

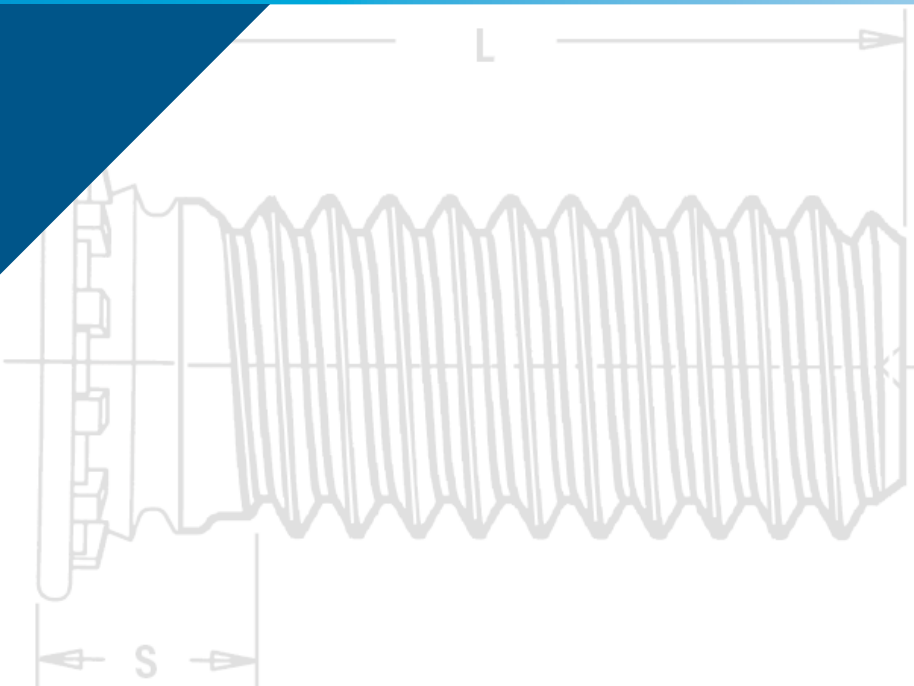


PEM® brand self-clinching studs and pins install permanently in aluminum, steel or stainless steel sheets.



**FH™**















**SELF-CLINCHING  
STUDS AND PINS**



# SELF-CLINCHING STUDS AND PINS

**PEM® self-clinching studs are easily installed by placing them in properly sized holes in sheets and squeezing into place with any standard press:**

- Install permanently in aluminum, steel or stainless steel in sheets as thin as .020" / 0.51 mm.
- High torque-out and pushout resistances.

|  |   |   |   |
|--|---|---|---|
| <p>Dog Point and Anti Cross-Thread Options - <b>PAGE 4</b></p>   |    | <p><b>HFE™/THFE™ (heavy-duty) studs</b> Provides maximum pull through in sheets as thin as .031" / 0.8 mm - <b>PAGE 10</b></p>  |    |
| <p><b>FH™/FHS™/FHA™ (flush-head) studs</b> are available in aluminum, steel, or stainless steel - <b>PAGE 5</b></p>  |    | <p><b>HFG8™/HF109™ (heavy-duty high tensile strength) studs</b> are manufactured for the most demanding applications from medium carbon alloy steel, then heat-treated to high strength and hardness qualities - <b>PAGE 11</b></p> |    |
| <p><b>FH4™/FHP™ (flush-head) studs</b> are designed to provide strong threads in stainless steel sheets as thin as .040"/1 mm. FHP studs have high corrosion resistance - <b>PAGE 6</b></p>                                |    | <p><b>HFLH™ studs</b> are for installation into thin, harder, high-strength materials - <b>PAGE 12</b></p>  |    |
| <p><b>FHL™/FHLS™ (flush, low-displacement head) studs</b> have a smaller head diameter and install closer to the edge of a sheet than PEM FH/FHS studs - <b>PAGE 7</b></p>   |    | <p><b>SGPC™ swaging collar studs</b> can install into most panel material and accommodate multiple panels as long as the total thickness does not exceed the maximum sheet thickness - <b>PAGE 13</b></p>                           |    |
| <p><b>TFH™/TFHS™ (non-flush) studs</b> are for sheets as thin as .020" / 0.51 mm. The stud head will project above the sheet surface approximately .025"/0.64mm - <b>PAGE 8</b></p>  |    | <p><b>FHX™ flush-head studs with X-Press™ thread profile</b> are typically used with push-on or other plastic fasteners - <b>PAGE 14</b></p>  |   |
| <p><b>HFH™/HFHS™ (heavy-duty) studs</b> have a large head which projects above the sheet material to distribute the axial tightening force over a large area thereby improving pull through resistance - <b>PAGE 9</b></p> |  | <p><b>FH™/FHS™/FHA™ (flush-head) Pins</b> are available on special order - <b>PAGE 15</b></p>   |  |
| <p><b>HFHB™ (heavy-duty BUSBAR®) studs</b> are ideal for applications which demand superior electrical/mechanical attachment points - <b>PAGE 9</b></p>  |  | <p><b>TPS™/TP4™/TPXS™ (flush-head) pilot pins</b> satisfy a wide range of positioning, pivot, and alignment applications - <b>PAGE 16</b></p>   |  |
|  |   | <p><b>Material and finish specifications - PAGE 17</b></p>  |   |
|  |   | <p><b>Installation - PAGES 18 - 29</b></p>  |   |
|  |   | <p><b>Performance data - PAGES 30 - 36</b></p>  |   |



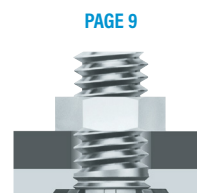
Flush-head studs  
Types FH/FHA/FHS/FHP/FH4



Flush, low-displacement head studs  
Types FHL/FHLS



Thin sheet studs  
Types TFH/TFHS



Heavy-duty studs  
Types HFH/HFHS/HFHB



Heavy-duty studs for thin sheets  
Types HFE/THFE

## STUD SELECTOR GUIDE

| PEM Stud Type  | Application Requires: |            |  |                                  |  |                                       |                               |                                     |                     |                                |              |                         |
|----------------|-----------------------|------------|--|----------------------------------|--|---------------------------------------|-------------------------------|-------------------------------------|---------------------|--------------------------------|--------------|-------------------------|
|                | Flush-head            | Heavy duty | Sheet thickness as thin as .020" / 0.51 mm | Superior electrical conductivity | Installation into stainless steel sheets | Compatibility with aluminum anodizing | Superior corrosion resistance | Closest centerline-to-edge distance | Unthreaded stud/pin | Largest hole in attached Panel | Non-magnetic | Max. panel hardness (2) |
| FH             | ▪                     |            |  |                                  |  |                                       |                               |                                     |                     |                                |              | HRB 80<br>HB 150        |
| FHA            | ▪                     |            |  |                                  |  | ▪                                     | ▪                             |                                     |                     |                                | ▪            | HRB 50<br>HB 82         |
| FHS            | ▪                     |            |  |                                  |  |                                       | ▪                             |                                     |                     |                                | ▪            | HRB 70<br>HB 125        |
| FH4            | ▪                     |            |  |                                  | ▪  |                                       |                               |                                     |                     |                                |              | HRB 92<br>HB 202        |
| FHP            | ▪                     |            |  |                                  | ▪  |                                       | ▪                             |                                     |                     |                                | ▪            | HRB 92<br>HB 202        |
| FHL            | ▪                     |            |  |                                  |  |                                       |                               | ▪                                   |                     |                                |              | HRB 80<br>HB 150        |
| FHLS           | ▪                     |            |  |                                  |  |                                       | ▪                             | ▪                                   |                     |                                | ▪            | HRB 70<br>HB 125        |
| TFH            |                       |            | ▪  |                                  |  |                                       |                               |                                     |                     |                                |              | HRB 80<br>HB 150        |
| TFHS           |                       |            | ▪  |                                  |  |                                       | ▪                             |                                     |                     |                                | ▪            | HRB 70<br>HB 125        |
| HFH            |                       | ▪ (1)      |  |                                  |  |                                       |                               |                                     |                     | ▪                              |              | HRB 85<br>HB 165        |
| HFHB           |                       | ▪          |  | ▪                                |  |                                       | ▪                             |                                     |                     | ▪                              | ▪            | HRB 55<br>HB 83         |
| HFHS           |                       | ▪          |  |                                  |  |                                       | ▪                             |                                     |                     | ▪                              | ▪            | HRB 70<br>HB 125        |
| HFE            |                       | ▪          |  |                                  |  |                                       |                               |                                     |                     | ▪                              |              | HRB 85<br>HB 165        |
| THFE           |                       | ▪          |  |                                  |  |                                       |                               |                                     |                     | ▪                              |              | HRB 85<br>HB 165        |
| HFG8/HF109     |                       | ▪ (3)      |  |                                  |  |                                       |                               |                                     |                     | ▪                              |              | HRB 89<br>HB 180        |
| HFLH           |                       | ▪          |  |                                  |  |                                       |                               |                                     |                     | ▪                              |              | HRB 96<br>HB 216        |
| SGPC           |                       |            |  |                                  | ▪  |                                       |                               | ▪                                   |                     |                                | ▪            | Any sheet hardness      |
| FHX            | ▪                     |            |  |                                  |  |                                       |                               |                                     |                     |                                |              | HRB 80<br>HB 150        |
| FH Unthreaded  | ▪                     |            |  |                                  |  |                                       |                               | ▪                                   |                     |                                |              | HRB 80<br>HB 150        |
| FHA Unthreaded | ▪                     |            |  |                                  |  | ▪                                     | ▪                             | ▪                                   |                     | ▪                              |              | HRB 50<br>HB 82         |
| FHS Unthreaded | ▪                     |            |  |                                  |  |                                       | ▪                             | ▪                                   |                     | ▪                              |              | HRB 70<br>HB 125        |
| TPS            | ▪                     |            |  |                                  |  |                                       | ▪                             |                                     |                     | ▪                              |              | HRB 70<br>HB 125        |
| TP4            | ▪                     |            |  |                                  | ▪  |                                       |                               |                                     |                     | ▪                              |              | HRB 92<br>HB 202        |
| TPXS           | ▪                     |            |  |                                  |  |                                       | ▪                             |                                     | ▪                   |                                | ▪            | HRB 70<br>HB 125        |

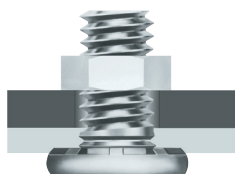
(1) Meets grade 5 / property class 9.8 tensile requirements.

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

(3) Grade 8 / Property Class 10.9 thread strength.

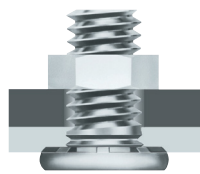
Standard product features shown above. Studs can also be custom designed to meet your exact application requirements.

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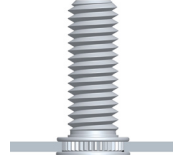
Heavy-duty, high tensile strength studs  
Types HFG8/HF109

PAGE 12



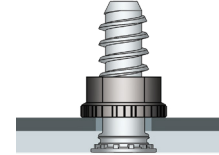
Studs for hard panels  
Type HFLH

PAGE 13



Swaging collar studs  
Type SGPC

PAGE 14



Flush-head Studs with  
X-Press™ Thread Profile  
Type FHX

PAGE 16



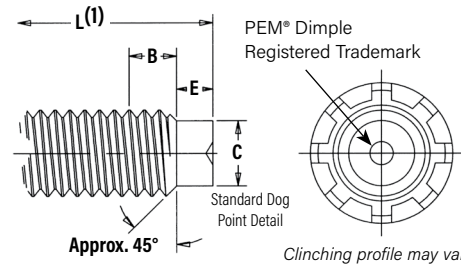
Flush-head pins  
Types TPS/TP4



# SELF-CLINCHING STUDS AND PINS

## OPTIONAL DOG POINT FEATURE

PEM® 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, FHL, HFH, HFE, HF109, HFG8, TFH and THFE studs.

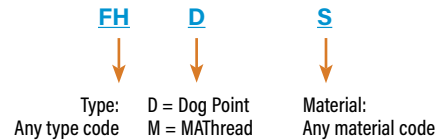


All dimensions are in inches.

All dimensions are in millimeters.

| Unified Thread Size | C ±.005 (2) | E ±.010 | B Nom. Transitional Length to Full Thread | Metric Thread Size | C ±0.13 (2) | E ±0.25 | B nom. Transitional Length to Full Thread |
|---------------------|-------------|---------|---|--------------------|-------------|---------|---|
| .138-32 (#6-32)     | .086        | .050    | .098                                      | M3.5 x 0.6         | 2.4         | 1.27    | 1.88                                      |
| .164-32 (#8-32)     | .111        | .055    | .099                                      | M4 x 0.7           | 2.79        | 1.4     | 2.26                                      |
| .190-24 (#10-24)    | .124        | .065    | .127                                      | M5 x 0.8           | 3.66        | 1.78    | 2.48                                      |
| .190-32 (#10-32)    | .138        | .065    | .098                                      | M6 x 1             | 4.37        | 2.03    | 3.05                                      |
| .250-20 (1/4-20)    | .173        | .085    | .149                                      | M8 x 1.25          | 6.05        | 2.67    | 3.73                                      |
| .250-28 (1/4-28)    | .192        | .085    | .110                                      | M10 x 1.5          | 7.72        | 3.43    | 4.37                                      |
| .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                                      |                    |             |         |   |

### OPTIONAL PART NUMBER DESIGNATION



(1) For "L" refer to type stud lengths.

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

## OPTIONAL MATHread® ANTI CROSS-THREAD FEATURE

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.

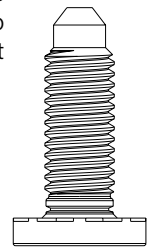


Anti Cross-Thread Feature

MATHread is a registered trademark of MATHread inc.

## OPTIONAL POINTED STUD FEATURE

A pointed lead-in option for studs allows quick location of mating fastener during assembly to speed assembly and significantly reduces the likelihood of cross threading. Clip grooves for snap rings can also be added. This feature can be added to most types of PEM® studs.



## OPTIONAL THREAD MASK

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. [Click here](#) for more information.



Thread mask color may vary.

"BC" suffix will be added to part number to designate thread mask to fastener.

## AVAILABLE PEM® VARIMOUNT® FASTENING SYSTEM

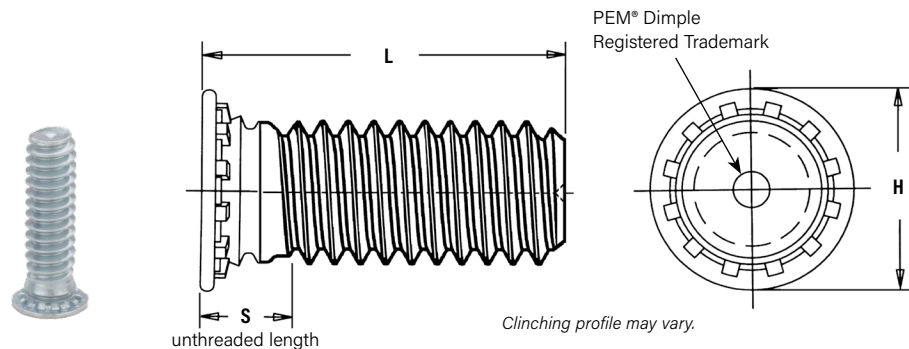
The PEM® VariMount® fastening system (see PEM® Bulletin VM) utilizes a self-clinching stud paired with a round steel or stainless steel base plate to offer a clean and ready-made assembly for mounting into any rigid material or panel, including composites, plastics, and metals. Multiple radial holes in the base plate and a generous footprint provide effective mounting of the assembly. Mounting can be performed either on the front or through the back of a panel.



# SELF-CLINCHING STUDS AND PINS

## FH™/FHS™/FHA™ FLUSH-HEAD STUDS

- Flush-head for sheet thickness of .040" / 1 mm and greater.
- FH studs are recommended for use in steel or aluminum sheets HRB (Rockwell "B" scale) 80 / HB (Hardness Brinell) 150 or less.
- FHS studs are recommended for use in steel or aluminum sheets HRB (Rockwell "B" scale) 70 / HB (Hardness Brinell) 125 or less.
- FHA studs are recommended for use in aluminum sheets HRB (Rockwell "B" scale) 50 / HB (Hardness Brinell) 82 or less.



### PART NUMBER DESIGNATION

|      |               |             |             |             |    |
|------|---------------|-------------|-------------|-------------|----|
| FH   | -             | 632         | -           | 6           | ZI |
| FH   | S             | -           | 632         | -           | 6  |
| FH   | A             | -           | 632         | -           | 6  |
| ↓    | ↓             | ↓           | ↓           | ↓           | ↓  |
| Type | Material Code | Thread Code | Length Code | Finish Code |    |

All dimensions are in inches.

| UNIFIED | Thread Size       | Type              |                 |          | Thread Code | Length Code "L" ±.015<br>(Length Code in 16ths of an inch) |      |      |      |      |      |      |      |      |      | Min. Sheet Thickness (1) | Hole Size in Sheet +.003<br>-.000 | H ± .015 | S Max. (2) | Max. Hole in Attached Parts | Min. Dist. Hole to Edge |
|---------|-------------------|-------------------|-----------------|----------|-------------|--|------|------|------|------|------|------|------|------|------|--------------------------|-----------------------------------|----------|------------|-----------------------------|-------------------------|
|         |                   | Fastener Material |                 |          |             | .250   | .312 | .375 | .500 | .625 | .750 | .875 | 1.00 | 1.25 | 1.50 |                          |                                   |          |            |                             |                         |
|         |                   | Steel             | Stainless Steel | Aluminum |             |  |      |      |      |      |      |      |      |      |      |                          |                                   |          |            |                             |                         |
|         | .086-56 (#2-56)   | FH                | FHS             | -        | 256         | 4  | 5    | 6    | 8    | 10   | 12   | -    | -    | -    | .040 | .085                     | .144                              | .075     | .105       | .187                        |                         |
|         | .112-40 (#4-40)   | FH                | FHS             | FHA      | 440         | 4  | 5    | 6    | 8    | 10   | 12   | 14   | 16   | 20   | -    | .040                     | .111                              | .176     | .085       | .135                        | .219                    |
|         | .138-32 (#6-32)   | FH                | FHS             | FHA      | 632         | 4  | 5    | 6    | 8    | 10   | 12   | 14   | 16   | 20   | 24   | .040                     | .137                              | .206     | .090       | .160                        | .250                    |
|         | .164-32 (#8-32)   | FH                | FHS             | FHA      | 832         | 4  | 5    | 6    | 8    | 10   | 12   | 14   | 16   | 20   | 24   | .040                     | .163                              | .237     | .090       | .185                        | .281                    |
|         | .190-24 (#10-24)  | FH                | FHS             | FHA      | 024         | -  | 5    | 6    | 8    | 10   | 12   | 14   | 16   | 20   | 24   | .040                     | .189                              | .256     | .100       | .210                        | .281                    |
|         | .190-32 (#10-32)  | FH                | FHS             | FHA      | 032         | -  | 5    | 6    | 8    | 10   | 12   | 14   | 16   | 20   | 24   | .040                     | .189                              | .256     | .100       | .210                        | .281                    |
|         | .250-20 (1/4-20)  | FH                | FHS             | FHA      | 0420        | -  | -    | 6    | 8    | 10   | 12   | 14   | 16   | 20   | 24   | .062                     | .249                              | .337     | .135       | .270                        | .312                    |
|         | .313-18 (5/16-18) | FH                | FHS             | -        | 0518        | -  | -    | -    | 8    | 10   | 12   | 14   | 16   | 20   | 24   | .093                     | .311                              | .376     | .160       | .333                        | .375                    |

All dimensions are in millimeters.

| METRIC | Thread Size x Pitch | Type              |                 |          | Thread Code | Length Code "L" ±0.4<br>(Length Code in millimeters) |   |    |    |    |    |    |    |    |    | Min. Sheet Thickness (1) | Hole Size in Sheet +0.08 | H ± 0.4 | S Max. (2) | Max. Hole in Attached Parts | Dist. Hole to Edge |
|--------|---------------------|-------------------|-----------------|----------|-------------|--|---|----|----|----|----|----|----|----|----|--------------------------|--------------------------|---------|------------|-----------------------------|--------------------|
|        |                     | Fastener Material |                 |          |             | 6  | 8 | 10 | 12 | 15 | 18 | -  | -  | -  | -  |                          |                          |         |            |                             |                    |
|        |                     | Steel             | Stainless Steel | Aluminum |             |  |   |    |    |    |    |    |    |    |    |                          |                          |         |            |                             |                    |
|        | M2.5 x 0.45         | FH                | FHS             | FHA      | M2.5        | 6  | 8 | 10 | 12 | 15 | 18 | -  | -  | -  | 1  | 2.5                      | 4.1                      | 1.95    | 3.1        | 5.4                         |                    |
|        | M3 x 0.5            | FH                | FHS             | FHA      | M3          | 6  | 8 | 10 | 12 | 15 | 18 | 20 | 25 | -  | 1  | 3                        | 4.6                      | 2.1     | 3.6        | 5.6                         |                    |
|        | M3.5 x 0.6          | FH                | FHS             | FHA      | M3.5        | 6  | 8 | 10 | 12 | 15 | 18 | 20 | 25 | 30 | 1  | 3.5                      | 5.3                      | 2.25    | 4.1        | 6.4                         |                    |
|        | M4 x 0.7            | FH                | FHS             | FHA      | M4          | 6  | 8 | 10 | 12 | 15 | 18 | 20 | 25 | 30 | 35 | 1                        | 4                        | 5.9     | 2.4        | 4.6                         | 7.2                |
|        | M5 x 0.8            | FH                | FHS             | FHA      | M5          | -  | 8 | 10 | 12 | 15 | 18 | 20 | 25 | 30 | 35 | 1                        | 5                        | 6.5     | 2.7        | 5.6                         | 7.2                |
|        | M6 x 1              | FH                | FHS             | FHA      | M6          | -  | - | 10 | 12 | 15 | 18 | 20 | 25 | 30 | 35 | 1.6                      | 6                        | 8.2     | 3          | 6.6                         | 7.9                |
|        | M8 x 1.25           | FH                | FHS             | -        | M8          | -  | - | -  | 12 | 15 | 18 | 20 | 25 | 30 | 35 | 2.4                      | 8                        | 9.6     | 3.7        | 8.6                         | 9.6                |

(1) See page 18 for installation tool requirements.

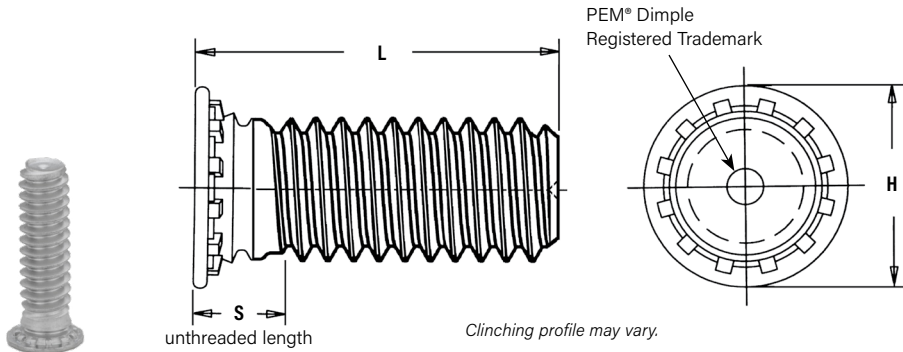
(2) Threads are gaugeable to within 2 pitches of the "S" Max. dimension. A class 3B/5H maximum material commercial nut shall pass up to the "S" Max. dimension.



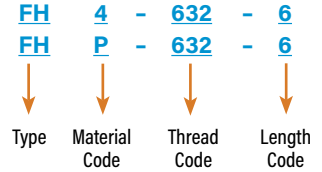
# SELF-CLINCHING STUDS AND PINS

## FH4™/FHP™ FLUSH-HEAD STUDS FOR STAINLESS STEEL SHEETS

- FHP studs offer optimum corrosion resistance and are ideal for medical, foodservice, and marine applications.
- Recommended for use in stainless steel sheets HRB (Rockwell "B" Scale) 92 / HB (Hardness Brinell) 195 or less.



### PART NUMBER DESIGNATION



All dimensions are in inches.

| UNIFIED          | Thread Size | Type                |      | Thread Code | Length Code "L" ±.015<br>(Length code in 16ths of an inch) |      |      |      |      |      |      |      |      | Sheet Thickness (2) | Hole Size in Sheet<br>+.003<br>-.000 | H<br>±.015 | S<br>Max. (3) | Max. Hole in Attached Parts | Min. Dist. Hole $\varnothing$ to Edge |      |
|------------------|-------------|---------------------|------|-------------|--|------|------|------|------|------|------|------|------|---------------------|--------------------------------------|------------|---------------|-----------------------------|---------------------------------------|------|
|                  |             | Fastener Material   |      |             | .250   | .312 | .375 | .500 | .625 | .750 | .875 | 1.00 | 1.25 |                     |                                      |            |               |                             |                                       | 1.50 |
|                  |             | Stainless Steel (1) |      |             |  |      |      |      |      |      |      |      |      |                     |                                      |            |               |                             |                                       |      |
| .112-40 (#4-40)  | FH4         | FHP                 | 440  | 4           | 5  | 6    | 8    | 10   | 12   | 14   | 16   | —    | —    | .040-.095           | .111                                 | .176       | .085          | .131                        | .219                                  |      |
| .138-32 (#6-32)  | FH4         | FHP                 | 632  | 4           | 5  | 6    | 8    | 10   | 12   | 14   | 16   | 20   | 24   | .040-.095           | .137                                 | .206       | .090          | .157                        | .250                                  |      |
| .164-32 (#8-32)  | FH4         | FHP                 | 832  | 4           | 5  | 6    | 8    | 10   | 12   | 14   | 16   | 20   | 24   | .040-.095           | .163                                 | .237       | .090          | .183                        | .281                                  |      |
| .190-32 (#10-32) | FH4         | FHP                 | 032  | —           | 5  | 6    | 8    | 10   | 12   | 14   | 16   | 20   | 24   | .040-.095           | .189                                 | .256       | .100          | .209                        | .281                                  |      |
| .250-20 (1/4-20) | FH4         | —                   | 0420 | —           | —  | 6    | 8    | 10   | 12   | 14   | 16   | 20   | 24   | .062-.117           | .249                                 | .337       | .135          | .269                        | .312                                  |      |

All dimensions are in millimeters.

| METRIC   | Thread Size x Pitch | Type                |    | Thread Code | Length Code "L" ±0.4<br>(Length Code in millimeters) |    |    |    |    |    |    |    |    | Sheet Thickness (2) | Hole Size in Sheet<br>+0.08 | H<br>±0.4 | S<br>Max. (3) | Max. Hole in Attached Parts | Min. Dist. Hole $\varnothing$ to Edge |    |
|----------|---------------------|---------------------|----|-------------|--|----|----|----|----|----|----|----|----|---------------------|-----------------------------|-----------|---------------|-----------------------------|---------------------------------------|----|
|          |                     | Fastener Material   |    |             | 6  | 8  | 10 | 12 | 15 | 18 | 20 | 25 | 30 |                     |                             |           |               |                             |                                       | 35 |
|          |                     | Stainless Steel (1) |    |             |  |    |    |    |    |    |    |    |    |                     |                             |           |               |                             |                                       |    |
| M3 x 0.5 | FH4                 | FHP                 | M3 | 6           | 8  | 10 | 12 | 15 | 18 | 20 | 25 | —  | —  | 1 - 2.4             | 3                           | 4.6       | 2.1           | 3.3                         | 5.6                                   |    |
| M4 x 0.7 | FH4                 | FHP                 | M4 | 6           | 8  | 10 | 12 | 15 | 18 | 20 | 25 | 30 | 35 | 1 - 2.4             | 4                           | 5.9       | 2.4           | 4.7                         | 7.2                                   |    |
| M5 x 0.8 | FH4                 | FHP                 | M5 | —           | 8  | 10 | 12 | 15 | 18 | 20 | 25 | 30 | 35 | 1 - 2.4             | 5                           | 6.5       | 2.7           | 5.3                         | 7.2                                   |    |
| M6 x 1   | FH4                 | —                   | M6 | —           | —  | 10 | 12 | 15 | 18 | 20 | 25 | 30 | 35 | 1.6 - 3             | 6                           | 8.2       | 3             | 6.8                         | 7.9                                   |    |

(1) See material and finish specifications chart on page 17 for details.

(2) See page 19 for installation tool requirements. Performance may be reduced for studs installed into thicker sheets.

(3) Threads are gaugeable to within 2 pitches of the "S" Max. dimension. A class 3B/5H maximum material commercial nut shall pass up to the "S" Max. dimension.

### A NOTE ABOUT 400 SERIES FASTENERS FOR STAINLESS STEEL PANELS

In order for self-clinching fasteners to work properly, the fastener must be harder than the sheet into which it is being installed. In the case of stainless steel panels, fasteners made from 300 Series Stainless Steel do not meet this hardness criteria. For this reason, we offer FH4™ and TP4™ 400 series fasteners. However, while these 400 Series fasteners install and perform well in 300 Series stainless sheets they should not be used if the end product:

- Will be exposed to any appreciable corrosive presence.
- Requires non-magnetic fasteners.
- Will be exposed to any temperatures above 300°F (149°C)

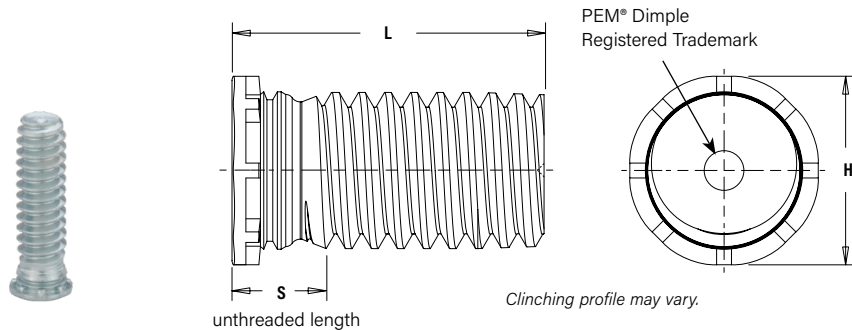
If any of these are issues, please contact [techsupport@pemnet.com](mailto:techsupport@pemnet.com) for other options such as the FHP™ stud, made from precipitation hardened grade stainless steel which is not subject to these issues.



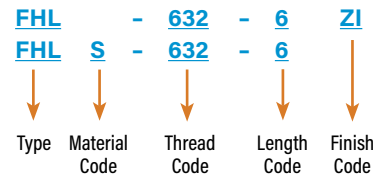
# SELF-CLINCHING STUDS AND PINS

## FHL™/FHLS™ FLUSH, LOW-DISPLACEMENT HEAD STUDS

- Installs closer to the edge of a sheet than PEM Type FH/FHS studs without causing that edge to bulge.
- Flush-head for sheet thickness .040" / 1 mm and greater.
- FHL studs are recommended for use in steel or aluminum sheets HRB (Rockwell "B" Scale) 80 / HB (Hardness Brinell) 150 or less.
- FHLS studs are recommended for use in steel or aluminum sheets HRB (Rockwell "B" Scale) 70 / HB (Hardness Brinell) 125 or less.



### PART NUMBER DESIGNATION



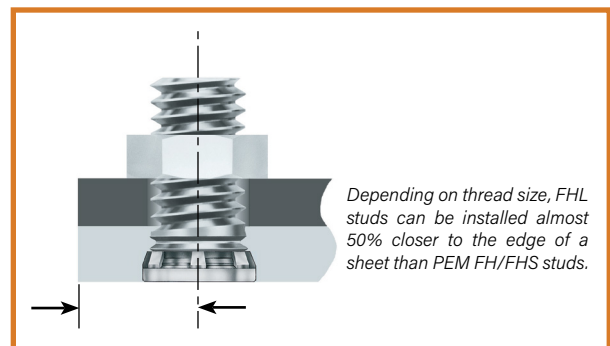
All dimensions are in inches.

| UNIFIED          | Thread Size | Type              |                 | Thread Code | Length Code "L" ±.015<br>(Length Code in 16ths of an inch) |      |      |      |      |      |      |      |      |      | Min. Sheet Thickness (1) | Hole Size in Sheet +.003 - .000 | H ±.015 | S Max. (2) | Max. Hole in Attached Parts | Min. Dist. Hole $\phi$ to Edge |
|------------------|-------------|-------------------|-----------------|-------------|--|------|------|------|------|------|------|------|------|------|--------------------------|---------------------------------|---------|------------|-----------------------------|--------------------------------|
|                  |             | Fastener Material |                 |             | .250   | .312 | .375 | .500 | .625 | .750 | .875 | 1.00 | 1.25 | 1.50 |                          |                                 |         |            |                             |                                |
|                  |             | Steel             | Stainless Steel |             |  |      |      |      |      |      |      |      |      |      |                          |                                 |         |            |                             |                                |
| .086-56 (#2-56)  | FHL         | FHLS              | 256             | 4           | 5  | 6    | 8    | 10   | 12   | —    | —    | —    | —    | .040 | .085                     | .112                            | .080    | .100       | .098                        |                                |
| .112-40 (#4-40)  | FHL         | FHLS              | 440             | 4           | 5  | 6    | 8    | 10   | 12   | 14   | 16   | —    | —    | .040 | .111                     | .138                            | .085    | .126       | .124                        |                                |
| .138-32 (#6-32)  | FHL         | FHLS              | 632             | 4           | 5  | 6    | 8    | 10   | 12   | 14   | 16   | 20   | 24   | .040 | .137                     | .164                            | .090    | .152       | .150                        |                                |
| .164-32 (#8-32)  | FHL         | FHLS              | 832             | 4           | 5  | 6    | 8    | 10   | 12   | 14   | 16   | 20   | 24   | .040 | .163                     | .190                            | .090    | .178       | .176                        |                                |
| .190-32 (#10-32) | FHL         | FHLS              | 032             | —           | 5  | 6    | 8    | 10   | 12   | 14   | 16   | 20   | 24   | .040 | .189                     | .225                            | .100    | .204       | .210                        |                                |

All dimensions are in millimeters.

| METRIC      | Thread Size x Pitch | Type              |                 | Thread Code | Length Code "L" ±0.4<br>(Length Code in millimeters) |    |    |    |    |    |    |    |    |   | Min. Sheet Thickness (1) | Hole Size in Sheet +0.08 | H ±0.4 | S Max. (2) | Max. Hole in Attached Parts | Min. Dist. Hole $\phi$ to Edge |
|-------------|---------------------|-------------------|-----------------|-------------|--|----|----|----|----|----|----|----|----|---|--------------------------|--------------------------|--------|------------|-----------------------------|--------------------------------|
|             |                     | Fastener Material |                 |             | 6  | 8  | 10 | 12 | 15 | 18 | —  | —  | —  | — |                          |                          |        |            |                             |                                |
|             |                     | Steel             | Stainless Steel |             |  |    |    |    |    |    |    |    |    |   |                          |                          |        |            |                             |                                |
| M2.5 x 0.45 | FHL                 | FHLS              | M2.5            | 6           | 8  | 10 | 12 | 15 | 18 | —  | —  | —  | —  | 1 | 2.5                      | 3.15                     | 2.1    | 2.9        | 2.8                         |                                |
| M3 x 0.5    | FHL                 | FHLS              | M3              | 6           | 8  | 10 | 12 | 15 | 18 | 20 | 25 | —  | —  | 1 | 3                        | 3.65                     | 2.1    | 3.2        | 3.3                         |                                |
| M3.5 x 0.6  | FHL                 | FHLS              | M3.5            | 6           | 8  | 10 | 12 | 15 | 18 | 20 | 25 | 30 | —  | 1 | 3.5                      | 4.15                     | 2.3    | 3.9        | 3.8                         |                                |
| M4 x 0.7    | FHL                 | FHLS              | M4              | 6           | 8  | 10 | 12 | 15 | 18 | 20 | 25 | 30 | 35 | 1 | 4                        | 4.65                     | 2.4    | 4.5        | 4.3                         |                                |
| M5 x 0.8    | FHL                 | FHLS              | M5              | —           | 8  | 10 | 12 | 15 | 18 | 20 | 25 | 30 | 35 | 1 | 5                        | 5.9                      | 2.7    | 5.2        | 5.6                         |                                |

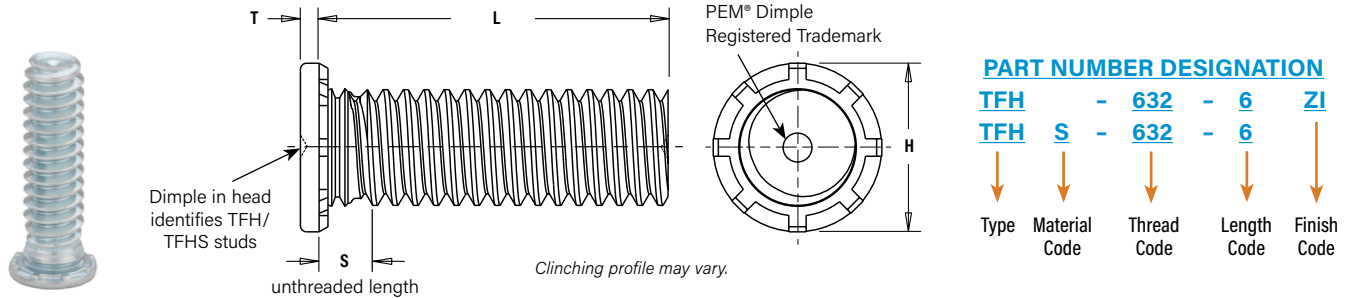
- See page 19 for installation tool requirements.
- Threads are gaugeable to within 2 pitches of the "S" Max. dimension. A class 3B/5H maximum material commercial nut shall pass up to the "S" Max. dimension.



# SELF-CLINCHING STUDS AND PINS

## TFH™/TFHS™ NON-FLUSH STUDS

- Non-flush for sheets as thin as .020" / 0.51 mm.
- TFH studs are recommended for use in steel or aluminum sheets HRB (Rockwell "B" Scale) 80 / HB (Hardness Brinell) 150 or less.
- TFHS studs are recommended for use in steel or aluminum sheets HRB (Rockwell "B" Scale) 70 / HB (Hardness Brinell) 125 or less.



All dimensions are in inches.

| UNIFIED             | Thread Size | Type  |                 | Thread Code | Length Code "L" ±.015<br>(Length Code in 16ths of an inch) |      |      |      |      |      |      |      |      | Min. Sheet Thickness (1) | Hole Size in Sheet<br>+.003<br>-.000 | H<br>±.015 | S<br>Max. (2) | T<br>Max. | Max. Hole in Attached Parts | Min. Dist. Hole<br>to Edge |      |
|---------------------|-------------|-------|-----------------|-------------|--|------|------|------|------|------|------|------|------|--------------------------|--------------------------------------|------------|---------------|-----------|-----------------------------|----------------------------|------|
|                     |             | Steel | Stainless Steel |             | .250   | .312 | .375 | .500 | .625 | .750 | .875 | 1.00 | 1.25 |                          |                                      |            |               |           |                             |                            | 1.50 |
|                     |             |       |                 |             |  |      |      |      |      |      |      |      |      |                          |                                      |            |               |           |                             |                            |      |
| .086-56<br>(#2-56)  | TFH         | TFHS  | 256             | 4           | 5  | 6    | 8    | 10   | 12   | —    | —    | —    | —    | .020                     | .085                                 | .141       | .070          | .025      | .105                        | .187                       |      |
| .112-40<br>(#4-40)  | TFH         | TFHS  | 440             | 4           | 5  | 6    | 8    | 10   | 12   | 14   | —    | —    | —    | .020                     | .111                                 | .176       | .070          | .025      | .131                        | .219                       |      |
| .138-32<br>(#6-32)  | TFH         | TFHS  | 632             | 4           | 5  | 6    | 8    | 10   | 12   | 14   | 16   | 20   | 24   | .020                     | .137                                 | .203       | .070          | .025      | .157                        | .250                       |      |
| .164-32<br>(#8-32)  | TFH         | TFHS  | 832             | 4           | 5  | 6    | 8    | 10   | 12   | 14   | 16   | 20   | 24   | .020                     | .163                                 | .234       | .070          | .025      | .183                        | .281                       |      |
| .190-24<br>(#10-24) | TFH         | TFHS  | 024             | —           | 5  | 6    | 8    | 10   | 12   | 14   | 16   | 20   | 24   | .020                     | .189                                 | .250       | .090          | .025      | .209                        | .281                       |      |
| .190-32<br>(#10-32) | TFH         | TFHS  | 032             | —           | 5  | 6    | 8    | 10   | 12   | 14   | 16   | 20   | 24   | .020                     | .189                                 | .250       | .090          | .025      | .209                        | .281                       |      |

All dimensions are in millimeters.

| METRIC   | Thread Size x Pitch | Type  |                 | Thread Code | Length Code "L" ±0.4<br>(Length Code in millimeters) |    |    |    |    |    |    |    |    | Min. Sheet Thickness (1) | Hole Size in Sheet<br>+0.08 | H<br>±0.4 | S<br>Max. (2) | T<br>Max. | Max. Hole in Attached Parts | Min. Dist. Hole<br>to Edge |   |
|----------|---------------------|-------|-----------------|-------------|--|----|----|----|----|----|----|----|----|--------------------------|-----------------------------|-----------|---------------|-----------|-----------------------------|----------------------------|---|
|          |                     | Steel | Stainless Steel |             | 6  | 8  | 10 | 12 | 15 | 18 | 20 | 25 | —  |                          |                             |           |               |           |                             |                            | — |
|          |                     |       |                 |             |  |    |    |    |    |    |    |    |    |                          |                             |           |               |           |                             |                            |   |
| M3 x 0.5 | TFH                 | TFHS  | M3              | 6           | 8  | 10 | 12 | 15 | 18 | 20 | 25 | —  | —  | 0.51                     | 3                           | 4.5       | 1.8           | 0.64      | 3.3                         | 5.6                        |   |
| M4 x 0.7 | TFH                 | TFHS  | M4              | —           | 8  | 10 | 12 | 15 | 18 | 20 | 25 | 30 | 35 | 0.51                     | 4                           | 5.8       | 1.8           | 0.64      | 4.7                         | 7.2                        |   |
| M5 x 0.8 | TFH                 | TFHS  | M5              | —           | 8  | 10 | 12 | 15 | 18 | 20 | 25 | 30 | 35 | 0.51                     | 5                           | 6.4       | 2.3           | 0.64      | 5.3                         | 7.2                        |   |

(1) See page 20 for installation tool requirements.

(2) Threads are gaugeable to within 2 pitches of the "S" Max. dimension. A class 3B/5H maximum material commercial nut shall pass up to the "S" Max. dimension.

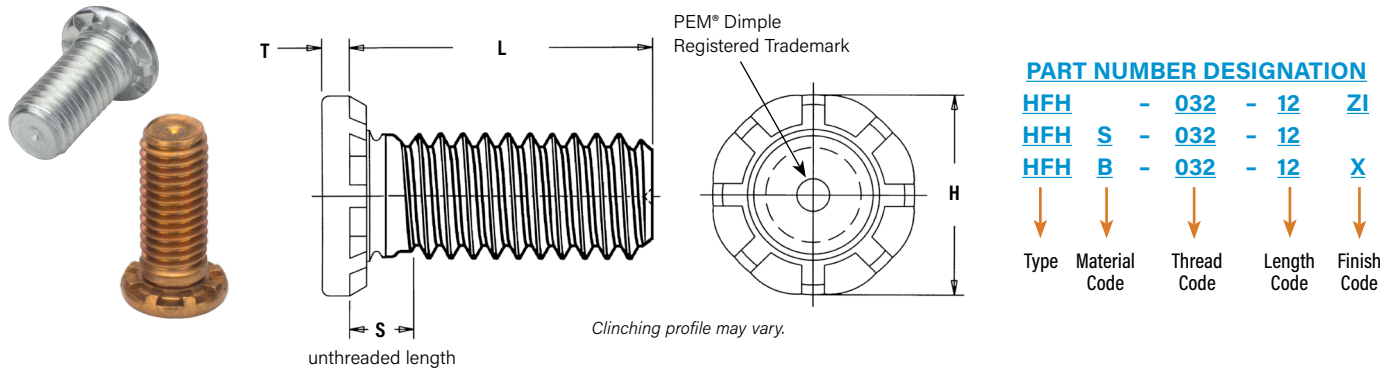




# SELF-CLINCHING STUDS AND PINS

## HFH™/HFHS™/HFHB™ HEAVY-DUTY STUDS

- HFH studs are for high-strength applications in sheets as thin as .050" / 1.3 mm.
- HFHS studs offer high corrosion resistance.
- HFHB studs are for superior electrical/mechanical attachment in copper.
- HFH studs are recommended for use in steel or aluminum sheets HRB (Rockwell "B" Scale) 85 / HB (Hardness Brinell) 165 or less.
- HFHS studs are recommended for use in steel or aluminum sheets HRB (Rockwell "B" Scale) 70 / HB (Hardness Brinell) 125 or less.
- HFHB studs are recommended for use in copper sheets HRB (Rockwell "B" Scale) 55 / HB (Hardness Brinell) 83 or less.



All dimensions are in inches.

| UNIFIED           | Thread Size | Type              |                 |                     | Thread Code | Length Code "L" ±.015<br>(Length Code in 16ths of an inch) |      |      |      |      |      | Min. Sheet Thickness (2) | Hole Size in Sheet +.005 -0.000 | H ±.01 | S Max. (3) | T Max. | Max. Hole in Attached Parts | Min. Dist. Hole $\varnothing$ 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                            | .300   | .105       | .040   | .252                        | .415                                  |
| .250-20 (1/4-20)  | HFH         | HFHS              | HFHB            | 0420                | .500        | .750   | 1.00 | 1.25 | 1.50 | 1.75 | 2.00 | .060                     | .250                            | .380   | .125       | .050   | .312                        | .460                                  |
| .313-18 (5/16-18) | HFH         | HFHS              | HFHB            | 0518                | .500        | .750   | 1.00 | 1.25 | 1.50 | 1.75 | 2.00 | .075                     | .312                            | .480   | .140       | .070   | .374                        | .500                                  |
| .375-16 (3/8-16)  | HFH         | HFHS              | HFHB            | 0616                | —           | .750   | 1.00 | 1.25 | 1.50 | 1.75 | 2.00 | .090                     | .375                            | .580   | .155       | .085   | .437                        | .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<br>(Length Code in millimeters) |    |    |    |    |    | Min. Sheet Thickness (2) | Hole Size in Sheet +0.13 | H ±0.25 | S Max. (3) | T Max. | Max. Hole in Attached Parts | Min. Dist. Hole $\varnothing$ to Edge |
|-----------|---------------------|-------------------|-----------------|--------------------|-------------|--|----|----|----|----|----|--------------------------|--------------------------|---------|------------|--------|-----------------------------|---------------------------------------|
|           |                     | Fastener Material |                 |                    |             |  |    |    |    |    |    |                          |                          |         |            |        |                             |                                       |
|           |                     | Steel             | Stainless Steel | Phosphor Bronze(1) |             |  |    |    |    |    |    |                          |                          |         |            |        |                             |                                       |
| M5 x 0.8  | HFH                 | HFHS              | HFHB            | M5                 | 15          | 20   | 25 | 30 | 35 | 40 | 50 | 1.3                      | 5                        | 7.8     | 2.7        | 1.14   | 6.4                         | 10.7                                  |
| M6 x 1    | HFH                 | HFHS              | HFHB            | M6                 | 15          | 20   | 25 | 30 | 35 | 40 | 50 | 1.5                      | 6                        | 9.4     | 2.8        | 1.27   | 7.5                         | 11.5                                  |
| M8 x 1.25 | HFH                 | HFHS              | HFHB            | M8                 | 15          | 20   | 25 | 30 | 35 | 40 | 50 | 2                        | 8                        | 12.5    | 3.5        | 1.78   | 9.5                         | 12.7                                  |
| M10 x 1.5 | HFH                 | HFHS              | HFHB            | M10                | 15          | 20   | 25 | 30 | 35 | 40 | 50 | 2.3                      | 10                       | 15.7    | 4.1        | 2.29   | 11.5                        | 13.7                                  |

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

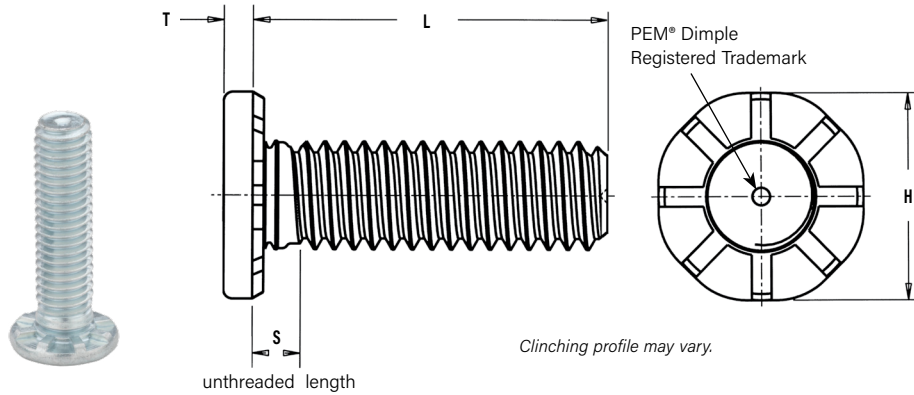
- The electrical resistance (tested at 10 amps DC) between phosphor bronze studs and copper busbars is below 104 $\mu$  ohms and 62 $\mu$  ohms for the #10-32 / M5 and 3/8-16 / M10 thread sizes respectively, after repeated thermal and mechanical cycling. For complete electrical resistance test data for type HFHB studs installed in copper, see bulletin entitled "Electrical Resistance of HFHB Studs Installed in Copper" on our website.
- See page 20 for installation tool requirements.
- Threads are gaugeable to within 2 pitches of the "S" Max. dimension. A class 3B/5H maximum material commercial nut shall pass up to the "S" Max. dimension.



# SELF-CLINCHING STUDS AND PINS

## HFE™/THFE™ HEAVY DUTY STUDS FOR THIN SHEETS

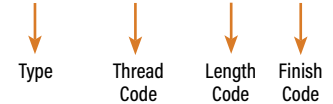
- Enlarged head diameter reduces stress on panel.
- Thicker head allows for larger hole in attached panels.
- Clinch design provides high-strength in sheets as thin as .031" / 0.8 mm.
- Recommended for use in steel or aluminum sheets HRB (Rockwell "B" Scale) 85 / HB (Hardness Brinell) 165 or less.



### PART NUMBER DESIGNATION

HFE - 0420 - 12 ZI

THFE - 0420 - 12 ZI



All dimensions are in inches.

| UNIFIED              | Thread Size | Type              | Thread Code | Length Code "L" ±.015<br>(Length Code in 16ths of an inch) |      |      |      |      |      | Min. Sheet Thickness (1) | Hole Size In Sheet<br>+.005<br>-.000 | H<br>±.01 | S<br>Max. (2) | T<br>Max. | Max. Hole in Attached Parts | Min. Dist. Hole $\varnothing$ To Edge |      |
|----------------------|-------------|-------------------|-------------|--|------|------|------|------|------|--------------------------|--------------------------------------|-----------|---------------|-----------|-----------------------------|---------------------------------------|------|
|                      |             | Fastener Material |             | .500   | .750 | 1.00 | 1.25 | 1.50 | 1.75 |                          |                                      |           |               |           |                             |                                       | 2.00 |
|                      |             | Steel             |             |  |      |      |      |      |      |                          |                                      |           |               |           |                             |                                       |      |
| .190-32<br>(#10-32)  | HFE         | 032               | 8           | 12   | 16   | 20   | 24   | 28   | 32   | .040                     | .190                                 | .357      | .102          | .048      | .280                        | .360                                  |      |
|                      | THFE        |                   |             |  |      |      |      |      |      |                          |                                      |           |               |           |                             |                                       |      |
| .250-20<br>(1/4-20)  | HFE         | 0420              | 8           | 12   | 16   | 20   | 24   | 28   | 32   | .040                     | .250                                 | .462      | .118          | .060      | .340                        | .470                                  |      |
|                      | THFE        |                   |             |  |      |      |      |      |      | .031                     |                                      |           | .109          | .069      |                             | .446                                  |      |
| .313-18<br>(5/16-18) | HFE         | 0518              | 8           | 12   | 16   | 20   | 24   | 28   | 32   | .060                     | .312                                 | .586      | .133          | .083      | .402                        | .560                                  |      |
|                      | THFE        |                   |             |  |      |      |      |      |      | .031                     |                                      |           | .117          | .099      |                             | .596                                  |      |

Tensile strength: 120 ksi

All dimensions are in millimeters.

| METRIC    | Thread Size x Pitch | Type              | Thread Code | Length Code "L" ±0.4<br>(Length Code in millimeters) |    |    |    |    |    | Min. Sheet Thickness (1) | Hole Size In Sheet<br>+0.13 | H<br>±0.25 | S<br>Max. (2) | T<br>Max. | Max. Hole in Attached Parts | Min. Dist. Hole $\varnothing$ To Edge |    |
|-----------|---------------------|-------------------|-------------|--|----|----|----|----|----|--------------------------|-----------------------------|------------|---------------|-----------|-----------------------------|---------------------------------------|----|
|           |                     | Fastener Material |             | 15   | 20 | 25 | 30 | 35 | 40 |                          |                             |            |               |           |                             |                                       | 50 |
|           |                     | Steel             |             |  |    |    |    |    |    |                          |                             |            |               |           |                             |                                       |    |
| M5 x 0.8  | HFE                 | M5                | 15          | 20   | 25 | 30 | 35 | 40 | 50 | 1                        | 5                           | 9.6        | 2.6           | 1.35      | 7.3                         | 10                                    |    |
|           | THFE                |                   |             |  |    |    |    |    |    |                          |                             |            |               |           |                             |                                       |    |
| M6 x 1    | HFE                 | M6                | 15          | 20   | 25 | 30 | 35 | 40 | 50 | 1                        | 6                           | 11.35      | 2.8           | 1.52      | 8.3                         | 11.5                                  |    |
|           | THFE                |                   |             |  |    |    |    |    |    | 0.8                      |                             |            | 2.62          | 1.7       |                             | 10.5                                  |    |
| M8 x 1.25 | HFE                 | M8                | 15          | 20   | 25 | 30 | 35 | 40 | 50 | 1.5                      | 8                           | 15.3       | 3.3           | 2.13      | 10.3                        | 14.5                                  |    |
|           | THFE                |                   |             |  |    |    |    |    |    | 0.8                      |                             |            | 2.9           | 2.54      |                             | 15                                    |    |

Tensile strength: 900 MPa

(1) See page 21 for installation tool requirements.

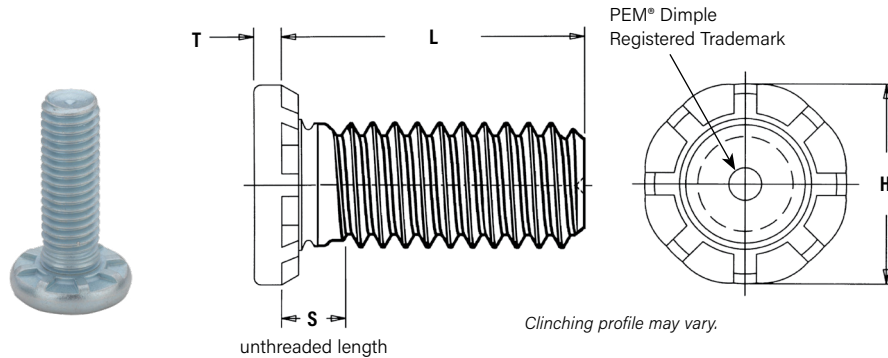
(2) Threads are gaugeable to within 2 pitches of the "S" Max. dimension. A class 3B/5H maximum material commercial nut shall pass up to the "S" Max. dimension.



# SELF-CLINCHING STUDS AND PINS

## HFG8™/HF109™ HEAVY DUTY, HIGH TENSILE STRENGTH STUDS

- HFG8 and HF109 studs are for heavy-duty applications in sheets as thin as .040" / 1 mm.
- Grade 8 and property class 10.9 studs meeting 150 ksi/1040 MPa minimum.
- Recommended for use in steel or HSLA steel sheets HRB (Rockwell "B" Scale) 89 / HB (Hardness Brinell) 180 or less.
- Large head diameter spreads compressive stress on panel.



### PART NUMBER DESIGNATION

|      |               |             |             |             |
|------|---------------|-------------|-------------|-------------|
| HF   | G8            | - 0420      | - 12        | ZI          |
| HF   | 109           | - M6        | - 20        | ZI          |
| ↓    | ↓             | ↓           | ↓           | ↓           |
| Type | Strength Code | Thread Code | Length Code | Finish Code |

All dimensions are in inches.

| UNIFIED              | Thread Size         | Type  | Thread Code | Length Code "L" ±.015 (1)<br>(Length Code in 16ths of an inch) |      |      | Min. Sheet Thickness (2) | Hole Size in Sheet<br>+.005 -.000 | H<br>±.01 | S<br>Max. (3) | T<br>Max. | Max. Hole in Attached Parts | Min. Dist. Hole C/L To Edge |
|----------------------|---------------------|-------|-------------|--|------|------|--------------------------|-----------------------------------|-----------|---------------|-----------|-----------------------------|-----------------------------|
|                      |                     | Steel |             | .500   | .750 | 1.00 |                          |                                   |           |               |           |                             |                             |
|                      | .190-32<br>(#10-32) | HFG8  | 032         | 8  | 12   | 16   | .040                     | .190                              | .391      | .105          | .077      | .280                        | .469                        |
| .250-20<br>(1/4-20)  | HFG8                | 0420  | 8           | 12   | 16   | .040 | .250                     | .507                              | .125      | .090          | .340      | .709                        |                             |
| .313-18<br>(5/16-18) | HFG8                | 0518  | —           | 12   | 16   | .060 | .312                     | .645                              | .140      | .126          | .402      | .827                        |                             |

Tensile strength: 150 ksi

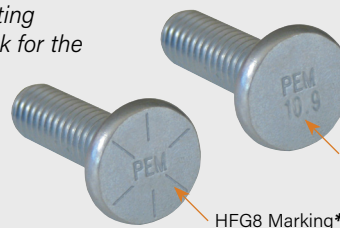
All dimensions are in millimeters.

| METRIC    | Thread Size x Pitch | Type  | Thread Code | Length Code "L" ±0.4 (1)<br>(Length Code in millimeters) |    |     | Min. Sheet Thickness (2) | Hole Size in Sheet<br>+0.13 | H<br>±0.25 | S<br>Max. (3) | T<br>Max. | Max. Hole in Attached Parts | Min. Dist. Hole C/L To Edge |
|-----------|---------------------|-------|-------------|--|----|-----|--------------------------|-----------------------------|------------|---------------|-----------|-----------------------------|-----------------------------|
|           |                     | Steel |             | 15   | 20 | 25  |                          |                             |            |               |           |                             |                             |
| M5 x 0.8  | HF109               | M5    | 15          | 20   | 25 | 1   | 5                        | 10.3                        | 2.6        | 2.06          | 7.3       | 11.5                        |                             |
| M6 x 1    | HF109               | M6    | 15          | 20   | 25 | 1   | 6                        | 12.1                        | 2.7        | 2.29          | 8.3       | 18.0                        |                             |
| M8 x 1.25 | HF109               | M8    | —           | 20   | 25 | 1.5 | 8                        | 16.6                        | 3.4        | 3.25          | 10.3      | 21.0                        |                             |

Tensile strength: 1040 MPa

- (1) Other lengths available up to a maximum of 1.5" (unified) and 40 mm (metric) on special order.
- (2) See page 22 for installation tool requirements.
- (3) Threads are gaugeable to within 2 pitches of the "S" Max. dimension. A class 3B/5H maximum material commercial nut shall pass up to the "S" Max. dimension.

To be sure that you are getting genuine PEM products, look for the PEM stamp. Studs within the size range of the SAE and ISO specs are also identified with the Grade 8 and 10.9 head markings respectively.



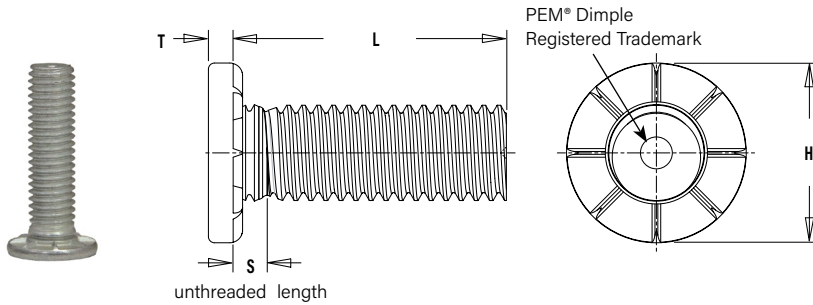
\* Thread size #10-32 does not have SAE head marking since it is technically not within the size range of the specification.



# SELF-CLINCHING STUDS AND PINS

## HFLH™ HARD PANEL STUDS

- Installs into thinner, harder, high strength steel materials
- Recommended for use in HSLA sheets up to 700 MPa ultimate (hardness up to 96 HRB) such as s500 (1)



### PART NUMBER DESIGNATION

**HFLH - 0420 - 20 ZI**

↓ Type      ↓ Thread Code      ↓ Length Code      ↓ Finish Code

All dimensions are in inches.

| UNIFIED | Thread Size          | Type                 | Thread Code | Length Code "L" ±.015<br>(Length Code in 16ths of an inch) |      |      |      |      |      | Min. Sheet Thickness (2) | Hole Size In Sheet<br>+.005<br>-.000 | H<br>±.01 | S<br>Max.<br>(3) | T<br>Max. | Max. Hole in Attached Parts | Min. Dist. Hole To Edge |      |
|---------|----------------------|----------------------|-------------|--|------|------|------|------|------|--------------------------|--------------------------------------|-----------|------------------|-----------|-----------------------------|-------------------------|------|
|         |                      | Fastener Material    |             | .500   | .750 | 1.00 | 1.25 | 1.50 | 1.75 |                          |                                      |           |                  |           |                             |                         | 2.00 |
|         |                      | Hardened Alloy Steel |             |  |      |      |      |      |      |                          |                                      |           |                  |           |                             |                         |      |
|         | .190-32<br>(#10-32)  | HFLH                 | 032         | 8  | 12   | 16   | 20   | 24   | 28   | 32                       | .040                                 | .190      | .357             | .102      | .048                        | .280                    | .360 |
|         | .250-20<br>(1/4-20)  | HFLH                 | 0420        | 8  | 12   | 16   | 20   | 24   | 28   | 32                       | .040                                 | .250      | .462             | .118      | .060                        | .340                    | .470 |
|         | .313-18<br>(5/16-18) | HFLH                 | 0518        | 8  | 12   | 16   | 20   | 24   | 28   | 32                       | .060                                 | .312      | .586             | .133      | .083                        | .402                    | .560 |

Tensile strength: 120 ksi

All dimensions are in millimeters.

| METRIC | Thread Size x Pitch | Type                 | Thread Code | Length Code "L" ±.04<br>(Length Code in millimeters) |    |    |    |    |    | Min. Sheet Thickness (2) | Hole Size In Sheet<br>+.013 | H<br>±0.25 | S<br>Max.<br>(3) | T<br>Max. | Max. Hole in Attached Parts | Min. Dist. Hole To Edge |      |
|--------|---------------------|----------------------|-------------|--|----|----|----|----|----|--------------------------|-----------------------------|------------|------------------|-----------|-----------------------------|-------------------------|------|
|        |                     | Fastener Material    |             | 15   | 20 | 25 | 30 | 35 | 40 |                          |                             |            |                  |           |                             |                         | 50   |
|        |                     | Hardened Alloy Steel |             |  |    |    |    |    |    |                          |                             |            |                  |           |                             |                         |      |
|        | M5 x 0.8            | HFLH                 | M5          | 15   | 20 | 25 | 30 | 35 | 40 | 50                       | 1                           | 5          | 9.6              | 2.6       | 1.35                        | 7.3                     | 10   |
|        | M6 x 1              | HFLH                 | M6          | 15   | 20 | 25 | 30 | 35 | 40 | 50                       | 1                           | 6          | 11.35            | 2.8       | 1.52                        | 8.3                     | 11.5 |
|        | M8 x 1.25           | HFLH                 | M8          | 15   | 20 | 25 | 30 | 35 | 40 | 50                       | 1.5                         | 8          | 15.3             | 3.3       | 2.13                        | 10.3                    | 14.5 |

Tensile strength: 900 MPa

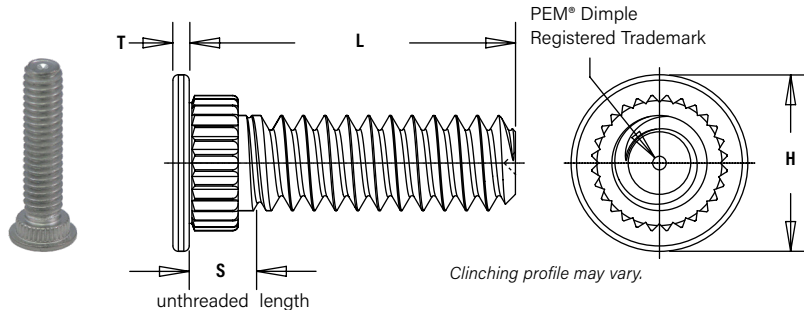
- Material meeting specification DIN EN 10149-2, grade S500MC with minimum yield of 500 MPa and max tensile of 700 MPa is a typical panel material in which type HFLH studs can be used.
- See page 21 for installation tool requirements.
- Threads are gaugeable to within 2 pitches of the "S" Max. dimension. A class 3B/5H maximum material commercial nut shall pass up to the "S" Max. dimension.



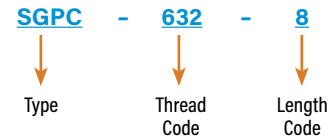
# SELF-CLINCHING STUDS AND PINS

## SGPC™ SWAGING COLLAR STUDS

- Installs into sheets as thin as .024" / 0.6 mm.
- Can be used to attach dissimilar materials.
- Can captivate multiple panels as long as the total thickness does not exceed the maximum sheet thickness.(1)
- Can be installed into most materials, including stainless steel and rigid non-metallic panels.
- Allows for close centerline-to-edge distance.



### PART NUMBER DESIGNATION



All dimensions are in inches.

| UNIFIED | Thread Size      | Type              | Thread Code | Length Code "L" ±.015<br>(Length Code in 16ths of an inch) |      |      |      |      |      |      |      | Sheet Thickness (2) | Hole Size in Sheet<br>+.003<br>-.000 | H<br>±.010 | S<br>Max.<br>(3) | T<br>±.004 | Hole Dia. of Attached Panel<br>+.005 -.000 | Min. Dist. Hole<br>⌀<br>To Edge |      |
|---------|------------------|-------------------|-------------|--|------|------|------|------|------|------|------|---------------------|--------------------------------------|------------|------------------|------------|--|---------------------------------|------|
|         |                  | Fastener Material |             | .312   | .375 | .500 | .625 | .750 | .875 | 1.00 | 1.25 |                     |                                      |            |                  |            |  |                                 | 1.50 |
|         |                  | Stainless Steel   |             |  |      |      |      |      |      |      |      |                     |                                      |            |                  |            |  |                                 |      |
|         | .086-56 (#2-56)  | SGPC              | 256         | 5  | 6    | 8    | 10   | 12   | —    | —    | —    | —                   | .024 - .047                          | .145       | .189             | .093       | .020                                       | .182                            | .130 |
|         | .112-40 (#4-40)  | SGPC              | 440         | 5  | 6    | 8    | 10   | 12   | 14   | 16   | 20   | —                   | .024 - .047                          | .171       | .228             | .101       | .024                                       | .205                            | .160 |
|         | .138-32 (#6-32)  | SGPC              | 632         | 5  | 6    | 8    | 10   | 12   | 14   | 16   | 20   | 24                  | .024 - .047                          | .196       | .256             | .109       | .024                                       | .229                            | .180 |
|         | .164-32 (#8-32)  | SGPC              | 832         | 5  | 6    | 8    | 10   | 12   | 14   | 16   | 20   | 24                  | .024 - .047                          | .223       | .279             | .109       | .024                                       | .259                            | .200 |
|         | .190-32 (#10-32) | SGPC              | 032         | 5  | 6    | 8    | 10   | 12   | 14   | 16   | 20   | 24                  | .024 - .047                          | .249       | .307             | .109       | .024                                       | .280                            | .210 |
|         | .250-20 (1/4-20) | SGPC              | 0420        | —  | 6    | 8    | 10   | 12   | 14   | 16   | 20   | 24                  | .024 - .047                          | .309       | .366             | .131       | .028                                       | .343                            | .250 |

All dimensions are in millimeters.

| METRIC | Thread Size x Pitch | Type              | Thread Code | Length Code "L" ±0.4<br>(Length Code in millimeters) |    |    |    |    |    |    |    | Sheet Thickness (2) | Hole Size in Sheet<br>+0.08 | H<br>±0.25 | S<br>Max.<br>(3) | T<br>±0.1 | Hole Dia. of Attached Panel<br>+0.13 | Min. Dist. Hole<br>⌀<br>To Edge |     |
|--------|---------------------|-------------------|-------------|--|----|----|----|----|----|----|----|---------------------|-----------------------------|------------|------------------|-----------|--------------------------------------|---------------------------------|-----|
|        |                     | Fastener Material |             | 8  | 10 | 12 | 15 | 18 | —  | —  | —  |                     |                             |            |                  |           |                                      |                                 | —   |
|        |                     | Stainless Steel   |             |  |    |    |    |    |    |    |    |                     |                             |            |                  |           |                                      |                                 |     |
|        | M2.5 x 0.45         | SGPC              | M2.5        | 8  | 10 | 12 | 15 | 18 | —  | —  | —  | —                   | 0.6 - 1.2                   | 4          | 5                | 2.4       | 0.5                                  | 4.95                            | 3.9 |
|        | M3 x 0.5            | SGPC              | M3          | 8  | 10 | 12 | 15 | 18 | 20 | 25 | —  | —                   | 0.6 - 1.2                   | 4.5        | 6                | 2.5       | 0.6                                  | 5.45                            | 4.3 |
|        | M4 x 0.7            | SGPC              | M4          | 8  | 10 | 12 | 15 | 18 | 20 | 25 | 30 | —                   | 0.6 - 1.2                   | 5.5        | 7                | 2.7       | 0.6                                  | 6.3                             | 4.9 |
|        | M5 x 0.8            | SGPC              | M5          | 8  | 10 | 12 | 15 | 18 | 20 | 25 | 30 | 35                  | 0.6 - 1.2                   | 6.5        | 8                | 2.8       | 0.6                                  | 7.45                            | 5.5 |
|        | M6 x 1              | SGPC              | M6          | —  | 10 | 12 | 15 | 18 | 20 | 25 | 30 | 35                  | 0.6 - 1.2                   | 7.5        | 9                | 3         | 0.7                                  | 8.3                             | 6.2 |

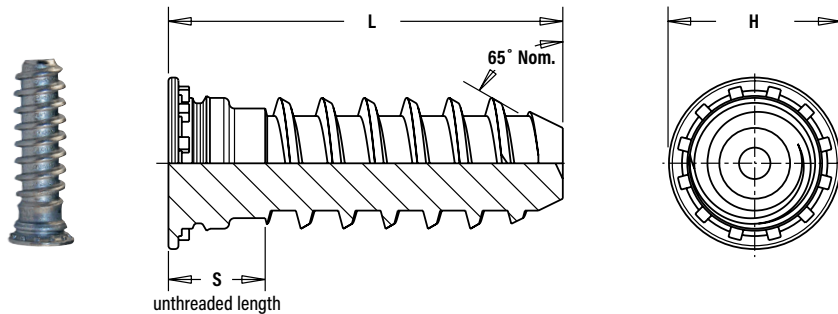
- When using the fastener to attach more than one sheet or panel, the stud may seem slightly loose after installation. This is a normal condition in some applications and will not effect the stud's performance.
- See page 23 for installation tooling requirements. Contact Technical Support (techsupport@pemnet.com) for other thicknesses.
- Threads are gaugeable to within 2 pitches on the "S" Max. dimension. A class 3B/5H maximum material commercial nut shall pass up to the "S" Max. dimension.



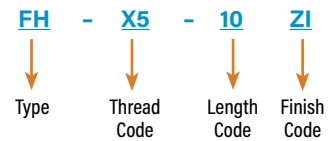
# SELF-CLINCHING STUDS AND PINS

## FHX™ FLUSH-HEAD STUDS WITH X-PRESS™ THREAD PROFILE FOR USE WITH PUSH ON PLASTIC MATING FASTENERS

- Offers fast, reliable attachment.
- Coarse thread design of the thread reduces assembly time and provides high retention force.
- Allows for lighter assembly.
- Self-clinching stud mounts flush in metal sheets as thin as 1mm.
- Thread design accommodates paints and coatings without compromising performance.
- Self-clinching technology is cleaner and has a more attractive finished appearance than welding.
- Can be installed during the stamping process with PEMSERTER® in-die technology.



### PART NUMBER DESIGNATION



All dimensions are in millimeters.

| Thread Size<br>x Pitch | Type | Thread<br>Code | Length Code "L" ±0.4<br>(Length Code in millimeters) |    |    |    | Min. Sheet<br>Thickness | Hole Size in Sheet<br>+0.08 | H<br>±0.4 | S<br>Max. |
|------------------------|------|----------------|--|----|----|----|-------------------------|-----------------------------|-----------|-----------|
|                        |      |                | 10   | 15 | 20 | 25 |                         |                             |           |           |
| 5 mm x 1.6             | FH   | X5             | 10   | 15 | 20 | 25 | 1                       | 5.2                         | 6.5       | 4         |
| 6 mm x 1.6             | FH   | X6             | 10   | 15 | 20 | 25 | 1.6                     | 6.2                         | 8.2       | 4         |

(1) See page 23 for installation tool requirements.

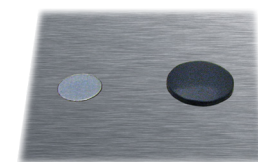
Examples of plastic nuts and wire tie products that can be used with PEM® X-Press™ studs.



Contact Tech Support for more information.



Press-on (kwik) nut can be used to hold down soft materials such as foam, cloth or insulation.



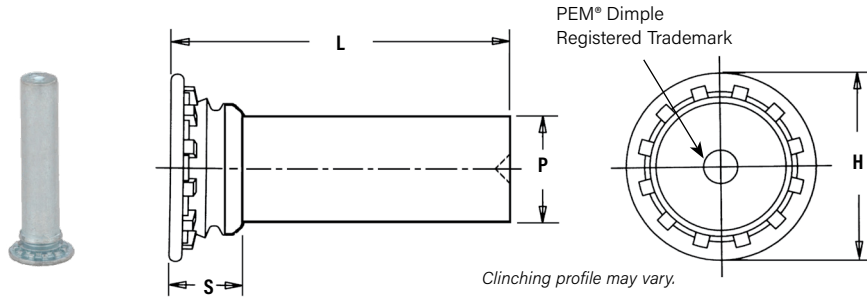
Standard head mounts flush in sheet. Domed head available on special order.

# SELF-CLINCHING STUDS AND PINS

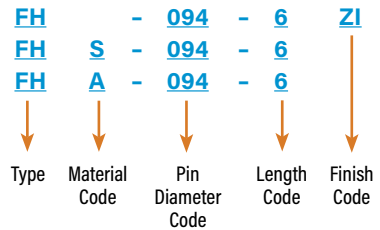
## FH™/FHS™/FHA™ FLUSH-HEAD PINS

- Flush-head for sheet thickness of .040" / 1 mm and greater.
- FH pins are recommended for use in steel or aluminum sheets HRB (Rockwell "B" Scale) 80 / HB (Hardness Brinell) 150 or less.
- FHS pins are recommended for use in steel or aluminum sheets HRB (Rockwell "B" Scale) 70 / HB (Hardness Brinell) 125 or less.
- FHA pins are recommended for use in aluminum sheets HRB (Rockwell "B" Scale) 50 / HB (Hardness Brinell) 82 or less.

**These PEM® pins are only available on special order. See TPS, TP4, and TPXS pins on page 16 for standard diameter pins.**



### PART NUMBER DESIGNATION



All dimensions are in inches.

| UNIFIED | Nominal Pin Diameter P±.002 | Type              |                 |          | Pin Dia. Code | Length Code "L" ±.015<br>(Length Code in 16ths of an inch) |      |      |      |      |      |      |      |      |      | Min. Sheet Thickness (1) | Hole Size in Sheet +.003 -0.000 | H ± .015 | S Max. (2) | Min. Dist. Hole to Edge |
|---------|-----------------------------|-------------------|-----------------|----------|---------------|--|------|------|------|------|------|------|------|------|------|--------------------------|---------------------------------|----------|------------|-------------------------|
|         |                             | Fastener Material |                 |          |               | .250   | .312 | .375 | .500 | .625 | .750 | .875 | 1.00 | 1.25 | 1.50 |                          |                                 |          |            |                         |
|         |                             | Steel             | Stainless Steel | Aluminum |               |  |      |      |      |      |      |      |      |      |      |                          |                                 |          |            |                         |
| .073    | FH                          | FHS               | FHA             | 073      | 4             | 5  | 6    | 8    | 10   | —    | —    | —    | —    | —    | .040 | .085                     | .15                             | .075     | .19        |                         |
| .084    | FH                          | FHS               | FHA             | 084      | 4             | 5  | 6    | 8    | 10   | 12   | —    | —    | —    | —    | .040 | .099                     | .16                             | .085     | .22        |                         |
| .094    | FH                          | FHS               | FHA             | 094      | 4             | 5  | 6    | 8    | 10   | 12   | —    | —    | —    | —    | .040 | .111                     | .18                             | .085     | .22        |                         |
| .103    | FH                          | FHS               | FHA             | 103      | 4             | 5  | 6    | 8    | 10   | 12   | —    | —    | —    | —    | .040 | .118                     | .18                             | .085     | .22        |                         |
| .106    | FH                          | FHS               | FHA             | 106      | 4             | 5  | 6    | 8    | 10   | 12   | 14   | 16   | 20   | —    | .040 | .125                     | .19                             | .090     | .22        |                         |
| .116    | FH                          | FHS               | FHA             | 116      | 4             | 5  | 6    | 8    | 10   | 12   | 14   | 16   | 20   | —    | .040 | .137                     | .21                             | .090     | .25        |                         |
| .120    | FH                          | FHS               | FHA             | 120      | 4             | 5  | 6    | 8    | 10   | 12   | 14   | 16   | 20   | 24   | .040 | .137                     | .21                             | .090     | .25        |                         |
| .137    | FH                          | FHS               | FHA             | 137      | 4             | 5  | 6    | 8    | 10   | 12   | 14   | 16   | 20   | 24   | .040 | .157                     | .23                             | .090     | .28        |                         |
| .141    | FH                          | FHS               | FHA             | 141      | 4             | 5  | 6    | 8    | 10   | 12   | 14   | 16   | 20   | 24   | .040 | .163                     | .24                             | .090     | .28        |                         |
| .160    | FH                          | FHS               | FHA             | 160      | 4             | 5  | 6    | 8    | 10   | 12   | 14   | 16   | 20   | 24   | .040 | .189                     | .26                             | .100     | .28        |                         |
| .167    | FH                          | FHS               | FHA             | 167      | —             | 5  | 6    | 8    | 10   | 12   | 14   | 16   | 20   | 24   | .040 | .189                     | .26                             | .100     | .28        |                         |
| .173    | FH                          | FHS               | FHA             | 173      | —             | 5  | 6    | 8    | 10   | 12   | 14   | 16   | 20   | 24   | .040 | .197                     | .26                             | .100     | .28        |                         |
| .207    | FH                          | FHS               | FHA             | 207      | —             | 5  | 6    | 8    | 10   | 12   | 14   | 16   | 20   | 24   | .062 | .236                     | .32                             | .135     | .31        |                         |
| .215    | FH                          | FHS               | FHA             | 215      | —             | —  | —    | 8    | 10   | 12   | 14   | 16   | 20   | 24   | .062 | .250                     | .34                             | .135     | .31        |                         |
| .223    | FH                          | FHS               | FHA             | 223      | —             | —  | —    | 8    | 10   | 12   | 14   | 16   | 20   | 24   | .062 | .250                     | .34                             | .135     | .31        |                         |
| .273    | FH                          | FHS               | FHA             | 273      | —             | —  | —    | 8    | 10   | 12   | 14   | 16   | 20   | 24   | .093 | .312                     | .38                             | .160     | .38        |                         |
| .281    | FH                          | FHS               | FHA             | 281      | —             | —  | —    | 8    | 10   | 12   | 14   | 16   | 20   | 24   | .093 | .312                     | .38                             | .160     | .38        |                         |

All dimensions are in millimeters.

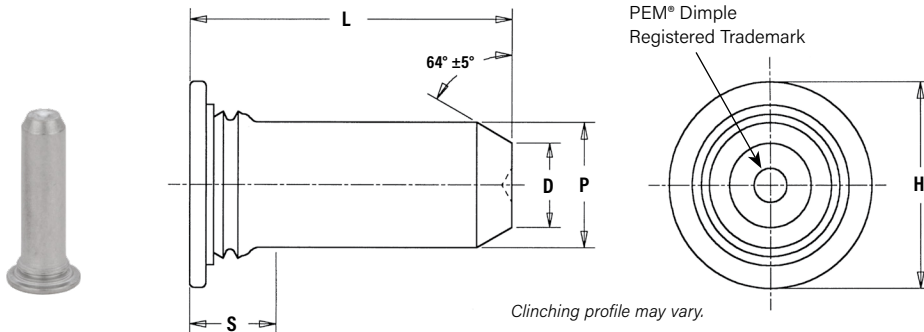
| METRIC | Nominal Pin Diameter P±0.05 | Type              |                 |          | Pin Dia. Code | Length Code "L" ±0.4<br>(Length Code in millimeters) |    |    |    |    |    |    |    |    |    | Min. Sheet Thickness (1) | Hole Size in Sheet +0.08 | H ± 0.4 | S Max. (2) | Min. Dist. Hole to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

(1) See page 24 for installation tool requirements.  
 (2) Pin diameter may exceed max. in this region.

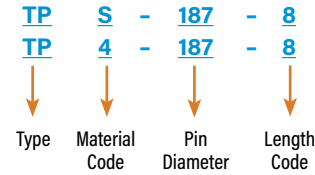
# SELF-CLINCHING STUDS AND PINS

## TPS™/TP4™ FLUSH-HEAD PILOT PINS

- Flush-head for sheet thickness of .040" / 1 mm and greater.
- Satisfies a wide range of positioning, pivot, and alignment applications.
- Chamfered end makes mating hole location easy.
- TPS pins are recommended for use in steel or aluminum sheets HRB (Rockwell "B" Scale) 70 / HB (Hardness Brinell) 125 or less.
- TP4 pins are recommended for use in stainless steel sheets HRB (Rockwell "B" Scale) 92 / HB (Hardness Brinell) 195 or less.



### PART NUMBER DESIGNATION



All dimensions are in inches.

| UNIFIED | Pin Diameter<br>P ±.002 | Type                          |                               | Pin Diameter Code | Length Code "L" ± .015<br>(Length Code in 16ths of an inch) |      |      |      |      | Min. Sheet Thickness<br>(1) | Hole Size in Sheet<br>+.003 -.000 | D<br>±.006 | H<br>±.015 | S<br>Max. (2) | Min. Distance Hole<br>to Edge |
|---------|-------------------------|-------------------------------|-------------------------------|-------------------|---|------|------|------|------|-----------------------------|-----------------------------------|------------|------------|---------------|-------------------------------|
|         |                         | Fastener Material             |                               |                   | .375  | .500 | .625 | .750 | 1.00 |                             |                                   |            |            |               |                               |
|         |                         | 300 Series<br>Stainless Steel | 400 Series<br>Stainless Steel |                   |   |      |      |      |      |                             |                                   |            |            |               |                               |
| .125    | TPS                     | TP4                           | 125                           | 6                 | 8   | 10   | 12   | —    | .040 | .144                        | .090                              | .205       | .090       | .250          |                               |
| .187    | TPS                     | TP4                           | 187                           | 6                 | 8   | 10   | 12   | 16   | .040 | .205                        | .132                              | .270       | .090       | .280          |                               |
| .250    | TPS                     | TP4                           | 250                           | —                 | 8   | 10   | 12   | 16   | .040 | .272                        | .177                              | .335       | .090       | .310          |                               |

All dimensions are in millimeters.

| METRIC | Pin Diameter<br>P ±0.05 | Type                          |                               | Pin Diameter Code | Length Code "L" ± 0.4<br>(Length Code in millimeters) |    |    |    |    | Min. Sheet Thickness<br>(1) | Hole Size in Sheet<br>+0.08 | D<br>±0.15 | H<br>±0.4 | S<br>Max. (2) | Min. Distance Hole<br>to Edge |
|--------|-------------------------|-------------------------------|-------------------------------|-------------------|---|----|----|----|----|-----------------------------|-----------------------------|------------|-----------|---------------|-------------------------------|
|        |                         | Fastener Material             |                               |                   | 6   | 8  | 10 | 12 | 16 |                             |                             |            |           |               |                               |
|        |                         | 300 Series<br>Stainless Steel | 400 Series<br>Stainless Steel |                   |   |    |    |    |    |                             |                             |            |           |               |                               |
| 3      | TPS                     | TP4                           | 3MM                           | 6                 | 8   | 10 | 12 | 16 | —  | 1                           | 3.5                         | 2.11       | 5.2       | 2.29          | 6.4                           |
| 4      | TPS                     | TP4                           | 4MM                           | 6                 | 8   | 10 | 12 | 16 | —  | 1                           | 4.5                         | 2.82       | 6.12      | 2.29          | 7.1                           |
| 5      | TPS                     | TP4                           | 5MM                           | —                 | —   | 10 | 12 | 16 | 20 | 1                           | 5.5                         | 3.53       | 7.19      | 2.29          | 7.6                           |
| 6      | TPS                     | TP4                           | 6MM                           | —                 | —   | —  | 12 | 16 | 20 | 1                           | 6.5                         | 4.24       | 8.13      | 2.29          | 7.9                           |

- (1) See page 25 for installation tool requirements.  
 (2) Pin diameter may exceed max. in this region.

If your application requires corrosion resistant fasteners, non-magnetic fasteners, or will be exposed to temperatures above 300° F (149° C), see note at bottom of page 6 about "400 series fasteners for stainless steel panels".

## TPXS™ SELF-CLINCHING PILOT PINS

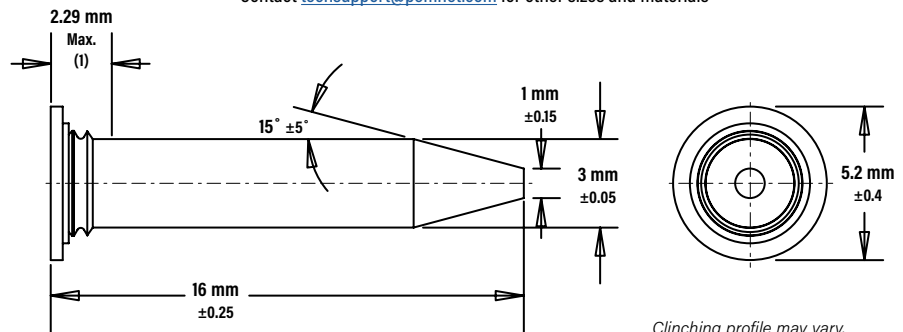
- Meets the ATCA PICMG 3.0 specification.
- 15° tapered point makes engaging the mating hole easy.



Min. Sheet Thickness: 1 mm  
 Hole Size In Sheet: 3.5 mm +0.08  
 Min. Dist. Hole C/L To Edge: 6.4 mm

PEM® Part Number: TPXS-3MM-16

Contact [techsupport@pemnet.com](mailto:techsupport@pemnet.com) for other sizes and materials



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





# SELF-CLINCHING STUDS AND PINS

## MATERIAL AND FINISH SPECIFICATIONS

| Type                           | Threads (1)                               | Fastener Materials    |                                    |                         |                         |                                   |                            |                            | Standard Finishes |  |  | Optional Finishes (2)                                      |               |                       |
|--------------------------------|---|-----------------------|------------------------------------|-------------------------|-------------------------|-----------------------------------|----------------------------|----------------------------|-------------------|--|--|--|---------------|-----------------------|
|                                | External, ASME B1.1, 2A / ASME B1.13M, 6g | Hardened Carbon Steel | Hardened Medium Carbon Alloy Steel | Aluminum (plain finish) | CDA 510 Phosphor Bronze | Age Hardened A286 Stainless Steel | 300 Series Stainless Steel | 400 Series Stainless Steel | No Finish (4)     | Zinc plated per ASTM B633, SC1 (5µm), Type III, Colorless, (5) | Passivated and/or Tested Per ASTM A380 | Zinc Plated per ASTM B633, SC1 (5µm), Type II, Yellow, (5) | No Finish (4) | Rust Preventative Oil |
| FH                             | ▪   | ▪                     |                                    |                         |                         |                                   |                            |                            |                   | ▪  | ▪                                      |  |               |                       |
| FHS                            | ▪   |                       |                                    |                         |                         |                                   | ▪                          |                            |                   |  | ▪                                      |  |               |                       |
| FHA                            | ▪   |                       |                                    | ▪                       |                         |                                   |                            |                            | ▪ (3)             |  |  |  |               |                       |
| FH4                            | ▪   |                       |                                    |                         |                         |                                   |                            | ▪                          |                   |  | ▪                                      |  |               |                       |
| FHP                            | ▪   |                       |                                    |                         |                         | ▪                                 |                            |                            |                   |  | ▪                                      |  |               |                       |
| FHL                            | ▪   | ▪                     |                                    |                         |                         |                                   |                            |                            |                   | ▪  | ▪                                      |  |               |                       |
| FHLS                           | ▪   |                       |                                    |                         |                         |                                   | ▪                          |                            |                   |  | ▪                                      |  |               |                       |
| TFH                            | ▪   | ▪                     |                                    |                         |                         |                                   |                            |                            |                   | ▪  | ▪                                      |  |               |                       |
| TFHS                           | ▪   |                       |                                    |                         |                         |                                   | ▪                          |                            |                   |  | ▪                                      |  |               |                       |
| HFE                            | ▪   | ▪                     |                                    |                         |                         |                                   |                            |                            |                   | ▪  | ▪                                      |  |               |                       |
| THFE                           | ▪   | ▪                     |                                    |                         |                         |                                   |                            |                            |                   | ▪  | ▪                                      |  |               |                       |
| HFH                            | ▪   | ▪                     |                                    |                         |                         |                                   |                            |                            |                   | ▪  | ▪                                      |  |               |                       |
| HFHB                           | ▪   |                       |                                    |                         | ▪                       |                                   |                            |                            | ▪                 |  |  |  |               |                       |
| HFHS                           | ▪   |                       |                                    |                         |                         |                                   | ▪                          |                            |                   | ▪  |  |  |               |                       |
| HFG8                           | ▪   |                       | ▪                                  |                         |                         |                                   |                            |                            |                   | ▪  | ▪                                      |  |               |                       |
| HF109                          | ▪   |                       | ▪                                  |                         |                         |                                   |                            |                            |                   | ▪  | ▪                                      |  |               |                       |
| HFLH                           | ▪   |                       | ▪                                  |                         |                         |                                   |                            |                            |                   | ▪  |  | ▪ (6)  |               |                       |
| SGPC                           | ▪   |                       |                                    |                         |                         |                                   | ▪                          |                            |                   | ▪  |  |  |               |                       |
| FHX                            |   | ▪                     |                                    |                         |                         |                                   |                            |                            |                   | ▪  |  |  | ▪             |                       |
| TPS                            |   |                       |                                    |                         |                         |                                   | ▪                          |                            |                   | ▪  |  |  |               |                       |
| TP4                            |   |                       |                                    |                         |                         |                                   |                            | ▪                          |                   | ▪  |  |  |               |                       |
| TPXS                           |   |                       |                                    |                         |                         |                                   | ▪                          |                            |                   | ▪  |  |  |               |                       |
| Part Number Codes for Finishes |   |                       |                                    |                         |                         |                                   |                            |                            | X                 | ZI   | None                                   | ZC   | X             | X                     |

| Type  | For use in Sheet Hardness (7) |                        |                         |                         |                         |                         |                         |                         |                    |
|-------|-------------------------------|------------------------|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|--------------------|
|       | HRB 50 / HB 82 or Less        | HRB 55 / HB 83 or Less | HRB 70 / HB 125 or Less | HRB 80 / HB 150 or Less | HRB 85 / HB 165 or Less | HRB 89 / HB 180 or Less | HRB 92 / HB 202 or Less | HRB 96 / HB 216 or Less | Any Sheet Hardness |
| FH    |                               |                        |                         | ▪                       |                         |                         |                         |                         |                    |
| FHS   |                               |                        | ▪                       |                         |                         |                         |                         |                         |                    |
| FHA   | ▪                             |                        |                         |                         |                         |                         |                         |                         |                    |
| FH4   |                               |                        |                         |                         |                         |                         | ▪                       |                         |                    |
| FHP   |                               |                        |                         |                         |                         |                         | ▪                       |                         |                    |
| FHL   |                               |                        |                         | ▪                       |                         |                         |                         |                         |                    |
| FHLS  |                               |                        | ▪                       |                         |                         |                         |                         |                         |                    |
| TFH   |                               |                        |                         | ▪                       |                         |                         |                         |                         |                    |
| TFHS  |                               |                        | ▪                       |                         |                         |                         |                         |                         |                    |
| HFE   |                               |                        |                         |                         | ▪                       |                         |                         |                         |                    |
| THFE  |                               |                        |                         |                         | ▪                       |                         |                         |                         |                    |
| HFH   |                               |                        |                         |                         | ▪                       |                         |                         |                         |                    |
| HFHB  |                               | ▪                      |                         |                         |                         |                         |                         |                         |                    |
| HFHS  |                               |                        | ▪                       |                         |                         |                         |                         |                         |                    |
| HFG8  |                               |                        |                         |                         |                         | ▪                       |                         |                         |                    |
| HF109 |                               |                        |                         |                         |                         | ▪                       |                         |                         |                    |
| HFLH  |                               |                        |                         |                         |                         |                         |                         | ▪                       |                    |
| SGPC  |                               |                        |                         |                         |                         |                         |                         |                         | ▪                  |
| FHX   |                               |                        |                         | ▪                       |                         |                         |                         |                         |                    |
| TPS   |                               |                        | ▪                       |                         |                         |                         |                         |                         |                    |
| TP4   |                               |                        |                         |                         |                         |                         | ▪                       |                         |                    |
| TPXS  |                               |                        | ▪                       |                         |                         |                         |                         |                         |                    |

- (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 ASME B1.1, Section 7, Paragraph 7.2 and ASME B1.13M, Section 8, paragraph 8.2.
- (2) Special order with additional charge.
- (3) Part numbers for aluminum studs have no finish suffix.
- (4) "X" suffix studs may have pitch diameters and major diameters below 2A/6g minimum size, per ANSI B1.1, Section 7, and B1.13M, Section 8 to allow for minimum of 0.0002" / 0.0051 mm of plating.
- (5) See PEM Technical Support section of our web site for related plating standards and specifications.
- (6) With rust preventative oil.
- (7) HRB - Hardness Rockwell "B" Scale. HB - Hardness Brinell.



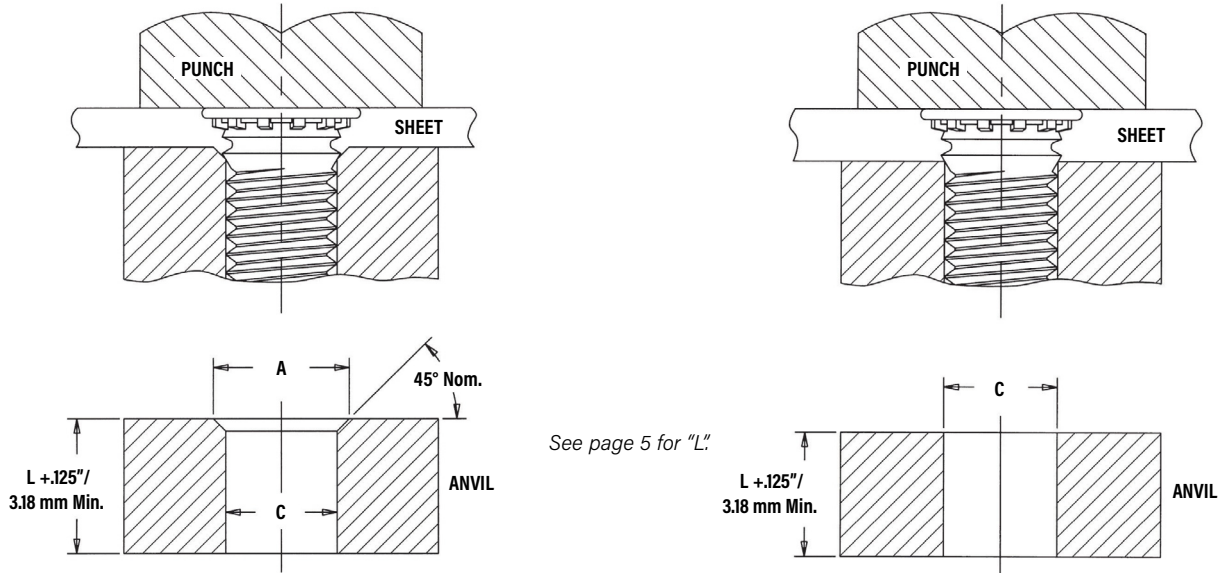
# SELF-CLINCHING STUDS AND PINS

## INSTALLATION - FH™/FHS™/FHA™ THREADED STUDS

1. Prepare properly sized mounting hole in sheet. Do not perform any secondary operations such as deburring.
2. Insert stud through mounting hole (punch side) of sheet and into anvil hole.
3. With punch and anvil surfaces parallel, apply squeezing force to embed the head of the stud flush in the sheet. In most cases, when using 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 for metal flow around the shank of the stud.

Tooling for sheet thicknesses less than .060 / 1.51 mm with #2 thru #10 / M2.5 thru M5 thread sizes and less than .093" / 2.36 mm for 1/4" / M6 threads.

Tooling for sheet thicknesses .060" / 1.51 mm and greater with #2 thru #10 / M2.5 thru M5 thread sizes and .093" / 2.36 mm and greater for 1/4" and 5/16" / M6 and M8 threads.



### Installation Tooling

| UNIFIED | Thread Code | HAEGER® Part No.         |                          |              | PEMSERTER® Part No.      |                          |             | Anvil Dimensions (in.) |             |
|---------|-------------|--------------------------|--------------------------|--------------|--------------------------|--------------------------|-------------|------------------------|-------------|
|         |             | Anvil for Sheets > .060" | Anvil for Sheets ≤ .059" | Punch        | Anvil for Sheets > .060" | Anvil for Sheets ≤ .059" | Punch       | A                      | C           |
|         | 256         | H-103-2L                 | H-103-2LC                | H-108-0020L  | 970200005300             | 970200240300             | 975200048   | .110 - .114            | .087 - .090 |
| 440     | H-103-4L    | H-103-4LC                | H-108-0020L              | 970200006300 | 970200241300             | 975200048                | .136 - .140 | .113 - .116            |             |
| 632     | H-103-6L    | H-103-6LC                | H-108-0020L              | 970200007300 | 970200243300             | 975200048                | .162 - .166 | .139 - .142            |             |
| 832     | H-103-8L    | H-103-8LC                | H-108-0020L              | 970200008300 | 970200245300             | 975200048                | .188 - .192 | .165 - .168            |             |
| 024/032 | H-103-10L   | H-103-10LC               | H-108-0020L              | 970200009300 | 970200246300             | 975200048                | .216 - .220 | .191 - .194            |             |
|         |             | Anvil for Sheets > .093" | Anvil for Sheets ≤ .092" |              | Anvil for Sheets > .093" | Anvil for Sheets ≤ .092" |             |                        |             |
| 0420    | H-103-04L   | H-103-04LC               | H-108-0020L              | 970200010300 | 970200249300             | 975200048                | .295 - .300 | .250 - .253            |             |
| 0518    | H-103-05L   | H-103-05LC               | H-108-0020L              | 970200011300 | —                        | 975200048                | .334 - .338 | .3125 - .3155          |             |

| METRIC | Thread Code | HAEGER® Part No.          |                           |              | PEMSERTER® Part No.       |                           |           | Anvil Dimensions (mm) |          |
|--------|-------------|---------------------------|---------------------------|--------------|---------------------------|---------------------------|-----------|-----------------------|----------|
|        |             | Anvil for Sheets > 1.51mm | Anvil for Sheets ≤ 1.51mm | Punch        | Anvil for Sheets > 1.51mm | Anvil for Sheets ≤ 1.51mm | Punch     | A + 0.1               | C + 0.08 |
|        | M2.5        | H-103-M2.5L               | H-103-M2.5LC              | H-108-0020L  | 970200300300              | 970200493300              | 975200048 | 3.1                   | 2.53     |
| M3     | H-103-M3L   | H-103-M3LC                | H-108-0020L               | 970200229300 | 970200242300              | 975200048                 | 3.6       | 3.03                  |          |
| M3.5   | H-103-M3.5L | H-103-M3.5LC              | H-108-0020L               | 970200007300 | 970200243300              | 975200048                 | 4.1       | 3.53                  |          |
| M4     | H-103-M4L   | H-103-M4LC                | H-108-0020L               | 970200019300 | 970200244300              | 975200048                 | 4.6       | 4.03                  |          |
| M5     | H-103-M5L   | H-103-M5LC                | H-108-0020L               | 970200020300 | 970200247300              | 975200048                 | 5.6       | 5.03                  |          |
|        |             | Anvil for Sheets > 2.36mm | Anvil for Sheets ≤ 2.36mm |              | Anvil for Sheets > 2.36mm | Anvil for Sheets ≤ 2.36mm |           |                       |          |
| M6     | H-103-M6L   | H-103-M6LC                | H-108-0020L               | 970200230300 | 970200248300              | 975200048                 | 6.6       | 6.03                  |          |
| M8     | H-103-M8L   | H-103-M8LC                | H-108-0020L               | 970200231300 | —                         | 975200048                 | 8.6       | 8.03                  |          |

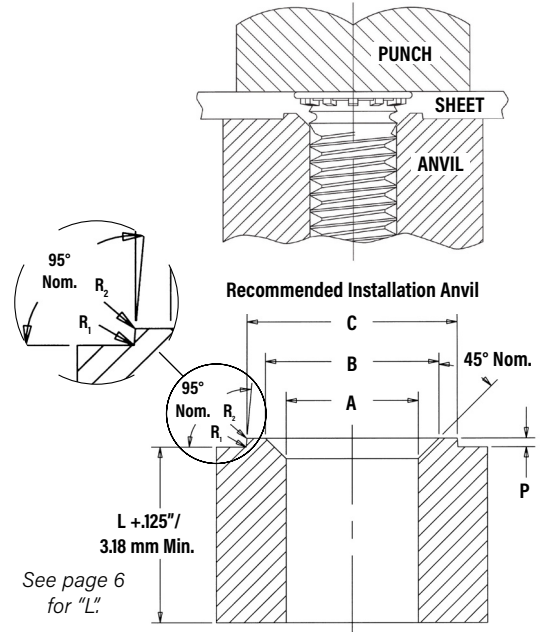


## INSTALLATION - FH4™/FHP™ STUDS FOR STAINLESS STEEL SHEETS

1. Prepare properly sized mounting hole in sheet. Do not perform any secondary operations such as deburring.
2. Insert stud through mounting hole (punch side) of sheet and into anvil hole.
3. With punch and anvil surfaces parallel, apply squeezing force to embed the head of the stud flush in the sheet.

For FH4/FHP 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. Please see page 6 for recommended sheet thickness range.

The special anvils are available from PEM stock or can be machined from suitable tool steel. A hardness of HRC 55 / HB 547 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.



### Installation Tooling

| UNIFIED | Thread Code | HAEGER® Part Number |             | PEMSERTER® Part Number |           | Anvil Dimensions (in.) |            |            |            |            |            |
|---------|-------------|---------------------|-------------|------------------------|-----------|------------------------|------------|------------|------------|------------|------------|
|         |             | Anvil               | Punch       | Anvil                  | Punch     | A<br>+.003 -.000       | B<br>±.002 | C<br>±.002 | P<br>±.001 | Ri<br>Max. | R2<br>Max. |
|         | 440         | H-181-4L            | H-108-0020L | 8001645                | 975200048 | .113                   | .144       | .174       | .101       | .003       | .005       |
| 632     | H-181-6L    | H-108-0020L         | 8001644     | 975200048              | .140      | .170                   | .200       | .100       | .003       | .005       |            |
| 832     | H-181-8L    | H-108-0020L         | 8001643     | 975200048              | .166      | .202                   | .236       | .100       | .003       | .005       |            |
| 032     | H-181-10L   | H-108-0020L         | 8001642     | 975200048              | .191      | .235                   | .275       | .100       | .003       | .005       |            |
| 0420    | H-181-04L   | H-108-0020L         | 8002535     | 975200048              | .252      | .324                   | .360       | .020       | .003       | .005       |            |

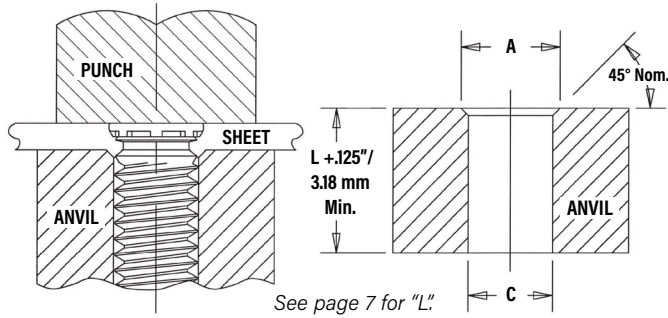
| METRIC | Thread Code | HAEGER® Part Number |             | PEMSERTER® Part Number |           | Anvil Dimensions (mm) |            |            |             |            |            |
|--------|-------------|---------------------|-------------|------------------------|-----------|-----------------------|------------|------------|-------------|------------|------------|
|        |             | Anvil               | Punch       | Anvil                  | Punch     | A<br>±0.08            | B<br>±0.05 | C<br>±0.05 | P<br>±0.025 | Ri<br>Max. | R2<br>Max. |
|        | M3          | H-181-M3L           | H-108-0020L | 8001678                | 975200048 | 3.05                  | 3.81       | 4.57       | 0.25        | 0.08       | 0.13       |
| M4     | H-181-M4L   | H-108-0020L         | 8001677     | 975200048              | 4.04      | 4.95                  | 5.82       | 0.25       | 0.08        | 0.13       |            |
| M5     | H-181-M5L   | H-108-0020L         | 8001676     | 975200048              | 5.08      | 6.15                  | 7.16       | 0.25       | 0.08        | 0.13       |            |
| M6     | H-181-M6L   | H-108-0020L         | 8002536     | 975200048              | 6.05      | 7.87                  | 8.79       | 0.51       | 0.08        | 0.13       |            |

# SELF-CLINCHING STUDS AND PINS

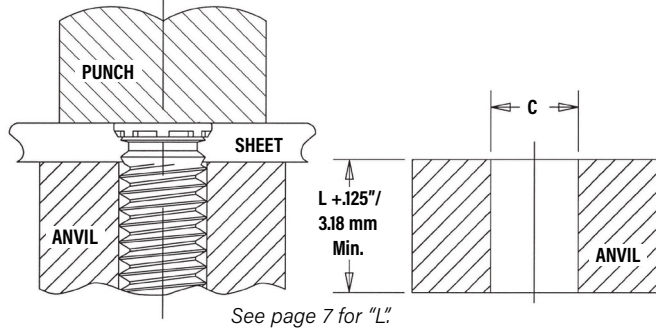
## INSTALLATION - FHL™/FHLS™ STUDS

1. Prepare properly sized mounting hole in sheet. Do not perform any secondary operations such as deburring.
2. Insert stud through mounting hole (punch side) of sheet and into anvil hole.
3. With punch and anvil surfaces parallel, apply squeezing force to embed the head of the stud flush in the sheet. 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.



Tooling for sheet thicknesses .060" / 1.51 mm and greater.



### Installation Tooling

| UNIFIED | Thread Code | HAEGER® Part No.         |                          |             | PEMSERTER® Part No.      |                          |             | Anvil Dimensions (in.) |             |
|---------|-------------|--------------------------|--------------------------|-------------|--------------------------|--------------------------|-------------|------------------------|-------------|
|         |             | Anvil for Sheets > .060" | Anvil for Sheets ≤ .059" | Punch       | Anvil for Sheets > .060" | Anvil for Sheets ≤ .059" | Punch       | A                      | C           |
|         | 256         | H-103-2L                 | H-103-2LC                | H-108-0020L | 8003313                  | 8003297                  | 975200997   | .110 - .114            | .087 - .090 |
| 440     | H-103-4L    | H-103-4LC                | H-108-0020L              | 8003618     | 8003298                  | 975200997                | .136 - .140 | .113 - .116            |             |
| 632     | H-103-6L    | H-103-6LC                | H-108-0020L              | 8003314     | 8003299                  | 975200997                | .162 - .166 | .139 - .142            |             |
| 832     | H-103-8L    | H-103-8LC                | H-108-0020L              | 8003315     | 8003300                  | 975200997                | .188 - .192 | .165 - .168            |             |
| 032     | H-103-10L   | H-103-10LC               | H-108-0020L              | 8003619     | 8003301                  | 975200997                | .216 - .220 | .191 - .194            |             |

| METRIC | Thread Code | HAEGER® Part No.          |                          |             | PEMSERTER® Part No.       |                          |           | Anvil Dimensions (mm) |            |
|--------|-------------|---------------------------|--------------------------|-------------|---------------------------|--------------------------|-----------|-----------------------|------------|
|        |             | Anvil for Sheets > 1.51mm | Anvil for Sheets ≤ 1.5mm | Punch       | Anvil for Sheets > 1.51mm | Anvil for Sheets ≤ 1.5mm | Punch     | A<br>±0.05            | C<br>±0.08 |
|        | M2.5        | H-103-M2.5L               | H-103-M2.5LC             | H-108-0020L | 8003316                   | 8003302                  | 975200997 | 3.1                   | 2.53       |
| M3     | H-103-M3L   | H-103-M3LC                | H-108-0020L              | 8003317     | 8003303                   | 975200997                | 3.6       | 3.03                  |            |
| M3.5   | H-103-M3.5L | H-103-M3.5LC              | H-108-0020L              | 8003318     | 8003304                   | 975200997                | 4.1       | 3.53                  |            |
| M4     | H-103-M4L   | H-103-M4LC                | H-108-0020L              | 8003620     | 8003305                   | 975200997                | 4.6       | 4.03                  |            |
| M5     | H-103-M5L   | H-103-M5LC                | H-108-0020L              | 8003319     | 8003306                   | 975200997                | 5.6       | 5.03                  |            |

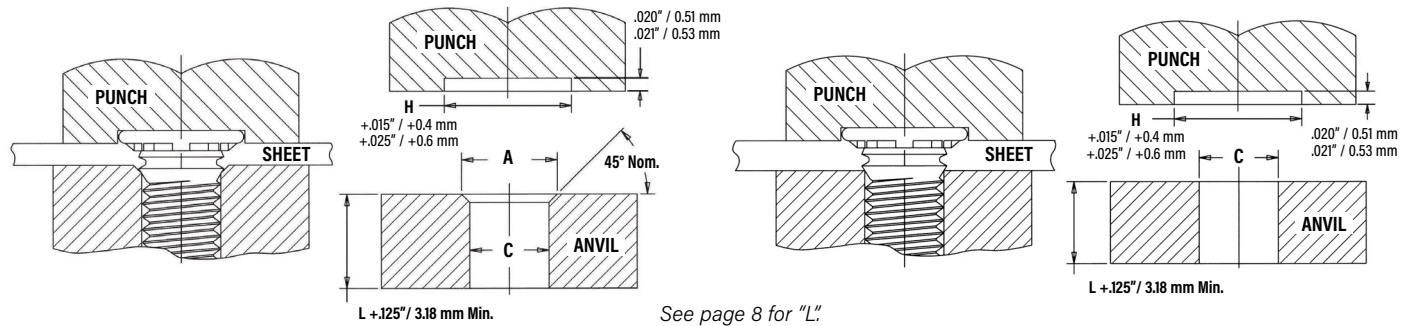
# SELF-CLINCHING STUDS AND PINS

## INSTALLATION - TFH™/TFHS™ NON-FLUSH STUDS

1. Prepare properly sized mounting hole in sheet. Do not perform any secondary operations such as deburring.
2. Insert stud through mounting hole (punch side) of sheet and into anvil hole.
3. With punch and anvil surfaces parallel, apply squeezing force until the punch contacts the sheet. When installed, the stud head is not flush but will protrude approximately .025" / 0.64 mm. 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.

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 Tooling

| UNIFIED | Thread Code | HAEGER® Part No.         |                                 |              | PEMSERTER® Part No.      |                                 |              | Anvil Dimension (in.) |             |
|---------|-------------|--------------------------|---------------------------------|--------------|--------------------------|---------------------------------|--------------|-----------------------|-------------|
|         |             | Anvil for Sheets > .030" | Anvil for Sheets .020" to .029" | Punch (1)    | Anvil for Sheets > .030" | Anvil for Sheets .020" to .029" | Punch        | A                     | C           |
|         | 256         | H-103-2L                 | H-103-2LC                       | H-108-0020L  | 970200005300             | 970200240300                    | 970200235400 | .110 - .114           | .087 - .090 |
| 440     | H-103-4L    | H-103-4LC                | H-108-0020L                     | 970200006300 | 970200241300             | 970200236400                    | .136 - .140  | .113 - .116           |             |
| 632     | H-103-6L    | H-103-6LC                | H-108-0020L                     | 970200007300 | 970200243300             | 970200237400                    | .162 - .166  | .139 - .142           |             |
| 832     | H-103-8L    | H-103-8LC                | H-108-0020L                     | 970200008300 | 970200245300             | 970200238400                    | .188 - .192  | .165 - .168           |             |
| 032     | H-103-10L   | H-103-10LC               | H-108-0020L                     | 970200009300 | 970200246300             | 970200239400                    | .216 - .220  | .191 - .194           |             |
| 0420    | H-103-04L   | H-103-04LC               | H-108-0020L                     | 970200010300 | 970200249300             | 970200496400                    | .295 - .300  | .250 - .253           |             |

| METRIC | Thread Code | HAEGER® Part No.          |                                   |              | PEMSERTER® Part No.       |                                   |              | Anvil Dimensions (mm) |            |
|--------|-------------|---------------------------|-----------------------------------|--------------|---------------------------|-----------------------------------|--------------|-----------------------|------------|
|        |             | Anvil for Sheets > 0.76mm | Anvil for Sheets 0.51mm to 0.75mm | Punch (1)    | Anvil for Sheets > 0.76mm | Anvil for Sheets 0.51mm to 0.75mm | Punch        | A<br>+0.1             | C<br>+0.08 |
|        | M3          | H-103-M3L                 | H-103-M3LC                        | H-108-0020L  | 970200229300              | 970200242300                      | 970200236400 | 3.6                   | 3.03       |
| M3.5   | H-103-M3.5L | H-103-M3.5LC              | H-108-0020L                       | 970200007300 | 970200243300              | 970200237400                      | 4.1          | 3.53                  |            |
| M4     | H-103-M4L   | H-103-M4LC                | H-108-0020L                       | 970200019300 | 970200244300              | 970200238400                      | 4.6          | 4.03                  |            |
| M5     | H-103-M5L   | H-103-M5LC                | H-108-0020L                       | 970200020300 | 970200247300              | 970200239400                      | 5.6          | 5.03                  |            |
| M6     | H-103-M6L   | H-103-M6LC                | H-108-0020L                       | 970200230300 | 970200248300              | 970200496400                      | 6.6          | 6.03                  |            |

(1) Flat punch. [Pocket punch](#) available on special order.



# SELF-CLINCHING STUDS AND PINS

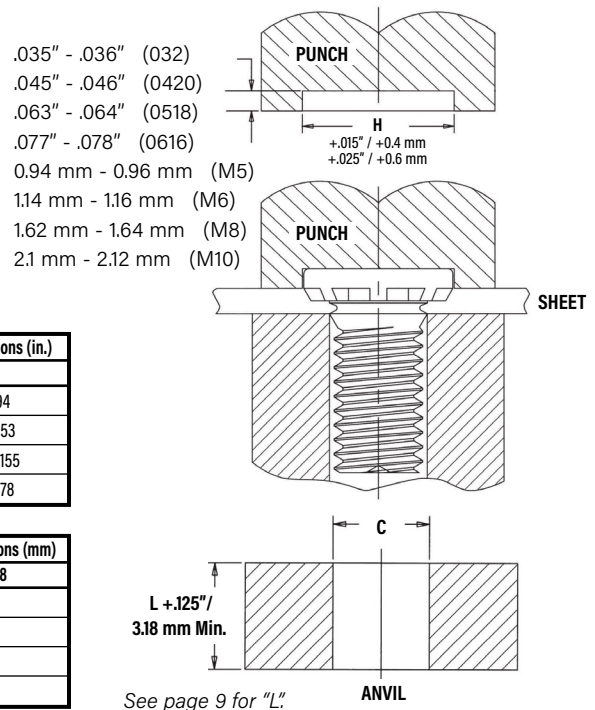
## INSTALLATION - HFH™/HFHB™/HFHS™ STUDS

1. Prepare properly sized mounting hole in sheet. Do not perform any secondary operations such as deburring.
2. Insert stud through mounting hole (punch side) of sheet and into anvil hole.
3. With punch and anvil surfaces parallel, apply squeezing force on the punch sufficient only to embed the ribs on the head of the stud into the sheet. The standard punch design provides clearance for the stud head and reduces chances of over squeezing.

### Installation Tooling

| UNIFIED | Thread Code | HAEGER® Part No. |              | PEMSERTER® Part No. |               | Anvil Dimensions (in.) |
|---------|-------------|------------------|--------------|---------------------|---------------|------------------------|
|         |             | Anvil            | Punch        | Anvil               | Punch         | C                      |
|         | 032         | H-103-10L        | H-184-10L    | 970200009300        | 970200311400  | .191 - .194            |
| 0420    | H-103-04L   | H-184-04L        | 970200010300 | 970200312400        | .250 - .253   |                        |
| 0518    | H-103-05L   | H-184-05L        | 970200011300 | 970200313400        | .3125 - .3155 |                        |
| 0616    | H-103-06L   | H-184-06L        | 970200004300 | 970200314400        | .375 - .378   |                        |

| METRIC | Thread Code | HAEGER® Part No. |              | PEMSERTER® Part No. |              | Anvil Dimensions (mm) |
|--------|-------------|------------------|--------------|---------------------|--------------|-----------------------|
|        |             | Punch            | Punch        | Anvil               | Punch        | C + 0.08              |
|        | M5          | H-103-M5L        | H-184-10L    | 970200020300        | 970200311400 | 5.03                  |
| M6     | H-103-M6L   | H-184-04L        | 970200230300 | 970200312400        | 6.03         |                       |
| M8     | H-103-M8L   | H-184-05L        | 970200231300 | 970200313400        | 8.03         |                       |
| M10    | H-103-M10L  | H-184-M10L       | 970200402300 | 970200314400        | 10.03        |                       |



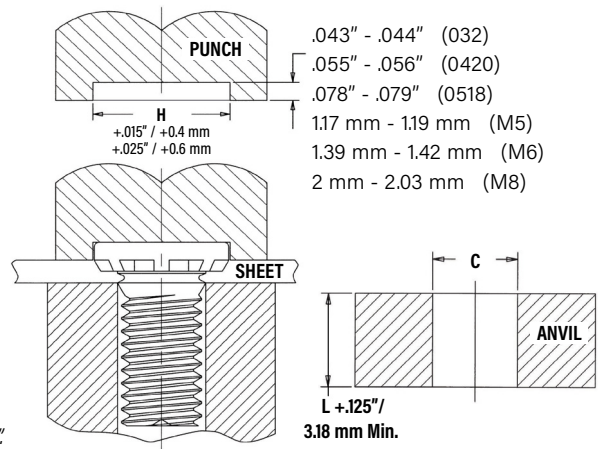
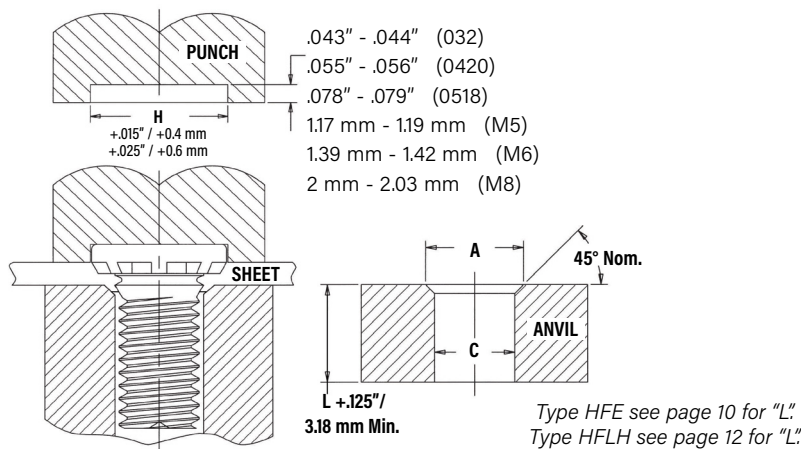
## INSTALLATION - HFE™/THFE™/HFLH™ STUDS

### HFE™/HFLH™ STUDS

1. Prepare properly sized mounting hole in sheet. Do not perform any secondary operations such as deburring.
2. Insert stud through mounting hole (punch side) of sheet and into anvil hole.
3. With punch and anvil surfaces parallel, apply squeezing force on the punch sufficient only to embed the ribs on the head of the stud into the sheet.

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.



# SELF-CLINCHING STUDS AND PINS

## Installation Tooling - HFE™/HFLH™ STUDS

| UNIFIED | Thread Code | HAEGER® Part No.         |                                |              | PEMSERTER® Part No.      |                                |             | Anvil Dimensions (in.) |             |
|---------|-------------|--------------------------|--------------------------------|--------------|--------------------------|--------------------------------|-------------|------------------------|-------------|
|         |             | Anvil for Sheets > .060" | Anvil for Sheets .040" - .060" | Punch (1)    | Anvil for Sheets > .060" | Anvil for Sheets .040" - .060" | Punch       | A                      | C           |
|         | 032         | H-103-10L                | H-103-10LC                     | H-108-0020L  | 97020009300              | 970200246300                   | 8003707     | .216 - .220            | .191 - .194 |
| 0420    | H-103-04L   | H-103-04LC               | H-108-0020L                    | 970200010300 | 8003702                  | 8003708                        | .295 - .300 | .250 - .253            |             |
| 0518    | H-103-05L   | H-103-05LC               | H-108-0020L                    | 970200011300 | 8003703                  | 8003709                        | .334 - .338 | .3125 - .3155          |             |

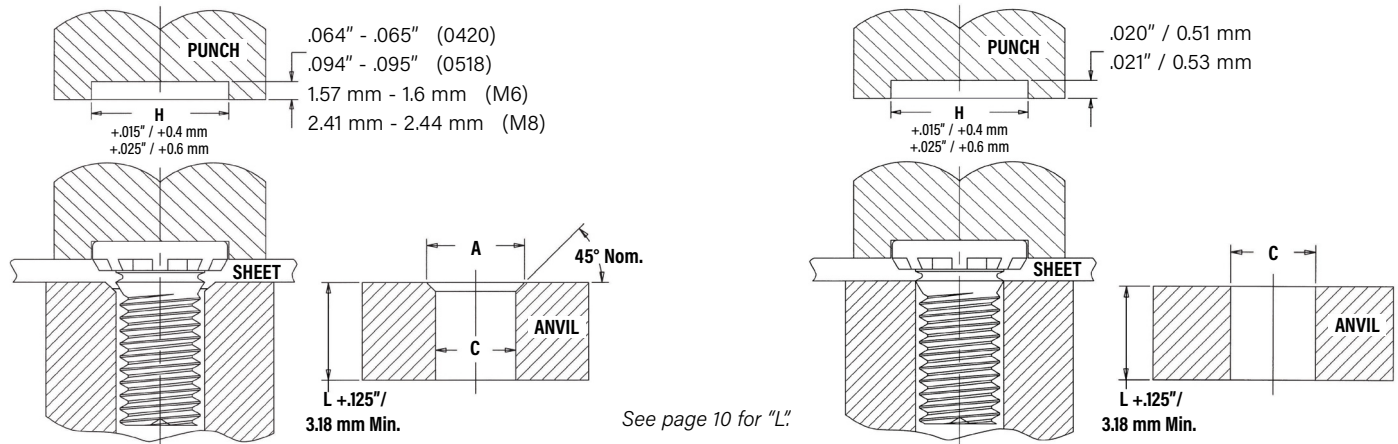
| METRIC | Thread Code | HAEGER® Part No.           |                                 |              | PEMSERTER® Part No.        |                                 |         | Anvil Dimensions (mm) |         |
|--------|-------------|----------------------------|---------------------------------|--------------|----------------------------|---------------------------------|---------|-----------------------|---------|
|        |             | Anvil for Sheets > 1.51 mm | Anvil for Sheets 1 mm - 1.51 mm | Punch (1)    | Anvil for Sheets > 1.51 mm | Anvil for Sheets 1 mm - 1.51 mm | Punch   | A +0.1                | C +0.08 |
|        | M5          | H-103-M5L                  | H-103-M5LC                      | H-108-0020L  | 970200020300               | 8003704                         | 8003710 | 5.6                   | 5.03    |
| M6     | H-103-M6L   | H-103-M6LC                 | H-108-0020L                     | 970200030300 | 8003705                    | 8003711                         | 6.6     | 6.03                  |         |
| M8     | H-103-M8L   | H-103-M8LC                 | H-108-0020L                     | 970200231300 | 8003706                    | 8003712                         | 8.6     | 8.03                  |         |

(1) Flat punch. *Pocket punch* available on special order.

## THFE™ STUDS

Tooling for sheet thicknesses less than .052" / 1.31 mm with 1/4" / M6 thread sizes, and less than .067" / 1.71 mm with 5/16" / M8 thread sizes.

Tooling for sheet thicknesses .052" / 1.31 mm and greater with 1/4" / M6 and .067" / 1.71 mm thread sizes and greater with 5/16" / M8 threads.



## Installation Tooling

| UNIFIED | Thread Code | HAEGER® Part No.         |                                |              | PEMSERTER® Part No.      |                                |             | Anvil Dimensions (in.) |             |
|---------|-------------|--------------------------|--------------------------------|--------------|--------------------------|--------------------------------|-------------|------------------------|-------------|
|         |             | Anvil for Sheets > .051" | Anvil for Sheets .031" - .051" | Punch (1)    | Anvil for Sheets > .051" | Anvil for Sheets .031" - .051" | Punch       | A                      | C           |
|         | 0420        | H-103-04L                | H-103-04LC                     | H-108-0020L  | 970200010300             | 8019886                        | 8019890     | .302 - .306            | .250 - .253 |
| 0518    | H-103-05L   | H-103-05LC               | H-108-0020L                    | 970200011300 | 8019887                  | 8019891                        | .374 - .378 | .3125 - .3155          |             |

| METRIC | Thread Code | HAEGER® Part No.          |                                  |              | PEMSERTER® Part No.       |                                  |         | Anvil Dimensions (mm) |          |
|--------|-------------|---------------------------|----------------------------------|--------------|---------------------------|----------------------------------|---------|-----------------------|----------|
|        |             | Anvil for Sheets > 1.3 mm | Anvil for Sheets 0.8 mm - 1.3 mm | Punch (1)    | Anvil for Sheets > 1.3 mm | Anvil for Sheets 0.8 mm - 1.3 mm | Punch   | A +0.1                | C + 0.08 |
|        | M6          | H-103-M6L                 | H-103-M6LC                       | H-108-0020L  | 970200230300              | 8019888                          | 8019892 | 7.25                  | 6.03     |
| M8     | H-103-M8L   | H-103-M8LC                | H-108-0020L                      | 970200231300 | 8019889                   | 8019893                          | 9.55    | 8.03                  |          |

(1) Flat punch. *Pocket punch* available on special order.

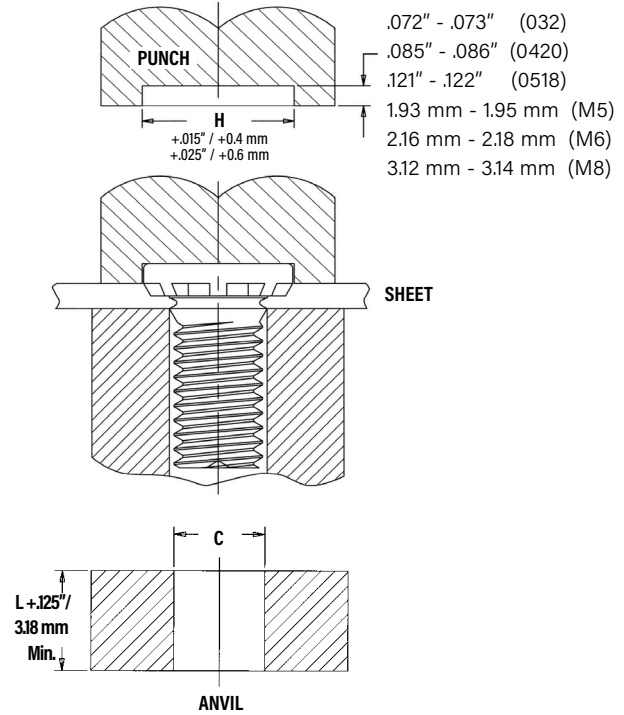
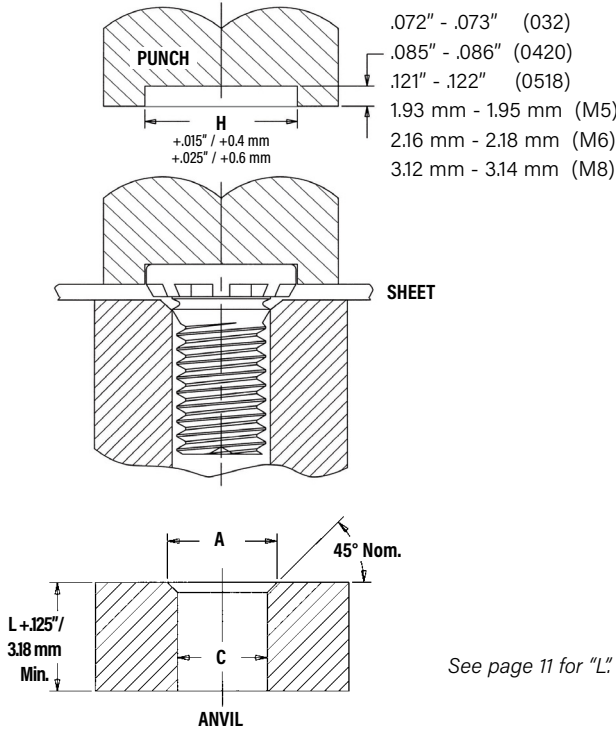
# SELF-CLINCHING STUDS AND PINS

## INSTALLATION - HFG8™/HF109™ STUDS

1. Prepare properly sized mounting hole in sheet. Do not perform any secondary operations such as deburring.
2. Insert stud through mounting hole (punch side) of sheet and into anvil hole.
3. With punch and anvil surfaces parallel, apply squeezing force on the punch sufficient only to embed the ribs on the head of the stud into the sheet. 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.



See page 11 for "L"

## PEMSERTER® Installation Tooling

| UNIFIED | Thread Code | HAEGER® Part No.        |                     |             | PEMSERTER® Part No.     |                     |         | Anvil Dimensions (in.) |               |
|---------|-------------|-------------------------|---------------------|-------------|-------------------------|---------------------|---------|------------------------|---------------|
|         |             | Anvil (Standard Sheets) | Anvil (Thin Sheets) | Punch (1)   | Anvil (Standard Sheets) | Anvil (Thin Sheets) | Punch   | A                      | C             |
|         | 032         | H-103-10L               | H-103-10LC          | H-108-0020L | 970200009300            | 970200246300        | 8014456 | .216 - .220            | .191 - .194   |
|         | 0420        | H-103-04L               | H-103-04LC          | H-108-0020L | 8021609                 | 8021613             | 8014458 | .273 - .278            | .250 - .253   |
|         | 0518        | H-103-05L               | H-103-05LC          | H-108-0020L | 8021610                 | 8021614             | 8014460 | .334 - .338            | .3125 - .3155 |

| METRIC | Thread Code | HAEGER® Part No.        |                     |             | PEMSERTER® Part No.     |                     |         | Anvil Dimensions (mm) |            |
|--------|-------------|-------------------------|---------------------|-------------|-------------------------|---------------------|---------|-----------------------|------------|
|        |             | Anvil (Standard Sheets) | Anvil (Thin Sheets) | Punch (1)   | Anvil (Standard Sheets) | Anvil (Thin Sheets) | Punch   | A<br>+0.1             | C<br>+0.08 |
|        | M5          | H-103-M5L               | H-103-M5LC          | H-108-0020L | 970200020300            | 8003704             | 8014457 | 5.6                   | 5.03       |
|        | M6          | H-103-M6L               | H-103-M6LC          | H-108-0020L | 8021611                 | 8021615             | 8014459 | 6.6                   | 6.03       |
|        | M8          | H-103-M8L               | H-103-M8LC          | H-108-0020L | 8021612                 | 8021616             | 8014461 | 8.6                   | 8.03       |

(1) Flat punch. Pocket punch available on special order.r.



## INSTALLATION - SGPC™ SWAGING COLLAR STUDS

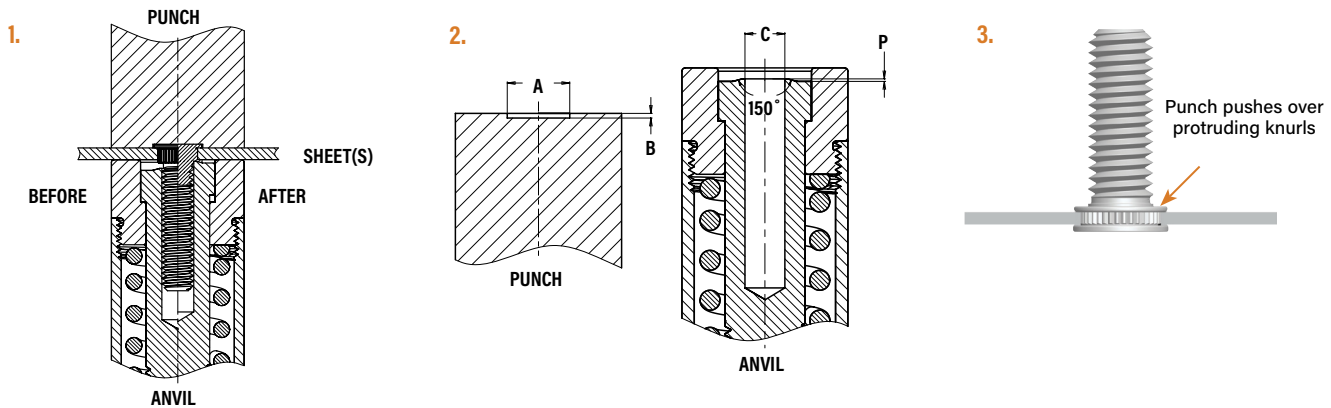
1. Prepare properly sized mounting hole in sheet.
2. Insert fastener through mounting hole (punch side) as shown in drawing.
3. With installation punch and anvil surfaces parallel, apply squeezing force until the punch pushes over the protruding knurls of the stud.

### Installation Tooling

| UNIFIED | Thread Code | Punch Dimensions (in.) |                  | Punch Part Number <sup>(1)</sup> | Anvil Dimensions (in.) |                  | Anvil Part Number <sup>(1)</sup> |
|---------|-------------|------------------------|------------------|----------------------------------|------------------------|------------------|----------------------------------|
|         |             | A<br>+.004 -.000       | B<br>+.000 -.001 | PEMSERTER®                       | C<br>+.001             | P<br>+.000 -.002 | PEMSERTER®                       |
|         | 256         | .209                   | .019             | 8015111                          | .087                   | .014             | 8016983                          |
| 440     | .248        | .022                   | 8015112          | .113                             | .014                   | 8016984          |                                  |
| 632     | .276        | .022                   | 8015113          | .139                             | .014                   | 8016985          |                                  |
| 832     | .299        | .022                   | 8015114          | .165                             | .014                   | 8016986          |                                  |
| 032     | .327        | .022                   | 8015115          | .191                             | .014                   | 8016987          |                                  |
| 0420    | .386        | .026                   | 8015116          | .251                             | .014                   | 8016988          |                                  |

| METRIC | Thread Code | Punch Dimensions (mm) |             | Punch Part Number <sup>(1)</sup> | Anvil Dimensions (mm) |            | Anvil Part Number <sup>(1)</sup> |
|--------|-------------|-----------------------|-------------|----------------------------------|-----------------------|------------|----------------------------------|
|        |             | A<br>+0.1             | B<br>-0.025 | PEMSERTER®                       | C<br>+0.025           | P<br>-0.05 | PEMSERTER®                       |
|        | M2.5        | 5.5                   | 0.47        | 8015117                          | 2.53                  | 0.35       | 8016989                          |
| M3     | 6.5         | 0.57                  | 8015118     | 3.03                             | 0.35                  | 8016990    |                                  |
| M4     | 7.5         | 0.57                  | 8015119     | 4.03                             | 0.35                  | 8016991    |                                  |
| M5     | 8.5         | 0.57                  | 8015120     | 5.03                             | 0.35                  | 8016992    |                                  |
| M6     | 9.5         | 0.67                  | 8015121     | 6.03                             | 0.35                  | 8016993    |                                  |

(1) [Click here](#) for a quote on Haeger® custom installation tooling.



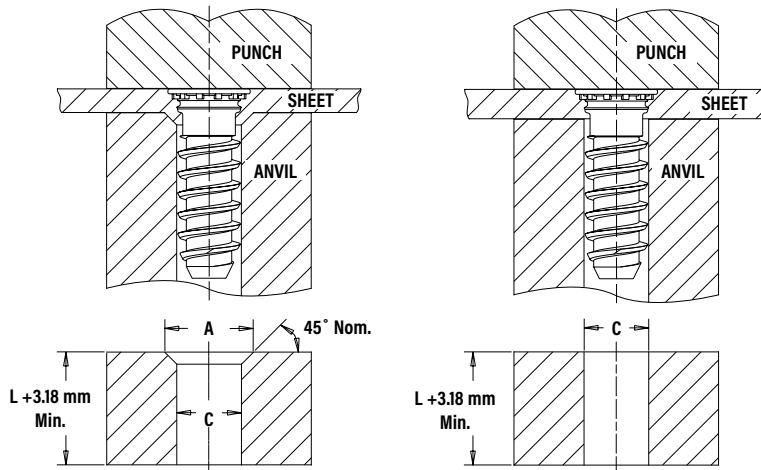
NOTE: For panel design information, go to [http://www.pemnet.com/SGPC\\_Panel\\_Designs.pdf](http://www.pemnet.com/SGPC_Panel_Designs.pdf)

## INSTALLATION - FHX™ STUDS

1. Prepare properly sized mounting hole in sheet. Do not perform any secondary operations such as deburring.
2. Insert stud through mounting hole (punch side) of sheet and into anvil hole.
3. With punch and anvil surfaces parallel, apply squeezing force to embed the head of the stud flush in the sheet. In most cases, when using sheets 1.51 mm and thicker, the anvil requires only a straight thru hole to accommodate the stud (see illustrations below for details). For sheets less than 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 1.51 mm with 5 mm thread size and less than 2.4 mm for 6 mm thread size.

Tooling for sheet thicknesses 1.51 mm and greater with 5 mm thread size and 2.4 mm and greater for 6 mm thread size.



See page 14 for "L."

### Installation Tooling

| METRIC | Thread Code | PEMSERTER® Part No. (1) |                         |                   | Anvil Dimensions (mm) |             |
|--------|-------------|-------------------------|-------------------------|-------------------|-----------------------|-------------|
|        |             | Anvil for Sheets < 1.51 | Anvil for Sheets ≥ 1.51 | Punch Part Number | A                     | C           |
|        | X5          | 8021189                 | 8021188                 | 975200048         | 6.12 - 6.22           | 5.23 - 5.31 |
|        |             |                         | < 2.4                   | ≥ 2.4             |                       |             |
|        | X6          | 8021191                 | 8021190                 | 975200048         | 7.04 - 7.14           | 6.25 - 6.33 |

(1) [Click here](#) for a quote on Haeger® custom installation tooling.

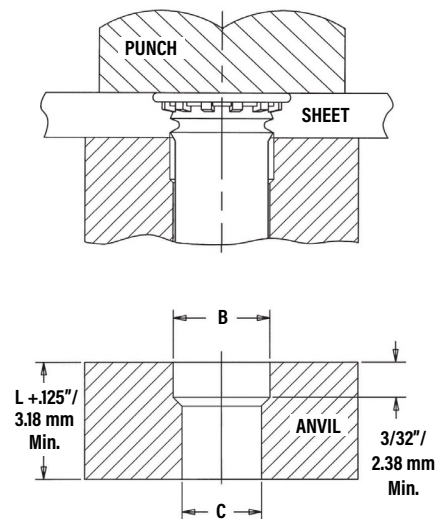
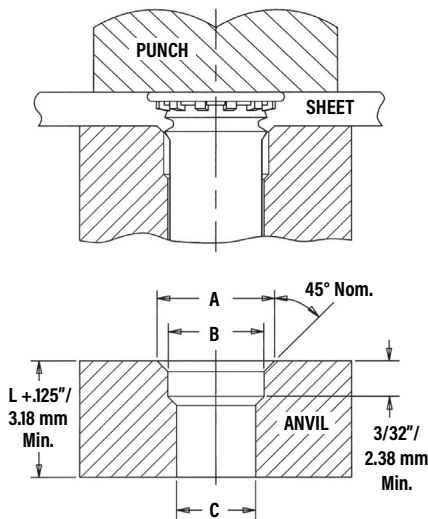
# SELF-CLINCHING STUDS AND PINS

## INSTALLATION - FH™/FHS™/FHA™ PINS

1. Prepare properly sized mounting hole in sheet. Do not perform any secondary operations such as deburring.
2. Insert pin through mounting hole (punch side) of sheet and into anvil hole.
3. With punch and anvil surfaces parallel, apply squeezing force to embed the head of the pin flush in the sheet. In most cases, when using sheets .060" / 1.51 mm and thicker, the anvil requires only a straight thru hole to accommodate the pin (see illustrations below for details). 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 pin.

Tooling for sheet thicknesses less than .060" / 1.52 mm with 073 thru 173 / 3 mm thru 5 mm pin diameter codes and for sheet thicknesses less than .093" / 2.36 mm with 207 thru 223 pin diameter codes.

Tooling for sheet thicknesses greater than .060" / 1.52 mm with 073 thru 173 / 3 mm thru 5 mm pin diameter codes and for sheet thicknesses greater than .093" / 2.36 mm with 207 thru 281 pin diameter codes.



### Installation Tooling

| UNIFIED | Pin Dia. Code | Anvil Dimensions (in.) |         |         |
|---------|---------------|------------------------|---------|---------|
|         |               | A +.004 -.000          | B ±.002 | C ±.002 |
| 073     | .116          | .089                   | .078    |         |
| 084     | .133          | .103                   | .089    |         |
| 094     | .162          | .115                   | .099    |         |
| 103     | .166          | .122                   | .109    |         |
| 106     | .168          | .129                   | .111    |         |
| 116     | .191          | .141                   | .121    |         |
| 120     | .191          | .141                   | .125    |         |
| 137     | .215          | .161                   | .144    |         |
| 141     | .216          | .167                   | .147    |         |
| 160     | .244          | .193                   | .166    |         |
| 167     | .244          | .193                   | .172    |         |
| 173     | .250          | .201                   | .180    |         |
| 207     | .286          | .240                   | .213    |         |
| 215     | .290          | .254                   | .221    |         |
| 223     | .298          | .254                   | .228    |         |
| 273     | .325          | .316                   | .277    |         |
| 281     | .320          | .316                   | .290    |         |

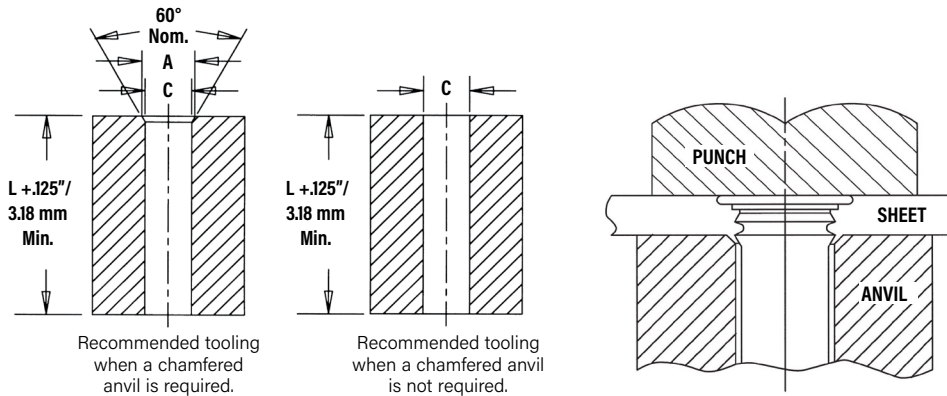
| METRIC | Pin Dia. Code | Anvil Dimensions (mm) |         |         |
|--------|---------------|-----------------------|---------|---------|
|        |               | A +0.1                | B ±0.05 | C ±0.05 |
| 3MM    | 4.9           | 3.61                  | 3.1     |         |
| 4MM    | 5.44          | 4.19                  | 4.1     |         |
| 5MM    | 6.93          | 5.61                  | 5.1     |         |



# SELF-CLINCHING STUDS AND PINS

## INSTALLATION - TPS™/TP4™/TPXS™ PILOT PINS

1. Prepare properly sized mounting hole in sheet. Do not perform any secondary operations such as deburring.
2. Insert pin through mounting hole (punch side) of sheet and into anvil hole.
3. With punch and anvil surfaces parallel, apply squeezing force to embed the head of the pin flush in the sheet.



See page 16 for "L."

### Installation Tooling

| UNIFIED | Pin Dia. Code            | Test Sheet Thickness (in.) | Anvil Dimensions (in.) |                            | HAEGER® Part Number        |                            | PEMSERTER® Part Number |                        |
|---------|--------------------------|----------------------------|------------------------|----------------------------|----------------------------|----------------------------|------------------------|------------------------|
|         |                          |                            | A ±.002                | C ±.002                    | Anvil                      | Punch                      | Anvil                  | Punch                  |
|         | 125                      | .040 - .060<br>Over .060   | .160<br>(1)            | .130                       | H-106-125L-C<br>H-106-125L | H-108-0020L<br>H-108-0020L | 8003284<br>8003278     | 975200048<br>975200048 |
| 187     | .040 - .065<br>Over .065 | .220<br>(1)                | .192                   | H-106-187L-C<br>H-106-187L | H-108-0020L<br>H-108-0020L | 8003285<br>8003279         | 975200048<br>975200048 |                        |
| 250     | .040 - .075<br>Over .075 | .285<br>(1)                | .255                   | H-106-250L-C<br>H-106-250L | H-108-0020L<br>H-108-0020L | 8003286<br>8003280         | 975200048<br>975200048 |                        |

| METRIC | Pin Dia. Code       | Test Sheet Thickness (mm) | Anvil Dimensions (mm) |                            | HAEGER® Part Number        |                            | PEMSERTER® Part Number |                        |
|--------|---------------------|---------------------------|-----------------------|----------------------------|----------------------------|----------------------------|------------------------|------------------------|
|        |                     |                           | A ±0.05               | C ±0.05                    | Anvil                      | Punch                      | Anvil                  | Punch                  |
|        | 3MM                 | 1 - 1.7<br>Over 1.7       | 3.88<br>(1)           | 3.11                       | H-106-3MML-C<br>H-106-3MML | H-108-0020L<br>H-108-0020L | 8008096<br>8008095     | 975200048<br>975200048 |
| 4MM    | 1 - 1.7<br>Over 1.7 | 4.88<br>(1)               | 4.11                  | H-106-4MML-C<br>H-106-4MML | H-108-0020L<br>H-108-0020L | 8003287<br>8003281         | 975200048<br>975200048 |                        |
| 5MM    | 1 - 1.8<br>Over 1.8 | 5.89<br>(1)               | 5.13                  | H-106-5MML-C<br>H-106-5MML | H-108-0020L<br>H-108-0020L | 8003288<br>8003282         | 975200048<br>975200048 |                        |
| 6MM    | 1 - 1.9<br>Over 1.9 | 6.89<br>(1)               | 6.12                  | H-106-6MML-C<br>H-106-6MML | H-108-0020L<br>H-108-0020L | 8003289<br>8003283         | 975200048<br>975200048 |                        |

(1) Chamfered anvil not required.

### INSTALLATION NOTES

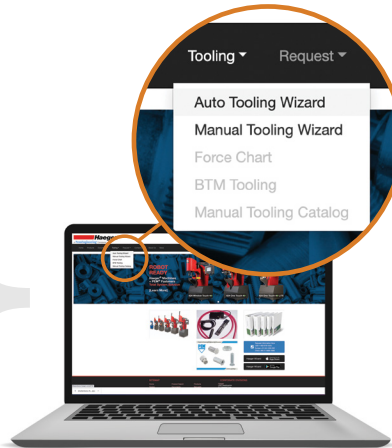
- For best results we recommend using a Haeger® or PEMSERTER® machine for installation of PEM® self-clinching fasteners. Please check our website for more information.
- Visit the Animation Library on our website to view the installation process [for select products](#).

## For Additional HAEGER® and PEMSERTER® Tooling Information / Part Numbers

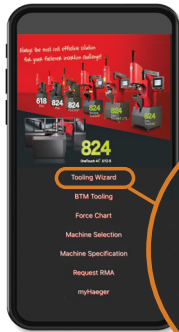


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# SELF-CLINCHING STUDS AND PINS

Published installation forces are for general reference. Actual set-up and confirmation of complete installation should be made by observing proper seating of fastener as described in the installation steps. Other performance values reported are averages when all proper installation parameters and procedures are followed. Variations in mounting hole size, sheet material, and installation procedure may affect performance. Performance testing this product in your application is recommended. We will be happy to provide technical assistance and/or samples for this purpose.

## PERFORMANCE DATA - FH™/FHS™ FLUSH-HEAD STUDS

| UNIFIED | Thread Code | Rec. Nut Tightening Torque (in. lbs.) (1) | Type           | Test Sheet Thickness & Material | Sheet Hardness HRB | Installation (lbs.) | Pushout (lbs.) | Torque-out (in. lbs.) | Pull Thru (lbs.) |
|---------|-------------|---|----------------|---------------------------------|--------------------|---------------------|----------------|-----------------------|------------------|
|         | 256         | 4.4                                       | FH             | .062" Aluminum                  | 29                 | 2000                | 100            | 5                     | 425              |
|         |             | 2.7                                       | FHS            | .062" Aluminum                  | 29                 | 2000                | 100            | 4.5                   | 300              |
|         |             | 4.4                                       | FH             | .060" Steel                     | 59                 | 2500                | 180            | 5                     | 425              |
|         |             | 2.7                                       | FHS            | .060" Steel                     | 59                 | 2500                | 180            | 4.5                   | 300              |
|         | 440         | 8.7                                       | FH             | .064" Aluminum                  | 29                 | 3800                | 170            | 10                    | 650              |
|         |             | 5.9                                       | FHS            | .064" Aluminum                  | 29                 | 3200                | 170            | 8                     | 500              |
|         |             | 8.7                                       | FH             | .060" Steel                     | 59                 | 4300                | 275            | 10                    | 650              |
|         |             | 5.9                                       | FHS            | .060" Steel                     | 59                 | 4700                | 275            | 8                     | 500              |
|         | 632         | 14  | FH             | .064" Aluminum                  | 29                 | 3800                | 180            | 17                    | 850              |
| 11      |             | FHS                                       | .064" Aluminum | 29                              | 3500               | 180                 | 16             | 775                   |                  |
| 14      |             | FH  | .060" Steel    | 59                              | 4700               | 300                 | 20             | 850                   |                  |
| 11      |             | FHS                                       | .060" Steel    | 59                              | 5000               | 300                 | 16             | 775                   |                  |
| 832     | 20          | FH  | .064" Aluminum | 29                              | 4800               | 220                 | 28             | 1000                  |                  |
|         | 16          | FHS                                       | .064" Aluminum | 29                              | 4500               | 220                 | 28             | 940                   |                  |
|         | 25          | FH  | .060" Steel    | 59                              | 6800               | 375                 | 40             | 1270                  |                  |
|         | 19          | FHS                                       | .060" Steel    | 59                              | 5500               | 375                 | 28             | 1130                  |                  |
| 032/024 | 28          | FH  | .064" Aluminum | 29                              | 5500               | 270                 | 30             | 1220                  |                  |
|         | 24          | FHS                                       | .064" Aluminum | 29                              | 5500               | 270                 | 30             | 1220                  |                  |
|         | 32          | FH  | .060" Steel    | 59                              | 7500               | 450                 | 60             | 1410                  |                  |
|         | 28          | FHS                                       | .060" Steel    | 59                              | 6800               | 450                 | 50             | 1410                  |                  |
| 0420    | 69          | FH  | .093" Aluminum | 28                              | 6500               | 310                 | 65             | 2300                  |                  |
|         | 55          | FHS                                       | .093" Aluminum | 28                              | 6500               | 310                 | 65             | 2100                  |                  |
|         | 77          | FH  | .088" Steel    | 46                              | 9500               | 575                 | 100            | 2550                  |                  |
|         | 67          | FHS                                       | .088" Steel    | 46                              | 10000              | 575                 | 100            | 2550                  |                  |
| 0518    | 85          | FH  | .093" Aluminum | 28                              | 6500               | 430                 | 100            | 2260                  |                  |
|         | 74          | FHS                                       | .093" Aluminum | 28                              | 6700               | 430                 | 100            | 2260                  |                  |
|         | 130         | FH  | .093" Steel    | 46                              | 10000              | 650                 | 175            | 3475                  |                  |
|         | 102         | FHS                                       | .093" Steel    | 46                              | 11200              | 650                 | 175            | 3120                  |                  |

| METRIC | Thread Code | Rec. Nut Tightening Torque (N-m) (1) | Type            | Test Sheet Thickness & Material | Sheet Hardness HRB | Installation (kN) | Pushout (N) | Torque-out (N-m) | Pull Thru (N) |
|--------|-------------|--------------------------------------|-----------------|---------------------------------|--------------------|-------------------|-------------|------------------|---------------|
|        | M2.5        | 0.78                                 | FH              | 1.6 mm Aluminum                 | 29                 | 8.9               | 465         | 1.0              | 2600          |
|        |             | 0.48                                 | FHS             | 1.6 mm Aluminum                 | 29                 | 11.6              | 465         | 0.8              | 1820          |
|        |             | 0.84                                 | FH              | 1.5 mm Steel                    | 59                 | 11.1              | 740         | 1.0              | 2800          |
|        |             | 0.48                                 | FHS             | 1.5 mm Steel                    | 59                 | 13.8              | 740         | 0.8              | 1820          |
|        | M3          | 1.1                                  | FH              | 1.6 mm Aluminum                 | 29                 | 12.9              | 600         | 1.7              | 3150          |
|        |             | 0.81                                 | FHS             | 1.6 mm Aluminum                 | 29                 | 12.9              | 600         | 1.3              | 2570          |
|        |             | 1.4                                  | FH              | 1.5 mm Steel                    | 59                 | 14.7              | 820         | 1.7              | 3840          |
|        |             | 0.77                                 | FHS             | 1.5 mm Steel                    | 59                 | 14.7              | 820         | 1.3              | 2440          |
|        | M3.5        | 1.6                                  | FH              | 1.6 mm Aluminum                 | 29                 | 15.6              | 800         | 1.7              | 3780          |
| 1.3    |             | FHS                                  | 1.6 mm Aluminum | 29                              | 15.6               | 800               | 1.7         | 3445             |               |
| 1.6    |             | FH                                   | 1.5 mm Steel    | 59                              | 22.3               | 1335              | 2.8         | 3780             |               |
| 1.3    |             | FHS                                  | 1.5 mm Steel    | 59                              | 22.3               | 1335              | 2.0         | 3445             |               |
| M4     | 2.1         | FH                                   | 1.6 mm Aluminum | 29                              | 20                 | 975               | 2.9         | 4448             |               |
|        | 1.8         | FHS                                  | 1.6 mm Aluminum | 29                              | 22.3               | 975               | 2.9         | 4180             |               |
|        | 2.7         | FH                                   | 1.5 mm Steel    | 59                              | 28.9               | 1780              | 4.2         | 5650             |               |
|        | 2           | FHS                                  | 1.5 mm Steel    | 59                              | 26.7               | 1780              | 2.9         | 4775             |               |
| M5     | 3.1         | FH                                   | 1.6 mm Aluminum | 29                              | 24.5               | 1070              | 3.5         | 5170             |               |
|        | 2.5         | FHS                                  | 1.6 mm Aluminum | 29                              | 24.5               | 1070              | 3.5         | 4760             |               |
|        | 3.8         | FH                                   | 1.5 mm Steel    | 59                              | 33.4               | 2000              | 6.5         | 6270             |               |
|        | 3.2         | FHS                                  | 1.5 mm Steel    | 59                              | 32.5               | 2000              | 6.3         | 6000             |               |
| M6     | 7.3         | FH                                   | 2.4 mm Aluminum | 28                              | 28.9               | 1660              | 7.3         | 10200            |               |
|        | 5.7         | FHS                                  | 2.4 mm Aluminum | 28                              | 28.9               | 1660              | 7.3         | 9090             |               |
|        | 8.1         | FH                                   | 2.2 mm Steel    | 46                              | 44.5               | 2560              | 11.3        | 11300            |               |
|        | 6.7         | FHS                                  | 2.2 mm Steel    | 46                              | 44.5               | 2560              | 10.1        | 10600            |               |
| M8     | 10          | FH                                   | 2.4 mm Aluminum | 28                              | 29.8               | 1910              | 11.3        | 10500            |               |
|        | 8           | FHS                                  | 2.4 mm Aluminum | 28                              | 29.8               | 1910              | 11.3        | 9540             |               |
|        | 15          | FH                                   | 2.4 mm Steel    | 46                              | 44.5               | 2890              | 19.2        | 15450            |               |
|        | 11          | FHS                                  | 2.4 mm Steel    | 46                              | 49.8               | 2890              | 17.5        | 13630            |               |

(1) Tightening torque shown is a theoretical value calculated to induce a load of 75% of minimum axial yield strength of the stud with an assumed K value or nut factor equal to 0.20. In some applications tightening torque may need to be adjusted based on the actual K value.



# SELF-CLINCHING STUDS AND PINS

## PERFORMANCE DATA - FHA™ FLUSH-HEAD STUDS

| UNIFIED | Thread Code | Rec. Nut Tightening Torque (in. lbs.) <sup>(1)</sup> | Type | Test Sheet Thickness & Material | Sheet Hardness HR15T | Installation (lbs.) | Pushout (lbs.) | Torque-out (in. lbs.) | Pull Thru (lbs.) |
|---------|-------------|--|------|---------------------------------|----------------------|---------------------|----------------|-----------------------|------------------|
|         | 440         | 3.6  | FHA  | .061" 5052-H34 Aluminum         | 75                   | 2500                | 155            | 4                     | 270              |
|         | 632         | 6.3  | FHA  | .061" 5052-H34 Aluminum         | 75                   | 2600                | 180            | 8                     | 380              |
|         | 832         | 9.8  | FHA  | .061" 5052-H34 Aluminum         | 73                   | 3200                | 190            | 15                    | 500              |
|         | 032         | 14   | FHA  | .061" 5052-H34 Aluminum         | 75                   | 3200                | 220            | 28                    | 600              |
|         | 0420        | 32   | FHA  | .062" 5052-H34 Aluminum         | 75                   | 5500                | 300            | 55                    | 1050             |

| METRIC | Thread Code | Rec. Nut Tightening Torque (N-m) <sup>(1)</sup> | Type | Test Sheet Thickness & Material | Sheet Hardness HR15T | Installation (kN) | Pushout (N) | Torque-out (N-m) | Pull Thru (N) |
|--------|-------------|---|------|---------------------------------|----------------------|-------------------|-------------|------------------|---------------|
|        | M3          | 0.54  | FHA  | 1.55 mm 5052-H34 Aluminum       | 74                   | 10.7              | 575         | 0.5              | 1500          |
|        | M4          | 0.96  | FHA  | 1.55 mm 5052-H34 Aluminum       | 75                   | 14.3              | 775         | 1.35             | 2000          |
|        | M5          | 1.5   | FHA  | 1.55 mm 5052-H34 Aluminum       | 75                   | 15.2              | 900         | 2.6              | 2500          |
|        | M6          | 3.2   | FHA  | 1.6 mm 5052-H34 Aluminum        | 75                   | 24.5              | 1500        | 5.3              | 4500          |

## PERFORMANCE DATA - FH4™ STUDS<sup>(2)</sup>

| UNIFIED | Thread Code | Rec. Nut Tightening Torque (in. lbs.) <sup>(1)</sup> | Test Sheet Thickness and Material <sup>(3)</sup> | Sheet Hardness HRB | Installation (lbs.) | Pushout (lbs.) | Torque-out (in. lbs.) | Pull Thru (lbs.) |
|---------|-------------|--|--|--------------------|---------------------|----------------|-----------------------|------------------|
|         | 440         | 11   | .060" Stainless Steel                            | 87                 | 9000                | 450            | 16                    | 800              |
|         | 632         | 22   | .060" Stainless Steel                            | 87                 | 9500                | 540            | 27                    | 1350             |
|         | 832         | 35   | .060" Stainless Steel                            | 86                 | 11200               | 780            | 58                    | 1800             |
|         | 032         | 51   | .060" Stainless Steel                            | 86                 | 12000               | 800            | 95                    | 2250             |
|         | 0420        | 117  | .062" Stainless Steel                            | 88                 | 23000               | 1600           | 156                   | 3900             |

| METRIC | Thread Code | Rec. Nut Tightening Torque (N-m) <sup>(1)</sup> | Test Sheet Thickness and Material <sup>(3)</sup> | Sheet Hardness HRB | Installation (kN) | Pushout (N) | Torque-out (N-m) | Pull Thru (N) |
|--------|-------------|---|--|--------------------|-------------------|-------------|------------------|---------------|
|        | M3          | 1.3   | 1.5 mm Stainless Steel                           | 87                 | 40                | 2220        | 1.8              | 3500          |
|        | M4          | 3.8   | 1.5 mm Stainless Steel                           | 86                 | 50                | 3210        | 6.5              | 8000          |
|        | M5          | 6   | 1.5 mm Stainless Steel                           | 86                 | 53                | 3560        | 10.7             | 10000         |
|        | M6          | 11  | 1.6 mm Stainless Steel                           | 88                 | 100               | 4200        | 15.9             | 14900         |

## PERFORMANCE DATA - FHP™ STUDS<sup>(2)</sup>

| UNIFIED | Thread Code | Rec. Nut Tightening Torque (in. lbs.) <sup>(1)</sup> | Test Sheet Thickness and Material <sup>(3)</sup> | Sheet Hardness HRB | Installation (lbs.) | Pushout (lbs.) | Torque-out (in. lbs.) | Pull Thru (lbs.) |
|---------|-------------|--|--|--------------------|---------------------|----------------|-----------------------|------------------|
|         | 440         | 8.1  | .045" Stainless Steel                            | 86                 | 9000                | 520            | 10.6                  | 605              |
|         | 632         | 16   | .045" Stainless Steel                            | 86                 | 9500                | 670            | 19.5                  | 940              |
|         | 832         | 28   | .045" Stainless Steel                            | 86                 | 11200               | 785            | 37.5                  | 1415             |
|         | 032         | 34   | .045" Stainless Steel                            | 86                 | 12000               | 800            | 59.5                  | 1500             |

| METRIC | Thread Code | Rec. Nut Tightening Torque (N-m) <sup>(1)</sup> | Test Sheet Thickness and Material <sup>(3)</sup> | Sheet Hardness HRB | Installation (kN) | Pushout (N) | Torque-out (N-m) | Pull Thru (N) |
|--------|-------------|---|--|--------------------|-------------------|-------------|------------------|---------------|
|        | M3          | 1.3   | 2 mm Stainless Steel                             | 86                 | 40                | 2500        | 1.6              | 3500          |
|        | M4          | 2.9   | 1.14 mm Stainless Steel                          | 86                 | 50                | 3000        | 3.9              | 6000          |
|        | M5          | 4.4   | 1.14 mm Stainless Steel                          | 86                 | 53                | 3560        | 7.35             | 7320          |

- <sup>(1)</sup> Tightening torque shown is a theoretical value calculated to induce a load of 75% of minimum axial yield strength of the stud with an assumed K value or nut factor equal to 0.20. In some applications tightening torque may need to be adjusted based on the actual K value.
- <sup>(2)</sup> 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" falls out of tolerance (see page 18). 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.
- <sup>(3)</sup> Performance may be reduced for studs installed into thicker sheets.



# SELF-CLINCHING STUDS AND PINS

## PERFORMANCE DATA - FHL™/FHLS™ STUDS

| UNIFIED | Thread Code | Rec. Nut Tightening Torque (in. lbs.) <sup>(1)</sup> | 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         | 2.1  | FHL / FHLS  | .047" Aluminum                    | 33                 | 700                 | 55             | 4                     | 230              | .106                                   |
|         |             | 3.8  | FHL / FHLS  | .045" Steel                       | 54                 | 1200                | 85             | 8                     | 425              | .106                                   |
|         | 440         | 3.5  | FHL / FHLS  | .047" Aluminum                    | 33                 | 1000                | 60             | 5                     | 300              | .132                                   |
|         |             | 6.8  | FHL / FHLS  | .045" Steel                       | 54                 | 1200                | 105            | 11                    | 580              | .132                                   |
|         | 632         | 4.7  | FHL / FHLS  | .047" Aluminum                    | 33                 | 1000                | 65             | 6.5                   | 325              | .158                                   |
|         |             | 9  | FHL / FHLS  | .045" Steel                       | 54                 | 1500                | 110            | 15                    | 650              | .158                                   |
|         | 832         | 6  | FHL / FHLS  | .047" Aluminum                    | 33                 | 1200                | 80             | 9                     | 350              | .184                                   |
|         |             | 13   | FHL / FHLS  | .045" Steel                       | 54                 | 1500                | 125            | 18                    | 740              | .184                                   |
|         | 032         | 7.9  | FHL / FHLS  | .047" Aluminum                    | 33                 | 2500                | 115            | 18                    | 395              | .210                                   |
| 16      |             | FHL / FHLS   | .045" Steel | 54                                | 4500               | 210                 | 38             | 800                   | .210             |  |

| METRIC | Thread Code | Rec. Nut Tightening Torque (N-m) <sup>(1)</sup> | 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        | 0.32  | FHL / FHLS   | 1.2 mm Aluminum                   | 33                 | 3.1               | 285         | 0.55             | 1200          | 3                                     |
|        |             | 0.59  | FHL / FHLS   | 1.1 mm Steel                      | 54                 | 5.3               | 450         | 1.1              | 2250          | 3                                     |
|        | M3          | 0.41  | FHL / FHLS   | 1.2 mm Aluminum                   | 33                 | 4.4               | 285         | 0.65             | 1300          | 3.5                                   |
|        |             | 0.79  | FHL / FHLS   | 1.1 mm Steel                      | 54                 | 5.3               | 475         | 1.25             | 2500          | 3.5                                   |
|        | M3.5        | 0.51  | FHL / FHLS   | 1.2 mm Aluminum                   | 33                 | 4.4               | 290         | 0.76             | 1400          | 4                                     |
|        |             | 1.03  | FHL / FHLS   | 1.1 mm Steel                      | 54                 | 6.6               | 500         | 1.75             | 2800          | 4                                     |
|        | M4          | 0.65  | FHL / FHLS   | 1.2 mm Aluminum                   | 33                 | 5.3               | 365         | 1.1              | 1550          | 4.5                                   |
|        |             | 1.39  | FHL / FHLS   | 1.1 mm Steel                      | 54                 | 6.6               | 550         | 2.1              | 3300          | 4.5                                   |
|        | M5          | 0.97  | FHL / FHLS   | 1.2 mm Aluminum                   | 33                 | 11.1              | 530         | 2.2              | 1850          | 5.5                                   |
| 1.97   |             | FHL / FHLS                                      | 1.1 mm Steel | 54                                | 20                 | 1000              | 4.4         | 3750             | 5.5           |                                       |

## PERFORMANCE DATA - TFH™/TFHS™ NON-FLUSH STUDS

| UNIFIED | Thread Code | Rec. Nut Tightening Torque (in. lbs.) <sup>(1)</sup> | Type           | Test Sheet Thickness and Material | Sheet Hardness HRB | Installation (lbs.) <sup>(2)</sup> | Pushout (lbs.) | Torque-out (in. lbs.) | Pull Thru (lbs.) | Pull Thru Test Bushing Hole Size (in.) |
|---------|-------------|--|----------------|-----------------------------------|--------------------|------------------------------------|----------------|-----------------------|------------------|--|
|         | 440         | 9.2  | TFH            | .025" Aluminum                    | 38                 | 1300                               | 75             | 10                    | 683              | .132                                   |
|         |             | 6.2  | TFHS           | .025" Aluminum                    | 38                 | 1200                               | 75             | 8                     | 527              | .132                                   |
|         |             | 9.2  | TFH            | .022" Steel                       | 57                 | 2800                               | 85             | 10                    | 684              | .132                                   |
|         |             | 6.2  | TFHS           | .022" Steel                       | 57                 | 1500                               | 80             | 9                     | 531              | .132                                   |
|         | 632         | 13   | TFH            | .025" Aluminum                    | 41                 | 2400                               | 87             | 9                     | 791              | .158                                   |
|         |             | 11   | TFHS           | .025" Aluminum                    | 41                 | 2400                               | 88             | 12                    | 748              | .158                                   |
|         |             | 15   | TFH            | .022" Steel                       | 57                 | 2800                               | 97             | 14                    | 906              | .158                                   |
|         | 832         | 11   | TFHS           | .022" Steel                       | 57                 | 2800                               | 100            | 16                    | 750              | .158                                   |
|         |             | 19   | TFH            | .025" Aluminum                    | 41                 | 2100                               | 94             | 14                    | 943              | .184                                   |
| 17      |             | TFHS   | .025" Aluminum | 41                                | 2200               | 94                                 | 17             | 963                   | .184             |  |
| 024/032 | 21          | TFH  | .022" Steel    | 57                                | 3500               | 111                                | 23             | 1065                  | .184             |  |
|         | 19          | TFHS   | .022" Steel    | 57                                | 2700               | 113                                | 26             | 1109                  | .184             |  |
|         | 24          | TFH  | .025" Aluminum | 38                                | 2300               | 98                                 | 13             | 1033                  | .210             |  |
|         | 21          | TFHS   | .025" Aluminum | 38                                | 2500               | 101                                | 12             | 1040                  | .210             |  |
|         | 28          | TFH  | .022" Steel    | 57                                | 3900               | 121                                | 25             | 1214                  | .210             |  |
|         | 24          | TFHS   | .022" Steel    | 57                                | 3200               | 112                                | 23             | 1184                  | .210             |  |

| METRIC | Thread Code | Rec. Nut Tightening Torque (N-m) <sup>(1)</sup> | Type             | Test Sheet Thickness and Material | Sheet Hardness HRB | Installation (kN) <sup>(2)</sup> | Pushout (N) | Torque-out (N-m) | Pull Thru (N) | Pull Thru Test Bushing Hole Size (mm) |
|--------|-------------|---|------------------|-----------------------------------|--------------------|----------------------------------|-------------|------------------|---------------|---------------------------------------|
|        | M3          | 1.1   | TFH              | 0.65 mm Aluminum                  | 42                 | 5.8                              | 370         | 0.72             | 3091          | 3.51                                  |
|        |             | 0.93  | TFHS             | 0.65 mm Aluminum                  | 43                 | 5.8                              | 255         | 0.19             | 2962          | 3.51                                  |
|        |             | 1.3   | TFH              | 0.57 mm Steel                     | 57                 | 8                                | 419         | 1.32             | 3477          | 3.51                                  |
|        |             | 0.94  | TFHS             | 0.57 mm Steel                     | 57                 | 6.7                              | 394         | 0.84             | 2971          | 3.51                                  |
|        | M4          | 1.9   | TFH              | 0.65 mm Aluminum                  | 42                 | 14.2                             | 396         | 1.29             | 3963          | 4.5                                   |
|        |             | 1.7   | TFHS             | 0.65 mm Aluminum                  | 40                 | 9.8                              | 391         | 1.83             | 4126          | 4.5                                   |
|        |             | 2.1   | TFH              | 0.57 mm Steel                     | 57                 | 17.8                             | 453         | 1.69             | 4380          | 4.5                                   |
|        |             | 2   | TFHS             | 0.57 mm Steel                     | 57                 | 13.4                             | 460         | 2.49             | 4701          | 4.5                                   |
|        | M5          | 2.8   | TFH              | 0.64 mm Aluminum                  | 42                 | 3.2                              | 499         | 1.71             | 4720          | 5.51                                  |
| 2.6    |             | TFHS  | 0.64 mm Aluminum | 42                                | 3.2                | 518                              | 2.29        | 4977             | 5.51          |                                       |
| 3.4    |             | TFH   | 0.56 mm Steel    | 57                                | 12.1               | 570                              | 2.77        | 5654             | 5.51          |                                       |
| 2.8    |             | TFHS  | 0.57 mm Steel    | 57                                | 12.9               | 582                              | 2.9         | 5328             | 5.51          |                                       |

(1) Tightening torque shown is a theoretical value calculated to induce a load of 75% of minimum axial yield strength of the stud with an assumed K value or nut factor equal to 0.20. In some applications tightening torque may need to be adjusted based on the actual K value.

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





# SELF-CLINCHING STUDS AND PINS

## PERFORMANCE DATA - HFE™ STUDS

| UNIFIED | Thread Code | Rec. Nut Tightening Torque (ft. lbs.) <sup>(1)</sup> | Test Sheet Thickness and Material <sup>(2)</sup> (in.) | Sheet Hardness HRB | Installation (lbs.) <sup>(3)</sup> | Pushout (lbs.) | Torque-out (in. lbs.) | Tensile Strength (lbs.) <sup>(4)</sup> | Pull Thru (lbs.) | Test Bushing Hole Size For Pull Thru Tests |
|---------|-------------|--|--|--------------------|------------------------------------|----------------|-----------------------|--|------------------|--|
|         | 032         | 3.6  | .040" Aluminum   | 27                 | 7500                               | 170            | 60                    | 2400                                   | 1900             | .279                                       |
| 4.2     |             | .040" Cold-rolled Steel                              | 67   | 9500               | 300                                | 60             | 2400                  | 2200                                   |                  |  |
| 0420    | 8           | .040" Aluminum                                       | 27   | 8000               | 180                                | 120            | 3820                  | 3200                                   | .335             |  |
|         | 9           | .040" Cold-rolled Steel                              | 67   | 13500              | 340                                | 130            | 3820                  | 3600                                   |                  |  |
| 0518    | 19          | .060" Aluminum                                       | 22   | 9000               | 275                                | 240            | 6280                  | 6000                                   | .407             |  |
|         | 20          | .060" Cold-rolled Steel                              | 65   | 15500              | 575                                | 290            | 6280                  | 6280                                   |                  |  |

| METRIC | Thread Code | Rec. Nut Tightening Torque (N-m) <sup>(1)</sup> | Test Sheet Thickness and Material <sup>(2)</sup> (mm) | Sheet Hardness HRB | Installation (kN) <sup>(3)</sup> | Pushout (N) | Torque-out (N-m) | Tensile Strength (kN) <sup>(4)</sup> | Pull Thru (kN) | Test Bushing Hole Size For Pull Thru Tests |
|--------|-------------|---|---|--------------------|----------------------------------|-------------|------------------|--------------------------------------|----------------|--|
|        | M5          | 5.8   | 1 mm Aluminum   | 27                 | 37.7                             | 690         | 8.1              | 12.8                                 | 9.7            | 7.4  |
| 6.4    |             | 1 mm Cold-rolled Steel                          | 67  | 51.1               | 1350                             | 8.1         | 12.8             | 10.6                                 |                |  |
| M6     | 10          | 1 mm Aluminum                                   | 27  | 39                 | 750                              | 11.8        | 18.1             | 14.2                                 | 8.2            |  |
|        | 11          | 1 mm Cold-rolled Steel                          | 67  | 60                 | 1400                             | 14.4        | 18.1             | 15.5                                 |                |  |
| M8     | 24          | 1.5 mm Aluminum                                 | 22  | 42                 | 1230                             | 23.5        | 32.9             | 25                                   | 10.3           |  |
|        | 26          | 1.5 mm Cold-rolled Steel                        | 65  | 71.1               | 2400                             | 33.9        | 32.9             | 27.5                                 |                |  |

## PERFORMANCE DATA - THFE™ STUDS

| UNIFIED | Thread Code | Rec. Nut Tightening Torque (ft. lbs.) <sup>(1)</sup> | Test Sheet Thickness and Material <sup>(2)</sup> (in.) | Sheet Hardness HRB | Installation (lbs.) <sup>(3)</sup> | Pushout (lbs.) | Torque-out (in. lbs.) | Tensile Strength (lbs.) <sup>(4)</sup> | Pull Thru (lbs.) | Test Bushing Hole Size For Pull Thru Tests |
|---------|-------------|--|--|--------------------|------------------------------------|----------------|-----------------------|--|------------------|--|
|         | 0420        | 8.1  | .031" Aluminum   | 35                 | 8800                               | 116            | 71                    | 3820                                   | 3249             | .340                                       |
| 8.5     |             | .031" Cold-rolled Steel                              | 47   | 13500              | 197                                | 116            | 3820                  | 3388                                   |                  |  |
| 0518    | 18          | .031" Aluminum                                       | 44   | 11700              | 131                                | 103            | 6280                  | 5701                                   | .402             |  |
|         | 18          | .031" Cold-rolled Steel                              | 47   | 16000              | 187                                | 124            | 6280                  | 5772                                   |                  |  |

| METRIC | Thread Code | Rec. Nut Tightening Torque (N-m) <sup>(1)</sup> | Test Sheet Thickness and Material <sup>(2)</sup> (mm) | Sheet Hardness HRB | Installation (kN) <sup>(3)</sup> | Pushout (N) | Torque-out (N-m) | Tensile Strength (kN) <sup>(4)</sup> | Pull Thru (kN) | Test Bushing Hole Size For Pull Thru Tests |
|--------|-------------|---|---|--------------------|----------------------------------|-------------|------------------|--------------------------------------|----------------|--|
|        | M6          | 9   | 0.8 mm Aluminum                                       | 38                 | 39.2                             | 550         | 7.3              | 18.1                                 | 13             | 8.3  |
| 10     |             | 0.8 mm Cold-rolled Steel                        | 47  | 60.1               | 886                              | 13.4        | 18.1             | 14.3                                 |                |  |
| M8     | 27          | 0.8 mm Aluminum                                 | 44  | 56                 | 582                              | 12.2        | 32.9             | 27.8                                 | 10.3           |  |
|        | 27          | 0.8 mm Cold-rolled Steel                        | 47  | 71.2               | 881                              | 13.1        | 32.9             | 28.1                                 |                |  |

(1) Tightening torque shown is a theoretical value calculated to induce a load of 75% of minimum axial yield strength of the stud with an assumed K value or nut factor equal to 0.20. In some applications tightening torque may need to be adjusted based on the actual K value.

(2) See [tech sheet](#) on our website for performance data of PEM® Types HFE™ and THFE™ studs installed into copper sheets.

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

(4) Head size is adequate to ensure failure in threaded area when tested with industry standard tensile bushing diameter.

# SELF-CLINCHING STUDS AND PINS

## PERFORMANCE DATA - HFH™/HFHS™/HFHB™ STUDS

| UNIFIED | Thread Code | Type | Rec. Nut Tightening Torque (ft. lbs.) (1) | Test Sheet Thickness and Material | Sheet Hardness HRB | Installation (lbs.) (2) | Pushout (lbs.) | Torque-out (ft. lbs.) | Tensile Strength (lbs.) |
|---------|-------------|------|---|-----------------------------------|--------------------|-------------------------|----------------|-----------------------|-------------------------|
|         | 032         | HFH  | 4.6                                       | .060" Aluminum                    | 15                 | 3000                    | 180            | 4                     | 2400                    |
|         |             | HFH  | 4.6                                       | .060" Steel                       | 65                 | 6000                    | 375            | 5                     | 2400                    |
|         |             | HFHS | 2.5                                       | .050" Aluminum                    | 38                 | 3000                    | 180            | 4                     | 1500                    |
|         |             | HFHS | 2.5                                       | .058" Steel                       | 52                 | 4500                    | 325            | 4                     | 1500                    |
|         | 0420        | HFHB | 1.7                                       | .061" Copper CDA-110              | 28                 | 3400                    | 150            | 2.9                   | 1200                    |
|         |             | HFH  | 9.6                                       | .060" Aluminum                    | 43                 | 5500                    | 285            | 11                    | 3820                    |
|         |             | HFH  | 9.6                                       | .060" Steel                       | 59                 | 7000                    | 480            | 11                    | 3820                    |
|         |             | HFHS | 5.2                                       | .064" Aluminum                    | 32                 | 4000                    | 285            | 8                     | 2385                    |
|         | 0518        | HFHS | 5.2                                       | .072" Steel                       | 43                 | 6500                    | 480            | 8                     | 2385                    |
| HFHB    |             | 3.6  | .061" Copper CDA-110                      | 28                                | 6000               | 380                     | 5              | 1908                  |                         |
| HFH     |             | 20   | .091" Aluminum                            | 39                                | 8000               | 380                     | 22             | 6280                  |                         |
| HFH     |             | 20   | .090" Steel                               | 58                                | 10000              | 590                     | 22             | 6280                  |                         |
| 0616    | HFHS        | 11   | .087" Aluminum                            | 41                                | 5500               | 380                     | 15             | 3930                  |                         |
|         | HFHS        | 11   | .099" Steel                               | 44                                | 7500               | 590                     | 15             | 3930                  |                         |
|         | HFHB        | 7    | .126" Copper CDA-110                      | 32                                | 7500               | 500                     | 11             | 3140                  |                         |
|         | HFH         | 35   | .091" Aluminum                            | 39                                | 12000              | 550                     | 25             | 9300                  |                         |
| 0616    | HFH         | 35   | .090" Steel                               | 58                                | 16000              | 780                     | 36             | 9300                  |                         |
|         | HFHS        | 19   | .123" Aluminum                            | 44                                | 10000              | 560                     | 25             | 5810                  |                         |
|         | HFHS        | 19   | .099" Steel                               | 44                                | 13000              | 780                     | 25             | 5810                  |                         |
|         | HFHB        | 13   | .126" Copper CDA-110                      | 32                                | 12000              | 560                     | 18             | 4650                  |                         |

| METRIC | Thread Code | Type | Rec. Nut Tightening Torque (N-m) (1) | Test Sheet Thickness and Material | Sheet Hardness HRB | Installation (kN) (2) | Pushout (N) | Torque-out (N-m) | Tensile Strength (kN) |
|--------|-------------|------|--------------------------------------|-----------------------------------|--------------------|-----------------------|-------------|------------------|-----------------------|
|        | M5          | HFH  | 7.7                                  | 1.5 mm Aluminum                   | 15                 | 13                    | 800         | 5.4              | 12.8                  |
|        |             | HFH  | 7.7                                  | 1.5 mm Steel                      | 65                 | 26                    | 1500        | 7.6              | 12.8                  |
|        |             | HFHS | 3.8                                  | 1.62 mm Aluminum                  | 35                 | 12.4                  | 800         | 5.4              | 7.3                   |
|        |             | HFHS | 3.8                                  | 1.47 mm Steel                     | 54                 | 21.7                  | 1500        | 6.4              | 7.3                   |
|        | M6          | HFHB | 2.7                                  | 1.5 mm Copper CDA-110             | 28                 | 15.6                  | 1115        | 3.4              | 5.9                   |
|        |             | HFH  | 13                                   | 1.5 mm Aluminum                   | 43                 | 29                    | 1270        | 14               | 18.1                  |
|        |             | HFH  | 13                                   | 1.5 mm Steel                      | 59                 | 33                    | 1750        | 14               | 18.1                  |
|        |             | HFHS | 6.5                                  | 1.62 mm Aluminum                  | 35                 | 15.4                  | 1270        | 11               | 10.3                  |
|        | M8          | HFHS | 6.5                                  | 1.6 mm Steel                      | 45                 | 24.6                  | 1750        | 11               | 10.3                  |
| HFHB   |             | 4.5  | 1.5 mm Copper CDA-110                | 28                                | 25.3               | 1600                  | 6.7         | 8.3              |                       |
| HFH    |             | 32   | 2.3 mm Aluminum                      | 39                                | 35.6               | 1700                  | 30          | 32.9             |                       |
| HFH    |             | 32   | 2.3 mm Steel                         | 58                                | 44.5               | 2200                  | 30          | 32.9             |                       |
| M10    | HFHS        | 16   | 2.23 mm Aluminum                     | 44                                | 24.4               | 1700                  | 20          | 18.8             |                       |
|        | HFHS        | 16   | 2.48 mm Steel                        | 43                                | 37.8               | 2100                  | 20          | 18.8             |                       |
|        | HFHB        | 11   | 3.2 mm Copper CDA-110                | 32                                | 33                 | 2250                  | 15.3        | 15.1             |                       |
|        | HFH         | 63   | 2.3 mm Aluminum                      | 39                                | 53.3               | 2445                  | 36          | 52.2             |                       |
| M10    | HFH         | 63   | 2.3 mm Steel                         | 58                                | 71.2               | 3470                  | 49          | 52.2             |                       |
|        | HFHS        | 31   | 2.3 mm Aluminum                      | 44                                | 44.4               | 2445                  | 36          | 29.9             |                       |
|        | HFHS        | 31   | 2.3 mm Steel                         | 44                                | 57.7               | 3470                  | 36          | 29.9             |                       |
|        | HFHB        | 22   | 3.2 mm Copper CDA-110                | 32                                | 53.3               | 2500                  | 25          | 24               |                       |

## PERFORMANCE DATA - HFG8™/HF109™ HIGH TENSILE STRENGTH STUDS

| UNIFIED | Thread Code | Rec. Nut Tightening Torque (ft. lbs.) | Tensile Strength (lbs.) (3) | Test Sheet Material | Sheet Hardness HRB | Installation (lbs.) (2) | Pushout (lbs.) | Torque-out (ft. lbs.) | Test Sheet Material     | Sheet Hardness HRB | Installation (lbs.) (2) | Pushout (lbs.) | Torque-out (ft. lbs.) |
|---------|-------------|---------------------------------------|-----------------------------|---------------------|--------------------|-------------------------|----------------|-----------------------|-------------------------|--------------------|-------------------------|----------------|-----------------------|
|         | 032         | 6.4                                   | 3000                        | .047" HSLA Steel    | 85.5               | 14000                   | 483            | 6.2                   | .040" Cold-rolled Steel | 45.0               | 9900                    | 249            | 5.9                   |
|         | 0420        | 13                                    | 4750                        | .047" HSLA Steel    | 85.7               | 21400                   | 592            | 11.5                  | .040" Cold-rolled Steel | 45.0               | 14100                   | 248            | 11.5                  |
|         | 0518        | 28                                    | 7850                        | .060" HSLA Steel    | 84.9               | 32600                   | 667            | 25.6                  | .060" Cold-rolled Steel | 55.2               | 19100                   | 447            | 25.2                  |

| METRIC | Thread Code | Rec. Nut Tightening Torque (N-m) | Tensile Strength (kN) (3) | Test Sheet Material | Sheet Hardness HRB | Installation (kN) (2) | Pushout (N) | Torque-out (N-m) | Test Sheet Material      | Sheet Hardness HRB | Installation (kN) (2) | Pushout (N) | Torque-out (N-m) |
|--------|-------------|----------------------------------|---------------------------|---------------------|--------------------|-----------------------|-------------|------------------|--------------------------|--------------------|-----------------------|-------------|------------------|
|        | M5          | 10                               | 14.8                      | 1.2 mm HSLA Steel   | 86.1               | 60.1                  | 2084        | 9                | 1 mm Cold-rolled Steel   | 45.3               | 43.2                  | 978         | 9                |
|        | M6          | 17                               | 20.9                      | 1.2 mm HSLA Steel   | 85.6               | 90                    | 2454        | 15.6             | 1 mm Cold-rolled Steel   | 45.5               | 60                    | 1072        | 14.4             |
|        | M8          | 41                               | 38.1                      | 1.5 mm HSLA Steel   | 84                 | 145                   | 3026        | 38.4             | 1.5 mm Cold-rolled Steel | 55                 | 85                    | 1992        | 37.7             |

- (1) Tightening torque shown is a theoretical value calculated to induce a load of 75% of minimum axial yield strength of the stud with an assumed K value or nut factor equal to 0.20. In some applications tightening torque may need to be adjusted based on the actual K value.
- (2) Installation controlled by proper cavity depth in punch.
- (3) Head size is adequate to ensure failure in threaded area when tested with industry standard tensile bushing diameter.



# SELF-CLINCHING STUDS AND PINS

## PERFORMANCE DATA - HFLH™ STUDS

| UNIFIED | Thread Code | Rec. Nut Tightening Torque (ft. lbs.) (1) | Test Sheet Thickness and Material (in.) | Sheet Hardness HRB | Installation (lbs.) (2) | Pushout (lbs.) | Torque-out (in. lbs.) | Tensile Strength (lbs.) (3) | Pull Thru (lbs.) | Test Bushing Hole Size For Pull Thru Tests |
|---------|-------------|---|---|--------------------|-------------------------|----------------|-----------------------|-----------------------------|------------------|--|
|         | 032         | 4.2                                       | .040" HC500LA                           | 89                 | 9500                    | 300            | 60                    | 2400                        | 2200             | .279                                       |
|         | 0420        | 10  | .040" HC500LA                           | 89                 | 13500                   | 340            | 130                   | 3820                        | 3600             | .335                                       |
|         | 0518        | 23  | .060" HC500LA                           | 91                 | 16000                   | 575            | 290                   | 6280                        | 6280             | .407                                       |

| METRIC | Thread Code | Rec. Nut Tightening Torque (N-m) (1) | Test Sheet Thickness and Material (mm) | Sheet Hardness HRB | Installation (kN) (2) | Pushout (N) | Torque-out (N-m) | Tensile Strength (kN) (3) | Pull Thru (kN) | Test Bushing Hole Size For Pull Thru Tests |
|--------|-------------|--------------------------------------|--|--------------------|-----------------------|-------------|------------------|---------------------------|----------------|--|
|        | M5          | 6.4                                  | 1 mm HC500LA                           | 89                 | 51.1                  | 1350        | 8.1              | 12.8                      | 10.6           | 7.4  |
|        | M6          | 11                                   | 1 mm HC500LA                           | 89                 | 60                    | 1400        | 14.4             | 18.1                      | 15.5           | 8.2  |
|        | M8          | 26                                   | 1.5 mm HC500LA                         | 91                 | 71.1                  | 2400        | 33.9             | 32.9                      | 27.5           | 10.3                                       |

## PERFORMANCE DATA - SGPC™ SWAGING COLLAR STUDS

| UNIFIED | Thread Code | Rec. Nut Tightening Torque (in. lbs.) (1) | Test Sheet Material                              |                |                       |                  |
|---------|-------------|---|--|----------------|-----------------------|------------------|
|         |             |   | Single sheet of .039" 300 Series Stainless Steel |                |                       |                  |
|         |             |   | Installation (lbs.)                              | Pushout (lbs.) | Torque-out (in. lbs.) | Pull-thru (lbs.) |
|         | 256         | 3.7                                       | 4000   | 425            | 5.2                   | 415              |
| 440     | 6           | 5000                                      | 450  | 8              | 512                   |                  |
| 632     | 12          | 5500                                      | 460  | 15.8           | 811                   |                  |
| 832     | 20          | 6500                                      | 480  | 29.3           | 1133                  |                  |
| 032     | 25          | 7300                                      | 545  | 42.8           | 1273                  |                  |
| 0420    | 45          | 10000                                     | 565  | 76.7           | 1721                  |                  |

| METRIC | Thread Code | Rec. Nut Tightening Torque (N-m) (1) | Test Sheet Material                             |             |                  |               |
|--------|-------------|--------------------------------------|---|-------------|------------------|---------------|
|        |             |                                      | Single sheet of 1 mm 300 Series Stainless Steel |             |                  |               |
|        |             |                                      | Installation (kN)                               | Pushout (N) | Torque-out (N-m) | Pull-thru (N) |
|        | M2.5        | 0.67                                 | 20.1  | 2546        | 0.86             | 2561          |
| M3     | 0.9         | 21.8                                 | 2051  | 1.35        | 2851             |               |
| M4     | 2.5         | 28.5                                 | 2396  | 2.66        | 4000             |               |
| M5     | 3.3         | 35.6                                 | 3200  | 5.96        | 4284             |               |
| M6     | 3.3         | 42.3                                 | 3262  | 9.19        | 6311             |               |

## PERFORMANCE DATA - FHX™ STUDS WITH X-PRESS™ THREAD PROFILE

| Thread Code | Test Sheet Material (4)        | Installation kN | Pushout N | Torque-out N-m |
|-------------|--------------------------------|-----------------|-----------|----------------|
| X5          | 1.1 mm Steel HRB 58 / HB 104   | 24.9            | 1519      | 4.7            |
|             | 1.2 mm Aluminum HRB 44 / HB 66 | 19.2            | 1070      | 3.2            |
| X6          | 1.6 mm Steel HRB 58 / HB 104   | 35.6            | 2964      | 13.3           |
|             | 1.6 mm Aluminum HRB 44 / HB 66 | 29.4            | 1623      | 7              |

- (1) Tightening torque shown is a theoretical value calculated to induce a load of 75% of minimum axial yield strength of the stud with an assumed K value or nut factor equal to 0.20. In some applications tightening torque may need to be adjusted based on the actual K value.
- (2) Installation controlled by proper cavity depth in punch.
- (3) Head size is adequate to ensure failure in threaded area when tested with industry standard tensile bushing diameter.
- (4) HRB - Hardness Rockwell "B" Scale. HB - Hardness Brinell.



# SELF-CLINCHING STUDS AND PINS

## PERFORMANCE DATA - TPS™ 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               |              |

## PERFORMANCE DATA - TP4™ PILOT PINS

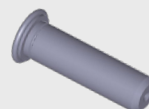
| UNIFIED | Pin Dia. Code              | Test Sheet Material        | Installation (lbs.) | Pushout (lbs.) |
|---------|----------------------------|----------------------------|---------------------|----------------|
|         | 125                        | 300 Series Stainless Steel | 8000                | 350            |
| 187     | 300 Series Stainless Steel | 12000                      | 570                 |                |
| 250     | 300 Series Stainless Steel | 14000                      | 650                 |                |

| METRIC | Pin Dia. Code              | Test Sheet Material        | Installation (kN) | Pushout (N) |
|--------|----------------------------|----------------------------|-------------------|-------------|
|        | 3MM                        | 300 Series Stainless Steel | 35                | 1556        |
| 4MM    | 300 Series Stainless Steel | 45                         | 2335              |             |
| 5MM    | 300 Series Stainless Steel | 54                         | 2535              |             |
| 6MM    | 300 Series Stainless Steel | 60                         | 2891              |             |

## PERFORMANCE DATA - TPXS™ PILOT PINS

| 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              |              |

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