# AUTOMOTIVE ELECTRONICS FASTENING DESIGN STANDARDS


## DISCOVER THE DIFFERENCE

Busbar | Infotainment | Powertrain | Safety and ADAS | Body Electronics

## Table of Contents

Click links below for shortcuts to information.



# SEE HOW THE INNOVATIVE THINKING BEHIND OUR FASTENING SOLUTIONS CAN MOVE YOU FORWARD

From airbags to infotainment systems, the PennEngineering® family of fastener solutions – including PEM® and SI® brands – can be found in practically any automotive electronics system. In fact, over 90% of automakers rely on our forward-thinking innovation.

With new capabilities and one of the largest and most diverse portfolios in the industry, see how you can move forward with greater cost savings, reliability, and eco-friendly performance.

# DESIGN ENGINEERED FOR ALL OF YOUR CRITICAL AUTOMOTIVE ELECTRONICS APPLICATIONS

The complexity and use of electronics-based vehicle systems grows every day. They're a critical piece of automotive architecture – keeping navigation systems running, lights powered, batteries charged.

PEM® self-clinching fasteners and SI® threaded inserts for plastics play a critical role in the performance of those systems. Whether it's a standard catalog fastener, custom part, or total system solution, our engineering expertise makes it possible to design a solution for any application.

## Table of Contents

Click links below for shortcuts to information.



# 90%

## OF TODAY'S TOP AUTOMAKERS RELY ON PEM® SELF-CLINCHING FASTENING SOLUTIONS.

### DISCOVER THE DIFFERENCE WITH PEM® SELF-CLINCHING FASTENERS

Using PEM® self-clinching fastening solutions doesn't just help you achieve better performance. With the benefits below, you'll also comply with industry standards and achieve lead time reduction – a winning combination that gives you a competitive edge.

**One Single Part Number, Anywhere in the World**

We offer one single part number for each of our standard parts, making it easy for you to order while increasing product availability.

**PPAP Available Parts, Off the Shelf**

Our extensive portfolio of standard parts is PPAP ready, directly off the shelf, to help you reduce your critical lead times.

**Choose Your Technical Cleanliness Level**

With our PEM® Clean Lab, you can achieve C400 and C600 technical cleanliness in accordance with your project specifications.

**Total System Solution with Haeger® Installation Machines**

Get even greater efficiency and reliability when you use PEM® fasteners with Haeger® installation machines – a total system solution.

## WHY CHOOSE PEM® SELF-CLINCHING FASTENERS

PennEngineering® was founded on a single revolutionary product – an easy-to-install, self-clinching fastener that provides load-carrying threads in metal sheets too thin to be tapped.

Today, PEM® fasteners include hundreds of innovative products that provide hundreds of design applications – with unmatched quality, performance, and reliability.

## FEWER PARTS. FEWER ASSEMBLY STEPS. FASTER TIME TO MARKET

PEM® fasteners attach to a sheet of ductile material by causing the material to cold-flow under pressure into an annular recess of the fastener – securely locking it into place:

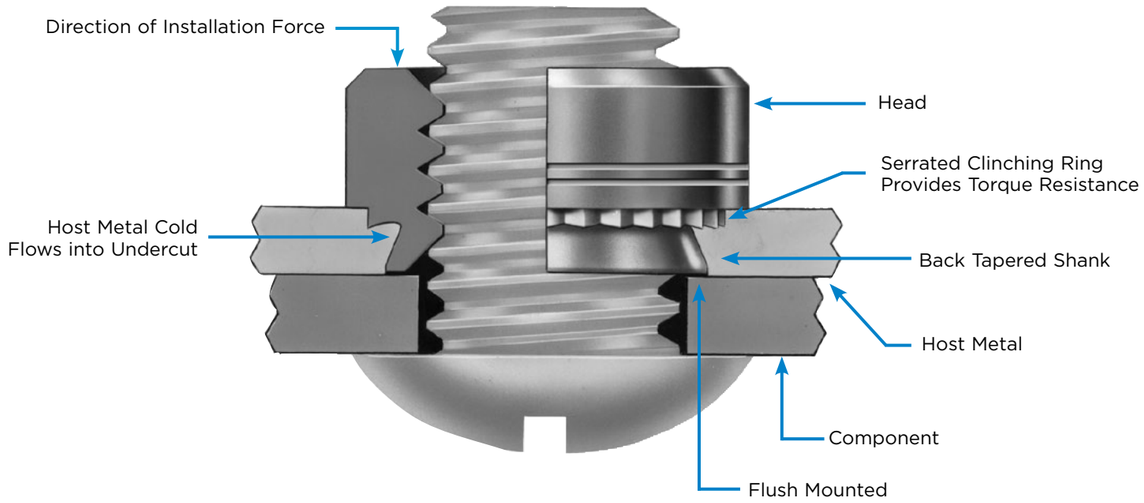
**Strength** – Stronger threads vs. a tapped panel

**In-Process Installation** – Parts are installed into a plain round hole with no secondary operations required

**Cost Reduction** – Decreased installation cycle times with in-die capability

**Design Flexibility** – Can be installed into dissimilar metals

**Clean Process** – Environmentally friendly, with no weld splatter and less energy requirements




**WATCH INSTALLATION VIDEO**

## Table of Contents

Click links below for shortcuts to information.



# TECHNICAL CLEANLINESS STARTS WITH PEM® CLEAN LAB

As automotive electronics components get more compact, even the smallest particle contamination puts performance at risk. To ensure the technical cleanliness of PEM® fasteners, our PEM® Clean Lab uses the most sophisticated cleaning and testing processes to meet today's clean requirements.

Our Clean Lab can test for technical cleanliness in accordance with customer specifications and ISO 16232 and VDA 19 standards, and all parts presented in this catalog meet technical cleanliness guidelines.



# SI® THREADED INSERTS FOR PLASTIC

As automakers convert more assemblies from metal to plastic, SI® inserts have been specified to provide strong, reusable, wear-resistant threads especially when frequent assembly and disassembly is required.

**Sample Applications**
Control Modules
Current-Carrying Devices
Busbar
Powertrain
Thermal Management
Housings – Cameras, Taillights
Electric Vehicles

# SI® COMPRESSION LIMITERS

SI® Compression Limiters are non-threaded inserts for applications where compressive load is applied to a plastic assembly – strengthening the plastic and withstanding the compressive force applied during assembly.

- Plastic integrity uncompromised by applied load
- Custom-engineered for many sizes and profiles
- Flexible materials – brass, stainless steel, lead-free aluminum
- Press-in, mold-in, heat staking, ultrasonic installation
- Design types – flange head, symmetrical, full diamond knurl, non-knurled symmetrical

**FOR A QUOTE, TRY THE NEW SI® COMPRESSION LIMITER CONFIGURATION TOOL**

# GET A TOTAL SYSTEM SOLUTION WITH PEM® FASTENERS AND HAEGER® INSTALLATION MACHINES

Whether you're new to hardware insertion or insert millions of fasteners per year, using PEM® parts with Haeger® installation machines provides a total system solution – engineered to work together for greater efficiency, reliability, and cost savings.
.

**WATCH INSTALLATION VIDEO**

## Table of Contents

Click links below for shortcuts to information.



# SEE WHAT'S POSSIBLE WITH PEM® SELF-CLINCHING FASTENING SOLUTIONS

## POWERTRAIN

From electronics systems for engine control or fuel supply, to busbars and connectors that carry critical power, our solutions ensure top performance for many applications.

| Sample Applications | PEM® Solutions |
|---|---|
| Battery Management Systems | Self-clinching Nuts |
| Battery Connections | Self-clinching Studs |
| Busbars | Micro Standoff |
| Motors | High Voltage Busbar Studs |
| | Captive Spinning Flare Nut |
| | SI Molded Insert |

## SAFETY & ADAS

Our fastening solutions provide peace of mind for vehicle safety and ADAS applications and are used in systems for electronic power steering, ABS, object detection, and more.

| Sample Applications | PEM® Solutions |
|---|---|
| Multi-Camera Systems | microPEM® TackSert® Fastener |
| Radar and Lidar | Self-clinching Studs |
| Electronic Power Steering | Self-clinching Nuts |
| Smart Mirrors | PCB Surface Mount Standoffs |
| | SI Molded Insert |

## BODY ELECTRONICS

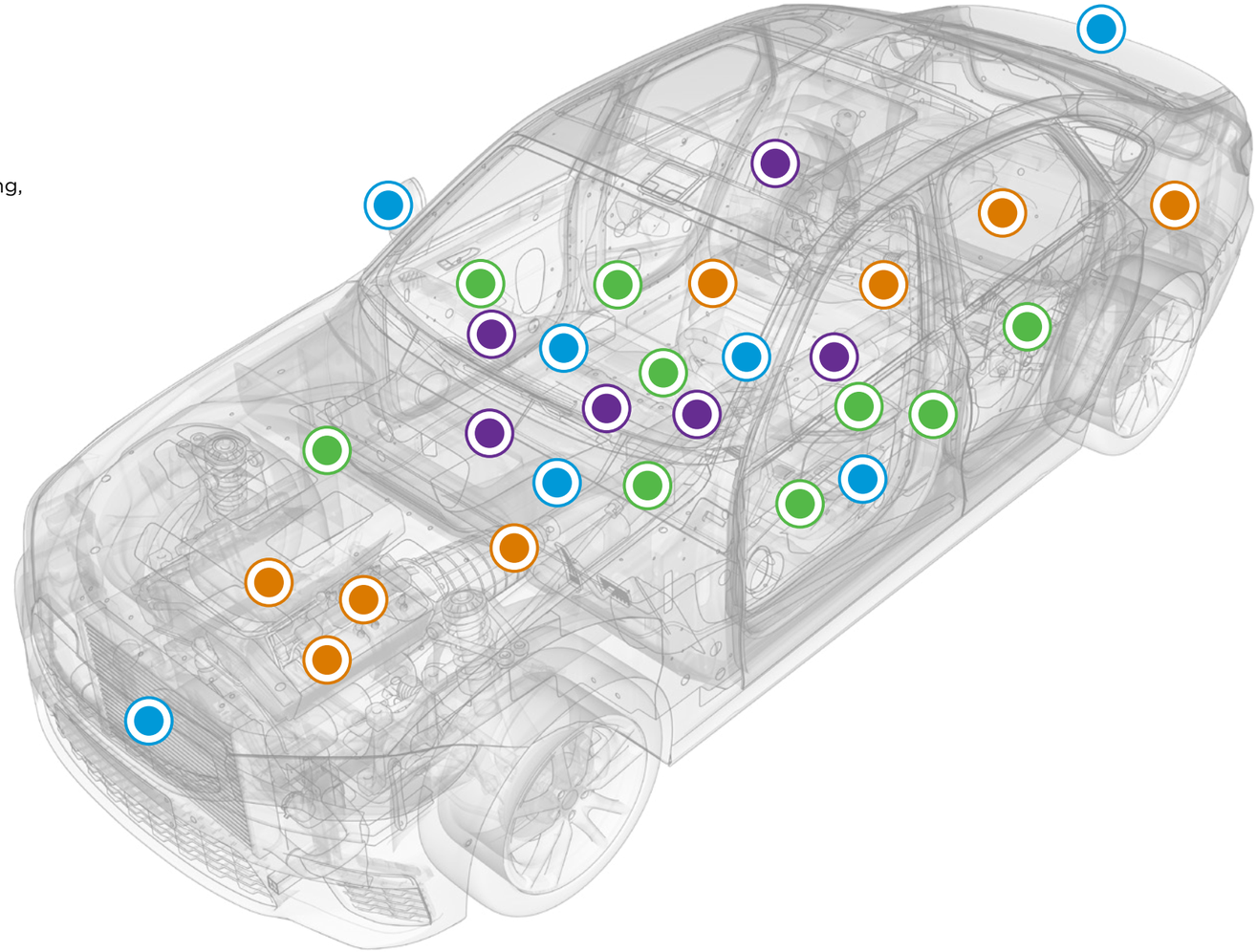
From window and door control to on-board diagnostics systems, our solutions are used in many body electronics applications that deliver driver comfort and convenience.

| Sample Applications | PEM® Solutions |
|---|---|
| ECU | Self-clinching Studs |
| Lighting Systems | Spinning Flare Nuts |
| Window Control | microPEM® TackPin® Fastener |
| HVAC | Cable Tie-mount Fasteners |
| | SI Molded Insert |

## INFOTAINMENT

Our fastening solutions are used in many infotainment applications, providing reliability to connectivity and telematics systems, dashboard instrumentation, audio/video, and more.

| Sample Applications | PEM® Solutions |
|---|---|
| Display Units | Self-clinching Nuts |
| Navigation Units | Self-clinching Pins |
| Heads-Up Display | Self-clinching Standoffs |
| Rear Passenger Entertainment | PCB Surface Mount Standoffs |



## Table of Contents

Click links below for shortcuts to information.



## EXPERTISE TO TAKE YOU FURTHER

Our fastening solutions are not just precisely designed and manufactured. They're also backed by expert technical support services – so you can always be confident in our product quality and reliability.

- Application Engineering Support
- Technical Lab Services & Testing
- Prototype Development Center
- Installation Equipment Solutions
- Global Distribution Network

## NEED INFORMATION ON A SPECIFIC PRODUCT? BROWSE OUR AUTOMOTIVE ELECTRONICS FASTENING DESIGN STANDARDS

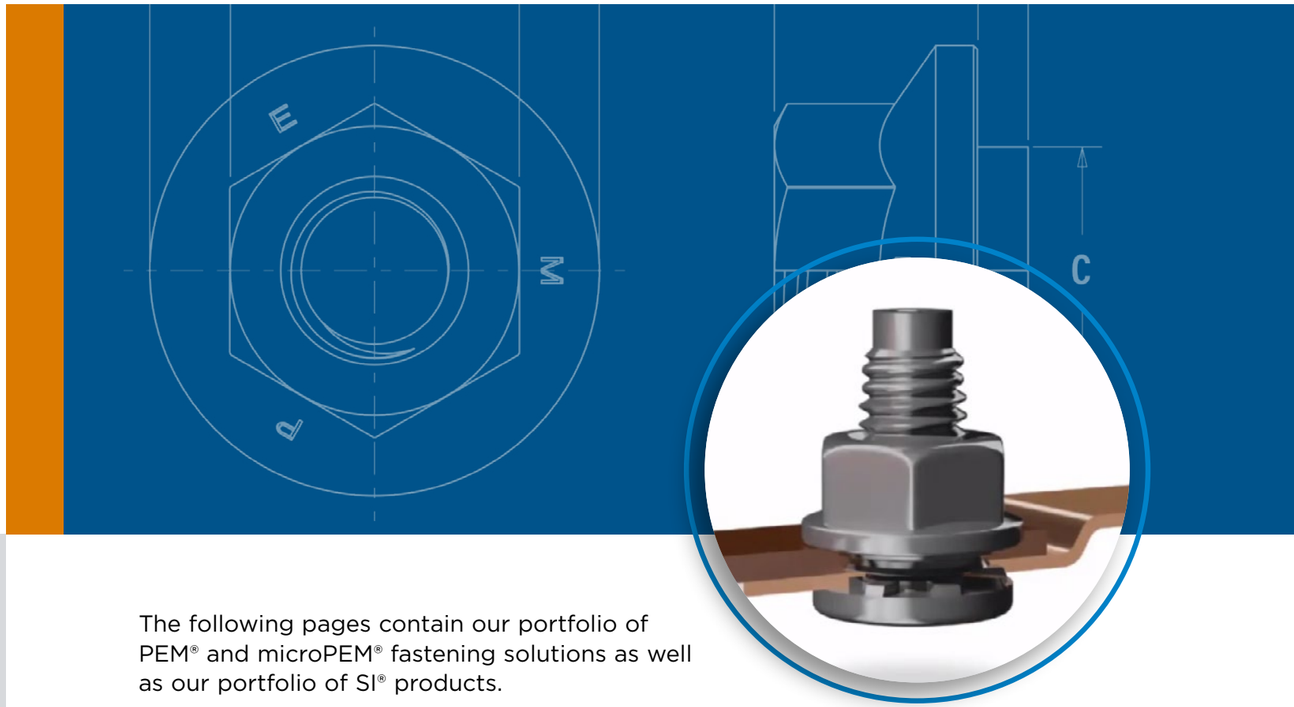
To see our full range of self-clinching fastening solutions, visit PEMnet.com. To learn about our in-die fastener installation solutions, click here.

For assistance with technical information or to request samples, call **800-342-5736** or email us at info@pemnet.com.

## GET PEM® AND MICROPEM® PARTS AND SUPPORT ANYTIME, ANYWHERE




# AUTOMOTIVE ELECTRONICS FASTENING DESIGN STANDARDS




The following pages contain our portfolio of PEM® and microPEM® fastening solutions as well as our portfolio of SI® products.

## Table of Contents

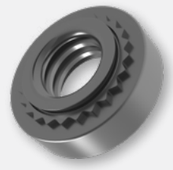
Click links below for shortcuts to information.



# PEM® FASTENERS

The innovation behind PEM® fastening solutions can add significant value and cost savings to your most complex automotive electronics requirements. Our portfolio is one of the largest and most diverse in the industry.

AUB™ Nut Self-Clinching Blind Fasteners



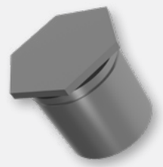
AUS™ Nut CL Self-Clinching Fasteners

AUFH™ Studs Self-Clinching Studs and Pins

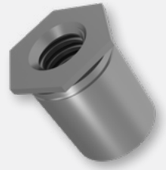
AUHFH™ Studs Self-Clinching Studs and Pins

AUHFE™ Studs Self-Clinching Studs and Pins

AUTHFE™ Studs Self-Clinching Studs and Pins



AUBSO™ Standoff Self-Clinching Blind Standoffs



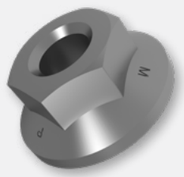
AUSO™ Standoff Self-Clinching Standoffs

AUSMT™ Fasteners for use with PC Boards

AUKF2™ Fasteners for use with PC Boards

AUKFE™ Fasteners for use with PC Boards

AUKFB3™ Fasteners for use with PC Boards



AUSFN™ Spinning Flare nut

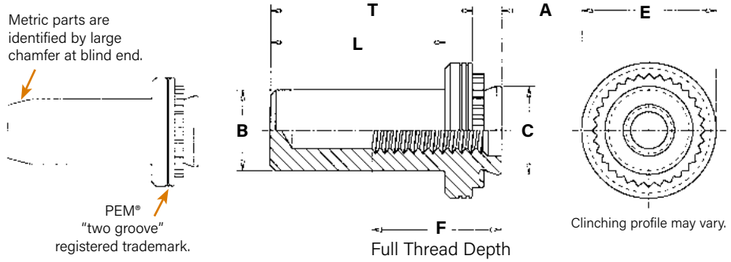


# SELF-CLINCHING BLIND FASTENERS

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

- Provides barrier to protect threads against foreign matter.
- Limits screw penetration, protecting internal components from potential damage.
- Available on special order with free-running locking thread feature.

PEM® self-clinching blind fasteners employ the proven PEM® self-clinching design and are easily installed into properly sized holes. Shanks of PEM® fasteners act as their own pilots. PEM® blind fasteners can be installed with any standard press applying squeezing forces between parallel surfaces.




**PART NUMBER DESIGNATION**

| | | | | | | |
|---|---|---|---|---|---|---|
| AUB | - | M4 | - | 2 | ZI | C400 |
| AUBS | - | M4 | - | 2 | | C400 |
| Type/ Material | | Thread Size | | Shank | Finish | Clean Level |

## AUB™/AUBS™ NUTS

**All dimensions are in millimeters.**

| | Thread Size x Pitch | Type: Fastener Material: Steel | Type: Fastener Material: Stainless Steel | Thread Code (1) | Shank Code | A (Shank) Max. | Min. Sheet Thickness | Hole Size in Sheet + 0.08 | B Max. | C Max. | E ± 0.25 | F Min. | L Max. | T ± 0.25 | Min. Dist. Hole ℄ to Edge |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| METRIC | M3 x 0.5 | AUB | AUBS | M3 | 1 | 0.97 | 1 | 4.22 | 3.84 | 4.2 | 6.35 | 5.3 | 8.5 | 9.6 | 4.8 |
| | | | | | 2 | 1.38 | 1.4 | | | | | | | | |
| | M4 x 0.7 | AUB | AUBS | M4 | 1 | 0.97 | 1 | 5.41 | 5.2 | 5.38 | 7.95 | 7.1 | 9.8 | 11.2 | 6.9 |
| | | | | | 2 | 1.38 | 1.4 | | | | | | | | |
| | M5 x 0.8 | AUB | AUBS | M5 | 1 | 0.97 | 1 | 6.35 | 6.02 | 6.33 | 8.75 | 7.1 | 9.8 | 11.2 | 7.1 |
| | | | | | 2 | 1.38 | 1.4 | | | | | | | | |
| | M6 x 1 | AUB | AUBS | M6 | 1 | 1.38 | 1.4 | 8.75 | 7.8 | 8.73 | 11.1 | 7.8 | 12.7 | 14.3 | 8.6 |
| | | | | | 2 | 2.21 | 2.29 | | | | | | | | |

(1) PEM® AUB™ nuts are available on special order with a free-running locking thread feature allowing mating screw to turn freely until clamp load is applied. For more information, contact PEM® Technical Support.

## MATERIAL AND FINISH SPECIFICATIONS

| | Threads | Fastener Materials | | Finishes | | | Clean Level (2) | | For Use in Sheet Hardness: (3) | |
|---|---|---|---|---|---|---|---|---|---|---|
| Type | Internal, ASME B1.1, 2B / ASME B1.13M, 6H | Hardened Carbon Steel | 300 Series Stainless Steel | Passivated and/or Tested Per ASTM A380 | Zinc Plated per ASTM B633, SC1 (5µm) Type III, Colorless (1) | Zinc Nickel Plated per ISO 19598 Fe//ZnNi8//Cn//T0 720h to red rust per ISO 9227 Salt Spray Test (1) | Max. Metallic Particle Size 400µm | Max. Metallic Particle Size 600µm | HRB 80 / HB 150 or less | HRB 70 / HB 125 or less |
| AUB | ▪ | ▪ | | | ▪ | ▪ | ▪ | ▪ | ▪ | |
| AUBS | ▪ | | ▪ | ▪ | | | ▪ | ▪ | | ▪ |
| Part Number Code For Finishes | | | | None | ZI | ZN | C400 | C600 | | |

(1) See PEM Technical Support section of our web site for related plating standards and specifications.

(2) Parts requiring technical cleanliness will be considered a custom fastening solution. If technical cleanliness is not required on your part, do not include a clean level number when ordering.

(3) HRB - Hardness Rockwell “B” Scale. HB - Hardness Brinell.

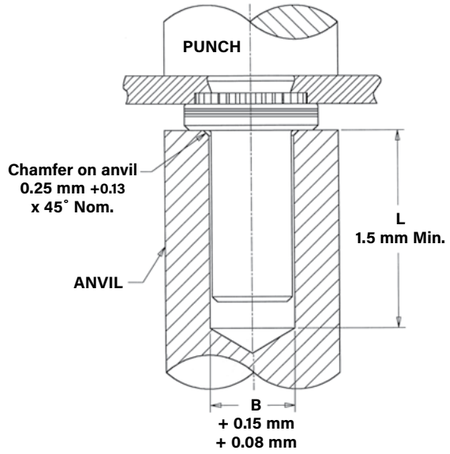
Table of Contents

# SELF-CLINCHING BLIND FASTENERS

## INSTALLATION

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

WATCH INSTALLATION VIDEO




## PERFORMANCE DATA

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

(1) 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.

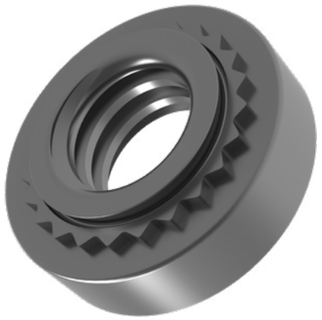
## PEMSERTER® Installation Tooling

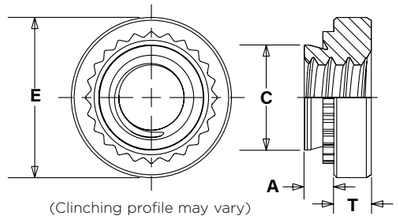
| Type | Thread Code | Anvil Part Number | Punch Part Number |
|---|---|---|---|
| AUB/AUBS | M3 | 975200001 | 975200048 |
| AUB/AUBS | M4 | 975200003 | 975200048 |
| AUB/AUBS | M5 | 975200004 | 975200048 |
| AUB/AUBS | M6 | 975200005 | 975200048 |

# SELF-CLINCHING NUTS

Self-clinching nuts are installed by placing them in properly sized holes in sheets and applying a parallel squeezing force to the head of the nut. The sheet metal surrounding the head cold flows into an undercut thereby making the fastener an integral part of the sheet. A serrated clinching ring prevents the fastener from rotating after installation.

AUS™/AUSS™/AUCLS™/AUCLSS™ nuts provide load-bearing threads in thin sheets with high pushout and torque-out resistance. AUSP™, PEM 300®, nuts provide strong load-bearing threads in stainless steel sheets as thin as 0.8 mm.






(Clinching profile may vary)
Due to manufacturing procedure, parts may have a counterbore at shank end.

**PART NUMBER DESIGNATION**

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| AUS | - | M3 | - | 1 | ZI | C400 | ↓ | Type/ Material |
| AUSS | - | M5 | - | 1 | ZI | C400 | ↓ | Thread Size |
| AUCLS | - | M3 | - | 1 | | C400 | ↓ | Shank |
| AUCLSS | - | M5 | - | 1 | | C400 | ↓ | Finish |
| AUSP | - | M3 | - | 1 | | C400 | ↓ | Clean Level |

## AUS™/AUSS™/AUCLS™/AUCLSS™/AUSP™ NUTS

| | Thread Size | Type: Fastener Material: Carbon Steel | Stainless Steel | Hardened Stainless Steel | Thread Code | Shank Code | A (Shank) Max. | Rec. Min. Sheet Thickness (1) | Hole Size In Sheet +0.08 | C Max. | E ±0.25 | T ±0.25 | Min. Dist. Hole ℄ To Edge |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| METRIC | M2 x 0.4 | AUS | AUCLS | AUSP | M2 | 0 (2) | 0.77 | 0.8 | 4.22 | 4.2 | 6.35 | 1.5 | 4.8 |
| | | | | | | 1 | 0.97 | 1 | | | | | |
| | | | | | | 2 | 1.38 | 1.4 | | | | | |
| | M2.5 x 0.45 | AUS | AUCLS | AUSP | M2.5 | 0 | 0.77 | 0.8 | 4.22 | 4.2 | 6.35 | 1.5 | 4.8 |
| | | | | | | 1 | 0.97 | 1 | | | | | |
| | | | | | | 2 | 1.38 | 1.4 | | | | | |
| | M3 x 0.5 | AUS | AUCLS | AUSP | M3 | 0 | 0.77 | 0.8 | 4.22 | 4.2 | 6.35 | 1.5 | 4.8 |
| | | | | | | 1 | 0.97 | 1 | | | | | |
| | | | | | | 2 | 1.38 | 1.4 | | | | | |
| | M3.5 x 0.6 | AUS | AUCLS | – | M3.5 | 0 | 0.77 | 0.8 | 4.75 | 4.73 | 7.11 | 1.5 | 5.6 |
| | | | | | | 1 | 0.97 | 1 | | | | | |
| | | | | | | 2 | 1.38 | 1.4 | | | | | |
| | M4 x 0.7 | AUS | AUCLS | AUSP | M4 | 0 | 0.77 | 0.8 | 5.41 | 5.38 | 7.87 | 2 | 6.9 |
| | | | | | | 1 | 0.97 | 1 | | | | | |
| | | | | | | 2 | 1.38 | 1.4 | | | | | |
| | M5 x 0.8 | AUSS | AUCLSS | AUSP | M5 | 0 | 0.77 | 0.8 | 6.35 | 6.33 | 8.64 | 2 | 7.1 |
| | | | | | | 1 | 0.97 | 1 | | | | | |
| | | | | | | 2 | 1.38 | 1.4 | | | | | |
| | M6 x 1 | AUS (3) | AUCLS | AUSP | M6 | 00 (2) | 0.89 | 0.92 | 8.75 | 8.73 | 11.18 | 4.08 | 8.6 |
| | | | | | | 0 (2) | 1.15 | 1.2 | | | | | |
| | | | | | | 1 | 1.38 | 1.4 | | | | | |
| | | | | | | 2 | 2.21 | 2.29 | | | | | |
| | M8 x 1.25 | AUS (3) | AUCLS | AUSP | M8 | 1 | 1.38 | 1.4 | 10.5 | 10.47 | 12.7 | 5.47 | 9.7 |
| | | | | | | 2 | 2.21 | 2.29 | | | | | |
| | M10 x 1.5 | AUS | AUCLS | AUSP | M10 | 1 | 2.21 | 2.29 | 14 | 13.97 | 17.35 | 7.48 | 13.5 |
| | | | | | | 2 (2) | 3.05 | 3.18 | | | | | |
| | M12 x 1.75 | AUS | – | – | M12 | 1 | 3.05 | 3.18 | 17 | 16.95 | 20.57 | 8.5 | 16 |

(1) For maximum performance, we recommend that you use the maximum shank length for your sheet thickness.
(2) This shank code not available for AUSP nuts.
(3) This thread size AUS nut, with a -2 shank code, can be installed successfully without the need to pre punch a mounting hole in a separate operation.

Table of Contents

# SELF-CLINCHING NUTS

## MATERIAL AND FINISH SPECIFICATIONS

| | Threads | Fastener Materials | | | Finishes (1) | | | Clean Level (2) | | For use in Sheet Hardness (5) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Type | Internal ASME B1.1 2B/ASME B1.13M, 6H | Hardened Carbon Steel | 300 Series Stainless Steel | Age Haerdened A286 Stainless Steel | Passivated and/or Tested per ASTM A380 | Zinc Plated per ASTM B633, SC1 (5µm) Type III, Colorless | Zinc Nickel Plated per ISO 19598 Fe//ZnNi8//Cn//T0 720h to red rust per ISO 9227 Salt Spray Test | Max. Metallic Particle Size 400µm | Max. Metallic Particle Size 600µm | HRB 90 / HB 192 or less | HRB 80 / HB 150 or less | HRB 70 / HB 125 or less |
| AUS | ▪ | ▪ | | | | ▪ | ▪ | ▪ | ▪ | | ▪ | |
| AUSS | ▪ | ▪ | | | | ▪ | ▪ | ▪ | ▪ | | ▪ | |
| AUCLS | ▪ | | ▪ | | ▪ | | | ▪ | ▪ | | | ▪ |
| AUCLSS | ▪ | | ▪ | | ▪ | | | ▪ | ▪ | | | ▪ |
| AUSP | ▪ | | | ▪ | ▪ | | | ▪ | ▪ | ▪ (3)(4) | | |
| Part number codes for finishes | | | | | None | ZI | ZN | C400 | C600 | | | |

(1) See PEM® Technical Support section of our web site for related plating standards and specifications.

(2) Parts requiring technical cleanliness will be considered a custom fastening solution. If technical cleanliness is not required on your part, do not include a clean level number when ordering.

(3) Panel material should be in the annealed condition.

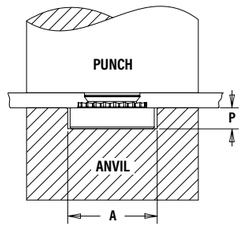
(4) Fasteners should not be installed adjacent to bends or other highly cold-worked areas.

(5) HRB - Hardness Rockwell "B" Scale. HRC - Hardness Rockwell "C" Scale. HB - Hardness Brinell.

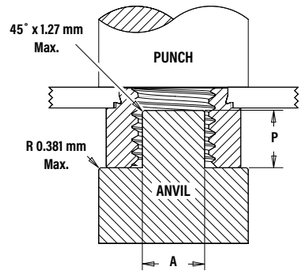
## INSTALLATION - AUCLS™/AUCLSS™/AUS™/AUSS™

1. Prepare properly sized mounting hole in sheet. Do not perform any secondary operations such as deburring.
2. Place fastener into the anvil hole and place the mounting hole (preferably the punch side) over the shank of the fastener as shown in diagram to the right.
3. With installation punch and anvil surfaces parallel, apply squeezing force until the head of the nut comes into contact with the sheet material.

**COUNTERBORE ANVIL**
Thread Sizes M2 to M8




**PROTRUSION ANVIL (1)**
Thread Sizes M10 and M12




WATCH INSTALLATION VIDEO

### PEMSERTER® Installation Tooling

| | Thread Code | Anvil Dimensions (mm) A ±0.05 | Anvil Dimensions (mm) P ±0.13 | Anvil Part Number | Punch Part Number |
|---|---|---|---|---|---|
| METRIC | M2/M3 | 6.78 | 1.14 | 975200034 | 975200048 |
| | M3.5 | 7.57 | 1.14 | 975200035 | 975200048 |
| | M4 | 8.38 | 1.78 | 975200036 | 975200048 |
| | M5 | 9.17 | 1.78 | 975200037 | 975200048 |
| | M6 | 11.53 | 3.81 | 975200038 | 975200048 |
| | M8 | 13.08 | 5.08 | 975200039 | 975200048 |
| | M10 | 7.62 | 6.35 | 8005682 (1) | 975200901400 |
| | M12 | 9.53 | 8.76 | 975200900300 (1) | 975200901400 |

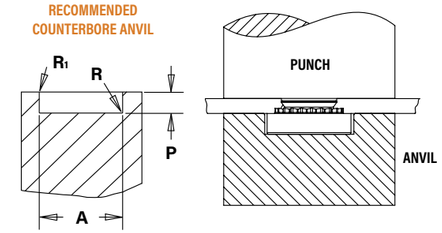


# SELF-CLINCHING NUTS

## INSTALLATION - AUSP™

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

**RECOMMENDED COUNTERBORE ANVIL**




(1) For best results, we recommend using the installation punch and anvil shown. Deviations from recommended installation tooling may result in sheet distortion and reduced performance.

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

### PEMSERTER® Installation Tooling

| | Thread Code | Anvil Dimensions (mm) A ±0.05 | P −0.03 | R Max. | R1 +0.13 | Anvil Part Number | Punch Part Number |
|---|---|---|---|---|---|---|---|
| METRIC | M2 | 6.48 | 1.63 | 0.25 | 0.13 | 8012821 | 975200048 |
| | M2.5-0 | 6.48 | 1.42 | 0.25 | 0.13 | 8019477 | |
| | M2.5-1,-2 | 6.48 | 1.63 | 0.25 | 0.13 | 8012821 | |
| | M3 | 6.48 | 1.63 | 0.25 | 0.13 | 8012821 | |
| | M3.5 | 7.26 | 1.63 | 0.25 | 0.13 | 8012822 | |
| | M4 | 8.05 | 2.08 | 0.25 | 0.13 | 8012823 | |
| | M5 | 8.84 | 2.08 | 0.25 | 0.13 | 8012824 | |
| | M6 | 11.25 | 4.14 | 0.25 | 0.13 | 8012825 | 8003076 |
| | M8 | 12.83 | 5.41 | 0.25 | 0.13 | 8015360 | |
| | M10 | 17.58 | 7.47 | 0.25 | 0.13 | 8015886 | |

## PERFORMANCE DATA(1)

### AUS™/AUCLS™/AUCLSS™ NUTS

| | Type | Thread Code | Shank Code | Test Sheet Material (2) | Installation (kN) | Pushout (N) | Torque-out (N-m) |
|---|---|---|---|---|---|---|---|
| METRIC | AUS AUCLS | M2 M2.5 M3 | 0 | 5052-H34 Aluminum | 6.7-8.9 | 280 | 0.9 |
| | | | 1 | | | 400 | 1.13 |
| | | | 2 | | | 750 | 1.47 |
| | | | 0 | Cold-rolled Steel | 11.2-15.6 | 470 | 1.47 |
| | | | 1 | | | 550 | 1.7 |
| | | | 2 | | | 1010 | 2.03 |
| | AUS AUCLS | M3.5 | 0 | 5052-H34 Aluminum | 11.2-13.5 | 280 | 1.8 |
| | | | 1 | | | 400 | 1.92 |
| | | | 2 | | | 840 | 2.5 |
| | | | 0 | Cold-rolled Steel | 13.4-26.7 | 480 | 1.8 |
| | | | 1 | | | 570 | 2.3 |
| | | | 2 | | | 1210 | 2.3 |
| | AUS AUCLS | M4 | 0 | 5052-H34 Aluminum | 11.2-13.4 | 300 | 2.37 |
| | | | 1 | | | 470 | 2.6 |
| | | | 2 | | | 970 | 4 |
| | | | 0 | Cold-rolled Steel | 18-27 | 490 | 2.95 |
| | | | 1 | | | 645 | 4 |
| | | | 2 | | | 1250 | 5.1 |
| | AUSS AUCLSS | M5 | 0 | 5052-H34 Aluminum | 11.2-15.6 | 300 | 3 |
| | | | 1 | | | 480 | 3.6 |
| | | | 2 | | | 845 | 5.7 |
| | | | 0 | Cold-rolled Steel | 18-38 | 530 | 3.6 |
| | | | 1 | | | 800 | 4.5 |
| | | | 2 | | | 1420 | 6.8 |
| | AUS AUCLS | M6 | 00 | 5052-H34 Aluminum | 18-32 | 750 | 6.5 |
| | | | 0 | | | 970 | 7.9 |
| | | | 1 | | | 1580 | 10.2 |
| | | | 2 | | | | 14.1 |
| | | | 00 | Cold-rolled Steel | 27-36 | 900 | 10 |
| | | | 0 | | | 1380 | 13 |
| | | | 1 | | | 1760 | 17 |
| | | | 2 | | | | |
| | AUS AUCLS | M8 | 1 | 5052-H34 Aluminum | 18-32 | 1570 | 13.6 |
| | | | 2 | | | | 18.1 |
| | | | 1 | Cold-rolled Steel | 27-36 | 1870 | 18.7 |
| | | | 2 | | | | 20.3 |
| | AUS AUCLS | M10 | 1 | 5052-H34 Aluminum | 22-36 | 1760 | 32.7 |
| | | | 2 | | | | |
| | | | 1 | Cold-rolled Steel | 32-50 | 2020 | 36.2 |
| | | | 2 | | | | |
| | AUS | M12 | 1 | 5052-H34 Aluminum | 31-40 | 2113 | 39.5 |
| | | | 1 | Cold-rolled Steel | 44-67 | 4670 | 83.1 |

### AUSP™ NUTS

| | Type | Thread Code | Shank Code | Test Sheet Material | Installation (kN) | Pushout (N) | Torque-out (N-m) |
|---|---|---|---|---|---|---|---|
| METRIC | AUSP | M2 | 1 | 304 Stainless Steel | 40 | 725 | 1.92 |
| | | | 2 | | 44.5 | 1290 | 2.03 |
| | AUSP | M2.5 | 0 | 304 Stainless Steel | 35.6 | 575 | 1.58 |
| | | | 1 | | 40 | 725 | 1.92 |
| | | | 2 | | 44.5 | 1290 | 2.03 |
| | AUSP | M3 | 0 | 304 Stainless Steel | 35.6 | 575 | 1.58 |
| | | | 1 | | 40 | 725 | 1.92 |
| | | | 2 | | 44.5 | 1290 | 2.03 |
| | AUSP | M4 | 0 | 304 Stainless Steel | 40 | 645 | 3.38 |
| | | | 1 | | 44.5 | 800 | 4.18 |
| | | | 2 | | 49 | 1600 | 5.08 |
| | AUSP | M5 | 0 | 304 Stainless Steel | 42.3 | 800 | 3.95 |
| | | | 1 | | 46.7 | 1025 | 5.08 |
| | | | 2 | | 51.2 | 1775 | 6.77 |
| | AUSP | M6 | 1 | 304 Stainless Steel | 60 | 2000 | 17 |
| | | | 2 | | 60 | 2600 | 19 |
| | AUSP | M8 | 1 | 304 Stainless Steel | 66 | 2100 | 19 |
| | | | 2 | | 80 | 4500 | 23 |
| | AUSP | M10 | 1 | 304 Stainless Steel | 80 | 2150 | 38 |

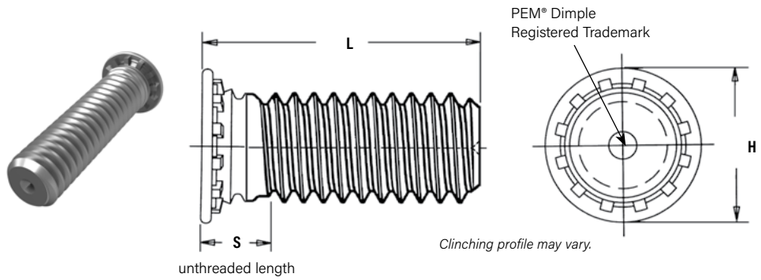
(1) Published installation forces are for general reference. Actual set-up and confirmation of complete installation should be made by observing proper seating of fastener as described in the installation steps. Other performance values reported are averages when all proper installation parameters and 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.

Table of Contents

# SELF-CLINCHING STUDS AND PINS

## AUFH™/AUFHS™/AUFHA™ STUDS

AUFH™/AUFHS™/AUFHA™ (flush-head) studs are available in aluminum, steel, or stainless steel. PEM® standard flush-head studs are designed to be installed in sheets as thin as 1 mm.




**PART NUMBER DESIGNATION**

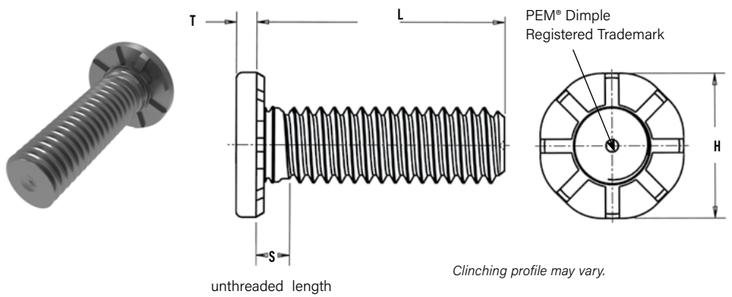
| | | | | | | |
|---|---|---|---|---|---|---|
| AUFH | - | M5 | - | 12 | ZI | C400 |
| AUFHS | - | M5 | - | 12 | | C400 |
| AUFHA | - | M5 | - | 12 | | C400 |
| Type/ Materials | | Thread | | Length | Finish | Clean Level |

All dimensions are in millimeters.

| | Thread Size x Pitch | Type: Fastener Material: Steel | Type: Fastener Material: Stainless Steel | Type: Fastener Material: Alu-minum | Thread Code | Length Code "L" ±0.4 (Length Code in millimeters) | | | | | | | | | | Min. Sheet Thick-ness (1) | Hole Size in Sheet +0.08 | H ± 0.4 | S Max. (2) | Max. Hole in Attached Parts | Dist. Hole ℄ to Edge |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| METRIC | M2.5 x 0.45 | AUFH | AUFHS | AUFHA | M2.5 | 6 | 8 | 10 | 12 | 15 | 18 | – | – | – | – | 1 | 2.5 | 4.1 | 1.95 | 3.1 | 5.4 |
| | M3 x 0.5 | AUFH | AUFHS | AUFHA | M3 | 6 | 8 | 10 | 12 | 15 | 18 | 20 | 25 | – | – | 1 | 3 | 4.6 | 2.1 | 3.6 | 5.6 |
| | M3.5 x 0.6 | AUFH | AUFHS | AUFHA | 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 | AUFH | AUFHS | AUFHA | 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 | AUFH | AUFHS | AUFHA | M5 | – | 8 | 10 | 12 | 15 | 18 | 20 | 25 | 30 | 35 | 1 | 5 | 6.5 | 2.7 | 5.6 | 7.2 |
| | M6 x 1 | AUFH | AUFHS | AUFHA | M6 | – | – | 10 | 12 | 15 | 18 | 20 | 25 | 30 | 35 | 1.6 | 6 | 8.2 | 3 | 6.6 | 7.9 |
| | M8 x 1.25 | AUFH | AUFHS | – | M8 | – | – | – | 12 | 15 | 18 | 20 | 25 | 30 | 35 | 2.4 | 8 | 9.6 | 3.7 | 8.6 | 9.6 |

## AUHFE™/AUTHFE™ STUDS

AUHFE™/AUTHFE™ (heavy-duty) studs Provides maximum pull through in sheets as thin as 0.8 mm.




**PART NUMBER DESIGNATION**

| | | | | | | |
|---|---|---|---|---|---|---|
| AUHFE | - | M6 | - | 25 | ZI | C400 |
| AUTHFE | - | M8 | - | 30 | ZI | C400 |
| Type/ Material | | Thread | | Length | Finish | Clean Level |

All dimensions are in millimeters.

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

(1) See installation section 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.

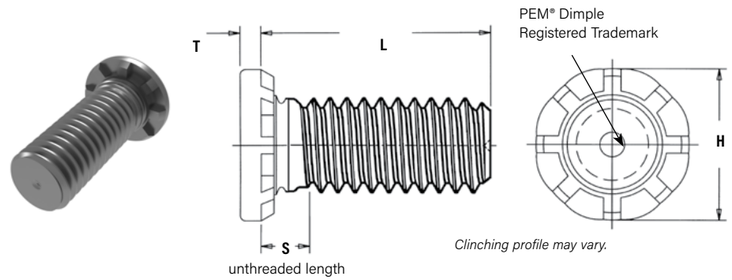
Tensile strength: 900 MPa



# SELF-CLINCHING STUDS AND PINS

## AUHFH™/AUHFHS™/AUHFHB™ STUDS

AUHFH™/AUHFHS™ (heavy-duty) studs 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. AUHFHB™ (heavy-duty BUSBAR®) studs are ideal for applications which demand superior electrical/mechanical attachment points.




**PART NUMBER DESIGNATION**

| | | | | | | |
|---|---|---|---|---|---|---|
| AUHFH | - | M8 | - | 30 | ZI | C400 |
| AUHFHS | - | M8 | - | 30 | | C400 |
| AUHFHB | - | M8 | - | 30 | X | C400 |
| Type/ Material | | Thread | | Length | Finish | Clean Level |

**All dimensions are in millimeters.** ***Tensile strength:*** *AUHFH - 900 MPa / AUHFHS - 515 MPa / AUHFHB - 415 MPa.*

| | Thread Size x Pitch | Type: Fastener Material: Steel | Type: Fastener Material: Stainless Steel | Type: Fastener Material: Phosphor Bronze(1) | Thread Code | Length code "L" ±0.4 (Length Code in millimeters) | | | | | | | Min. Sheet Thick-ness (2) | Hole Size in Sheet +0.13 | H ±0.25 | S Max. (3) | T Max. | Max. Hole in Attached Parts | Min. Dist. Hole ℄ to Edge |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| METRIC | M5 x 0.8 | AUHFH | AUHFHS | AUHFHB | M5 | 15 | 20 | 25 | 30 | 35 | 40 | 50 | 1.3 | 5 | 7.8 | 2.7 | 1.14 | 6.4 | 10.7 |
| | M6 x 1 | AUHFH | AUHFHS | AUHFHB | 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 | AUHFH | AUHFHS | AUHFHB | M8 | 15 | 20 | 25 | 30 | 35 | 40 | 50 | 2 | 8 | 12.5 | 3.5 | 1.78 | 9.5 | 12.7 |
| | M10 x 1.5 | AUHFH | AUHFHS | AUHFHB | M10 | 15 | 20 | 25 | 30 | 35 | 40 | 50 | 2.3 | 10 | 15.7 | 4.1 | 2.29 | 11.5 | 13.7 |

(1) The electrical resistance (tested at 10 amps DC) between phosphor bronze studs and copper busbars is below 104µ ohms and 62µ ohms for the M5 and M10 thread sizes respectively, after repeated thermal and mechanical cycling. For complete electrical resistance test data for type AUHFHB studs installed in copper, see bulletin entitled "Electrical Resistance of AUHFHB Studs Installed in Copper" on our website.

(2) See installation section 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.

## MATERIAL AND FINISH SPECIFICATIONS

| Type | Threads (1): External, ASME B1.1, 2A / ASME B1.13M, 6g | Fastener Materials: Hardened Carbon Steel | Fastener Materials: Aluminum (plain finish) | Fastener Materials: 300 Series Stainless Steel | Fastener Materials: CDA 510 Phosphor Bronze | Finishes: No Finish (5) | Finishes: Zinc Plated per ASTM B633, SC1 (5um), Type III, Colorless (3) | Finishes: Passivated and/or Tested Per ASTM A380 | Finishes: Zinc Nickel Plated per ISO 19598 Fe//ZnNi8//Cn//T0 720h to red rust per ISO 9227 Salt Spray Test (3) | Clean Level (2): Max. Metallic Particle Size 400µm | Clean Level (2): Max. Metallic Particle Size 600µm | For Use in Sheet Hardness (4): HRB 50/ HB 82 | HRB 55/ HB 83 | HRB 70/ HB 125 | HRB 80/ HB 150 | HRB 85/ HB 165 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| AUFH | ▪ | ▪ | | | | | ▪ | | ▪ | ▪ | ▪ | | | | ▪ | |
| AUFHS | ▪ | | | ▪ | | | | ▪ | | ▪ | ▪ | | | ▪ | | |
| AUFHA | ▪ | | ▪ | | | ▪ | | | | ▪ | ▪ | ▪ | | | | |
| AUHFE | ▪ | ▪ | | | | | ▪ | | ▪ | ▪ | ▪ | | | | | ▪ |
| AUTHFE | ▪ | ▪ | | | | | ▪ | | ▪ | ▪ | ▪ | | | | | ▪ |
| AUHFH | ▪ | ▪ | | | | | ▪ | | ▪ | ▪ | ▪ | | | | | ▪ |
| AUHFHB | ▪ | | | | ▪ | ▪ | | | | ▪ | ▪ | | ▪ | | | |
| AUHFHS | ▪ | | | ▪ | | | | ▪ | | ▪ | ▪ | | | ▪ | | |
| Part Number Codes for Finishes | | | | | | X | ZI | None | ZN | C400 | C600 | | | | | |

(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) Parts requiring technical cleanliness will be considered a custom fastening solution. If technical cleanliness is not required on your part, do not include a clean level number when ordering.

(3) See PEM® Technical Support section of our web site for related plating standards and specifications.

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

(5) "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.

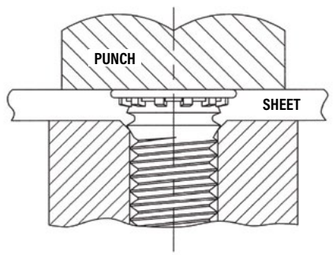
Table of Contents

# SELF-CLINCHING STUDS AND PINS

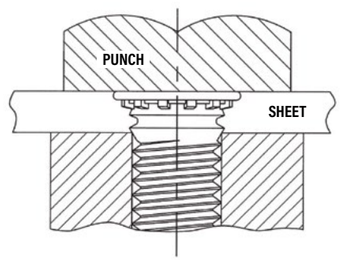
## INSTALLATION - AUFH™/AUFHS™/AUFHA™ STUDS

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.

WATCH INSTALLATION VIDEO




Tooling for sheet thicknesses less than 1.51 mm with M2.5 thru M5 thread sizes and less than 2.36 mm for M6 threads.




Tooling for sheet thicknesses 1.51 mm and greater with M2.5 thru M5 thread sizes and .2.36 mm and greater for 1M6 and M8 threads.

### PEMSERTER® Installation Tooling

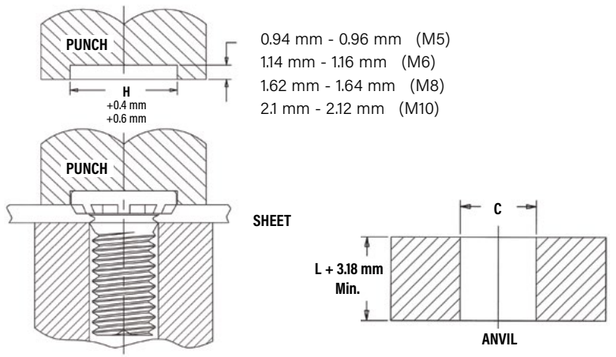
| | Thread Code | Anvil Dimensions (mm) | | Anvil Part No. For Sheets > 1.51 mm | Anvil Part No. For Sheets ≤ 1.5 mm | Punch Part Number |
|---|---|---|---|---|---|---|
| | | A + 0.1 | C + 0.08 | | | |
| METRIC | M2.5 | 3.1 | 2.53 | 970200300300 | 970200493300 | |
| | M3 | 3.6 | 3.03 | 970200229300 | 970200242300 | |
| | M3.5 | 4.1 | 3.53 | 970200007300 | 970200243300 | 975200048 |
| | M4 | 4.6 | 4.03 | 970200019300 | 970200244300 | |
| | M5 | 5.6 | 5.03 | 970200020300 | 970200247300 | |
| | | | | For Sheets > 2.36 mm | For Sheets ≤ 2.36 mm | |
| | M6 | 6.6 | 6.03 | 970200230300 | 970200248300 | 975200048 |
| | M8 | 8.6 | 8.03 | 970200231300 | – | |



# SELF-CLINCHING STUDS AND PINS

## INSTALLATION - AUHFH™/AUHFHB™/AUHFHS™ 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.

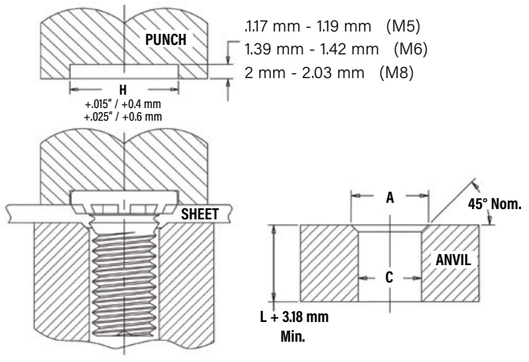



### PEMSERTER® Installation Tooling

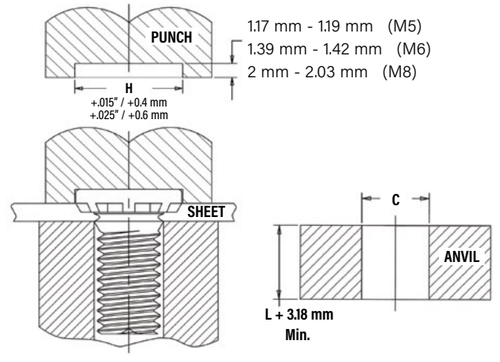
| | Thread Code | Anvil Dimensions (mm) | Anvil Part Number | Punch Part Number |
|---|---|---|---|---|
| | | C +0.08 | | |
| METRIC | M5 | 5.03 | 970200020300 | 970200311400 |
| | M6 | 6.03 | 970200230300 | 970200312400 |
| | M8 | 8.03 | 970200231300 | 970200313400 |
| | M10 | 10.03 | 970200402300 | 970200491400 |

## INSTALLATION - AUHFE™ 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 1.51 mm with M5 and M6 thread sizes and less than 1.9 mm with M8 threads.




Tooling for sheet thicknesses 1.51 mm and greater with M5 and M6 thread sizes and 1.9 mm and greater with M8 threads.

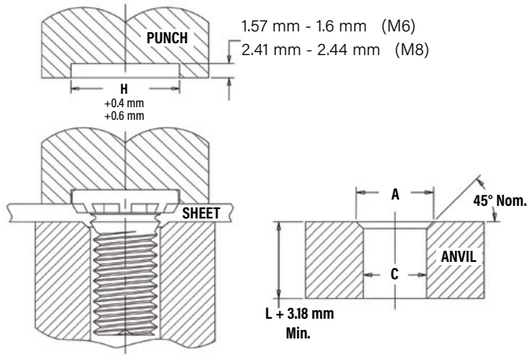
### PEMSERTER® Installation Tooling

| | Thread Code | Anvil Dimensions (mm) | | Anvil Part No. For Sheets > 1.51 mm | Anvil Part No. For Sheets 1 mm - 1.51 mm | Punch Part Number |
|---|---|---|---|---|---|---|
| | | A + 0.1 | C + 0.08 | | | |
| METRIC | M5 | 5.6 | 5.03 | 970200020300 | 8003704 | 8003710 |
| | M6 | 6.6 | 6.03 | 970200230300 | 8003705 | 8003711 |
| | | | | For Sheets > 1.9 mm | For Sheets 1.5 - 1.9 mm | |
| | M8 | 8.6 | 8.03 | 970200231300 | 8003706 | 8003712 |

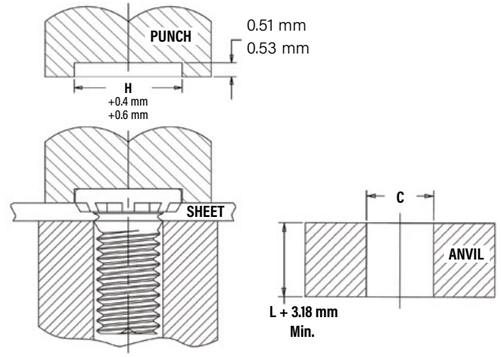
Table of Contents

# SELF-CLINCHING STUDS AND PINS

## INSTALLATION - AUTHFE™ STUDS




Tooling for sheet thicknesses less than 1.31 mm with M6 thread sizes, and less than 1.71 mm with M8 thread sizes.




Tooling for sheet thicknesses 1.31 mm and greater with M6 and 1.71 mm thread sizes and greater with M8 threads.

WATCH INSTALLATION VIDEO

## PEMSERTER® Installation Tooling

| | Thread Code | Anvil Dimensions (mm) | | Anvil Part No. For Sheets > 1.3 mm | Anvil Part No. For Sheets 0.8 - 1.3 mm | Punch Part Number |
|---|---|---|---|---|---|---|
| | | A + 0.1 | C + 0.08 | | | |
| METRIC | M6 | 7.25 | 6.03 | 970200230300 | 8019888 | 8019892 |
| | | | | For Sheets > 1.7 mm | For Sheets 0.8 - 1.7 mm | |
| | M8 | 9.55 | 8.03 | 970200231300 | 8019889 | 8019893 |



# 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 - AUFH™/AUFHS™ STUDS

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

## PERFORMANCE DATA - AUFHA™ STUDS

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

(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.

Table of Contents

# SELF-CLINCHING STUDS AND PINS

## PERFORMANCE DATA - AUHFE™ STUDS

| | Thread Code | Rec. Nut Tightening Torque (N·m) (1) | Test Sheet Thickness and Material (2) (mm) | Sheet Hardness HRB | Installation (kN) (3) | Pushout (N) | Torque-out (N-m) | Tensile Strength (kN) (4) | Pull Thru (kN) | Test Bushing Hole Size For Pull Thru Tests |
|---|---|---|---|---|---|---|---|---|---|---|
| METRIC | 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 - AUTHFE™ STUDS

| | Thread Code | Rec. Nut Tightening Torque (N·m) (1) | Test Sheet Thickness and Material (2) (mm) | Sheet Hardness HRB | Installation (kN) (3) | Pushout (N) | Torque-out (N-m) | Tensile Strength (kN) (4) | Pull Thru (kN) | Test Bushing Hole Size For Pull Thru Tests |
|---|---|---|---|---|---|---|---|---|---|---|
| METRIC | 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 | |

## PERFORMANCE DATA - AUHFH™/AUHFHS™/AUHFHB™ STUDS

| | 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) |
|---|---|---|---|---|---|---|---|---|---|
| METRIC | M5 | AUHFH | 7.7 | 1.5 mm Aluminum | 15 | 13 | 800 | 5.4 | 12.8 |
| | | AUHFH | 7.7 | 1.5 mm Steel | 65 | 26 | 1500 | 7.6 | 12.8 |
| | | AUHFHS | 3.8 | 1.62 mm Aluminum | 35 | 12.4 | 800 | 5.4 | 7.3 |
| | | AUHFHS | 3.8 | 1.47 mm Steel | 54 | 21.7 | 1500 | 6.4 | 7.3 |
| | | AUHFHB | 2.7 | 1.5 mm Copper CDA-110 | 28 | 15.6 | 1115 | 3.4 | 5.9 |
| | M6 | AUHFH | 13 | 1.5 mm Aluminum | 43 | 29 | 1270 | 14 | 18.1 |
| | | AUHFH | 13 | 1.5 mm Steel | 59 | 33 | 1750 | 14 | 18.1 |
| | | AUHFHS | 6.5 | 1.62 mm Aluminum | 35 | 15.4 | 1270 | 11 | 10.3 |
| | | AUHFHS | 6.5 | 1.6 mm Steel | 45 | 24.6 | 1750 | 11 | 10.3 |
| | | AUHFHB | 4.5 | 1.5 mm Copper CDA-110 | 28 | 25.3 | 1600 | 6.7 | 8.3 |
| | M8 | AUHFH | 32 | 2.3 mm Aluminum | 39 | 35.6 | 1700 | 30 | 32.9 |
| | | AUHFH | 32 | 2.3 mm Steel | 58 | 44.5 | 2200 | 30 | 32.9 |
| | | AUHFHS | 16 | 2.23 mm Aluminum | 44 | 24.4 | 1700 | 20 | 18.8 |
| | | AUHFHS | 16 | 2.48 mm Steel | 43 | 37.8 | 2100 | 20 | 18.8 |
| | | AUHFHB | 11 | 3.2 mm Copper CDA-110 | 32 | 33 | 2250 | 15.3 | 15.1 |
| | M10 | AUHFH | 63 | 2.3 mm Aluminum | 39 | 53.3 | 2445 | 36 | 52.2 |
| | | AUHFH | 63 | 2.3 mm Steel | 58 | 71.2 | 3470 | 49 | 52.2 |
| | | AUHFHS | 31 | 2.3 mm Aluminum | 44 | 44.4 | 2445 | 36 | 29.9 |
| | | AUHFHS | 31 | 2.3 mm Steel | 44 | 57.7 | 3470 | 36 | 29.9 |
| | | AUHFHB | 22 | 3.2 mm Copper CDA-110 | 32 | 53.3 | 2500 | 25 | 24 |

(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 AUHFE™ and AUTHFE™ 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 STANDOFFS

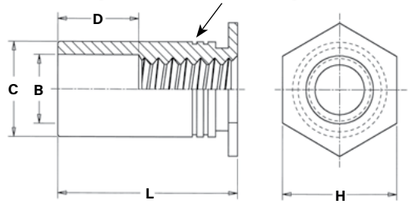
PEM® self-clinching standoffs, which use the proven self-clinching design, provide ideal solutions for applications where mounting, spacing or stacking of panels, boards or components are required. Pressed into round holes, these fasteners mount permanently into metal sheets as thin as 0.63 mm.

Specially designed AUSO4™ and AUBSO4™ standoffs are made from hardened stainless steel and are ideal for clinching into stainless steel sheets. An optional nickel plating is now available if product is expected to be used in a corrosive environment.

For more information on the proper use of PEM® self-clinching standoffs, check our website for Tech Sheet **PEM® - REF/Standoff Basics**.

## AUSO™/AUSOS™/AUSOA™/AUSO4™ - THROUGH-HOLE THREADED STANDOFFS

*PEM® "Single" or PEM® "Two Groove" Registered Trademark*




*Clinching profile may vary.*

**PART NUMBER DESIGNATION**

| | | | | | | |
|---|---|---|---|---|---|---|
| AUSO | - | M4 | - | 18 | ZI | C400 |
| AUSOS | - | M4 | - | 18 | | C400 |
| AUSOA | - | M4 | - | 18 | | C400 |
| AUSO4 | - | M4 | - | 18 | NC* | C400 |
| Type/ Material | | Thread Size | | Length | Finish | Clean Level |

* NC suffix is required if optional nickel plating (for corrosion resistance) is desired. Otherwise, no suffix is necessary.

## GENERAL DIMENSIONAL DATA

All dimensions are in millimeters.

| | Thread Code | Min. Sheet Thickness | Hole Size In Sheet +0.08 | B Counter-Bore Dia. ±0.13 | C -0.13 | H Nom. | Min. Dist. Hole ℄ To Edge | D ±0.25 |
|---|---|---|---|---|---|---|---|---|
| METRIC | M3 | 1 | 4.22 | 3.2 | 4.2 | 4.8 | 6 | Varies according to length. See length charts below. |
| | 3.5M3 | 1 | 5.41 | 3.2 | 5.39 | 6.4 | 6.8 | |
| | M3.5 | 1 | 5.41 | 3.9 | 5.39 | 6.4 | 6.8 | |
| | M4 | 1.27 | 7.14 | 4.8 | 7.12 | 7.9 | 8 | |
| | M5 | 1.27 | 7.14 | 5.35 | 7.12 | 7.9 | 8 | |

Micro sizes also available.
See PEM® **Bulletin MPF** for more information.

## THREAD SIZE AND LENGTH SELECTION DATA

All dimensions are in millimeters.

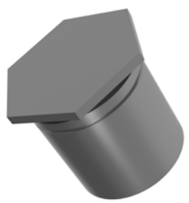
| | Thread Size x Pitch | Type: Fastener Material: Steel | Stainless Steel | Aluminum | Hardened Stainless Steel | Thread Code | Length "L" +0.05 -0.13 (Length Code in millimeters) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| METRIC | M3 x 0.5 | AUSO | AUSOS | AUSOA | AUSO4 | M3 | 3 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | - | - | - |
| | | | | | | 3.5M3(1) | | | | | | | | | | | | |
| | M3.5 x 0.6 | AUSO | AUSOS | AUSOA | AUSO4 | M3.5 | 3 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 | 25 |
| | M4 x 0.7 | AUSO | AUSOS | AUSOA | AUSO4 | M4 | 3 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 | 25 |
| | M5 x 0.8 | AUSO | AUSOS | AUSOA | AUSO4 | M5 | 3 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 | 25 |
| | D Dimension ±0.25 | | | | | | None | | | | 4 | | | 8 | | | 11 | |

(1) Standoffs with thread code 3.5M3 have a thicker wall to provide more bearing surface for the mating component or panel reducing the chance of cracking or cutting into the board.

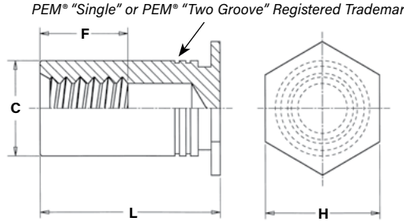
Table of Contents

# SELF-CLINCHING STANDOFFS

## AUBSO™/AUBSOS™/AUBSOA™/AUBSO4™ - BLIND THREADED STANDOFFS



*PEM® "Single" or PEM® "Two Groove" Registered Trademark*




*Clinching profile may vary.*

### PART NUMBER DESIGNATION

| | | | | | | |
|---|---|---|---|---|---|---|
| AUBSO | - | M4 | - | 18 | ZI | C400 |
| AUBSOS | - | M4 | - | 18 | | C400 |
| AUBSOA | - | M4 | - | 18 | | C400 |
| AUBSO4 | - | M4 | - | 18 | | C400 |
| | | ↓ Type/ Material | | ↓ Thread Size | ↓ Length | ↓ Finish | ↓ Clean Level |

## GENERAL DIMENSIONAL DATA

All dimensions are in millimeters.

| | Thread Code | Min. Sheet Thickness | Hole Size In Sheet +0.08 | C -0.13 | H Nom. | Min. Dist. Hole ℄ To Edge | F Min. |
|---|---|---|---|---|---|---|---|
| METRIC | M3 | 1 | 4.22 | 4.2 | 4.8 | 6 | Varies according to length. See length charts below. |
| | 3.5M3 | 1 | 5.41 | 5.39 | 6.4 | 6.8 | |
| | M3.5 | 1 | 5.41 | 5.39 | 6.4 | 6.8 | |
| | M4 | 1.27 | 7.14 | 7.12 | 7.9 | 8 | |
| | M5 | 1.27 | 7.14 | 7.12 | 7.9 | 8 | |

## THREAD SIZE AND LENGTH SELECTION DATA

All dimensions are in millimeters.

| | Thread Size x Pitch | Type: Steel | Type: Stainless Steel | Type: Aluminum | Type: Hardened Stainless Steel | Thread Code | Length "L" +0.05 -0.13 (Length Code in millimeters) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| METRIC | M3 x 0.5 | AUBSO | AUBSOS | AUBSOA | AUBSO4 | M3 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 | 25 |
| | | | | | | 3.5M3(1) | | | | | | | | | | |
| | M3.5 x 0.6 | AUBSO | AUBSOS | AUBSOA | AUBSO4 | M3.5 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 | 25 |
| | M4 x 0.7 | AUBSO | AUBSOS | AUBSOA | AUBSO4 | M4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 | 25 |
| | M5 x 0.8 | AUBSO | AUBSOS | AUBSOA | AUBSO4 | M5 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 | 25 |
| | F Dimension Min. | | | | | | 3.2 | 4 | | 5 | 6.5 | | 9.5 | | | |

(1) Standoffs with thread code 3.5M3 have a thicker wall to provide more bearing surface for the mating component or panel reducing the chance of cracking or cutting into the board.



# SELF-CLINCHING STANDOFFS

## MATERIAL AND FINISH SPECIFICATIONS

| Type | Threads (1): Internal, ASME B1.1, 2B ASME B1.13M, 6H | Fastener Materials: Hardened Carbon Steel | Aluminum | 300 Series Stainless Steel | Hardened 400 Series Stainless Steel (5) | Finishes: Zinc Plated per ASTM, B633, SC1 (5µm) Type III, Colorless (2) | Passivated and/or Tested Per ASTM A380 | Zinc Nickel Plated per ISO 19598 Fe//ZnNi8//Cn//T0 720h to red rust per ISO 9227 Salt Spray Test (2) | Clean Level (3): Max. Metallic Particle Size 400µm | Max. Metallic Particle Size 600µm | For Use In Sheet Hardness: (4) HRB 88/ HB 183 or Less | HRB 80/ HB 150 or Less | HRB 70/ HB 125 or Less | HRB 50/ HB 89 or Less |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| AUSO | ■ | ■ | | | | ■ | | ■ | ■ | ■ | | ■ | | |
| AUSOA | ■ | | ■ | | | | | | ■ | ■ | | | | ■ |
| AUSOS | ■ | | | ■ | | | ■ | | ■ | ■ | | | ■ | |
| AUSO4 | ■ | | | | ■ | | ■ | | ■ | ■ | ■ | | | |
| AUBSO | ■ | ■ | | | | ■ | | ■ | ■ | ■ | | ■ | | |
| AUBSOA | ■ | | ■ | | | | | | ■ | ■ | | | | ■ |
| AUBSOS | ■ | | | ■ | | | ■ | | ■ | ■ | | | ■ | |
| AUBSO4 | ■ | | | | ■ | | ■ | | ■ | ■ | ■ | | | |
| Part Number Codes For Finishes | | | | | | ZI | None | ZN | C400 | C600 | | | | |

(1) Where applicable.

(2) See PEM® Technical Support section of our website for related plating standards and specifications.

(3) Parts requiring technical cleanliness will be considered a custom fastening solution. If technical cleanliness is not required on your part, do not include a clean level number when ordering.

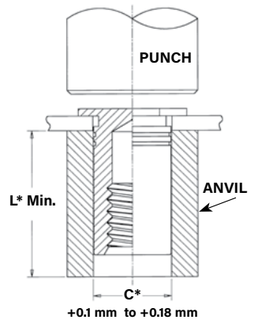
(4) HRB - Hardness Rockwell "B" Scale. HB - Hardness Brinell.

(5) In order for self-clinching fasteners to work properly, the fastener must be harder than the sheet into which it is being installed (For more information, see our **tech sheet** for installing fasteners into stainless steel sheets). In the case of stainless steel panels, fasteners made from 300 Series Stainless Steel do not meet this hardness criteria. It is for this reason that AUSO4™ and AUBSO4™ 400 series fasteners are offered. 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 environment (unless finished with optional nickel plating), requires non-magnetic fasteners or will be exposed to any temperatures above 300˚F (149˚C). If any of the these are issues, please contact **techsupport@pemnet.com** for other options.

## INSTALLATION

### AUSO™/AUSOS™/AUSOA™/AUSO4™/AUBSO™/AUBSOS™/AUBSOA™/AUBSO4™ STANDOFFS

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




**WATCH INSTALLATION VIDEO**

### PEMSERTER® Installation Tooling

| Thread Code | Anvil Part Number | Punch Part Number |
|---|---|---|
| M2/M2.5/M3 | 970200487300 | 975200048 |
| 3.5M3/M3.5 | 970200012300 | |
| M4 | 970200013300 | |
| M5 | 970200013300 | |
| M6 | 970200393300 | |

Table of Contents

# SELF-CLINCHING STANDOFFS

## PERFORMANCE DATA

### AUSO™/AUSOS™/AUSOA™/AUBSO™/AUBSOS™/AUBSOA™ STANDOFFS

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

### AUSO4™/AUBSO4™ STANDOFFS

| | Thread Code | Max. Rec. Tightening Torque For Mating Screw (N-m) | Test Sheet Material | | | |
|---|---|---|---|---|---|---|
| | | | 1.3 mm 300 Series Stainless Steel | | | |
| | | | Installation (kN) | Pushout (N) | Torque-out (N-m) (3) | Pull-thru (N) (3) |
| METRIC | M3 | 0.55 | 24.5 | 1493 | 2.36 | 2650 |
| | 3.5M3 | 0.55 | 42.3 | 2877 | 3.06 | 3025 |
| | M3.5 | 0.91 | 42.3 | 2877 | 3.06 | 3025 |
| | M4 | 2 | 46.7 | 4003 | 8.89 | 6458 |
| | M5 | 3.6 | 46.7 | 4003 | 8.89 | 6226 |

(1) **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.**

(2) See **tech sheet** on our website for performance data of PEM® Type AUSO™ standoffs installed into copper sheets.

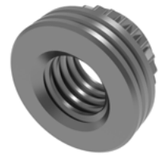
(3) Joint failure in torque-out and pull-thru will depend on the strength and type of screw being used. In some cases the failure will be in the screw and not in the self-clinching standoff. Please contact our Applications Engineering group with any questions.



# FASTENERS FOR USE WITH PC BOARDS

No matter how sophisticated or advanced, electronic components must be attached reliably and securely if they are to deliver optimum performance. We offer several fastener products for use with PC boards to satisfy component-to-board, board-to-board, and board-to-chassis attachment needs.

**ReelFast® Surface Mount Fasteners** mount on PC boards in the same manner and at the same time as other surface mount components prior to the automated reflow solder process. The fasteners simply become another board component. This alleviates concerns about potential damage to PC boards due to improper secondary installation operations. The fasteners are provided on tape and reel compatible with existing SMT automated installation equipment. The benefits of using ReelFast® SMT fasteners are: faster assembly; reduced scrap; reduced handling; and reduced risk of board damage.



**Broaching Fasteners** can also offer practical alternatives to “loose” hardware. A broaching fastener is a knurled-shank fastening device that can be pressed into a hole to provide a permanent, strong, threaded or unthreaded attachment point in PC boards. They can also be used in aluminum, acrylic, casting and polycarbonate components. Specially formed axial grooves around the shank of the fastener “broach” or cut into the material, creating a firm, interference-type fit resistant to rotation. In PC boards, broaching fasteners are recommended for use in non-plated holes.

**Broach/Flare-mount Standoffs** (AUKFB3™) offer a combined broach/flare feature for even greater pullout performance in PC board materials.

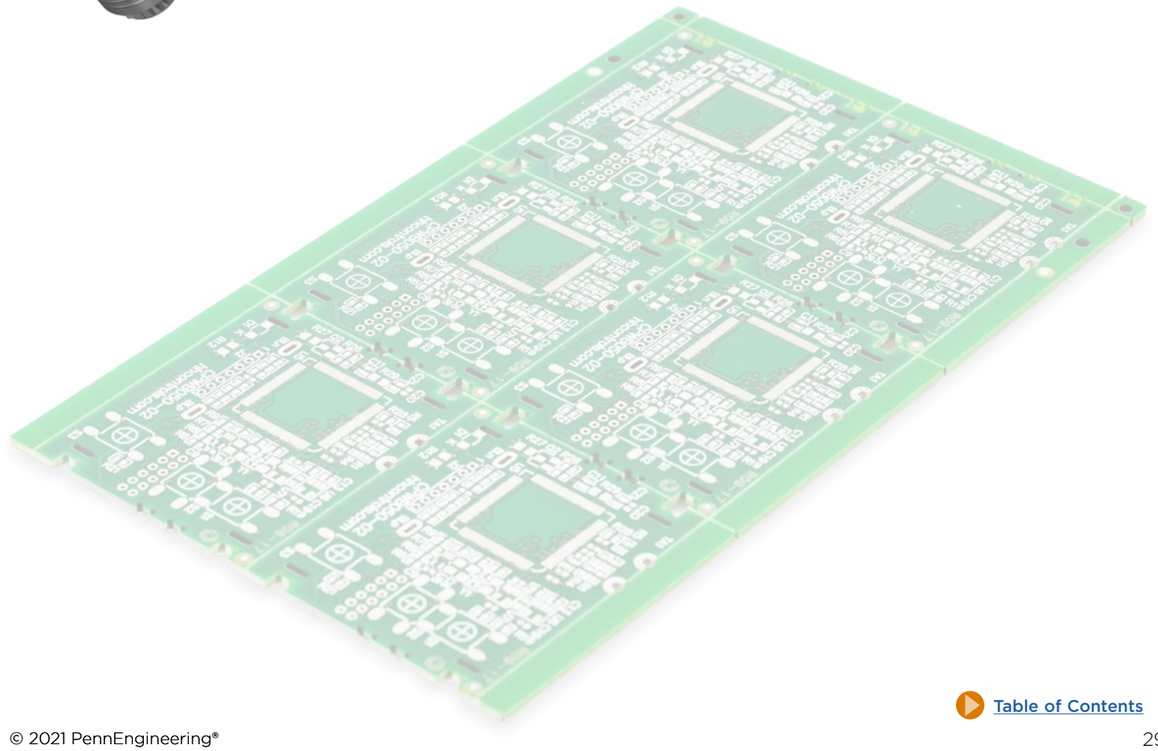
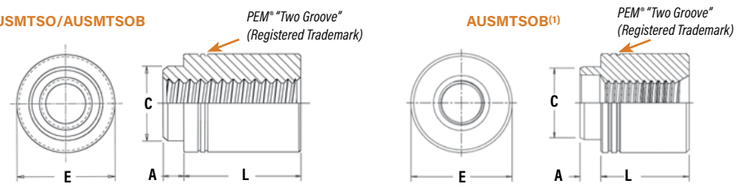


Table of Contents

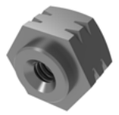
# FASTENERS FOR USE WITH PC BOARDS

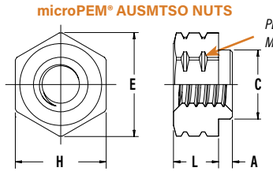
## AUSMTSO™/AUSMTSOB™ REELFAST® SURFACE MOUNT NUTS AND SPACERS/STANDOFFS



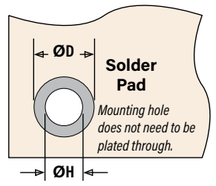



Thread/thru hole sizes M2, M2.5, M3, M3.5, M4, 3.1, 3.6, and 4.2



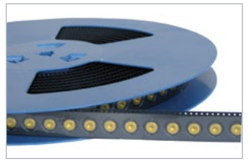



Thread sizes S1, S1.2, S1.4 and M1.6


### PART NUMBER DESIGNATION

| | | | | | | |
|---|---|---|---|---|---|---|
| AUSMTSO | – | M3 | – | 8 | ET | C400 |
| AUSMTSOB | – | M3 | – | 8 | ET | C400 |
| Type/ Material | | Thread or Thru Hole | | Length | Finish | Clean Level |



**Packaged on 330 mm recyclable reels. Tape width is 24 mm. Reels conform to EIA-481.**

A polyimide patch is supplied to allow for reliable vacuum pickup. Fasteners are also available without a patch which may provide a lower cost alternative, depending on your installation methods/requirements.

All dimensions are in millimeters.

| | Thread Size x Pitch | Thru Hole +0.10 -0.08 | Type: Fastener Material Steel | Type: Fastener Material Brass | Thread or Thru Hole Code | Length Code "L" ±0.13 (Length code in millimeters) | | | | | | | Min. Sheet Thickness | A Max. | C Max. | E Ref. | E ±0.13 | H Nom. | ØH Hole Size In Sheet +0.08 | ØD Min. Solder Pad |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| METRIC | S1 | – | AUSMTSO | – | M1 | 1 | 2 | 3 | – | – | – | – | 0.5 | 0.48 | 2.41 | 3.66 | – | 3.18 | 2.5 | 4.19 |
| | S1.2 | – | AUSMTSO | – | M1.2 | 1 | 2 | 3 | – | – | – | – | 0.5 | 0.48 | 2.41 | 3.66 | – | 3.18 | 2.5 | 4.19 |
| | S1.4 | – | AUSMTSO | – | M1.4 | 1 | 2 | 3 | – | – | – | – | 0.5 | 0.48 | 2.41 | 3.66 | – | 3.18 | 2.5 | 4.19 |
| | M1.6 x 0.35 | – | AUSMTSO | – | M1.6 | 1 | 2 | 3 | – | – | – | – | 0.5 | 0.48 | 2.41 | 3.66 | – | 3.18 | 2.5 | 4.19 |
| | M2 x 0.4 | – | AUSMTSO | AUSMTSOB | M2 | – | 2 | 3 | 4 (1) | 6 (1) | 8 (1) | 10 (1) | 1.53 | 1.53 | 3.6 | – | 5.56 | – | 3.73 | 6.2 |
| | M2.5 x 0.45 | – | AUSMTSO | AUSMTSOB | M25 | – | 2 | 3 | 4 (1) | 6 (1) | 8 (1) | 10 (1) | 1.53 | 1.53 | 4.09 | – | 5.56 | – | 4.22 | 6.2 |
| | M3 x 0.5 | – | AUSMTSO | AUSMTSOB | M3 | – | 2 | 3 | 4 (1) | 6 (1) | 8 (1) | 10 (1) | 1.53 | 1.53 | 4.09 | – | 5.56 | – | 4.22 | 6.2 |
| | M3.5 x 0.6 | – | AUSMTSO | AUSMTSOB | M35 | – | 2 | 3 | 4 (1) | 6 (1) | 8 (1) | 10 (1) | 1.53 | 1.53 | 5.28 | – | 7.14 | – | 5.41 | 7.77 |
| | M4 x 0.7 | – | AUSMTSO | AUSMTSOB | M4 | – | 2 | 3 | 4 | 6 (1) | 8 (1) | 10 (1) | 1.53 | 1.53 | 6.22 | – | 8.74 | – | 6.35 | 9.37 |
| | – | 3.1 | AUSMTSO | AUSMTSOB | 3.1 | – | 2 | 3 | 4 | 6 | 8 | 10 | 1.53 | 1.53 | 4.09 | – | 5.56 | – | 4.22 | 6.2 |
| | – | 3.6 | AUSMTSO | AUSMTSOB | 3.6 | – | 2 | 3 | 4 | 6 | 8 | 10 | 1.53 | 1.53 | 5.28 | – | 7.14 | – | 5.41 | 7.77 |
| | – | 4.2 | AUSMTSO | AUSMTSOB | 4.2 | – | 2 | 3 | 4 | 6 | 8 | 10 | 1.53 | 1.53 | 6.22 | – | 8.74 | – | 6.35 | 9.37 |

(1) AUSMTSOB fasteners with this length code have a shank counterbore.

## NUMBER OF PARTS PER REEL / PITCH (MM) FOR EACH SIZE

| Thread/Thru-Hole Size | Length Code | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 6 | 8 | 10 | 12 |
| M1, M1.2, M1.4, M1.6 | 3500 / 8 | 2500 / 8 | 2000 / 8 | – | – | – | – | – |
| M2, M25, M3, M35, 3.1, 3.6 | – | 1500 / 12 | 1000 / 12 | 900 / 12 | 650 / 12 | 375 / 16 | 300 / 16 | – |
| M4, 4.2 | – | 1100 / 16 | 800 / 16 | 675 / 16 | 500 / 16 | 375 / 16 | 300 / 16 | – |

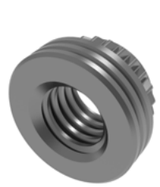
NOTE: Standoffs are available on special order without a pilot that do not require a thru hole for installation. Contact techsupport@pemnet.com for more information.

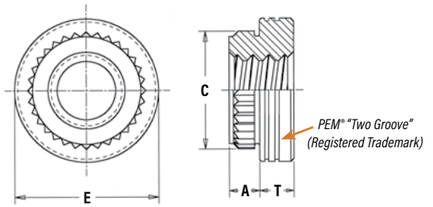


# FASTENERS FOR USE WITH PC BOARDS

## AUKF2™/AUKFS2™ BROACHING NUTS

Can be used in aluminum, acrylic, casting and polycarbonate components





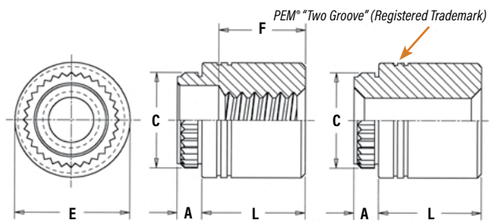

### PART NUMBER DESIGNATION

| | | | | | | |
|---|---|---|---|---|---|---|
| AUKFS2 | – | M3 | – | | | C400 |
| AUKF2 | – | M3 | – | ET | | C400 |
| Type/ Material | | Thread | | Finish | | Clean Level |

All dimensions are in millimeters.

| | Thread Size x Pitch | Type: Carbon Steel | Type: Stainless Steel | Thread Code | A (Shank) Max. | Min. Sheet Thickness | Hole Size In Sheet +0.08 | C ±0.08 | E ±0.13 | T ±0.13 | Min. Dist. Hole ℄ To Edge |
|---|---|---|---|---|---|---|---|---|---|---|---|
| METRIC | M2 x 0.4 | AUKF2 | AUKFS2 | M2 | 1.53 | 1.53 | 3.73 | 4.19 | 5.56 | 1.5 | 4.2 |
| | M2.5 x 0.45 | AUKF2 | AUKFS2 | M2.5 | 1.53 | 1.53 | 4.22 | 4.68 | 5.56 | 1.5 | 4.4 |
| | M3 x 0.5 | AUKF2 | AUKFS2 | M3 | 1.53 | 1.53 | 4.22 | 4.68 | 5.56 | 1.5 | 4.4 |
| | M4 x 0.7 | AUKF2 | AUKFS2 | M4 | 1.53 | 1.53 | 6.4 | 6.81 | 8.74 | 2 | 6.4 |
| | M5 x 0.8 | AUKF2 | AUKFS2 | M5 | 1.53 | 1.53 | 6.9 | 7.37 | 9.53 | 3 | 7.1 |

## AUKFE™/AUKFSE™ BROACHING STANDOFFS




### PART NUMBER DESIGNATION

| | | | | | | |
|---|---|---|---|---|---|---|
| AUKFSE | – | M3 | – | 12 | | C400 |
| AUKFE | – | M3 | – | 12 | ET | C400 |
| Type/ Material | | Thread or Thru Hole | | Length | Finish | Clean Level |

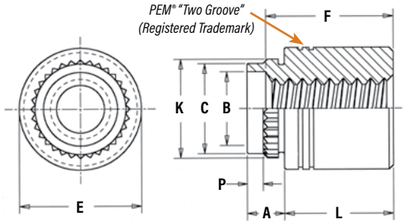
All dimensions are in millimeters.

| | Thread Size x Pitch | Thru Hole +0.10 -0.08 | Type: Carbon Steel | Type: Stainless Steel | Thread or Thru Hole Code | Length "L" ±0.13 (Length Code is in millimeters) | | | | | | | | A (Shank) Max. | Min. Sheet Thickness | Hole Size In Sheet +0.08 | C ±0.08 | E ±0.13 | Min. Dist. Hole ℄ To Edge |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| METRIC | M3 x 0.5 | – | AUKFE | AUKFSE | M3 | 3 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 1.53 | 1.53 | 4.22 | 4.68 | 5.56 | 4.4 |
| | – | 3.6 | AUKFE | AUKFSE | 3.6 | 3 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 1.53 | 1.53 | 5.41 | 5.87 | 7.14 | 5.5 |
| | – | 4.2 | AUKFE | AUKFSE | 4.2 | 3 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 1.53 | 1.53 | 6.4 | 6.81 | 8.74 | 7.1 |
| | "F" Minimum Thread Length (Where Applicable) | | | | | Full | | | | | 9.5 ± 0.4 | | | | | | | | |

Table of Contents

# FASTENERS FOR USE WITH PC BOARDS

## AUKFB3™ BROACH/FLARE-MOUNT STANDOFFS




**PART NUMBER DESIGNATION**

| AUKFB3 | - | M3 | - | 12 | ET | C400 |
|---|---|---|---|---|---|---|
| Type/ Material | | Thread | | Length | Finish | Clean Level |

All dimensions are in millimeters.

| | Thread Size x Pitch | Type | Thread Code | Length "L" ±0.13 (Length Code is in millimeters) | | | | | | | | | A (Shank) Max. | Sheet Thickness | Hole Size in Sheet +0.13 -0.03 | B ±0.08 | C Max. | E ±0.13 | K ±0.08 | P ±0.25 | Min. Dist. Hole ℄ To Edge |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| METRIC | M3 x 0.5 | AUKFB3 | M3 | 2 | 3 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 2.29 | 1.27-1.65 | 4.22 | 3.23 | 4.2 | 5.56 | 4.55 | 1 | 4.33 |
| | M4 x 0.7 | AUKFB3 | M4 | 2 | 3 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 2.29 | 1.27-1.65 | 6.4 | 5.23 | 6.33 | 8.74 | 6.68 | 1 | 6.36 |
| | "F" Min. Thread Length (Where Applicable) | | | Full | | | | | | 9.5 ±0.4 | | | | | | | | | | | |

## MATERIAL AND FINISH SPECIFICATIONS

| | Threads (1) | | Fastener Materials | | | Finishes (2) | | Clean Level (3) | | For Use in Sheet Hardness: (4) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Type | Miniature ISO 1501, 4H6 | Internal, ASME B1.13M 6H | Lead-free Carbon Steel | 300 Series Stainless Steel | Brass | Passivated and/or Tested per ASTM A380 | Electro-Plated Tin ASTM B 545, Class B with Clear Preservative Coating, annealed (5) | Max. Metallic Particle Size 400µm | Max. Metallic Particle Size 600µm | HRB 70 / HB 125 or Less | HRB 65 / HB 116 or Less | HRB 60 / HB 107 or Less | Aluminum, Acrylic Castings, Polycarbonate, and PC board | PC Board |
| AUKF2 | | ▪ | ▪ | | | | ▪ | ▪ | ▪ | | | ▪ | ▪ | |
| AUKFS2 | | ▪ | | ▪ | | ▪ | | ▪ | ▪ | ▪ | | | ▪ | |
| AUKFE | | ▪ | ▪ | | | | ▪ | ▪ | ▪ | | | ▪ | ▪ | |
| AUKFSE | | ▪ | | ▪ | | ▪ | | ▪ | ▪ | ▪ | | | ▪ | |
| AUKFB3 | | ▪ | | | ▪ | | ▪ | ▪ | ▪ | | ▪ | | ▪ | |
| AUSMTSO | ▪ S1 to S1.4 | ▪ 0-80 to 8-32/ M1.6 to M4 | ▪ | | | | ▪ | ▪ | ▪ | | | | | ▪ |
| AUSMTSOB | | ▪ | | | ▪ | | (6) | ▪ | ▪ | | | | | ▪ |
| Part Number Codes For Finishes | | | | | | None | ET | C400 | C600 | | | | | |

(1) For plated studs, Class 2A/6g, the maximum major and pitch diameter, after plating, may equal basic sizes and can be gauged to Class 3A/6h, per ASME B1.1 Section 7, Paragraph 2 and ASME B1.13M, Section 8, Paragraph 8.2.

(2) See PEM® Technical Support section of our web site for related plating standards and specifications.

(3) Parts requiring technical cleanliness will be considered a custom fastening solution. If technical cleanliness is not required on your part, do not include a clean level number when ordering.

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

(5) Optimal solderability life noted on packaging.

(6) The tin deposit on type AUSMTSOB meets the requirements of ASTM B545, Class A and although the copper and nickel barrier layers used under the tin do not strictly comply with ASTM B545 thickness requirements they have proven effective at preventing zinc migration and providing the specified solderable shelf life.

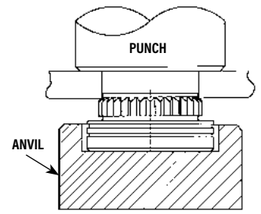


# FASTENERS FOR USE WITH PC BOARDS

## INSTALLATIONS

### AUKF2™/AUKFS2™/AUKFE™/AUKFSE™ FASTENERS

1. Prepare properly sized mounting hole in board.
2. Place fastener into the anvil hole and place the mounting hole over the shank of the fastener as shown in drawing.
3. With installation punch and anvil surfaces parallel, apply squeezing force until shoulder contacts the board.




AUKF2/AUKFS2/ AUKFE/AUKFSE

**WATCH INSTALLATION VIDEO**

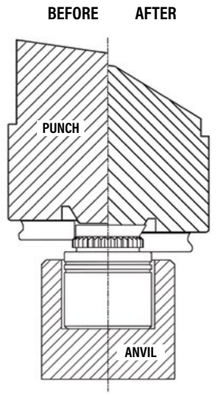
### PEMSERTER® Installation Tooling

| Type | Thread Code | Anvil Part Number | Punch Part Number |
|---|---|---|---|
| AUKFE/AUKFSE | M3 -3 to -6 | 975200846300 | |
| AUKFE/AUKFSE | M3 -8 to -10 | 975200847300 | |
| AUKFE/AUKFSE | M3 -12 to -14 | 975201222300 | |
| AUKFE/AUKFSE | M3 -14 to -16 | 975200848300 | |
| AUKFE/AUKFSE | 3.6 -3 to -6 | 975200849300 | |
| AUKFE/AUKFSE | 3.6 -8 to -10 | 975200850300 | 975200048 |
| AUKFE/AUKFSE | 3.6 -12 to -16 | 975200851300 | |
| AUKFE/AUKFSE | 4.2 -2 | 975201216300 | |
| AUKFE/AUKFSE | 4.2 -3 to -6 | 975201217300 | |
| AUKFE/AUKFSE | 4.2 -8 to -10 | 975201218300 | |
| AUKFE/AUKFSE | 4.2 -12 to -14 | 975201220300 | |
| AUKFE/AUKFSE | 4.2 -14 to -16 | 975201219300 | |

| Type | Thread Code | Anvil Part Number | Punch Part Number |
|---|---|---|---|
| KF2/KFS2 | M2/M2.5/M3 | 975200904300 | 975200048 |
| KF2/KFS2 | M3.5 | 975200035 | |
| KF2/KFS2 | M4 | 975200037 | |
| KF2/KFS2 | M5 | 975200905300 | |

### AUKFB3™ FASTENERS

1. Prepare properly sized mounting hole in board.
2. Place fastener into the anvil hole and place the mounting hole over the shank of the fastener as shown in diagram to the left.
3. Using a punch flaring tool and a recessed anvil, apply squeezing force until the shoulder of the fastener contacts the board. As the fastener seats itself in the proper position, the punch tool will flare the extended portion of the shank outward to complete the installation. The combination of broaching and flaring provides high pushout performance.




AUKFB3

### PEMSERTER® Installation Tooling

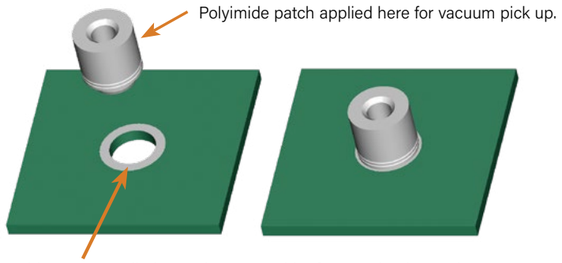
| Thread Code | Length Code | Anvil | Punch (Flaring Tool) |
|---|---|---|---|
| M3 | -2 | 975201213300 | 975201231400 |
| M3 | -3 to -6 | 975200846300 | |
| M3 | -8 to -10 | 975200847300 | |
| M3 | -12 to -14 | 975201222300 | |
| M3 | -14 to -16 | 975200848300 | |
| M4 | -2 | 975201216300 | 975201221400 |
| M4 | -3 to -6 | 975201217300 | |
| M4 | -8 to -10 | 975201218300 | |
| M4 | -12 to -14 | 975201220300 | |
| M4 | -14 to -16 | 975201219300 | |

(1) PennEngineering® manufactures and stocks the installation tooling for AUKFB3 fasteners.

Table of Contents

## INSTALLATIONS

### AUSMTSO™ NUTS AND STANDOFFS




WATCH INSTALLATION VIDEO

### PERFORMANCE DATA(1)

### AUKF2™/AUKFS2™/AUKFE™/AUKFSE™/AUKFB3™ FASTENERS

| | Type | Thread Code | Max. Nut Tightening Torque (N-m) | Test Sheet Thickness & Test Sheet Material | Installation (kN) | Pushout (2) (N) | Torque-out (N-m) |
|---|---|---|---|---|---|---|---|
| METRIC | AUKF2, AUKFS2 AUKFE, AUKFSE | M2 | (3) | 1.5 mm FR-4 Panel | 2.2 | 267 | 0.68 |
| | | M3 | (3) | 1.5 mm FR-4 Panel | 2.2 | 290 | 1.7 |
| | | M4 | (3) | 1.5 mm FR-4 Panel | 2.2 | 420 | 3.4 |
| | | M5 | (3) | 1.5 mm FR-4 Panel | 2.9 | 440 | 4.5 |
| | AUKFB3 | M3 | (3) | 1.5 mm FR-4 Panel | 4.4 | 560 | 2.03 |
| | | M4 | (3) | 1.5 mm FR-4 Panel | 6 | 680 | 3.2 |
| | AUKFH | M3 | 0.45 | 1.5 mm FR-4 Panel | 1.8 | 285 | 0.79 |
| | | M4 | 1.6 | 1.5 mm FR-4 Panel | 1.8 | 355 | 1.8 |
| | | M5 | 2.1 | 1.5 mm FR-4 Panel | 1.8 | 400 | 1.92 |
| | AUPFK | M3 | (3) | 1.5 mm FR-4 Panel | 1.1 | 245 | (3) |

### AUSMTSO™/AUSMTSOB™ FASTENERS(1)(2)

| Type | Thread/ Thru-hole Code | Test Sheet Material - .062" Single Layer FR-4 | | Rated Current Amps (3) |
|---|---|---|---|---|
| | | Pushout (N) | Torque-out (N-m) | |
| AUSMTSO | M1 | 378.7 | 0.56 | 11 |
| AUSMTSOB | | | | — |
| AUSMTSO | M1.2 | 378.7 | 0.56 | 10 |
| AUSMTSOB | | | | — |
| AUSMTSO | M1.4 | 378.7 | 0.56 | 10 |
| AUSMTSOB | | | | — |
| AUSMTSO | M1.6 | 378.7 | 0.56 | 10 |
| AUSMTSOB | | | | — |
| AUSMTSO | M3 | 251 | 1 | 22 |
| AUSMTSOB | | | | 36 |
| AUSMTSO | M3.5 | 416 | 1.6 | 34 |
| AUSMTSOB | | | | 55 |
| AUSMTSO | M4 | 672 | 3 | 47 |
| AUSMTSOB | | | | 76 |
| AUSMTSO | 3.1 | — | — | 22 |
| AUSMTSOB | | | | 36 |
| AUSMTSO | 3.6 | — | — | 33 |
| AUSMTSOB | | | | 55 |
| AUSMTSO | 4.2 | — | — | 46 |
| AUSMTSOB | | | | 75 |

(1) With lead-free paste. Average values of 30 test points. The data presented here is for general comparison purposes only. Actual performance is dependent upon application variables. We will be happy to provide samples for you to install. If required, we can also test your installed hardware and provide you with the performance data specific to your application.

(2) Further testing details can be found in our website's literature section.

(3) The maximum carrying current for each of the above fasteners is calculated based on a heat transfer coefficient of 20 W/m² °K and a maximum temperature rise of 15°C / 27˚F above ambient.



FASTENERS FOR USE WITH PC BOARDS

### AUSMTSO™/AUSMTSOB™ FASTENERS(1)(2)

**Testing Conditions for Surface Mounted Fasteners**

**Oven:** Quad ZCR convection oven w/ 4 zones
**High Temp:** 473˚F / 245˚C
**Board Finish:** 62% Sn, 38% Pb
**Screen Printer:** Ragin Manual Printer
**Vias:** None

Spokes: 2 Spoke Pattern
Paste: Amtech NC559LF Sn96.5/3.0Ag/0.5Cu **(AUSAC305) (AUSMTSO, AUSMTRA, AUSMTPR)**
Alpha CVP-390 Sn96.5/3.0Ag/0.5Cu **(AUSAC305) (AUSMTPFLSM, AUSMTSS, AUSMTSK)**
Stencil: .0067" / 0.17 mm thick **(AUSMTSO, AUSMTRA, AUSMTPR, AUSMTSS, AUSMTSK)**
.005" / 0.13 mm thick **(AUSMTPFLSM)**

### AUSMTSO™ REFLOW CURVE

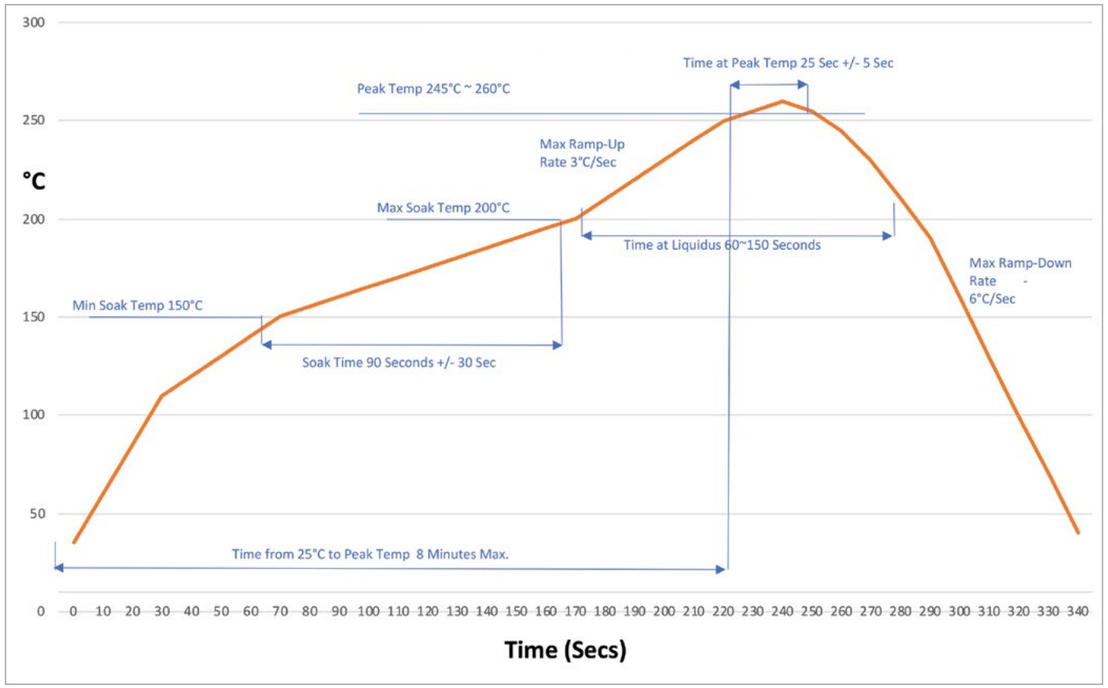
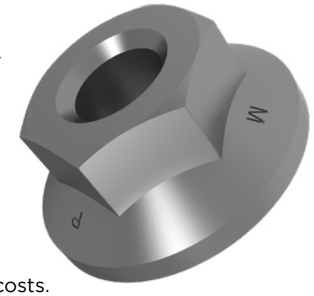



Table of Contents

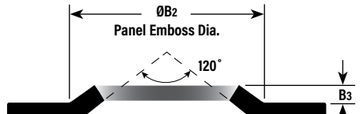
# SPINNING FLARE NUT

PEM® AUSFN™ spinning flare nuts are installed by simply pressing them into a properly sized, pre punched mounting hole. These fasteners are then permanently captivated in the panel but still able to spin freely within the sheet. This allows quick attachment of mating hardware, eliminating much of the need for loose fasteners such as flange nuts. When used with a self-clinching stud or other externally threaded fixed hardware, all loose hardware is eliminated from the applications.

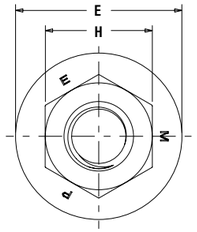


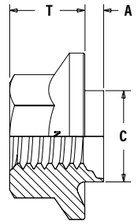
- Installs by pressing into properly sized, pre-punched embossed mounting hole.
- Permanently captive and spins freely in the sheet.
- Quick attachment to mating hardware promotes savings in assembly time and costs.
- Can eliminates all loose hardware including flange nuts.
- Installs into any sheet hardness.forces between parallel surfaces.


Pre-Embossed Mounting Hole (1)




Embossed Mounting Hole (1)




**PART NUMBER DESIGNATION**

| AUSFN | - | M6 | - | 1 | ZI | C400 |
|---|---|---|---|---|---|---|
| Type/ Material | | Thread | | Length | Finish | Clean Level |

All dimensions are in millimeters.

| | Thread Size x Pitch | Type / Fastener Material / Steel | Thread Code | Shank Code | A (Shank) Max. | Sheet Thickness ±0.1 | ØB1 Hole Size In Sheet +0.08 | ØB2 Panel Emboss Dia. Nom. | B3 Panel Emboss Height Nom. | C Max. | E ±0.3 | H -0.2 | T ±0.25 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| METRIC | M5 x 0.8 | AUSFN | M5 | 1 | 1.3 | 1 | 7.5 | 10 | 0.4 | 7.25 | 12.8 | 7.98 | 6 |
| | | | | 2 | 1.8 | 1.5 | | | | | | | |
| | M6 x 1 | AUSFN | M6 | 00 | 1.3 | 1 | 8.75 | 12.25 | 0.7 | 8.5 | 15.5 | 9.98 | 7 |
| | | | | 1 | 1.8 | 1.5 | | | | | | | |
| | M8 x 1.25 | AUSFN | M8 | 00 | 1.3 | 1 | 10.5 | 14.9 | 1 | 10.25 | 20 | 12.98 | 9 |
| | | | | 1 | 1.8 | 1.5 | | | | | | | |

(1) Variations in mounting hole size and sheet material hardness may affect results of the hole preparation procedure shown here. For technical assistance, send an e-mail to techsupport@pemnet.com.

## MATERIALS AND FINISH SPECIFICATIONS

**Threads:** Internal, ASME B1.1, 2B / ASME B1.13M, 6H
**Material:** Carbon steel
**Finishes**(2)**:** ZI - Zinc plated per ASTM B633, SC1 (5µm), Type III, colorless
ZN- Zinc Nickel Plated per ISO 19598 Fe//ZnNi8//Cn//T0 720h to red rust per ISO 9227 Salt Spray Test
**Clean Level**(3)**:** C400 - Max. Metallic Particle Size 400µm
C600 - Max. Metallic Particle Size 600µm
**For use in:** Any sheet hardness

(2) See PEM® Technical Support section of our website (www.pemnet.com) for related plating standards and specifications.
(3) Parts requiring technical cleanliness will be considered a custom fastening solution. If technical cleanliness is not required on your part, do not include a clean level number when ordering.



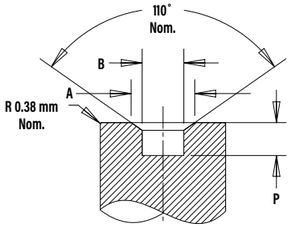
# SPINNING FLARE NUT

## INSTALLATIONS

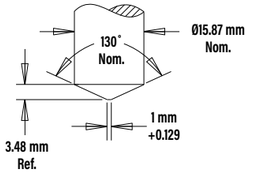
1. Prepare properly sized embossed mounting hole in sheet. Do not perform any secondary operations such as deburring.
2. Insert fastener into the recessed anvil and place the mounting hole (preferably the punch side) over the shank of the fastener.
3. With installation punch and anvil surfaces parallel, apply squeezing force to flare the shank of the fastener.

**WATCH INSTALLATION VIDEO**

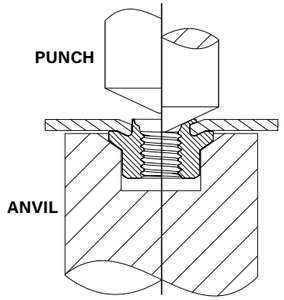
**ANVIL DETAIL**




**PUNCH DETAIL**




**BEFORE AFTER**




Captivated spinning nuts have been designed for self-clinching into a properly sized pre-punched straight hole. Contact Tech Support for more information

## PEMSERTER® Installation Tooling

| Type | Thread Code | Anvil Dimensions (mm) A ±0.127 | Anvil Dimensions (mm) B ±0.025 | Anvil Dimensions (mm) P Min. | Flaring Anvil Part Number | Punch Part Number |
|---|---|---|---|---|---|---|
| AUSFN | M5 | 14.5 | 9.5 | 7.49 | 8018538 | 8018670 |
| AUSFN | M6 | 19 | 11.81 | 8.51 | 8018539 | 8018670 |
| AUSFN | M8 | 22.61 | 15.29 | 10.49 | 8018540 | 8018670 |

If your application requires installation into a flat sheet, please contact our technical support at techsupport@pemnet.com as we have tooling options available.

## PERFORMANCE DATA(1)

| | Type | Thread Code | Shank Code | Test Sheet Material: Stainless Steel Installation (kN) | Stainless Steel Pushout (N) | Cold-rolled Steel Installation (kN) | Cold-rolled Steel Pushout (N) | Aluminum Installation (kN) | Aluminum Pushout (N) |
|---|---|---|---|---|---|---|---|---|---|
| METRIC | AUSFN | M5 | 1 | 7.2 | 862 | 7.2 | 642 | 5.8 | 428 |
| | | | 2 | 7.2 | 1261 | 7.2 | 1261 | 5.8 | 1261 |
| | AUSFN | M6 | 00 | 12.9 | 964 | 12.9 | 642 | 12.9 | 428 |
| | | | 1 | 12.9 | 1431 | 12.9 | 1431 | 12.9 | 1329 |
| | AUSFN | M8 | 00 | 12.9 | 964 | 12.9 | 642 | 12.9 | 642 |
| | | | 1 | 12.9 | 1431 | 12.9 | 1431 | 12.9 | 1329 |

(1) 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.

Table of Contents

## Table of Contents

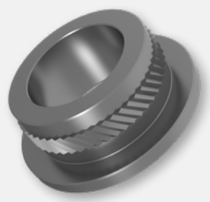
Click links below for shortcuts to information.



# SI® FASTENERS

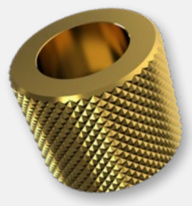
SI® inserts are typically specified in applications where strong, reusable, permanent threads are required in plastic materials, especially when frequent assembly and disassembly of the unit is required.

## COMPRESSION LIMITERS



Flange-Head

Symmetrical

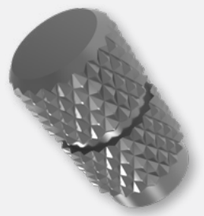


Full Diamond Knurl

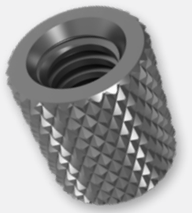
Non-knurled Symmetrical

## INSERTS FOR PLASTIC

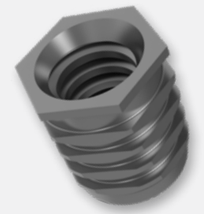
Ultrasonic / Heat Staking Inserts



Blind Threaded Molded-in Inserts



Thru-threaded, Knurled Molded-in Inserts



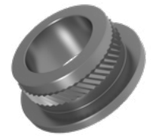
Hexagonal Press-in Inserts



# COMPRESSION LIMITERS FOR PLASTIC APPLICATIONS

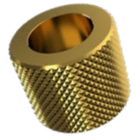
SI® Compression limiters are non-threaded inserts that are commonly used in applications where a compressive load is applied to a plastic assembly. The compression limiter strengthens the plastic and withstands the compressive force that is applied when a mating screw is tightened in the assembly. The integrity of the plastic is not compromised by the load that is applied.

- Custom designed in a wide range of sizes and profiles
- Available in brass, stainless steel, and lead-free aluminum
- Installed using ultrasonic, heat-staking or molded-in installation methods
- Available design types; flange-head, symmetrical, full diamond knurl and non-knurled symmetrical



**Flange-head**
Larger contact area provides high resistance to axial loads and eliminates direct contact of plastic with mating components. Can be used for all installation methods.

**Symmetrical**
Symmetrical design offers fast loading without the need to orientate the part. Can be used for all installation methods.



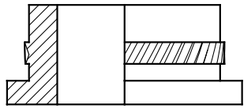
**Full Diamond Knurl**
Symmetrical design and uniform diamond knurl reduces the risk of sink marks. Can be used in mold-in installation.

**Non-knurled Symmetrical**
Symmetrical design with retention groove for use in automation and high-volume applications needing compreressive load resistance. Can be used in mold-in installation.

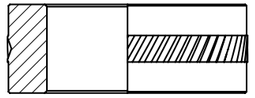
## AVAILABLE OPTIONS

| Installation Methods | Insert Design Types | Insert Materials | Finishes | Clearance Hole for Mating Screw Sizes: |
|---|---|---|---|---|
| Ultrasonic<br>Heat Staking<br>Molded-in | Flange-head<br>Symmetrical<br>Full Diamond Knurl<br>Non-knurled Symmetrical | Aluminum, Brass | Plain | #2-56 through 5/16-18 and M2 through M8 |
| | | Carbon Steel | Zinc plated, 5µm, colorless | |
| | | Stainless Steel | Passivated and/or tested per ASTM A380 | |

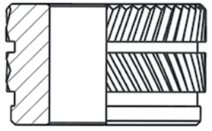
## SAMPLING OF INSERT DESIGN TYPES



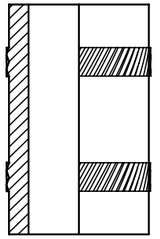
Flange-head



Symmetrical



Straight Wall Knurled



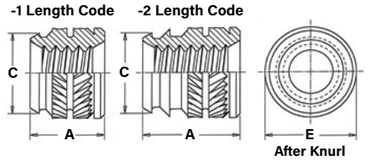
Symmetrical

Table of Contents

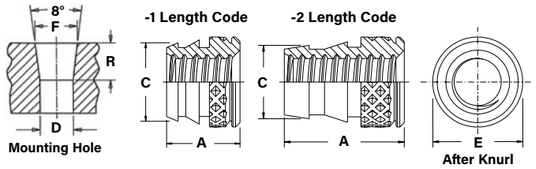
# ULTRASONIC / HEAT STAKING INSERTS

### Tapered Thru-Threaded, AUIUA™, AUIUB™ and AUIUC™ Inserts

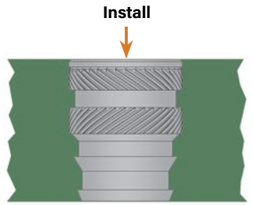
- Designed for use in tapered holes.
- Tapered mounting hole allows for rapid and accurate alignment prior to installation.
- Aluminum inserts ideal for light weight designs.
- Aluminum and stainless steel inserts offer lead-free alternative.




**Diagonal Knurl**
Thread sizes
4-40 to 3/8-16
and M2.5 to M8




**Diamond Knurl**
Thread sizes
0-80, 2-56
and M2




All dimensions are in millimeters.

| | Thread Size x Pitch | Type | | | Thread Code (1) | Length Code | A ± 0.13 | E ± 0.13 | C ±0.13 | Hole Size in Material | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Aluminum | Brass | Stainless Steel | | | | | | Min. Hole Depth | D ± 0.05 | F ± 0.05 | R Ref. Taper Length |
| METRIC | M2 x 0.4 | AUIUA | AUIUB | AUIUC | M2 | 1 | 2.92 | 3.58 | 3.12 | 3.94 | 3 | 3.12 | 0.9 |
| | M2.5 x 0.45 | AUIUA | AUIUB | AUIUC | M2.5 | 1 | 3.43 | 4.37 | 3.99 | 4.44 | 3.89 | 4.04 | 1.07 |
| | | | | | | 2 | 5.56 | | 3.79 | 6.58 | 3.58 | | 3.29 |
| | M3 x 0.5 | AUIUA | AUIUB | AUIUC | M3 | 1 | 3.43 | 4.37 | 3.99 | 4.44 | 3.89 | 4.04 | 1.07 |
| | | | | | | 2 | 5.56 | | 3.79 | 6.58 | 3.58 | | 3.29 |
| | M3 x 0.5 | AUIUAA | AUIUBB | AUIUCC | M3 | 1 | 3.81 | 5.56 | 5.16 | 4.83 | 5.05 | 5.23 | 1.29 |
| | | | | | | 2 | 6.35 | | 4.83 | 7.42 | 4.7 | | 3.79 |
| | M3.5 x 0.6 | AUIUA | AUIUB | AUIUC | M3.5 | 1 | 3.81 | 5.56 | 5.16 | 4.83 | 5.05 | 5.23 | 1.29 |
| | | | | | | 2 | 6.35 | | 4.83 | 7.42 | 4.7 | | 3.79 |
| | M4 x 0.7 | AUIUA | AUIUB | AUIUC | M4 | 1 | 4.7 | 6.35 | 5.84 | 5.72 | 5.74 | 5.94 | 1.43 |
| | | | | | | 2 | 7.92 | | 5.41 | 8.94 | 5.28 | | 4.72 |
| | M5 x 0.8 | AUIUA | AUIUB | AUIUC | M5 | 1 | 5.72 | 7.54 | 6.91 | 6.74 | 6.78 | 7.03 | 1.79 |
| | | | | | | 2 | 9.53 | | 6.38 | 10.55 | 6.25 | | 5.58 |
| | M5 x 0.8 | AUIUAA | AUIUBB | AUIUCC | M5 | 1 | 6.71 | 8.33 | 7.83 | 7.72 | 7.7 | 8 | 2.15 |
| | | | | | | 2 | 11.1 | | 7.16 | 12.12 | 7.06 | | 6.72 |
| | M6 x 1 | AUIUA | AUIUB | AUIUC | M6 | 1 | 7.62 | 9.52 | 8.99 | 8.64 | 8.86 | 9.22 | 2.57 |
| | | | | | | 2 | 12.7 | | 8.43 | 13.72 | 8.15 | | 7.65 |
| | M8 x 1.25 | AUIUA | AUIUB | AUIUC | M8 | 1 | 8.51 | 11.91 | 11.15 | 9.53 | 10.95 | 11.38 | 3.07 |
| | | | | | | 2 | 14.27 | | 10.31 | 15.29 | 10.19 | | 8.51 |

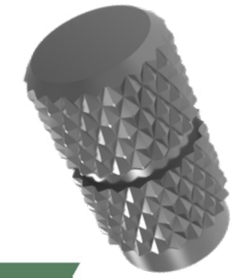
*(1) Thread tapped thru, Class 3A/4h screw must pass with finger torque, but basic go gauge may stop at last thread.*

## PERFORMANCE DATA FOR AUIUA, AUIUB, AUIUBB, AUIUC AND AUIUCC INSERTS

| | Thread Code | ABS | | Polycarbonate | |
|---|---|---|---|---|---|
| | | Pullout (N) | Torque-out (N-m) | Pullout (N) | Torque-out (N-m) |
| METRIC | M2-1 | 334 | 0.3 | 400 | 0.7 |
| | M2.5-1 | 334 | 0.3 | 400 | 0.7 |
| | M2.5-2 | 334 | 0.3 | 400 | 0.7 |
| | M3-1 | 356 | 0.5 | 712 | 0.8 |
| | M3-2 | 356 | 0.5 | 712 | 0.8 |
| | M3.5-1 | 645 | 1.7 | 734 | 2 |
| | M3.5-2 | 1223 | 1.7 | 2002 | 2.7 |
| | M4-1 | 912 | 2 | 1312 | 2.3 |
| | M4-2 | 1646 | 2.1 | 2869 | 2.3 |
| | M5-1 | 1201 | 5.1 | 1913 | 6.2 |
| | M5-2 | 2491 | 6.8 | 4048 | 9 |
| | M6-1 | 1664 | 7.3 | 2731 | 9.6 |
| | M6-2 | 3025 | 7.3 | 6294 | 12.2 |

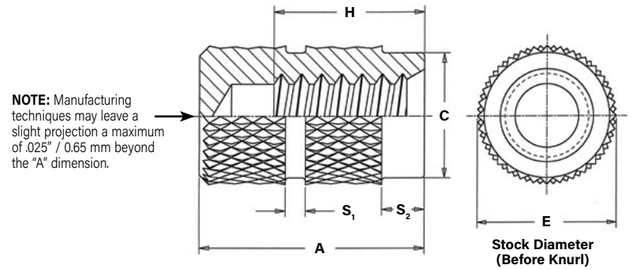


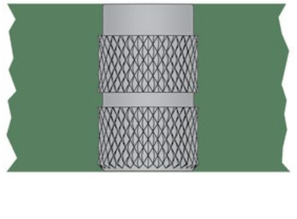
# MOLDED-IN INSERTS



### Blind Threaded, AUIBA™, AUIBB™ and AUIBC™ Inserts.

- Blind-end protects the threads from plastic intrusion.
- Aluminum inserts ideal for light weight designs.
- Aluminum and stainless steel inserts offer lead-free alternative.



All dimensions are in millimeters.

| | Thread Size x Pitch | Type | | | Thread Code | Length A ± 0.13 / H Min. Min. No. of Full Threads | | | | | E Nom. | C ± 0.13 | $S_1$ Nom. | $S_2$ Nom. | Minor Dia. Min./Max. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Aluminum | Brass | Stainless Steel | | 4 | 6 | 8 | 10 | 12 | | | | | |
| METRIC | M2.5 x 0.45 | AUIBA | AUIBB | AUIBC | M2.5 | 4.78/2.01 | 6.35/2.87 | 7.14/3.74 | 9.53/4.6 | 10.31/5.47 | 4.78 | 4.34 | 0.8 | 0.8 | 2.03/2.14 |
| | M3 x 0.5 | AUIBA | AUIBB | AUIBC | M3 | 5.21/2.21 | 7.13/3.21 | 8.73/4.21 | 10.31/5.21 | 11.13/6.21 | 4.78 | 4.34 | 0.8 | 0.8 | 2.47/2.59 |
| | M3.5 x 0.6 | AUIBA | AUIBB | AUIBC | M3.5 | 6.35/2.62 | 8.73/3.81 | 10.31/5.02 | 11.91/6.22 | 13.48/7.42 | 5.56 | 5.13 | 0.8 | 1.6 | 2.87/3.01 |
| | M4 x 0.7 | AUIBA | AUIBB | AUIBC | M4 | 6.35/3.08 | 8.73/4.47 | 10.31/5.89 | 11.91/7.29 | 13.48/8.69 | 6.35 | 5.74 | 1.2 | 1.6 | 3.25/3.42 |
| | M5 x 0.8 | AUIBA | AUIBB | AUIBC | M5 | 7.13/3.49 | 11.12/5.09 | 13.48/6.69 | 11.91/8.29 | 13.48/9.89 | 7.14 | 6.57 | 1.2 | 1.6 | 4.15/4.34 |
| | M6 x 1 | AUIBA | AUIBB | AUIBC | M6 | 8.73/4.37 | 13.49/6.37 | 15.87/8.37 | 18.26/10.57 | 20.8/12.37 | 8.74 | 8.15 | 1.6 | 2.4 | 4.94/5.16 |
| | M8 x 1.25 | AUIBA | AUBB | AUIBC | M8 | 11.13/5.72 | 15.09/7.82 | 18.24/10.32 | 20.62/12.82 | 22.23/15.32 | 11.13 | 10.26 | 1.98 | 2.4 | 6.68/6.92 |

## PERFORMANCE DATA FOR AUIBA, AUIBB, AND AUIBC INSERTS

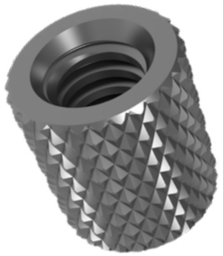
| | Thread Code | Length Code | ABS | | Polycarbonate | |
|---|---|---|---|---|---|---|
| | | | Pullout (N) | Torque-out (N-m) | Pullout (N) | Torque-out (N-m) |
| METRIC | M2.5/M3 | 4 | 1105 / 1050 | 0.69 / 0.63 | 1160 / 1100 | 0.76 / 0.73 |
| | | 6 | 1110 / 1060 | 0.7 / 0.64 | 1170 / 1120 | 0.77 / 0.73 |
| | | 8 | 1115 / 1070 | 0.71 / 0.65 | 1180 / 1140 | 0.78 / 0.74 |
| | | 10 | 1120 / 1080 | 0.72 / 0.66 | 1190 / 1160 | 0.79 / 0.74 |
| | | 12 | 1125 / 1090 | 0.73 / 0.67 | 1200 / 1180 | 0.8 / 0.75 |
| | M4 | 4 | 2340 / 2300 | 1.66 / 1.54 | 2415 / 2370 | 1.79 / 1.72 |
| | | 6 | 2350 / 2310 | 1.69 / 1.59 | 2420 / 2380 | 1.81 / 1.74 |
| | | 8 | 2360 / 2320 | 1.74 / 1.64 | 2425 / 2390 | 1.83 / 1.77 |
| | | 10 | 2370 / 2330 | 1.78 / 1.69 | 2430 / 2400 | 1.85 / 1.79 |
| | | 12 | 2380 / 2340 | 1.83 / 1.74 | 2435 / 2410 | 1.87 / 1.82 |
| | M5 | 4 | 2815 / 2760 | 6.39 / 5.8 | 2870 / 2825 | 6.6 / 6.26 |
| | | 6 | 2820 / 2770 | 6.44 / 5.87 | 2880 / 2840 | 6.66 / 6.32 |
| | | 8 | 2825 / 2780 | 6.5 / 5.94 | 2885 / 2855 | 6.72 / 6.38 |
| | | 10 | 2830 / 2790 | 6.55 / 6.1 | 2890 / 2870 | 6.78 / 6.44 |
| | | 12 | 2835 / 2800 | 6.61 / 6.17 | 2895 / 2885 | 6.84 / 6.7 |
| | M6 | 6 | 4040 / 3980 | 12.2 / 11.6 | 4120 / 4050 | 12.5 / 12 |

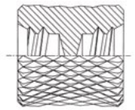
Table of Contents

# MOLDED-IN INSERTS

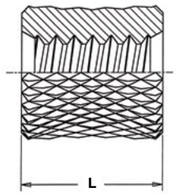
**Thru-Threaded, Knurled, AUSTKA™, AUSTKB™ and AUSTKC™ Inserts.**

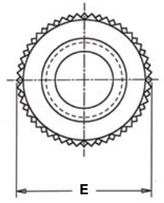
- Uniform knurl diameter reduces the risk of sink marks.
- Available in varying lengths for injection molding assemblies.
- Aluminum inserts ideal for light weight designs.
- Aluminum and stainless steel inserts offer lead-free alternative.





*Configuration for AUSTKA/AUSTKB/AUSTKC-256-20 and -24*




**Stock Diameter (Before Knurl)**

**All dimensions are in millimeters.**

| | Thread Size x Pitch | Type | | | Thread Code (1) | Length Code "L" ±0.13 in millimeters | | | | | | | | E Nom. | Minor Dia. Min./Max. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Aluminum | Brass | Stainless Steel | | | | | | | | | | | |
| METRIC | M3 x 0.5 | AUSTKA | AUSTKB | AUSTKC | M3 | 3 | 4 | 6 | 8 | 10 | 12 | 15 | 18 | 4.74 | 2.47/2.59 |
| | M4 x 0.7 | AUSTKA | AUSTKB | AUSTKC | M4 | 3 | 4 | 6 | 8 | 10 | 12 | 15 | 18 | 6.35 | 3.25/3.42 |
| | M5 x 0.8 | AUSTKA | AUSTKB | AUSTKC | M5 | 3 | 4 | 6 | 8 | 10 | 12 | 15 | 18 | 7.13 | 4.15/4.34 |

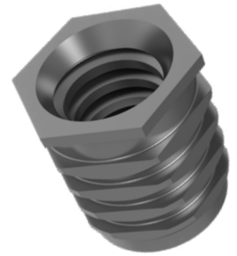
*(1) Thread tapped thru, Class 3A/4h screw must pass with finger torque, but basic go gauge may stop at last thread.*

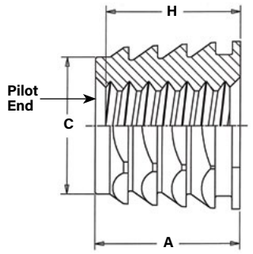


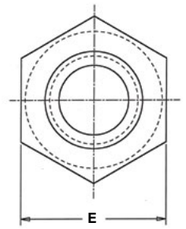
# MOLDED-IN INSERTS

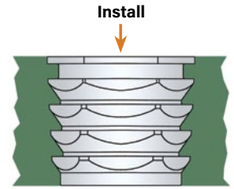
**Hexagonal, AUNFPA™ and AUNFPC™ Inserts.**

- Press-fit insert provides strong, reusable threads. No heat or ultrasonics required.
- Hexagonal "barbed" configuration ensures high torque-out and pullout values.
- Aluminum inserts ideal for light weight designs.
- Aluminum and stainless steel inserts offer lead-free alternative.






**All dimensions are in millimeters.**

| | Thread Size x Pitch | Type | | Thread Code | A Max. | Min. Material Thickness | Hole Size in Material + 0.08 | C Max. | E Nom. | Min. Boss Dia. | Min. Depth Full Thread H(1) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Aluminum | Stainless Steel | | | | | | | | |
| METRIC | M2.5 x 0.45 | AUNFPA | AUNFPC | M2.5 | 5.84 | 6.1 | 4.75 | 4.72 | 4.75 | 12.7 | 5.38 |
| | M3 x 0.5 | AUNFPA | AUNFPC | M3 | 5.84 | 6.1 | 4.75 | 4.72 | 4.75 | 12.7 | 5.38 |
| | M3.5 x 0.6 | AUNFPA | AUNFPC | M3.5 | 5.84 | 6.1 | 4.75 | 4.72 | 4.75 | 12.7 | 5.38 |
| | M4 x 0.7 | AUNFPA | AUNFPC | M4 | 6.73 | 6.99 | 6.35 | 6.32 | 6.35 | 15.88 | 6.3 |
| | M5 x 0.8 | AUNFPA | AUNFPC | M5 | 6.73 | 6.99 | 6.35 | 6.32 | 6.35 | 15.88 | 6.3 |
| | M6 x 1 | AUNFPA | UNFPC | M6 | 8 | 8.33 | 7.92 | 7.89 | 7.92 | 19.05 | 7.62 |
| | M8 x 1.25 | AUNFPA | AUNFPC | M8 | 9.27 | 9.65 | 9.53 | 9.50 | 9.53 | 24.13 | 8.76 |

*(1) Thread tapped thru, Class 3A/4h screw must pass with finger torque, but basic go gauge may stop at pilot end.*

## PERFORMANCE DATA FOR AUNPFA AND AUNFPC INSERTS

| | Thread Code | ABS | | | Polycarbonate | | |
|---|---|---|---|---|---|---|---|
| | | Install. Force (kN) | Pullout (N) | Torque-out (N • m) | Install. Force (kN) | Pullout (N) | Torque-out (N • m) |
| METRIC | M3 | 1 | 556 | 0.45 | 2.67 | 1245 | 1.8 |
| | M4 | 1.33 | 600 | 1.13 | 2.67 | 1690 | 4.74 |
| | M5 | 1.33 | 600 | 1.13 | 2.67 | 1690 | 4.74 |
| | M6 | 1.78 | 1045 | 3.16 | – | – | – |

Table of Contents


## GLOBAL CONTACT INFORMATION

**NORTH AMERICA**
Danboro, Pennsylvania USA
info@pemnet.com
+1-215-766-8853
800-237-4736 (USA)

**EUROPE**
Galway, Ireland
europe@pemnet.com
+353-91-751714

**ASIA/PACIFIC**
Singapore
singapore@pemnet.com
+65-6-745-0660

**SHANGHAI, CHINA**
china@pemnet.com
+86-21-5868-3688

**TOKYO, JAPAN**
tokyo@pemnet.com
+81-42-798-7177

## CONNECT WITH PENNENGINEERING®

Follow us for the latest company and product news, bulletin updates, tech tips, videos, and more.



July 2021