRIC | Thread Code | Max. Nut Tightening Torque (N•m) ⁽¹⁾ | Type | Test Sheet Thickness and Material | Sheet Hardness HRB | Installation (kN) | Pushout (N) | Torque-out (N•m) | Pull Thru (N) |
|--------|-------------|---|------|-----------------------------------|--------------------|-------------------|-------------|------------------|---------------|
| | M2.5 | 0.41 | FH | 1.6 mm Aluminum | 29 | 8.9 | 465 | 1.0 | 2600 |
| | | | FHS | 1.6 mm Aluminum | 29 | 11.6 | 465 | 0.8 | 1820 |
| | | | FH | 1.5 mm Steel | 59 | 11.1 | 740 | 1.0 | 2800 |
| | | | FHS | 1.5 mm Steel | 59 | 13.8 | 740 | 0.8 | 1820 |
| | M3 | 0.74 | FH | 1.6 mm Aluminum | 29 | 12.9 | 600 | 1.7 | 3150 |
| | | | FHS | 1.6 mm Aluminum | 29 | 12.9 | 600 | 1.3 | 2570 |
| | | | FH | 1.5 mm Steel | 59 | 14.7 | 820 | 1.7 | 3840 |
| | | | FHS | 1.5 mm Steel | 59 | 14.7 | 820 | 1.3 | 2440 |
| | M3.5 | 1.15 | FH | 1.6 mm Aluminum | 29 | 15.6 | 800 | 1.7 | 3780 |
| | | | FHS | 1.6 mm Aluminum | 29 | 15.6 | 800 | 1.7 | 3445 |
| | | | FH | 1.5 mm Steel | 59 | 22.3 | 1335 | 2.8 | 3780 |
| | | | FHS | 1.5 mm Steel | 59 | 22.3 | 1335 | 2.0 | 3445 |
| | M4 | 1.7 | FH | 1.6 mm Aluminum | 29 | 20 | 975 | 2.9 | 4448 |
| | | | FHS | 1.6 mm Aluminum | 29 | 22.3 | 975 | 2.9 | 4180 |
| | | | FH | 1.5 mm Steel | 59 | 28.9 | 1780 | 4.2 | 5650 |
| | | | FHS | 1.5 mm Steel | 59 | 26.7 | 1780 | 2.9 | 4775 |
| | M5 | 3.5 | FH | 1.6 mm Aluminum | 29 | 24.5 | 1070 | 3.5 | 5170 |
| | | | FHS | 1.6 mm Aluminum | 29 | 24.5 | 1070 | 3.5 | 4760 |
| | | | FH | 1.5 mm Steel | 59 | 33.4 | 2000 | 6.5 | 6270 |
| | | | FHS | 1.5 mm Steel | 59 | 32.5 | 2000 | 6.3 | 6000 |
| | M6 | 5.9 | FH | 2.4 mm Aluminum | 28 | 28.9 | 1660 | 7.3 | 10200 |
| | | | FHS | 2.4 mm Aluminum | 28 | 28.9 | 1660 | 7.3 | 9090 |
| | | | FH | 2.2 mm Steel | 46 | 44.5 | 2560 | 11.3 | 11300 |
| | | | FHS | 2.2 mm Steel | 46 | 44.5 | 2560 | 10.1 | 10600 |
| | M8 | 14.2 | FH | 2.4 mm Aluminum | 28 | 29.8 | 1910 | 11.3 | 10500 |
| | | | FHS | 2.4 mm Aluminum | 28 | 29.8 | 1910 | 11.3 | 9540 |
| | | | FH | 2.4 mm Steel | 46 | 44.5 | 2890 | 19.2 | 15450 |
| | | | FHS | 2.4 mm Steel | 46 | 49.8 | 2890 | 17.5 | 13630 |

(1) Maximum recommended tightening torques for aluminum studs are 60 percent of these values.

PERFORMANCE DATA (Continued)

Type TFH and TFHS Non-Flush Studs

| UNIFIED | Thread Code | Max. Nut Tightening Torque (in. lbs.) | Type | Test Sheet Thickness and Material | Sheet Hardness HRB | (1) Installation (lbs.) | Pushout (lbs.) | Torque-out (in. lbs.) |
|---------|-------------|---------------------------------------|------|-----------------------------------|--------------------|-------------------------|----------------|-----------------------|
| | 440 | 5 | TFH | .020" Aluminum | 28 | 1300 | 45 | 7 |
| | | | TFHS | .020" Aluminum | 28 | 1200 | 45 | 7 |
| | | | TFH | .023" Steel | 52 | 2800 | 100 | 8 |
| | | | TFHS | .025" Steel | 52 | 1500 | 100 | 8 |
| | 632 | 9 | TFH | .020" Aluminum | 28 | 2100 | 50 | 8 |
| | | | TFHS | .020" Aluminum | 28 | 1500 | 50 | 8 |
| | | | TFH | .023" Steel | 52 | 2500 | 110 | 16 |
| | | | TFHS | .025" Steel | 52 | 2500 | 110 | 16 |
| | 832 | 17 | TFH | .020" Aluminum | 28 | 2100 | 60 | 10 |
| | | | TFHS | .020" Aluminum | 28 | 2200 | 60 | 11 |
| | | | TFH | .023" Steel | 52 | 3100 | 120 | 26 |
| | | | TFHS | .025" Steel | 52 | 2700 | 120 | 26 |
| | 024 | 24 | TFH | .020" Aluminum | 28 | 2300 | 65 | 14 |
| | | | TFHS | .020" Aluminum | 28 | 2500 | 65 | 14 |
| | 032 | 27 | TFH | .023" Steel | 52 | 3700 | 150 | 30 |
| | | | TFHS | .025" Steel | 52 | 3000 | 130 | 28 |

| METRIC | Thread Code | Max. Nut Tightening Torque (N•m) | Type | Test Sheet Thickness and Material | Sheet Hardness HRB | (1) Installation (kN) | Pushout (N) | Torque-out (N•m) |
|--------|-------------|----------------------------------|------|-----------------------------------|--------------------|-----------------------|-------------|------------------|
| | M3 | 0.74 | TFH | 0.5 mm Aluminum | 28 | 5.8 | 195 | 0.6 |
| | | | TFHS | 0.5 mm Aluminum | 28 | 5.3 | 195 | 0.6 |
| | | | TFH | 0.6 mm Steel | 52 | 12.5 | 300 | 1 |
| | | | TFHS | 0.6 mm Steel | 52 | 6.7 | 300 | 1 |
| | M4 | 1.7 | TFH | 0.5 mm Aluminum | 28 | 12.5 | 250 | 0.7 |
| | | | TFHS | 0.5 mm Aluminum | 28 | 9.8 | 250 | 0.7 |
| | | | TFH | 0.6 mm Steel | 52 | 17.8 | 500 | 2.5 |
| | | | TFHS | 0.6 mm Steel | 52 | 13.4 | 500 | 2.5 |
| | M5 | 3.5 | TFH | 0.5 mm Aluminum | 28 | 15.6 | 270 | 1.3 |
| | | | TFHS | 0.5 mm Aluminum | 28 | 13.4 | 270 | 1.3 |
| | | | TFH | 0.6 mm Steel | 52 | 26.7 | 670 | 3 |
| | | | TFHS | 0.6 mm Steel | 52 | 17.8 | 670 | 3 |

(1) Installation controlled by proper cavity depth in punch.

PERFORMANCE DATA (Continued)

Type HFH and HFHS High Strength Studs and Type HFHB Phosphor Bronze Studs

| UNIFIED | Thread Code | Type | Max. Nut Tightening Torque (ft. lbs.) | Test Sheet Thickness and Material | Sheet Hardness HRB | (1) Installation (lbs.) | Pushout (lbs.) | Torque-out (ft. lbs.) | (2) Tensile Strength (lbs.) |
|---------|-------------|------|---------------------------------------|-----------------------------------|--------------------|-------------------------|----------------|-----------------------|-----------------------------|
| | 032 | HFH | 3.25 | .060" Aluminum | 15 | 3000 | 180 | 4 | 2400 |
| | | HFH | 3.25 | .060" Steel | 65 | 6000 | 375 | 5 | 2400 |
| | | HFHS | 3.25 | .050" Aluminum | 38 | 3000 | 180 | 4 | 1500 |
| | | HFHS | 3.25 | .058" Steel | 52 | 4500 | 325 | 4 | 1500 |
| | | HFHB | 2.56 | .061" Copper CDA-110 | 28 | 3400 | 250 | 4.5 | 1200 |
| | 0420 | HFH | 8 | .060" Aluminum | 43 | 5500 | 285 | 11 | 3820 |
| | | HFH | 8 | .060" Steel | 59 | 7000 | 480 | 11 | 3820 |
| | | HFHS | 8 | .064" Aluminum | 32 | 4000 | 285 | 8 | 2385 |
| | | HFHS | 8 | .072" Steel | 43 | 6500 | 480 | 8 | 2385 |
| | | HFHB | 4.35 | .061" Copper CDA-110 | 28 | 6000 | 380 | 5 | 1908 |
| | 0518 | HFH | 16 | .091" Aluminum | 39 | 8000 | 380 | 22 | 6280 |
| | | HFH | 16 | .090" Steel | 58 | 10000 | 590 | 22 | 6280 |
| | | HFHS | 16 | .087" Aluminum | 41 | 5500 | 380 | 15 | 3930 |
| | | HFHS | 16 | .099" Steel | 44 | 7500 | 590 | 15 | 3930 |
| | | HFHB | 10.55 | .126" Copper CDA-110 | 32 | 7500 | 500 | 11 | 3140 |
| | 0616 | HFH | 27 | .091" Aluminum | 39 | 9000 | 550 | 25 | 9300 |
| | | HFH | 27 | .090" Steel | 58 | 12000 | 780 | 36 | 9300 |
| | | HFHS | 27 | .123" Aluminum | 44 | 7500 | 560 | 25 | 5810 |
| | | HFHS | 27 | .099" Steel | 44 | 10500 | 780 | 25 | 5810 |
| | | HFHB | 21 | .126" Copper CDA-110 | 32 | 9500 | 560 | 18 | 4650 |

| METRIC | Thread Code | Type | Max. Nut Tightening Torque (N•m) | Test Sheet Thickness and Material | Sheet Hardness HRB | (1) Installation (kN) | Pushout (N) | Torque-out (N•m) | (2) Tensile Strength (kN) |
|--------|-------------|------|----------------------------------|-----------------------------------|--------------------|-----------------------|-------------|------------------|---------------------------|
| | M5 | HFH | 4.4 | 1.5 mm Aluminum | 15 | 13 | 800 | 5.4 | 12.8 |
| | | HFH | 4.4 | 1.5 mm Steel | 65 | 26 | 1500 | 7.6 | 12.8 |
| | | HFHS | 4.4 | 1.62 mm Aluminum | 35 | 12.4 | 800 | 5.4 | 7.3 |
| | | HFHS | 4.4 | 1.47 mm Steel | 54 | 21.7 | 1500 | 6.4 | 7.3 |
| | | HFHB | 3.47 | 1.5 mm Copper CDA-110 | 28 | 15.6 | 1115 | 3.4 | 5.9 |
| | M6 | HFH | 10 | 1.5 mm Aluminum | 43 | 29 | 1270 | 14 | 18.1 |
| | | HFH | 10 | 1.5 mm Steel | 59 | 33 | 1750 | 14 | 18.1 |
| | | HFHS | 10 | 1.62 mm Aluminum | 35 | 15.4 | 1270 | 11 | 10.3 |
| | | HFHS | 10 | 1.6 mm Steel | 45 | 24.6 | 1750 | 11 | 10.3 |
| | | HFHB | 5.9 | 1.5 mm Copper CDA-110 | 28 | 25.3 | 1600 | 6.7 | 8.3 |
| | M8 | HFH | 21.7 | 2.3 mm Aluminum | 39 | 35.6 | 1700 | 30 | 32.9 |
| | | HFH | 21.7 | 2.3 mm Steel | 58 | 44.5 | 2200 | 30 | 32.9 |
| | | HFHS | 21.7 | 2.23 mm Aluminum | 44 | 24.4 | 1700 | 20 | 18.8 |
| | | HFHS | 21.7 | 2.48 mm Steel | 43 | 37.8 | 2100 | 20 | 18.8 |
| | | HFHB | 14.3 | 3.2 mm Copper CDA-110 | 32 | 33 | 2250 | 15.3 | 15.1 |
| | M10 | HFH | 36.6 | 2.3 mm Aluminum | 39 | 40 | 2445 | 36 | 52.2 |
| | | HFH | 36.6 | 2.3 mm Steel | 58 | 54 | 3470 | 49 | 52.2 |
| | | HFHS | 36.6 | 2.3 mm Aluminum | 44 | 33.3 | 2445 | 36 | 29.9 |
| | | HFHS | 36.6 | 2.3 mm Steel | 44 | 46.7 | 3470 | 36 | 29.9 |
| | | HFHB | 28.5 | 3.2 mm Copper CDA-110 | 32 | 42 | 2500 | 25 | 24 |

(1) Installation controlled by proper cavity depth in punch.

(2) Head size is adequate to ensure failure in threaded area.

PERFORMANCE DATA (Continued)

Type FHL and FHLS Self-clinching Studs

| UNIFIED | Thread Code | Max. Nut Tightening Torque (in. lbs.) | Type | Test Sheet Thickness and Material | Sheet Hardness HRB | Installation (lbs.) | Pushout (lbs.) | Torque-out (in. lbs.) | Pull Thru (lbs.) | Pull Thru Test Bushing Hole Size (in.) |
|---------|-------------|---------------------------------------|------------|-----------------------------------|--------------------|---------------------|----------------|-----------------------|------------------|--|
| | 256 | 2.3 | FHL / FHLS | .047" Aluminum | 33 | 700 | 55 | 4 | 230 | .106 |
| | | 2.3 | FHL / FHLS | .045" Steel | 54 | 1200 | 85 | 8 | 425 | .106 |
| | 440 | 4.0 | FHL / FHLS | .047" Aluminum | 33 | 1000 | 60 | 5 | 300 | .132 |
| | | 5.0 | FHL / FHLS | .045" Steel | 54 | 1200 | 105 | 11 | 580 | .132 |
| | 632 | 5.4 | FHL / FHLS | .047" Aluminum | 33 | 1000 | 65 | 6.5 | 325 | .158 |
| | | 9.0 | FHL / FHLS | .045" Steel | 54 | 1500 | 110 | 15 | 650 | .158 |
| | 832 | 6.9 | FHL / FHLS | .047" Aluminum | 33 | 1200 | 80 | 9 | 350 | .184 |
| | | 15.2 | FHL / FHLS | .045" Steel | 54 | 1500 | 125 | 18 | 740 | .184 |
| | 032 | 9.7 | FHL / FHLS | .047" Aluminum | 33 | 2500 | 115 | 18 | 395 | .210 |
| | | 19.4 | FHL / FHLS | .045" Steel | 54 | 4500 | 210 | 38 | 800 | .210 |

| METRIC | Thread Code | Max. Nut Tightening Torque (N•m) | Type | Test Sheet Thickness and Material | Sheet Hardness HRB | Installation (kN) | Pushout (N) | Torque-out (N•m) | Pull Thru (N) | Pull Thru Test Bushing Hole Size (mm) |
|--------|-------------|----------------------------------|------------|-----------------------------------|--------------------|-------------------|-------------|------------------|---------------|---------------------------------------|
| | M2.5 | 0.41 | FHL / FHLS | 1.2 mm Aluminum | 33 | 3.1 | 285 | 0.55 | 1200 | 3 |
| | | 0.41 | FHL / FHLS | 1.1 mm Steel | 54 | 5.3 | 450 | 1.1 | 2250 | 3 |
| | M3 | 0.46 | FHL / FHLS | 1.2 mm Aluminum | 33 | 4.4 | 285 | 0.65 | 1300 | 3.5 |
| | | 0.74 | FHL / FHLS | 1.1 mm Steel | 54 | 5.3 | 475 | 1.25 | 2500 | 3.5 |
| | M3.5 | 0.58 | FHL / FHLS | 1.2 mm Aluminum | 33 | 4.4 | 290 | 0.76 | 1400 | 4 |
| | | 1.15 | FHL / FHLS | 1.1 mm Steel | 54 | 6.6 | 500 | 1.75 | 2800 | 4 |
| | M4 | 0.75 | FHL / FHLS | 1.2 mm Aluminum | 33 | 5.3 | 365 | 1.1 | 1550 | 4.5 |
| | | 1.7 | FHL / FHLS | 1.1 mm Steel | 54 | 6.6 | 550 | 2.1 | 3300 | 4.5 |
| | M5 | 1.11 | FHL / FHLS | 1.2 mm Aluminum | 33 | 11.1 | 530 | 2.2 | 1850 | 5.5 |
| | | 2.25 | FHL / FHLS | 1.1 mm Steel | 54 | 20 | 1000 | 4.4 | 3750 | 5.5 |

Type FH4 Self-Clinching Studs⁽¹⁾

| UNIFIED | Thread Code | Max. Nut Tightening Torque (in. lbs.) | Test Sheet Thickness and Material | Sheet Hardness HRB Max. | Installation (lbs.) | Pushout (lbs.) | Torque-out (in. lbs.) | Pull Thru (lbs.) |
|---------|-------------|---------------------------------------|-----------------------------------|-------------------------|---------------------|----------------|-----------------------|------------------|
| | 440 | 6 | .060" Stainless Steel | 92 | 9000 | 450 | 16 | 800 |
| | 632 | 11 | .060" Stainless Steel | 92 | 9500 | 540 | 27 | 1350 |
| | 832 | 21 | .060" Stainless Steel | 92 | 11200 | 780 | 58 | 1800 |
| | 032 | 33 | .060" Stainless Steel | 92 | 12000 | 1050 | 95 | 2250 |
| | 0420 | 70 | .060" Stainless Steel | 92 | 23000 | 1600 | 156 | 3900 |

| METRIC | Thread Code | Max. Nut Tightening Torque (N•m) | Test Sheet Thickness and Material | Sheet Hardness HRB Max. | Installation (kN) | Pushout (N) | Torque-out (N•m) | Pull Thru (N) |
|--------|-------------|----------------------------------|-----------------------------------|-------------------------|-------------------|-------------|------------------|---------------|
| | M3 | .9 | 1.5 mm Stainless Steel | 92 | 40 | 2220 | 1.8 | 3500 |
| | M4 | 2.1 | 1.5 mm Stainless Steel | 92 | 50 | 3210 | 6.5 | 8000 |
| | M5 | 4.3 | 1.5 mm Stainless Steel | 92 | 53 | 3575 | 10.7 | 10000 |
| | M6 | 7.2 | 1.5 mm Stainless Steel | 92 | 71 | 4200 | 15.9 | 14900 |

Type FHP Self-Clinching Studs⁽¹⁾

| UNIFIED | Thread Code | Max. Nut Tightening Torque (in. lbs.) | Test Sheet Thickness and Material | Sheet Hardness HRB Max. | Installation (lbs.) | Pushout (lbs.) | Torque-out (in. lbs.) | Pull Thru (lbs.) |
|---------|-------------|---------------------------------------|-----------------------------------|-------------------------|---------------------|----------------|-----------------------|------------------|
| | 632 | 11 | .045" Stainless Steel | 92 | 9500 | 670 | 19.5 | 940 |
| | 832 | 21 | .045" Stainless Steel | 92 | 11200 | 785 | 37.5 | 1415 |

| METRIC | Thread Code | Max. Nut Tightening Torque (N•m) | Test Sheet Thickness and Material | Sheet Hardness HRB Max. | Installation (kN) | Pushout (N) | Torque-out (N•m) | Pull Thru (N) |
|--------|-------------|----------------------------------|-----------------------------------|-------------------------|-------------------|-------------|------------------|---------------|
| | M5 | 4.3 | 1.14 mm Stainless Steel | 92 | 53 | 3890 | 7.35 | 7320 |

(1) Performance values shown are typical for fasteners properly installed using raised ring tooling in good condition. We recommend replacing installation tooling when the height of the "P" (see page FH-16) dimension is reduced to .005" / 0.13 mm due to wear. Reductions in performance may occur as the height of the protrusion wears. Variations in hole preparation, installation force, and sheet material type, thickness, and hardness will affect both performance and tooling life.

PERFORMANCE DATA (Continued)

Type TPS™ Flush-Mounted, Self-Clinching Pilot Pins

| UNIFIED | Pin Dia. Code | Test Sheet Material | Sheet Hardness HRB | Installation (lbs.) | Pushout (lbs.) |
|---------|---------------|---------------------|--------------------|---------------------|----------------|
| | 125 | Aluminum | 20 | 4500 | 150 |
| | | Steel | 62 | 6500 | 250 |
| | 187 | Aluminum | 18 | 6500 | 230 |
| | | Steel | 60 | 8000 | 400 |
| | 250 | Aluminum | 18 | 7000 | 270 |
| | | Steel | 62 | 9000 | 500 |

| METRIC | Pin Dia. Code | Test Sheet Material | Sheet Hardness HRB | Installation (kN) | Pushout (kN) |
|--------|---------------|---------------------|--------------------|-------------------|--------------|
| | 3mm | Aluminum | 22 | 12 | 0.56 |
| | | Steel | 65 | 22 | 0.98 |
| | 4mm | Aluminum | 19 | 22 | 0.89 |
| | | Steel | 66 | 26.4 | 1.54 |
| | 5mm | Aluminum | 18 | 28.6 | 1.01 |
| | | Steel | 60 | 35.2 | 1.76 |
| | 6mm | Aluminum | 18 | 30.8 | 1.1 |
| | | Steel | 62 | 39.6 | 2.1 |

Type HFE Self-Clinching Studs

| UNIFIED | Thread Code | Max. Nut Tightening Torque (ft. lbs.) | Test Sheet Thickness and Material (in.) | Sheet Hardness HRB | Installation (lbs.) (1) | Pushout (lbs.) | Torque-out (in. lbs.) | Pull Thru (lbs.) | Test Bushing Hole Size For Pull Thru Tests |
|---------|-------------|---------------------------------------|---|--------------------|-------------------------|----------------|-----------------------|------------------|--|
| | 032 | 3.25 | .040" Aluminum | 27 | 7500 | 170 | 60 | 1900 | .279 |
| | | | .040" Cold-rolled Steel | 67 | 9500 | 300 | 60 | 2200 | |
| | 0420 | 8 | .040" Aluminum | 27 | 8000 | 180 | 120 | 3200 | .335 |
| | | | .040" Cold-rolled Steel | 67 | 13500 | 340 | 130 | 3600 | |
| | 0518 | 16 | .060" Aluminum | 22 | 9000 | 275 | 240 | 6000 | .407 |
| | | | .060" Cold-rolled Steel | 65 | 15500 | 575 | 290 | 6400 | |

| METRIC | Thread Code | Max. Nut Tightening Torque (N•m) | Test Sheet Thickness and Material (mm) | Sheet Hardness HRB | Installation (kN) (1) | Pushout (N) | Torque-out (N•m) | Pull Thru (kN) | Test Bushing Hole Size For Pull Thru Tests |
|--------|-------------|----------------------------------|--|--------------------|-----------------------|-------------|------------------|----------------|--|
| | M5 | 4.4 | 1 mm Aluminum | 27 | 37.7 | 690 | 8.1 | 9.7 | 7.4 |
| | | | 1 mm Cold-rolled Steel | 67 | 51.1 | 1350 | 8.1 | 10.6 | |
| | M6 | 10 | 1 mm Aluminum | 27 | 39 | 750 | 11.8 | 14.2 | 8.2 |
| | | | 1 mm Cold-rolled Steel | 67 | 60 | 1400 | 14.4 | 15.5 | |
| | M8 | 21.7 | 1.5 mm Aluminum | 22 | 42 | 1230 | 23.5 | 25 | 10.3 |
| | | | 1.5 mm Cold-rolled Steel | 65 | 71.1 | 2400 | 33.9 | 27.5 | |

(1) Installation controlled by proper cavity depth in punch.



SELF-LOCKING



SELF-CLINCHING



FASTENERS

BULLETIN



LK 1206

SELF-LOCKING SELF-CLINCHING FASTENERS

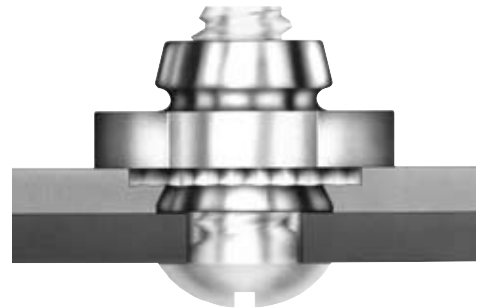
PEM® self-locking fasteners (Type LK/LKS/LKA) permanently retain their inherent flexing action, permitting repeated use and effective prevailing locking torque.

The unique PEMFLEX® self-locking feature with EF or MD finishes, meet the locking torque requirements for 250°F nuts of NASM25027 specification. The self-clinching feature is the same tried and proven design preferred and appreciated for fast, simple assembly. These fasteners do not protrude through the reverse side of the sheet and provide positive, permanent attachment with high torque-out (many times greater than locking torque) and pushout resistances.

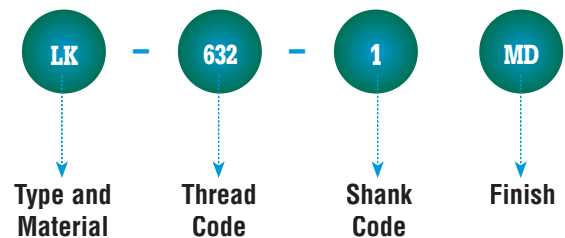
PEM all-metal, self-locking fasteners are available in steel, stainless steel, and aluminum. Types LK (steel) and LKS (stainless) are treated with a black dry film lubricant for better locking performance. Type LKA (aluminum) must be used with a lubricated screw. The PEM design utilizes two rugged, semicircular flexing jaws instead of several less-supported segments. The greater ruggedness and retention of this PEMFLEX action prevents relaxation and loosening of the fastener in severe service.

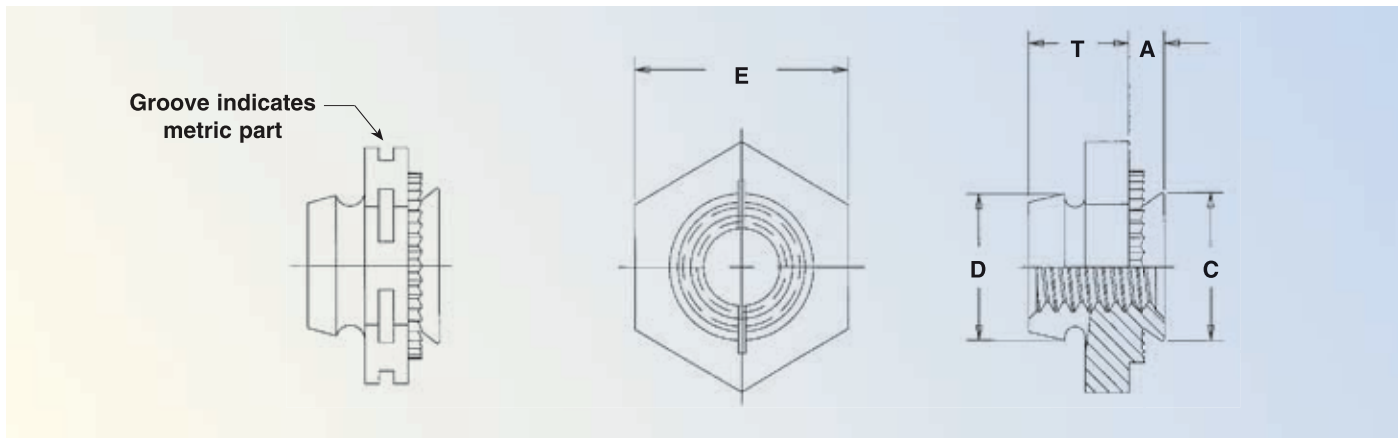
This PEMFLEX design also protects the screw threads. Clearances obtained by only two interruptions of a full circumference, together with the spreading of the jaws by the entering screw, minimize the possibility of thread damage.

Screws for use with PEM self-locking fasteners should be Class 3A fit or no smaller than Class 2A (metric—Class 4h fit or no smaller than Class 6g) and long enough so that at least two threads project through PEMFLEX fasteners when tightened.



Part Number Designation





All dimensions are in inches.

| UNIFIED | Thread Size | Type | | | Thread Code | Shank Code | A (Shank) Max. | Min. Sheet Thickness | Hole Size In Sheet +.003 -.000 | C Max. | D Max. | E Nom. | T ±.010 | Min. Dist. Hole C/L To Edge |
|------------------|-----------------|-------------------|-------------------|----------|-------------------|------------|----------------|----------------------|--------------------------------|--------|--------|--------|---------|-----------------------------|
| | | Fastener Material | | | | | | | | | | | | |
| | | Carbon Steel | Stainless Steel | Aluminum | | | | | | | | | | |
| | .086-56 (#2-56) | LK | LKS | LKA | 256 ^{NS} | 1 | .038 | .040 | .172 | .171 | .165 | .250 | .135 | .156 |
| | | | | | | 2 | .054 | .056 | | | | | | |
| | .112-40 (#4-40) | LK | LKS | LKA | 440 | 1 | .038 | .040 | .187 | .186 | .185 | .250 | .135 | .156 |
| | | | | | | 2 | .054 | .056 | | | | | | |
| | .138-32 (#6-32) | LK | LKS | LKA | 632 | 1 | .038 | .040 | .219 | .218 | .220 | .312 | .145 | .187 |
| | | | | | | 2 | .054 | .056 | | | | | | |
| | .164-32 (#8-32) | LK | LKS | LKA | 832 | 1 | .038 | .040 | .266 | .265 | .250 | .343 | .175 | .203 |
| 2 | | | | | | .054 | .056 | | | | | | | |
| .190-32 (#10-32) | LK | LKS | LKA ^{NS} | 032 | 1 ^{NS} | .038 | .040 | .312 | .311 | .300 | .375 | .205 | .218 | |
| | | | | | 2 | .054 | .056 | | | | | | | |

All dimensions are in millimeters.

| METRIC | Thread Size x Pitch | Type | | | Thread Code | Shank Code | A (Shank) Max. | Min. Sheet Thickness | Hole Size In Sheet +0.08 | C Max. | D Max. | E Nom. | T ± 0.25 | Min. Dist. Hole C/L To Edge |
|--------|---------------------|-------------------|-----------------|-------------------|--------------------|-----------------|----------------|----------------------|--------------------------|--------|--------|--------|----------|-----------------------------|
| | | Fastener Material | | | | | | | | | | | | |
| | | Carbon Steel | Stainless Steel | Aluminum | | | | | | | | | | |
| | M2.5 X 0.45 | LK | LKS | LKA | M2.5 ^{NS} | 1 | 0.97 | 1 | 4.37 | 4.35 | 4.45 | 6.35 | 3.43 | 3.9 |
| | | | | | | 2 | 1.38 | 1.4 | | | | | | |
| | M3 X 0.5 | LK | LKS | LKA ^{NS} | M3 | 1 | 0.97 | 1 | 4.75 | 4.73 | 4.85 | 6.35 | 3.43 | 4 |
| | | | | | | 2 | 1.38 | 1.4 | | | | | | |
| | M4 X 0.7 | LK | LKS | LKA ^{NS} | M4 | 1 | 0.97 | 1 | 6.76 | 6.73 | 6.2 | 8.73 | 4.45 | 5.2 |
| | | | | | | 2 | 1.38 | 1.4 | | | | | | |
| | M5 X 0.8 | LK | LKS | LKA ^{NS} | M5 | 1 ^{NS} | 0.97 | 1 | 7.92 | 7.9 | 7.75 | 9.53 | 5.21 | 5.6 |
| 2 | | | | | | 1.38 | 1.4 | | | | | | | |

^{NS} Not stocked. Available on special order only.

MATERIAL & FINISH SPECIFICATIONS

| Type | Threads | Thread Locking Performance | Fastener Materials | | | Standard Finishes | | | Optional Finish | For Use In Sheet Hardness | |
|--------------------------------|--|----------------------------|---------------------------|----------------------------|------------------|---|------------------------------|-------|---|--------------------------------------|--------------------------------------|
| | Internal, ANSI B1.1, 3B/ANSI/ASME B1.13M, 6H | NASM25027 (as applicable) | Heat-treated Carbon Steel | 300 Series Stainless Steel | 7075-T6 Aluminum | Black, Dry-film Lubricant Over Zinc Phosphate (2) | Black Dry-film Lubricant (1) | Plain | Black Dry-film Lubricant Per MIL-PRF-46010 Over Cadmium Chromate Prime(1) | 70 or Less on the Rockwell "B" Scale | 50 or Less on the Rockwell "B" Scale |
| LK | • | • | • | | | • | | | • | • | |
| LKS | • | • | | • | | | • | | • | • | |
| LKA ⁽³⁾ | • | • | | | • | | | • | | | • |
| Part number codes for finishes | | | | | | MD ⁽⁴⁾ | MD ⁽⁴⁾ | | EF ⁽⁴⁾ | | |

(1) EF finish on steel and stainless steel and MD finish on stainless steel provides a minimum of 100 hours of salt spray resistance.

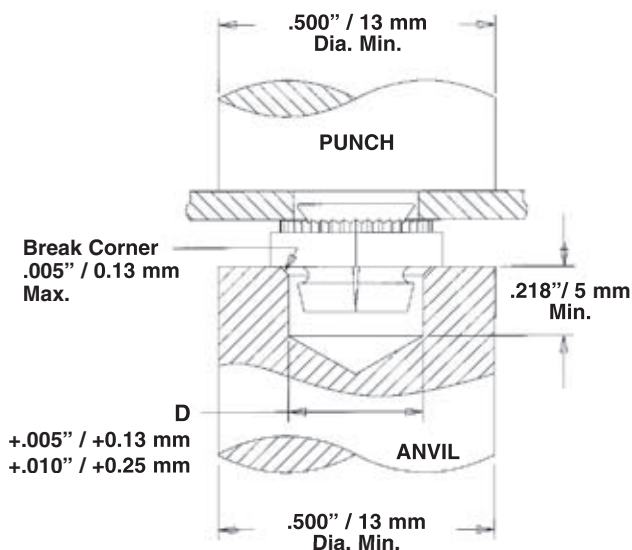
(2) MD finish on steel provides a minimum of 24 hours of salt spray resistance.

(3) Aluminum mating screws must be lubricated.

(4) Check our web site for details on EF and MD finish specifications.

INSTALLATION

1. Punch or drill properly sized mounting hole in sheet. Do not perform any secondary operations such as deburring.
2. Insert fastener into the anvil hole and place the mounting hole over the shank of fastener as shown in drawing to the right.
3. With punch and anvil surfaces parallel, apply squeezing force until hexagonal flange contacts mounting sheet. Examples of installation forces are shown below. The sketch at the right indicates suggested tooling for applying these forces.



PEMSERTER® PRESSES

For best results we recommend using a PEMSERTER® press for either manual or automatic installation of PEM LK, LKS, and LKA fasteners. For more information on our line of presses call 1-800-523-5321, or check our website.

PERFORMANCE DATA⁽¹⁾

| UNIFIED | Thread Code | Shank Code | Maximum Prevailing Torque In Locking Element (in. lbs.) | Test Sheet Material | | | | | |
|---------|-------------|------------|---|---------------------|----------------|-----------------------|---------------------|----------------|-----------------------|
| | | | | 5052-H34 Aluminum | | | Cold-rolled Steel | | |
| | | | | Installation (lbs.) | Pushout (lbs.) | Torque-out (in. lbs.) | Installation (lbs.) | Pushout (lbs.) | Torque-out (in. lbs.) |
| | 256 | 1 | 2.5 | 1600 | 130 | 20 | 3000 | 150 | 20 |
| | | 2 | | 2000 | 150 | 30 | 3000 | 160 | 20 |
| | 440 | 1 | 5 | 1600 | 130 | 25 | 3000 | 150 | 30 |
| | | 2 | | 2000 | 200 | 35 | 3000 | 250 | 40 |
| | 632 | 1 | 10 | 2400 | 130 | 25 | 4000 | 150 | 45 |
| | | 2 | | 2700 | 225 | 45 | 4300 | 275 | 50 |
| | 832 | 1 | 15 | 2700 | 150 | 45 | 4000 | 190 | 50 |
| | | 2 | | 3000 | 250 | 50 | 4300 | 300 | 70 |
| | 032 | 1 | 18 | 3200 | 150 | 90 | 4000 | 250 | 100 |
| | | 2 | | 3200 | 250 | 105 | 4300 | 300 | 120 |

| METRIC | Thread Code | Shank Code | Maximum Prevailing Torque In Locking Element (N•m) | Test Sheet Material | | | | | |
|--------|-------------|------------|--|---------------------|-------------|------------------|-------------------|-------------|------------------|
| | | | | 5052-H34 Aluminum | | | Cold-rolled Steel | | |
| | | | | Installation (kN) | Pushout (N) | Torque-out (N•m) | Installation (kN) | Pushout (N) | Torque-out (N•m) |
| | M2.5 | 1 | 0.45 | 7 | 578 | 2.8 | 13.5 | 665 | 3.4 |
| | | 2 | | 9 | 890 | 3.9 | 13.5 | 1110 | 4.5 |
| | M3 | 1 | 0.56 | 7 | 578 | 2.8 | 13.5 | 665 | 3.4 |
| | | 2 | | 9 | 890 | 3.9 | 13.5 | 1110 | 4.5 |
| | M4 | 1 | 1.7 | 12 | 665 | 5 | 18 | 845 | 5.6 |
| | | 2 | | 12 | 1110 | 5.6 | 18 | 1330 | 7.9 |
| | M5 | 1 | 2.05 | 12 | 665 | 10.1 | 18 | 1110 | 11.3 |
| | | 2 | | 12 | 1110 | 11.8 | 19 | 1330 | 13.5 |

(1) The installation, pushout and torque-out values reported are averages when all installation specifications and procedures are followed. Variations in mounting hole size, panel material and installation procedure will affect this data. Performance testing of this product in your application is recommended. We will be happy to provide samples for this purpose.

RoHS compliance information can be found on our website.

Specifications subject to change without notice.
Check our website for the most current version of this bulletin.

PennEngineering®



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CAGE-46384



NYLON INSERT

SELF-LOCKING

FASTENERS

BULLETIN



PL 505

Revised 406

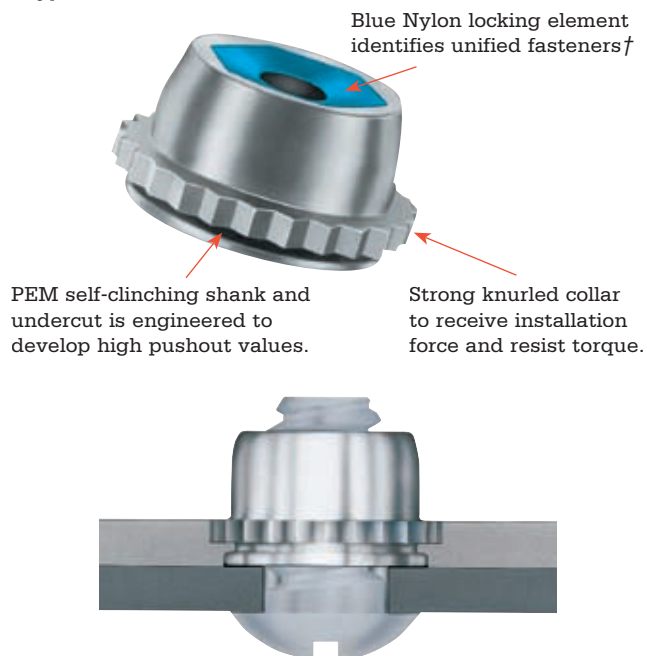
SELF-LOCKING FASTENERS

Effective mounting for reusable locking threads.

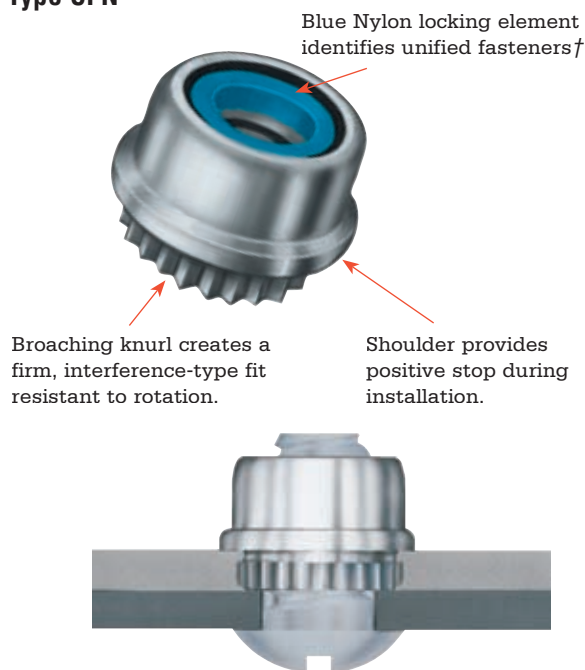
The thread locking performance of Type PL PEMHEX® self-clinching fastener meets the applicable standards of NASM25027. A nylon hexagonal element provides a reusable, non-metallic prevailing torque thread lock. The strong knurled collar receives the installation force and resists torque. The spin resistance of the knurl greatly exceeds the torque that can be exerted by the self-locking feature. As the knurled collar is embedded in the sheet, the undercut cavity beneath the collar is filled with displaced sheet material, thereby captivating the fastener in the sheet.

Type CFN broaching fasteners are available for thinner sheet, close-to-edge applications. The locking element provides prevailing torque to eliminate loosening of mating threaded hardware.

Type PL

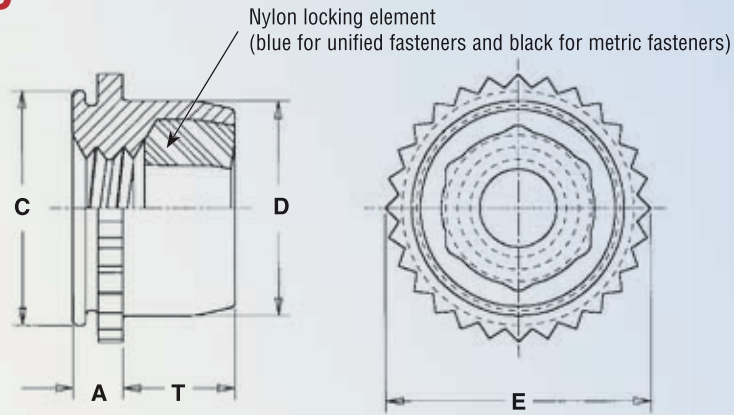


Type CFN



† The color blue for fastener locking elements is a registered trademark. Unified fasteners have a blue nylon locking element and metric fasteners have a black nylon locking element.

TYPES PL AND PLC



All dimensions are in inches.

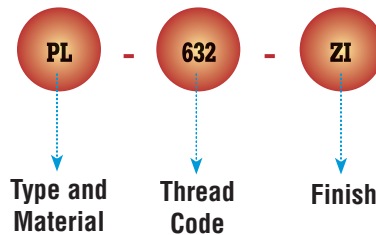
| | Thread Size | Type | | Thread Code | A (Shank) Max. | Sheet Thickness (1) | Hole Size In Sheet +.003 -.000 | C Max. | D Max. | E Max. | T Max. | Min. Dist. Hole C/L To Edge | Max. Hole In Attached Parts |
|---------|------------------|-------|-----------------|-------------|----------------|---------------------|--------------------------------|--------|--------|--------|--------|-----------------------------|-----------------------------|
| | | Steel | Stainless Steel | | | | | | | | | | |
| UNIFIED | .112-40 (#4-40) | PL | PLC | 440 | .060 | .059-.070 | .234 | .233 | .216 | .28 | .130 | .17 | .132 |
| | .138-32 (#6-32) | PL | PLC | 632 | .060 | .059-.070 | .265 | .264 | .246 | .31 | .130 | .19 | .158 |
| | .164-32 (#8-32) | PL | PLC | 832 | .060 | .059-.070 | .297 | .296 | .278 | .34 | .155 | .22 | .184 |
| | .190-32 (#10-32) | PL | PLC | 032 | .060 | .059-.070 | .312 | .311 | .292 | .35 | .165 | .25 | .210 |

All dimensions are in millimeters.

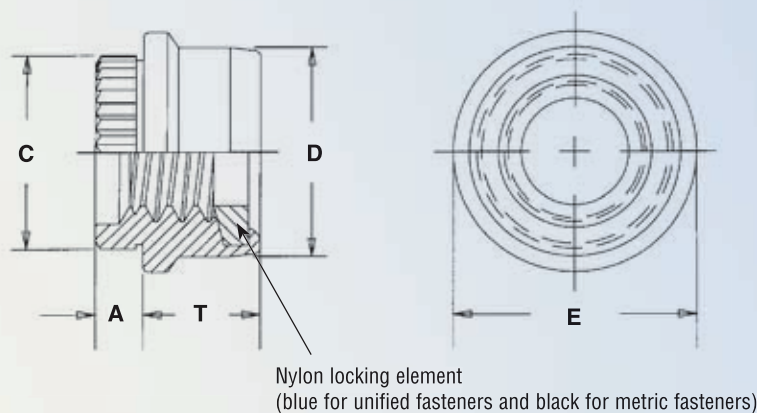
| | Thread Size x Pitch | Type | | Thread Code | A (Shank) Max. | Sheet Thickness (1) | Hole Size In Sheet +0.08 | C Max. | D Max. | E Max. | T Max. | Min. Dist. Hole C/L To Edge | Max. Hole In Attached Parts |
|--------|---------------------|-------|-----------------|-------------|----------------|---------------------|--------------------------|--------|--------|--------|--------|-----------------------------|-----------------------------|
| | | Steel | Stainless Steel | | | | | | | | | | |
| METRIC | M3 x 0.5 | PL | PLC | M3 | 1.52 | 1.5-1.78 | 6 | 5.97 | 5.5 | 7.1 | 3.6 | 4.3 | 3.5 |
| | M4 x 0.7 | PL | PLC | M4 | 1.52 | 1.5-1.78 | 7.5 | 7.47 | 7 | 8.6 | 4.2 | 5.6 | 4.5 |
| | M5 x 0.8 | PL | PLC | M5 | 1.52 | 1.5-1.78 | 8 | 7.97 | 7.5 | 8.9 | 4.5 | 6.4 | 5.5 |

(1) Can be used in panel thickness of .040" to .059" / 1 mm to 1.5 mm provided the fastener is not fully installed. The knurled collar must be left protruding above the sheet to the degree that the sheet thickness is less than .059" / 1.5 mm. Knurled collar may fracture if fastener is used in sheets thicker than .070" / 1.7 mm and screw is tightened beyond maximum tightening torque.

Type PL Part Number Designation



TYPE CFN



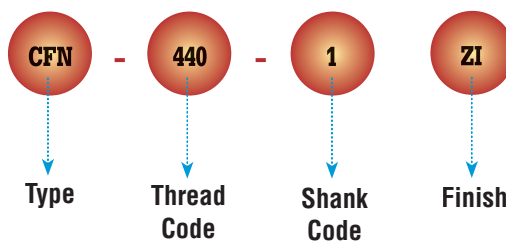
All dimensions are in inches.

| UNIFIED | Thread Size | Type | Thread Code | Shank Code | A (Shank) ±.003 | Min. Sheet Thickness | Hole Size In Sheet +.003 -.000 | C ±.002 | D ±.004 | E +.001 -.004 | T Max. | Min. Dist. Hole C/L To Edge |
|---------|-----------------|------|-------------|------------|--------------------|----------------------|-----------------------------------|------------|------------|---------------------|-----------|-----------------------------|
| | .112-40 (#4-40) | CFN | 440 | 1 | .040 | .043 | .152 | .162 | .175 | .203 | .104 | .115 |

All dimensions are in millimeters.

| METRIC | Thread Size x Pitch | Type | Thread Code | Shank Code | A (Shank) ±0.08 | Min. Sheet Thickness | Hole Size In Sheet +0.08 | C ±0.05 | D ±0.1 | E +0.03 -0.1 | T Max. | Min. Dist. Hole C/L To Edge |
|--------|---------------------|------|-------------|------------|--------------------|----------------------|-----------------------------|------------|-----------|--------------------|-----------|-----------------------------|
| | M3 x 0.5 | CFN | M3 | 1 | 1.02 | 1.1 | 3.86 | 4.11 | 4.45 | 5.16 | 2.65 | 2.92 |

Type CFN Part Number Designation



MATERIAL & FINISH SPECIFICATIONS

| | Threads | Thread Locking Performance | Temperature Limit | Fastener Material | | | | Standard Finishes | | Optional Finish | For Use in Sheet Hardness: | |
|-------------------------------|--|----------------------------|-------------------|---------------------------|--------------|----------------------------|--------------------------------------|---|--|---|--------------------------------------|--------------------------------------|
| Type | Internal, ANSI B1.1 2B / ANSI / ASME B1.13M 6H | NASM25027 (As Applicable) | 250° F / 120° C | Heat-treated Carbon Steel | Carbon Steel | 300 Series Stainless Steel | Locking Element: Blue or Black Nylon | Zinc Per ASTM B 633 SC1 (5µm), Type III Colorless | Passivated and / or Tested Per ASTM A380 | Zinc Per ASTM B 633 SC1 (5µm), Type II Yellow | 60 or Less on the Rockwell "B" Scale | 70 or Less on the Rockwell "B" Scale |
| PL | • | • | • | • | | | • | • | | • | | • |
| PLC | • | • | • | | | • | • | | • | | | • |
| CFN | • | (1) | • | | • | | • | • | | • | • | |
| Part Number Code For Finishes | | | | | | | | ZI | None | ZC | | |

(1) See Performance Data chart for Type CFN on page PL-6.

INSTALLATION

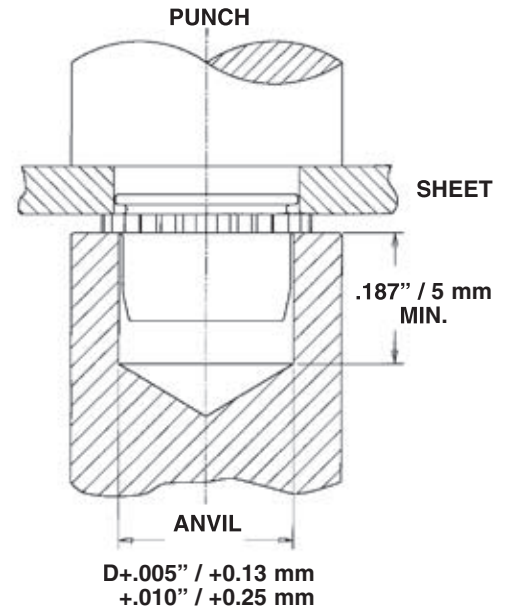
1. Punch or drill the properly sized mounting hole in the sheet. Do not perform any secondary operations such as deburring.
2. Insert fastener into the anvil hole and place the mounting hole over the shank of fastener as shown in drawing.
3. With the punch and anvil surfaces parallel, apply a squeezing force. For PL, apply force until the knurled collar is flush with the top sheet for sheets .060" / 1.5 mm thick and up, or until the shank is flush with the bottom of the sheet for sheets .040" / 1 mm to .060" / 1.5 mm thick. For CFN, apply squeezing force until the shoulder of the fastener contacts the sheet.

When it is necessary to install a Type PL fastener in a sheet whose thickness is less than the "A" dimension of the fastener, instead of flushing off the top of the knurled collar and the top surface of the sheet, bring the bottom of the fastener shank smooth with the underside of the sheet. When this method is used, care must be taken to protect the fastener against crushing which would damage the threads. This method will also result in reduced pushout and torque-out values.

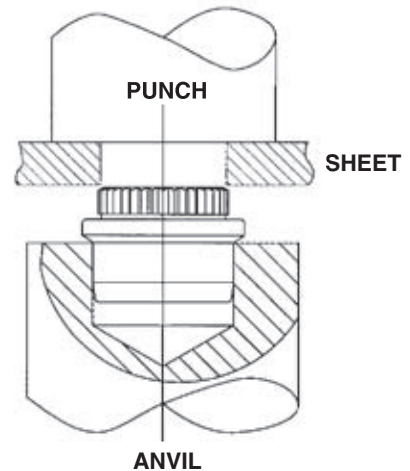
PEMSERTER® PRESSES

For best results we recommend using a PEMSERTER® press for either manual or automatic installation of PEM PL, PLC, and CFN fasteners. For more information on our line of presses call 1-800-523-5321 (USA only).

Type PL



Type CFN



PERFORMANCE DATA⁽¹⁾

For Types PL and PLC

| UNIFIED | Thread Code | Max. Rec. Tightening Torque (in. lbs.) | (2) Locking Torque (in. lbs.) | Test Sheet Material | | | | | | | | | | | |
|---------|-------------|--|-------------------------------|-------------------------|----------------|-----------------------|-------------------------|----------------|-----------------------|-------------------------|----------------|-----------------------|-------------------------|----------------|-----------------------|
| | | | | .060" 5052-H34 Aluminum | | | .040" 5052-H34 Aluminum | | | .060" Cold-rolled Steel | | | .048" Cold-rolled Steel | | |
| | | | | Installation (lbs.) | Pushout (lbs.) | Torque-out (in. lbs.) | Installation (lbs.) | Pushout (lbs.) | Torque-out (in. lbs.) | Installation (lbs.) | Pushout (lbs.) | Torque-out (in. lbs.) | Installation (lbs.) | Pushout (lbs.) | Torque-out (in. lbs.) |
| | | | | | | | | | | | | | | | |
| | 440 | 9.3 | .5 to 5 | 2000 | 225 | 20 | 1500 | 160 | 20 | 3000 | 260 | 20 | 3000 | 225 | 20 |
| | 632 | 12.9 | 1 to 10 | 2000 | 285 | 30 | 1500 | 180 | 25 | 3000 | 290 | 30 | 3000 | 270 | 30 |
| | 832 | 19.1 | 1.5 to 15 | 2000 | 290 | 60 | 1500 | 180 | 28 | 3000 | 290 | 60 | 3000 | 270 | 60 |
| | 032 | 26.0 | 2 to 18 | 2000 | 300 | 70 | 1500 | 180 | 40 | 3000 | 350 | 70 | 3000 | 310 | 70 |

| METRIC | Thread Code | Max. Rec. Tightening Torque (N • m) | (2) Locking Torque (N•m) | Test Sheet Material | | | | | | | | | | | |
|--------|-------------|-------------------------------------|--------------------------|--------------------------|-------------|--------------------|------------------------|-------------|--------------------|--------------------------|-------------|--------------------|--------------------------|-------------|--------------------|
| | | | | 1.5 mm 5052-H34 Aluminum | | | 1 mm 5052-H34 Aluminum | | | 1.5 mm Cold-rolled Steel | | | 1.2 mm Cold-rolled Steel | | |
| | | | | Installation (kN) | Pushout (N) | Torque-out (N • m) | Installation (kN) | Pushout (N) | Torque-out (N • m) | Installation (kN) | Pushout (N) | Torque-out (N • m) | Installation (kN) | Pushout (N) | Torque-out (N • m) |
| | | | | | | | | | | | | | | | |
| | M3 | 1.13 | .056 to .56 | 8.9 | 1000 | 2.25 | 6.67 | 710 | 2.25 | 13.34 | 1156 | 2.25 | 13.34 | 1000 | 2.25 |
| | M4 | 2.3 | .169 to 1.69 | 8.9 | 1290 | 6.77 | 6.67 | 800 | 3.16 | 13.34 | 1290 | 6.77 | 13.34 | 1200 | 6.77 |
| | M5 | 3.12 | .226 to 2.03 | 8.9 | 1330 | 7.9 | 6.67 | 800 | 4.51 | 13.34 | 1557 | 7.9 | 13.34 | 1380 | 7.9 |

For Type CFN

| UNIFIED | Thread Code | Max. Rec. Tightening Torque (in. lbs.) | Max. Run-in Torque For 3 Full Turn (in. lbs.) | Min. Breakaway Torque (in. lbs.) | Test Sheet Material | | |
|---------|-------------|--|---|----------------------------------|-------------------------|----------------|-----------------------|
| | | | | | .040" Cold-rolled Steel | | |
| | | | | | Installation (lbs.) | Pushout (lbs.) | Torque-out (in. lbs.) |
| | | | | | | | |
| | 440 | 5 | 3 | 0.38 | 1000 | 10 | 4 |

| METRIC | Thread Code | Max. Rec. Tightening Torque (N•m) | Max. Run-in Torque For 3 Full Turn (N•m) | Min. Breakaway Torque (N•m) | Test Sheet Material | | |
|--------|-------------|-----------------------------------|--|-----------------------------|------------------------|-------------|------------------|
| | | | | | 1 mm Cold-rolled Steel | | |
| | | | | | Installation (kN) | Pushout (N) | Torque-out (N•m) |
| | | | | | | | |
| | M3 | 0.75 | 0.339 | 0.042 | 4.45 | 44.5 | 0.45 |

(1) The installation, pushout and torque-out values reported are averages when all installation specifications and procedures are followed. Variations in mounting hole size, sheet material, and installation procedure will affect this data. Performance testing of this product in your application is recommended. We will be happy to provide samples for this purpose.

(2) The maximum locking torque and the minimum breakaway will fall within these values for fifteen cycles when tested in accordance with the locking torque test procedure specified in NASM25027.

RoHS compliance information can be found on our website.

Specifications subject to change without notice.
Check our website for the most current version of this bulletin.

PennEngineering®



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Visit our PEMNET™ Resource Center at www.pemnet.com

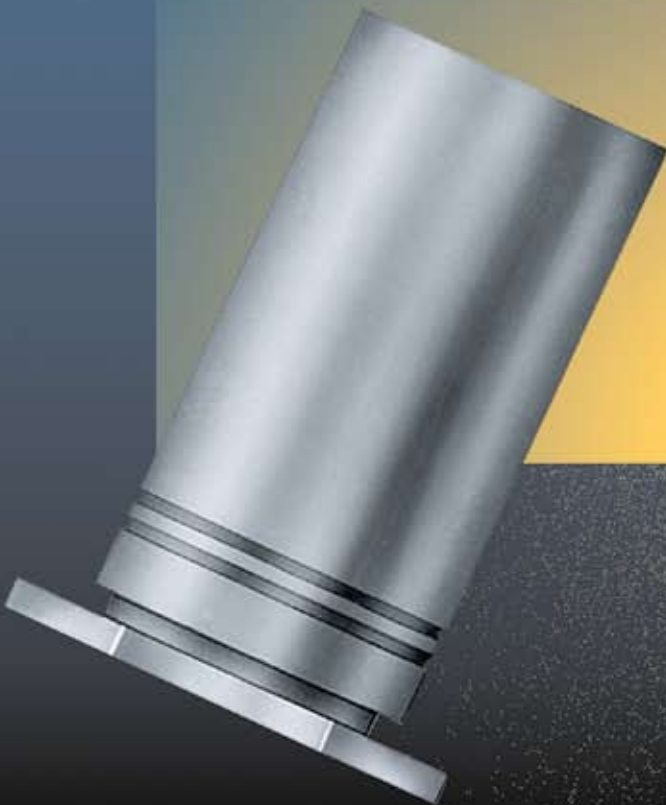
CAGE-46384



SELF-CLINCHING

STANDOFFS

BULLETIN



\$0

1206

Revised 1207

SELF-CLINCHING STANDOFFS

These standoffs, which use the proven self-clinching design, install with a squeeze in punched or drilled round holes – and become permanently mounted in the thin sheet.

PEM® brand thru-hole threaded standoffs (**Page 3**) are installed with their heads flush with one surface of the mounting sheet. When blind-threaded types (**Page 4**) are used, outer sheet surfaces are not only flush, but closed as well. Unthreaded standoffs (**Page 5**) are also available for spacing multi-panel assemblies.

Types SO4 and BSO4 standoffs (**Pages 6 and 7**) are for installation into stainless steel sheets as thin as .040" / 1.02 mm.

Types TSO, TSOS, and TSOA self-clinching threaded standoffs (**Page 8**) provide permanent threads in sheets as thin as .025" / 0.63 mm.

PEM® self-clinching standoffs are also available on special order in non-heat treated carbon steel as type SON (thru-hole threaded) or BSON (blind threaded).

Types DSO and DSOS standoffs (**Page 9**) are available for close-to-edge applications.

If you require a standoff which we do not offer in this bulletin, please contact us. We will be happy to work with you to satisfy your special need.

For other types of PEM® brand standoffs and spacers see:

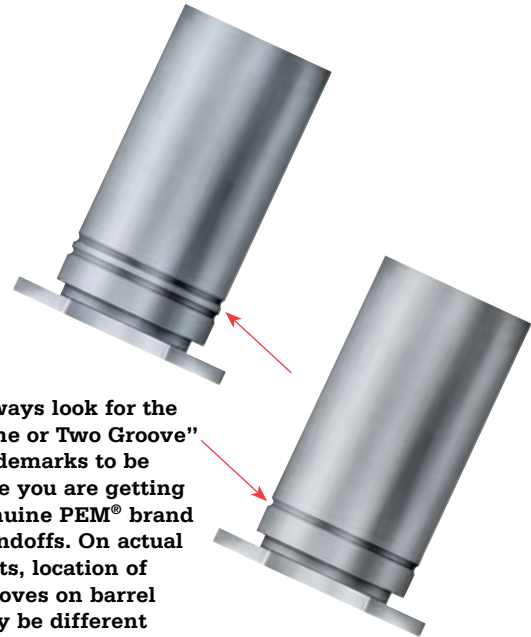
Bulletin CH PEM® Concealed-head Standoffs.

Bulletin K PEM® Standoffs for printed circuit boards.

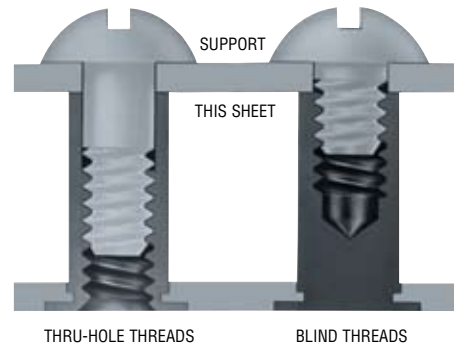
Bulletin SK PEM® KEYHOLE® Standoffs.

Bulletin SMT PEM® ReelFast™ SMT Spacers/Nuts.

Bulletin SSA PEM® brand SNAP-TOP® Standoffs.



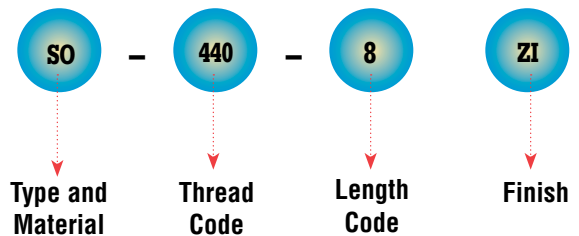
Always look for the "One or Two Groove" trademarks to be sure you are getting genuine PEM® brand standoffs. On actual parts, location of grooves on barrel may be different than shown in photo.



THRU-HOLE THREADS

BLIND THREADS

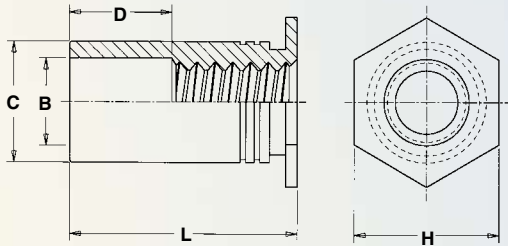
Part Number Designation



TYPES SO, SOA, SOS THRU-HOLE THREADED STANDOFFS

GENERAL DIMENSIONAL DATA

All dimensions are in inches.



| UNIFIED | Thread Code | Min. Sheet Thickness | Hole Size In Sheet +.003 -.000 | B Counter-Bore Dia. ±.005 | C +.000 -.005 | H Nom. | Min. Dist. Hole C/L To Edge |
|---------|-------------|----------------------|--------------------------------------|------------------------------|---------------------|--------|-----------------------------|
| | 440 | .040 | .166 | .125 | .165 | .187 | .23 |
| | 6440 | .040 | .213 | .125 | .212 | .250 | .27 |
| | 632 | .040 | .213 | .156 | .212 | .250 | .27 |
| | 8632 | .050 | .281 | .156 | .280 | .312 | .31 |
| | 832 | .050 | .281 | .188 | .280 | .312 | .31 |
| | 032 | .050 | .281 | .203 | .280 | .312 | .31 |

All dimensions are in millimeters.

| METRIC | Thread Code | Min. Sheet Thickness | Hole Size In Sheet +0.08 | B Counter-Bore Dia. ±0.13 | C -0.13 | H Nom. | Min. Dist. Hole C/L To Edge |
|--------|-------------|----------------------|-----------------------------|------------------------------|------------|--------|-----------------------------|
| | M3 | 1.02 | 4.22 | 3.2 | 4.2 | 4.8 | 6 |
| | 3.5M3 | 1.02 | 5.41 | 3.2 | 5.39 | 6.4 | 6.8 |
| | M3.5 | 1.02 | 5.41 | 3.9 | 5.39 | 6.4 | 6.8 |
| | M4 | 1.27 | 7.14 | 4.8 | 7.12 | 7.9 | 8 |
| | M5 | 1.27 | 7.14 | 5.35 | 7.12 | 7.9 | 8 |

THREAD SIZE AND LENGTH SELECTION DATA

All dimensions are in inches.

| UNIFIED | Thread Size | Type | | | Thread Code | Length "L" +.002 -.005 (Length Code in 32nds of an inch) | | | | | | | | | | | | | | | |
|---------|-------------------|-------|-----------------|----------|----------------------------|--|------|------|------|------|------|------|------|------|------|------|------|------|------|------|-------|
| | | Steel | Stainless Steel | Aluminum | | .125 | .187 | .250 | .312 | .375 | .437 | .500 | .562 | .625 | .687 | .750 | .812 | .875 | .937 | 1.00 | 1.062 |
| | .112-40 (#4-40) | SO | SOS | SOA | 440 6440 ⁽¹⁾ | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 | 24 | N/A | N/A | N/A | N/A | N/A |
| | .138-32 (#6-32) | SO | SOS | SOA | 632 8632 ⁽¹⁾ | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 | 24 | 26 | 28 | 30 | 32 | 34 |
| | .164-32 (#8-32) | SO | SOS | SOA | 832 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 | 24 | 26 | 28 | 30 | 32 | 34 |
| | .190-32 (#10-32) | | | | 032 | | | | | | | | | | | | | | | | |
| | D Dimension ±.010 | | | | | None | | | .187 | | | .312 | | | .437 | | | | | | |

All dimensions are in millimeters.

| METRIC | Thread Size x Pitch | Type | | | Thread Code | Length "L" +0.05 -0.13 (Length Code in millimeters) | | | | | | | | | | | |
|--------|---------------------|-------|-----------------|----------|----------------------------|--|---|---|---|----|----|----|----|----|-----|-----|-----|
| | | Steel | Stainless Steel | Aluminum | | | | | | | | | | | | | |
| | M3 x 0.5 | S0 | S0S | SOA | M3 3.5M3 ⁽¹⁾ | 3 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | N/A | N/A | N/A |
| | M3.5 x 0.6 | S0 | S0S | SOA | M3.5 | 3 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 | 25 |
| | M4 x 0.7 | | | | | | | | | | | | | | | | |
| | M5 x 0.8 | | | | | | | | | | | | | | | | |
| | D Dimension ±0.25 | | | | | None | | | | 4 | | | 8 | | | 11 | |

(1) Standoffs with thread codes 6440, 8632, and 3.5M3 offer greater wall thickness for thread sizes 440, 632, and M3 respectively.

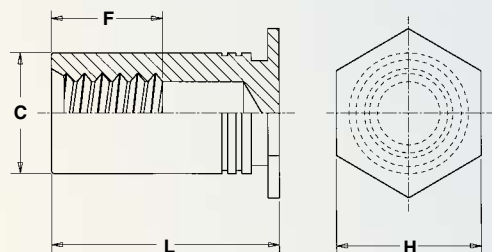
(N/A) Not Available.

Please contact your local PEM® distributor for availability, minimum quantity, and pricing information.

TYPES BSO, BSOA, BSOS BLIND THREADED STANDOFFS

GENERAL DIMENSIONAL DATA

All dimensions are in inches.



| UNIFIED | Thread Code | Min. Sheet Thickness | Hole Size In Sheet +.003 -.000 | C +.000 -.005 | H Nom. | Min. Dist. Hole C/L To Edge |
|---------|-------------|----------------------|--------------------------------------|---------------------|-----------|-----------------------------------|
| | 440 | .040 | .166 | .165 | .187 | .23 |
| | 6440 | .040 | .213 | .212 | .250 | .27 |
| | 632 | .040 | .213 | .212 | .250 | .27 |
| | 8632 | .050 | .281 | .280 | .312 | .31 |
| | 832 | .050 | .281 | .280 | .312 | .31 |
| | 032 | .050 | .281 | .280 | .312 | .31 |

All dimensions are in millimeters.

| METRIC | Thread Code | Min. Sheet Thickness | Hole Size In Sheet +0.08 | C -0.13 | H Nom. | Min. Dist. Hole C/L To Edge |
|--------|-------------|----------------------|-----------------------------|------------|-----------|-----------------------------------|
| | M3 | 1.02 | 4.22 | 4.2 | 4.8 | 6 |
| | 3.5M3 | 1.02 | 5.41 | 5.39 | 6.4 | 6.8 |
| | M3.5 | 1.02 | 5.41 | 5.39 | 6.4 | 6.8 |
| | M4 | 1.27 | 7.14 | 7.12 | 7.9 | 8 |
| | M5 | 1.27 | 7.14 | 7.12 | 7.9 | 8 |

THREAD SIZE AND LENGTH SELECTION DATA

All dimensions are in inches.

| UNIFIED | Thread Size | Type | | | Thread Code | Length "L" +.002 -.005 (Length Code in 32nds of an inch) | | | | | | | | | | | | |
|---------|---------------------|-------|-----------------|----------|-------------|--|------|------|------|------|------|------|------|------|------|------|------|-------|
| | | Steel | Stainless Steel | Aluminum | | .312 | .375 | .437 | .500 | .562 | .625 | .687 | .750 | .812 | .875 | .937 | 1.00 | 1.062 |
| | .112-40 (#4-40) | BSO | BSOS | BSOA | 440 | 10 | 12 | 14 | 16 | 18 | 20 | 22 | 24 | 26 | 28 | 30 | 32 | 34 |
| | 6440 ⁽¹⁾ | | | | | | | | | | | | | | | | | |
| | .138-32 (#6-32) | BSO | BSOS | BSOA | 632 | 10 | 12 | 14 | 16 | 18 | 20 | 22 | 24 | 26 | 28 | 30 | 32 | 34 |
| | 8632 ⁽¹⁾ | | | | | | | | | | | | | | | | | |
| | .164-32 (#8-32) | BSO | BSOS | BSOA | 832 | 10 | 12 | 14 | 16 | 18 | 20 | 22 | 24 | 26 | 28 | 30 | 32 | 34 |
| | .190-32 (#10-32) | | | | 032 | | | | | | | | | | | | | |
| | F Dimension Min. | | | | | | .156 | .187 | .250 | | | .375 | | | | | | |

All dimensions are in millimeters.

| METRIC | Thread Size x Pitch | Type | | | Thread Code | Length "L" +0.05 -0.13 (Length Code in millimeters) | | | | | | | | | |
|--------|---------------------|-------|-----------------|----------|----------------------------|--|---|----|----|----|----|----|----|----|----|
| | | Steel | Stainless Steel | Aluminum | | | | | | | | | | | |
| | M3 x 0.5 | BS0 | BS0S | BS0A | M3 3.5M3 ⁽¹⁾ | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 | 25 |
| | M3.5 x 0.6 | | | | M3.5 | | | | | | | | | | |
| | M4 x 0.7 | | | | M4 | | | | | | | | | | |
| | M5 x 0.8 | | | | M5 | | | | | | | | | | |
| | F Dimension Min. | | | | | | | | | | | | | | |

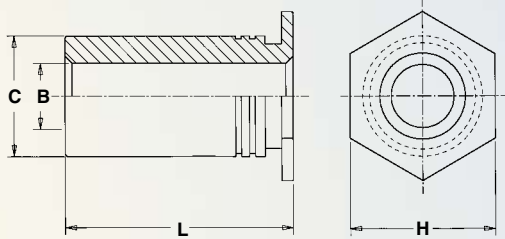
(1) Standoffs with thread codes 6440, 8632, and 3.5M3 offer greater wall thickness for thread sizes 440, 632, and M3 respectively.

Please contact your local PEM® distributor for availability, minimum quantity, and pricing information.

TYPES SO, SOA, SOS THRU-HOLE UNTHREADED STANDOFFS

GENERAL DIMENSIONAL DATA

All dimensions are in inches.



**PEM® thru-hole, unthreaded
standoffs are available on
special order only.**

| UNIFIED | Thru-hole Code | Min. Sheet Thickness | Hole Size In Sheet +.003 -.000 | C +.000 -.005 | H Nom. | Min. Dist. Hole C/L To Edge |
|---------|----------------|----------------------|--------------------------------------|---------------------|-----------|-----------------------------------|
| | 4116 | .040 | .166 | .165 | .187 | .23 |
| | 6116 | .040 | .213 | .212 | .250 | .27 |
| | 6143 | .040 | .213 | .212 | .250 | .27 |
| | 8143 | .050 | .281 | .280 | .312 | .31 |
| | 8169 | .050 | .281 | .280 | .312 | .31 |
| | 8194 | .050 | .281 | .280 | .312 | .31 |

All dimensions are in millimeters.

| METRIC | Thru-hole Code | Min. Sheet Thickness | Hole Size In Sheet +0.08 | C -0.13 | H Nom. | Min. Dist. Hole C/L To Edge |
|--------|----------------|----------------------|-----------------------------|------------|-----------|-----------------------------------|
| | 43.1 | 1.02 | 4.22 | 4.2 | 4.8 | 6 |
| | 63.1 | 1.02 | 5.41 | 5.39 | 6.4 | 6.8 |
| | 63.6 | 1.02 | 5.41 | 5.39 | 6.4 | 6.8 |
| | 83.6 | 1.27 | 7.14 | 7.12 | 7.9 | 8 |
| | 84.1 | 1.27 | 7.14 | 7.12 | 7.9 | 8 |
| | 85.1 | 1.27 | 7.14 | 7.12 | 7.9 | 8 |

THRU-HOLE DIAMETER AND LENGTH SELECTION DATA

All dimensions are in inches.

| UNIFIED | B Thru-hole Diameter +.004 -.003 | Type | | | Thru-hole Code | Length "L" +.002 -.005 (Length Code in 32nds of an inch) | | | | | | | | | | |
|---------|---|-------|--------------------|----------|-----------------------------|--|------|------|------|------|------|------|------|------|------|------|
| | | Steel | Stainless Steel | Aluminum | | .125 | .187 | .250 | .312 | .375 | .437 | .500 | .562 | .625 | .687 | .750 |
| | .116 | SO | SOS | SOA | 4116 6116 ⁽¹⁾ | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 | 24 |
| | .143 | SO | SOS | SOA | 6143 8143 ⁽¹⁾ | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 | 24 |
| | .169 | SO | SOS | SOA | 8169 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 | 24 |
| | .194 | | | | 8194 | | | | | | | | | | | |

All dimensions are in millimeters.

| METRIC | B Thru-hole Diameter +0.1 -0.08 | Type | | | Thru-hole Code | Length "L" +0.05 -0.13 (Length Code in millimeters) | | | | | | | | | | |
|--------|--|-------|--------------------|----------|-----------------------------|--|---|---|---|----|----|----|----|----|----|--|
| | | Steel | Stainless Steel | Aluminum | | | | | | | | | | | | |
| | 3.1 | SO | SOS | SOA | 43.1 63.1 ⁽¹⁾ | 3 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | |
| | 3.6 | SO | SOS | SOA | 63.6 83.6 ⁽¹⁾ | 3 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | |
| | 4.1 | SO | SOS | SOA | 84.1 | 3 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | |
| | 5.1 | | | | 85.1 | | | | | | | | | | | |

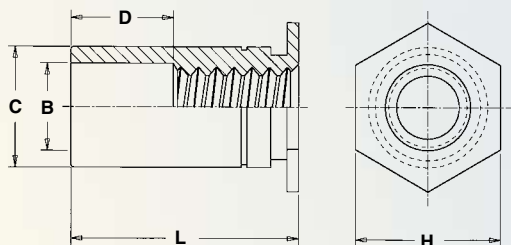
(1) Standoffs with thru-hole codes 6116, 8143, 63.1 and 83.6 offer greater wall thickness for that thru-hole diameter.

Please contact your local PEM® distributor for availability, minimum quantity, and pricing information.

TYPE S04 THRU-HOLE THREADED STANDOFFS FOR INSTALLATION INTO STAINLESS STEEL

GENERAL DIMENSIONAL DATA

All dimensions are in inches.



| UNIFIED | Thread Code | Min. Sheet Thickness | Hole Size In Sheet +.003 -.000 | B Counter-Bore Dia. ±.005 | C +.000 -.005 | H Nom. | Min. Dist. Hole C/L To Edge |
|---------|-------------|----------------------|--------------------------------------|------------------------------|---------------------|-----------|-----------------------------|
| | 440 | .040 | .166 | .125 | .165 | .187 | .23 |
| | 6440 | .040 | .213 | .125 | .212 | .250 | .28 |
| | 632 | .040 | .213 | .156 | .212 | .250 | .28 |
| | 8632 | .050 | .281 | .156 | .280 | .312 | .33 |
| | 832 | .050 | .281 | .188 | .280 | .312 | .33 |
| | 032 | .050 | .281 | .203 | .280 | .312 | .33 |

All dimensions are in millimeters.

| METRIC | Thread Code | Min. Sheet Thickness | Hole Size In Sheet +0.08 | B Counter-Bore Dia. ±0.13 | C -0.13 | H Nom. | Min. Dist. Hole C/L To Edge |
|--------|-------------|----------------------|-----------------------------|------------------------------|------------|-----------|-----------------------------|
| | M3 | 1.02 | 4.22 | 3.25 | 4.2 | 4.8 | 6 |
| | 3.5M3 | 1.02 | 5.41 | 3.25 | 5.39 | 6.4 | 7.1 |
| | M3.5 | 1.02 | 5.41 | 3.9 | 5.39 | 6.4 | 7.1 |
| | M4 | 1.27 | 7.14 | 4.8 | 7.12 | 7.9 | 8.4 |
| | M5 | 1.27 | 7.14 | 5.35 | 7.12 | 7.9 | 8.4 |

THREAD SIZE AND LENGTH SELECTION DATA

All dimensions are in inches.

| UNIFIED | Thread Size | Type | Thread Code | Length "L" +.002 -.005 (Length Code in 32nds of an inch) | | | | | | | | | | | | | | | |
|---------------------|--------------------|------|---------------------|--|------|------|------|------|------|------|------|------|------|------|------|------|------|------|-------|
| | | | | .125 | .187 | .250 | .312 | .375 | .437 | .500 | .562 | .625 | .687 | .750 | .812 | .875 | .937 | 1.00 | 1.062 |
| | .112-40 (#4-40) | S04 | 440 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 | 24 | N/A | N/A | N/A | N/A | N/A |
| | | | 6440 ⁽¹⁾ | | | | | | | | | | | | | | | | |
| | .138-32 (#6-32) | S04 | 632 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 | 24 | 26 | 28 | 30 | 32 | 34 |
| | | | 8632 ⁽¹⁾ | | | | | | | | | | | | | | | | |
| | .164-32 (#8-32) | S04 | 832 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 | 24 | 26 | 28 | 30 | 32 | 34 |
| | | | 032 | | | | | | | | | | | | | | | | |
| .190-32 (#10-32) | | | | | | | | | | | | | | | | | | | |
| D Dimension ±.010 | | | | None | | | | .187 | | | | .312 | | | | .437 | | | |

All dimensions are in millimeters.

| METRIC | Thread Size x Pitch | Type | Thread Code | Length "L" +0.05 -0.13 (Length Code in millimeters) | | | | | | | | | | | |
|--------|---------------------|------|----------------------|--|---|---|---|----|----|----|----|----|-----|-----|-----|
| | M3 x 0.5 | S04 | M3 | 3 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | N/A | N/A | N/A |
| | | | 3.5M3 ⁽¹⁾ | | | | | | | | | | | | |
| | M3.5 x 0.6 | S04 | M3.5 | 3 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 | 25 |
| | M4 x 0.7 | | | | | | | | | | | | | | |
| | M5 x 0.8 | | | | | | | | | | | | | | |
| | D Dimension ±0.25 | | | None | | | | 4 | | | 8 | | | 11 | |

(1) Standoffs with thread codes 6440, 8632, and 3.5M3 offer greater wall thickness for thread sizes 440, 632, and M3 respectively.

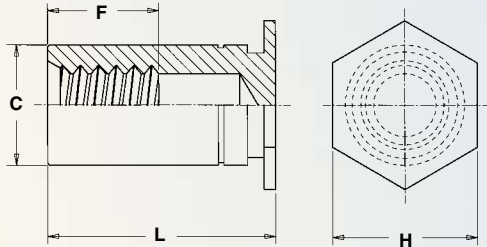
(N/A) Not Available.

Please contact your local PEM® distributor for availability, minimum quantity, and pricing information.

TYPE BS04 BLIND THREADED STANDOFFS FOR INSTALLATION INTO STAINLESS STEEL

GENERAL DIMENSIONAL DATA

All dimensions are in inches.



| UNIFIED | Thread Code | Min. Sheet Thickness | Hole Size In Sheet +.003 -.000 | C +.000 -.005 | H Nom. | Min. Dist. Hole C/L To Edge |
|---------|-------------|----------------------|--------------------------------------|---------------------|-----------|-----------------------------------|
| | 440 | .040 | .166 | .165 | .187 | .23 |
| | 6440 | .040 | .213 | .212 | .250 | .28 |
| | 632 | .040 | .213 | .212 | .250 | .28 |
| | 8632 | .050 | .281 | .280 | .312 | .33 |
| | 832 | .050 | .281 | .280 | .312 | .33 |
| | 032 | .050 | .281 | .280 | .312 | .33 |

All dimensions are in millimeters.

| METRIC | Thread Code | Min. Sheet Thickness | Hole Size In Sheet +0.08 | C -0.13 | H Nom. | Min. Dist. Hole C/L To Edge |
|--------|-------------|----------------------|-----------------------------|------------|-----------|-----------------------------------|
| | M3 | 1.02 | 4.22 | 4.2 | 4.8 | 6 |
| | 3.5M3 | 1.02 | 5.41 | 5.39 | 6.4 | 7.1 |
| | M3.5 | 1.02 | 5.41 | 5.39 | 6.4 | 7.1 |
| | M4 | 1.27 | 7.14 | 7.12 | 7.9 | 8.4 |
| | M5 | 1.27 | 7.14 | 7.12 | 7.9 | 8.4 |

THREAD SIZE AND LENGTH SELECTION DATA

All dimensions are in inches.

| UNIFIED | Thread Size | Type | Thread Code | Length "L" +.002 -.005 (Length Code in 32nds of an inch) | | | | | | | | | | | | | |
|---------|---------------------|------|----------------------------|--|------|------|------|------|------|------|------|------|------|------|------|-------|--|
| | | | | .312 | .375 | .437 | .500 | .562 | .625 | .687 | .750 | .812 | .875 | .937 | 1.00 | 1.062 | |
| | .112-40 (#4-40) | BS04 | 440 6440 ⁽¹⁾ | 10 | 12 | 14 | 16 | 18 | 20 | 22 | 24 | 26 | 28 | 30 | 32 | 34 | |
| | .138-32 (#6-32) | | 632 8632 ⁽¹⁾ | 10 | 12 | 14 | 16 | 18 | 20 | 22 | 24 | 26 | 28 | 30 | 32 | 34 | |
| | .164-32 (#8-32) | BS04 | 832 | 10 | 12 | 14 | 16 | 18 | 20 | 22 | 24 | 26 | 28 | 30 | 32 | 34 | |
| | .190-32 (#10-32) | | 032 | | | | | | | | | | | | | | |
| | F Dimension Min. | | | | .156 | | .187 | | .250 | | | .375 | | | | | |

All dimensions are in millimeters.

| METRIC | Thread Size x Pitch | Type | Thread Code | Length "L" +0.05 -0.13 (Length Code in millimeters) | | | | | | | | | |
|--------|---------------------|------|----------------------|--|---|----|----|----|----|----|----|----|----|
| | M3 x 0.5 | BS04 | M3 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 | 25 |
| | | | 3.5M3 ⁽¹⁾ | | | | | | | | | | |
| | M3.5 x 0.6 | M3.5 | | | | | | | | | | | |
| | M4 x 0.7 | M4 | | | | | | | | | | | |
| | M5 x 0.8 | M5 | | | | | | | | | | | |
| | F Dimension Min. | | | | | | | | | | | | |

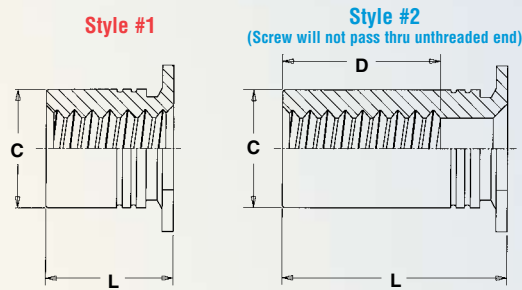
(1) Standoffs with thread codes 6440, 8632, and 3.5M3 offer greater wall thickness for thread sizes 440, 632, and M3 respectively.

Please contact your local PEM® distributor for availability, minimum quantity, and pricing information.

TYPES TSO, TSOS, TSOA THREADED STANDOFFS FOR SHEETS AS THIN AS .025" / 0.63 mm

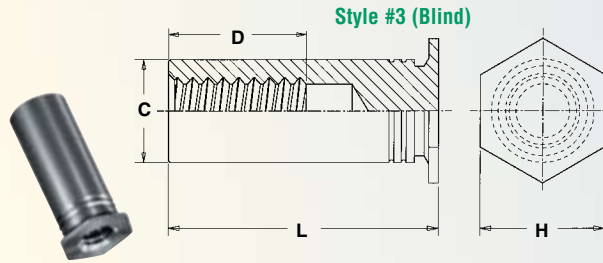
GENERAL DIMENSIONAL DATA

All dimensions are in inches.



| UNIFIED | Thread Code | Min. Sheet Thickness | Hole Size In Sheet +.003 -.000 | C +.000 -.005 | D Min. Thread Depth | H Nom. | Min. Dist. Hole C/L To Edge |
|---------|-------------|----------------------|--------------------------------------|---------------------|------------------------|-----------|-----------------------------|
| | 256 | .025 | .166 | .165 | .200 | .187 | .23 |
| | 6256 | .025 | .213 | .212 | | .250 | .27 |
| | 440 | .025 | .166 | .165 | .220 | .187 | .23 |
| | 6440 | .025 | .213 | .212 | | .250 | .27 |
| | 632 | .025 | .213 | .212 | .270 | .250 | .27 |

All dimensions are in millimeters.



| METRIC | Thread Code | Min. Sheet Thickness | Hole Size In Sheet +.08 | C -0.13 | D Min. Thread Depth | H Nom. | Min. Dist. Hole C/L To Edge |
|--------|-------------|----------------------|----------------------------|------------|------------------------|-----------|-----------------------------|
| | M25 | 0.63 | 4.22 | 4.19 | 5.2 | 4.8 | 5.8 |
| | 6M25 | 0.63 | 5.41 | 5.39 | | 6.4 | 7.1 |
| | M3 | 0.63 | 4.22 | 4.19 | 6.2 | 4.8 | 5.8 |
| | 6M3 | 0.63 | 5.41 | 5.39 | | 6.4 | 7.1 |
| | M35 | 0.63 | 5.41 | 5.39 | 7 | 6.4 | 7.1 |

THREAD SIZE AND LENGTH SELECTION DATA

All dimensions are in inches.

| UNIFIED | Thread Size | Type | | | Thread Code | Length "L" ±.003 For other lengths / thread depth data see chart below. | | | | | | | | | | | |
|---------|--------------------|-------|-----------------|----------|----------------------------|--|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|
| | | Steel | Stainless Steel | Aluminum | | .090 | .125 | .187 | .250 | .312 | .375 | .437 | .500 | .562 | .625 | .687 | .750 |
| | | | | | | Length Code (Length "L" without decimal point) | | | | | | | | | | | |
| | .086-56 (#2-56) | TSO | TSOS | TSOA | 256 6256 ⁽⁴⁾ | 090 ⁽¹⁾ | 125 ⁽¹⁾ | 187 ⁽¹⁾ | 250 ⁽¹⁾ | 312 ⁽²⁾ | 375 ⁽²⁾ | 437 ⁽³⁾ | 500 ⁽³⁾ | 562 ⁽³⁾ | 625 ⁽³⁾ | 687 ⁽³⁾ | 750 ⁽³⁾ |
| | .112-40 (#4-40) | TSO | TSOS | TSOA | 440 6440 ⁽⁴⁾ | 090 ⁽¹⁾ | 125 ⁽¹⁾ | 187 ⁽¹⁾ | 250 ⁽¹⁾ | 312 ⁽²⁾ | 375 ⁽²⁾ | 437 ⁽²⁾ | 500 ⁽³⁾ | 562 ⁽³⁾ | 625 ⁽³⁾ | 687 ⁽³⁾ | 750 ⁽³⁾ |
| | .138-32 (#6-32) | TSO | TSOS | TSOA | 632 | N/A | 125 ⁽¹⁾ | 187 ⁽¹⁾ | 250 ⁽¹⁾ | 312 ⁽¹⁾ | 375 ⁽²⁾ | 437 ⁽²⁾ | 500 ⁽²⁾ | 562 ⁽³⁾ | 625 ⁽³⁾ | 687 ⁽³⁾ | 750 ⁽³⁾ |

All dimensions are in millimeters.

| METRIC | Thread Size x Pitch | Type | | | Thread Code | Length “L” ±0.08 For other lengths / thread depth data see chart below. | | | | | | | | | | |
|------------|---------------------|-------|-----------------|----------|-------------|--|--------|--------|--------|---------|---------|---------|---------|---------|---------|---------|
| | | Steel | Stainless Steel | Aluminum | | 2.00 | 3.00 | 4.00 | 6.00 | 8.00 | 10.00 | 12.00 | 14.00 | 16.00 | 18.00 | 19.00 |
| | | | | | | Length Code (Length “L” without decimal point) | | | | | | | | | | |
| | M2.5 x 0.45 | TSO | TSOS | TSOA | M25 | 200(1) | 300(1) | 400(1) | 600(1) | 800(2) | 1000(3) | 1200(3) | 1400(3) | 1600(3) | 1800(3) | 1900(3) |
| | | | | | 6M25(4) | | | | | | | | | | | |
| | M3 x 0.5 | TSO | TSOS | TSOA | M3 | 200(1) | 300(1) | 400(1) | 600(1) | 800(2) | 1000(2) | 1200(3) | 1400(3) | 1600(3) | 1800(3) | 1900(3) |
| 6M3(4) | | | | | | | | | | | | | | | | |
| M3.5 x 0.6 | TSO | TSOS | TSOA | M35 | N/A | 300(1) | 400(1) | 600(1) | 800(1) | 1000(2) | 1200(2) | 1400(3) | 1600(3) | 1800(3) | 1900(3) | |

(1) Style #1.

(2) Style #2.

(3) Style #3.

(N/A) Not Available

(4) Standoffs with thread codes 6256, 6440, 6M25 and 6M3 offer greater wall thickness for thread sizes 256, 440, M2.5 and M3 respectively.

Please contact your local PEM® distributor for availability, minimum quantity, and pricing information.

LENGTH / STYLE DATA

All dimensions are in inches.

(Length can be specified in .001" increments.)

| UNIFIED | Thread Code | Length "L" (Style #1) | Length "L" (Style #2) | Length "L" (Style #3) |
|---------|-------------|-----------------------|-----------------------|-----------------------|
| | 256 | .090-.250 | .251-.375 | .376-.750 |
| | 6256 | | | |
| | 440 | .090-.280 | .281-.450 | .451-.750 |
| | 6440 | | | |
| | 632 | .120-.350 | .351-.540 | .541-.750 |

All dimensions are in millimeters.

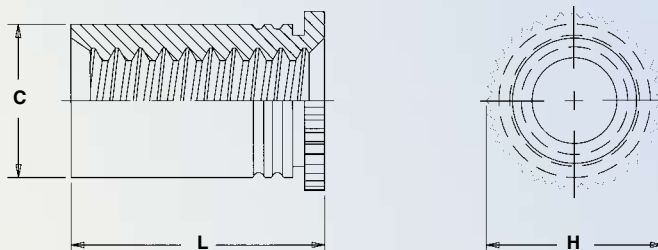
(Length can be specified in .02 mm increments.)

| METRIC | Thread Code | Length "L" (Style #1) | Length "L" (Style #2) | Length "L" (Style #3) |
|--------|-------------|-----------------------|-----------------------|-----------------------|
| | M25 | 2.00-6.30 | 6.32-9.50 | 9.52-19.00 |
| | 6M25 | | | |
| | M3 | 2.00-7.50 | 7.52-11.00 | 11.02-19.00 |
| | 6M3 | | | |
| | M35 | 3.00-8.80 | 8.82-12.80 | 12.82-19.00 |

TYPES DSO AND DSOS THREADED STANDOFFS FOR CLOSE-TO-EDGE APPLICATIONS



Patented.



All dimensions are in inches.

| UNIFIED | Thread Size | Type | | Thread Code | Length Code | Sheet Thickness | Hole Size In Sheet +.003 -.000 | C Max. | H Nom. | L ⁽¹⁾ +.002 -.005 | Min. Dist. Hole C/L To Edge |
|---------|--------------------|-----------------|-------------------|-------------|-------------|-----------------|-----------------------------------|-----------|-----------|------------------------------------|-----------------------------------|
| | | Stainless Steel | Steel | | | | | | | | |
| | .112-40 (#4-40) | DSOS | DSO ^{NS} | 440 | 250 275 | .037 - .250 | .166 | .165 | .194 | .250 .275 | .126 |

All dimensions are in millimeters.

| METRIC | Thread Size x Pitch | Type | | Thread Code | Length Code | Sheet Thickness | Hole Size In Sheet +0.08 | C Max. | H Nom. | L ⁽¹⁾ +0.05 -0.13 | Min. Dist. Hole C/L To Edge |
|--------|---------------------|-----------------|-------------------|-------------|-------------|-----------------|-----------------------------|-----------|-----------|------------------------------------|-----------------------------------|
| | | Stainless Steel | Steel | | | | | | | | |
| | M3 x 0.5 | DSOS | DSO ^{NS} | M3 | 6.35 7 | 0.94 - 6.35 | 4.2 | 4.2 | 4.92 | 6.35 7 | 3.2 |

(1) Available in other lengths on special order.

(NS) Not Stocked, available on special order.

Please contact your local PEM® distributor for availability, minimum quantity, and pricing information.

MATERIAL & FINISH SPECIFICATIONS

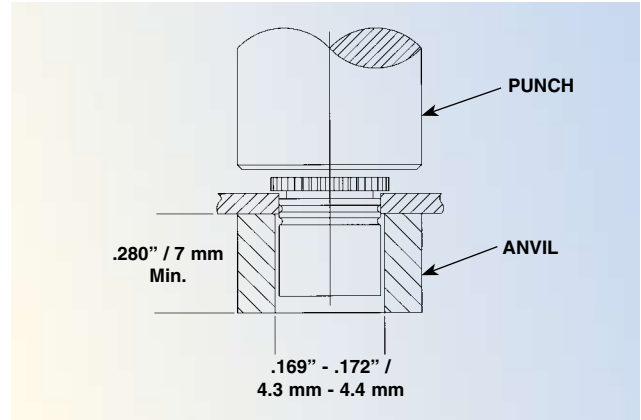
| Type | Threads ⁽¹⁾ | Fastener Materials | | | | | Standard Finishes | | | For Use In Sheet Hardness: | | | | |
|--------------------------------|--|---------------------------|-------------------------------|------------------|----------------------------|----------------------------|---|--|-----------|--------------------------------------|--------------------------------------|--------------------------------------|--------------------------------------|--------------------------------------|
| | Internal, ANSI B1.1 2B ANSI/ASME B1.13M, 6H | Heat-treated Carbon Steel | Non-heat Treated Carbon Steel | 7075-T6 Aluminum | 300 Series Stainless Steel | 400 Series Stainless Steel | Zinc Per ASTM B 633 SC1 (5µm) Type III, Colorless | Passivated and/or Tested Per ASTM A380 | No Finish | 88 or less on the Rockwell "B" Scale | 80 or less on the Rockwell "B" Scale | 70 or less on the Rockwell "B" Scale | 60 or less on the Rockwell "B" Scale | 50 or less on the Rockwell "B" Scale |
| SO | • | • | | | | | • | | | | • | | | |
| SOA | • | | | • | | | | | • | | | | | • |
| SOS | • | | | | • | | | • | | | | • | | |
| SO4 | • | | | | | • | | • | | • | | | | |
| BSO | • | • | | | | | • | | | | • | | | |
| BSOA | • | | | • | | | | | • | | | | | • |
| BSOS | • | | | | • | | | • | | | | • | | |
| BSO4 | • | | | | | • | | • | | • | | | | |
| TSO | • | | • | | | | • | | | | | | • | |
| TSOS | • | | | | • | | | • | | | | • | | |
| TSOA | • | | | • | | | | | • | | | | | • |
| DSO | • | • | | | | | • | | | | • | | | |
| DSOS | • | | | | • | | | • | | | | • | | |
| Part Number Codes For Finishes | | | | | | | ZI | None | None | | | | | |

(1) Where applicable.

INSTALLATION

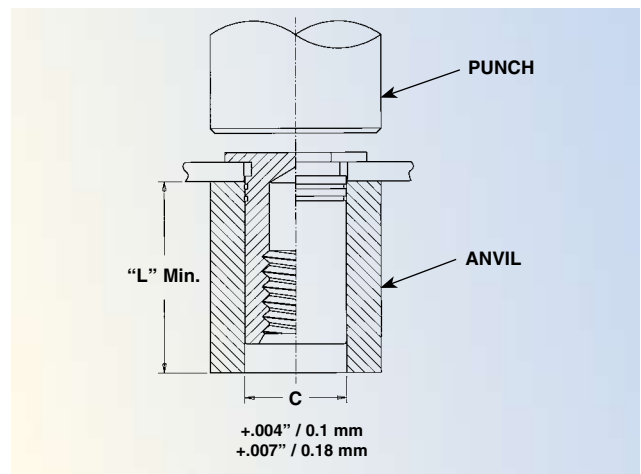
Types DSO and DSOS

1. Provide the correct diameter mounting hole.
2. Do not perform any secondary operations such as deburring.
3. Insert fastener through mounting hole and into anvil as shown in drawing at right.
4. With punch and anvil surfaces parallel, apply only enough squeezing force to embed the standoff's head flush in the sheet.



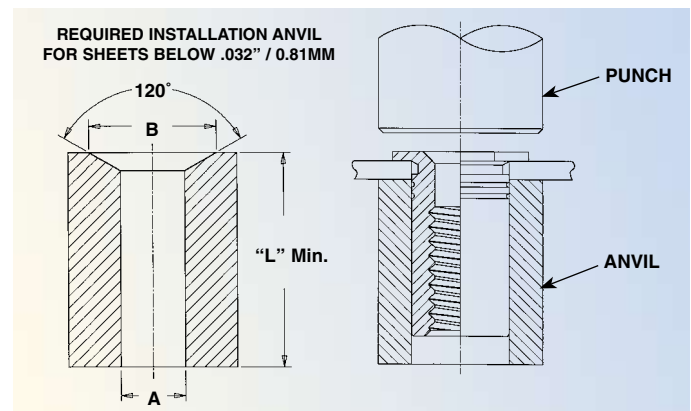
Types SO, SOS, SOA, SO4, BSO, BSOS, BSOA, and BSO4

1. Punch or drill properly sized mounting hole in sheet. Do not perform any secondary operation such as deburring.
2. Insert standoff through mounting hole of sheet and into anvil as shown in drawing.
3. With punch and anvil surfaces parallel, apply only enough squeezing force to embed the standoff's head flush in the sheet. Drawing at right shows suggested tooling for applying these forces.



Types TSO, TSOS, and TSOA

1. Punch or drill properly sized mounting hole in sheet. Do not perform any secondary operation such as deburring.
2. Insert standoff through mounting hole of sheet and into anvil as shown in drawing.
3. With punch and anvil surfaces parallel, apply only enough squeezing force to embed the standoff's head flush in the sheet. Drawing at right shows required installation anvil for sheet thickness of .025\"/>



All dimensions are in inches.

| Standoff "C" Dimensions | Anvil Dimensions | |
|----------------------------|------------------|-------------|
| | A | B |
| .165 | .167 - .170 | .187 - .194 |
| .212 | .213 - .216 | .250 - .257 |

All dimensions are in millimeters.

| Standoff "C" Dimensions | Anvil Dimensions | |
|----------------------------|------------------|-------------|
| | A | B |
| 4.19 | 4.24 - 4.32 | 4.75 - 4.93 |
| 5.39 | 5.41 - 5.49 | 6.35 - 6.53 |

PEMSERTER® PRESSES

For best results we recommend using a PEMSERTER® press for either manual or automatic installation of PEM standoffs. For more information on our line of presses call 1-800-523-5321, or check our web site.

PERFORMANCE DATA ⁽¹⁾

Types SO, SOS, SOA, BSO, BSOS, and BSOA

| UNIFIED | Thread Code | Standoff Material | Max. Rec. Tightening Torque For Mating Screw (in. lbs.) | Test Sheet Material | | | | | | | |
|----------|-----------------|-------------------|---|-------------------------|----------------|-----------------------|---------------------------------|-------------------------|----------------|-----------------------|---------------------------------|
| | | | | .060" 5052-H34 Aluminum | | | | .060" Cold-rolled Steel | | | |
| | | | | Installation (lbs.) | Pushout (lbs.) | Torque-out (in. lbs.) | Pull-thru ⁽²⁾ (lbs.) | Installation (lbs.) | Pushout (lbs.) | Torque-out (in. lbs.) | Pull-thru ⁽²⁾ (lbs.) |
| 440 | Steel | 4.75 | 1100 | 1100 | 160 | 11 | 280 | 2200 | 225 | 19 | 330 |
| | Stainless Steel | 3.8 | 1100 | 1100 | 160 | 11 | 224 | 2200 | 225 | 19 | 264 |
| | Aluminum | 2.85 | 1100 | 160 | 11 | 168 | (3) | (3) | (3) | (3) | (3) |
| 6440 | Steel | 4.75 | 1700 | 300 | 300 | 11 | 280 | 3300 | 420 | 19 | 330 |
| | Stainless Steel | 3.8 | 1700 | 300 | 300 | 11 | 224 | 3300 | 420 | 19 | 264 |
| | Aluminum | 2.85 | 1700 | 300 | 11 | 168 | (3) | (3) | (3) | (3) | (3) |
| 632 | Steel | 8.75 | 1700 | 300 | 25 | 310 | 3300 | 420 | 35 | 380 | 380 |
| | Stainless Steel | 7 | 1700 | 300 | 25 | 248 | 3300 | 420 | 35 | 304 | 304 |
| | Aluminum | 5.25 | 1700 | 300 | 25 | 186 | (3) | (3) | (3) | (3) | (3) |
| 8632 | Steel | 8.75 | 2400 | 400 | 25 | 310 | 4000 | 560 | 35 | 380 | 380 |
| | Stainless Steel | 7 | 2400 | 400 | 25 | 248 | 4000 | 560 | 35 | 304 | 304 |
| | Aluminum | 5.25 | 2400 | 400 | 25 | 186 | (3) | (3) | (3) | (3) | (3) |
| 832, 032 | Steel | 18, 32 | 2400 | 400 | 45 | 580 | 4000 | 560 | 75 | 700 | 700 |
| | Stainless Steel | 14.4, 25.6 | 2400 | 400 | 45 | 464 | 4000 | 560 | 75 | 560 | 560 |
| | Aluminum | 11, 19 | 2400 | 400 | 45 | 348 | (3) | (3) | (3) | (3) | (3) |

| METRIC | Thread Code | Standoff Material | Max. Rec. Tightening Torque For Mating Screw (N•m) | Test Sheet Material | | | | | | | |
|--------|-----------------|-------------------|--|--------------------------|-------------|------------------|------------------------------|--------------------------|-------------|------------------|------------------------------|
| | | | | 1.5 mm 5052-H34 Aluminum | | | | 1.5 mm Cold-rolled Steel | | | |
| | | | | Installation (kN) | Pushout (N) | Torque-out (N•m) | Pull-thru ⁽²⁾ (N) | Installation (kN) | Pushout (N) | Torque-out (N•m) | Pull-thru ⁽²⁾ (N) |
| M3 | Steel | 0.55 | 4.9 | 710 | 1.24 | 1245 | 9.8 | 1000 | 2.15 | 1465 | 1465 |
| | Stainless Steel | 0.44 | 4.9 | 710 | 1.24 | 996 | 9.8 | 1000 | 2.15 | 1172 | 1172 |
| | Aluminum | 0.33 | 4.9 | 710 | 1.24 | 747 | (3) | (3) | (3) | (3) | (3) |
| 3.5M3 | Steel | 0.55 | 7.6 | 1330 | 1.24 | 1245 | 14.7 | 1860 | 2.15 | 1465 | 1465 |
| | Stainless Steel | 0.44 | 7.6 | 1330 | 1.24 | 996 | 14.7 | 1860 | 2.15 | 1172 | 1172 |
| | Aluminum | 0.33 | 7.6 | 1330 | 1.24 | 747 | (3) | (3) | (3) | (3) | (3) |
| M3.5 | Steel | 0.91 | 7.6 | 1330 | 2.82 | 1375 | 14.7 | 1860 | 3.95 | 1690 | 1690 |
| | Stainless Steel | 0.73 | 7.6 | 1330 | 2.82 | 1100 | 14.7 | 1860 | 3.95 | 1352 | 1352 |
| | Aluminum | 0.55 | 7.6 | 1330 | 2.82 | 825 | (3) | (3) | (3) | (3) | (3) |
| M4, M5 | Steel | 2, 3.6 | 10.7 | 1780 | 5.08 | 2575 | 17.8 | 2490 | 8.47 | 3110 | 3110 |
| | Stainless Steel | 1.6, 2.88 | 10.7 | 1780 | 5.08 | 2060 | 17.8 | 2490 | 8.47 | 2488 | 2488 |
| | Aluminum | 1.2, 2.16 | 10.7 | 1780 | 5.08 | 1545 | (3) | (3) | (3) | (3) | (3) |

Types SO4 and BSO4

| UNIFIED | Thread Code | Max. Rec. Tightening Torque For Mating Screw (in. lbs.) | Test Sheet Material | | | |
|---------|-------------|---|----------------------------------|----------------|-----------------------|------------------|
| | | | .050" 300 Series Stainless Steel | | | |
| | | | Installation (lbs.) | Pushout (lbs.) | Torque-out (in. lbs.) | Pull-thru (lbs.) |
| 440 | 4.75 | 5500 | 336 | 17 | 600 | 600 |
| 6440 | 4.75 | 9500 | 647 | 17 | 680 | 680 |
| 632 | 8.75 | 9500 | 647 | 30 | 1392 | 1392 |
| 8632 | 8.75 | 10500 | 900 | 30 | 1517 | 1517 |
| 832 | 18 | 10500 | 900 | 53 | 1517 | 1517 |
| 032 | 32 | 10500 | 900 | 71 | 1368 | 1368 |

| METRIC | Thread Code | Max. Rec. Tightening Torque For Mating Screw (N • m) | Test Sheet Material | | | |
|--------|-------------|--|-----------------------------------|-------------|--------------------|---------------|
| | | | 1.3 mm 300 Series Stainless Steel | | | |
| | | | Installation (kN) | Pushout (N) | Torque-out (N • m) | Pull-thru (N) |
| M3 | 0.55 | 24.5 | 1493 | 2.36 | 2650 | 2650 |
| 3.5M3 | 0.55 | 42.3 | 2877 | 2.36 | 3025 | 3025 |
| M3.5 | 0.91 | 42.3 | 2877 | 3.06 | 3025 | 3025 |
| M4 | 2 | 46.7 | 4003 | 6.34 | 6458 | 6458 |
| M5 | 3.6 | 46.7 | 4003 | 8.89 | 6226 | 6226 |

Types TSO, TSOS, and TSOA

| Standoff "C" Dimension | Standoff Material | Test Sheet Material | | | | | | | | | | | |
|---------------------------|----------------------|-----------------------------------|------|---------|-----|------------|-------|-----------------------------------|------|---------|-----|------------|-------|
| | | .025" / 0.64 mm 5052-H34 Aluminum | | | | | | .025" / 0.64 mm Cold-rolled Steel | | | | | |
| | | Installation | | Pushout | | Torque-out | | Installation | | Pushout | | Torque-out | |
| | | (lbs.) | (kN) | (lbs.) | (N) | (in. lbs.) | (N•m) | (lbs.) | (kN) | (lbs.) | (N) | (in. lbs.) | (N•m) |
| .165" / 4.19 mm | Steel | 1500 | 6.7 | 70 | 311 | 6 | 0.68 | 2000 | 8.9 | 100 | 445 | 9 | 1 |
| | Stainless Steel | 1500 | 6.7 | 70 | 311 | 6 | 0.68 | 2000 | 8.9 | 100 | 445 | 9 | 1 |
| | Aluminum | 1500 | 6.7 | 70 | 311 | 6 | 0.68 | — | — | — | — | — | — |
| .212" / 5.38 mm | Steel | 1800 | 8 | 90 | 400 | 11 | 1.24 | 2500 | 11.1 | 150 | 667 | 15 | 1.7 |
| | Stainless Steel | 1800 | 8 | 90 | 400 | 11 | 1.24 | 2500 | 11.1 | 150 | 667 | 15 | 1.7 |
| | Aluminum | 1800 | 8 | 90 | 400 | 11 | 1.24 | — | — | — | — | — | — |

(1) The installation, pushout, torque-out and pull-thru values reported are averages when all installation specifications and procedures are followed. Variations in mounting hole size, sheet material and installation procedure will affect this data. Performance testing of this product in your application is recommended. We will be happy to provide samples for this purpose.

(2) Standoffs installed in sheets thinner than .060"/1.5mm will have pull-thru, pushout, and torque-out values at 80% of tabulated values.

(3) Not recommended.

PERFORMANCE DATA ⁽¹⁾ (continued)

Types DSO and DSOS

| UNIFIED | Thread Code | Max. Rec. Tightening Torque For Mating Screw (in. lbs.) | Test Sheet Material | | | | | |
|---------|-------------|---|-------------------------|----------------|-----------------------|-------------------------|----------------|-----------------------|
| | | | .040" Cold-rolled Steel | | | .040" 5052-H34 Aluminum | | |
| | | | Installation (lbs.) | Pushout (lbs.) | Torque-out (in. lbs.) | Installation (lbs.) | Pushout (lbs.) | Torque-out (in. lbs.) |
| | | | 1300 | 75 | 10 | 1000 | 50 | 10 |

| METRIC | Thread Code | Max. Rec. Tightening Torque For Mating Screw (N • m) | Test Sheet Material | | | | | |
|--------|-------------|--|------------------------|-------------|--------------------|------------------------|-------------|--------------------|
| | | | 1 mm Cold-rolled Steel | | | 1 mm 5052-H34 Aluminum | | |
| | | | Installation (kN) | Pushout (N) | Torque-out (N • m) | Installation (kN) | Pushout (N) | Torque-out (N • m) |
| | | | 5.8 | 334 | 1.1 | 4.5 | 223 | 1.1 |

(1) The installation, pushout, and torque-out values reported are averages when all installation specifications and procedures are followed. Variations in mounting hole size, sheet material and installation procedure will affect this data. Performance testing of this product in your application is recommended. We will be happy to provide samples for this purpose.

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