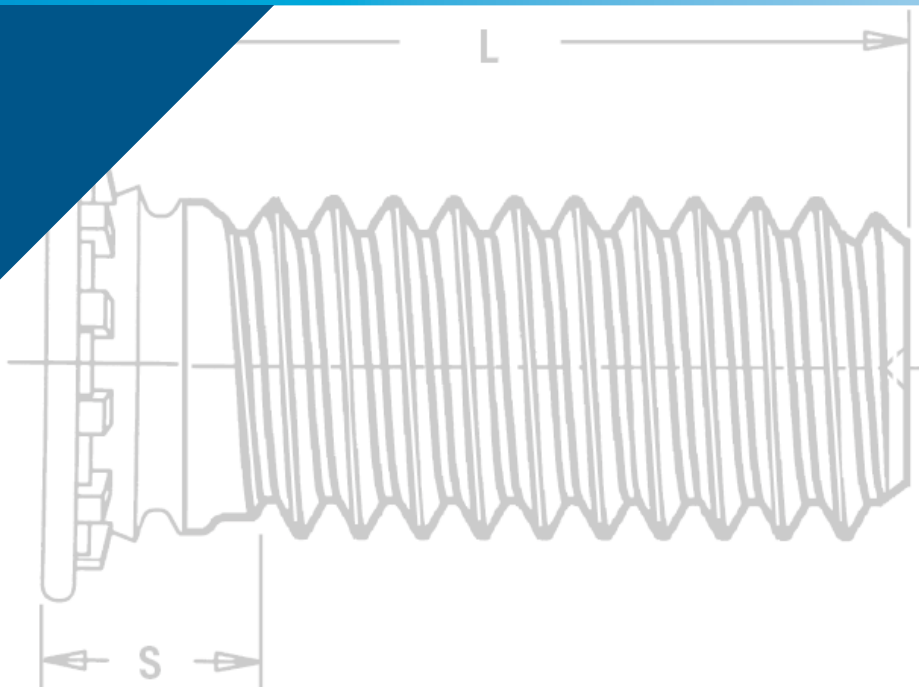
PEM® brand fasteners utilize self-clinching, broaching, flaring, surface mount, bonding or weld technology to provide strong, reusable, and permanent threads and mounting points in thin sheet metal, P.C. board or other rigid materials.

INDEX

QUICK PRODUCT LOCATOR



PEM® FASTENER IDENTIFICATION MARKS

To help you identify genuine PEM® brand fasteners, most are marked by one of our trademarks or identifiers. Genuine PEM fasteners can only be purchased from one of our authorized worldwide distributors. For a complete listing of these distributors, check our web site: www.pemnet.com.

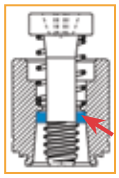
Trademark PEM® Dimple
CFHA, CFHC, CHA, CHC, FH, FH4, FHA, FHL, FHLS, FHP, FHS, FHX, HF109, HFG8, HFE, HFH, HFHB, HFHS, HFLH, HSCB, KFH, KSSB, MPP, PF10, PF30, PF31, PF32, PF50, PF51, PF52, PF60, PF61, PF62, PF11, PF11M, PF11MF, PF11MW, PF11PM, PF12, PF12M, PF12MF, PF12MW, PF7M, PF7MF, PFC2, PFC2P, PFC4, PFHV, PFK, PFS2, PSHP, SCB, SCBJ, SCBR, SF, SFK, SFP, SFW, SGPC, SKC, SKC-F, SMTPFLSM, SSA, SSC, SSS, T, T4, TFH, TFHS, THFE, TK4, TKA, TP4, TPS, TPXS, and TS fasteners

Trademark PEM® Stamp
CLS, CLSS, H, HN, HNL, PSHP, S, SFN, SL, SMPP, SMPS, SS, and WN fasteners

Trademark PEM® "Single Groove"
A4, BSO4, LA4, MSO4, PFC4, SO4, SP (Select sizes), and TSO4 fasteners

Trademark PEM® "Double Squares"
A4, AC, AS, LA4, LAC, and LAS fasteners

Trademark PEM® Circle on Pedestal
RAS fastener



PEM® Blue Nylon Ring
PFC4, PFC2P, PFC2, PFS2, and PFK fasteners

Trademark ATLAS® AE Stamp
MaxTite® and Plus+Tite® products

Trademark PEM® Skirted Shoulder
PF11, PF11M, PF11MF, PF11MW, PF11PM, PF12, PF12M, PF12MF, PF12MW, PF7M, and PF7MF fasteners

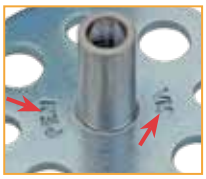
Trademark PEM® "Two Groove"
B, BS, BSO, BSON, BSOS, CSOS, CSS, DSO, DSOS, HSR, KF2, KFB3, KFE, KFS2, KFSE, PF7M, PF7MF, SMTSO, SMTSOB, SMTPFLSM, SO, SOA, SOAG, SON, SOS, SOSG, TSO, TSOA, and TSOS fasteners

Trademark PEM® C.A.P.S.® Dot Pattern
PF11PM fastener

Trademark PEM® Double Notch
microPEM® SMTSO fastener

Trademark PEM® Blue Nylon Locking Element
PL, PLC and CFN fasteners

Trademark PEM VM® Stamp
(Both Sides)
VariMount™ Base Plates



Trademark PEM® SH Stamp
SH fasteners

PEM® RT Stamp
S-RT fasteners

Trademark PEM® SP Stamp
SP fasteners

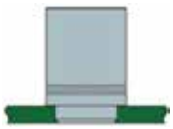
SC **Self-clinching** fasteners are pressed into sheet metal panels as this as .016" / 0.4 mm.

FM **Flare Mounted** fasteners can be installed into almost any rigid type of panel.

B **Broaching** fasteners are pressed into P.C. board or other plastic materials as thin as .060" / 1.53 mm.

VM **VariMount® bonding fasteners** are assemblies comprised of a standard PEM fastener mounted permanently into base plates.

SM **Surface Mounted** fasteners on tape and reel are soldered to a PC board in the same way as other surface mount components.



W **Weld** nuts are designed specially to be welded into place.

(Products are listed alphabetically by type. Refer to matching color square for mounting style)

HFLH — Bulletin FH

Studs are for installation into thin, harder, high-strength materials.

SC

HSCB — Bulletin PF

Heat sink mounting system.
HSCB (screw), HSR (nut) and HSL (spring).

SC B

KF2, KFS2 — Bulletin K

Nuts, internally threaded, for mounting on P.C. boards.

B

KFB3 — Bulletin K

Flare-mounted standoffs for mounting on P.C. boards with greater pullout performance.

B

KFE, KFSE — Bulletin K

Threaded or unthreaded standoffs mounted on P.C. boards for stacking or spacing.

B

KFH — Bulletin K

Threaded studs for use as solderable connectors or as permanently mounted studs on P.C. boards.

B

KSSB — Bulletins K & SSA

SNAP-TOP® standoffs featuring a spring action to hold a P.C. Board securely without screws or threaded hardware.

SC

LA4, LAC, LAS — Bulletins ALA & LN

Nuts with load-bearing, self-locking threads that permits up to .030" / 0.76 mm adjustment for mating hole misalignment.

SC

LK, LKA, LKS — Bulletin LN

Nuts with a unique PEMFLEX® self-locking feature permitting repeated use and effective prevailing locking torque.

SC

MPP — Bulletin MPF

microPEM® pins that can be installed into sheets as thin as 0.5 mm.

SC

MSIB — Bulletin MPF

microPEM® symmetrical designed thru-threaded inserts for plastics for use in straight or tapered holes.

Inserts

MSO4 — Bulletin MPF

microPEM® standoffs that can be installed into sheets as thin as .016" / 0.4 mm.

SC

MSOFS — Bulletin MPF

microPEM® flaring standoffs attached permanently in panels as thin as .008" / 0.2 mm of any hardness including stainless steel.

FM

PEM C.A.P.S.® — Bulletin PF

Colored Access Panel Screws with plastic cap. Key features include Phillips drive and MAThread® anti-cross threading feature.

SC FM

PF10 — Bulletin PF

Flush-mounted panel screw components.
N10 (nut), PR10 (retainer) and PS10 (screw).

SC

PF11, PF11M — Bulletin PF

Panel fastener assembly with knurled cap and universal slot/Phillips recess. Available with anti cross-thread feature.

SC

PF11MF — Bulletin PF

Flare-mounted captive screw assembly with anti cross-thread feature.

FM

PF11MW — Bulletin PF

Floating captive screw assembly allows for mating hole misalignment.

FM

PF12, PF12M — Bulletin PF

Panel fastener assembly with smooth cap and universal slot/Phillips recess. Available with anti cross-thread feature.

SC

PF12MF — Bulletin PF

Flare-mounted captive screw assembly with anti cross-thread feature.

FM

PF12MW — Bulletin PF

Floating captive screw assembly allows for mating hole misalignment.

FM

PF30, PF31, PF32 — Bulletin PF

Low-profile panel fastener assembly with large knurled head for tool or hand operation.

SC

PF50 — Bulletin PF

Low-profile panel fastener assembly with large knurled cap and Phillips recess for tool or hand operation.

SC

PF60 — Bulletin PF

Low-profile panel fastener assembly with large smooth cap and Phillips recess for tool or hand operation.

SC

PF7M — Bulletin PF

Small, compact, and low-profile self-clinching captive panel screws designed for limited access areas.

SC

PF7MF — Bulletin PF

Small, compact, and low-profile flaring captive panel screws designed for limited access areas.

FM

PFC2, PFS2 — Bulletin PF

Spring-loaded panel fastener assembly for tool or hand operation.

SC

PFC2P — Bulletin PF

Panel fastener assembly with Phillips recess for tool only operation.

SC

PFC4 — Bulletin PF & SS

Panel fastener assembly for installation into stainless steel sheets with Phillips recess for tool only operation.

SC

PFHV — Bulletin PF

Low-cost panel fastener assembly with universal slot/Phillips recess for tool or hand operation.

SC

PFK — Bulletins K & PF

Panel fastener assembly for mounting on P.C. boards.

B

PL, PLC — Bulletin LN

PEMHEX® self-locking nuts with a nylon hexagonal element to provide a reusable prevailing torque thread lock.

SC

PSHP — Bulletin K

Surface mount panel fastener screw that is used with Type SMTPR retainer.

SM

PSL2, PTL2 — Bulletin PF

Spring-loaded plunger assembly. Quick lockout feature on Type PTL2 holds plunger in retracted position.

SC

RAA — Bulletin RA

Self-tapping R'ANGLE® fasteners provide strong right angle attachment points in thin sheets.

SC

RAS — Bulletin RA

Threaded R'ANGLE® fasteners provide strong right angle attachment points in thin sheets.

SC

S, SS — Bulletin CL

Nuts that provide load-bearing threads in thin sheets with high pushout and torque-out resistances.

SC

S-RT — Bulletin CL

Free-running locknuts with a thread form that creates a lock when clamp load is applied.

SC

SCB — Bulletin PF

The spinning clinch bolt with axial float installs captive in panel and still spins freely.

SC

SCBJ — Bulletin PF

The spinning clinch bolt with jacking feature installs captive in panel and still spins freely.

SC

SCBR — Bulletin PF

The spinning clinch bolt with axial float utilizes self-retracting spring.

SC

SF, SFP — Bulletin SF

SpotFast® self-clinching fasteners create a permanent, flush joining of two sheets of metal.

SC

SFK — Bulletin SF

SpotFast® self-clinching fasteners create a permanent, flush joining of metal to PCB or plastic panels.

SC B

SFN — Bulletin SFN

Spinning flare nut is a one-piece, flanged hex nut that is permanently captive and still spins freely in the sheet.

FM

SH — Bulletin CL

Nuts are for installation into thin, harder, high-strength materials.

SC

SFW — Bulletin SF

SpotFast® self-clinching fasteners create a permanent, flush joining of two sheets of metal. The washer allows for consistent pivoting of the two metal panels.

SC

SGPC — Bulletin FH

Install into most panel material, provide strong torque-out resistance and are suitable for close centerline-to-edge situations.

FM

SKC — Bulletin SK

KEYHOLE® standoffs designed for a board to be quickly slipped into place and removed by sliding it sideways and lifting it off.

SC

SKC-F — Bulletin SK

KEYHOLE® sheet joining fasteners designed to quickly join two sheets flat against each other and then can be removed.

SC

SL — Bulletins CL & LN

Locknuts designed with a unique TRI-DENT® locking feature, which meets demanding locking performance requirements.

SC

SMPS, SMPP — Bulletin CL

Nuts that feature a lower profile and can be mounted closer to the edge of a sheet than standard self-clinching nuts.

SC

SMTPFLSM — Bulletin K

Surface mount spring-loaded captive panel screws.

SM

SMTPR — Bulletin K

Surface mount panel fastener retainer that is used with Type PSHP screw.

SM

SMTRA — Bulletin K

Surface mount R'ANGLE® fasteners provide strong re-usable threads at right angle to PC board.

SM

SMTSO, SMTSOB — Bulletin K

Surface mount spacers and nuts are available threaded and unthreaded.

SM

SMTSS — Bulletin K

Surface mount standoffs that eliminate the need for attaching screws.

SM

SO, SO4, SOA, SOS — Bulletin SO

Thru-hole threaded and unthreaded standoffs installed with their heads flush with one surface of the mounting sheets.

SC

SOAG, SOSG — Bulletin SO

Grounding standoffs for clinching into metal chassis with "gripping teeth" at opposite end to firmly contact mating board.

SC

SP — Bulletins CL & SS

Specially hardened self-clinching nuts for installation into stainless steel sheets.

SC

SSA, SSC, SSS — Bulletin SSA

SNAP-TOP® standoffs featuring a spring action to hold a P.C. board securely without screws or threaded hardware.

SC

T, T4 — Bulletin MPF

microPEM® TackPin® fasteners for compact electronic assemblies enable sheet-to-sheet attachment.

SC

TD — Bulletin TD

TY-D® self-clinching tie-mounts provide secure attachment points for mounting wires to electronic chassis or enclosure.

SC

TDO — Bulletin TD

TY-D® self-clinching hooks enable users to easily attach, remove, and return tie-bundled wires to their mounting points.

SC

TFH, TFHS — Bulletin FH

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

SC

THFE — Bulletin FH

Heavy-duty studs for sheets as thin as .031" / 0.8 mm.

SC

TK4, TKA — Bulletin MPF

microPEM® TackSert® pins designed to hold a top panel to a bottom panel by broaching into the bottom panel.

B

TPS, TP4 — Bulletin FH

Flush-mounted pilot pins with chamfered end to make mating hole location easy.

SC

TPXS — Bulletin FH

Alignment pin for ATCA® faceplate fastening solutions.

SC

TS — Bulletin MPF

TackScrew® fasteners enable cost-effective sheet-to-sheet attachment by simply pressing into place. Can be removed by simply unscrewing.

SC

TSO4 — Bulletin SO

Standoffs for installation into ultra-thin stainless steel sheets as thin as .025" / 0.63 mm.

SC

TSO, TSOA, TSOS — Bulletin SO

Standoffs provide permanent threads in ultra-thin sheets.

SC

U, UL — Bulletin FE

Miniature nuts with strong threads. Available with locking or non-locking threads.

SC

VM — Bulletin VM

The PEM® VariMount® bonding fasteners are assemblies comprised of a standard PEM fastener mounted permanently into base plates.

VM

WN, WNS — Bulletin WN

Self-locating projection weld nuts. The engineered projections prevent burn-outs in thin sheets.

W

SELF-CLINCHING FASTENER INSTALLATION DOS AND DON'TS

"Dos"

Do provide mounting hole of specified size for each fastener.

Do install fastener into punch side of sheet.

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

Do apply squeezing force between parallel surfaces.

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

"Don'ts"

Don't attempt to install a 300 series stainless steel fastener into a stainless steel sheet.

Don't install steel or stainless steel fasteners in aluminum panels before anodizing or finishing.

Don't deburr mounting holes on either side of sheet before installing fasteners – deburring will remove metal required for clinching fastener into sheet.

Don't install fastener closer to edge of sheet than minimum edge distance indicated by manufacturer – unless a special fixture is used to restrict bulging of sheet edge.

Don't over-squeeze. It will crush the head, distort threads, and buckle the sheet. Approximate installation forces are listed in performance data tables. Use this info as a guide. Be certain to determine optimum installation force by test prior to production runs.

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

Don't install screw in the head side of fastener. Install from opposite side so that the fastener load is toward sheet. The clinching force is designed only to hold the fastener during handling and to resist torque during assembly.

Don't install fastener on pre-painted side of panel.

HOW CAN WE HELP?

PennEngineering offers a wide range of technical support assistance. Let us put our expertise to work for you. We can provide:

Training

- On customer site group or individual training by a technical representative and/or PEM® factory personnel
- Tutorial materials on website

Global Network of Engineering Representatives to:

- Provide local company liaison
- Provide application review/product selection
- Provide technical materials
- Provide on-site product training and new product updates
- Assist with quotations
- The representative nearest you can be found on our website. rep/distributor locator

Application Engineering Services and Online Tools

- Application analysis/review
- Custom solutions
- Online technical papers
- Get answers to technical questions at techsupport@pemnet.com
- Customer assist performance testing
- Cost Savings Investigation (CSI)
- Custom design and product development
- Customer drawings
- Finite Element Analysis (FEA)
- Free samples on standard (catalog) products
- 3D Models (download or direct insert free on website)
- Free design PEMspec™ APP
- Instructional videos and animations

Stay connected to PennEngineering

Now you can follow us for the latest news releases, new products, bulletin updates, tech tips, videos and more.

Technical Lab Services - Complete testing in accordance with NASM 25027, 45938 and ASTM as well as PEM® fastener test specs and customer parameters.

- Mechanical testing
- Compression
- Micro hardness (Knoop, Rockwell and superficial)
- Image analysis
- Tensile strength
- In sheet performance
- Thermal Cycling
- Corrosion and plating issues and analysis

Prototype Development Center - Shop equipped with latest CNC equipment to provide prototype or short run samples and necessary installation tooling. Capabilities include:

- Turning
- Milling
- Drilling
- 3D Printing
- Installation
- Reaming
- Punching
- Grinding
- Assembly

Installation Equipment

We can assess your application and recommend equipment that helps you achieve your lowest installed cost. PEMSERTER® systems can be developed to handle multiple fastener types simultaneously or even in-die equipment to address challenging component handling and fastener installation. For more information call us at 800-523-5321 (USA only) or 215-766-8853 or visit us at www.pemnet.com.

All PEM® products meet our stringent quality standards. If you require additional industry or other specific quality certifications, special procedures and/or part numbers are required. Please contact your local sales office or representative for further information.

Regulatory compliance information is available in Technical Support section of our website. Specifications subject to change without notice. See our website for the most current version of this bulletin.

PennEngineering®

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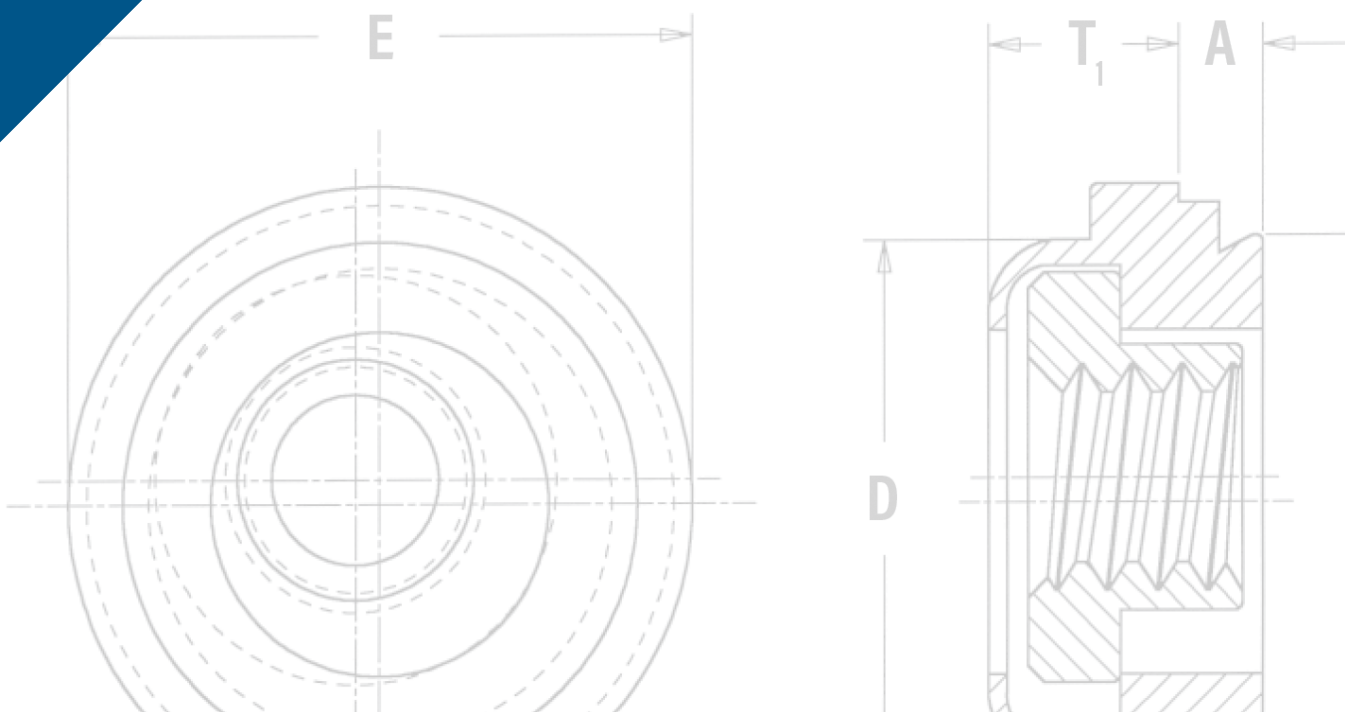
Visit our PEMNET™ Resource Center at www.pemnet.com ▪ Technical support e-mail: techsupport@pemnet.com

Bulletin ALA-1217

PEM® floating self-clinching fasteners are available with or without locking threads.

ALA™

FLOATING SELF-CLINCHING FASTENERS



Locking and Non-locking Threads

- Provide load-bearing threads in thin sheets
- Permit a total of .030"/0.76 mm adjustment for mating hole misalignment.
- Sheet remains flush on one side, and the fastener is permanently locked in place.
- Threads of the floating nut extend into the retainer shank for extra strength and support in assembly.

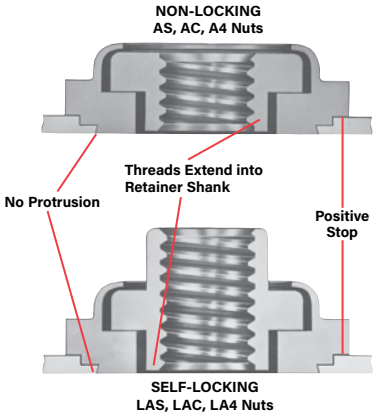
AC™/AS™/LAC™/LAS™ floating Nuts

- Designed for clinching into steel or aluminum panels and sheets.
- Available with (LAC/LAS) or without (AC/AS) locking threads.

A4™/LA4™ floating nuts

- Provide prevailing torque locking threads with performance equivalent to applicable NASM25027 specifications(1).
- Designed for clinching into stainless steel panels and sheets.
- Available with (LA4) or without (A4) locking threads.

(1) To meet national aerospace standards and to obtain testing documentation, product must be ordered to US NASM45938/11 specifications. Check our web site for a complete Military Specification and National Aerospace Standards Reference Guide (Bulletin NASM). Screws for use with PEM self-clinching locking fasteners should be Class 3A/4h fit or no smaller than Class 2A/6g.



PART NUMBER DESIGNATION

A	C	-	440	-	1	
A	S	-	440	-	1	ZI
A	4	-	440	-	1	
LA	C	-	440	-	1	MD
LA	S	-	440	-	1	MD
LA	4	-	440	-	1	MD
↓	↓		↓		↓	↓
Type	Retainer Material Code		Thread Size Code		Shank Code	Finish Code

PEM® Double Squares (Registered Trademark)

PEM® Single groove (Registered Trademark) *Identifies product for installation into stainless steel sheets (A4 and LA4)*

AXIAL STRENGTH AND TIGHTENING TORQUE - TYPES LAC/LAS/LA4

UNIFIED	Thread Code	Locknut Min. Axial Strength (1) (lbs.)	Mating Screw Strength Level (1) (ksi)	Mating Screw Tightening Torque (2) (in. lbs.)
	440	1085	180	15.8
	632	1636	180	29.4
	832	2522	180	53.8
	032	3600	180	88.9
	0420	5728	180	186

METRIC	Thread Code	Locknut Min. Axial Strength (1) (kN)	Mating Screw Strength Level (1) (MPa)	Mating Screw Tightening Torque (2) (N·m)
	M3	6.14	1220	2.39
	M4	10.71	1220	5.57
	M5	17.3	1220	11.2
	M6	24.55	1220	19.1

Fastener drawings and models are available at www.pemnet.com

(1) All LAC, LAS and LA4 locknuts have axial strength exceeding the minimum tensile strength of 180 ksi/Property Class 12.9 screws. Contact techsupport regarding assemble strength for higher strength screws.

(2) Tightening torque shown will induce preload of 65% of locknut minimum axial strength with K or nut factor is equal to 0.20. In some applications tightening torque may need to be adjusted based on the actual K value. All tightening torques shown are based on 180 ksi/ Property Class 12.9 screws. For lower strength screws the tightening torque is proportionately less. For example, for 120 ksi screws, torque is 67% value shown. For 900 MPa screws (Property Class 9.8) torque value is 74% of value shown.

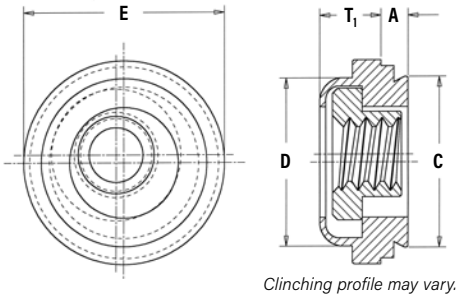
A NOTE ABOUT 400 SERIES FASTENERS FOR STAINLESS STEEL PANELS

In order for self-clinching fasteners to work properly, the fastener must be harder than the sheet into which it is being installed. In the case of stainless steel panels, fasteners made from 300 Series Stainless Steel do not meet this hardness criteria. It is for this reason that 400 series fasteners are offered (Types A4 and LA4). However, while these 400 Series fasteners install and perform well in 300 Series stainless sheets they should not be used if the end product:

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

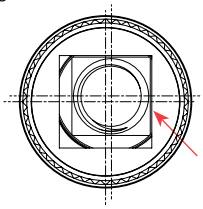
If any of the these are issues, please contact techsupport@pemnet.com for other options.

NON-LOCKING
AS/AC/A4



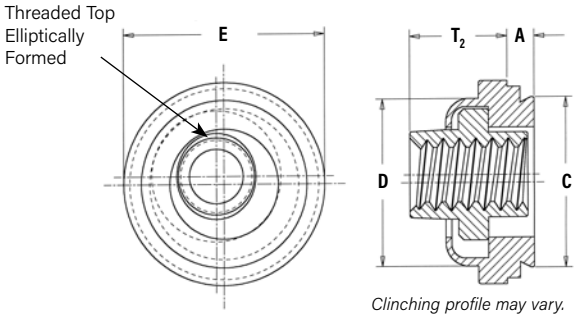
Clinching profile may vary.

PEM® Double Squares are a registered trademark.



***Float –** .015"/0.38 mm minimum, in all directions from center, .030"/0.76 mm total.*

SELF-LOCKING
LAS/LAC/LA4



Clinching profile may vary.

All dimensions are in inches.

	Thread Size	Type: Non-Locking Fastener Material: Steel	Non-Locking: 300 Series Stainless	Non-Locking: 400 Series Stainless	Type: Self-Locking Fastener Material: Steel	Self-Locking: 300 Series Stainless	Self-Locking: 400 Series Stainless	Thread Code	Shank Code	A (Shank) Max.	Min. Sheet Thickness	Hole Size in Sheet +.003 -.000	C Max.	D Max.	E ±.015	T_1 Max.	T_2 Max.	Min. Dist. Hole ℄ To Edge
UNIFIED	.112-40 (#4-40)	AS	AC	A4	LAS	LAC	LA4	440	1	.038	.038	.290	.289	.290	.360	.130	.190	.30
									2 (1)	.054	.054							
	.138-32 (#6-32)	AS	AC	A4	LAS	LAC	LA4	632	1	.038	.038	.328	.327	.335	.390	.130	.200	.32
									2 (1)	.054	.054							
	.164-32 (#8-32)	AS	AC	A4	LAS	LAC	LA4	832	1	.038	.038	.368	.367	.365	.440	.130	.210	.34
									2 (1)	.054	.054							
	.190-24 (#10-24)	AS	AC	A4	LAS	LAC	LA4	024	1	.038	.038	.406	.405	.405	.470	.170	.270	.36
									2 (1)	.054	.054							
	.190-32 (#10-32)	AS	AC	A4	LAS	LAC	LA4	032	1	.038	.038	.406	.405	.405	.470	.170	.270	.36
									2 (1)	.054	.054							
	.250-20 (1/4-20)	AS	AC	–	LAS	LAC	–	0420	2	.054	.054	.515	.514	.510	.600	.210	.310	.42
	.250-28 (1/4-28)	AS	AC	–	LAS	LAC	–	0428	2	.054	.054	.515	.514	.510	.600	.210	.310	.42

All dimensions are in millimeters.

	Thread Size x Pitch	Type: Non-Locking Fastener Material: Steel	Non-Locking: 300 Series Stainless	Non-Locking: 400 Series Stainless	Type: Self-Locking Fastener Material: Steel	Self-Locking: 300 Series Stainless	Self-Locking: 400 Series Stainless	Thread Code	Shank Code	A (Shank) Max.	Min. Sheet Thickness	Hole Size in Sheet +0.08	C Max.	D Max.	E ±0.38	T_1 Max.	T_2 Max.	Min. Dist. Hole ℄ To Edge
METRIC	M3 x 0.5	AS	AC	A4	LAS	LAC	LA4	M3	1	0.97	0.97	7.37	7.35	7.37	9.14	3.31	4.83	7.62
									2 (1)	1.38	1.38							
	M4 x 0.7	AS	AC	A4	LAS	LAC	LA4	M4	1	0.97	0.97	9.35	9.33	9.28	11.18	3.31	5.34	8.64
									2 (1)	1.38	1.38							
	M5 x 0.8	AS	AC	A4	LAS	LAC	LA4	M5	1	0.97	0.97	10.31	10.29	10.29	11.94	4.32	6.86	9.14
									2 (1)	1.38	1.38							
	M6 x 1	AS	AC	–	LAS	LAC	–	M6	2	1.38	1.38	13.08	13.06	12.96	15.24	5.34	7.88	10.67

(1) This shank code is not available for A4 and LA4 nuts.

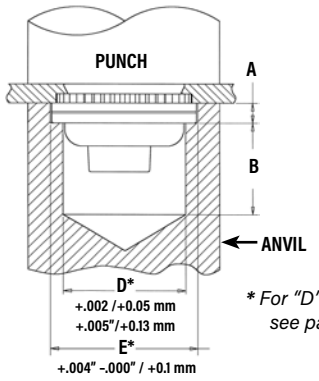
MATERIAL AND FINISH SPECIFICATIONS

	Threads: Non-locking	Threads: Self-locking	Fastener Materials: Retainer			Fastener Materials: Nut		Standard Finishes: Non-locking Retainer & Nut	Standard Finishes: Non-locking Retainer & Nut	Standard Finishes: Self-locking Retainer	Standard Finishes: Self-locking Retainer	Standard Finishes: Self-locking Nut	For Use In Sheet Hardness (2)	
Type	Internal, ASME B1.1, 2B/ ASME B1.13M, 6H	Internal, UNJ Class 3B per ASME B1.15 / MJ Class 4H6H per ASME B1.21M (M6 thread 4H5H)	Hardened Carbon Steel	Hardened 400 Series Stainless Steel	300 Series Stainless Steel	Carbon Steel	300 Series Stainless Steel	Zinc Plated, 5µm, Colorless (3)	Passivated and/or tested per ASTM A380	Zinc Plated, 5µm, Colorless (3)	Passivated and/or tested per ASTM A380	Black Dry-film Lubricant (4)	HRB 70/ HB 125 or Less	HRB 88/ HB 183 or Less
AS	▪		▪			▪		▪					▪	
AC	▪				▪		▪		▪				▪	
A4	▪			▪			▪		▪					▪
LAS		▪	▪				▪			▪		▪	▪	
LAC		▪			▪		▪				▪	▪	▪	
LA4		▪		▪			▪				▪	▪		▪
Part number codes for finishes								ZI	None	MD				

(2) HRB - Hardness Rockwell "B" Scale. HB - Hardness Brinell.
(3) See PEM Technical Support section of our web site (www.pemnet.com) for related plating standards and specifications.
(4) Temperature limit 400˚ F / 204˚ C.

INSTALLATION

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.
3. With installation punch and anvil surfaces parallel, apply sufficient squeezing force until anvil contacts the mounting sheet. Drawing shows suggested tooling for applying these forces.



* For "D" and "E", see page 3.

PEMSERTER® Installation Tooling - AC/AS/LAC/LAS/A4/LA4 NUTS

Thread Code	Counterbore A		Hole Depth Below Counterbore B		Anvil Part Number	Punch Part
	±.001	±0.03	±.005	±0.13		
440/M3	.054	1.37	.258	6.55	8013889	975200048
632	.054	1.37	.258	6.55	8013890	975200048
832/M4	.054	1.37	.258	6.55	8013891	975200048
032/M5	.071	1.8	.241	6.12	8013892	975200048
0420/M6	.092	2.34	.220	5.59	8021392	8012030

INSTALLATION NOTES

- For best results we recommend using a PEMSERTER® press for installation of PEM self-clinching fasteners. Please check our website for more information.
- Visit the Animation Library on our website to view the installation process for select products.

PERFORMANCE DATA(1)(2)

AC/AS/LAC/LAS NUTS

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

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

A4/LA4 (3) NUTS

	Thread Code	Test Sheet Material: 300 Series Stainless Steel Installation (lbs.)	300 Series Stainless Steel Retainer Pushout (lbs.)	300 Series Stainless Steel Retainer Torque-out (in. lbs.)
UNIFIED	440	9000	200	85
	632	10000	200	85
	832	12000	200	85
	032	13000	250	125

	Thread Code	Test Sheet Material: 300 Series Stainless Steel Installation (kN)	300 Series Stainless Steel Retainer Pushout (N)	300 Series Stainless Steel Retainer Torque-out (N-m)
METRIC	M3	40	890	9.6
	M4	53	890	9.6
	M5	57	1100	14.1

(3) Specifically designed for installation into stainless steel.

(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) For LAC, LAS and LA4 nuts, thread locking performance is equivalent to applicable NASM25027 specifications. Consult document PEM-REF25027 for details.

All PEM® products meet our stringent quality standards. If you require additional industry or other specific quality certifications, special procedures and/or part numbers are required. Please contact your local sales office or representative for further information.

Regulatory compliance information is available in Technical Support section of our website. Specifications subject to change without notice. See our website for the most current version of this bulletin.

PennEngineering®

PEM®

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PennEngineering®

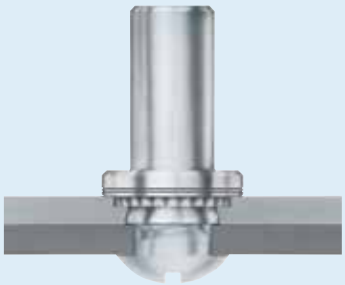
SELF-CLINCHING BLIND FASTENERS

BULLETIN B

PEM®

SELF-CLINCHING BLIND FASTENERS

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

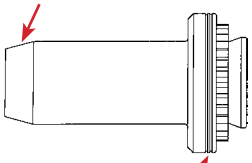


- Provides barrier to protect threads against foreign matter.
- Limits screw penetration, protecting internal components from potential damage.

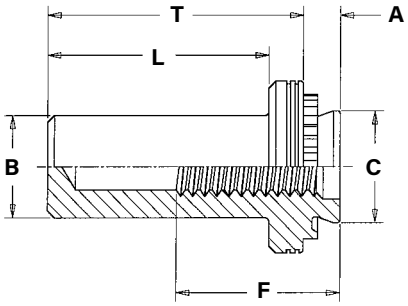
PEM blind fasteners employ the proven PEM self-clinching design and are easily installed into properly sized holes. Shanks of PEM fasteners act as their own pilots. PEM blind fasteners can be installed with any standard press applying squeezing forces between parallel surfaces.

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

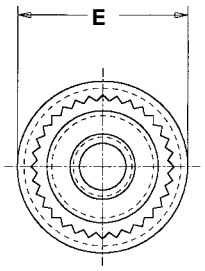
Metric parts are identified by large chamfer at blind end.



PEM® "two groove" registered trademark.



Full Thread Depth



Clinching profile may vary.

PART NUMBER DESIGNATION

B		-	832	- 2	ZI
B	S	-	832	- 2	
Type	Material Code		Thread Size Code	Shank Code	Finish

All dimensions are in inches.

	Thread Size	Type: Fastener Material: Steel	Type: Fastener Material: Stainless Steel	Thread Code	Shank Code	A (Shank) Max.	Min. Sheet Thickness	Hole Size in Sheet + .003 - .000	B Max.	C Max.	E ± .010	F Min.	L Max.	T ± .010	Min. Dist. Hole ℄ to Edge
UNIFIED	.112-40 (#4-40)	B	BS	440	1	.038	.040	.166	.150	.165	.250	.210	.335	.380	.19
					2	.054	.056								
	.138-32 (#6-32)	B	BS	632	1	.038	.040	.1875	.169	.187	.280	.230	.335	.380	.22
					2	.054	.056								
	.164-32 (#8-32)	B	BS	832	1	.038	.040	.213	.204	.212	.310	.280	.385	.440	.27
					2	.054	.056								
	.190-32 (#10-32)	B	BS	032	1	.038	.040	.250	.235	.249	.340	.280	.385	.440	.28
					2	.054	.056								
	.250-20 (1/4-20)	B	BS	0420	1	.054	.056	.344	.305	.343	.430	.310	.500	.560	.34
					2	.087	.090								

All dimensions are in millimeters.

	Thread Size x Pitch	Type: Fastener Material: Steel	Type: Fastener Material: Stainless Steel	Thread Code	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	B	BS	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	B	BS	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	B	BS	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	B	BS	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								

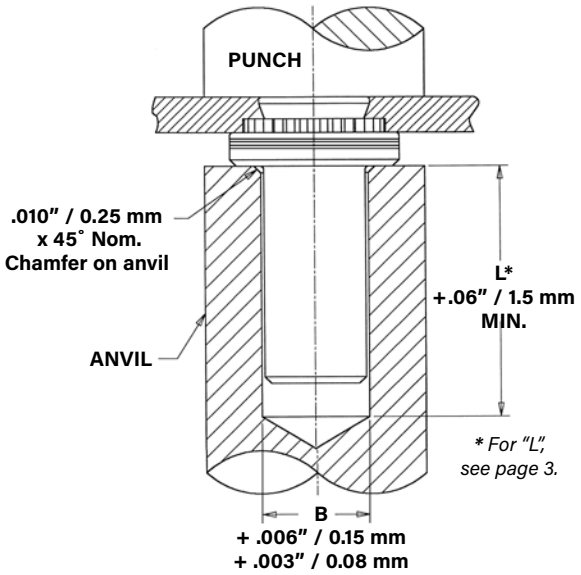
MATERIAL AND FINISH SPECIFICATIONS

	Threads	Fastener Materials		Standard Finishes		For Use in Sheet Hardness: (2)	
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, 5µm, Colorless (1)	HRB 80 / HB 150 or less	HRB 70 / HB 125 or less
B	▪	▪			▪	▪	
BS	▪		▪	▪			▪
Part Number Code For Finishes				None	ZI		

(1) See PEM Technical Support section of our web site (www.pemnet.com) for related plating standards and specifications.
(2) HRB - Hardness Rockwell "B" Scale. HB - Hardness Brinell.

INSTALLATION

1. Prepare properly sized mounting hole in the sheet. Do not perform any secondary operations such as deburring.
2. Place the barrel of the fastener into the anvil hole and place the mounting hole (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.



PEMSERTER® Installation Tooling

Type	Thread Code	Anvil Part Number	Punch Part Number
B/BS	440/M3	975200001	975200048
B/BS	632	975200002	975200048
B/BS	832/M4	975200003	975200048
B/BS	032/M5	975200004	975200048
B/BS	0420/M6	975200005	975200048

INSTALLATION NOTES

- For best results we recommend using a PEMSERTER® press for installation of PEM Types B and BS fasteners. Please check our website for more information.
- Visit the Animation Library on our website to view the installation process for this product.

PERFORMANCE DATA(1)

UNIFIED

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

METRIC

Thread Code	Shank Code	Sheet Thickness (mm)	Test Sheet Material: 5052-H34 Aluminum 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)
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.

All PEM® products meet our stringent quality standards. If you require additional industry or other specific quality certifications, special procedures and/or part numbers are required. Please contact your local sales office or representative for further information.

Regulatory compliance information is available in Technical Support section of our website. Specifications subject to change without notice. See our website for the most current version of this bulletin.

PennEngineering®

PEM®

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

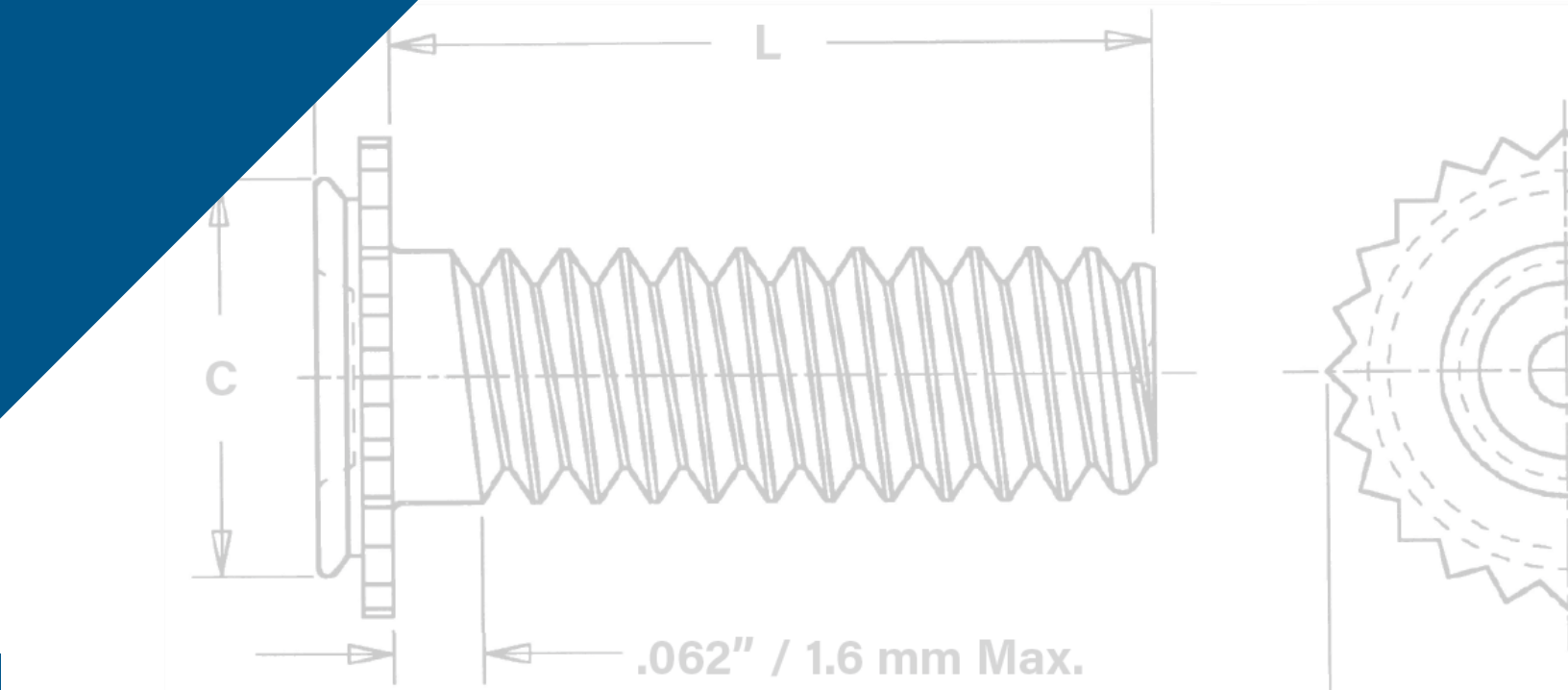
Technical support e-mail: techsupport@pemnet.com

Bulletin CH-1217

PEM® concealed-head self-clinching studs and standoffs install permanently and promote smooth designs.

CH™

CONCEALED-HEAD SELF-CLINCHING STUDS AND STANDOFFS

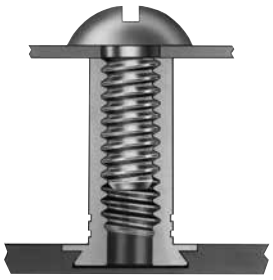


Concealed-head self-clinching studs and standoffs install permanently and promote smooth designs:

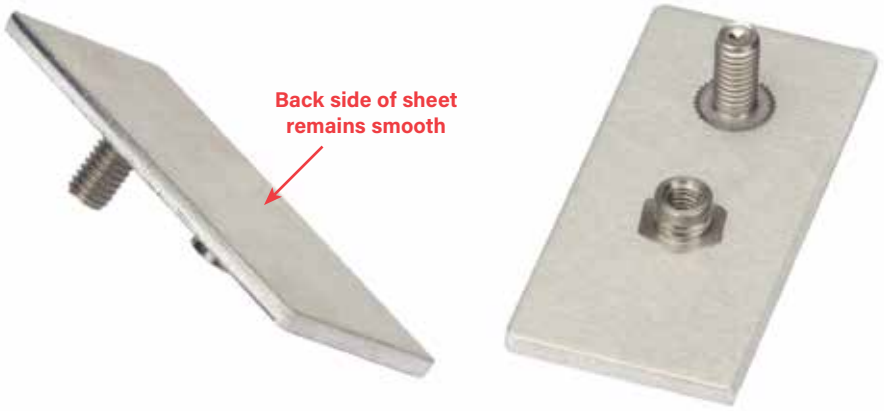
- Install permanently in steel or aluminum sheets as thin as .062" / 1.6 mm to provide strong and reusable threads for mating hardware in a wide range of assembly applications.
- Allow the side of the sheet opposite installation to remain smooth and unmarred.
- One side installation additionally serves to satisfy strict ingress protection (IP) requirements where the sheet must remain completely sealed from air, liquid, dust, gases or other potentially infiltrating elements.
- Only require a blind milled hole to the recommended size and minimum depth.
- Install using a PEMSERTER® press or other standard press.
- CFHC™ studs can be ordered to NAS63540/4 specifications.(1)

(1) To meet national aerospace standards and to obtain testing documentation, Type CFHC studs must be ordered using appropriate NAS63540/4 part number. Check our web site for a complete Military Specification and National Aerospace Standards Reference Guide (Bulletin NASM).

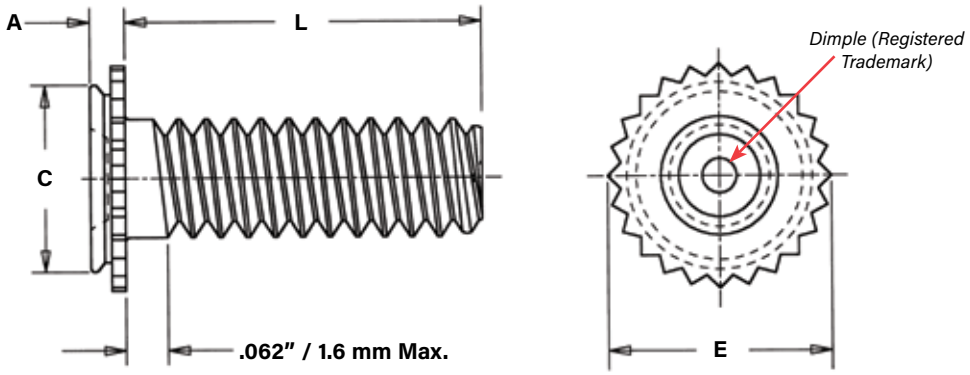
Concealed-head Stud



Concealed-head Standoff



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



Clinching profile may vary.

All dimensions are in inches.

	Thread Size	Type		Thread Code	Length Code "L" ±.015 (Length code is in 16ths of an inch)						Min. Sheet Thick-ness	Blind Mounting Hole Dia. +.003 -.000	Min. Depth of Blind Hole (1)	A (Shank) Max.	E ±.010	C Max.	Min. Dist. Hole ℄ To Edge	Max. Hole In Attached Parts
		Aluminum	Stainless Steel		.250	.375	.500	.625	.750	1.00								
UNIFIED	.112-40 (#4-40)	CHA	CHC	440	4	6	8	10	12	—	.062	.172	.043	.041	.205	.171	.156	.135
		CFHA	CFHC								.093		.075	.071				
	.138-32 (#6-32)	CHA	CHC	632	4	6	8	10	12	16	.062	.213	.043	.041	.250	.212	.188	.160
		CFHA	CFHC								.093		.075	.071				
	.164-32 (#8-32)	CHA	CHC	832	4	6	8	10	12	16	.062	.290	.043	.041	.328	.289	.219	.185
		CFHA	CFHC								.093		.075	.071				
	.190-32 (#10-32)	CHA	CHC	032	—	6	8	10	12	16	.062	.312	.043	.041	.350	.311	.250	.210
		CFHA	CFHC								.093		.075	.071				

All dimensions are in millimeters.

	Thread Size x Pitch	Type		Thread Code	Length Code "L" ±0.4 (Length code is in millimeters)							Min. Sheet Thick-ness	Blind Mounting Hole Dia. +0.08	Min. Depth of Blind Hole (1)	A (Shank) Max.	E ±0.25	C Max.	Min. Dist. Hole ℄ To Edge	Max. Hole In Attached Parts
		Aluminum	Stainless Steel																
METRIC	M3 x 0.5	CHA	CHC	M3	6	8	10	12	16	20	—	1.6	4.37	1.1	1.04	5.21	4.35	4	3.6
		CFHA	CFHC									2.4		1.91	1.8				
	M4 x 0.7	CHA	CHC	M4	6	8	10	12	16	20	25	1.6	7.37	1.1	1.04	8.33	7.35	5.6	4.6
		CFHA	CFHC									2.4		1.91	1.8				
	M5 x 0.8	CHA	CHC	M5	—	—	10	12	16	20	25	1.6	7.93	1.1	1.04	8.89	7.9	6.4	5.6
		CFHA	CFHC									2.4		1.91	1.8				

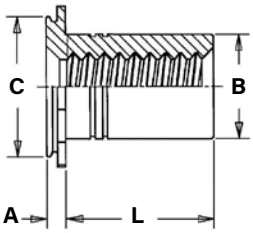
(1) Blind holes may be deeper than minimums except where sheet material is at or near minimum thickness. Fasteners should always be installed so the flange is flush with the surface of the sheet.

PART NUMBER DESIGNATION

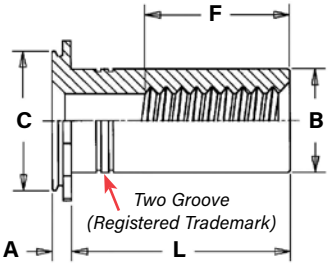
CH	A	- 632	- 6	
CFH	A	- 632	- 6	
CH	C	- 632	- 6	
CFH	C	- 632	- 6	
↓	↓	↓	↓	
Type	Material	Thread Code	Length Code	

CSS™ AND CSOS™ STAINLESS STEEL STANDOFFS

Style #1



Style #2



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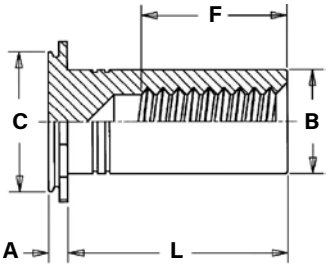

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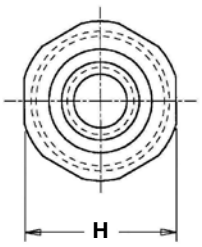

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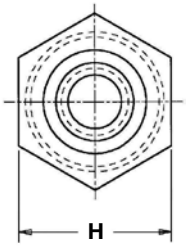


Clinching profile may vary.

All dimensions are in inches.

	Thread Size	Type: Stainless Steel	Thread Code	Length Code "L" +.002 -.005 (Length code is in 16ths of an inch): .187	.250	.312	.375	.500	.625	.750	1.00	Min. Sheet Thickness	Blind Mounting Hole Dia. +.003 -.000	Min. Depth of Blind Hole (4)	Min. Depth Full Thread F	A (Shank) Max.	B Max. (5)	C Max.	H Nom.	Min. Dist. Hole ℄ To Edge
UNIFIED	.112-40 (#4-40)	CSS	440	3(1)	4(2)	5(2)	6(2)	8(3)	10(3)	12(3)	16(3)	.062	.213	.043	.188	.041	.165	.212	.250	.188
		CSOS										.093		.075		.072				
	.138-32 (#6-32)	CSS	632	3(1)	4(1)	5(2)	6(2)	8(3)	10(3)	12(3)	16(3)	.062	.290	.043	.250	.041	.213	.289	.312	.219
		CSOS										.093		.075		.072				
	.164-32 (#8-32)	CSS	832	3(1)	4(1)	5(2)	6(2)	8(3)	10(3)	12(3)	16(3)	.062	.312	.043	.250	.041	.245	.311	.344	.250
		CSOS										.093		.075		.072				
	.190-32 (#10-32)	CSS	032	3(1)	4(1)	5(1)	6(1)	8(2)	10(3)	12(3)	16(3)	.062	.344	.043	.375	.041	.290	.343	.375	.281
		CSOS										.093		.075		.072				
	.250-20 (1/4-20)	CSS	0420	3(1)	4(1)	5(1)	6(1)	8(2)	10(2)	12(3)	16(3)	.062	.390	.043	.375	.041	.354	.389	.438	.375
		CSOS										.093		.075		.072				

All dimensions are in millimeters.

	Thread Size x Pitch	Type: Stainless Steel	Thread Code	Length Code "L" +0.05 -0.13 (Length code is in millimeters)								Min. Sheet Thickness	Blind Mounting Hole Diameter +0.08	Min. Depth of Blind Hole (4)	Min. Depth Full Thread F	A (Shank) Max.	B Max. (5)	C Max.	H Nom.	Min. Dist. Hole ℄ To Edge
METRIC	M3 x 0.5	CSS	M3	4(1)	6(1)	8(2) 8(3)	10(3)	12(3)	16(3)	20(3)	25(3)	1.6	5.41	1.1	5	1.04	4.2	5.39	6.35	4.8
		CSOS										2.4		1.91		1.83				
	M4 x 0.7	CSS	M4	4(1)	6(1)	8(2)	10(2) 10(3)	12(3)	16(3)	20(3)	25(3)	1.6	7.92	1.1	6.5	1.04	6.23	7.9	8.74	6.4
		CSOS										2.4		1.91		1.83				
	M5 x 0.8	CSS	M5	4(1)	6(1)	8(1)	10(2)	12(2)	16(3)	20(3)	25(3)	1.6	8.74	1.1	9.6	1.04	7.37	8.72	9.53	7.2
		CSOS										2.4		1.91		1.83				
	M6 x 1	CSOS	M6	4(1)	6(1)	8(1)	10(2)	12(2)	16(3)	20(3)	25(3)	2.4	9.9	1.91	9.6	1.83	9	9.89	11.11	9.5

(1) ***Style #1.*** *Minimum thread length is equal to barrel length "L". Screw might not pass through shank end. Screws with lengths exceeding "L" should not be used or they may cause "jacking-out" of standoff from the sheet.*

(2) ***Style #2.*** *Screw might not pass through unthreaded end. Screws with lengths exceeding "L" should not be used or they may cause "jacking-out" of standoff from the sheet.*

(3) ***Style #3.*** *Blind.*

(4) *Blind mounting holes may be deeper than minimums except where sheet material is at or near minimum thickness. Fasteners should always be installed so the flange is flush with the surface of the sheet.*

(5) *If standoff is used as a bushing, the hole in attached part must not exceed "B" plus .020" / 0.51 mm.*

PART NUMBER DESIGNATION

CS	S	- 632	- 6	
CSO	S	- 632	- 6	
↓	↓	↓	↓	
Type	Material	Thread Code	Length Code	

MATERIAL AND FINISH SPECIFICATIONS

Type	Threads		Fastener Materials		Finish		For Use In Sheet Hardness (1)	
	External, ASME B1.1 2A / ASME B1.13M, 6g	Internal, ASME B1.1 2B / ASME B1.13M, 6H	Aluminum	300 Series Stainless Steel	No Finish	Passivated and/or tested per ASTM A380	HRB 70 / HB 125 or Less	HRB 50 / HB 89 or Less
CHA	▪		▪		▪			▪
CFHA	▪		▪		▪			▪
CHC	▪			▪		▪	▪	
CFHC	▪			▪		▪	▪	
CSS		▪		▪		▪	▪	
CSOS		▪		▪		▪	▪	

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

INSTALLATION

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

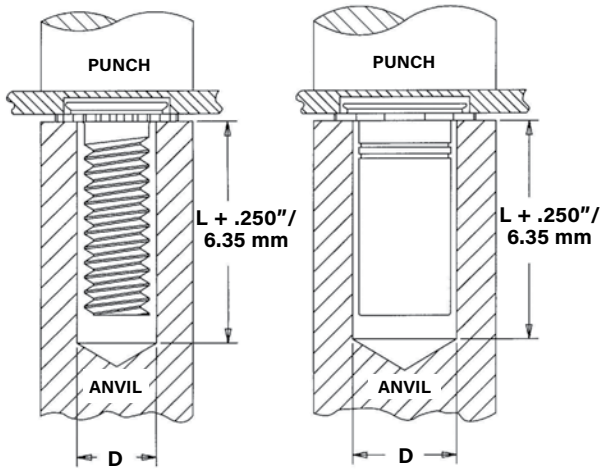
** End mills available from PennEngineering. See chart below.*

INSTALLATION NOTES

- For best results we recommend using a PEMSERTER® press for installation of PEM self-clinching fasteners. Please check our website for more information.
- Visit the Animation Library on our website to view the installation process for select products.

CFHA, CFHC, CHC, CHA
Concealed-head studs

CSOS, CSS
Concealed-head standoffs



END MILL INFORMATION

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

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

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

PEMSERTER® Installation Tooling

All dimensions are in inches.

	Type	Thread Code	D +.003 -.000	Punch Part Number	Anvil Part Number
UNIFIED	CHA / CHC / CFHA / CFHC	440	.127	975200048	970200006300
	CHA / CHC / CFHA / CFHC	632	.139	975200048	970200007300
	CHA / CHC / CFHA / CFHC	832	.179	975200048	970200008300
	CHA / CHC / CFHA / CFHC	032	.205	975200048	970200009300
	CSS / CSOS	440	.170	975200048	970200014300
	CSS / CSOS	632	.218	975200048	970200015300
	CSS / CSOS	832	.250	975200048	970200016300
	CSS / CSOS	032	.295	975200048	970200017300
	CSS / CSOS	0420	.358	975200048	970200018300

All dimensions are in millimeters.

	Type	Thread Code	D +0.08	Punch Part Number	Anvil Part Number
METRIC	CHA / CHC / CFHA / CFHC	M3	3.4	975200048	970200229300
	CHA / CHC / CFHA / CFHC	M4	4.4	975200048	970200019300
	CHA / CHC / CFHA / CFHC	M5	5.4	975200048	970200020300
	CSS / CSOS	M3	4.33	975200048	970200014300
	CSS / CSOS	M4	6.36	975200048	970200016300
	CSS / CSOS	M5	7.5	975200048	970200017300
	CSS / CSOS	M6	9.13	975200048	970200018300

PERFORMANCE DATA(1)

UNIFIED

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

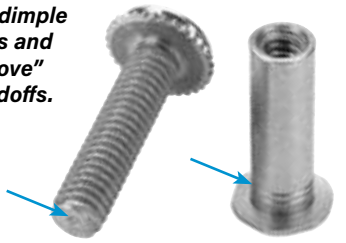
METRIC

Type	Thread Code	Max. Tightening Torque Ref. (N-m)	Test Sheet Material: Cold-rolled steel Installation (kN)	Cold-rolled steel Pullout (N)	5052-H34 Aluminum Installation (kN)	5052-H34 Aluminum Pullout (N)
Concealed-head Standoffs						
CSS	M3	0.55	17.8	1330	12.5	890
	M4	2	21.3	1775	17.8	1200
	M5	3.6	24.5	2000	22.2	1290
CSOS	M3	.55	19.2	1465	12.9	975
	M4	2	23.6	1955	17.8	1335
	M5	3.6	26.7	2665	22.2	1775
	M6	7.2	28.9	2860	24.4	1915
Concealed-head Studs						
CHC	M3	0.55	8	1065	6.2	575
	M4	2	17.8	1200	12.5	800
	M5	3.6	22.2	1290	17.8	930
CFHC	M3	0.55	8.9	1065	6.7	890
	M4	2	14.7	1955	13.3	1375
	M5	3.6	17.8	3020	15.6	1600
CHA	M3	0.3	(2)	(2)	6.2	555
	M4	1.2	(2)	(2)	12.5	645
	M5	2.16	(2)	(2)	17.8	755
CFHA	M3	0.3	(2)	(2)	6.7	845
	M4	1.2	(2)	(2)	13.3	1065
	M5	2.16	(2)	(2)	15.6	1330

(1) 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) Not recommended.

Look for the PEM® dimple trademark on studs and the PEM® "two groove" trademark on standoffs.



Fastener drawings and models are available at www.pemnet.com

All PEM® products meet our stringent quality standards. If you require additional industry or other specific quality certifications, special procedures and/or part numbers are required. Please contact your local sales office or representative for further information.

Regulatory compliance information is available in Technical Support section of our website. Specifications subject to change without notice. See our website for the most current version of this bulletin.

PennEngineering®

PEM®

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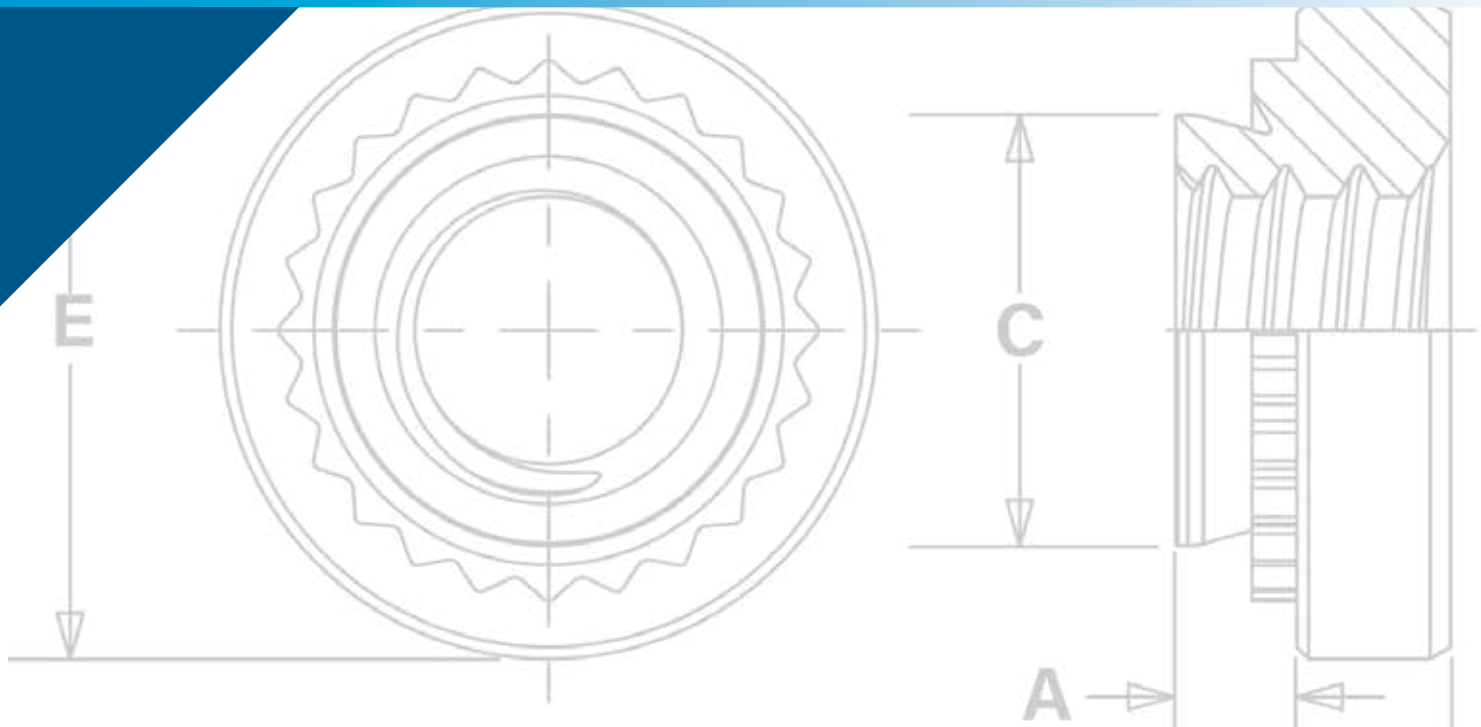
Bulletin CL-1016
Rev. 118

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

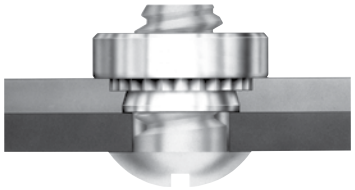
CL™

SELF-CLINCHING NUTS



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.

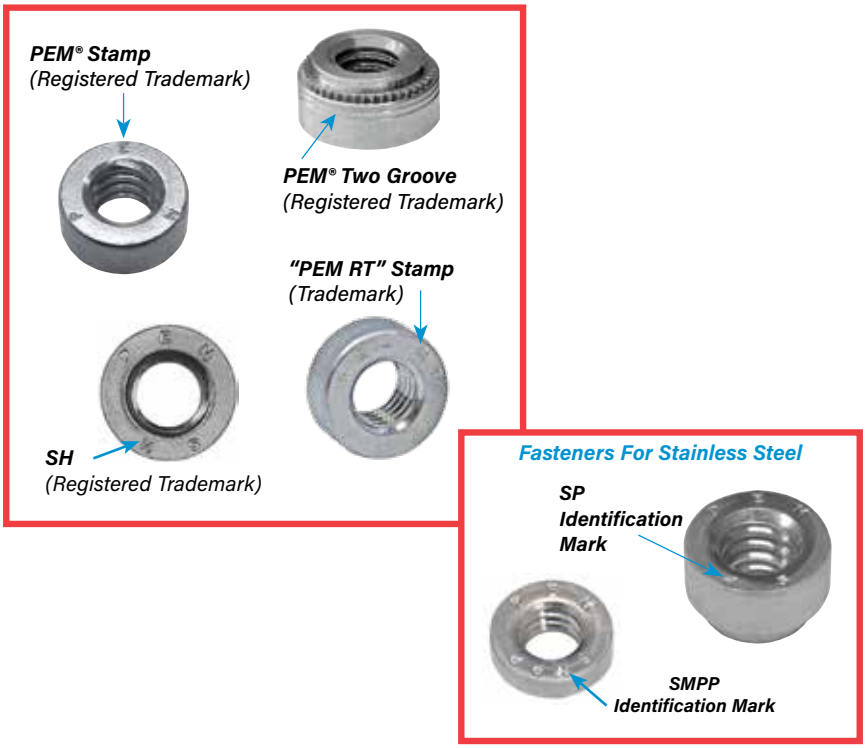


S™/SS™/CLA™/CLS™/CLSS™ nuts provide load-bearing threads in thin sheets with high pushout and torque-out resistance - **PAGES 4 and 5**	
SP™, PEM 300® nuts provide strong load-bearing threads in stainless steel sheets as thin as .030"/0.8 mm - **PAGES 4 and 5**	
S-RT™ free-running locknuts are free-running until clamp load is induced. A modified thread angle on the loaded flank provides the vibration resistant locking feature- **PAGE 6**	NEW! 
SL™ self-locking nuts are designed with a unique and economical TRI-DENT® locking feature, meeting 3 cycle locking performance requirements - **PAGE 7**	

H™ (non-locking) and HNL™ (locking) nuts have threads that provide high pushout and torque-out resistance - **PAGE 8**	
SH™ hard panel nuts install into thin, harder, high strength steel materials - **PAGE 8**	
SMPS™/SMPP™ nuts are for thinner sheet/close-to-edge applications - **PAGE 9**	
Material and finish specifications - PAGE 9	
Installation - PAGES 10 and 11	
Performance data - PAGES 12 - 15	

Many PEM self-clinching nuts in this bulletin are dimensionally equivalent to nuts manufactured to NASM45938/1 specifications. Consult our Marketing department for a complete Military Specifications and National Aerospace Standards guide (Bulletin NASM) on our website.

Screws for use with PEM self-clinching locking fasteners should be Class 3A/4h fit or no smaller than Class 2A/6g.



PEM® SELF-CLINCHING NUT SELECTOR GUIDE

PEM Nut Type	Application Requires:									
	Recommended panel material (1)	Thinnest sheet .025" / 0.64 mm	Locking Threads		Closest centerline-to-edge distance	Superior corrosion resistance	Recommended for installation into stainless steel sheets	Compatible with aluminum anodizing	Harder high strength steel material	Non-magnetic
			Free-running	Prevailing torque						
S/SS/H	steel / aluminum									
CLS/CLSS	steel / aluminum					▪				▪
CLA	aluminum					▪		▪		▪
SP	stainless steel					▪	▪			▪
S-RT	steel / aluminum		▪							
SL	steel / aluminum			▪						
HNL	aluminum			▪						
SH	hardened alloy steel								▪	
SMPS	steel / aluminum	▪			▪	▪				▪
SMPP	stainless steel	▪			▪	▪	▪			▪

(1) Describes "best practice" for typical applications. Fasteners can be used in other panel materials not listed here if specified hardness limits are met. In all cases "For Use in Sheet Hardness" information is shown in chart on page 9.

Thread Mask

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

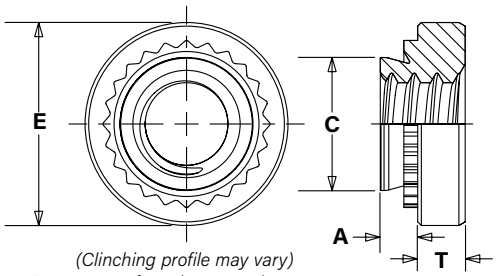
"BC" suffix will be added to part number to designate Blu-Coat thread mask to fastener.

Fastener drawings and models are available at www.pemnet.com

- S/SS nuts are recommended for use in steel or aluminum sheets HRB 80 / HB 150 or less.
- CLS/CLSS nuts are recommended for use in steel or aluminum sheets HRB 70 / HB 125 or less.
- SP nuts are recommended for use in stainless steel sheets HRB 90 / HB 192 or less.
- CLA nuts are recommended for use in steel or aluminum sheets HRB 50 / HB 82 or less.

PART NUMBER DESIGNATION

S		–	632	–	1	ZI
SS		–	032	–	1	ZI
CL	S	–	632	–	1	
CLS	S	–	032	–	1	
S	P	–	632	–	1	
CL	A	–	632	–	1	
↓ Type	↓ Material Code		↓ Thread Size Code		↓ Shank Code	↓ Finish



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

S™/SS™/CLS™/CLSS™/SP™ NUTS

All dimensions are in inches.

UNIFIED

Thread Size	Type – Fastener Material: Carbon Steel	Type – Fastener Material: Stainless Steel	Type – Fastener Material: Hardened Stainless Steel	Thread Code	Shank Code	A (Shank) Max.	Rec. Min. Sheet Thickness (1)	Hole Size In Sheet +.003 –.000	C Max.	E ±.010	T ±.010	Min. Dist. Hole ℄ To Edge
.086-56 (#2-56)	S	CLS	SP	256	0	.030	.030	.166	.165	.250	.070	.19
					1	.038	.040					
					2	.054	.056					
.099-48 (#3-48)	S	CLS	—	348	0	.030	.030	.166	.165	.250	.070	.19
					1	.038	.040					
					2	.054	.056					
.112-40 (#4-40)	S	CLS	SP	440	0	.030	.030	.166	.165	.250	.070	.19
					1	.038	.040					
					2	.054	.056					
					3 (2)	.087	.090					
.138-32 (#6-32)	S	CLS	SP	632	0	.030	.030	.1875	.187	.280	.070	.22
					1	.038	.040					
					2	.054	.056					
					3 (2)	.087	.090					
.164-32 (#8-32)	S	CLS	SP	832	0	.030	.030	.213	.212	.310	.090	.27
					1	.038	.040					
					2	.054	.056					
					3 (2)	.087	.090					
.190-24 (#10-24)	SS	CLSS	SP	024	0	.030	.030	.250	.249	.340	.090	.28
					1	.038	.040					
					2	.054	.056					
					3 (2)	.087	.090					
.190-32 (#10-32)	SS	CLSS	SP	032	0	.030	.030	.250	.249	.340	.090	.28
					1	.038	.040					
					2	.054	.056					
					3 (2)	.087	.090					
.216-24 (#12-24)	S	CLS	—	1224	1	.038	.040	.277	.276	.370	.130	.31
					2	.054	.056					
					3	.087	.090					
.250-20 (1/4-20)	S (3)	CLS	SP	0420	0	.045	.047	.344	.343	.440	.170	.34
					1	.054	.056					
					2	.087	.090					
					3 (2)	.120	.125					
.250-28 (1/4-28)	S	CLS	—	0428	1	.054	.056	.344	.343	.440	.170	.34
					2	.087	.090					
					3	.120	.125					
.313-18 (5/16-18)	S (3)	CLS	SP	0518	1	.054	.056	.413	.412	.500	.230	.38
					2	.087	.090					
					3 (2)	.120	.125					
.313-24 (5/16-24)	S	CLS	SP	0524	1	.054	.056	.413	.412	.500	.230	.38
					2	.087	.090					
					3 (2)	.120	.125					
.375-16 (3/8-16)	S	CLS	SP	0616	1	.087	.090	.500	.499	.560	.270	.44
					2	.120	.125					
					3 (2)	.235	.250					
.375-24 (3/8-24)	S	CLS	SP	0624	1	.087	.090	.500	.499	.560	.270	.44
					2	.120	.125					
					3 (2)	.235	.250					
.438-20 (7/16-20)	S	—	—	0720	1	.087	.092	.562	.561	.687	.311	.562
.500-13 (1/2-13)	S	CLS	—	0813	1	.120	.125	.656	.655	.810	.360	.63
					2	.235	.250					
.500-20 (1/2-20)	S	CLS	—	0820	1	.120	.125					
					2	.235	.250					

(1) For maximum performance, we recommend that you use the maximum shank length for your sheet thickness.
(2) This shank code not available for SP nuts.
(3) This thread size S nut, with a -2 shank code, can be installed successfully without the need to pre punch a mounting hole in a separate operation. See page 15 for more information.

The increased hardness of stainless steel panels requires careful consideration when installing self-clinching fasteners. See page 16 or refer to Fastener Installation Dos and Don'ts on our web site.

S™/SS™/CLS™/CLSS™/SP™ NUTS

(See drawing at top of page 4) All dimensions are in millimeters.

	Thread Size	Type: Fastener Material: Carbon Steel	Type: Fastener Material: Stainless Steel	Type: Fastener Material: 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	S	CLS	SP	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	S	CLS	SP	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	S	CLS	SP	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	S	CLS	—	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	S	CLS	SP	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	SS	CLSS	SP	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	S (3)	CLS	SP	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	S (3)	CLS	SP	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	S	CLS	SP	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	S	—	—	M12	1	3.05	3.18	17	16.95	20.57	8.5	16

CLA™ NUTS

(See drawing at top of page 4) All dimensions are in inches.

	Thread Size	Type: Fastener Material: Aluminum	Thread Code	Shank Code	A (Shank) Max.	Min. Sheet Thickness (1)	Hole Size In Sheet ±.003 -.000	C Max.	E ±.010	T ±.010	Min. Dist. Hole ℄ To Edge
UNIFIED	.086-56 (#2-56)	CLA	256	1	.038	.040	.166	.165	.250	.070	.19
				2	.054	.056					
	.112-40 (#4-40)	CLA	440	1	.038	.040	.1875	.187	.250	.090	.22
				2	.054	.056					
	.138-32 (#6-32)	CLA	632	1	.038	.040	.213	.212	.280	.090	.27
				2	.054	.056					
	.164-32 (#8-32)	CLA	832	1	.038	.040	.234	.233	.310	.130	.28
				2	.054	.056					
	.190-24 (#10-24)	CLA	024	1	.038	.040	.296	.295	.370	.160	.31
				2	.054	.056					
	.190-32 (#10-32)	CLA	032	1	.038	.040	.296	.295	.370	.160	.31
				2	.054	.056					
	.250-20 (1/4-20)	CLA	0420	1	.054	.056	.344	.343	.440	.170	.34
				2	.087	.091					
				3	.120	.125					

(See drawing at top of page 4) All dimensions are in millimeters.

	Thread Size x Pitch	Type: Fastener Material: Aluminum	Thread Code	Shank Code	A (Shank) Max.	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	CLA	M2	1	0.98	1	4.22	4.2	6.35	1.5	4.8
				2	1.38	1.4					
	M3 x 0.5	CLA	M3	1	0.98	1	4.75	4.73	6.35	2	5.6
				2	1.38	1.4					
	M3.5 x 0.6	CLA	M3.5	1	0.98	1	5.41	5.38	7.11	2	6.9
				2	1.38	1.4					
	M4 x 0.7	CLA	M4	1	0.98	1	5.94	5.92	7.8	3	7.1
				2	1.38	1.4					
	M5 x 0.8	CLA	M5	1	0.98	1	7.52	7.49	9.4	3.8	7.9
				2	1.38	1.4					
	M6 x 1	CLA	M6	1	1.38	1.4	8.75	8.73	11.18	4.08	8.6
				2	2.21	2.3					

(1) For maximum performance, we recommend that you use the maximum shank length for your sheet thickness.

(2) This shank code not available for SP nuts.

(3) This thread size S nut, with a -2 shank code, can be installed successfully without the need to pre punch a mounting hole in a separate operation. See page 15 for more information.

NEW!

S-RT™ FREE-RUNNING LOCKNUTS

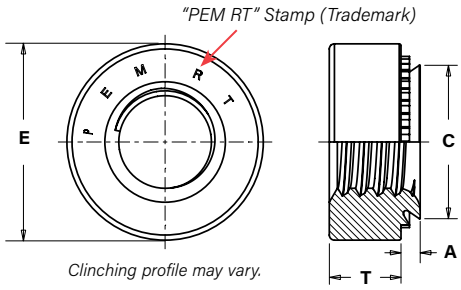
Free-running locking feature allows screw to turn freely until clamp load is applied. If the tightening force is removed, these nuts no longer provide any torsional resistance to rotation.

- Resistant to vibrational loosening.
- Back side of panel is flush or sub-flush for screw installation.
- Locking feature reusability is not affected by number of on/off cycles.
- Uses same mounting hole and installation tooling as standard S™ nuts.
- Recommended for use in steel or aluminum sheets HRB 80 / HB 150 or less.

PART NUMBER DESIGNATION

S - RT632 - 1 ZI

Type | Thread Size Code | Shank Code | Finish



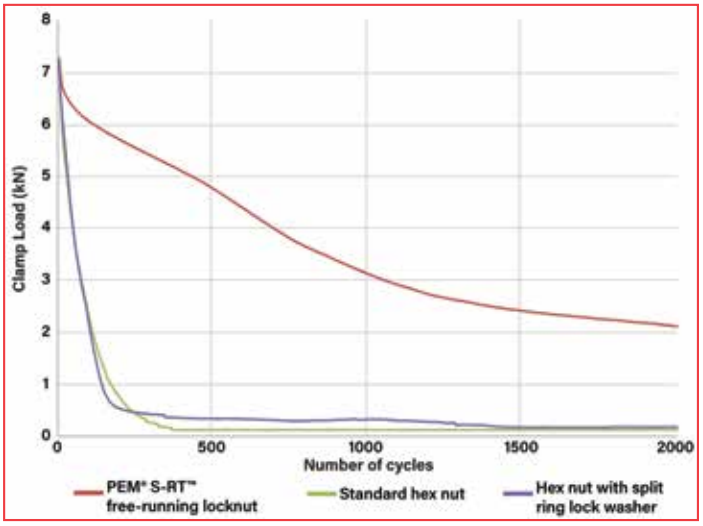
All dimensions are in inches.

	Thread Size	Type	Thread Code	Shank Code	A (Shank) Max.	Rec. Min. Sheet Thickness (1)	Hole Size In Sheet +.003 -.000	C Max.	E ±.010	T ±.010	Min. Dist Hole ℄ To Edge
UNIFIED	.112-40 (#4-40)	S	RT440	0	.030	.030	.166	.165	.250	.070	.19
				1	.038	.040					
				2	.054	.056					
	.138-32 (#6-32)	S	RT632	0	.030	.030	.1875	.187	.280	.070	.22
				1	.038	.040					
				2	.054	.056					
	.164-32 (#8-32)	S	RT832	0	.030	.030	.213	.212	.310	.090	.27
				1	.038	.040					
				2	.054	.056					
	.190-32 (#10-32)	SS	RT032	0	.030	.030	.250	.249	.340	.090	.28
				1	.038	.040					
				2	.054	.056					
	.250-20 (1/4-20)	S	RT0420	0	.045	.047	.344	.343	.440	.170	.34
				1	.054	.056					
				2	.087	.090					
	.313-18 (5/16-18)	S	RT0518	1	.054	.056	.413	.412	.500	.230	.38
				2	.087	.090					

All dimensions are in millimeters

	Thread Size x Pitch	Type	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	M3 x 0.5	S	RTM3	0	0.77	0.8	4.22	4.2	6.35	1.5	4.8
				1	0.97	1					
				2	1.38	1.4					
	M4 x 0.7	S	RTM4	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	SS	RTM5	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	S	RTM6	00	0.89	0.92	8.75	8.73	11.18	4.08	8.6
				0	1.15	1.2					
				1	1.38	1.4					
				2	2.21	2.29					

The graph represents the clamp load of the joint versus the amount of cycles during transverse vibration testing for an S-RT™ free-running locknut, a standard hex nut and a hex nut with a split ring lock washer.



Testing conditions:
Transverse vibration testing.
M6 thread size nuts, average of 30 pieces.
Clamp load applied using metric property class 10.9 screws.
Nuts tested until loss of clamp load or 2,000 cycles is reached.

Details on PEM® RT™ vibration resistant thread technology can be found on our web site at:
https://www.pemnet.com/files/design_info/techsheets/RT_Thread_Form.pdf

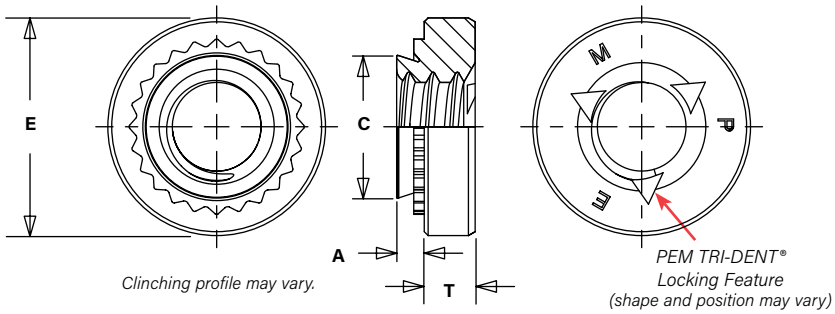
SL™ TRI-DENT® PREVAILING TORQUE LOCKNUTS

Prevailing torque locking feature produces friction between threads of mated components thereby increasing the force needed to tighten as well as loosen the nut. Prevailing torque locknuts provide essentially the same torque value regardless of the amount axial load applied.

- 3 cycle locking performance. (1)
- Resistant to vibrational loosening.
- Back side of panel is flush or sub-flush for screw installation.
- Uses same mounting hole and installation tooling as standard S™ nuts.
- Recommended for use in sheets HRB 80 / HB 150 or less.

PART NUMBER DESIGNATION

S	L	-	632	-	1	ZI
Type	Locking		Thread Size Code		Shank Code	Finish



Clinching profile may vary.

PEM TRI-DENT® Locking Feature (shape and position may vary)

All dimensions are in inches.

	Thread Size	Type	Thread Code	Shank Code	A (Shank) Max.	Min. Sheet Thickness	Hole Size In Sheet +.003 -.000	C Max.	E ±.010	T ±.010	Min. Dist. Hole ℄ To Edge
UNIFIED	.112-40 (#4-40)	SL	440	1	.038	.040	.166	.165	.250	.070	.19
				2	.054	.056					
	.138-32 (#6-32)	SL	632	1	.038	.040	.1875	.187	.280	.070	.22
				2	.054	.056					
	.164-32 (#8-32)	SL	832	1	.038	.040	.213	.212	.310	.090	.27
				2	.054	.056					
	.190-32 (#10-32)	SL	032	1	.038	.040	.250	.249	.340	.090	.28
				2	.054	.056					
	.250-20 (1/4-20)	SL	0420	1	.054	.056	.344	.343	.440	.170	.34
				2	.087	.091					
	.313-18 (5/16-18)	SL	0518	1	.054	.056	.413	.412	.500	.230	.38
				2	.087	.091					
	.375-16 (3/8-16)	SL	0616	1	.087	.090	.500	.499	.625	.270	.44
				2	.120	.125					

All dimensions are in millimeters.

	Thread Size x Pitch	Type	Thread Code	Shank Code	A (Shank) Max.	Min. Sheet Thickness	Hole Size In Sheet +0.08	C Max.	E ±0.25	T ±0.25	Min Dist Hole ℄ To Edge
METRIC	M3 x 0.5	SL	M3	1	0.98	1	4.22	4.2	6.35	1.5	4.8
				2	1.38	1.4					
	M3.5 x 0.6	SL	M3.5	1	0.98	1	4.75	4.73	7.11	1.5	5.6
				2	1.38	1.4					
	M4 x 0.7	SL	M4	1	0.98	1	5.41	5.38	7.87	2	6.9
				2	1.38	1.4					
	M5 x 0.8	SL	M5	1	0.98	1	6.35	6.33	8.64	2	7.1
				2	1.38	1.4					
	M6 x 1	SL	M6	1	1.38	1.4	8.75	8.73	11.18	4.08	8.6
				2	2.21	2.3					
	M8 x 1.25	SL	M8	1	1.38	1.4	10.5	10.47	12.7	5.47	9.7
				2	2.21	2.3					
	M10 x 1.5	SL	M10	1	2.21	2.29	14	13.97	17.35	7.48	13.5
				2	3.05	3.18					

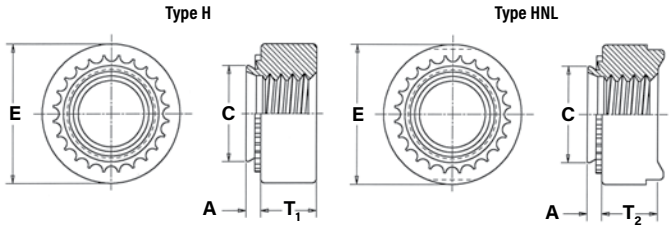
(1) Achieved using steel socket head cap screws,180 ksi / property class 12.9 with standard finish of thermal oxide and light oil.

H™ NUTS AND HNL™ PREVAILING TORQUE LOCKNUTS

- Meets torque requirements for IFI 100/107 Grade B (unified) and ANSI B18.16.1M (metric) locknuts.
- H nut is recommended for use in sheets HRB 80 / HB 150 or less.
- HNL nut is recommended for use in sheets HRB 60 / HB 107 or less.

PART NUMBER DESIGNATION

H			-	0616	ZI
H	N	L	-	0616	LZ
↓	↓	↓		↓	↓
Type	Not Heat-treated	Locking		Thread Size Code	Finish



Clinching profile may vary.

All dimensions are in inches.

	Thread Size	Type: Non-Locking	Type: Self-Locking (1)	Thread Code	A (Shank) Max.	Min. Sheet Thickness	Hole Size In Sheet +.005 -.000	C Max.	E ±.010	T_1 Non-locking ±.005	T_2 Self-locking ±.010	Min. Dist. Hole ℄ To Edge
UNIFIED	.250-20 (1/4-20)	–	HNL	0420	.058	.058	.344	.343	.500	.189		.380
	.313-18 (5/16-18)	–	HNL	0518	.058	.058	.413	.412	.575	.240		.420
	.375-16 (3/8-16)	H	HNL	0616	.058	.058	.500	.499	.650	.300		.480

All dimensions are in millimeters.

	Thread Size x Pitch	Type: Non-Locking	Type: Self-Locking (1)	Thread Code	A (Shank) Max.	Min. Sheet Thickness	Hole Size In Sheet +0.13	C Max.	E ±0.25	T_1 Non-locking ±0.13	T_2 Self-locking ±0.25	Min. Dist. Hole ℄ To Edge
METRIC	M6 x 1	–	HNL	M6	1.48	1.48	8.75	8.72	12.7	5		10
	M8 x 1.25	–	HNL	M8	1.48	1.48	10.5	10.47	14.6	6.3		11
	M10 x 1.5	H	HNL	M10	1.48	1.48	12.7	12.67	16.5	7.9		12

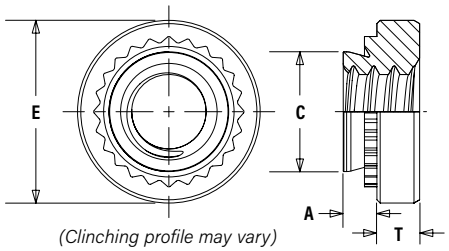
(1) During installation, the projections on the heads of HNL self-locking nuts may be flattened. This is not detrimental in any way and will not affect self-locking or self-clinching performance.

SH™ HARD PANEL NUTS

- Installs into harder, high strength steel materials (high strength steel sheets up to 975MPa tensile strength).
- Hardened nut material provides stronger thread strength.

PART NUMBER DESIGNATION

SH	-	0420	-	1	X
↓		↓		↓	↓
Type		Thread Size Code		Shank Code	Finish



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

All dimensions are in inches.

	Thread Size	Type: Fastener Material: Hardened Alloy Steel	Thread Code	Shank Code	A (Shank) Max.	Min. Sheet Thickness (1)	Hole Size in Sheet +.003 -.000	C Max.	E ±.010	T ±.010	Min. Dist Hole ℄ To Edge
UNIFIED	.250-20 (1/4-20)	SH	0420	1	.054	.056	.344	.343	.440	.170	.34
				2	.087	.090					
	.313-18 (5/16-18)	SH	0518	1	.054	.056	.413	.412	.500	.230	.38
				2	.087	.090					
	.375-16 (3/8-16)	SH	0616	1	.087	.090	.500	.499	.623	.270	.44

All dimensions are in millimeters.

	Thread Size x Pitch	Type: Fastener Material: Hardened Alloy Steel	Thread Code	Shank Code	A (Shank) Max.	Min. Sheet Thickness (1)	Hole Size in Sheet +0.08	C Max.	E ±0.25	T ±0.25	Min. Dist Hole ℄ To Edge
METRIC	M6 x 1	SH	M6	1	1.38	1.4	8.75	8.73	11.18	4.08	8.6
				2	2.21	2.29					
	M8 x 1.25	SH	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	SH	M10	1	2.21	2.29	14	13.97	17.35	7.48	13.5

(1) For maximum performance, we recommend that you use the maximum shank length for your sheet thickness.

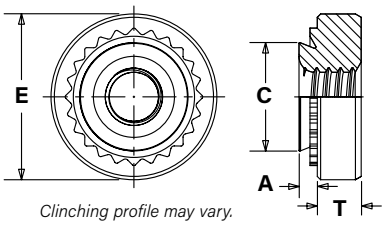
SMPS™/SMPP™ NUTS

- Installs into sheets as thin as .025"/ 0.64 mm.
- Reduced outer dimensions and thinner sheet capabilities compared to Type S/SP thread sizes.
- SMPS nut is recommended for use in sheets HRB 70 / HB 125 or less.
- SMPP nut is recommended for use in stainless steel sheets HRB 90 / HB 192 or less.

PART NUMBER DESIGNATION

SMPS - 440
SMPP - 440

Type — Thread Size Code



Clinching profile may vary.

All dimensions are in inches.

	Thread Size	Type: Fastener Material: Stainless Steel	Type: Fastener Material: Hardened Stainless Steel	Thread Code	A (Shank) Max.	Min. Sheet Thickness	Hole Size In Sheet +.003 -.000	C Max.	E ±.010	T ±.010	Min. Dist. Hole ℄ To Edge: SMPS	Min. Dist. Hole ℄ To Edge: SMPP
UNIFIED	.086-56 (#2-56)	SMPS	SMPP	256	.024	.025	.136	.135	.220	.065	.15	.16
	.112-40 (#4-40)	SMPS	SMPP	440	.024	.025	.166	.165	.220	.065	.17	.20
	.138-32 (#6-32)	SMPS	SMPP	632	.024	.025	.187	.186	.252	.065	.20	.22

All dimensions are in millimeters.

	Thread Size x Pitch	Type: Fastener Material: Stainless Steel	Type: Fastener Material: Hardened Stainless Steel	Thread Code	A (Shank) Max.	Min. Sheet Thickness	Hole Size In Sheet +0.08	C Max.	E ±0.25	T ±0.25	Min. Dist. Hole ℄ To Edge: SMPS	Min. Dist. Hole ℄ To Edge: SMPP
METRIC	M2.5 x 0.45	SMPS	SMPP	M2.5	0.61	0.64	3.8	3.79	5.6	1.4	3.7	3.9
	M3 x 0.5	SMPS	SMPP	M3	0.61	0.64	4.24	4.22	5.6	1.4	4.3	5.1
	M3.5 x 0.6	SMPS	SMPP	M3.5	0.61	0.64	4.75	4.73	6.4	1.4	5.1	5.5

MATERIAL AND FINISH SPECIFICATIONS

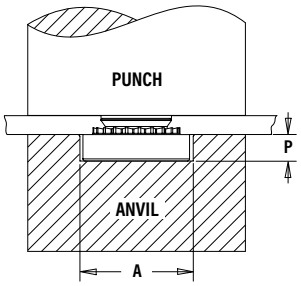
	Threads			Fastener Materials						Standard Finishes				Optional Finish	For use in Sheet Hardness (8)					
Type	Internal ASME B1.1 2B/ASME B1.13M, 6H	Meets Torque Requirements for IFI 100/ 107 Grade B (unified) and ANSI B18. 16.1M (metric) Locknuts	3 Cycle Locking Perfor- mance	Hardened Carbon Steel	300 Series Stainless Steel	Aluminum	Carbon Steel	Hardened Alloy Steel	Age Hardened A286 Stainless Steel	Passivated and/or Tested per ASTM A380	Zinc Plated, 5µm, Colorless (4)	Zinc Plated, 5µm, Colorless Plus Sealant/ Lubricant (4)	No Finish (3)	Zinc Plated, 5µm, Yellow (4)	HRC 30/ HB 277 or less	HRB 90/ HB 192 or less	HRB 80/ HB 150 or less	HRB 70/ HB 125 or less	HRB 60/ HB 107 or less	HRB 50/ HB 82 or less
S	▪			▪							▪			▪			▪			
SS	▪			▪							▪			▪			▪			
CLS	▪				▪					▪								▪		
CLSS	▪				▪					▪								▪		
CLA	▪					▪							▪ (2)							▪
H	▪			▪							▪		▪				▪			
SP	▪								▪	▪						▪				
S-RT	▪			▪							▪			▪			▪			
SL	▪		▪	▪							▪						▪			
HNL	▪	▪					▪					▪							▪	
SH	▪							▪					▪ (5)		▪					
SMPS	▪				▪					▪								▪		
SMPP	▪								▪	▪						▪				
Part number codes for finishes										None	ZI	LZ	X	ZC						

(1) Special order with additional charge.
(2) Part numbers for aluminum nuts have no plating suffix.
(3) Unplated threads are sized to accept a basic go gauge after .00025" / 0.0064 mm plating.
(4) See PEM Technical Support section of our web site for related plating standards and specifications.
(5) With rust preventative oil.
(6) Panel material should be in the annealed condition.
(7) Fasteners should not be installed adjacent to bends or other highly cold-worked areas.
(8) HRB - Hardness Rockwell "B" Scale. HRC - Hardness Rockwell "C" Scale. HB - Hardness Brinell.

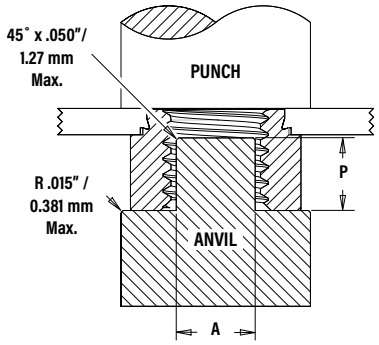
INSTALLATION - S™/SL™/SMPS™/SS™/CLS™/CLSS™/CLA™/S-RT™/H™/HNL™ NUTS

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 #2-56 to 5/16 and M2 to M8



PROTRUSION ANVIL (1)
CLS/S/SL/S-RT Thread Sizes 3/8, 7/16, 1/2, M10 and M12
H/HNL Thread Sizes 5/16, 3/8, M8 and M10



PEMSERTER® Installation Tooling

CLS™/CLSS™/S™/SS™/S-RT™ NUTS

	Thread Code	Anvil Dimensions (in.) A ±.002	Anvil Dimensions (in.) P ±.005	Anvil Part Number	Punch Part Number
UNIFIED	256/440/RT440	.267	.045	975200034	975200048
	632/RT632	.298	.045	975200035	975200048
	832/RT832	.330	.070	975200036	975200048
	024/032/RT032	.361	.070	975200037	975200048
	1224	.415	.080	975200786300	975200048
	0420/RT0420	.454	.150	975200038	975200048
	0518/RT0518	.517	.200	975200039	975200048
	0616	.280	.250	975200045 (1)	975200048
	0720	.338	.295	8020361 (1)	975200901400
	0813	.375	.345	975200900300 (1)	975200901400

	Thread Code	Anvil Dimensions (mm) A ±0.05	Anvil Dimensions (mm) P ±0.13	Anvil Part Number	Punch Part Number
METRIC	M2/M3/RTM3	6.78	1.14	975200034	975200048
	M3.5	7.57	1.14	975200035	975200048
	M4/RTM4	8.38	1.78	975200036	975200048
	M5/RTM5	9.17	1.78	975200037	975200048
	M6/RTM6	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

CLA™ NUTS

	Thread Code	Anvil Dimensions (in.) A ±.002	Anvil Dimensions (in.) P ±.005	Anvil Part Number	Punch Part Number
UNIFIED	256/440	.267	.045	975200034	975200048
	632	.298	.045	975200035	975200048
	832	.330	.070	975200036	975200048
	024/032	.392	.140	975200782300	975200048
	0420	.454	.150	975200038	975200048

	Thread Code	Anvil Dimensions (mm) A ±0.05	Anvil Dimensions (mm) P ±0.13	Anvil Part Number	Punch Part Number
METRIC	M3	6.78	1.14	975200034	975200048
	M3.5	7.57	1.14	975200035	975200048
	M4	8.38	1.78	975200036	975200048
	M5	9.96	3.56	975200782300	975200048
	M6	11.53	3.81	975200038	975200048

(1) Large nut anvils use protrusion to locate part instead of counterbore.

SL™ NUTS

	Thread Code	Anvil Dimensions (in.) A ±.002	Anvil Dimensions (in.) P ±.005	Anvil Part Number	Punch Part Number
UNIFIED	440	.267	.045	975200034	975200048
	632	.298	.045	975200035	975200048
	832	.330	.070	975200036	975200048
	032	.361	.070	975200037	975200048
	0420	.454	.150	975200038	975200048
	0518	.515	.200	975200039	975200048
	0616	.280	.250	975200045 (1)	975200048

	Thread Code	Anvil Dimensions (mm) A ±0.05	Anvil Dimensions (mm) P ±0.13	Anvil Part Number	Punch Part Number
METRIC	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

SMPS™ NUTS

	Thread Code	Anvil Dimensions (in.) A ±.002	Anvil Dimensions (in.) P ±.005	Anvil Part Number	Punch Part Number
UNIFIED	256/440	.236	.045	975200904300	975200048
	632	.267	.045	975200034	975200048

	Thread Code	Anvil Dimensions (mm) A ±0.05	Anvil Dimensions (mm) P ±0.13	Anvil Part Number	Punch Part Number
METRIC	M2.5/M3	5.99	1.14	975200904300	975200048
	M3.5	6.78	1.14	975200034	975200048

H™/HNL™ NUTS

	Thread Code	Anvil Dimensions (in.) A ±.002	Anvil Dimensions (in.) P ±.005	Anvil Part Number	Punch Part Number
UNIFIED	0420	.517	.200	975200039	975200048
	0518	.220	.250	975200783300 (1)	975200048
	0616	.280	.250	975201240 (1)	8003076

	Thread Code	Anvil Dimensions (mm) A ±0.05	Anvil Dimensions (mm) P ±0.13	Anvil Part Number	Punch Part Number
METRIC	M6	13.13	5.08	975200039	975200048
	M8	5.59	6.35	975200783300 (1)	975200048
	M10	7.62	6.35	8005682 (1)	8003076

INSTALLATION - SP™/SMPP™ NUTS (1)

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.

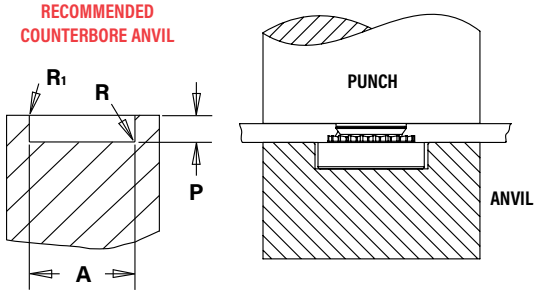
PEMSERTER® Installation Tooling

SP™ NUTS

	Thread Code	Anvil Dimensions (in.) A ±.002	P +.000 -.001	R Max.	R1 +.005	Anvil Part Number	Punch Part Number
UNIFIED	440	.255	.064	.010	.005	8012821	975200048
	632	.286	.064	.010	.005	8012822	
	832	.317	.082	.010	.005	8012823	
	024/032	.348	.082	.010	.005	8012824	
	0420	.443	.163	.010	.005	8012825	8003076
	0518	.505	.230	.010	.005	8015359	
	0616/0624	.570	.263	.010	.005	8015863	

	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	

RECOMMENDED COUNTERBORE ANVIL



SMPP™ NUTS

	Thread Code	Anvil Dimensions (in.) A ±.002	P +.000 -.001	R Max.	R1 +.005	Anvil Part Number	Punch Part Number
UNIFIED	256	.223	.060	.010	.005	8020023	975200048
	440	.233	.060	.010	.005	8021386	
	632	.255	.060	.010	.005	8020024	

	Thread Code	Anvil Dimensions (mm) A ±0.05	P -0.03	R Max.	R1 +0.13	Anvil Part Number	Punch Part Number
METRIC	M2.5	5.66	1.27	0.25	0.13	8020025	975200048
	M3	5.9	1.27	0.25	0.13	8021474	
	M3.5	6.48	1.27	0.25	0.13	8020026	

(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.*

INSTALLATION - SH™ NUTS

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.

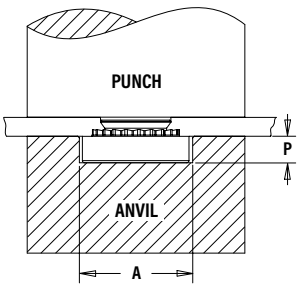
PEMSERTER® Installation Tooling

	Thread Code	Anvil Dimensions (in.) A ±.002	P ±.005	Anvil Part Number	Punch Part Number
UNIFIED	0420	.454	.150	975200038	975200048
	0518	.517	.200	975200039	975200048
	0616	.280	.250	8020084(1)	9752000901400

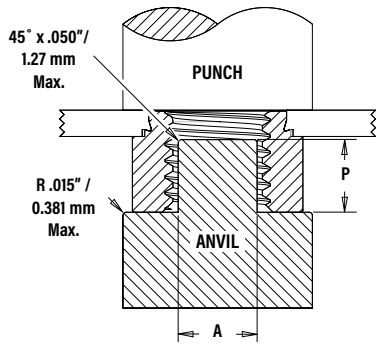
	Thread Code	Anvil Dimensions (mm) A ±0.05	P ±0.13	Anvil Part Number	Punch Part Number
METRIC	M6	11.53	3.81	975200038	975200048
	M8	13.13	5.08	975200039	975200048
	M10	7.62	6.35	8005682(1)	975200901400

(1) Large nut anvils use protrusion to locate part instead of counterbore.

COUNTERBORE ANVIL
Thread Sizes 1/4-20 to 5/16 and M5 to M8



PROTRUSION ANVIL
Thread Sizes 3/8 and M10



INSTALLATION NOTES

- For best results we recommend using a PEMSERTER® press for installation of PEM self-clinching fasteners. Please check our website for more information.
- Visit the Animation Library on our website to view the installation process for select products.

PERFORMANCE DATA[1]

S™/CLS™/CLSS™ NUTS

	Type	Thread Code	Shank Code	Test Sheet Material	Installation (lbs.)	Pushout (lbs.)	Torque-out (in. lbs.)
UNIFIED	S CLS	256 348 440	0	5052-H34 Aluminum	1500-2000	63	8
			1			90	10
			2			170	13
			3			170	13
			0	Cold-rolled Steel	2500-3500	105	13
			1			125	15
			2			230	18
			3			230	18
	S CLS	632	0	5052-H34 Aluminum	2500-3000	63	16
			1			95	17
			2			190	22
			3			190	22
			0	Cold-rolled Steel	3000-6000	110	16
			1			130	20
			2			275	28
			3			275	28
	S CLS	832	0	5052-H34 Aluminum	2500-3000	68	21
			1			105	23
			2			220	35
			3			220	35
			0	Cold-rolled Steel	4000-6000	110	26
			1			145	35
			2			285	45
			3			285	45
	SS CLSS	024 032	0	5052-H34 Aluminum	2500-3500	68	26
			1			110	32
			2			190	50
			3			225	50
			0	Cold-rolled Steel	4000-9000	120	32
			1			180	40
			2			320	60
			3			320	60
	S CLS	1224	1	5052-H34 Aluminum	2500-6500	120	63
			2			285	70
			3			285	70
			1	Cold-rolled Steel	5000-6500	200	74
			2			350	80
			3			350	80
	S CLS	0420	0	5052-H34 Aluminum	4000-7000	220	70
			1			360	90
			2				125
			3				
			0	Cold-rolled Steel	6000-8000	315	115
			1			400	150
			2				
			3				
	S CLS	0518 0524	1	5052-H34 Aluminum	4000-7000	380	120
			2				160
			3				
			1	Cold-rolled Steel	6000-8000	420	165
			2				180
			3				
	S CLS	0616 0624	1	5052-H34 Aluminum	5000-8000	400	270
			2				
			3				
			1	Cold-rolled Steel	7000-11000	460	320
			2				
			3				
	S	0720	1	Cold-rolled Steel	9000-13000	450	340
	S CLS	0813 0820	1	5052-H34 Aluminum	7000-9000	475	350
			2				
			1	Cold-rolled Steel	10000-15000	1050	735
			2				

	Type	Thread Code	Shank Code	Test Sheet Material	Installation (kN)	Pushout (N)	Torque-out (N-m)
METRIC	S CLS	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
	S CLS	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
	S CLS	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
	SS CLSS	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			1112	6.8
	S CLS	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				
	S CLS	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
	S CLS	M10	1	5052-H34 Aluminum	22-36	1760	32.7
			2				
			1	Cold-rolled Steel	32-50	2020	36.2
			2				
	S	M12	1	5052-H34 Aluminum	31-40	2113	39.5
			1	Cold-rolled Steel	44-67	4670	83.1

CLA™ NUTS

	Type	Thread Code	Shank Code	Test Sheet Material	Installation (lbs.)	Pushout (lbs.)	Torque-out (in. lbs.)
UNIFIED	CLA	440	1	5052-H34 Aluminum	800 - 1500	100	6
			2	5052-H34 Aluminum	800 - 1500	120	9
	CLA	632	1	5052-H34 Aluminum	1000 - 1500	110	21
			2	5052-H34 Aluminum	1200 - 1700	155	24
	CLA	832	1	5052-H34 Aluminum	1000 - 1500	120	27
			2	5052-H34 Aluminum	1300 - 1800	170	29
	CLA	032	1	5052-H34 Aluminum	1700 - 2200	130	34
			2	5052-H34 Aluminum	2600 - 3100	200	50

	Type	Thread Code	Shank Code	Test Sheet Material	Installation (kN)	Pushout (N)	Torque-out (N-m)
METRIC	CLA	M2	2	5052-H34 Aluminum	3.56 - 6.67	500	0.4
	CLA	M3	1	5052-H34 Aluminum	3.56 - 6.67	445	0.68
			2	5052-H34 Aluminum	3.56 - 6.67	534	1.02
	CLA	M4	1	5052-H34 Aluminum	4.45 - 6.67	534	3.05
			2	5052-H34 Aluminum	5.78 - 8.01	756	3.27

(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.

PERFORMANCE DATA

S-RT™ NUTS

	Type	Thread Code	Shank Code	Test Sheet Material	Installation (lbs.)	Pushout (lbs.)	Torque-out (in. lbs.)
UNIFIED	S	RT440	0	5052-H34 Aluminum	1500-2000	63	8
			1			90	10
			2			170	13
			0	Cold-rolled Steel	2500-3500	105	13
			1			125	15
			2			230	18
	S	RT632	0	5052-H34 Aluminum	2500-3000	63	16
			1			95	17
			2			190	22
			0	Cold-rolled Steel	3000-6000	110	16
			1			130	20
			2			275	28
	S	RT832	0	5052-H34 Aluminum	2500-3000	68	21
			1			105	23
			2			220	35
			0	Cold-rolled Steel	4000-6000	110	26
			1			145	35
			2			285	45
	SS	RT032	0	5052-H34 Aluminum	2500-3500	68	26
			1			110	32
			2			190	50
			0	Cold-rolled Steel	4000-9000	120	32
			1			180	40
			2			320	60
	S	RT0420	0	5052-H34 Aluminum	4000-7000	220	70
			1			360	90
			2				125
			0	Cold-rolled Steel	6000-8000	315	115
			1			400	150
			2				
	S	RT0518	1	5052-H34 Aluminum	4000-7000	380	120
			2				160
			1	Cold-rolled Steel	6000-8000	420	165
			2				180

	Type	Thread Code	Shank Code	Test Sheet Material	Installation (kN)	Pushout (N)	Torque-out (N·m)
METRIC	S	RTM3	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
	S	RTM4	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
	SS	RTM5	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			1112	6.8
	S	RTM6	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				

SL™ NUTS

	Thread Code	Shank Code	Prevailing Torque Specifications (1)		Test Sheet Material					
					5052-H34 Aluminum			Cold-rolled Steel		
			Max. Torque (1st thru 3rd) (in. lbs.)	Min. Torque (1st thru 3rd) (in. lbs.)	Installation (lbs.)	Pushout (lbs.)	Torque-out (in. lbs.)	Installation (lbs.)	Pushout (lbs.)	Torque-out (in. lbs.)
UNIFIED	440	1	5.75	0.4	1500 - 2000	90	10	2500 - 3500	125	15
		2				170	13		230	18
	632	1	10.5	0.8	2500 - 3000	95	17	3000 - 6000	130	20
		2				190	22		275	28
	832	1	18	1.2	2500 - 3000	105	23	4000 - 6000	145	35
		2				220	35		285	45
	032	1	21	1.65	2500 - 3000	110	32	4000 - 9000	180	40
		2				190	50		250	60
	0420	1	35	3.75	4000 - 7000	360	90	6000 - 9000	400	150
		2				360	125		400	150
	0518	1	53	4.75	4000 - 7000	380	120	6000 - 8000	420	165
		2				380	160		420	180
	0616	1	95	6.3	5000 - 8000	400	270	7000 - 11000	460	320
		2				400	270		460	320

	Thread Code	Shank Code	Prevailing Torque Specifications (1)		Test Sheet Material					
					5052-H34 Aluminum			Cold-rolled Steel		
			Max. Torque (1st thru 3rd) (N·m)	Min. Torque (1st thru 3rd) (N·m)	Installation (kN)	Pushout (N)	Torque-out (N·m)	Installation (kN)	Pushout (N)	Torque-out (N·m)
METRIC	M3	1	0.67	0.04	6.7 - 8.9	400	1.13	11.2 - 15.6	550	1.7
		2				750	1.47		1010	2.03
	M3.5	1	1.2	0.08	11.2 - 13.5	400	1.92	13.4 - 26.7	570	2.3
		2				840	2.5		1210	2.3
	M4	1	2.1	0.13	11.2 - 13.4	470	2.6	18 - 27	645	4
		2				970	4		1250	5.1
	M5	1	2.4	0.18	11.2 - 15.6	480	3.6	18 - 38	800	4.5
		2				845	5.7		1112	6.8
	M6	1	4	0.3	18 - 32	1580	10.2	27 - 36	1760	17
		2				1580	14.1		1760	17
	M8	1	6	0.5	18 - 32	1570	13.6	27 - 36	1870	18.7
		2				1570	18.1		1870	20.3
	M10	1	12	0.8	22 - 36	1760	32.7	32 - 50	2020	36.2
		2				1760	32.7		2020	36.2

(1) 3 cycle locking performance. Max. on / Min. off torque for 1st through 3rd cycles.

PERFORMANCE DATA

SP™ NUTS

UNIFIED

Type	Thread Code	Shank Code	Test Sheet Material	Installation (lbs.)	Pushout (lbs.)	Torque-out (in. lbs.)
SP	256	0	304 Stainless Steel	8000	130	14
		1		9000	165	17
		2		10000	290	18
SP	440	0	304 Stainless Steel	8000	130	14
		1		9000	165	17
		2		10000	290	18
SP	632	0	304 Stainless Steel	8500	140	18
		1		9500	170	24
		2		10500	340	28
SP	832	0	304 Stainless Steel	9000	145	30
		1		10000	180	37
		2		11000	360	45
SP	024/032	0	304 Stainless Steel	9500	180	35
		1		10500	230	45
		2		11500	400	60
SP	0420	1	304 Stainless Steel	13500	450	150
		2		13500	600	170
SP	0518	1	304 Stainless Steel	14800	470	170
		2		14800	750	250
SP	0524	1	304 Stainless Steel	14800	470	170
		2		14800	750	250
SP	0616/0624	1	304 Stainless Steel	16000	600	300
		2		20000	700	370

METRIC

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

H™ NUTS

UNIFIED

Type	Thread Code	Test Sheet Thickness and Sheet Material	Installation (lbs.)	Pushout (lbs.)	Torque-out (in. lbs.)
H	0616	.090" 5052-H34 Aluminum	4900	380	190
		.088" Cold-rolled Steel	7400	460	240

METRIC

Type	Thread Code	Test Sheet Thickness and Sheet Material	Installation (kN)	Pushout (N)	Torque-out (N·m)
H	M10	2.29 mm 5052-H34 Aluminum	22	1760	21.5
		2.24 mm Cold-rolled Steel	33	2020	27.1

SH™ NUTS

UNIFIED

Thread Code	Shank Code	Test Sheet Thickness and Material (in.)	Sheet Hardness HRC	Installation (lbs.)	Pushout (lbs.)	Torque-out (in. lbs.)
0420	1	.098" S700MC	23	11700	950	150
	2	.098" S700MC	23	12900	1000	170
0518	1	.098" S700MC	23	12600	1050	265
	2	.098" S700MC	23	12900	1100	265
0616	1	.098" S700MC	23	15300	1200	500

METRIC

Thread Code	Shank Code	Test Sheet Thickness and Material (mm)	Sheet Hardness HRC	Installation (kN)	Pushout (N)	Torque-out (N·m)
M6	1	2.5 mm S700MC	23	52.1	4200	17
	2	2.5 mm S700MC	23	57.4	4500	19
M8	1	2.5 mm S700MC	23	56.1	4600	30
	2	2.5 mm S700MC	23	57.4	4900	30
M10	1	2.5 mm S700MC	23	71.2	5400	56

PERFORMANCE DATA

SMPS™ NUTS

	Type	Thread Code	Test Sheet Material: Cold-rolled Steel — Installation (lbs.)	Pushout (lbs.)	Torque-out (in. lbs.)
UNIFIED	SMPS	256	1500	35	8
	SMPS	440	1800	60	12
	SMPS	632	2000	65	14

	Type	Thread Code	Test Sheet Material: Cold-rolled Steel — Installation (kN)	Pushout (N)	Torque-out (N·m)
METRIC	SMPS	M2.5	6.7	156	1.13
	SMPS	M3	8	267	1.35
	SMPS	M3.5	8.8	289	1.58

SMPP™ NUTS

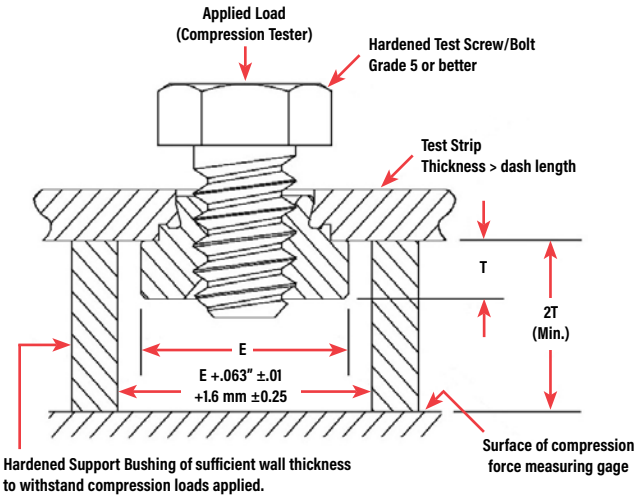
	Thread Code	Max. Tightening Torque (in. lbs.) (1) (2)	Test Sheet Thickness and Material (in.)	Sheet Hardness HRB	Installation (lbs.) (3)	Pushout (lbs.)	Torque-out (in. lbs.)	Tensile Strength (lbs.) (1) (2)	Test Bushing Hole Size For Pull Thru Tests (in.)
UNIFIED	256	7.5	.029" 304 Stainless Steel	89	4500	50	10	640	.104
	440	13	.029" 304 Stainless Steel	89	4500	75	15	850	.112
	632	20	.029" 304 Stainless Steel	89	6000	75	20	1020	.138

	Thread Code	Max. Tightening Torque (N·m) (1) (2)	Test Sheet Thickness and Material (mm)	Sheet Hardness HRB	Installation (kN) (3)	Pushout (N)	Torque-out (N·m)	Tensile Strength (kN) (1) (2)	Test Bushing Hole Size For Pull Thru Tests (mm)
METRIC	M2.5	1.05	0.7 mm 304 Stainless Steel	89	20	200	1.35	3.05	3
	M3	1.5	0.7 mm 304 Stainless Steel	89	20	300	1.85	3.63	3.5
	M3.5	2.1	0.7 mm 304 Stainless Steel	89	27	300	1.9	4.25	4

(1) Head size is adequate to ensure failure in threaded area when tested with industry standard tensile bushing diameter.
(2) Tightening torque shown will induce preload of 70% of minimum axial strength assuming K or nut factor is equal to 0.20. In some applications tightening torque may need to be adjusted based on the actual K value. All tightening torques shown are based on 180 ksi/ Property Class 12.9 screws. For lower strength screws the tightening torque is proportionately less. For example, for 120 ksi screws, torque is 67% of value shown. For 900 MPa screws (Property Class 9.8) torque value is 74% of value shown.
(3) Installation controlled by proper cavity depth in installation tooling.

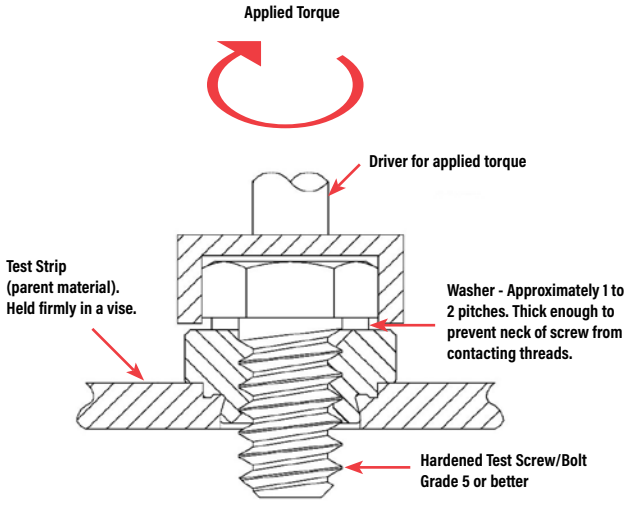
PUSHOUT TEST

Pushout tests shall be performed from the grip or shank side of the installed fastener. An axial load shall be applied to the fastener as shown using a hardened test screw, while evenly supporting the test strip around the fastener. The typical position rate is .25" / 6.35 mm per minute. Dimensions are identified per PEM Bulletins where "E" equals head diameter and "T" (or "L") equals head height. The pushout force is measured using a force or compression tester with a range that will cover the expected forces.



TORQUE-OUT TEST

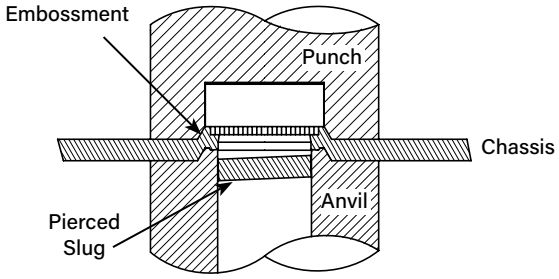
Torque-out tests shall be performed from the shoulder or head side of the installed fastener. Torque shall be applied to the fastener in the manner illustrated, using a hardened test screw and washer, while firmly holding the test strip. Test screws should be of sufficient tensile strength to resist thread stripping. A minimum of two screw threads must extend beyond the fastener.



SELF-PIERCING, SELF-CLINCHING TOOLING

Specialized PEMSERTER® tooling allows installation of S self-clinching nuts into aluminum sheets (sizes 1/4", 5/16", M6 and M8) in one pierce/press operation.

For more information, see our web site for Tech Sheet PEM® - Ref / Self-piercing, self-clinching tooling. To locate, simply type "self-piercing" in site search box.



SELF-CLINCHING NUT INSTALLATION DOS AND DON'TS

"DOS"

DO select the proper fastener material to meet corrosion requirements.
DO make certain that panel material is in the annealed condition.
DO make certain that hole punch is kept sharp to minimize work hardening around hole.
DO provide mounting hole of specified size for each fastener.
DO maintain the hole punch diameter to no greater than +.001"/.025 mm over the minimum recommended mounting hole for type SP nuts into stainless steel sheets.
DO install fastener into hole punch side of sheet.
DO make certain that shank (or pilot) is within hole before applying installation force.
DO make certain that fastener is not installed adjacent to bends or other highly cold-worked areas.
DO apply squeezing force between parallel surfaces.
DO utilize recommended installation tooling when installing fasteners.
DO apply sufficient force to totally embed clinching ring around entire circumference and to bring shoulder squarely in contact with sheet.

"DON'TS"

DON'T attempt to install any self-clinching nut other than types SP/SMPP fasteners into a stainless steel sheet.
DON'T install steel or stainless steel fasteners in aluminum panels before anodizing or finishing.
DON'T deburr mounting holes on either side of sheet before installing fasteners – deburring will remove metal required for clinching fastener into sheet.
DON'T install fastener closer to edge of sheet than minimum edge distance indicated by manufacturer – unless a special fixture is used to restrict bulging of sheet edge.
DON'T over-squeeze. It will crush the head, distort threads, and buckle the sheet. Approximate installation forces are listed in performance data tables. Use this info as a guide. Be certain to determine optimum installation force by test prior to production runs.
DON'T attempt to insert fastener with a hammer blow – under any circumstances. A hammer blow won't permit the sheet metal to flow and develop an interlock with the fastener's contour.
DON'T install screw in the head side of fastener. Install from opposite side so that the fastener load is toward sheet. The clinching force is designed only to hold the fastener during handling and to resist torque during assembly.
DON'T install fastener on pre-painted side of panel.

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PennEngineering®

PEMSERT® SELF-CLINCHING FLUSH FASTENERS

BULLETIN F

PEM®

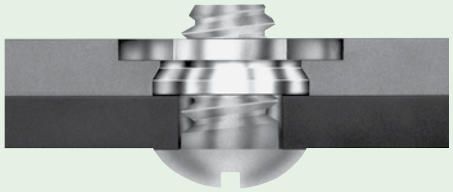
1216

PEMSERT® SELF-CLINCHING FLUSH FASTENERS

PEMSERT® self-clinching flush nuts are designed to be installed into sheets as thin as .060"/1.5 mm.

These Types F and F4™ fasteners are ideal for applications where a thin sheet requires threads stronger than a tapped hole but still must remain flat, with no protrusions on either surface, enhancing the functional and cosmetic qualities of the entire assembly.

PEMSERT® flush nuts are installed easily by squeezing them into a round hole in metal sheets. They can be installed before bending and forming to provide threads in places which would be inaccessible for installation after chassis are formed. The hexagonal head along with the proven PEM® self-clinching design ensures high axial and torsional strength.



Type F4™ flush nuts are specifically designed to be installed into stainless steel sheets.

PEMSERT® Type F fasteners can be ordered to conform to US NASM45938/4 specifications.*

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

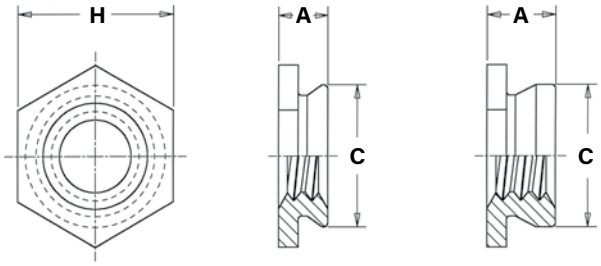
Fastener drawings and models are available at www.pemnet.com

A NOTE ABOUT FASTENERS FOR STAINLESS STEEL PANELS

In order for self-clinching fasteners to work properly, the fastener must be harder than the sheet into which it is being installed. In the case of stainless steel panels, fasteners made from 300 Series Stainless Steel do not meet this hardness criteria. It is for this reason that 400 series fasteners are offered (Type F4). 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.
- Requires non-magnetic fasteners.
- 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.



Clinching profile may vary.

PART NUMBER DESIGNATION

F - 632 - 1

F 4 - 632 - 1

Type | Material Code | Thread Size Code | Shank Code

All dimensions are in inches.

	Thread Size	Type: Fastener Material: Stainless Steel	Type: Fastener Material: Heat-Treated Stainless Steel	Thread Code	Shank Code	A (Shank) Max.	Sheet Thickness	Hole Size In Sheet +.003 -.000	C Max.	H Nom.	Min. Dist. Hole ℄ To Edge
UNIFIED	.086-56 (#2-56)	F	F4	256	1	.060	.060 - .091	.172	.171	.188	.23
					2	.090	.091 Min.				
	.112-40 (#4-40)	F	F4	440	1	.060	.060 - .091	.172	.171	.188	.23
					2	.090	.091 Min.				
	.138-32 (#6-32)	F	F4	632	1	.060	.060 - .091	.213	.212	.250	.27
					2	.090	.091 Min.				
	.164-32 (#8-32)	F	F4	832	1	.060	.060 - .091	.290	.289	.312	.28
					2	.090	.091 Min.				
	.190-32 (#10-32)	F	F4	032	1	.060	.060 - .091	.312	.311	.343	.31
					2	.090	.091 Min.				
	.250-20 (1/4-20)	F	F4	0420	3	.120	.125 - .156	.344	.343	.375	.34
					4	.151	.156 - .187				
					5	.182	.187 Min.				

All dimensions are in millimeters.

	Thread Size	Type: Fastener Material: 300 Series Stainless Steel	Type: Fastener Material: Heat-Treated Stainless Steel	Thread Code	Shank Code	A (Shank) Max.	Sheet Thickness	Hole Size In Sheet +0.08	C Max.	H Nom.	Min. Dist. Hole ℄ To Edge
METRIC	M2 x 0.4	F	F4	M2	1	1.53	1.53 - 2.32	4.37	4.35	4.8	6
					2	2.3	2.32 Min.				
	M2.5 x 0.45	F	F4	M2.5	1	1.53	1.53 - 2.32	4.37	4.35	4.8	6
					2	2.3	2.32 Min.				
	M3 x 0.5	F	F4	M3	1	1.53	1.53 - 2.32	4.37	4.35	4.8	6
					2	2.3	2.32 Min.				
	M4 x 0.7	F	F4	M4	1	1.53	1.53 - 2.32	7.37	7.35	7.9	7.2
					2	2.3	2.32 Min.				
	M5 x 0.8	F	F4	M5	1	1.53	1.53 - 2.32	7.92	7.9	8.7	8
					2	2.3	2.32 Min.				
	M6 x 1	F	F4	M6	3	3.05	3.18 - 3.96	8.74	8.72	9.5	8.8
					4	3.84	3.96 - 4.75				
					5	4.63	4.75 Min.				

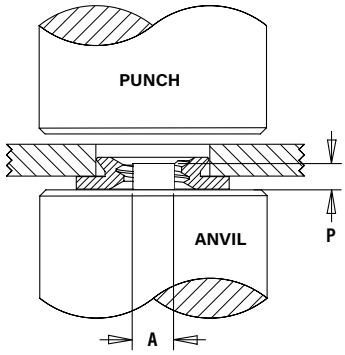
MATERIAL AND FINISH SPECIFICATIONS

	Threads	Fastener Materials		Standard Finish	For Use in Sheet Hardness: (1)	
Type	Internal, ASME B1.1, 2B / ASME B1.13M, 6H	300 Series Stainless Steel	Heat-Treated 400 Series Stainless Steel	Passivated and/or Tested Per ASTM A380	HRB 88 / HB 183 or less	HRB 70 / HB 125 or less
F	▪	▪		▪		▪
F4	▪		▪	▪	▪	
Part Number Code For Finishes				None		

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

INSTALLATION

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



PEMSERTER® Installation Tooling

Thread Code	Anvil Dimensions A +.002 -.000"/+0.05mm	Anvil Dimensions P ±.005"/0.13mm	Anvil Part Number	Punch Part Number
256/M2/M2.5	.060" / 1.52mm	.050" / 1.27mm	8006193	975200048
440/M3	.077" / 1.96mm	.050" / 1.27mm	975200040	
632	.092" / 2.34mm	.050" / 1.27mm	975200041	
832/M4	.124" / 3.15mm	.050" / 1.27mm	975200042	
032/M5	.139" / 3.53mm	.050" / 1.27mm	975200043	
0420/M6	.186" / 4.72mm	.100" / 2.54mm	975200044	

PERFORMANCE DATA(1)

Type F

	Thread Code	Shank Code	Axial Tensile Strength (lbs.) (2)	Rec. Tightening Torque (3) (in. lbs.)	Test Sheet Material: 5052-H34 Aluminum Installation (lbs.)	5052-H34 Aluminum Pushout (lbs.)	Cold-rolled Steel Installation (lbs.)	Cold-rolled Steel Pushout (lbs.)
UNIFIED	256	1	130	1.50	2000	150	3000	200
		2						
	440	1	165	2.50	2000	150	3000	200
		2						
	632	1	190	3.50	2000	200	3600	200
		2						
	832	1	230	5.25	2000	240	4000	240
		2						
	032	1	280	7.50	2500	240	5000	240
		2						
	0420	3	1035	36	3500	640	6000	840
		4						
		5						

	Thread Code	Shank Code	Axial Tensile Strength (kN) (2)	Rec. Tightening Torque (3) (N·m)	Test Sheet Material: 5052-H34 Aluminum Installation (kN)	5052-H34 Aluminum Pushout (N)	Cold-rolled Steel Installation (kN)	Cold-rolled Steel Pushout (N)
METRIC	M2	1	0.57	0.16	8.9	665	13.3	890
		2						
	M2.5	1	0.68	0.23	8.9	665	13.3	890
		2						
	M3	1	0.85	0.36	8.9	665	13.3	890
		2						
	M4	1	1	0.58	8.9	1068	17.8	1068
		2						
	M5	1	1.3	0.88	11.1	1068	22.2	1068
		2						
	M6	3	4.5	3.7	15.6	2847	26.7	3736
		4						
		5						

Type F4

	Thread Code	Shank Code	Axial Tensile Strength (lbs.) (2)	Rec. Tightening Torque (3) (in. lbs.)	Test Sheet Material: 300 Series Stainless Steel Installation (lbs.)	300 Series Stainless Steel Pushout (lbs.)
UNIFIED	256	1	130	1.50	7200	270
		2				
	440	1	165	2.50	7200	270
		2				
	632	1	190	3.50	7200	290
		2				
	832	1	230	5.25	9000	450
		2				
	032	1	280	7.50	9000	450
		2				
	0420	3	1035	36	14000	1000
		4				
		5				

	Thread Code	Shank Code	Axial Tensile Strength (kN) (2)	Rec. Tightening Torque (3) (N·m)	Test Sheet Material: 300 Series Stainless Steel Installation (kN)	300 Series Stainless Steel Pushout (N)
METRIC	M2	1	0.57	0.16	32	1200
		2				
	M2.5	1	0.68	0.23	32	1200
		2				
	M3	1	0.85	0.36	32	1200
		2				
	M4	1	1	0.58	40	2000
		2				
	M5	1	1.3	0.88	40	2000
		2				
	M6	3	4.5	3.7	65	4500
		4				
		5				

(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) Failure occurs in screw stripping using a 60 ksi screw and the shortest shank length fastener.

(3) Torque values shown will produce a preload of 70% of axial tensile strength with nut factor "k" equal to .2. Threads may strip or head of the F nut may bend and/or fail if screw is over-torqued beyond these values or if actual k value is less than .2.

All PEM® products meet our stringent quality standards. If you require additional industry or other specific quality certifications, special procedures and/or part numbers are required. Please contact your local sales office or representative for further information.

Regulatory compliance information is available in Technical Support section of our website. Specifications subject to change without notice. See our website for the most current version of this bulletin.

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PennEngineering®

BULLETIN

FE™

MINIATURE SELF-CLINCHING FASTENERS

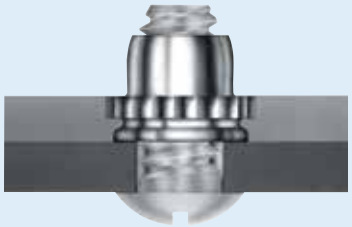
PEM®

MINIATURE SELF-CLINCHING FASTENERS

PEM® brand miniature fasteners fit into a minimal space and provide strong, reusable threads.

PEM miniature fasteners provide immediate visual indication when proper installation has been accomplished.

A strong, knurled collar, which is embedded in the sheet, guarantees against rotation of the fastener in the sheet. The torque-out resistance of the knurl greatly exceeds the torque that can be exerted by the self-locking feature.



When this collar is embedded in the sheet, the undercut cavity beneath the collar is filled with displaced sheet material thereby developing pushout resistance.

FE/FEO/UL prevailing torque locknuts provide ideal solutions to prevent mating hardware from loosening in service due to vibration or other application-related factors. A design feature of the lock nut produces friction between threads of mated components thereby increasing the force needed to tighten as well as loosen the nut. Prevailing torque locknuts provide essentially the same torque value regardless of the amount of axial load applied. Their use can save time and money compared with alternative chemical locking methods or patches.

A dry-film lubricant applied to locking FE/FEO/UL nuts provides the smooth, non-galling prevailing torque performance necessary for reliable locking and for reusability.(1) Screws for use with PEM self-clinching locking fasteners should be Class 3A/4h fit or no smaller than Class 2A/6g.

FE™/FEO™/UL™ elliptically squeezed nuts are **self-locking**. FE/FEO nut thread locking torque performance is equivalent to applicable NASM25027 specifications. UL self-locking nuts meet locking torque requirements specified herein. Some sizes of FE/FEO/UL nuts can be ordered to NASM45938/7 specifications (2). For more information on NASM25027 as applied to PEM self-clinching, self-locking nuts, check our web site for tech sheet PEM® - Ref/NASM25027.	
FEX™/FEOX™/U™ nuts have **free-running** class 2B/6H strong reusable threads. These fasteners can be installed into thinner sheets and closer to the edge of a sheet than standard self-clinching nuts. Some sizes of FEX/FEOX/U nuts can be ordered to NASM45938/7 specifications (2).	

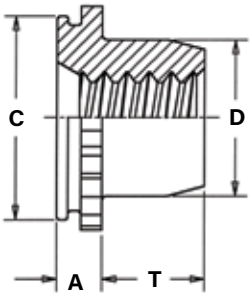
(1) Consult Bulletin LN for complete line of self-clinching, locking fasteners.

(2) To meet national aerospace standards and to obtain testing documentation, product must be ordered using appropriate NASM45938/7 part number. Check our web site for a complete Military Specification and National Aerospace Standards Reference Guide (Bulletin NASM).

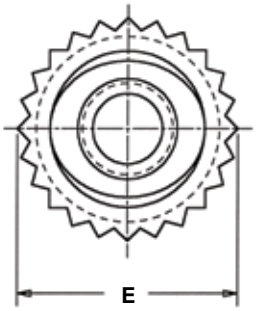
PART NUMBER DESIGNATION

U	–	080	–	0	
UL	–	080	–	0	CW
FE	–	440	–		MD
FEX	–	440			
FEO	–	440	–		MD
FEOX	–	440			
↓		↓		↓	↓
Type		Thread Code		Shank Code	Finish Code

SPECIFICATIONS



Clinching profile may vary.



U/FEX/FEOX NUTS ARE ROUND

TOPS OF UL/FE/FEO NUTS HAVE ELLIPTICALLY SQUEEZED LOCKING FEATURE

All dimensions are in inches.

	Thread Size	Type: Non-locking(1)	Type: Self-locking	Thread Code	Shank Code (2)	A (Shank) Max.	Sheet Thickness (3)	Hole Size In Sheet +.003 -.000	C +.000 -.005	D Max.	E ±.005	T +.015 -.000	Min. Dist. Hole ℄ To Edge	Max. Hole In Attached Parts
UNIFIED	.060-80 (#0-80)	U	UL	080	0	.020	.019-.022	.110	.1095	.076	.125	.050	.09	.080
	.073-64 (#1-64)	U	UL	164	0	.020	.019-.022	.110	.1095	.090	.125	.050	.09	.093
	.086-56 (#2-56)	U	UL	256	0	.020	.019-.022	.144	.1435	.106	.160	.065	.11	.106
					1	.031	.030-.036							
	.112-40 (#4-40)	FEOX	FEO	440		.040	.039-.045	.172	.171	.145	.192	.065	.14	.132
		FEX	FE			.060	.059-.070							
	.138-32 (#6-32)	FEOX	FEO	632		.040	.039-.045	.213	.212	.180	.244	.075	.17	.158
		FEX	FE			.060	.059-.070							
	.164-32 (#8-32)	FEOX	FEO	832		.040	.039-.045	.290	.289	.215	.322	.090	.20	.184
		FEX	FE			.060	.059-.070							
	.190-32 (#10-32)	FEOX	FEO	032		.040	.039-.045	.290	.289	.245	.322	.110	.20	.210
		FEX	FE			.060	.059-.070							
	1/4-20	FEX	FE	0420		.060	.059-.070	.344	.343	.318	.384	.120	.28	.270
	1/4-28			0428										

All dimensions are in millimeters.

	Thread Size x Pitch	Type: Non-locking(4)	Type: Self-locking	Thread Code	Shank Code (2)	A (Shank) Max.	Sheet Thickness (3)	Hole Size In Sheet +0.08	C -0.13	D Max.	E ±0.13	T +0.4	Min. Dist. Hole ℄ To Edge	Max. Hole In Attached Parts
METRIC	M2 x 0.4	U	UL	M2	1	0.79	0.76-0.91	3.61	3.6	2.5	4.07	1.65	2.8	2.5
	M3 x 0.5	FEOX	FEO	M3		1.02	0.99-1.14	4.39	4.37	3.96	4.88	1.9	3.6	3.5
		FEX	FE			1.53	1.5-1.78							
	M4 x 0.7	FEOX	FEO	M4		1.02	0.99-1.14	7.39	7.37	5.23	8.17	2.55	5.2	4.5
		FEX	FE			1.53	1.5-1.78							
	M5 x 0.8	FEOX	FEO	M5		1.02	0.99-1.14	7.39	7.37	6.48	8.17	3.05	5.2	5.5
		FEX	FE			1.53	1.5-1.78							
	M6 x 1	FEX	FE	M6		1.53	1.5-1.78	8.74	8.72	7.72	9.74	3.3	7.1	6.5

(1) 2B Go Gauge may stop at barrel end but class 3A screw will pass thru with finger torque.
(2) Shank code applicable only to U and UL fasteners.
(3) In applications between the sheet thicknesses for your thread size, see last paragraph of installation data on page 4. Knurled collar may fracture if fastener is used in sheets thicker than the specified range and the screw is tightened beyond maximum tightening torque.
(4) 6H Go Gauge may stop at barrel end but class 4h screw will pass thru with finger torque.

MATERIAL AND FINISH SPECIFICATIONS

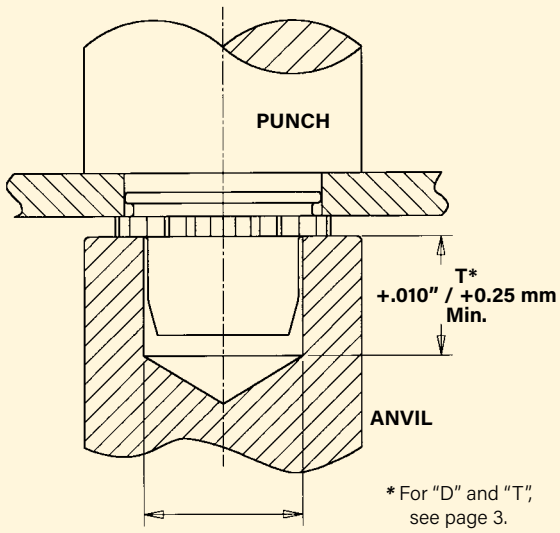
Type	Threads		Fastener Material	Standard Finishes			For Use In Sheet Hardness (1)			
	Internal, ASME B1.1, 2B / ASME B1.13M, 6H	Internal, UNJ Class 3B per ASME B1.15 / MJ Class 4H6H per ASME B1.21M (M6 thread 4H5H)	300 Series Stainless Steel	Passivated and/or Tested Per ASTM A380	Passivated Plus Clear Dry-film Lubricant	Black Dry-film Lubricant	HRB 70 / HB 125 or Less	Locking Temperature Limit	Self-locking	Covered by M45938/7 (2)
U	▪		▪	▪			▪			
UL		▪	▪		▪		▪	400˚ F / 204˚ C	▪	▪
FE		▪	▪			▪	▪	400˚ F / 204˚ C	▪	▪
FEX	▪		▪	▪			▪			
FEO		▪	▪			▪	▪	400˚ F / 204˚ C	▪	▪
FEOX	▪		▪	▪			▪			
Part number codes for finishes				None	CW(3)	MD(4)				

(1) HRB - Hardness Rockwell "B" Scale. HB - Hardness Brinell.
(2) To meet national aerospace standards and to obtain testing documentation, product must be ordered using appropriate NASM45938 part number. Check our web site for a complete Military Specification and National Aerospace Standards Reference Guide (Bulletin NASM).
(3) See PEM Technical Support section of our web site for related plating standards and specifications.
(4) MD finish on stainless steel provides a minimum of 100 hours of salt spray resistance.

INSTALLATION

1. Prepare properly sized mounting hole in sheet. Do not perform any secondary operations such as deburring.
2. Insert fastener into the anvil hole and place the mounting hole (preferably the punch side) over the shank of the fastener as shown in the drawing.
3. With installation punch and anvil surfaces parallel, apply squeezing force to the knurled collar until knurled collar is flush with top of the sheet for sheets .060"/1.5mm thick and up, or until shank is flush with the bottom of the sheet for sheets .040"/1mm to .060"/1.5mm thick for FE/FEO nuts.

PEM miniature fasteners must be installed by a force applied through parallel surfaces. Since force must not be applied to the barrel, a cavity must be used in either the punch or anvil so that the installation force is applied to the knurled collar. "D" dimensions for the punch or anvil cavity are given in the tables on page 3.



PEMSERTER® Installation Tooling

Type	Thread	Anvil Part Number	Punch Part Number
U/UL	080	8008451	975200048
U/UL	164	970200300300	
U/UL	256/M2	975200020	
FE/FEO/FEX/FEOX	440/M3	975200021	
FE/FEO/FEX/FEOX	632	975200022	
FE/FEO/FEX/FEOX	832/M4	975200023	
FE/FEO/FEX/FEOX	032/M5	975200024	
FE/FEO/FEX/FEOX	0420	975200025	
FE/FEO/FEX/FEOX	M6	8013143	

INSTALLATION NOTES

- For best results we recommend using a PEMSERTER® press for installation of PEM self-clinching fasteners. Please check our website for more information.
- Visit the Animation Library on our website to view the installation process for this product.

INSTALLATION RECOMMENDATION

In applications for sheet thicknesses between the two ranges (see "Sheet Thickness" on page 3) use the fastener with the larger "A" dimension. For example, if you want a #4-40 thread and your sheet thickness is between .045"/1.14 mm and .059"/1.49 mm, you should use FE or FEX nuts. This is not recommended installation practice, but in this case if it is necessary, you should install the fastener so that the bottom of the shank is flush with the underside of the sheet (instead of having the top of the knurled collar flush with the top of the sheet). When this method is used, care must be taken to protect the fastener against crushing which would damage the threads. This method will also result in reduced pushout and torque-out values.

PERFORMANCE DATA FOR TYPES U/UL[1]

	Type	Thread Code	Shank Code	Test Sheet Material					
				5052-H34 Aluminum			Cold-rolled Steel		
				Installation (lbs.)	Pushout (lbs.)	Torque-out (in. lbs.)	Installation (lbs.)	Pushout (lbs.)	Torque-out (in. lbs.)
UNIFIED	U/UL	080	0	750	20	2	1000	30	2
		164	0	750	20	3	1000	30	3
		256	0	1000	20	4	1300	30	4
			1						

	Type	Thread Code	Shank Code	Test Sheet Material					
				5052-H34 Aluminum			Cold-rolled Steel		
				Installation (kN)	Pushout (N)	Torque-out (N·m)	Installation (kN)	Pushout (N)	Torque-out (N·m)
METRIC	U/UL	M2	1	4	89	0.45	5.8	133	0.45

PERFORMANCE DATA FOR TYPES FE/FEO/FEX/FEOX[1][2]

	Type	Thread Code	Test Sheet Material					
			5052-H34 Aluminum			Cold-rolled Steel		
			Installation (lbs.)	Pushout (lbs.)	Torque-out (in. lbs.)	Installation (lbs.)	Pushout (lbs.)	Torque-out (in. lbs.)
UNIFIED	FEO/FEOX	440	900	88	12	1500	140	12
	FE/FEX			135			210	
	FEO/FEOX	632	1200	105	20	2100	185	20
	FE/FEX		1300	175			255	
	FEO/FEOX	832	1500	155	48	2500	260	48
	FE/FEX			255			360	
	FEO/FEOX	032	1500	155	48	2500	260	48
	FE/FEX			255			360	
	FE/FEX	0420	2100	320	110	3500	420	110
		0428						

	Type	Thread Code	Test Sheet Material					
			5052-H34 Aluminum			Cold-rolled Steel		
			Installation (kN)	Pushout (N)	Torque-out (N·m)	Installation (kN)	Pushout (N)	Torque-out (N·m)
METRIC	FEO/FEOX	M3	4	391	1.35	6.7	622	1.35
	FE/FEX			600			934	
	FEO/FEOX	M4	6.7	689	5.42	11.1	1156	5.42
	FE/FEX			1134			1601	
	FEO/FEOX	M5	6.7	689	5.42	11.1	1156	5.42
	FE/FEX			1134			1601	
	FE/FEX	M6	9.4	1423	12.43	15.6	1868	12.43

(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) For FE and FEO fasteners, thread locking performance is equivalent to applicable NASM25027 specifications. Consult technical sheet PEM-REF/NASM25027 on our web site for details.

AXIAL STRENGTH AND TIGHTENING TORQUE COMPARISON

	Thread Code	Increasing Axial Strength →					
		U-0/UL-0/FEOX/FEO Nuts			U-1/UL-1/FEX/FE Nuts		
		Locknut	Mating Screw		Locknut	Mating Screw	
		Min. Axial Strength (lbs.) (1)	Strength Level (ksi) (2)	Tightening Torque (in. lbs.) (3)	Min. Axial Strength (lbs.) (1)	Strength Level (ksi) (2)	Tightening Torque (in. lbs.) (3)
UNIFIED	080	125	69	1.0	—	—	—
	164	125	49	1.2	—	—	—
	256	169	46	1.9	316	85	3.5
	440	465	77	6.8	705	117	10.3
	632	546	60	9.8	847	93	15.2
	832	779	56	16.6	1,213	87	25.9
	032	779	39	19.2	1,213	61	30.0
	0420	—	—	—	1,412	44	45.9

	Thread Code	Increasing Axial Strength →					
		U-0/UL-0/FEOX/FEO Nuts			U-1/UL-1/FEX/FE Nuts		
		Locknut	Mating Screw		Locknut	Mating Screw	
		Min. Axial Strength (kN) (1)	Strength Level (MPa) (2)	Tightening Torque (N-m) (3)	Min. Axial Strength (kN) (1)	Strength Level (MPa) (2)	Tightening Torque (N-m) (3)
METRIC	M2	—	—	—	1.39	432	0.36
	M3	2.08	267	0.81	3.16	405	1.23
	M4	3.48	255	1.81	5.42	398	2.82
	M5	3.48	158	2.26	5.42	246	3.52
	M6	—	—	—	6.28	201	4.9

(1) Axial strength for nuts is limited by knurled ring strength.

(2) Screw strength level shown is the minimum needed to develop full nut strength, higher strength screws may be used.

(3) Tightening torque shown will induce preload of 65% of locknut minimum axial strength with K or nut factor is equal to 0.20. In some applications tightening torque may need to be adjusted based on the actual K value. If screw strength is less than the value shown, tightening torque should be proportionately reduced by multiplying the torque shown by the actual screw strength over the screw strength shown. If higher strength screws are used, torque is not adjusted upward because assemble strength is still limited by locknut strength.

Fastener drawings and models are available at www.pemnet.com

All PEM® products meet our stringent quality standards. If you require additional industry or other specific quality certifications, special procedures and/or part numbers are required. Please contact your local sales office or representative for further information.

Regulatory compliance information is available in Technical Support section of our website. Specifications subject to change without notice. See our website for the most current version of this bulletin.

PennEngineering®

PEM®

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

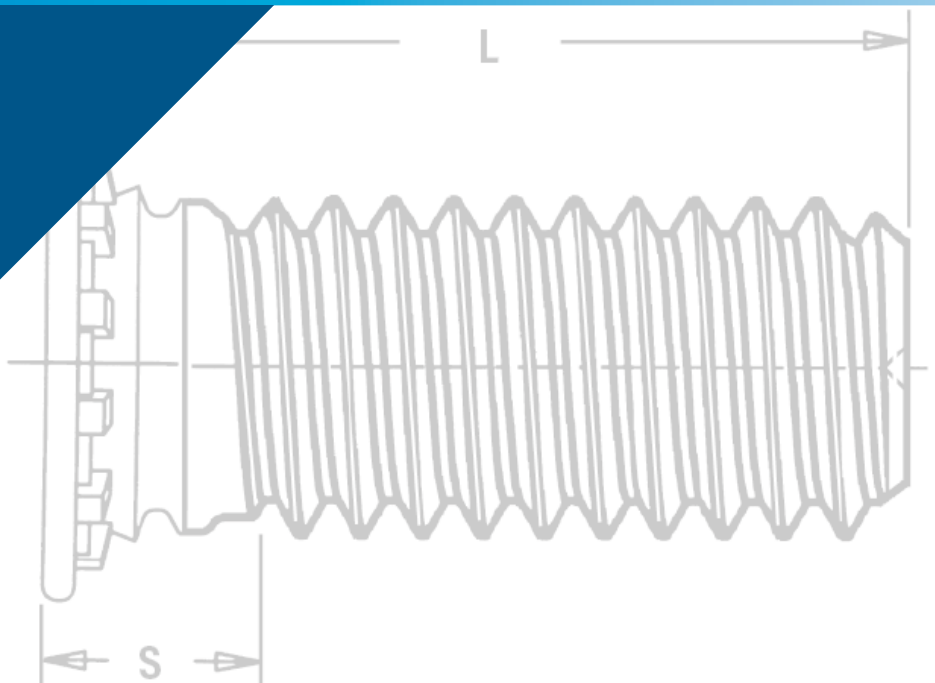
Technical support e-mail: techsupport@pemnet.com

Bulletin FH-1217
Rev 218

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

FH™

SELF-CLINCHING STUDS AND PINS



SELF-CLINCHING STUDS AND PINS

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

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

Dog Point and Anti Cross-Thread Options - PAGE 4	
FH™/FHS™/FHA™ (flush-head) studs are available in aluminum, steel, or stainless steel - PAGE 5	
FH4™/FHP™ (flush-head) studs are designed to provide strong threads in stainless steel sheets as thin as .040"/1 mm. FHP studs have high corrosion resistance - PAGE 6	
FHL™/FHLS™ (flush, low-displacement head) studs have a smaller head diameter and install closer to the edge of a sheet than PEM FH/FHS studs - PAGE 7	
TFH™/TFHS™ (non-flush) studs are for sheets as thin as .020" / 0.51 mm. The stud head will project above the sheet surface approximately .025"/0.64mm - PAGE 8	
HFH™/HFHS™ (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 - PAGE 9	
HFHB™ (heavy-duty BUSBAR®) studs are ideal for applications which demand superior electrical/mechanical attachment points - PAGE 9	

HFE™/THFE™ (heavy-duty) studs Provides maximum pull through in sheets as thin as .031" / 0.8 mm - PAGE 10	
HFG8™/HF109™ (heavy-duty high tensile strength) studs are manufactured for the most demanding applications from medium carbon alloy steel, then heat-treated to high strength and hardness qualities - PAGE 11	
HFLH™ studs are for installation into thin, harder, high-strength materials - PAGE 12	
SGPC™ swaging collar studs can install into most panel material and accommodate multiple panels as long as the total thickness does not exceed the maximum sheet thickness - PAGE 13	
FHX™ flush-head studs with X-Press™ thread profile are typically used with push-on or other plastic fasteners - PAGE 14	
FH™/FHS™/FHA™ (flush-head) Pins are available on special order - PAGE 15	
TPS™/TP4™/TPXS™ (flush-head) pilot pins satisfy a wide range of positioning, pivot, and alignment applications - PAGE 16	
Material and finish specifications - PAGE 17	
Installation - PAGES 18 - 25	
Performance data - PAGES 26 - 32	

PAGE 5

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

PAGE 7

Flush, low-displacement head studs
Types FHL/FHLS

PAGE 8

Thin sheet studs
Types TFH/TFHS

PAGE 9

Heavy-duty studs
Types HFH/HFHS/HFHB

PAGE 10

Heavy-duty studs for thin sheets
Types HFE/THFE

STUD SELECTOR GUIDE

PEM Stud Type	Application Requires:												
	Flush-head	Heavy duty	Grade 8/ Property Class 10.9 thread strength	Sheet thickness as thin as .020" / 0.51 mm	Superior electrical conductivity	Installation into stainless steel sheets	Compati-bility with aluminum anodizing	Superior corrosion resistance	Closest centerline-to-edge distance	Unthreaded stud/pin	Large hole in attached Panel	Push on plastic fasteners	Max. panel hardness (2)
FH	▪												HRB 80 HB 150
FHA	▪						▪	▪					HRB 50 HB 82
FHS	▪							▪					HRB 70 HB 158
FH4	▪					▪							HRB 92 HB 195
FHP	▪					▪		▪					HRB 92 HB 195
FHL	▪								▪				HRB 80 HB 150
FHLS	▪							▪	▪				HRB 70 HB 125
TFH				▪									HRB 80 HB 150
TFHS				▪				▪					HRB 70 HB 125
HFH		▪ (1)									▪		HRB 85 HB 165
HFHB		▪			▪			▪			▪		HRB 55 HB 83
HFHS		▪						▪			▪		HRB 70 HB 125
HFE		▪									▪		HRB 85 HB 165
THFE		▪									▪		HRB 85 HB 165
HFG8/HF109		▪	▪								▪		HRB 89 HB 180
HFLH		▪									▪		HRB 96 HB 216
SGPC						▪			▪				Any sheet hardness
FHX	▪											▪	HRB 80 HB 150
FH Unthreaded	▪									▪			HRB 80 HB 150
FHA Unthreaded	▪						▪	▪		▪			HRB 50 HB 82
FHS Unthreaded	▪							▪		▪			HRB 70 HB 125
TPS	▪							▪		▪			HRB 70 HB 125
TP4	▪					▪				▪			HRB 92 HB 195
TPXS	▪							▪		▪			HRB 70 HB 125

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

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

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

PAGE 11

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

PAGE 12

Studs for hard panels
Type HFLH

PAGE 13

Swaging collar studs
Type SGPC

PAGE 14

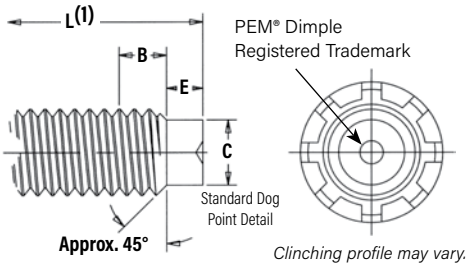
Flush-head Studs with X-Press™ Thread Profile
Type FHX

PAGE 16

Flush-head pins
Types TPS/TP4

OPTIONAL DOG POINT FEATURE

PEM® dog point lead-in option for studs allows quick location of the mating fastener during assembly and protects the first thread of the stud during nut engagement. This feature is available on Types FH, FHL, HFH, HFE, HF109, HFG8, TFH and THFE studs.



Clinching profile may vary.

All dimensions are in inches.

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

All dimensions are in millimeters.

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

(1) For "L" refer to type stud lengths.
(2) Maximum dog point diameter is .003" / 0.08 mm less than minimum minor diameter of 2B or 6H nut threads.

OPTIONAL PART NUMBER DESIGNATION

FH D S

Type: Any type code
D = Dog Point
M = MAThread
Material: Any material code

OPTIONAL MAThread® ANTI CROSS-THREAD FEATURE

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

Anti Cross-Thread Feature

MAThread is a registered trademark of MAThread inc.

OPTIONAL POINTED STUD FEATURE

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

OPTIONAL THREAD MASK

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

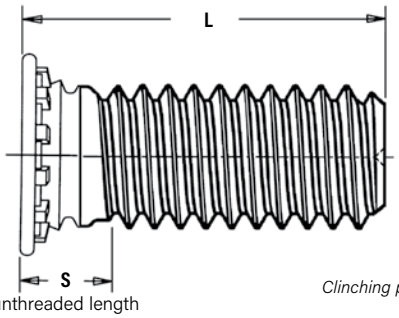
"BC" suffix will be added to part number to designate Blu-Coat thread mask to fastener.

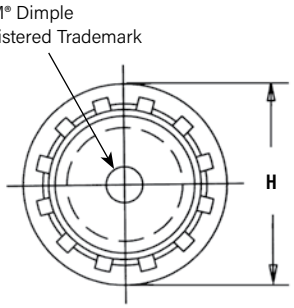
AVAILABLE PEM® VARIMOUNT® FASTENING SYSTEM

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

FH™/FHS™/FHA™ FLUSH-HEAD STUDS

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





Clinching profile may vary.

PART NUMBER DESIGNATION

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

All dimensions are in inches.

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

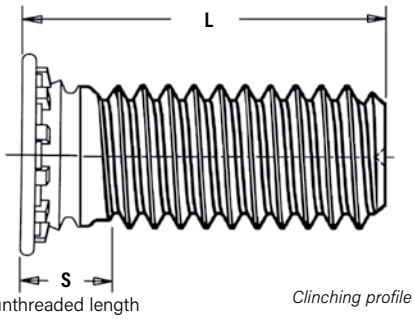
All dimensions are in millimeters.

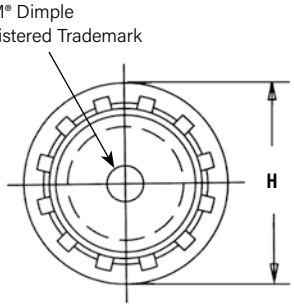
	Thread Size x Pitch	Type: Fastener Material: Steel	Type: Fastener Material: Stainless Steel	Type: Fastener Material: Alu-minum	Thread Code	Length Code "L" ±0.4 (Length Code in millimeters): 6	8	10	12	15	18	20	25	30	35	Min. Sheet Thick-ness (1)	Hole Size in Sheet +0.08	Max. Hole in Attach. Parts	H ± 0.4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

(1) See page 18 for installation tool requirements.
(2) Threads are gaugeable to within 2 pitches of the "S" Max. dimension. A class 3B/5H maximum material commercial nut shall pass up to the "S" Max. dimension.

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

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





Clinching profile may vary.

PART NUMBER DESIGNATION

FH	4	-	632	-	6		
FH	P	-	632	-	6		
↓ Type	↓ Material Code		↓ Thread Code		↓ Length Code		

All dimensions are in inches.

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

All dimensions are in millimeters.

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

(1) See material and finish specifications chart on page 17 for details.
(2) Performance may be reduced for studs installed into thicker sheets.
(3) Threads are gaugeable to within 2 pitches of the "S" Max. dimension. A class 3B/5H maximum material commercial nut shall pass up to the "S" Max. dimension.

A NOTE ABOUT 400 SERIES FASTENERS FOR STAINLESS STEEL PANELS

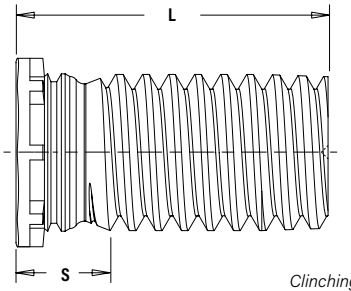
In order for self-clinching fasteners to work properly, the fastener must be harder than the sheet into which it is being installed. In the case of stainless steel panels, fasteners made from 300 Series Stainless Steel do not meet this hardness criteria. It is for this reason that 400 series fasteners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

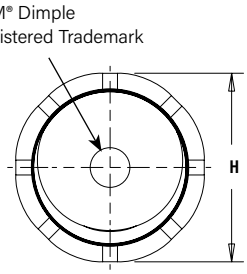
- Will be exposed to any appreciable corrosive presence.
- Requires non-magnetic fasteners.
- Will be exposed to any temperatures above 300˚F (149˚C)

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

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

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





Clinching profile may vary.

PART NUMBER DESIGNATION

FHL		-	632	- 6	ZI
FHL	S	-	632	- 6	
↓ Type	↓ Material Code		↓ Thread Code	↓ Length Code	↓ Finish Code

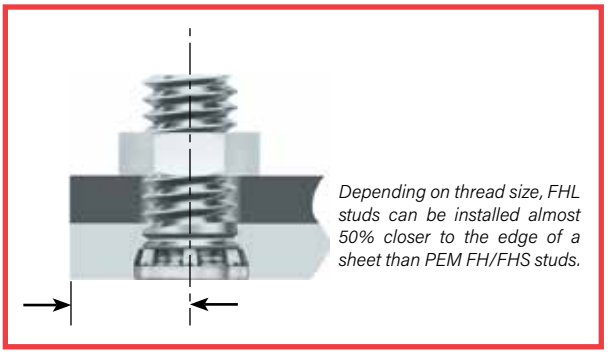
All dimensions are in inches.

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

All dimensions are in millimeters.

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

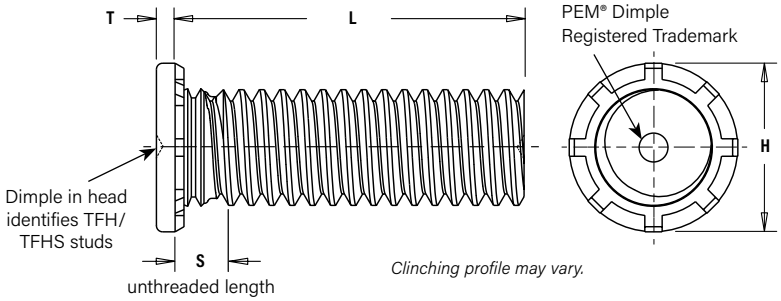
(1) See page 19 for installation tool requirements.
(2) Threads are gaugeable to within 2 pitches of the "S" Max. dimension. A class 3B/5H maximum material commercial nut shall pass up to the "S" Max. dimension.



Depending on thread size, FHL studs can be installed almost 50% closer to the edge of a sheet than PEM FH/FHS studs.

TFH™/TFHS™ NON-FLUSH STUDS

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



PART NUMBER DESIGNATION

TFH		-	632	- 6	ZI
TFH	S	-	632	- 6	
Type	Material Code		Thread Code	Length Code	Finish Code

All dimensions are in inches.

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

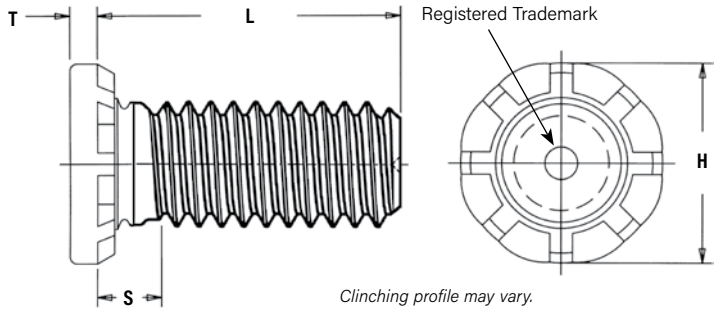
All dimensions are in millimeters.

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

(1) See page 20 for installation tool requirements.
(2) Threads are gaugeable to within 2 pitches of the "S" Max. dimension. A class 3B/5H maximum material commercial nut shall pass up to the "S" Max. dimension.

HFH™/HFHS™/HFHB™ HEAVY-DUTY STUDS

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



Clinching profile may vary.

PART NUMBER DESIGNATION

HFH		-	032	-	12	ZI
HFH	S	-	032	-	12	
HFH	B	-	032	-	12	X
Type	Material Code		Thread Code		Length Code	Finish Code

All dimensions are in inches.

	Thread Size	Type: Fastener Material: Steel	Type: Fastener Material: Stainless Steel	Type: Fastener Material: Phosphor Bronze (1)	Thread Code	Length Code "L" ±.015 (Length Code in 16ths of an inch): .500	.750	1.00	1.25	1.50	1.75	2.00	Min. Sheet Thickness	Hole Size in Sheet +.005 -.000	Max. Hole in Attach. Parts	H ±.01	S Max. (2)	T Max.	Min. Dist. Hole ℄ to Edge
UNIFIED	.190-32 (#10-32)	HFH	HFHS	HFHB	032	8	12	16	20	24	28	32	.050	.190	.252	.300	.105	.040	.415
	.250-20 (1/4-20)	HFH	HFHS	HFHB	0420	8	12	16	20	24	28	32	.060	.250	.312	.380	.125	.050	.460
	.313-18 (5/16-18)	HFH	HFHS	HFHB	0518	8	12	16	20	24	28	32	.075	.312	.374	.480	.140	.070	.500
	.375-16 (3/8-16)	HFH	HFHS	HFHB	0616	—	12	16	20	24	28	32	.090	.375	.437	.580	.155	.085	.530

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

All dimensions are in millimeters.

	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 Thickness	Hole Size in Sheet +0.13	Max. Hole in Attach. Parts	H ±0.25	S Max. (2)	T Max.	Min. Dist. Hole ℄ to Edge
METRIC	M5 x 0.8	HFH	HFHS	HFHB	M5	15	20	25	30	35	40	50	1.3	5	6.4	7.8	2.7	1.14	10.7
	M6 x 1	HFH	HFHS	HFHB	M6	15	20	25	30	35	40	50	1.5	6	7.5	9.4	2.8	1.27	11.5
	M8 x 1.25	HFH	HFHS	HFHB	M8	15	20	25	30	35	40	50	2	8	9.5	12.5	3.5	1.78	12.7
	M10 x 1.5	HFH	HFHS	HFHB	M10	15	20	25	30	35	40	50	2.3	10	11.5	15.7	4.1	2.29	13.7

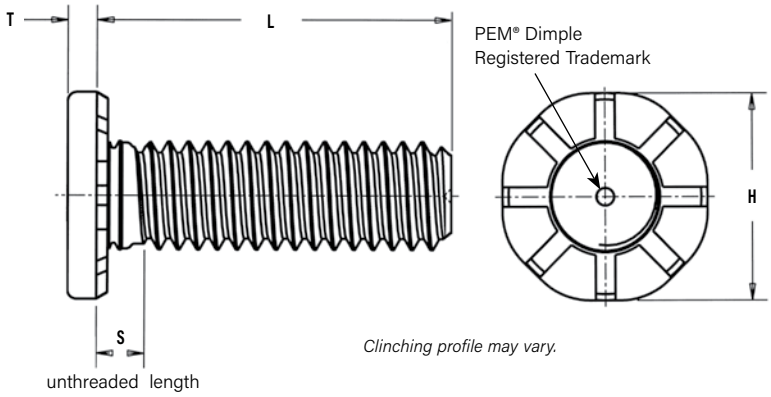
Tensile strength: *HFH - 900 MPa / HFHS - 515 MPa / HFHB - 415 MPa.*

(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 #10-32 / M5 and 3/8-16 / M10 thread sizes respectively, after repeated thermal and mechanical cycling. For complete electrical resistance test data for type HFHB studs installed in copper, see bulletin entitled "Electrical Resistance of HFHB Studs Installed in Copper" on our website.

(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.

HFE™/THFE™ HEAVY DUTY STUDS FOR THIN SHEETS

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



Clinching profile may vary.

PART NUMBER DESIGNATION

HFE	-	0420	-	12		ZI		
THFE	-	0420	-	12		ZI		
↓ Type		↓ Thread Code		↓ Length Code		↓ Finish Code		

All dimensions are in inches.

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

Tensile strength: *120 ksi*

All dimensions are in millimeters.

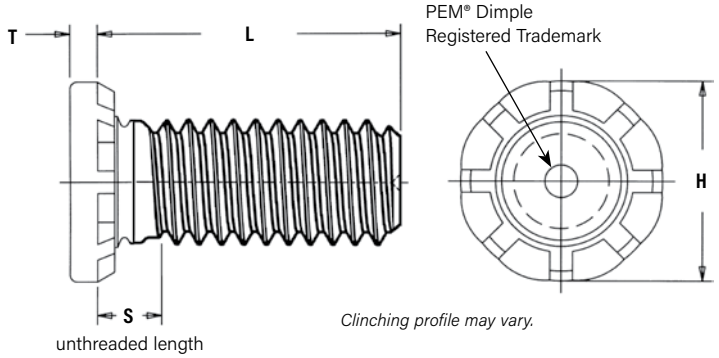
	Thread Size x Pitch	Type / Fastener Material / Steel	Thread Code	Length Code "L" ±0.4 (Length Code in millimeters) 15	20	25	30	35	40	50	Min. Sheet Thickness (1)	Hole Size In Sheet +0.13	Max. Hole In Attached Parts	H ±0.25	S Max. (2)	T Max.	Min. Dist. Hole ℄ To Edge
METRIC	M5 x 0.8	HFE	M5	15	20	25	30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

Tensile strength: *900 MPa*

(1) See page 21 for installation tool requirements.
(2) Threads are gaugeable to within 2 pitches of the "S" Max. dimension. A class 3B/5H maximum material commercial nut shall pass up to the "S" Max. dimension.

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

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



PART NUMBER DESIGNATION

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

All dimensions are in inches.

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

Tensile strength: *150 ksi*

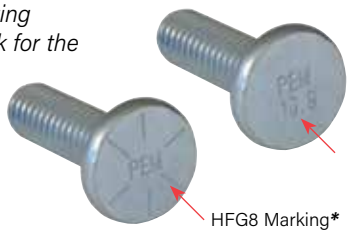
All dimensions are in millimeters.

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

Tensile strength: *1040 MPa*

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

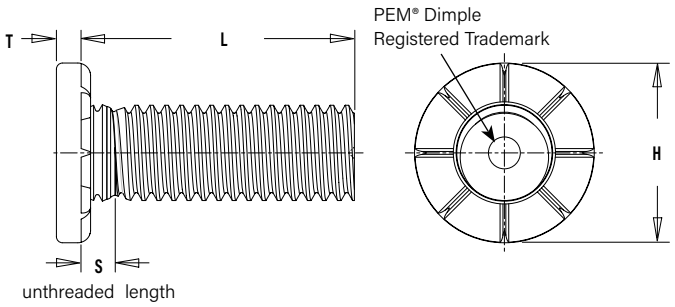
To be sure that you are getting genuine PEM products, look for the PEM stamp. Studs within the size range of the SAE and ISO specs are also identified with the Grade 8 and 10.9 head markings respectively.



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

HFLH™ HARD PANEL STUDS

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



PART NUMBER DESIGNATION

HFLH - 0420 - 20 ZI

- HFLH: Type
- 0420: Thread Code
- 20: Length Code
- ZI: Finish Code

All dimensions are in inches.

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

Tensile strength: *120 ksi*

All dimensions are in millimeters.

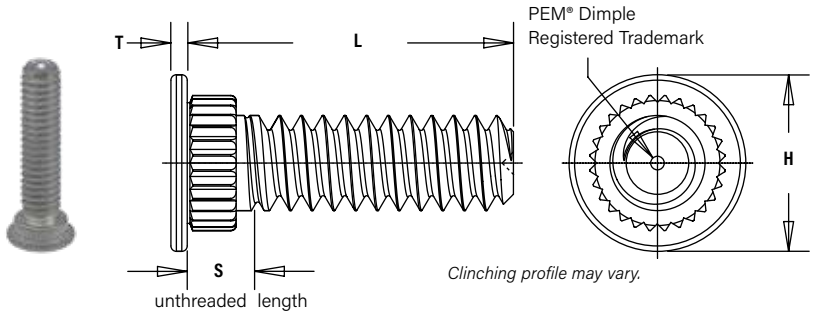
	Thread Size x Pitch	Type: Fastener Material: Hardened Alloy Steel	Thread Code	Length Code "L" ±.0.4 (Length Code in millimeters)							Min. Sheet Thickness (1)	Hole Size In Sheet +0.13	Max. Hole In Attached Parts	H ±0.25	S Max. (2)	T Max.	Min. Dist. Hole ℄ To Edge
METRIC	M5 x 0.8	HFLH	M5	15	20	25	30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

Tensile strength: *900 MPa*

(1) See page 21 for installation tool requirements.
(2) Threads are gaugeable to within 2 pitches of the "S" Max. dimension. A class 3B/5H maximum material commercial nut shall pass up to the "S" Max. dimension.
(3) See PEM Technical Support section of our web site (www.pemnet.com) for related plating standards and specifications.
(4) "X" suffix studs may have pitch diameters and major diameters below 2A "Basic", per ANSI B1.1, Section 7, and B1.13M, Section 8 to allow for minimum of 0.0002" / 0.0051 mm of plating.

SGPC™ SWAGING COLLAR STUDS

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



PART NUMBER DESIGNATION

SGPC - 632 - 8

SGPC: Type
632: Thread Code
8: Length Code

All dimensions are in inches.

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

All dimensions are in millimeters.

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

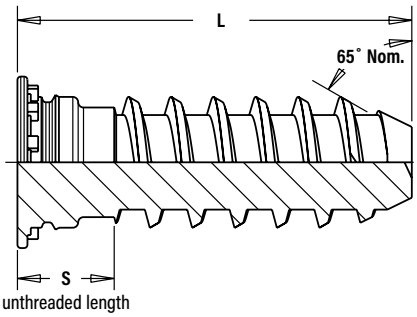
(1) When using the fastener to attach more than one sheet or panel, the stud may seem slightly loose after installation. This is a normal condition in some applications and will not effect the stud's performance.

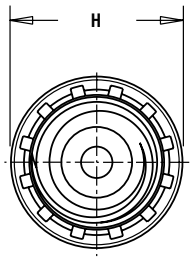
(2) See page 23 for installation tooling requirements. Contact Technical Support (techsupport@pemnet.com) for other thicknesses.

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

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

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





PART NUMBER DESIGNATION

FH	-	X5	-	10	ZI
↓		↓		↓	↓
Type		Thread Code		Length Code	Finish Code

All dimensions are in millimeters.

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

(1) See page 23 for installation tool requirements.

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

Contact Tech Support for more information.

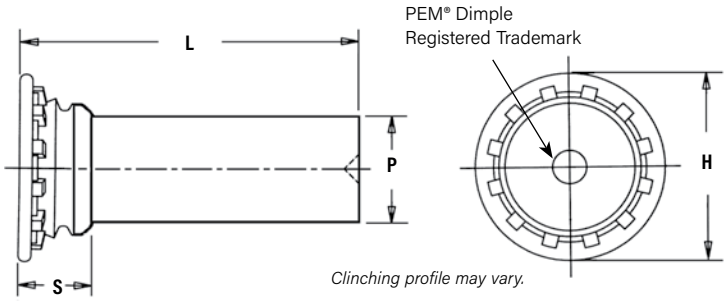
Press-on (kwik) nut can be used to hold down soft materials such as foam, cloth or insulation.

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

FH™/FHS™/FHA™ FLUSH-HEAD PINS

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

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



Clinching profile may vary.

PART NUMBER DESIGNATION

FH		- 094	- 6	ZI
FH	S	- 094	- 6	
FH	A	- 094	- 6	
Type	Material Code	Pin Diameter Code	Length Code	Finish Code

All dimensions are in inches.

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

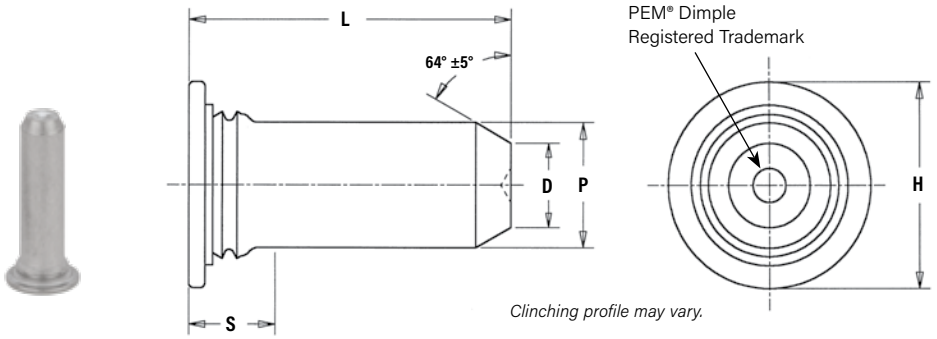
All dimensions are in millimeters.

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

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

TPS™/TP4™ FLUSH-HEAD PILOT PINS

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



Clinching profile may vary.

PART NUMBER DESIGNATION

TP	S	- 187	-	8
TP	4	- 187	-	8
↓ Type	↓ Material Code	↓ Pin Diameter Code		↓ Length Code

All dimensions are in inches.

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

All dimensions are in millimeters.

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

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

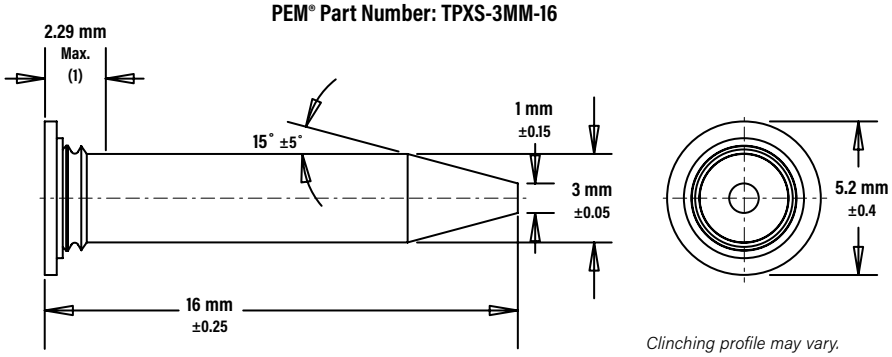
If your application requires corrosion resistant fasteners, non-magnetic fasteners, or will be exposed to temperatures above 300˚ F (149˚ C), see note at bottom of page 6 about "400 series fasteners for stainless steel panels".

TPXS™ SELF-CLINCHING PILOT PINS

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

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

PEM® Part Number: TPXS-3MM-16



Clinching profile may vary.

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

MATERIAL AND FINISH SPECIFICATIONS

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

	For use in Sheet Hardness (7)								
Type	HRB 50 / HB 82 or Less	HRB 55 / HB 83 or Less	HRB 70 / HB 125 or Less	HRB 80 / HB 150 or Less	HRB 85 / HB 165 or Less	HRB 89 / HB 180 or Less	HRB 92 / HB 195 or Less	HRB 96 / HB 216 or Less	Any Sheet Hardness
FH				▪					
FHS			▪						
FHA	▪								
FH4							▪		
FHP							▪		
FHL				▪					
FHLS			▪						
TFH				▪					
TFHS			▪						
HFE					▪				
THFE					▪				
HFH					▪				
HFHB		▪							
HFHS			▪						
HFG8						▪			
HF109						▪			
HFLH								▪	
SGPC									▪
FHX				▪					
TPS			▪						
TP4							▪		
TPXS			▪						

(1) For plated studs, Class 2A/6g, the maximum major and pitch diameter, after plating, may equal basic sizes and be gauged to Class 3A/4h. Per ASME B1.1, Section 7, Paragraph 7.2 and ASME B1.13M, Section 8, paragraph 8.2.

(2) Special order with additional charge.

(3) Part numbers for aluminum studs have no finish suffix.

(4) "X" suffix studs may have pitch diameters and major diameters below 2A/6g minimum size, per ANSI B1.1, Section 7, and B1.13M, Section 8 to allow for minimum of 0.0002" / 0.0051 mm of plating.

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

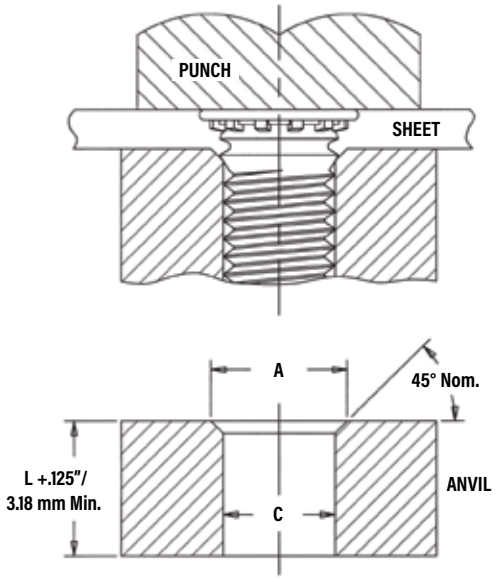
(6) With rust preventative oil.

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

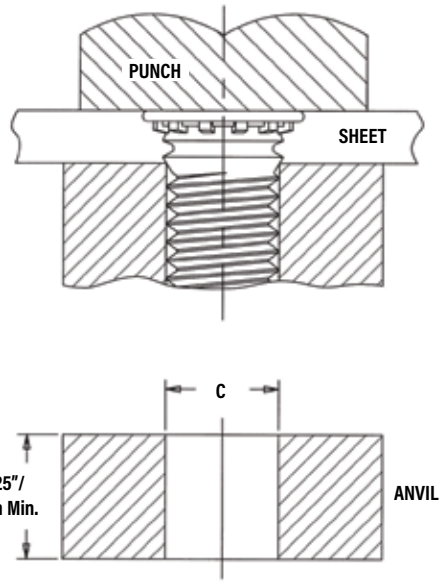
INSTALLATION - FH™/FHS™/FHA™ THREADED STUDS

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

Tooling for sheet thicknesses less than .060 / 1.51 mm with #2 thru #10 / M3 thru M5 thread sizes and less than .093" / 2.36 mm for 1/4" / M6 threads.



Tooling for sheet thicknesses .060" / 1.51 mm and greater with #2 thru #10 / M3 thru M5 thread sizes and .093" / 2.36 mm and greater for 1/4" and 5/16" / M6 and M8 threads.



See page 5 for "L".

PEMSERTER® Installation Tooling

UNIFIED

Thread Code	Anvil Dimensions (in.) A	Anvil Dimensions (in.) C	Anvil Part No. For Sheets > .060"	Anvil Part No. For Sheets ≤ .059"	Punch Part Number
256	.110-.114	.087-.090	970200005300	970200240300	975200048
440	.136-.140	.113-.116	970200006300	970200241300	
632	.162-.166	.139-.142	970200007300	970200243300	
832	.188-.192	.165-.168	970200008300	970200245300	
024/032	.216-.220	.191-.194	970200009300	970200246300	
			For Sheets > .093"	For Sheets ≤ .092"	
0420	.295-.300	.250-.253	970200010300	970200249300	975200048
0518	.334-338	.3125-.3155	970200011300	–	

METRIC

Thread Code	Anvil Dimensions (mm) A + 0.1	Anvil Dimensions (mm) C + 0.08	Anvil Part No. For Sheets > 1.51 mm	Anvil Part No. For Sheets ≤ 1.5 mm	Punch Part Number
M2.5	3.1	2.53	970200300300	970200493300	975200048
M3	3.6	3.03	970200229300	970200242300	
M3.5	4.1	3.53	970200007300	970200243300	
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	–	

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

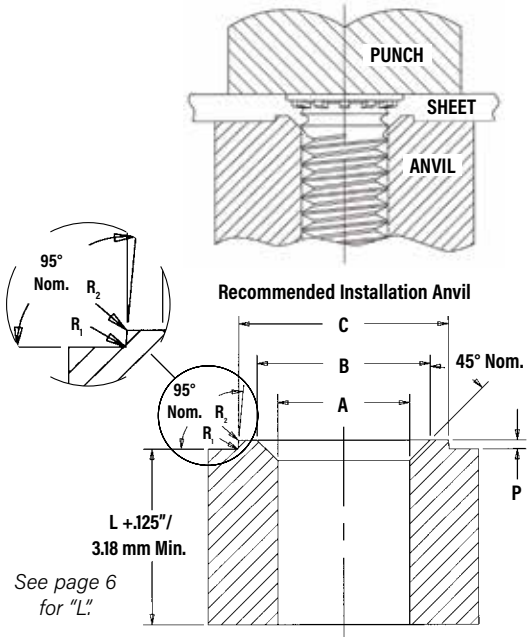
1. Prepare properly sized mounting hole in sheet. Do not perform any secondary operations such as deburring.
2. Insert stud through mounting hole (punch side) of sheet and into anvil hole.
3. With punch and anvil surfaces parallel, apply squeezing force to embed the head of the stud flush in the sheet.

For FH4/FHP studs, a special anvil with a raised ring is required to create a proper installation. The raised ring acts as a second displacer of the stainless sheet material, thereby ensuring that the annular groove is filled. Please see page 6 for recommended sheet thickness range.
The special anvils are available from PEM stock or can be machined from suitable tool steel. A hardness of HRC 55 / HB 547 minimum is required to provide long anvil life. We recommend measuring the "P" dimension every 5000 installations to ensure that the anvil remains within specification.

PEMSERTER® Installation Tooling

	Thread Code	Anvil Dimensions (in.) A +.003 -.000	B ±.002	C ±.002	P ±.001	R_1 Max.	R_2 Max.	Anvil Part Number	Punch Part Number
UNIFIED	440	.113	.144	.174	.010	.003	.005	8001645	975200048
	632	.140	.170	.200	.010	.003	.005	8001644	
	832	.166	.202	.236	.010	.003	.005	8001643	
	032	.191	.235	.275	.010	.003	.005	8001642	
	0420	.252	.324	.360	.020	.003	.005	8002535	

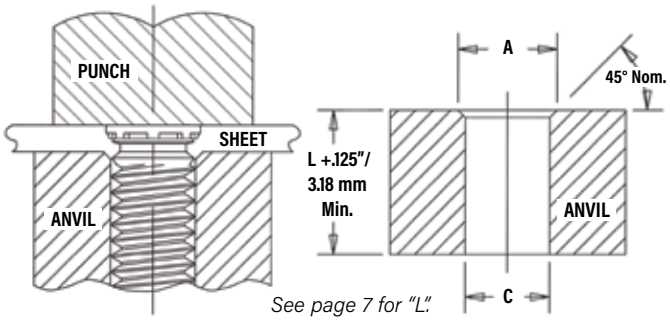
	Thread Code	Anvil Dimensions (mm) A +0.08	B ±0.05	C ±0.05	P ±.025	R_1 Max.	R_2 Max.	Anvil Part Number	Punch Part Number
METRIC	M3	3.05	3.81	4.57	0.25	0.08	0.13	8001678	975200048
	M4	4.04	4.95	5.82	0.25	0.08	0.13	8001677	
	M5	5.08	6.15	7.16	0.25	0.08	0.13	8001676	
	M6	6.05	7.87	8.79	0.51	0.08	0.13	8002536	



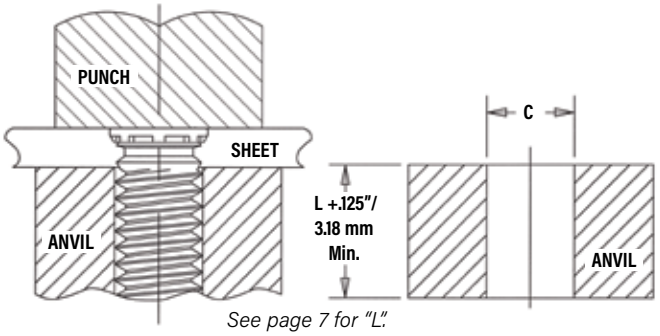
INSTALLATION - FHL™/FHLS™ STUDS

1. Prepare properly sized mounting hole in sheet. Do not perform any secondary operations such as deburring.
2. Insert stud through mounting hole (punch side) of sheet and into anvil hole.
3. With punch and anvil surfaces parallel, apply squeezing force to embed the head of the stud flush in the sheet. For sheets .060" / 1.51 mm and thicker, the anvil requires only a straight thru hole to accommodate the stud. For sheets less than .060" / 1.51 mm, the hole requires a countersink with dimension A at the top to provide for metal flow around the shank of the stud.

Tooling for sheet thicknesses less than .060" / 1.51 mm.



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



PEMSERTER® Installation Tooling

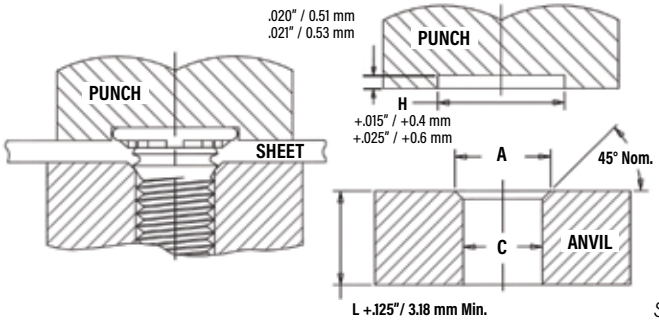
	Thread Code	Anvil Dimensions (in.) A	C	Anvil Part No. For Sheets > .060"	Anvil Part No. For Sheets ≤ .059"	Punch Part Number
UNIFIED	256	.110-.114	.087-.090	8003313	8003297	975200997
	440	.136-.140	.113-.116	8003618	8003298	
	632	.162-.166	.139-.142	8003314	8003299	
	832	.188-.192	.165-.168	8003315	8003300	
	032	.216-.220	.191-.194	8003619	8003301	

	Thread Code	Anvil Dimensions (mm) A ±0.05	C +0.08	Anvil Part No. For Sheets > 1.51 mm	Anvil Part No. For Sheets ≤ 1.5 mm	Punch Part Number
METRIC	M2.5	3.1	2.53	8003316	8003302	975200997
	M3	3.6	3.03	8003317	8003303	
	M3.5	4.1	3.53	8003318	8003304	
	M4	4.6	4.03	8003620	8003305	
	M5	5.6	5.03	8003319	8003306	

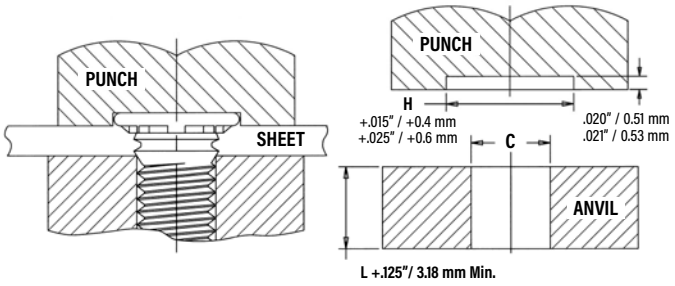
INSTALLATION - TFH™/TFHS™ NON-FLUSH STUDS

1. Prepare properly sized mounting hole in sheet. Do not perform any secondary operations such as deburring.
2. Insert stud through mounting hole (punch side) of sheet and into anvil hole.
3. With punch and anvil surfaces parallel, apply squeezing force until the punch contacts the sheet. When installed, the stud head is not flush but will protrude approximately .025" / 0.64 mm. For sheets .030" / 0.76 mm and thicker, the anvil requires only a straight thru hole to accommodate the stud. For sheets less than .030" / 0.76 mm down to .020" / 0.51 mm, the hole requires a countersink with dimension A at the top to provide for metal flow around the shank of the stud. The standard punch design below provides clearance for the stud head and reduces chances of over squeezing the head of the stud into the sheet metal.

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



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



See page 8 for "L".

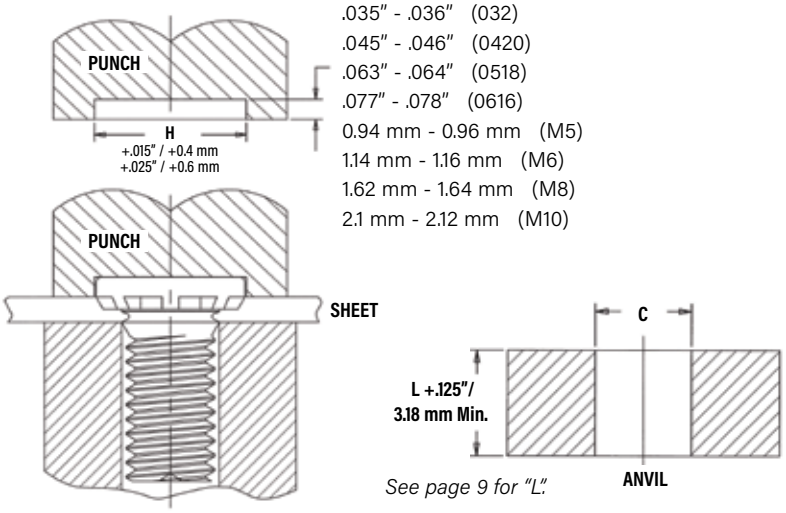
PEMSERTER® Installation Tooling

	Thread Code	Anvil Dimensions (in.) A	Anvil Dimensions (in.) C	Anvil Part No. For Sheets > .030"	Anvil Part No. For Sheets .020" - .029"	Punch Part Number
UNIFIED	256	.110-.114	.087-.090	970200005300	970200240300	970200235400
	440	.136-.140	.113-.116	970200006300	970200241300	970200236400
	632	.162-.166	.139-.142	970200007300	970200243300	970200237400
	832	.188-.192	.165-.168	970200008300	970200245300	970200238400
	032	.216-.220	.191-.194	970200009300	970200246300	970200239400
	0420	.295-.300	.250-.253	970200010300	970200249300	970200496400

	Thread Code	Anvil Dimensions (mm) A + 0.1	Anvil Dimensions (mm) C + 0.08	Anvil Part No. For Sheets > 0.76 mm	Anvil Part No. For Sheets 0.51 - 0.75 mm	Punch Part Number
METRIC	M3	3.6	3.03	970200229300	970200242300	970200236400
	M3.5	4.1	3.53	970200007300	970200243300	970200237400
	M4	4.6	4.03	970200019300	970200244300	970200238400
	M5	5.6	5.03	970200020300	970200247300	970200239400
	M6	6.6	6.03	970200230300	970200248300	970200496400

INSTALLATION - HFH™/HFHB™/HFHS™ STUDS

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



.035" - .036" (032)
.045" - .046" (0420)
.063" - .064" (0518)
.077" - .078" (0616)
0.94 mm - 0.96 mm (M5)
1.14 mm - 1.16 mm (M6)
1.62 mm - 1.64 mm (M8)
2.1 mm - 2.12 mm (M10)

See page 9 for "L".

PEMSERTER® Installation Tooling

	Thread Code	Anvil Dimensions (in.) C	Anvil Part Number	Punch Part Number
UNIFIED	032	.191 - .194	970200009300	970200311400
	0420	.250 - .253	970200010300	970200312400
	0518	.3125 - .3155	970200011300	970200313400
	0616	.375 - .378	970200004300	970200314400

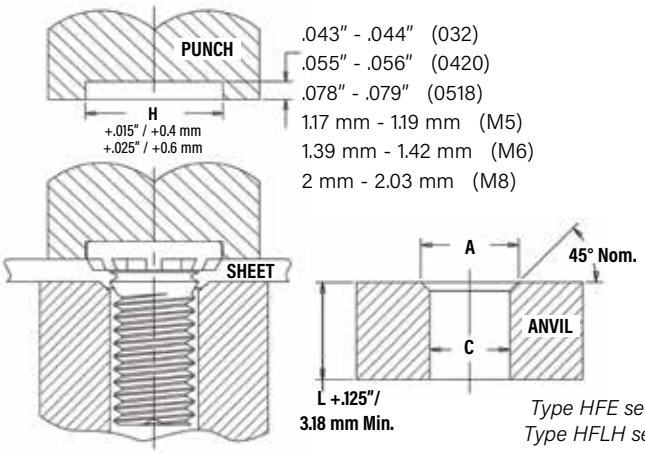
	Thread Code	Anvil Dimensions (mm) C +0.08	Anvil Part Number	Punch Part Number
METRIC	M5	5.03	970200020300	970200311400
	M6	6.03	970200230300	970200312400
	M8	8.03	970200231300	970200313400
	M10	10.03	970200402300	970200491400

INSTALLATION - HFE™/THFE™/HFLH™ STUDS

HFE™/HFLH™ STUDS

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

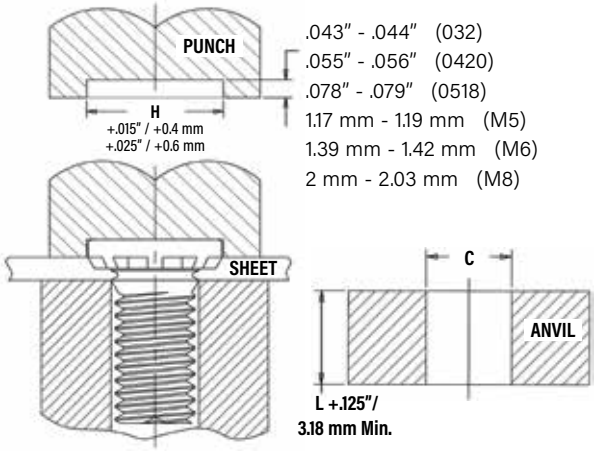
Tooling for sheet thicknesses less than .060" / 1.51 mm with #10 / M5 and 1/4" / M6 thread sizes and less than .075" / 1.9 mm with 5/16" / M8 threads.



.043" - .044" (032)
.055" - .056" (0420)
.078" - .079" (0518)
1.17 mm - 1.19 mm (M5)
1.39 mm - 1.42 mm (M6)
2 mm - 2.03 mm (M8)

Type HFE see page 10 for "L".
Type HFLH see page 12 for "L".

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



.043" - .044" (032)
.055" - .056" (0420)
.078" - .079" (0518)
1.17 mm - 1.19 mm (M5)
1.39 mm - 1.42 mm (M6)
2 mm - 2.03 mm (M8)

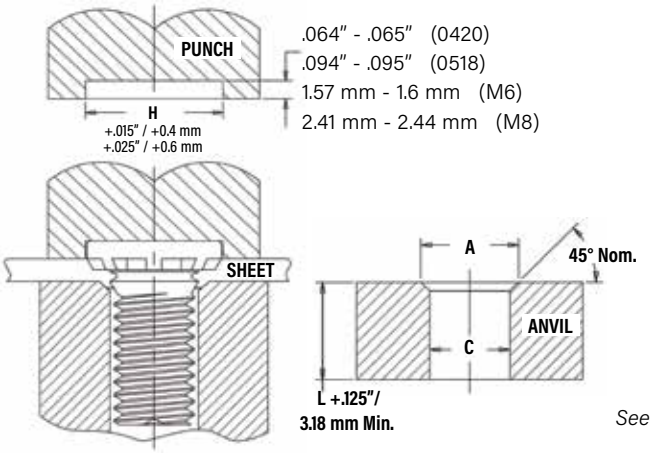
PEMSERTER® Installation Tooling

	Thread Code	Anvil Dimensions (in.) A	Anvil Dimensions (in.) C	Anvil Part No. For Sheets > .060"	Anvil Part No. For Sheets .040" - .060"	Punch Part Number
UNIFIED	032	.216-.220	.191-.194	970200009300	970200246300	8003707
	0420	.295-.300	.250-.253	970200010300	8003702	8003708
				For Sheets > .075"	For Sheets .060" - .075"	
	0518	.334-.338	.3125-.3155	970200011300	8003703	8003709

	Thread Code	Anvil Dimensions (mm) A + 0.1	Anvil Dimensions (mm) C + 0.08	Anvil Part No. For Sheets > 1.51 mm	Anvil Part No. For Sheets 1 mm - 1.51 mm	Punch Part Number
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

THFE™ STUDS

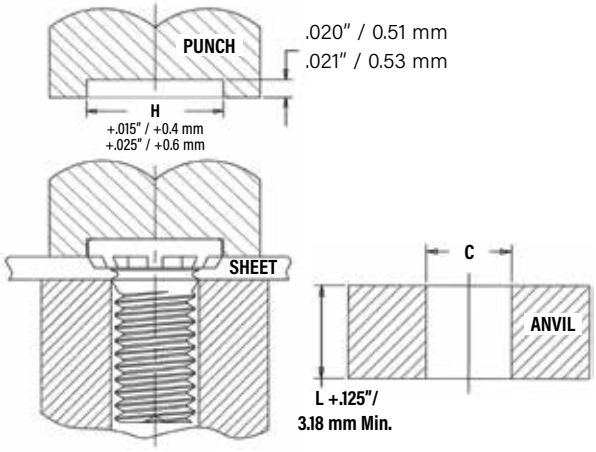
Tooling for sheet thicknesses less than .052" / 1.31 mm with 1/4" / M6 thread sizes, and less than .067" / 1.71 mm with 5/16" / M8 thread sizes.



.064" - .065" (0420)
.094" - .095" (0518)
1.57 mm - 1.6 mm (M6)
2.41 mm - 2.44 mm (M8)

See page 10 for "L".

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



.020" / 0.51 mm
.021" / 0.53 mm

PEMSERTER® Installation Tooling

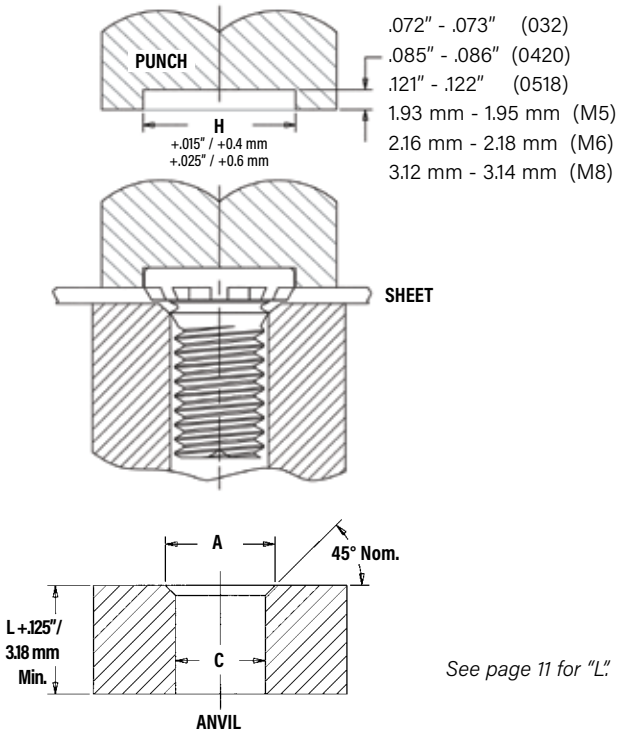
	Thread Code	Anvil Dimensions (in.) A	Anvil Dimensions (in.) C	Anvil Part No. For Sheets > .051"	Anvil Part No. For Sheets .031" - .051"	Punch Part Number
UNIFIED	0420	.302-.306	.250-.253	970200010300	8019886	8019890
				For Sheets > .066"	For Sheets .031" - .066"	
	0518	.374-.378	.3125-.3155	970200011300	8019887	8019891

	Thread Code	Anvil Dimensions (mm) A + 0.1	Anvil Dimensions (mm) C + 0.08	Anvil Part No. For Sheets > 1.3 mm	Anvil Part No. For Sheets 0.8 - 1.3 mm	Punch Part Number
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

INSTALLATION - HFG8™/HF109™ STUDS

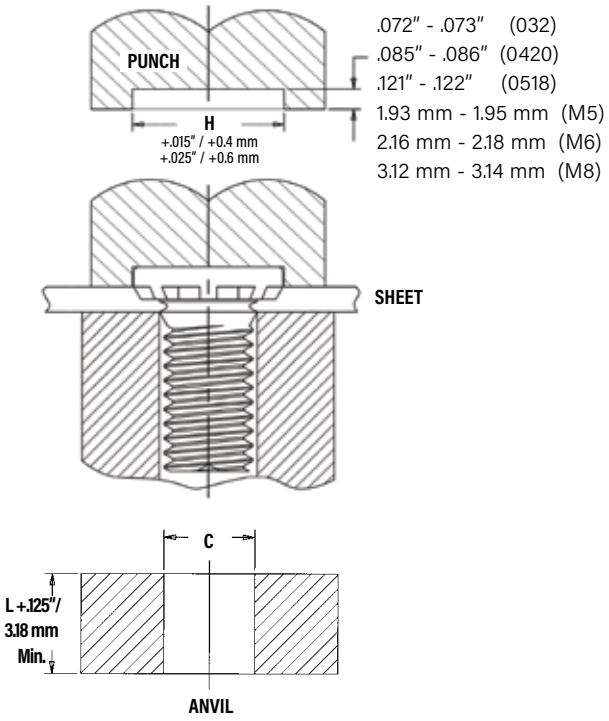
1. Prepare properly sized mounting hole in sheet. Do not perform any secondary operations such as deburring.
2. Insert stud through mounting hole (punch side) of sheet and into anvil hole.
3. With punch and anvil surfaces parallel, apply squeezing force on the punch sufficient only to embed the ribs on the head of the stud into the sheet. Note that for sheets .060" / 1.51 mm and thicker, the anvil requires only a straight thru hole to accommodate the stud. For sheets less than .060" / 1.51 mm to less than .075" / 1.9 mm, the hole requires a countersink with dimension A at the top to provide for metal flow around the shank of the stud.

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



See page 11 for "L".

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



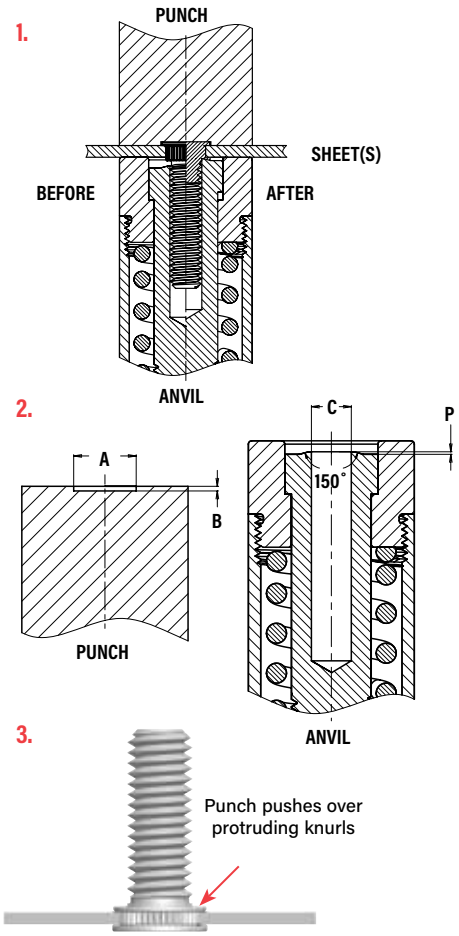
PEMSERTER® Installation Tooling

	Thread Code	Anvil Dimensions (in.)		Anvil Part Number (Standard Sheet)	Anvil Part Number (Thin Sheet)	Punch Part Number
		A	C			
UNIFIED	032	.216 – .220	.191 – .194	970200009300	970200246300	8014456
	0420	.273 – .278	.250 – .253	8021609	8021613	8014458
	0518	.334 – .338	.3125 – .3155	8021610	8021614	8014460

	Thread Code	Anvil Dimensions (mm)		Anvil Part Number (Standard Sheet)	Anvil Part Number (Thin Sheet)	Punch Part Number
		A +0.1	C +0.08			
METRIC	M5	5.6	5.03	970200020300	8003704	8014457
	M6	6.6	6.03	8021611	8021615	8014459
	M8	8.6	8.03	8021612	8021616	8014461

INSTALLATION - SGPC™ SWAGING COLLAR STUDS

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



PEMSERTER® Installation Tooling

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

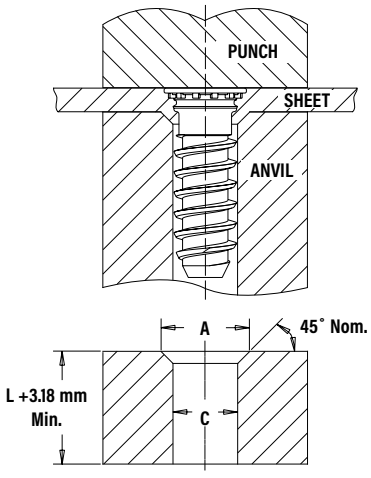
	Thread Code	Punch Dimensions (mm) A +0.1	Punch Dimensions (mm) B -0.025	Punch Part Number	Anvil Dimensions (mm) C +0.025	Anvil Dimensions (mm) P -0.05	Anvil Part Number
METRIC	M2.5	5.5	0.47	8015117	2.53	0.35	8016989
	M3	6.5	0.57	8015118	3.03	0.35	8016990
	M4	7.5	0.57	8015119	4.03	0.35	8016991
	M5	8.5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

NOTE: *For panel design information, go to* *http://www.pemnet.com/SGPC_Panel_Designs.pdf*

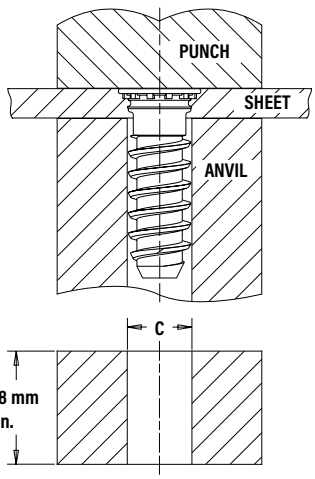
INSTALLATION - FHX™ STUDS

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

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



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



See page 14 for "L".

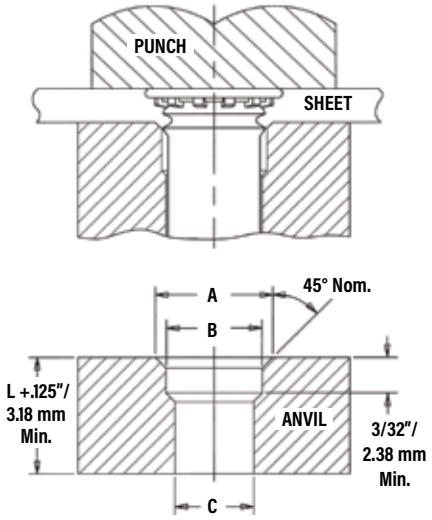
PEMSERTER® Installation Tooling

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

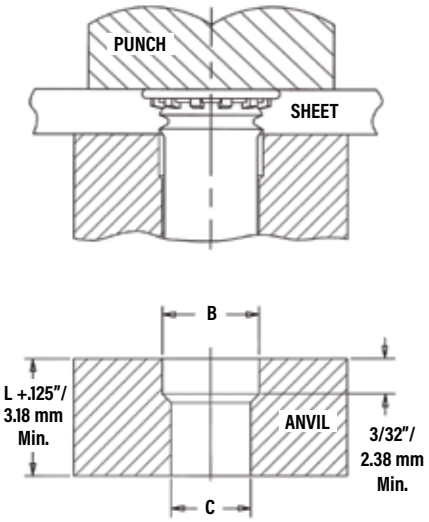
INSTALLATION - FH™/FHS™/FHA™ PINS

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

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



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



See page 15 for "L".

PEMSERTER® Installation Tooling

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

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

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

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

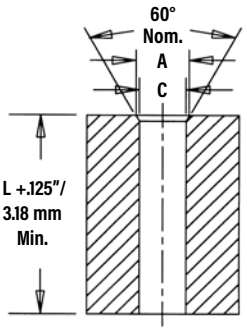
PEMSERTER® Installation Tooling

	Pin Dia. Code	Test Sheet Thickness (in.)	Anvil Dimensions (in.)		Anvil Part Number	Punch Part Number
			A ±.002	C ±.002		
UNIFIED	125	.040 - .060	.160	.130	8003284	975200048
		Over .060	(1)		8003278	
	187	.040 - .065	.220	.192	8003285	
		Over .065	(1)		8003279	
	250	.040 - .075	.285	.255	8003286	
		Over .075	(1)		8003280	

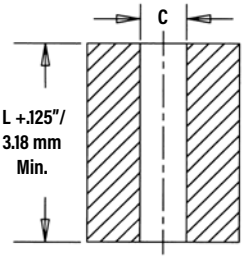
	Pin Dia. Code	Test Sheet Thickness (mm)	Anvil Dimensions (mm)		Anvil Part Number	Punch Part Number
			A ±0.05	C ±0.05		
METRIC	3MM	1 - 1.7	3.88	3.11	8008096	975200048
		Over 1.7	(1)		8008095	
	4MM	1 - 1.7	4.88	4.11	8003287	
		Over 1.7	(1)		8003281	
	5MM	1 - 1.8	5.89	5.13	8003288	
		Over 1.8	(1)		8003282	
	6MM	1 - 1.9	6.89	6.12	8003289	
		Over 1.9	(1)		8003283	

(1) Chamfered anvil not required.

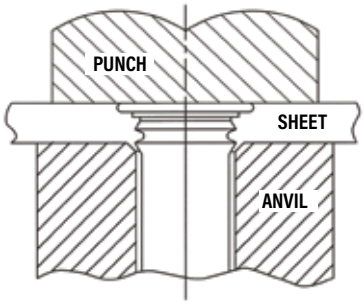
See page 16 for "L".



Recommended tooling when a chamfered anvil is required.



Recommended tooling when a chamfered anvil is not required.



INSTALLATION NOTES

- For best results we recommend using a PEMSERTER® press for installation of PEM self-clinching fasteners. Please check our website for more information.
- Visit the Animation Library on our website to view the installation process for select products.

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

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

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

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

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

PERFORMANCE DATA - FHA™ FLUSH-HEAD STUDS

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

	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	FHA	1.55 mm 5052-H34 Aluminum	74	10.7	575	0.5	1500
	M4	0.96	FHA	1.55 mm 5052-H34 Aluminum	75	14.3	775	1.35	2000
	M5	1.5	FHA	1.55 mm 5052-H34 Aluminum	75	15.2	900	2.6	2500
	M6	3.2	FHA	1.6 mm 5052-H34 Aluminum	75	24.5	1500	5.3	4500

PERFORMANCE DATA - FH4™ STUDS(2)

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

	Thread Code	Rec. Nut Tightening Torque (N·m) (1)	Test Sheet Thickness and Material (3)	Sheet Hardness HRB	Installation (kN)	Pushout (N)	Torque-out (N·m)	Pull Thru (N)
METRIC	M3	1.3	1.5 mm Stainless Steel	87	40	2220	1.8	3500
	M4	3.8	1.5 mm Stainless Steel	86	50	3210	6.5	8000
	M5	6	1.5 mm Stainless Steel	86	53	3560	10.7	10000
	M6	11	1.6 mm Stainless Steel	88	71	4200	15.9	14900

PERFORMANCE DATA - FHP™ STUDS(2)

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

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

(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 needed to be adjusted based on the actual K value.

(2) Performance values shown are typical for fasteners properly installed using raised ring tooling in good condition. We recommend replacing installation tooling when the height of the "P" falls out of tolerance (see page 18). Reductions in performance may occur as the height of the protrusion wears. Variations in hole preparation, installation force, and sheet material type, thickness, and hardness will affect both performance and tooling life.

(3) Performance may be reduced for studs installed into thicker sheets.

PERFORMANCE DATA - FHL™/FHLS™ STUDS

	Thread Code	Rec. Nut Tightening Torque (in. lbs.) (1)	Type	Test Sheet Thickness and Material	Sheet Hardness HRB	Installation (lbs.)	Pushout (lbs.)	Torque-out (in. lbs.)	Pull Thru (lbs.)	Pull Thru Test Bushing Hole Size (in.)
UNIFIED	256	2.1	FHL / FHLS	.047" Aluminum	33	700	55	4	230	.106
		3.8	FHL / FHLS	.045" Steel	54	1200	85	8	425	.106
	440	3.5	FHL / FHLS	.047" Aluminum	33	1000	60	5	300	.132
		6.8	FHL / FHLS	.045" Steel	54	1200	105	11	580	.132
	632	4.7	FHL / FHLS	.047" Aluminum	33	1000	65	6.5	325	.158
		9	FHL / FHLS	.045" Steel	54	1500	110	15	650	.158
	832	6	FHL / FHLS	.047" Aluminum	33	1200	80	9	350	.184
		13	FHL / FHLS	.045" Steel	54	1500	125	18	740	.184
	032	7.9	FHL / FHLS	.047" Aluminum	33	2500	115	18	395	.210
		16	FHL / FHLS	.045" Steel	54	4500	210	38	800	.210

	Thread Code	Rec. Nut Tightening Torque (N·m) (1)	Type	Test Sheet Thickness and Material	Sheet Hardness HRB	Installation (kN)	Pushout (N)	Torque-out (N·m)	Pull Thru (N)	Pull Thru Test Bushing Hole Size (mm)
METRIC	M2.5	0.32	FHL / FHLS	1.2 mm Aluminum	33	3.1	285	0.55	1200	3
		0.59	FHL / FHLS	1.1 mm Steel	54	5.3	450	1.1	2250	3
	M3	0.41	FHL / FHLS	1.2 mm Aluminum	33	4.4	285	0.65	1300	3.5
		0.79	FHL / FHLS	1.1 mm Steel	54	5.3	475	1.25	2500	3.5
	M3.5	0.51	FHL / FHLS	1.2 mm Aluminum	33	4.4	290	0.76	1400	4
		1.03	FHL / FHLS	1.1 mm Steel	54	6.6	500	1.75	2800	4
	M4	0.65	FHL / FHLS	1.2 mm Aluminum	33	5.3	365	1.1	1550	4.5
		1.39	FHL / FHLS	1.1 mm Steel	54	6.6	550	2.1	3300	4.5
	M5	0.97	FHL / FHLS	1.2 mm Aluminum	33	11.1	530	2.2	1850	5.5
		1.97	FHL / FHLS	1.1 mm Steel	54	20	1000	4.4	3750	5.5

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

	Thread Code	Max. Nut Tightening Torque (in. lbs.)	Type	Test Sheet Thickness and Material	Sheet Hardness HRB	Installation (lbs.) (2)	Pushout (lbs.)	Torque-out (in. lbs.)
UNIFIED	440	5	TFH	.020" Aluminum	28	1300	45	7
			TFHS	.020" Aluminum	28	1200	45	7
			TFH	.023" Steel	52	2800	100	8
			TFHS	.025" Steel	52	1500	100	8
	632	9	TFH	.020" Aluminum	28	2100	50	8
			TFHS	.020" Aluminum	28	1500	50	8
			TFH	.023" Steel	52	2500	110	16
			TFHS	.025" Steel	52	2500	110	16
	832	17	TFH	.020" Aluminum	28	2100	60	10
			TFHS	.020" Aluminum	28	2200	60	11
			TFH	.023" Steel	52	3100	120	26
			TFHS	.025" Steel	52	2700	120	26
	024	24	TFH	.020" Aluminum	28	2300	65	14
			TFHS	.020" Aluminum	28	2500	65	14
	032	27	TFH	.023" Steel	52	3700	150	30
			TFHS	.025" Steel	52	3000	130	28

	Thread Code	Max. Nut Tightening Torque (N-m)	Type	Test Sheet Thickness and Material	Sheet Hardness HRB	Installation (kN) (2)	Pushout (N)	Torque-out (N-m)
METRIC	M3	0.74	TFH	0.5 mm Aluminum	28	5.8	195	0.6
			TFHS	0.5 mm Aluminum	28	5.3	195	0.6
			TFH	0.6 mm Steel	52	12.5	300	1
			TFHS	0.6 mm Steel	52	6.7	300	1
	M4	1.7	TFH	0.5 mm Aluminum	28	12.5	250	0.7
			TFHS	0.5 mm Aluminum	28	9.8	250	0.7
			TFH	0.6 mm Steel	52	17.8	500	2.5
			TFHS	0.6 mm Steel	52	13.4	500	2.5
	M5	3.5	TFH	0.5 mm Aluminum	28	15.6	270	1.3
			TFHS	0.5 mm Aluminum	28	13.4	270	1.3
			TFH	0.6 mm Steel	52	26.7	670	3
			TFHS	0.6 mm Steel	52	17.8	670	3

(1) 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 needed to be adjusted based on the actual K value.

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

PERFORMANCE DATA - HFE™ STUDS

	Thread Code	Rec. Nut Tightening Torque (ft. lbs.) (1)	Test Sheet Thickness and Material (in.)	Sheet Hardness HRB	Installation (lbs.) (2)	Pushout (lbs.)	Torque-out (in. lbs.)	Tensile Strength (lbs.) (3)	Pull Thru (lbs.)	Test Bushing Hole Size For Pull Thru Tests
UNIFIED	032	3.6	.040" Aluminum	27	7500	170	60	2400	1900	.279
		4.2	.040" Cold-rolled Steel	67	9500	300	60	2400	2200	
	0420	8	.040" Aluminum	27	8000	180	120	3820	3200	.335
		9	.040" Cold-rolled Steel	67	13500	340	130	3820	3600	
	0518	19	.060" Aluminum	22	9000	275	240	6280	6000	.407
		20	.060" Cold-rolled Steel	65	15500	575	290	6280	6400	

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

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

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

(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 needed to be adjusted based on the actual K value.
(2) Installation controlled by proper cavity depth in punch.
(3) Head size is adequate to ensure failure in threaded area.

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

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

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

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

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

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

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

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

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

PERFORMANCE DATA - HFLH™ STUDS

	Thread Code	Rec. Nut Tightening Torque (ft. lbs.) (1)	Test Sheet Thickness and Material (in.)	Sheet Hardness HRB	Installation (lbs.) (2)	Pushout (lbs.)	Torque-out (in. lbs.)	Tensile Strength (lbs.) (3)	Pull Thru (lbs.)	Test Bushing Hole Size For Pull Thru Tests
UNIFIED	032	4.2	.040" HC500LA	89	9500	300	60	2400	2200	.279
	0420	10	.040" HC500LA	89	13500	340	130	3820	3600	.335
	0518	23	.060" HC500LA	91	16000	575	290	6280	6400	.407

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

PERFORMANCE DATA - SGPC™ SWAGING COLLAR STUDS

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

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

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

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

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

PERFORMANCE DATA - TPS™ PILOT PINS

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

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

PERFORMANCE DATA - TP4™ PILOT PINS

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

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

PERFORMANCE DATA - TPXS™ PILOT PINS

	Pin Dia. Code	Test Sheet Material	Sheet Hardness HRB	Installation (kN)	Pushout (kN)
METRIC	3MM	Aluminum	22	12	0.56
		Steel	65	22	0.98

Fastener drawings and models are available at www.pemnet.com

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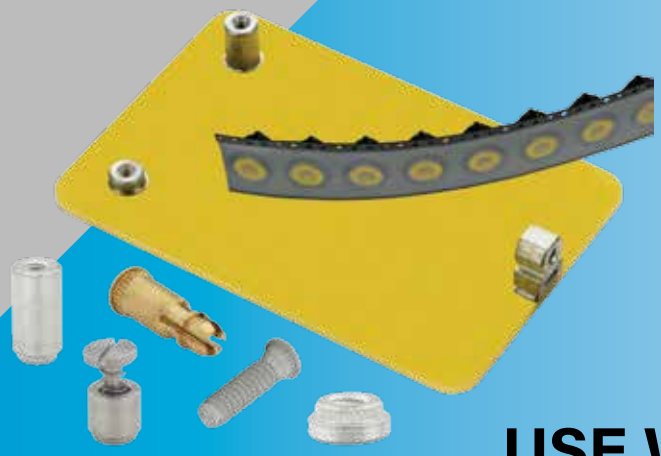
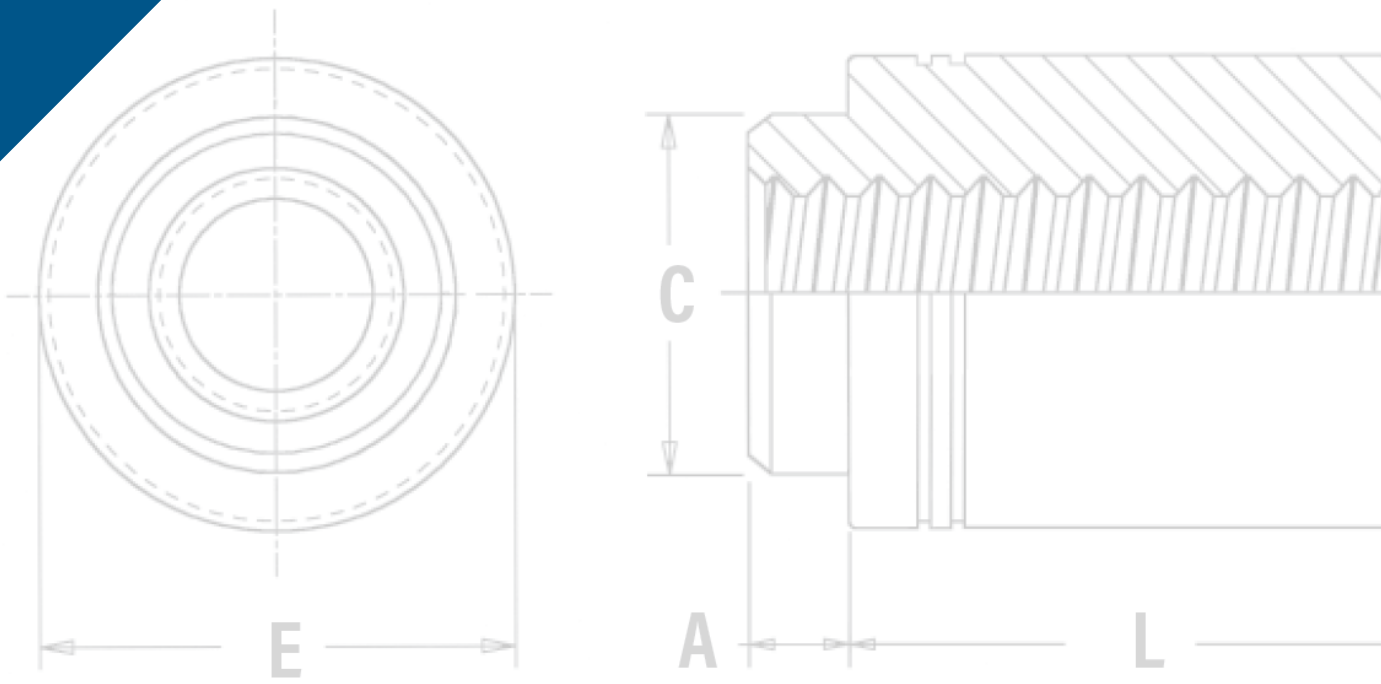
Bulletin K-1015
Rev 717

PEM® brand fasteners that utilize, surface-mount, broaching and flaring technology for use with PC boards



K™

FASTENERS FOR USE WITH PC BOARDS



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 (KFB3™) offer a combined broach/flare feature for even greater pullout performance in PC board materials.

NUTS AND SPACERS/STANDOFFS

SMTSO™/SMTSOB™ - ReelFast® surface mount nuts and standoffs are available threaded and unthreaded - **PAGE 4**

SMTSS™ - ReelFast® SNAP-TOP® standoffs feature a spring action to hold PC Board securely without screws or threaded hardware - **PAGE 5**

New

KF2™/KFS2™ - Broaching nuts, internally threaded for mounting on PC boards - **PAGE 6**

KFE™/KFSE™ - Broaching standoffs, threaded or unthreaded for stacking or spacing - **PAGE 7**

KFB3™ - Broach/flare-mount standoffs with greater pullout performance - **PAGE 7**

KSSB™ - Broaching, SNAP-TOP® standoffs feature a spring action to hold PC board securely without screws or threaded hardware - **PAGE 8**

CAPTIVE PANEL SCREWS

SMTPFLSM™ - ReelFast® surface mount spring-loaded captive panel screws - **PAGE 9**

SMTPF™ - ReelFast® surface mount captive panel screws - **PAGE 10**

PFK™ - Broaching panel fastener assemblies for mounting on PC boards - **PAGE 11**

STUDS

KFH™ - Threaded broaching studs for use as solderable connectors or as permanently mounted studs on PC boards - **PAGE 11**

RIGHT ANGLE FASTENERS

SMTRA™ - ReelFast® R'ANGLE® surface mount fasteners provide strong re-usable threads at right angles to PC boards - **PAGE 12**

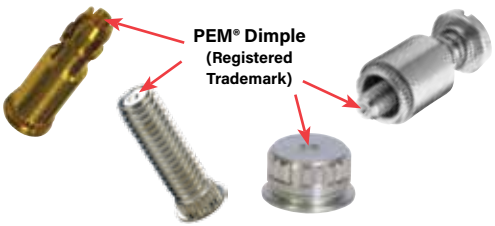
SHEET JOINING FASTENERS

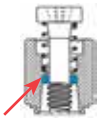
SFK™ - SpotFast® clinch/broach mount fasteners for joining metal to PCB/plastic panels - **PAGE 13**

QUICK REFERENCE CHART

PEM® Fastener	Page No.	Mounting Types				Primary Use							
		Broach	Broach/ Flare	Surface Mount	Clinch/ Broach	Nut	Spacer/ Standoff	Snap Attachment	Stud	Captive Screw	Color Coding	Right Angle Attachment	Sheet tp Sheet Joining
SMTSO/SMTSOB	4			▪		▪	▪						
SMTSS	5			▪			▪	▪					
KF2/KFS2	6	▪				▪							
KFE/KFSE	7	▪					▪						
KFB3	7		▪				▪						
KSSB	8	▪					▪	▪					
SMTPFLSM	9			▪						▪			
SMTPF	10			▪						▪	▪		
PFK	11	▪								▪			
KFH	11	▪							▪				
SMTRA	12			▪								▪	
SFK	13	▪			▪								▪

PEM® TRADEMARKS



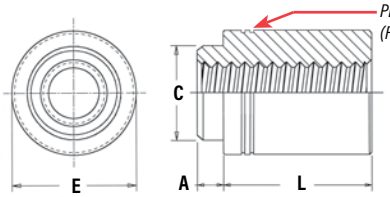


To be sure that you are getting genuine PEM® brand fasteners, look for the unique PEM® product markings and identifiers.

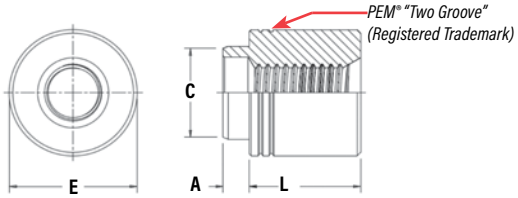
Fastener drawings and models are available at www.pemnet.com

SMTSO™/SMTSOB™ ReelFast® SURFACE MOUNT NUTS AND SPACERS/STANDOFFS

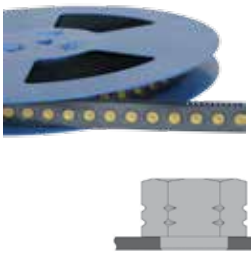
SMTSO



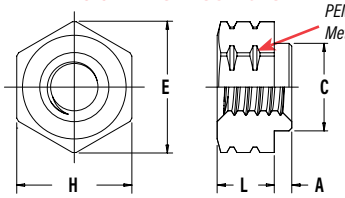
SMTSOB



Thread/thru hole sizes 2-56, 4-40, 6-32, 8-32, 116, 143, M2, M2.5, M3, M3.5, M4, 3.6, and 4.2

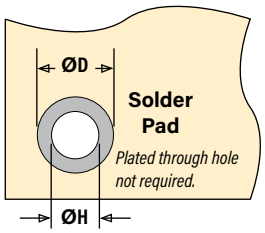


microPEM® SMTSO NUTS



Thread sizes 080, S1, S1.2, S1.4 and M1.6

Stencil Masking Examples



All dimensions are in inches.

	Thread Size	Thru Hole +.004 -.003	Type Fastener Material Steel	Type Fastener Material Brass	Thread or Thru Hole Code	Length Code "L" ±.005 (Length code in 32nds of an inch) .062	.125	.250	.375	Min. Sheet Thickness	A Max.	C Max.	E Ref.	E ±.005	H Nom.	ØH Hole Size In Sheet +.003 -.000	ØD Min. Solder Pad
UNIFIED	.060-80 (#0-80)	–	SMTSO	–	080	2	4	–	–	.020	.019	.095	.144		.125	.098	.165
UNIFIED	.086-56 (#2-56)	–	SMTSO	SMTSOB	256	2	4	8 (1)	12 (1)	.060	.060	.142	–	.219	–	.147	.244
UNIFIED	.112-40 (#4-40)	–	SMTSO	SMTSOB	440	2	4	8 (1)	12 (1)	.060	.060	.161	–	.219	–	.166	.244
UNIFIED	.138-32 (#6-32)	–	SMTSO	SMTSOB	632	2	4	8 (1)	12 (1)	.060	.060	.208	–	.281	–	.213	.306
UNIFIED	.164-32 (#8-32)	–	SMTSO	SMTSOB	832	2	4	8 (1)	12 (1)	.060	.060	.245	–	.344	–	.250	.369
UNIFIED	–	.116	SMTSO	SMTSOB	116	2	4	8	12	.060	.060	.161	–	.219	–	.166	.244
UNIFIED	–	.143	SMTSO	SMTSOB	143	2	4	8	12	.060	.060	.208	–	.281	–	.213	.306

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) 1	2	3	–	–	–	–	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	–	SMTSO	–	M1	1	2	3	–	–	–	–	0.5	0.48	2.41	3.66	–	3.18	2.5	4.19
METRIC	S1.2	–	SMTSO	–	M1.2	1	2	3	–	–	–	–	0.5	0.48	2.41	3.66	–	3.18	2.5	4.19
METRIC	S1.4	–	SMTSO	–	M1.4	1	2	3	–	–	–	–	0.5	0.48	2.41	3.66	–	3.18	2.5	4.19
METRIC	M1.6 x 0.35	–	SMTSO	–	M1.6	1	2	3	–	–	–	–	0.5	0.48	2.41	3.66	–	3.18	2.5	4.19
METRIC	M2 x 0.4	–	SMTSO	SMTSOB	M2	–	2	3	4 (1)	6 (1)	8 (1)	10 (1)	1.53	1.53	3.6	–	5.56	–	3.73	6.2
METRIC	M2.5 x 0.45	–	SMTSO	SMTSOB	M25	–	2	3	4 (1)	6 (1)	8 (1)	10 (1)	1.53	1.53	4.09	–	5.56	–	4.22	6.2
METRIC	M3 x 0.5	–	SMTSO	SMTSOB	M3	–	2	3	4 (1)	6 (1)	8 (1)	10 (1)	1.53	1.53	4.09	–	5.56	–	4.22	6.2
METRIC	M3.5 x 0.6	–	SMTSO	SMTSOB	M35	–	2	3	4 (1)	6 (1)	8 (1)	10 (1)	1.53	1.53	5.28	–	7.14	–	5.41	7.77
METRIC	M4 x 0.7	–	SMTSO	SMTSOB	M4	–	2	3	4	6 (1)	8 (1)	10 (1)	1.53	1.53	6.22	–	8.74	–	6.35	9.37
METRIC	–	3.6	SMTSO	SMTSOB	3.6	–	2	3	4	6	8	10	1.53	1.53	5.28	–	7.14	–	5.41	7.77
METRIC	–	4.2	SMTSO	SMTSOB	4.2	–	2	3	4	6	8	10	1.53	1.53	6.22	–	8.74	–	6.35	9.37

(1) SMTSOB 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
080	–	3500 / 8	–	2000 / 8	–	–	–	–
256, 440, 632, 116, 143	–	1500 / 12	–	1000 / 12	–	650 / 12	–	300 / 16
832	–	1100 / 16	–	800 / 16	–	500 / 16	–	300 / 16
M1, M1.2, M1.4, M1.6	3500 / 8	2500 / 8	2000 / 8	–	–	–	–	–
M2, M25, M3, M35, 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	–

PART NUMBER DESIGNATION

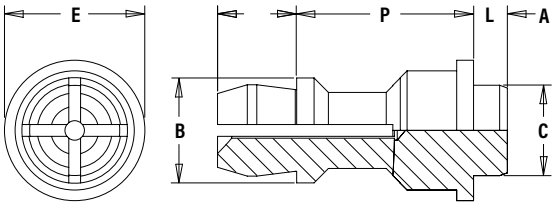
SMTSO	-	440	-	8		ET
SMTSOB	-	440	-	8		ET
↓ Type and Material		↓ Thread or Thru Hole Code		↓ Length Code		↓ Finish	

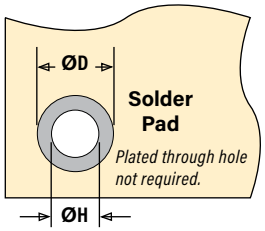
Packaged on 330 mm recyclable reels. Tape width is 24 mm. Supplied with polyimide patch for vacuum pick up. Reels conform to EIA-481.

SMTSS™ REELFAST® SNAP-TOP® STANDOFFS

NEW!

NOTE: *REELFAST® SNAP-TOP® SMTSS™ standoffs are for on-only applications. For removal applications, mounting hole can be increased to reduce removal force.*



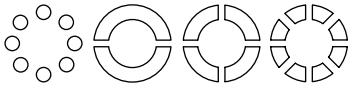


PART NUMBER DESIGNATION

SMTSS S - 156 - 12 ET

Type | Material | Panel 2 (Top) Mounting Hole Diameter Code | Length Code | Finish

Stencil Masking Examples



All dimensions are in inches.

	Top Board Mounting Hole Diameter Code	Type and Material	Length Code "L" ±.005 (Length Code in 32nds of an inch)		Min. Sheet Thickness	A Max.	C Max.	E ±.005	B ±.005	P ±.005	ØH Hole Size in Sheet +.003 -.000	ØD Min. Solder Pad
UNIFIED			.250	.375								
	156	SMTSS	8	12	.060	.060	.161	.250	.188	.141	.166	.276

All dimensions are in millimeters.

	Top Board Mounting Hole Diameter Code	Type and Material	Length Code "L" ±0.13 (Length Code in millimeters)			Min. Sheet Thickness	A Max.	C Max.	E ±0.13	B ±0.13	P ±0.13	ØH Hole Size in Sheet +0.08	ØD Min. Solder Pad
METRIC	4MM	SMTSS	6	8	10	1.53	1.53	4.09	6.35	4.8	3.58	4.22	7

NUMBER OF PARTS PER REEL

Type, Material and Size	Length Code / Number of Parts per Reel		
SMTSSS-156	-8 / 280	-12 / 220	
SMTSSS-4MM	-6 / 300	-8 / 250	-10 / 200

Packaged on 330 mm recyclable reels. Tape width is 24 mm.
Supplied with polyimide patch for vacuum pick up. Reels conform to EIA-481.

NOTE ABOUT PLATED AND UNPLATED MOUNTING HOLES FOR BROACHING FASTENERS

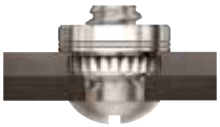
Broaching and broach/flare types are designed for unplated mounting hole applications. If used in plated mounting holes, the stresses involved can damage the plating, push out the plating entirely, or break any traces inside the board that might be connected to the plated hole. When installing into non-plated mounting holes there may even be issues with delamination, measeling or crazing in some instances.

Increasing the mounting hole size +.005" to +.008" /+0.13 mm to +0.2 mm may relieve these conditions. If increasing the mounting hole does not correct the issue then we recommend our surface-mount type fasteners.

It is always recommended that you try the fasteners in your specific application before full production begins. We are happy to provide samples for this purpose.

General recommendations for "Keep Out" areas are the same as our "Min. Distance Hole C/L to Edge" dimensions stated in the dimensional charts of our bulletin.

KF2™/KFS2™ BROACHING NUTS

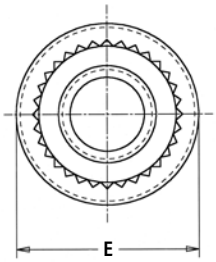


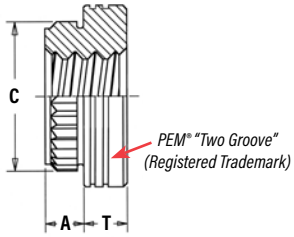
PART NUMBER DESIGNATION

KFS2 - 832

KF2 - 832 - ET

- KF2 / KFS2: Type and Material
- 832: Thread Code
- ET: Finish





All dimensions are in inches.

	Thread Size	Type: Carbon Steel	Type: Stainless Steel	Thread Code	A (Shank) Max.	Min. Sheet Thickness	Hole Size In Sheet +.003 -.000	C ±.003	E ±.005	T ±.005	Min. Dist. Hole ℄ To Edge
UNIFIED	.086-56 (#2-56)	KF2	KFS2	256	.060	.060	.147	.165	.219	.065	0.16
	.112-40 (#4-40)	KF2	KFS2	440	.060	.060	.166	.184	.219	.065	0.17
	.138-32 (#6-32)	KF2	KFS2	632	.060	.060	.213	.231	.281	.065	0.22
	.164-32 (#8-32)	KF2	KFS2	832	.060	.060	.250	.268	.344	.096	0.25
	.190-32 (#10-32)	KF2	KFS2	032	.060	.060	.272	.290	.375	.127	0.28

All dimensions are in millimeters.

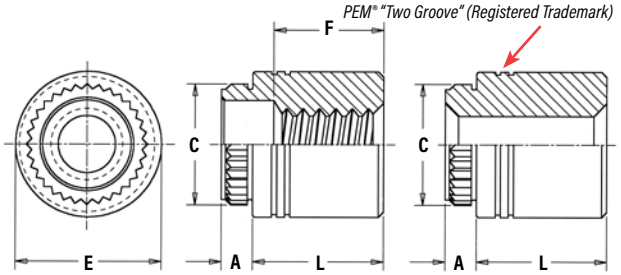
	Thread Size x Pitch	Type: Carbon Steel	Type: Stainless Steel	Thread Code	A (Shank) Max.	Min. Sheet Thickness	Hole Size In Sheet +0.08	C ±0.08	E ±0.13	T ±0.13	Min. Dist. Hole ℄ To Edge
METRIC	M2 x 0.4	KF2	KFS2	M2	1.53	1.53	3.73	4.19	5.56	1.5	4.2
	M2.5 x 0.45	KF2	KFS2	M2.5	1.53	1.53	4.22	4.68	5.56	1.5	4.4
	M3 x 0.5	KF2	KFS2	M3	1.53	1.53	4.22	4.68	5.56	1.5	4.4
	M4 x 0.7	KF2	KFS2	M4	1.53	1.53	6.4	6.81	8.74	2	6.4
	M5 x 0.8	KF2	KFS2	M5	1.53	1.53	6.9	7.37	9.53	3	7.1

KFE™/KFSE™ BROACHING STANDOFFS

PART NUMBER DESIGNATION

KFSE	-	632	-	12		
KFE	-	632	-	12		ET
↓ Type and Material		↓ Thread or Thru Hole Code		↓ Length Code		↓ Finish

PEM® "Two Groove" (Registered Trademark)



All dimensions are in inches.

	Thread Size	Thru Hole +.004 -.003	Type		Thread or Thru Hole Code	Length "L" ±.005 (Length Code is in 32nds of an inch)								A (Shank) Max.	Min. Sheet Thickness	Hole Size In Sheet +.003 -.000	C ±.003	E ±.005	Min. Dist. Hole ℄ To Edge
			Carbon Steel	Stainless Steel		.125	.250	.375	.500	.625	(1) .750	(1) .875	(1) 1.00						
UNIFIED	.112-40 (#4-40)	–	KFE	KFSE	440	4	8	12	16	20	24	–	–	.060	.060	.166	.184	.219	.17
	.138-32 (#6-32)	–	KFE	KFSE	632	4	8	12	16	20	24	28	32	.060	.060	.213	.231	.281	.22
	–	.116	KFE	KFSE	116	4	8	12	16	20	24	–	–	.060	.060	.166	.184	.219	.17
	–	.143	KFE	KFSE	143	4	8	12	16	20	24	28	32	.060	.060	.213	.231	.281	.22
	"F" Minimum Thread Length (Where Applicable)					Full			.375 ± .016		.375 Blind								

All dimensions are in millimeters.

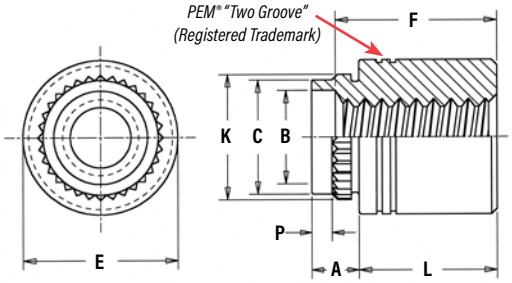
	Thread Size x Pitch	Thru Hole +0.10 -0.08	Type		Thread or Thru Hole Code	Length "L" ±0.13 (Length Code is in millimeters)								A (Shank) Max.	Min. Sheet Thickness	Hole Size In Sheet +0.08	C ±0.08	E ±0.13	Min. Dist. Hole ℄ To Edge
			Carbon Steel	Stainless Steel															
METRIC	M3 x 0.5	–	KFE	KFSE	M3	3	4	6	8	10	12	14	16	1.53	1.53	4.22	4.68	5.56	4.4
	–	3.6	KFE	KFSE	3.6	3	4	6	8	10	12	14	16	1.53	1.53	5.41	5.87	7.14	5.5
	–	4.2	KFE	KFSE	4.2	3	4	6	8	10	12	14	16	1.53	1.53	6.4	6.86	8.74	7.1
	"F" Minimum Thread Length (Where Applicable)					Full					9.5 ± 0.4								

KFB3™ BROACH/FLARE-MOUNT STANDOFFS

PART NUMBER DESIGNATION

KFB3	-	632	-	12	ET
↓ Type and Material		↓ Thread Code		↓ Length Code	↓ Finish

PEM® "Two Groove" (Registered Trademark)



All dimensions are in inches.

	Thread Size	Type	Thread Code	Length "L" ±.005 (Length Code is in 32nds of an inch)										A (Shank) Max.	Sheet Thickness	Hole Size in Sheet +.005 -.001	B ±.003	C Max.	E ±.005	K ±.003	P ±.010	Min. Dist. Hole ℄ To Edge
				.062	.125	.187	.250	.312	.375	.500	.625	(1) .750	(1) 1.00									
UNIFIED	.112-40 (#4-40)	KFB3	440	2	4	6	8	10	12	16	20	–	–	.09	.050-.065	.166	.122	.165	.219	.179	.040	.17
	.138-32 (#6-32)	KFB3	632	2	4	6	8	10	12	16	20	24	32	.09	.050-.065	.213	.171	.212	.280	.226	.040	.22
	"F" Min. Thread Length (Where Applicable)			Full								.375 Blind										

All dimensions are in millimeters.

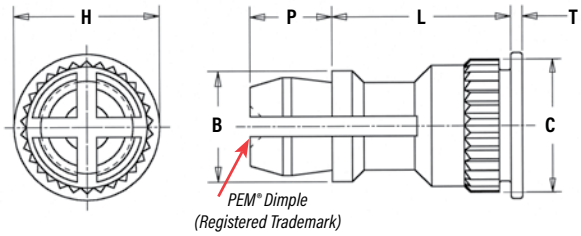
	Thread Size x Pitch	Type	Thread Code	Length "L" ±0.13 (Length Code is in millimeters)									A (Shank) Max.	Sheet Thickness	Hole Size in Sheet +0.13 -0.03	B ±0.08	C Max.	E ±0.13	K ±0.08	P ±0.25	Min. Dist. Hole ℄ To Edge
METRIC	M3 x 0.5	KFB3	M3	2	3	4	6	8	10	12	14	16	2.29	1.27-1.65	4.22	3.23	4.2	5.56	4.55	1	4.33
	M4 x 0.7	KFB3	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											

(1) Blind at shank end with .375" minimum thread length from head end.

KSSB™ BROACHING SNAP-TOP® STANDOFFS

PART NUMBER DESIGNATION

KSSB	-	156	-	12	X
Type and Material		Top Board Mounting Hole Diameter Code		Length Code	Finish



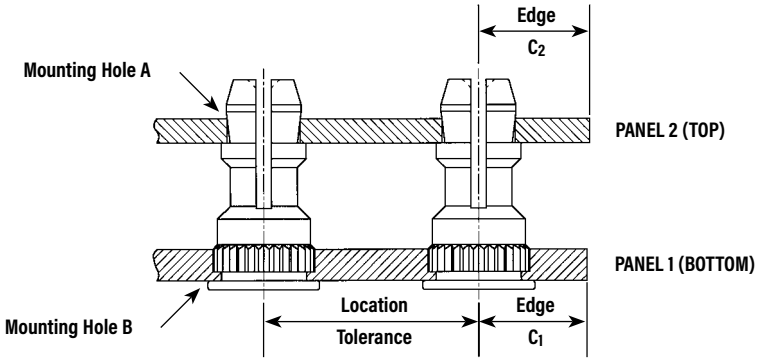
All dimensions are in inches.

	Type	Top Board Mounting Hole Diameter Code	Length "L" ±.005 (Length Code is in 32nds of an inch)										B ±.005	C ±.003	H ±.005	P ±.005	T ±.005
			.250	.312	.375	.437	.500	.562	.625	.750	.875	1.00					
UNIFIED	KSSB	156	8	10	12	14	16	18	20	24	28	32	.188	.226	.250	.141	.020

All dimensions are in millimeters.

	Type	Top Board Mounting Hole Diameter Code	Length "L" ±0.13 (Length Code is in millimeters)									B ±0.13	C ±0.08	H ±0.13	P ±0.13	T ±0.13
			8	10	12	14	16	18	20	22	25					
METRIC	KSSB	4MM										4.8	5.74	6.35	3.58	0.51

KSSB™ APPLICATION DATA



All dimensions are in inches.

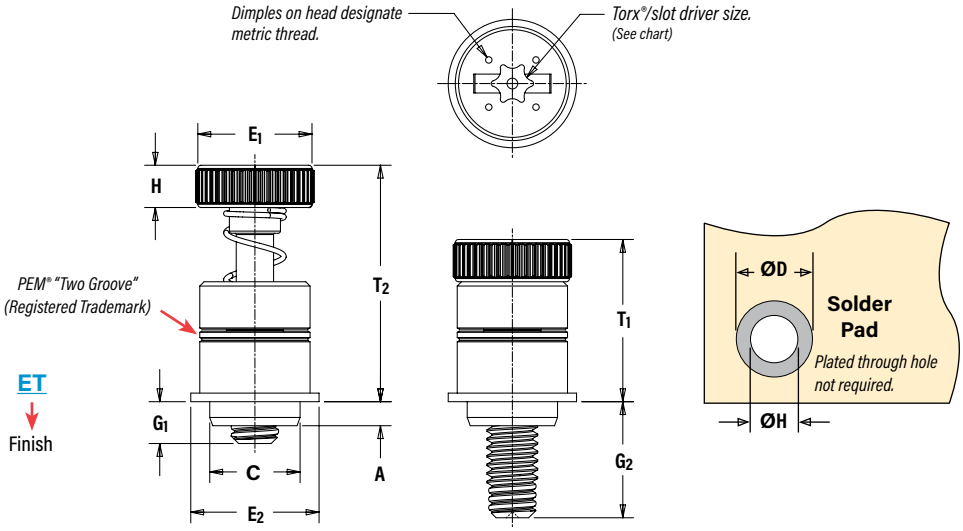
		Panel 1						Panel 2				
	Type	Hardness Max. (1)	Bottom Mounting Hole B +.003 -.000	Panel Material	Thickness Min.	Edge Distance C_1 Min.	Location Tolerance	Hardness Max.	Top Mounting Hole A +.003 -.000	Panel Material	Thickness Range (2)	Edge Distance C_2 Min.
UNIFIED	KSSB	HRB 65 / HB 116	.213	PC Board	.050	.220	±.005	No Limit	.156	PC Board or Metal	.040 - .070	.100

All dimensions are in millimeters.

		Panel 1						Panel 2				
	Type	Hardness Max. (1)	Bottom Mounting Hole B +0.08	Panel Material	Thickness Min.	Edge Distance C_1 Min.	Location Tolerance	Hardness Max.	Top Mounting Hole A +0.08	Panel Material	Thickness Range (2)	Edge Distance C_2 Min.
METRIC	KSSB	HRB 65 / HB 116	5.41	PC Board	1.27	5.59	±0.13	No Limit	4	PC Board or Metal	1 - 1.8	2.54

(1) HRB - Hardness Rockwell "B" Scale. HB - Hardness Brinell.
(2) Available for thicker boards on special order.

SMTPFLSM™ ReelFast® SURFACE MOUNT CAPTIVE PANEL SCREWS



PART NUMBER DESIGNATION

SMTPF	LS	M	-	440	-	0	ET
Type	Driver	Anti-cross Thread Feature		Thread Code		Length Code	Finish

All dimensions are in inches.

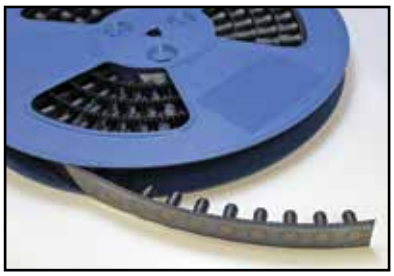
	Thread Size	Type	Thread Code	Screw Length Code	A (Shank) Max.	Min. Sheet Thickness	C Max.	E_1 ±.010	E_2 Nom	G_1 ±.025	G_2 ±.025	H ±.010	T_1 Nom.	T_2 Nom.	ØK Hole Size in Sheet +.003 -.000	ØD Min. Solder Pad	Driver Size
UNIFIED	.112-40 (#4-40)	SMTPFLSM	440	0	.063	.063	.215	.280	.300	.040	.210	.100	.38	.55	.220	.340	T15
				1						.100	.270						
	.138-32 (#6-32)	SMTPFLSM	632	0	.063	.063	.247	.310	.320	.040	.240	.100	.42	.62	.252	.400	T15
				1						.100	.300						

All dimensions are in millimeters.

	Thread Size	Type	Thread Code	Screw Length Code	A (Shank) Max.	Min. Sheet Thickness	C Max.	E_1 ±0.25	E_2 Nom	G_1 ±0.64	G_2 ±0.64	H ±0.25	T_1 Nom.	T_2 Nom.	ØK Hole Size in Sheet +0.08	ØD Min. Solder Pad	Driver Size
METRIC	M3 x 0.5	SMTPFLSM	M3	0	1.6	1.6	5.46	7	7.6	1	5.3	2.5	9.6	14	5.6	8.6	T15
				1						2.5	6.8						
	M3.5 x 0.6	SMTPFLSM	M3.5	0	1.6	1.6	6.27	7.9	8.13	1	6.1	2.5	10.7	15.7	6.4	10.2	T15
				1						2.5	7.62						

NUMBER OF PARTS PER REEL

Thread Size	Parts Per Reel
440	200
632	150
M3	200
M3.5	150



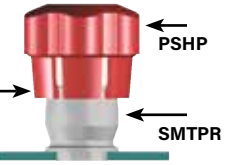
Packaged on 330 mm recyclable reels. Tape width is 24 mm. Supplied with polyimide patch for vacuum pick up. Reels conform to EIA-481.

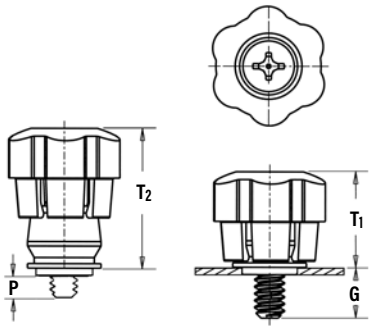
SMTPF™ ReelFast® SURFACE MOUNT CAPTIVE PANEL SCREWS

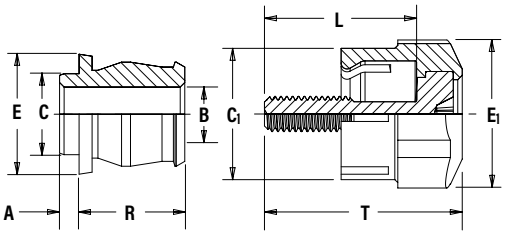
Patented.

When Assembled

Spring action of plastic "fingers" holds screw in retracted position.







All dimensions are in inches.

	Thread Size	Screw Part Number: Type	Thread Code	Screw Length Code	Retainer Part Number	Assembly Dimensions: G ±.025	P ±.025	T_1 Nom.	T_2 Nom.	Total Radial Float	Screw Dimensions: C_1 ±.010	E_1 ±.010	L ±.015	T Nom.	Retainer Dimensions: A (Shank) Max.	Min. Sheet Thick.	B ±.003	C Max.	E Nom.	R ±.005
UNIFIED	.112-40 (#4-40)	PSHP	440	0	SMTPR-6-1	.188	.000	.478	.646	.015	.440	.542	.510	.663	.060	.060	.167	.249	.375	.325
				1		.248	.026						.570	.723						
	.138-32 (#6-32)	PSHP	632	0	SMTPR-6-1	.188	.000	.478	.646	.020	.440	.542	.510	.663	.060	.060	.167	.249	.375	.325
				1		.248	.026						.570	.723						

All dimensions are in millimeters.

	Thread Size x Pitch	Screw Part Number: Type	Thread Code	Screw Length Code	Retainer Part Number	Assembly Dimensions: G ± 0.64	P ± 0.64	T_1 Nom.	T_2 Nom.	Total Radial Float	Screw Dimensions: C_1 ±0.25	E_1 ±0.25	L ±0.38	T Nom.	Retainer Dimensions: A (Shank) Max.	Min. Sheet Thick.	B ±0.08	C Max.	E Nom.	R ±0.13
METRIC	M3 x 0.5	PSHP	M3	0	SMTPR-6-1	4.78	0	12.14	16.41	.38	11.18	13.77	12.95	16.84	1.53	1.53	4.24	6.33	9.53	8.26
				1		6.3	.66						14.48	18.36						
	M3.5 x 0.6	PSHP	M3.5	0	SMTPR-6-1	4.78	0	12.14	16.41	.51	11.18	13.77	12.95	16.84	1.53	1.53	4.24	6.33	9.53	8.26
				1		6.3	.66						14.48	18.36						

RETAINER *- Packaged on 330 mm recyclable reels of 465 pieces. Tape width is 24 mm. Supplied with Kapton® patch for vacuum pick up. Reels conform to EIA-481.*

SCREW *- Packaged in bags. Retainers and screws are sold separately.*

PART NUMBER DESIGNATION FOR SCREW

PSHP	-	632	-	0	L	001
Type		Thread Code		Length Code	Cap Style (Lobed)	Color Code (Standard Black)

PART NUMBER DESIGNATION FOR RETAINER

SMTPR	-	6	-	1	ET
Type		Retainer Size		Shank Code	Finish

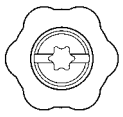
COLOR CAPABILITIES FOR TYPE PSHP SCREW

The colors shown here (codes #002 thru #007) are non-stocked standards and available on special order. Since actual cap colors may vary slightly from those shown here, we recommend that you request samples for color verification. If you require a custom color or you need a "color matched" cap, please contact us.

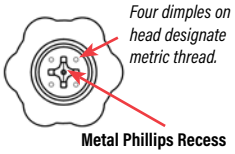
Std. Black #001 Red #002 Orange #003 Yellow #004

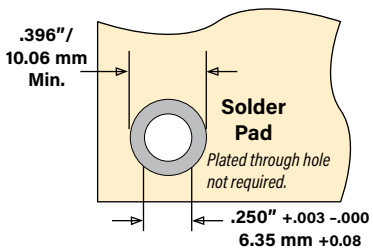
Green #005 Blue #006 Violet #007

Non-flammable UL 94-V0 plastic caps are available on special order.



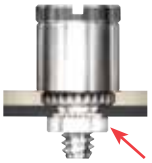
Available with Torx® recess on special order.





Stencil Masking Examples

PFK™ BROACHING CAPTIVE PANEL SCREWS

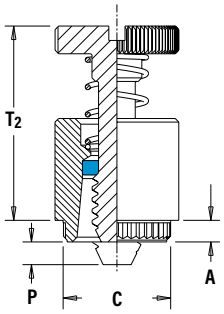


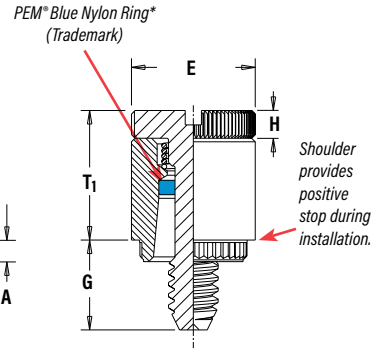
Shown here with self-clinching mating nut

PART NUMBER DESIGNATION

PFK	-	632	-	62
Type		Thread Code		Screw Length Code

Diagonal knurl identifies metric thread sizes





All dimensions are in inches.

	Thread Size	Type	Thread Code	Screw Length Code	A (Shank) Max.	Min. Sheet Thickness	Hole Size In Sheet +.003 -.000	C ±.003	E ±.010	G ±.016	H ±.005	P ±.025	T_1 Max.	T_2 Nom.	Min. Dist. Hole ℄ To Edge
UNIFIED	.112-40 (#4-40)	PFK	440	40	.060	.060	.265	.283	.312	.250	.072	.000	.36	.54	.20
				62						.375		.125			
				84						.500		.250			
	.138-32 (#6-32)	PFK	632	40	.060	.060	.281	.299	.344	.250	.072	.000	.36	.54	.26
				62						.375		.125			
				84						.500		.250			

All dimensions are in millimeters.

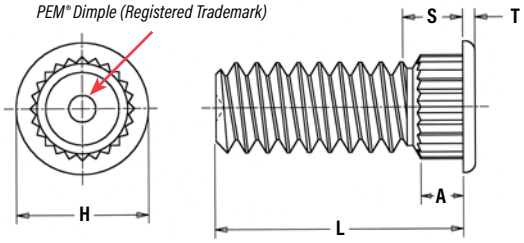
	Thread Size x Pitch	Type	Thread Code	Screw Length Code	A (Shank) Max.	Min. Sheet Thickness	Hole Size In Sheet +0.08	C ±0.08	E ±0.25	G ±0.4	H ±0.13	P ±0.64	T_1 Max.	T_2 Nom.	Min. Dist. Hole ℄ To Edge
METRIC	M3 x 0.5	PFK	M3	40	1.53	1.53	6.73	7.19	7.92	6.4	1.83	0	9.14	13.72	5.08
				62						9.5		3.2			
				84						12.7		6.4			

**Retaining rings are plastic with normal 250°F / 120°C temperature limit.*

KFH™ BROACHING STUDS

PART NUMBER DESIGNATION

KFH	-	632	-	8		ET
Type and Material		Thread Code		Length Code		Finish



All dimensions are in inches.

	Thread Size	Type	Thread Code	Length "L" ±.010 (Length Code is in 16ths of an inch)						A (Shank) Max.	Min. Sheet Thickness	Hole Size in Sheet +.003 -.000	Max. Hole Size in Attached Parts	H ±.010	S Max. (1)	T ±.005	Min. Dist. Hole ℄ To Edge
				.250	.312	.375	.500	.625	.750								
UNIFIED	.112-40 (#4-40)	KFH	440	4	5	6	8	10	12	.065	.060	.120	.145	.180	.09	.020	.15
	.138-32 (#6-32)	KFH	632	4	5	6	8	10	12	.065	.060	.140	.170	.200	.09	.020	.19
	.164-32 (#8-32)	KFH	832	4	5	6	8	10	12	.065	.060	.166	.195	.225	.09	.020	.20
	.190-32 (#10-32)	KFH	032	4	5	6	8	10	12	.065	.060	.189	.220	.250	.09	.020	.20

All dimensions are in millimeters.

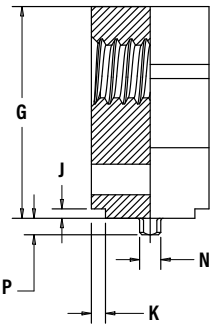
	Thread Size x Pitch	Type	Thread Code	Length "L" ±0.25 (Length Code is in millimeters)						A (Shank) Max.	Min. Sheet Thickness	Hole Size in Sheet +0.08	Max. Hole Size in Attached Parts	H ±0.25	S Max. (1)	T ±0.13	Min. Dist. Hole ℄ To Edge
METRIC	M3 x 0.5	KFH	M3	6	8	10	12	15	18	1.65	1.53	3	3.7	4.58	2.3	0.51	3.8
	M4 x 0.7	KFH	M4	6	8	10	12	15	18	1.65	1.53	4.2	4.8	5.74	2.3	0.51	5.1
	M5 x 0.8	KFH	M5	6	8	10	12	15	18	1.65	1.53	5	5.8	6.6	2.3	0.51	5.3

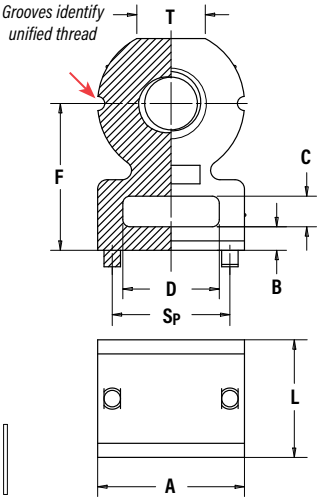
(1) *Threads are gaugeable to within 2 pitches of the "S" Max. dimension. A class 3B/5H maximum material commercial nut shall pass up to the "S" Max. dimension.*

ReelFast® SURFACE MOUNT RIGHT ANGLE (R'ANGLE®) FASTENERS

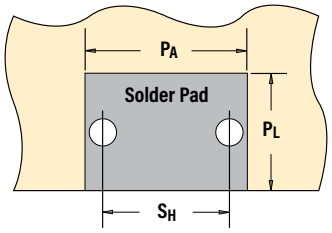
PART NUMBER DESIGNATION

SMTRA	256	-	8	-	6	ET
↓	↓		↓		↓	↓
Type	Thread Code		Height Code		Length Code	Finish



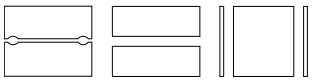


Patented.



Solder pad can be flush to edge.
Plated through hole not required.

Stencil Masking Examples



All dimensions are in inches.

	Thread Size	Type	Thread Code	Height Code	Length Code	Length L ±.005	Min. Sheet Thick-ness	Hole Size In Sheet +.003 -.000	A ±.006	B ±.006	C ±.006	D ±.006	Height F ±.006	G ±.006	J Nom.	K Nom.	N Max.	P Max.	S_P ±.003	T Nom.
UNIFIED	.086-56 (#2-56)	SMTRA	256	8	6	.188	.040	.053	.218	.040	.060	.140	.250	.345	.020	.030	.048	.040	.157	.105
	.112-40 (#4-40)	SMTRA	440	9	6	.188	.040	.053	.250	.050	.065	.160	.281	.390	.020	.030	.048	.040	.188	.125
	.138-32 (#6-32)	SMTRA	632	10	8	.250	.040	.053	.312	.050	.065	.205	.312	.450	.020	.030	.048	.040	.250	.145
	.164-32 (#8-32)	SMTRA	832	12	9	.281	.040	.053	.375	.050	.075	.250	.375	.535	.020	.030	.048	.040	.312	.195

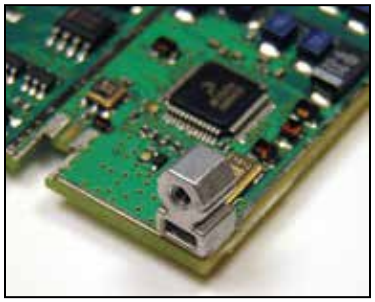
All dimensions are in millimeters.

	Thread Size x Pitch	Type	Thread Code	Height Code	Length Code	Length L ±0.13	Min. Sheet Thick-ness	Hole Size In Sheet +0.08	A ±0.15	B ±0.15	C ±0.15	D ±0.15	Height F ±0.15	G ±0.15	J Nom.	K Nom.	N Max.	P Max.	S_P ±0.08	T Nom.
METRIC	M2 x 0.4	SMTRA	M2	6	5	5	1	1.35	5.5	1	1.5	3.5	6	8.4	0.5	0.75	1.22	1	4	2.65
	M2.5 x 0.45	SMTRA	M25	6	5	5	1	1.35	5.5	1	1.5	3.5	6	8.4	0.5	0.75	1.22	1	4	2.65
	M3 x 0.5	SMTRA	M3	7	5	5	1	1.35	6.35	1.25	1.65	4	7	9.75	0.5	0.75	1.22	1	4.75	3.2
	M4 x 0.7	SMTRA	M4	9	7	7	1	1.35	9.53	1.25	1.65	6.35	9	13.1	0.5	0.75	1.22	1	7.9	4.8

	Thread Code	Pad Width P_A Min.	Pad Length P_L Min.	Hole Spacing S_H ±.002	Hole Size In Sheet +.003 -.000
UNIFIED	256	.262	.171	.157	.053
	440	.294	.171	.188	.053
	632	.356	.233	.250	.053
	832	.419	.264	.312	.053

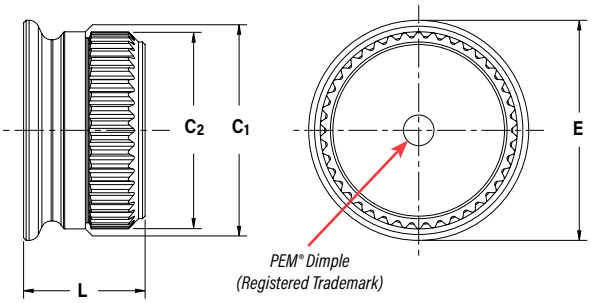
	Thread Code	Pad Width P_A Min.	Pad Length P_L Min.	Hole Spacing S_H ±0.05	Hole Size In Sheet +0.08
METRIC	M2	6.62	4.57	4	1.35
	M25	6.62	4.57	4	1.35
	M3	7.47	4.57	4.75	1.35
	M4	10.65	6.57	7.9	1.35

Part Number	Parts Per Reel	Pitch (mm)	Tape Width (mm)
SMTRA256-8-6	375	16	24
SMTRA440-9-6	300	16	24
SMTRA632-10-8	200	20	32
SMTRA832-12-9	200	20	32
SMTRAM2-6-5	375	16	24
SMTRAM25-6-5	375	16	24
SMTRAM3-7-5	300	16	24
SMTRAM4-9-7	200	20	32



SFK™ SpotFast® CLINCH/BROACH MOUNT FASTENERS

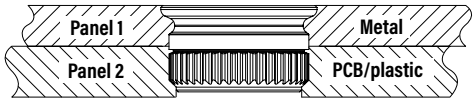
Patented.



Type and Size	Thickness Code	Panel 1 Thickness ±0.08 mm / ±.003"		Panel 1 Mounting Hole +0.08 mm / +.003" -.000"		Panel 2 Thickness Min. (1)		Panel 2 Mounting Hole +0.08 mm / +.003" -.000"		C_1 Max.		C_2 ±0.08 mm / ±.003"		E Max.		L Max.		Min. Dist Hole ℄ To Edge	
		mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.
SFK-3	0.8	0.8	.031	3	.118	1.6	.063	2.5	.098	2.98	.117	2.9	.114	3.53	.139	2.31	.091	3	0.12
SFK-3	1.0	1	.039	3	.118	1.6	.063	2.5	.098	2.98	.117	2.9	.114	3.76	.148	2.51	.099	3	0.12
SFK-3	1.2	1.2	.047	3	.118	1.6	.063	2.5	.098	2.98	.117	2.9	.114	3.76	.148	2.72	.107	3	0.12
SFK-3	1.6	1.6	.063	3	.118	1.6	.063	2.5	.098	2.98	.117	2.9	.114	3.76	.148	3.12	.123	3	0.12
SFK-5	0.8	0.8	.031	5	.197	1.6	.063	4.5	.177	4.98	.196	4.9	.193	5.56	.219	2.31	.091	5.1	0.20
SFK-5	1.0	1	.039	5	.197	1.6	.063	4.5	.177	4.98	.196	4.9	.193	5.56	.219	2.51	.099	5.1	0.20
SFK-5	1.2	1.2	.047	5	.197	1.6	.063	4.5	.177	4.98	.196	4.9	.193	5.56	.219	2.72	.107	5.1	0.20
SFK-5	1.6	1.6	.063	5	.197	1.6	.063	4.5	.177	4.98	.196	4.9	.193	5.56	.219	3.12	.123	5.1	0.20

(1) Fastener will provide flush application at minimum sheet thickness.

Can be used as a single flush-mounted pivot point. For more information, please contact our Applications Engineering Department.



Type SFK joining metal to PCB/plastic.

PART NUMBER DESIGNATION

SFK	-	3	-	0.8	-	ZI
Type		Panel 1 Mounting Hole Code		Thickness Code		Finish

MATERIAL AND FINISH SPECIFICATIONS

	Threads (1)		Fastener Materials					Standard Finishes			Optional Finish	For Use in Sheet Hardness: (3)				
Type	Internal, ASME B1.1 2B/ ASME B1.13M 6H	External, ASME B1.1 2A/ ASME B1.13M 6g	Carbon Steel	300 Series Stainless Steel	CDA-510 Phosphor Bronze	CDA-353 Brass	Nylon, Temp. Limit 200˚ F/ 93˚ C	Passivated and/or Tested Per ASTM A380	Electro-Plated Tin ASTM B 545, Class B With Clear Preservative Coating, annealed (4)	No Finish	Black Nitride	HRB 70 / HB 125 or Less	HRB 65 / HB 116 or Less	HRB 60 / HB 107 or Less	HRB 55 / HB 96 or Less	PC Board
KF2	▪		▪						▪					▪		▪
KFS2	▪			▪				▪				▪				▪
KFE	▪		▪						▪					▪		▪
KFSE	▪			▪				▪				▪				▪
KFB3	▪					▪			▪				▪			▪
KSSB						▪				▪			▪			▪
KFH		▪			▪				▪						▪	▪
PFK Retainer				▪				▪			▪				▪	▪
Screw		▪		▪				▪			▪					
Spring				▪												
Retaining Ring							▪									
Part Number Codes For Finishes								None	ET	X	BN					

	Threads (1)			Fastener Materials					Standard Finishes (2)			For Use in Sheet Hardness: (3)	
Type	Miniature ISO 1501, 4H6	Internal, ASME B1.1 2B/ ASME B1.13M 6H	External, ASME B1.1 2A/ ASME B1.13M 6g	Carbon Steel	Hardened Carbon Steel	300 Series Stainless Steel	Brass	Zinc Diecast	Zinc Plated 5µm, Colorless	Electro-Plated Tin ASTM B 545, Class A With Clear Preservative Coating, annealed (4)	Bright Nickel Over Copper Flash	HRB 80 / HB 150 or less	P.C. Board
SMTSO	▪ S1 to S1.4	▪ 0-80 to 8-32 M1.6 to M4		▪						▪			▪
SMTSOB		▪					▪			▪			▪
SMTRA		▪						▪		▪			▪
SMTPFLSM Retainer				▪						▪			▪
Screw			▪		▪				▪				
Spring						▪							
PSHP (5)				▪							▪		
SMTPR				▪						▪			▪
SFK				▪					▪			▪	▪
SMTSSS				▪						▪			▪
Part Number Codes For Finishes									ZI	ET	CN		

(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 (see notes at end of table C-1) 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) HRB - Hardness Rockwell "B" Scale. HB - Hardness Brinell.

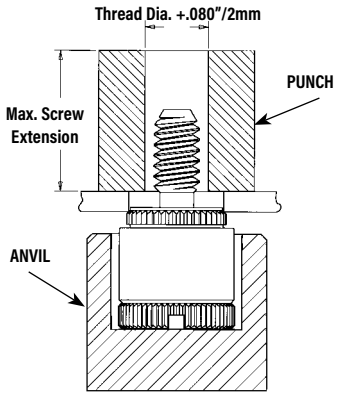
(4) Optimal solderability life noted on packaging.

(5) ABS cap on PSHP screw has a temperature limit of 200˚ F / 93˚ C.

INSTALLATION

KF2™/KFS2™/KFE™/KFSE™/ PFK™ FASTENERS

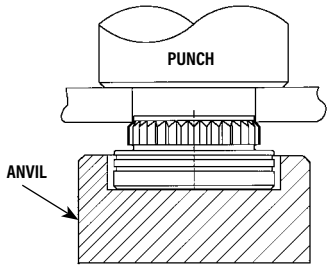
1. Prepare properly sized mounting hole in board.
2. Place fastener into the anvil hole and place the mounting hole over the shank of the fastener as shown in drawing.
3. With installation punch and anvil surfaces parallel, apply squeezing force until shoulder contacts the board.



PFK

PEMSERTER® Installation Tooling

Type	Thread Code	Anvil Part Number	Punch Part Number
PFK	440/M3	975200026	975200060
PFK	632	975200027	975200061



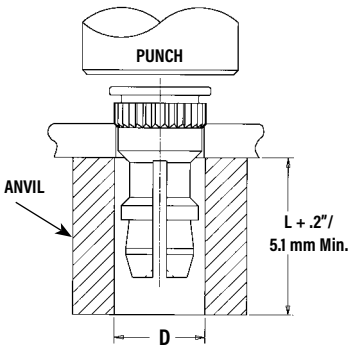
KF2/KFS2/
KFE/KFSE

PEMSERTER® Installation Tooling

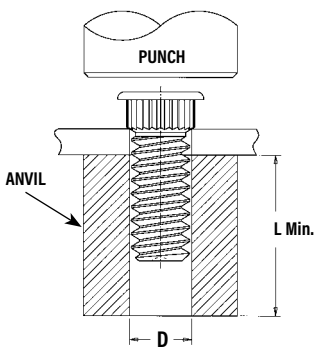
Type	Thread Code	Anvil Part Number	Punch Part Number
KF2/KFS2	080	8015899	975200048
KF2/KFS2	256/440/M2/M2.5/M3	975200904300	
KF2/KFS2	632/M3.5	975200035	
KF2/KFS2	832/M4	975200037	
KF2/KFS2	032/M5	975200905300	

PEMSERTER® Installation Tooling

Type	Thread Code	Anvil Part Number	Punch Part Number
KFE/KFSE	440/116 -4 to -8	975200846300	975200048
KFE/KFSE	440/116 -10 to -12	975200847300	
KFE/KFSE	440/116 -16 to -20	975200848300	
KFE/KFSE	440/116 -20 to -24	975200882300	
KFE/KFSE	M3 -3 to -6	975200846300	
KFE/KFSE	M3 -8 to -10	975200847300	
KFE/KFSE	M3 -12 to -14	975201222300	
KFE/KFSE	M3 -14 to -16	975200848300	
KFE/KFSE	632/143 -4 to -8	975200849300	
KFE/KFSE	632/143 -10 to -12	975200850300	
KFE/KFSE	632/143 -16 to -20	975200851300	
KFE/KFSE	632/143 -22 to -24	975200883300	
KFE/KFSE	632/143 -28 to -32	975200884300	
KFE/KFSE	3.6 -3 to -6	975200849300	975200048
KFE/KFSE	3.6 -8 to -10	975200850300	
KFE/KFSE	3.6 -12 to -16	975200851300	
KFE/KFSE	4.2 -2	975201216300	
KFE/KFSE	4.2 -3 to -6	975201217300	
KFE/KFSE	4.2 -8 to -10	975201218300	
KFE/KFSE	4.2 -12 to -14	975201220300	
KFE/KFSE	4.2 -14 to -16	975201219300	



KSSB



KFH

KSSB™/KFH™ FASTENERS

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

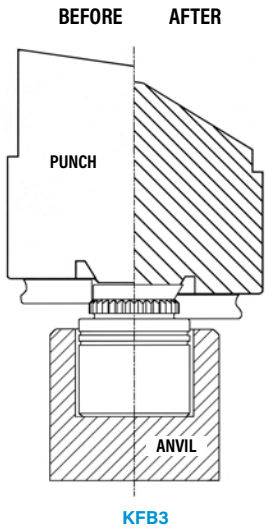
PEMSERTER® Installation Tooling

Part Number	D +.003" -.000"
KFH-440-L	.113"
KFH-632-L	.140"
KFH-832-L	.166"
KFH-032-L	.191"
KSSB-156-L	.216"

Part Number	D +0.08mm
KFH-M3-L	3.1mm
KFH-M4-L	4.1mm
KFH-M5-L	5.1mm
KSSB-4mm-L	5.49mm

KFB3™ FASTENERS

1. Punch or drill properly sized round 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.



KFB3

PEMSERTER® Installation Tooling(1)

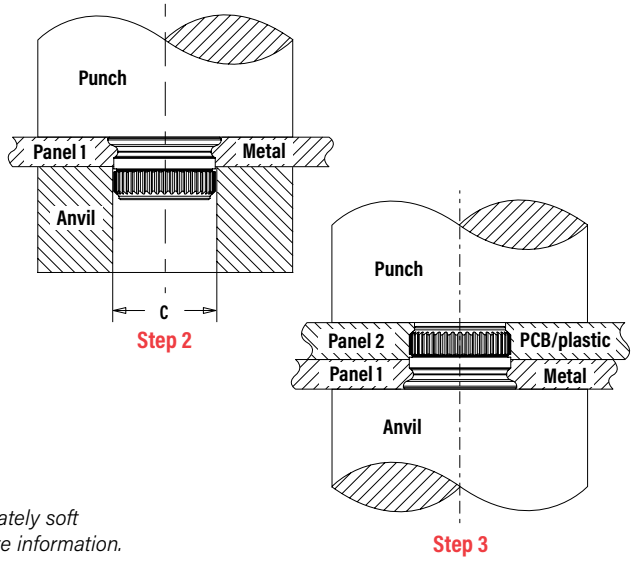
Thread Code	Length Code	Anvil	Punch (Flaring Tool)
#4-40	-2	975201213300	975201231400
#4-40	-4 to -8	975200846300	
#4-40	-10 to -12	975200847300	
#4-40	-16 to -20	975200848300	
#4-40	-20 to -24	975200882300	
#6-32	-2	975201215300	975201232400
#6-32	-4 to -8	975200849300	
#6-32	-10 to -12	975200850300	
#6-32	-16 to -20	975200851300	
#6-32	-22 to -24	975200883300	
#6-32	-28 to -32	975200884300	

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 KFB3 fasteners.

SFK™ FASTENERS

Step 1. Prepare properly sized mounting hole in both panels.
Step 2. Using only Panel 1, with the punch and anvil surfaces parallel, apply squeezing force until the fastener is flush with the top of Panel 1.
Step 3. Place Panel 2 over fastener and apply squeezing force.



PEMSERTER® Installation Tooling(1)

Size	C ±0.13/±.003 (mm) / (in.)	Punch Part No.	Anvil Part No.*
SFK-3	3.05 / .120	975200048	970200229300
SFK-5	5.05 / .199	975200048	970200020300

** Part number for anvil used in Step 2*

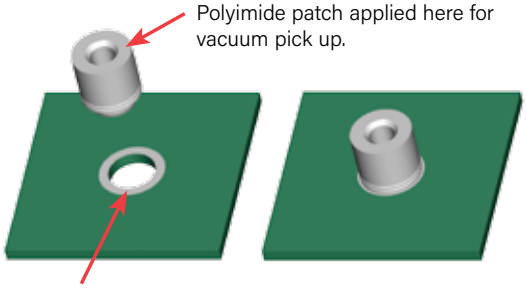
NOTE: *Fastener can be installed in both sheets at once when metal panel is adequately soft compared to the non-metal panel. E-mail techsupport@pemnet.com for more information.*

INSTALLATION NOTES

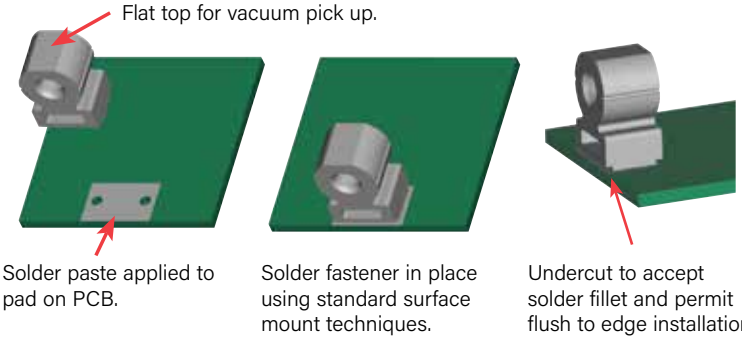
- For best results we recommend using a PEMSERTER® press for installation of PEM self-clinching fasteners. Please check our website for more information.
- Visit the Animation Library on our website to view the installation process for this product.

INSTALLATION

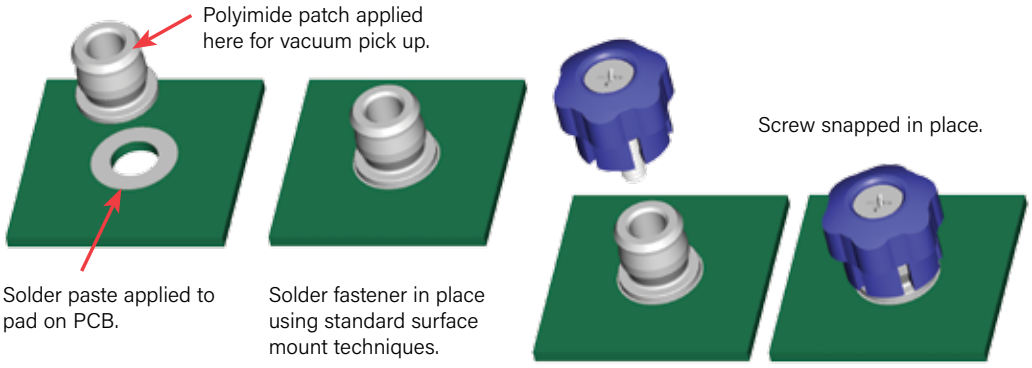
SMT NUTS AND STANDOFFS



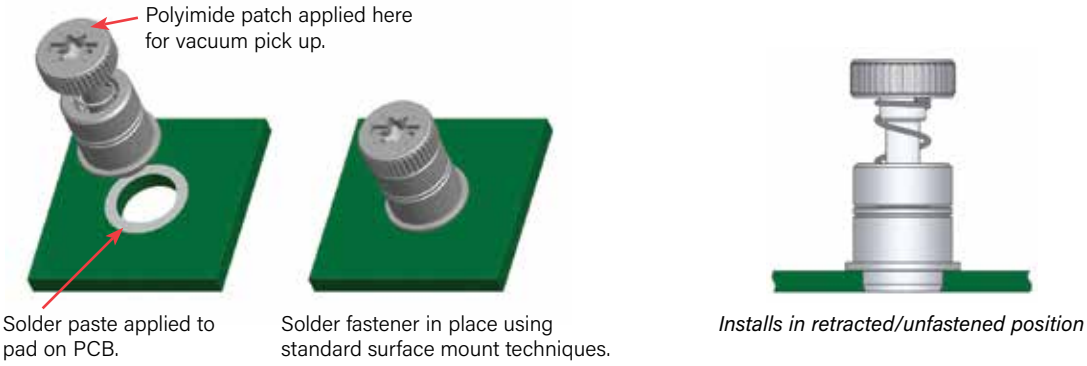
SMT R'ANGLE® FASTENERS



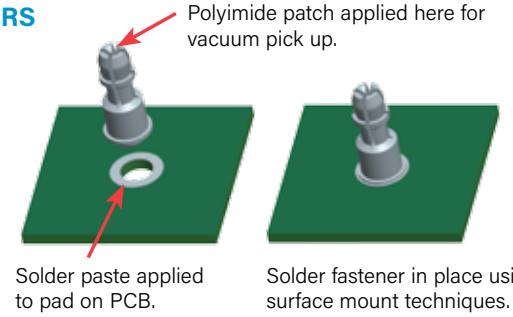
SMT CAPTIVE PANEL SCREWS



SMTPFLSM™ CAPTIVE PANEL SCREWS



SMTSS™ FASTENERS



PERFORMANCE DATA(1)

KF2™/KFS2™/KFE™/KFSE™/KFB3™/KFH™/PFK™ BROACHING AND BROACH/FLARE MOUNT FASTENERS

	Type	Thread Code	Max. Nut Tightening Torque (in. lbs.)	Test Sheet Thickness & Test Sheet Material	Installation (lbs.)	Pushout (lbs.) (2)	Torque-out (in. lbs.)
UNIFIED	KF2 KFS2 KFE KFSE	256	(3)	.060" FR-4 Panel	400	60	6
		440	(3)	.060" FR-4 Panel	400	65	15
		632	(3)	.060" FR-4 Panel	500	80	30
		832	(3)	.060" FR-4 Panel	700	95	35
		032	(3)	.060" FR-4 Panel	700	100	40
	KFB3	440	(3)	.060" FR-4 Panel	1,000	140	18
		632	(3)	.060" FR-4 Panel	1,500	170	28
	KFH	440	4	.060" FR-4 Panel	400	65	7
		632	8	.060" FR-4 Panel	400	70	11
		832	15	.060" FR-4 Panel	400	80	16
		032	18	.060" FR-4 Panel	400	90	17
	PFK	440	(3)	.060" FR-4 Panel	250	55	(3)
		632	(3)	.060" FR-4 Panel	400	60	(3)

	Type	Thread Code	Max. Nut Tightening Torque (N·m)	Test Sheet Thickness & Test Sheet Material	Installation (kN)	Pushout (N) (2)	Torque-out (N·m)
METRIC	KF2 KFS2 KFE KFSE	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
	KFB3	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
	KFH	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
	PFK	M3	(3)	1.5 mm FR-4 Panel	1.1	245	(3)

KSSB™ BROACHING SNAP-TOP® STANDOFFS

	Type	Panel 1 (.060" FR-4 Panel) (4)		Panel 2 (Removable) (4)		
		Installation (lbs.)	Pushout (lbs.)	Max. First On Force (lbs.)	Min. First Off Force (lbs.)	Min. 15th Off Force (lbs.)
UNIFIED	KSSB	500	110	13	3.0	1.0

	Type	Panel 1 (1.5 mm FR-4 Panel) (4)		Panel 2 (Removable) (4)		
		Installation (kN)	Pushout (N)	Max. First On Force (N)	Min. First Off Force (N)	Min. 15th Off Force (N)
METRIC	KSSB	2.2	484	57.7	13.3	4.4

(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) These are typical values for parts installed in drilled mounting holes. Punched mounting holes yield values approximately 15% less.

(3) Not applicable.

(4) See Application Data drawing on page 8.

SFK™ SpotFast® CLINCH/BROACH MOUNT FASTENERS

Type and Size	Thick-ness Code	Installation into Panel 1 Cold-rolled Steel		Installation into Panel 2 FR-4 Fiberglass		Pushout of Panel 2 (3)	
		kN	lbs.	kN	lbs.	N	lbs.
SFK-3	0.8	6.2	1400	1.8	400	200	45
SFK-3	1.0	8	1800	1.8	400	200	45
SFK-3	1.2	8.9	2000	1.8	400	200	45
SFK-3	1.6	10.2	2300	1.8	400	200	45
SFK-5	0.8	11.1	2500	1.8	400	400	90
SFK-5	1.0	13.5	3000	1.8	400	400	90
SFK-5	1.2	15.6	3500	1.8	400	400	90
SFK-5	1.6	17.8	4000	1.8	400	400	90

SMTSS™ ReelFast® SNAP-TOP® STANDOFFS(1)(2)

Type, Material and Size	Panel 1 (Bottom) Test Sheet Material	Panel 1 (Bottom) Pushout	Panel 2 (Top) Max. Snap-on Force
SMTSSS-156	.062" Single Layer FR-4	113 lbs.	20 lbs.
SMTSSS-4MM	1.58 mm Single Layer FR-4	500 N	89 N

SMTSO™ NUTS AND SPACERS/STANDOFFS(1)(2)

Type and Size	Test Sheet Material .062" Single Layer FR-4			
	Pushout (lbs.)	Pushout (N)	Torque-out (in. lbs.)	Torque-out (N·m)
SMTSO-440	56.5	251	8.56	1
SMTSO-632	93.5	416	13.83	1.6
SMTSO-832	151.1	672	26.96	3
SMTSO-M3	56.5	251	8.56	1
SMTSO-M3.5	93.5	416	13.83	1.6
SMTSO-M4	151.1	672	26.96	3

SMTSO™ microPEM® FASTENERS(1)(2)

Type and Size	Test Sheet Material .062" Single Layer FR-4			
	Pushout (lbs.)	Pushout (N)	Torque-out (in. lbs.)	Torque-out (N·m)
SMTSO-080	85.1	378.7	4.94	0.56
SMTSO-M1				
SMTSO-M1.2				
SMTSO-M1.4				
SMTSO-M1.6				

SMTRA™ R'ANGLE® FASTENERS(1)(2)

	Part Number	Test Sheet Material .062" Single Layer FR-4 Pushout (lbs.)	Side Load (lbs.)
UNIFIED	SMTRA256-8-6	51.7	7.1
	SMTRA440-9-6	89.5	10.8
	SMTRA632-10-8	110.3	8.4
	SMTRA832-12-9	137.2	21.2

	Part Number	Test Sheet Material 1.58mm Single Layer FR-4 Pushout (N)	Side Load (N)
METRIC	SMTRAM2-6-5	418.2	56.8
	SMTRAM25-6-5	216.5	36.9
	SMTRAM3-7-5	257.6	41.3
	SMTRAM4-9-7	369.3	73.3

SMTPR™ RETAINERS(1)

Part Number	Test Sheet Material .062" Single Layer FR-4 Pushout (lbs.)	Pushout (N)
SMTPR-6-1ET	161.4	718

SMTPFLSM™ FASTENERS(1)

	Type and Thread Size	Min. Tensile Strength (lbs.)	Rec. Tightening Torque (in. lbs.) (4)	Test Sheet Material .060" P.C. Board Pull-off (lbs.) (5)
UNIFIED	SMTPFLSM-440	556	4.4	100
	SMTPFLSM-632	724	7.0	105

	Type and Thread Size	Min. Tensile Strength (N)	Rec. Tightening Torque (N·m) (4)	Test Sheet Material 1.5 mm P.C. Board Pull-off (N) (5)
METRIC	SMTPFLSM-M3	2900	0.61	445
	SMTPFLSM-M3.5	3269	0.8	465

TESTING CONDITIONS

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 (SAC305) **(SMTSO, SMTRA, SMTPR)**
	Alpha CVP-390 Sn96.5/3.0Ag/0.5Cu (SAC305) **(SMTPFLSM, SMTSS)**
Stencil	.0067" / 0.17 mm thick **(SMTSO, SMTRA, SMTPR, SMTSS)**
	.005" / 0.13 mm thick **(SMTPFLSM)**

(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) In most applications, pullout strength of the SFK fastener in Panel 1 exceeds pushout strength of Panel 2.

(4) Torque values shown will produce a preload of 70% minimum tensile with a nut factor "k" equal to .1.

(5) Failure occurred at the solder joint. Screw retention strength is greater than the retainer.

OTHER FASTENERS FOR CONSIDERATION TO USE WITH PC BOARDS

PF11MW™ FLOATING CAPTIVE PANEL SCREWS
(See PEM® Bulletin PF)

Unique flare mount feature allow fasteners to "float" in mounting hole.
- Compensates for mating thread misalignment.
- Installs into any panel material.
- Appropriate for close center-line-to-edge applications.
- Color coded knobs available.

PF11MF™ FLARE-MOUNTED CAPTIVE PANEL SCREWS
(See PEM® Bulletin PF)
- Appropriate for close centerline-to-edge applications.
- Doesn't require high installation force.
- Installs into any panel material.
- Installs flush on back side of panel.
- Color coded knobs available.

SGPC™ SWAGING COLLAR STUDS
(See PEM® Bulletin FH)
- Can be installed into most materials, including stainless steel and rigid non-metallic panels.
- Can be used to attach dissimilar materials.
- Can accommodate multiple panels as long as the total thickness does not exceed the maximum sheet thickness.
- Appropriate for close center-line-to-edge applications.

SOAG™/SOSG™ GROUNDING STANDOFFS
(See PEM® Bulletin SO)
- Designed for clinching into steel or aluminum chassis.
- "Gripping teeth" on opposite side of standoff makes firm electrical contact with mating PC Board.

SKC™ KEYHOLE® STANDOFFS
(See PEM® Bulletin SK)
- Clinch feature mounts fastener permanently into metal sheet.
- Allows for quick attachment and detachment of PC Board.
- Head is flush or sub-flush in metal sheet.
- Makes horizontal or vertical component mounting possible.

SSA™/SSC™/SSS™ SNAP-TOP® STANDOFFS
(See PEM® Bulletin SSA)
- Spring action holds PC Boards and subassemblies securely, while allowing for quick removal.
- Screws and other threaded hardware are eliminated.

For more information on these and other PEM products, visit our PEMNET™ Resource Center at www.pemnet.com

All PEM® products meet our stringent quality standards. If you require additional industry or other specific quality certifications, special procedures and/or part numbers are required. Please contact your local sales office or representative for further information.

Regulatory compliance information is available in Technical Support section of our website. Specifications subject to change without notice. See our website for the most current version of this bulletin.

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PEM®

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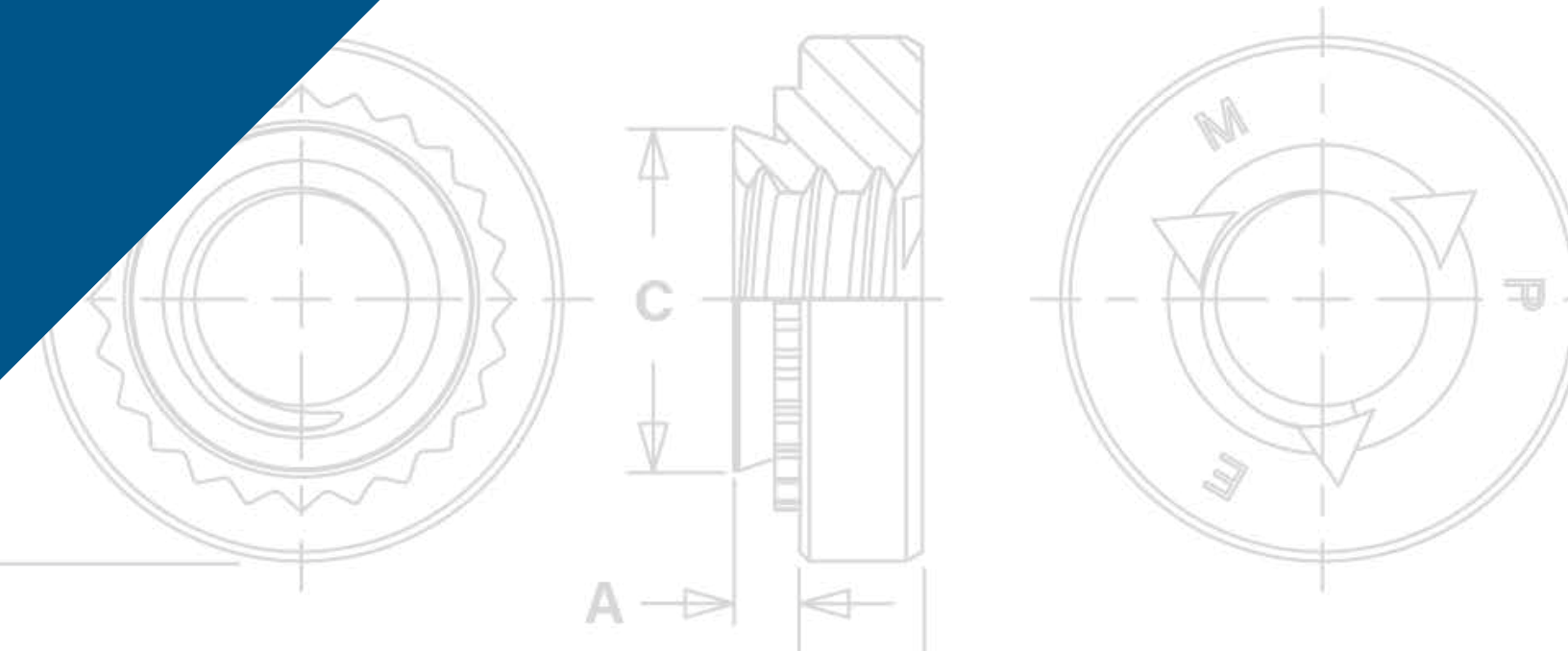
Visit our PEMNET™ Resource Center at www.pemnet.com ▪ Technical support e-mail: techsupport@pemnet.com

Bulletin LN-218

PEM® self-clinching locknuts prevent mating hardware from loosening.

LN™

SELF-LOCKING FASTENERS



PEM® SELF-CLINCHING LOCKNUTS PREVENT MATING HARDWARE FROM LOOSENING

PEM® self-clinching locknuts provide ideal solutions to prevent mating hardware from loosening in service due to vibration or other application-related factors. This family of fasteners includes a variety of types and different locking-feature styles to satisfy a wide range of applications. Their use can save time and money compared with alternative chemical locking methods or patches.

ABOUT LOCKING THREADS

PEM® locknuts include two locking designs:

1) **PREVAILING TORQUE** (CFN™, FE™, FEO™, UL™, LAS™, LAC™, LA4™, LK™, LKS™, LKA™, PL™, PLC™ and SL™ locknuts) – a design feature of the lock nut produces friction between threads of mated components thereby increasing the force needed to tighten as well as loosen the nut. Prevailing torque locknuts provide essentially the same torque value regardless of the amount of axial load applied.

   Available in two types:

   - **All metal –**
     All PEM metal prevailing torque type locknuts achieve their prevailing torque by altering the shape of the nut in some way - most commonly by distorting the threads of the nut, which then grips the mating part during tightening. Screws for use with PEM prevailing torque locknuts should be Class 3A/4h fit or no smaller than Class 2A/6g.

     Available in three styles:
     - **Elliptically squeezed threads** (UL™, FE™, FEO™, LAC™, LAS™ and LA4™ locknuts) – the thread barrel is slightly deformed into an elliptical shape.
     - **Flexing jaws** (LK™, LKS™ and LKA™ locknuts) - the thread barrel is vertically slit and then the two sections are squeezed together.
     - **One or two deformed threads** (SL™ locknuts) - the last threads on the head side of the nut are deformed.

     Typically prevailing torque locknuts utilizing a metal locking feature are treated with a dry film lubricant coating to afford some level of lubricity to reduce damage to the threads from repeated installation and removal of the screw and reduce required tightening torque. Care should be taken to be sure that lubricant is not removed in any post installed finishing operations.

   - **Nylon insert**
     The PL™, PLC™ and CFN™ locknuts use a plastic insert, typically made from nylon to generate the torque resistance. A nylon ring is attached to the self-clinching body on the screw exit side with an ID approximately at the screw pitch diameter. As the screw enters this ring, there is interference at the major diameter generating a prevailing torque. The major advantage of this locking method is the greatly reduced chance of any conductive debris being generated by repeated installation and removal of the screw.

2) **FREE-RUNNING** (S-RT™ locknuts) – a nut that requires tightening against a bearing surface in order for the locking mechanism to function. If the tightening force (clamp load) is removed for any reason, these nuts no longer provide any torsional resistance to rotation. The **modified thread formation** allows mating screws to spin freely during the attachment process until clamp load is induced during the screw-tightening process.

PEM free-running locknuts will accept a maximum material 6g/2A screw.

CFN™ broaching fasteners are available for thinner sheet, close-to-edge applications. The nylon locking element provides prevailing torque to eliminate loosening of mating threaded hardware - PAGE 4

Nylon Insert

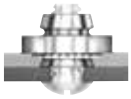
FE™/FEO™/UL™ miniature locking nuts, provide a smaller body for tight space, lightweight applications - PAGE 5

Elliptically Squeezed Threads

LAS™/LAC™/LA4™ nuts with self-locking, floating threads that permit up to .030"/0.76 mm adjustment for mating hole misalignment - PAGE 6

Elliptically Squeezed Threads

LK™/LKS™/LKA™ nuts have a rugged PEMFLEX® self-locking feature which meets demanding locking performance requirements - PAGE 7

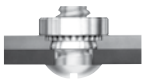


Flexing Jaws

PL™/PLC™ PEMHEX® nuts with a nylon hexagonal element provide a locking option for applications where a metal on metal locking feature is not desired - PAGE 8

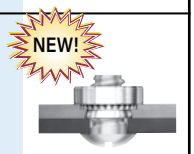
Nylon Insert

SL™ locknuts offer a cost effective TRI-DENT® locking feature and effective prevailing locking torque - PAGE 9



Deformed Threads

S-RT™ locknuts are free-running until clamp load is induced. A modified thread angle on the loaded flank provides the vibration resistant locking feature- PAGE 10



Free-running Threads

LOCKING NUT SELECTOR GUIDE

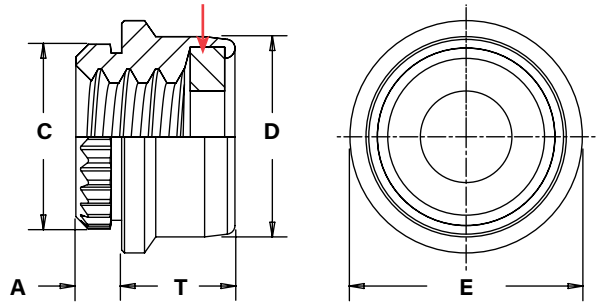
PEM Locking Nut	Page No.	Locking Performance Cycles	Application Features				Locking Performance Temperature Limit	Non-metal on Metal Locking Feature	Locking Style	Covered by (1)	
			High Clamp Strength	Floating Threads	Light Weight	Close-to-edge Applications				M45938/7	M45938/11
CFN	4	1	▪			▪	(6)	▪	Nylon Insert		
FE	5	15(3)			▪	▪	(7)		Elliptically Squeezed	▪	
FEO	5	15(3)			▪	▪	(7)		Elliptically Squeezed	▪	
UL	5	5(4)			▪	▪	(7)		Elliptically Squeezed	▪	
LAS	6	15(3)	▪	▪			(7)		Elliptically Squeezed		▪
LAC	6	15(3)	▪	▪			(7)		Elliptically Squeezed		▪
LA4(2)	6	15(3)	▪	▪			(7)		Elliptically Squeezed		▪
LK	7	15(3)	▪				(7)		Flexing Jaws		
LKS	7	15(3)	▪				(7)		Flexing Jaws		
LKA	7	15(3)	▪				(9)		Flexing Jaws		
PL	8	15(3)					(6)	▪	Nylon Insert		
PLC	8	15(3)					(6)	▪	Nylon Insert		
SL	9	3	▪				(8)		Deformed Threads		
S-RT	10	(5)	▪				(8)		Free-running Threads		

(1) To meet national aerospace standards and to obtain testing documentation, product must be ordered using appropriate NASM45938 part number. Check our web site for a complete Military Specification and National Aerospace Standards Reference Guide (Bulletin NASM).
(2) Specifically designed to be installed into stainless steel sheets.
(3) See page 19 for information on NASM25027 as applied to PEM self-clinching, self-locking nuts.
(4) Meets torque requirements for NASM25027 through five cycles.
(5) Locking performance is not affected by the number of on/off cycles.
(6) Nylon locking element temperature limit is 250˚ F / 120˚ C.
(7) Dry film lubricant rated for use up to 400˚ F / 204˚ C.
(8) The fastening strength of the locknut is maintained up to 800˚ F / 426˚ C. Temperatures above 300˚ F / 149˚ C will dehydrate the conversion coating.
(9) Aluminum material temperature limit is 250˚ F / 120˚ C.

CFN™ BROACHING LOCKNUT

- For thinner sheets, close-to-edge applications.
- Prevailing torque locking element provides torque to eliminate loosening of mating threaded hardware.

Nylon locking element
(Blue identifier* for unified fasteners / black identifies metric fasteners)



Clinching profile may vary.

PART NUMBER DESIGNATION

CFN	-	440	-	1	ZI
Type		Thread Code		Shank Code	Finish Code

All dimensions are in inches.

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

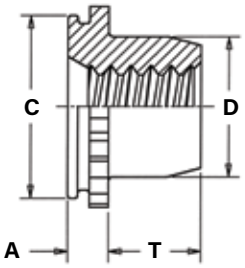
All dimensions are in millimeters.

	Thread Size x Pitch	Type	Thread Code	Shank Code	A (Shank) ±0.08	Min. Sheet Thickness	Hole Size In Sheet +0.08	C ±0.05	D ±0.1	E +0.03 -0.1	T Max.	Min. Dist. Hole ℄ to Edge
METRIC	M3 x 0.5	CFN	M3	1	1.02	1.1	3.86	4.11	4.45	5.16	2.65	2.93

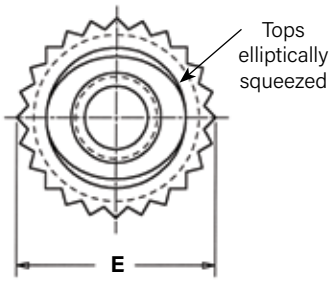
** PEM Trademark.*

FE™/FEO™/UL™ LOCKNUTS

- Strong, knurled collar guarantees against rotation of the fastener in the sheet.
- The torque-out resistance of the embedded knurl greatly exceeds the torque that can be exerted by the self-locking feature.



Clinching profile may vary.



PART NUMBER DESIGNATION

UL	-	080	-	0		CW
FE	-	440	-			MD
FEO	-	440	-			MD
↓ Type		↓ Thread Code		↓ Shank Code		↓ Finish Code

All dimensions are in inches.

	Thread Size	Type	Thread Code	Shank Code (1)	A (Shank) Max.	Sheet Thickness (2)	Hole Size In Sheet +.003 -.000	C +.000 -.005	D Max.	E ±.005	T +.015 -.000	Min. Dist. Hole ℄ to Edge	Max. Hole In Attached Parts
UNIFIED	.060-80 (#0-80)	UL	080	0	.020	.019 - .022	.110	.1095	.076	.125	.050	.09	.080
	.073-64 (#1-64)	UL	164	0	.020	.019 - .022	.110	.1095	.090	.125	.050	.09	.093
	.086-56 (#2-56)	UL	256	0	.020	.019 - .022	.144	.1435	.106	.160	.065	.11	.106
				1	.031	.030 - .036							
	.112-40 (#4-40)	FEO	440		.040	.039 - .045	.172	.171	.145	.192	.065	.14	.132
		FE			.060	.059 - .070							
	.138-32 (#6-32)	FEO	632		.040	.039 - .045	.213	.212	.180	.244	.075	.17	.158
		FE			.060	.059 - .070							
	.164-32 (#8-32)	FEO	832		.040	.039 - .045	.290	.289	.215	.322	.090	.20	.184
		FE			.060	.059 - .070							
	.190-32 (#10-32)	FEO	032		.040	.039 - .045	.290	.289	.245	.322	.110	.20	.210
		FE			.060	.059 - .070							
	1/4-20	FE	0420		.060	.059 - .070	.344	.343	.318	.384	.120	.28	.270
	1/4-28		0428										

All dimensions are in millimeters.

	Thread Size x Pitch	Type	Thread Code	Shank Code (1)	A (Shank) Max.	Sheet Thickness (2)	Hole Size In Sheet +0.08	C -0.13	D Max.	E ±0.13	T +0.4	Min. Dist. Hole ℄ to Edge	Max. Hole In Attached Parts
METRIC	M2 x 0.4	UL	M2	1	0.76	0.76 - 0.91	3.61	3.6	2.5	4.07	1.65	2.8	2.5
	M3 x 0.5	FEO	M3		1.02	0.99 - 1.14	4.39	4.37	3.96	4.88	1.9	3.6	3.5
		FE			1.53	1.5 - 1.78							
	M4 x 0.7	FEO	M4		1.02	0.99 - 1.14	7.39	7.37	5.23	8.17	2.55	5.2	4.5
		FE			1.53	1.5 - 1.78							
	M5 x 0.8	FEO	M5		1.02	0.99 - 1.14	7.39	7.37	6.48	8.17	3.05	5.2	5.5
		FE			1.53	1.5 - 1.78							
	M6 x 1	FE	M6		1.53	1.5 - 1.78	8.74	8.72	7.72	9.74	3.3	7.1	6.5

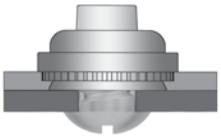
(1) Shank code applicable only to UL fasteners.

(2) In applications between the sheet thicknesses for your thread size, see last paragraph of installation data on page 11. Knurled collar may fracture if fastener is used in sheets thicker than the specified range and the screw is tightened beyond maximum tightening torque.

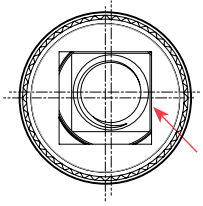
LAS™/LAC™/LA4™ LOCKNUTS

- Provide load-bearing threads in thin sheets and permit a minimum of .030"/0.76 mm adjustment for mating hole misalignment.
- Extra strength and support in assembly is obtained by the threads of the floating nut extending into the retainer shank.
- Thread locking torque performance is equivalent to applicable NASM25027 specifications.
- LA4 floating fasteners are specifically designed to be installed into stainless steel sheets.

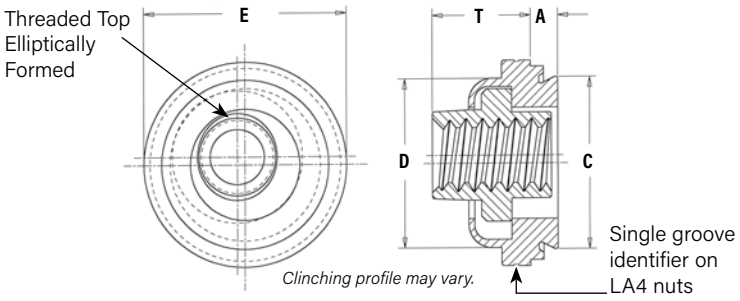
To meet national aerospace standards and to obtain testing documentation, product must be ordered to US NASM45938/11 specifications. Check our web site for a complete Military Specification and National Aerospace Standards Reference Guide (Bulletin NASM)



PEM® Double Squares are a registered trademark.



Float – *.015"/0.38 mm minimum, in all directions from center, .030"/0.76 mm total.*



All dimensions are in inches.

	Thread Size	Type: Fastener Material: Steel	Type: Fastener Material: 300 Series Stainless	Type: Fastener Material: 400 Series Stainless	Thread Code	Shank Code	A (shank) Max.	Min. Sheet Thickness	Hole Size in Sheet +.003 -.000	C Max.	D Max.	E ±.015	T_2 Max.	Min. Dist. Hole ℄ to Edge
UNIFIED	.112-40 (#4-40)	LAS	LAC	LA4	440	1	.038	.038	.290	.289	.290	.360	.190	.30
						2 (1)	.054	.054						
	.138-32 (#6-32)	LAS	LAC	LA4	632	1	.038	.038	.328	.327	.335	.390	.200	.32
						2 (1)	.054	.054						
	.164-32 (#8-32)	LAS	LAC	LA4	832	1	.038	.038	.368	.367	.365	.440	.210	.34
						2 (1)	.054	.054						
	.190-24 (#10-24)	LAS	LAC	LA4	024	1	.038	.038	.406	.405	.405	.470	.270	.36
						2	.054	.054						
	.190-32 (#10-32)	LAS	LAC	LA4	032	1	.038	.038	.406	.405	.405	.470	.270	.36
						2 (1)	.054	.054						
	.250-20 (1/4-20)	LAS	LAC	–	0420	2	.054	.054	.515	.514	.510	.600	.310	.42
	.250-28 (1/4-28)	LAS	LAC	–	0428	2	.054	.054	.515	.514	.510	.600	.310	.42

All dimensions are in millimeters.

	Thread Size x Pitch	Type: Fastener Material: Steel	Type: Fastener Material: 300 Series Stainless	Type: Fastener Material: 400 Series Stainless	Thread Code	Shank Code	A (shank) Max.	Min. Sheet Thickness	Hole Size in Sheet +0.08	C Max.	D Max.	E ±0.38	T_2 Max.	Min. Dist. Hole ℄ to Edge
METRIC	M3 x 0.5	LAS	LAC	LA4	M3	1	0.97	0.97	7.37	7.35	7.37	9.14	4.83	7.62
						2 (1)	1.38	1.38						
	M4 x 0.7	LAS	LAC	LA4	M4	1	0.97	0.97	9.35	9.33	9.28	11.18	5.34	8.64
						2 (1)	1.38	1.38						
	M5 x 0.8	LAS	LAC	LA4	M5	1	0.97	0.97	10.29	10.29	10.29	11.94	6.86	9.14
						2 (1)	1.38	1.38						
	M6 x 1	LAS	LAC	–	M6	2	1.38	1.38	13.08	13.06	12.96	15.24	7.88	10.67

(1) This shank code is not available for LA4 nuts.

PART NUMBER DESIGNATION

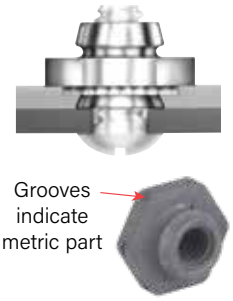
LA C - 440 - 1 MD
LA S - 440 - 1 MD
LA 4 - 440 - 1 MD

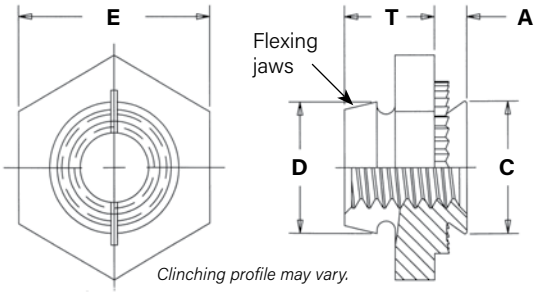
Type | Retainer Material Code | Thread Code | Shank Code | Finish Code

LK™/LKS™/LKA™ PEMFLEX® LOCKNUTS

The PEM design utilizes two rugged, semicircular flexing jaws instead of several less-supported segments. The greater ruggedness and retention of this PEMFLEX® action prevents relaxation and loosening of the fastener in severe service. This design also protects the screw threads. Clearances obtained by only two interruptions of a full circumference, together with the spreading of the jaws by the entering screw, minimize the possibility of thread damage.

- Hex shoulder provides increased pull-through performance and a positive stop during installation.
- The flexing action of locking feature permits repeated use and effective locking torque.
- Thread locking performance of LK and LKS fasteners (with MD finish) and LKA fasteners (lubricated) are equivalent to applicable NASM25027 specifications.





Clinching profile may vary.

PART NUMBER DESIGNATION

LK		-	632	-	1	MD
LK	S	-	632	-	1	MD
LK	A	-	632	-	1	
Type	Fastener Material Code		Thread Size Code		Shank Code	Finish Code

All dimensions are in inches.

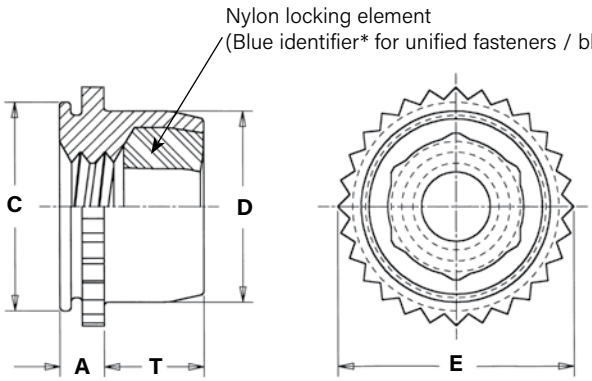
	Thread Size	Type: Fastener Material: Carbon Steel	Type: Fastener Material: Stainless Steel	Type: Fastener Material: Aluminum	Thread Code	Shank Code	A (Shank) Max.	Min. Sheet Thickness	Hole Size In Sheet +.003 -.000	C Max.	D Max.	E Nom.	T ±.010	Min. Dist. Hole ℄ to Edge
UNIFIED	.086-56 (#2-56)	LK	LKS	LKA	256	1	.038	.040	.172	.171	.165	.250	.135	.156
						2	.054	.056						
	.112-40 (#4-40)	LK	LKS	LKA	440	1	.038	.040	.187	.186	.185	.250	.135	.156
						2	.054	.056						
	.138-32 (#6-32)	LK	LKS	LKA	632	1	.038	.040	.219	.218	.220	.312	.145	.187
						2	.054	.056						
	.164-32 (#8-32)	LK	LKS	LKA	832	1	.038	.040	.266	.265	.250	.343	.175	.203
						2	.054	.056						
	.190-32 (#10-32)	LK	LKS	LKA	032	1	.038	.040	.312	.311	.285	.375	.205	.218
						2	.054	.056						

All dimensions are in millimeters.

	Thread Size x Pitch	Type: Fastener Material: Carbon Steel	Type: Fastener Material: Stainless Steel	Type: Fastener Material: Aluminum	Thread Code	Shank Code	A (Shank) Max.	Min. Sheet Thickness	Hole Size In Sheet +0.08	C Max.	D Max.	E Nom.	T ±0.25	Min. Dist. Hole ℄ to Edge
METRIC	M2.5 X 0.45	LK	LKS	LKA	M2.5	1	0.97	1	4.37	4.35	4.45	6.35	3.43	3.9
						2	1.38	1.4						
	M3 X 0.5	LK	LKS	LKA	M3	1	0.97	1	4.75	4.73	4.85	6.35	3.43	4
						2	1.38	1.4						
	M4 X 0.7	LK	LKS	LKA	M4	1	0.97	1	6.76	6.73	6.2	8.73	4.45	5.2
						2	1.38	1.4						
	M5 X 0.8	LK	LKS	LKA	M5	1	0.97	1	7.92	7.9	7.4	9.53	5.21	5.6
						2	1.38	1.4						

PL™/PLC™ PEMHEX® LOCKNUTS

- Thread locking torque performance is equivalent to applicable NASM25027 specifications.
- The strong knurled collar receives the installation force and resists torque.
- The spin resistance of the knurl greatly exceeds the torque that can be exerted by the self-locking feature.



Clinching profile may vary.

PART NUMBER DESIGNATION

PL		-	440	- ZI
PL	C	-	440	
↓ Type	↓ Material Code		↓ Thread Code	↓ Finish Code

All dimensions are in inches.

	Thread Size	Type: Fastener Material: Steel	Type: Fastener Material: Stainless Steel	Thread Code	A (Shank) Max.	Sheet Thickness (1) (2)	Hole Size In Sheet +.003 -.000	C Max.	D Max.	E Max.	T Max.	Min. Dist. Hole ℄ to Edge	Max. Hole In Attached Parts
UNIFIED	.112-40 (#4-40)	PL	PLC	440	.060	.040 - .070	.234	.233	.215	.274	.130	.170	.132
	.138-32 (#6-32)	PL	PLC	632	.060	.040 - .070	.265	.264	.246	.305	.130	.190	.158
	.164-32 (#8-32)	PL	PLC	832	.060	.040 - .070	.297	.296	.278	.338	.155	.220	.184
	.190-32 (#10-32)	PL	PLC	032	.060	.040 - .070	.312	.311	.293	.353	.165	.250	.210

All dimensions are in millimeters.

	Thread Size x Pitch	Type: Fastener Material: Steel	Type: Fastener Material: Stainless Steel	Thread Code	A (Shank) Max.	Sheet Thickness (1) (2)	Hole Size In Sheet +0.08	C Max.	D Max.	E Max.	T Max.	Min. Dist. Hole ℄ to Edge	Max. Hole In Attached Parts
METRIC	M3 x 0.5	PL	PLC	M3	1.53	1 - 1.78	6	5.98	5.52	7.01	3.56	4.32	3.5
	M4 x 0.7	PL	PLC	M4	1.53	1 - 1.78	7.5	7.48	7.01	8.54	4.2	5.59	4.5
	M5 x 0.8	PL	PLC	M5	1.53	1 - 1.78	8	7.98	7.52	9	4.45	6.35	5.5

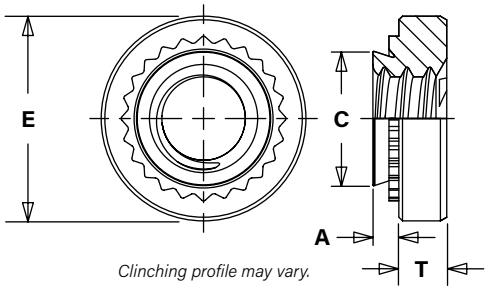
(1) Can be used in panel thickness of .040" to .060"/1 mm to 1.53 mm provided the fastener is not fully installed. The knurled collar must be left protruding above the sheet to the degree that the sheet thickness is less than .060"/1.53 mm. See installation instructions.

(2) Knurled collar may fracture if fastener is used in sheets thicker than .070"/1.78 mm and screw is tightened beyond maximum tightening torque.

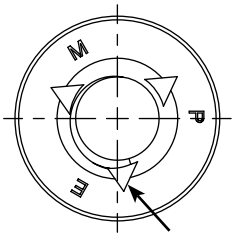
** PEM Trademark.*

SL™ TRI-DENT® LOCKNUTS

- SL locknuts meet 3 cycle locking performance (1).
- Recommended for use in sheets HRB (Rockwell "B" scale) 80 or less and HB (Hardness Brinell) 150 or less.



Clinching profile may vary.



PEM TRI-DENT® Locking Feature.
Locking feature appearance may vary.

PART NUMBER DESIGNATION

SL	-	440	-	1	ZI
Type		Thread Code		Shank Code	Finish Code

All dimensions are in inches.

	Thread Size	Type	Thread Code	Shank Code	A (Shank) Max.	Min. Sheet Thickness	Hole Size In Sheet +.003 -.000	C Max.	E ±.010	T ±.010	Min. Dist. Hole ℄ to Edge
UNIFIED	.112-40 (#4-40)	SL	440	1	.038	.040	.166	.165	.250	.070	.19
				2	.054	.056					
	.138-32 (#6-32)	SL	632	1	.038	.040	.1875	.187	.280	.070	.22
				2	.054	.056					
	.164-32 (#8-32)	SL	832	1	.038	.040	.213	.212	.310	.090	.27
				2	.054	.056					
	.190-32 (#10-32)	SL	032	1	.038	.040	.250	.249	.340	.090	.28
				2	.054	.056					
	.250-20 (1/4-20)	SL	0420	1	.054	.056	.344	.343	.440	.170	.34
				2	.087	.091					
	.313-18 (5/16-18)	SL	0518	1	.054	.056	.413	.412	.500	.230	.38
				2	.087	.091					
	.375-16 (3/8-16)	SL	0616	1	.087	.090	.500	.499	.625	.270	.44
				2	.120	.125					

All dimensions are in millimeters.

	Thread Size x Pitch	Type	Thread Code	Shank Code	A (Shank) Max.	Min. Sheet Thickness	Hole Size In Sheet +0.08	C Max.	E ±0.25	T ±0.25	Min. Dist Hole ℄ to Edge
METRIC	M3 x 0.5	SL	M3	1	0.98	1	4.22	4.2	6.35	1.5	4.8
				2	1.38	1.4					
	M3.5 x 0.6	SL	M3.5	1	0.98	1	4.75	4.73	7.11	1.5	5.6
				2	1.38	1.4					
	M4 x 0.7	SL	M4	1	0.98	1	5.41	5.38	7.87	2	6.9
				2	1.38	1.4					
	M5 x 0.8	SL	M5	1	0.98	1	6.35	6.33	8.64	2	7.1
				2	1.38	1.4					
	M6 x 1	SL	M6	1	1.38	1.4	8.75	8.73	11.18	4.08	8.6
				2	2.21	2.3					
	M8 x 1.25	SL	M8	1	1.38	1.4	10.5	10.47	12.7	5.47	9.7
				2	2.21	2.3					
	M10 x 1.5	SL	M10	1	2.21	2.29	14	13.97	17.35	7.48	13.5
				2	3.05	3.18					

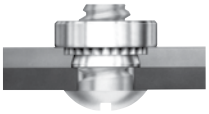
(1) Achieved using steel socket head cap screws, 180 ksi / property class 12.9 with standard finish of thermal oxide and light oil.

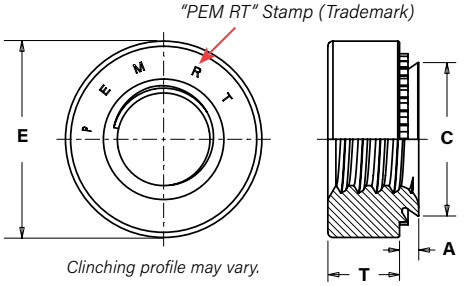
NEW!

S-RT™ FREE-RUNNING LOCKNUTS

Free-running locking feature allows screw to turn freely until clamp load is applied. If the tightening force is removed, these nuts no longer provide any torsional resistance to rotation.

- Resistant to vibrational loosening.
- Back side of panel is flush or sub-flush for screw installation.
- Locking feature reusability is not affected by number of on/off cycles.
- Uses same mounting hole and installation tooling as standard S™ nuts.
- Recommended for use in steel or aluminum sheets HRB 80 / HB 150 or less.





PART NUMBER DESIGNATION

S - RT632 - 1 ZI

- S: Type
- RT632: Thread Size Code
- 1: Shank Code
- ZI: Finish

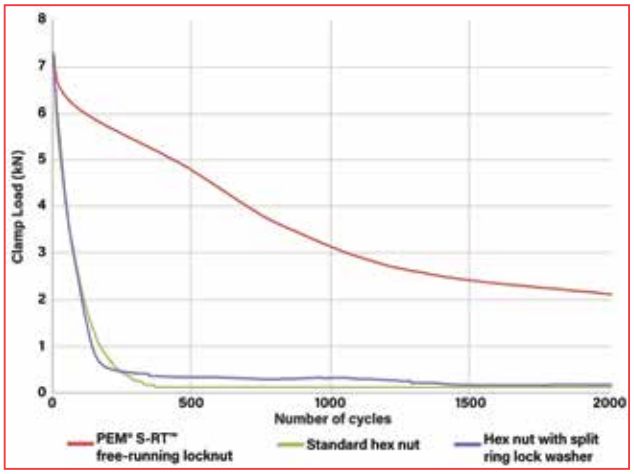
All dimensions are in inches.

	Thread Size	Type	Thread Code	Shank Code	A (Shank) Max.	Rec. Min. Sheet Thickness (1)	Hole Size In Sheet +.003 -.000	C Max.	E ±.010	T ±.010	Min. Dist Hole ℄ To Edge
UNIFIED	.112-40 (#4-40)	S	RT440	0	.030	.030	.166	.165	.250	.070	.19
				1	.038	.040					
				2	.054	.056					
	.138-32 (#6-32)	S	RT632	0	.030	.030	.1875	.187	.280	.070	.22
				1	.038	.040					
				2	.054	.056					
	.164-32 (#8-32)	S	RT832	0	.030	.030	.213	.212	.310	.090	.27
				1	.038	.040					
				2	.054	.056					
	.190-32 (#10-32)	SS	RT032	0	.030	.030	.250	.249	.340	.090	.28
				1	.038	.040					
				2	.054	.056					
	.250-20 (1/4-20)	S	RT0420	0	.045	.047	.344	.343	.440	.170	.34
				1	.054	.056					
				2	.087	.090					
	.313-18 (5/16-18)	S	RT0518	1	.054	.056	.413	.412	.500	.230	.38
				2	.087	.090					

All dimensions are in millimeters

	Thread Size x Pitch	Type	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	M3 x 0.5	S	RTM3	0	0.77	0.8	4.22	4.2	6.35	1.5	4.8
				1	0.97	1					
				2	1.38	1.4					
	M4 x 0.7	S	RTM4	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	SS	RTM5	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	S	RTM6	00	0.89	0.92	8.75	8.73	11.18	4.08	8.6
				0	1.15	1.2					
				1	1.38	1.4					
				2	2.21	2.29					

The graph represents the clamp load of the joint versus the amount of cycles during transverse vibration testing for an S-RT™ free-running locknut, a standard hex nut and a hex nut with a split ring lock washer.



Testing conditions:
Transverse vibration testing.
M6 thread size nuts, average of 30 pieces.
Clamp load applied using metric property class 10.9 screws.
Nuts tested until loss of clamp load or 2,000 cycles is reached.

Details on PEM® RT™ vibration resistant thread technology can be found on our web site at:
https://www.pemnet.com/files/design_info/techsheets/RT_Thread_Form.pdf

MATERIAL AND FINISH SPECIFICATIONS

	Threads				Fastener Material								
										Floating Fastener			
										Retainer	Retainer	Retainer	Nut
Type	Internal, ASME B1.1, 2B / ASME B1.13M, 6H	Internal, ASME B1.1, 3B / ASME B1.13M, 6H	Internal, UNJ Class 3B per ASME B1.15 / MJ Class 4H6H per ASME B1.21M (M6 thread 4H5H)	(1) Modified Thread Form on Loaded Flank	Hardened Carbon Steel	Carbon Steel	300 Series Stainless Steel	(2) 7075-T6 Aluminum	Nylon Locking Element Blue or Black Temperature Limit 250˚ F/ 120˚ C	Hardened Carbon Steel	Hardened 400 Series Stainless Steel	300 Series Stainless Steel	300 Series Stainless Steel
CFN	▪					▪			▪				
FE			▪				▪						
FEO			▪				▪						
UL			▪				▪						
LAS			▪							▪			▪
LAC			▪									▪	▪
LA4			▪								▪		▪
LK		▪			▪								
LKS		▪					▪						
LKA		▪						▪					
PL	▪				▪				▪				
PLC	▪						▪		▪				
SL	▪				▪								
S-RT				▪	▪								

	Standard Finishes (3)									Optional Finish (3)(4)	For Use In Sheet Hardness: (5)				
							Floating Fastener								
							Retainer	Retainer	Nut						
Type	Zinc Plated, 5µm, Color-less	Passivated and/or Tested Per ASTM A380	Passivated Plus Clear Dry-film Lubricant	(6) Black Dry-film Lubricant	(7) Black Dry-film Lubricant Over Phosphate	Plain	Zinc Plated, 5µm, Color-less	Passivated and/or Tested Per ASTM A380	Black Dry-film Lubricant	Zinc Plated 5µm, Yellow	HRB 88/ HB 183 or Less	HRB 80/ HB 150 or Less	HRB 70/ HB 125 or Less	HRB 60/ HB 107 or Less	HRB 50/ HB 89 or Less
CFN	▪									▪				▪	
FE				▪									▪		
FEO				▪									▪		
UL			▪										▪		
LAS							▪		▪				▪		
LAC								▪	▪				▪		
LA4								▪	▪		▪				
LK					▪								▪		
LKS				▪									▪		
LKA						▪									▪
PL	▪									▪			▪		
PLC		▪											▪		
SL	▪											▪			
S-RT	▪									▪		▪			
Finish Codes	ZI	None	CW	MD	MD		MD			ZC					

(1) Will accept a maximum material 6g/2A screw.
(2) Mating screws must be lubricated.
(3) See PEM Technical Support section of our web site for related plating standards and specifications.
(4) Special order with additional charge.
(5) HRB - Hardness Rockwell "B" Scale. HB - Hardness Brinell.
(6) MD finish on stainless steel provides a minimum of 100 hours of salt spray resistance.
(7) MD finish on steel provides a minimum of 24 hours of salt spray resistance.

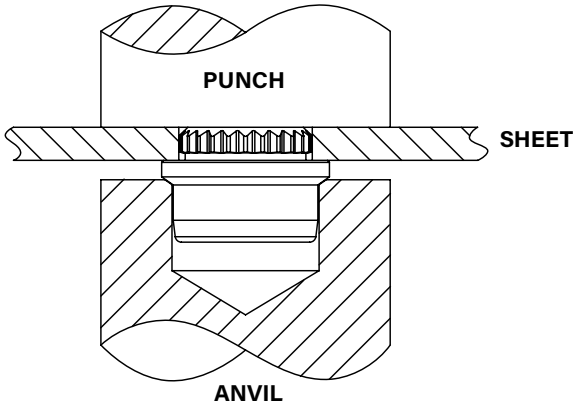
INSTALLATION

INSTALLATION NOTES

- For best results we recommend using a PEMSERTER® press for installation of PEM self-clinching fasteners. Please check our website for more information.
- Visit the Animation Library on our website to view the installation process for select products.

CFN™ NUTS

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



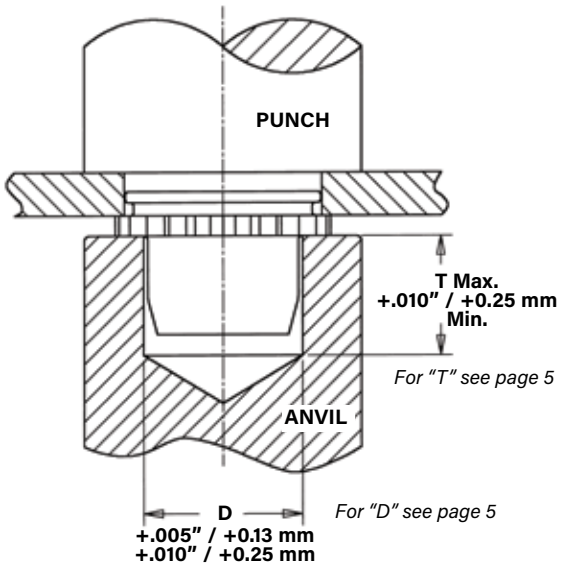
PEMSERTER® Installation Tooling

Type	Thread Code	Anvil Part Number	Punch Part Number
CFN	440/M3	8012038	975200048

FE™/FEO™/UL™ NUTS

1. Prepare properly sized mounting hole in sheet. Do not perform any secondary operations such as deburring.
2. Insert fastener into the anvil hole and place the mounting hole (preferably the punch side) over the shank of the fastener as shown in the drawing.
3. With installation punch and anvil surfaces parallel, apply squeezing force to the knurled collar until knurled collar is flush with top of the sheet for sheets .060"/1.5 mm thick and up, or until shank is flush with the bottom of the sheet for sheets .040" / 1 mm to .060"/1.5 mm thick for FE/FEO nuts.

PEM miniature fasteners must be installed by a force applied through parallel surfaces. Since force must not be applied to the barrel, a cavity must be used in either the punch or anvil so that the installation force is applied to the knurled collar. "D" dimensions for the punch or anvil cavity are given in the tables on page 5.



INSTALLATION RECOMMENDATION

In applications for sheet thicknesses between the two ranges (see "Sheet Thickness" on page 5) use the fastener with the larger "A" dimension. For example, if you want a #4-40 thread and your sheet thickness is between .045"/1.14 mm and .059"/1.49 mm, you should use FE or FEX nuts. This is not recommended installation practice, but in this case if it is necessary, you should install the fastener so that the bottom of the shank is flush with the underside of the sheet (instead of having the top of the knurled collar flush with the top of the sheet). When this method is used, care must be taken to protect the fastener against crushing which would damage the threads. This method will also result in reduced pushout and torque-out values.

PEMSERTER® Installation Tooling

Type	Thread Code	Anvil Part Number	Punch Part Number
UL	256/M2	975200020	975200048
FE/FEO	440/M3	975200021	975200048
FE/FEO	632/M3.5	975200022	975200048
FE/FEO	832/M4	975200023	975200048
FE/FEO	032/M5	975200024	975200048
FE/FEO	0420	975200025	975200048
FE/FEO	M6	8013143	975200048

LAS™/LAC™/LA4™ NUTS

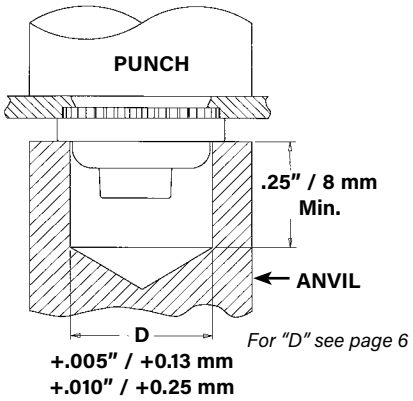
1. Prepare properly sized mounting hole in sheet. Do not perform any secondary operations such as deburring.
2. Place fastener into the anvil hole and place the mounting hole (preferably the punch side) over the shank of the fastener.
3. With installation punch and anvil surfaces parallel, apply sufficient squeezing force until flange contacts mounting sheet (LAC/LAS) or until anvil contacts the mounting sheet (LA4). Drawings show suggested tooling for applying these forces.

PEMSERTER® Installation Tooling

Type	Thread Code	Anvil Part Number	Punch Part Number
LAC/LAS	440/M3	975200006	975200048
LAC/LAS	632	8013890	975200048
LAC/LAS	832/M4	8013891	975200048
LAC/LAS	032/M5	8013892	975200048
LAC/LAS	0420/M6	975200010	975200048

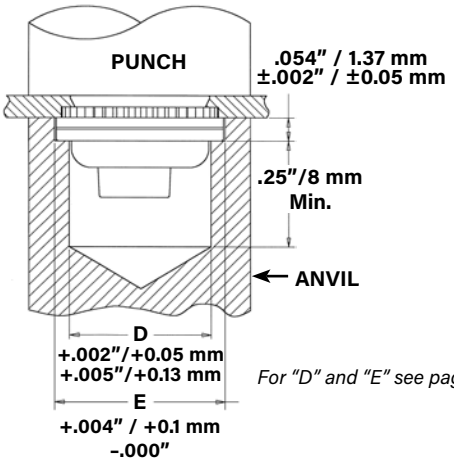
Type	Thread Code	Anvil Part Number	Punch Part Number
LA4	440/M3	8013889	975200048
LA4	632	8013890	975200048
LA4	832/M4	8013891	975200048
LA4	032/M5	8013892	975200048

LAC/LAS



For "D" see page 6

LA4
Tooling for installation into stainless steel sheets



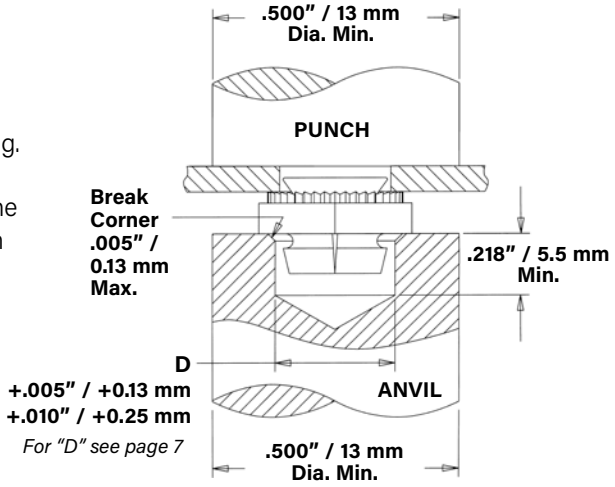
For "D" and "E" see page 6

LK™/LKS™/LKA™ NUTS

1. Prepare properly sized mounting hole in sheet. Do not perform any secondary operations such as deburring.
2. Insert fastener into the anvil hole and place the mounting hole over the shank of fastener (preferably the punch side) as shown in drawing.
3. With installation punch and anvil surfaces parallel, apply squeezing force until hexagonal shoulder contacts mounting sheet. Sketch at the right shows suggested tooling for applying these forces. Installation force and performance data shown below.

PEMSERTER® Installation Tooling

Type	Thread Code	Anvil Part Number	Punch Part Number
LK/LKS/LKA	256/M2.5	975200015	975200048
LK/LKS/LKA	440/M3	975200016	975200048
LK/LKS/LKA	632	975201242	975200048
LK/LKS/LKA	832/M4	975201241	975200048
LK/LKS/LKA	032/M5	975200019	975200048

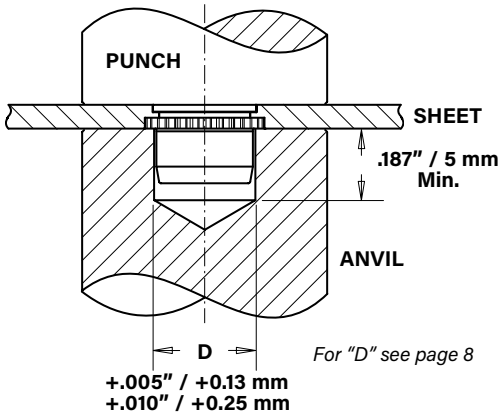


For "D" see page 7

PL™/PLC™ NUTS

Sheet thickness .060" to .070" / 1.53 mm to 1.78 mm

1. Prepare properly sized mounting hole in sheet. Do not perform any secondary operations such as deburring.
2. Insert fastener into the anvil hole and place the mounting hole over the shank of the fastener (preferably the punch side) as shown in drawing.
3. With the punch and anvil surfaces parallel, apply a squeezing force until the knurled collar is flush with the top sheet.



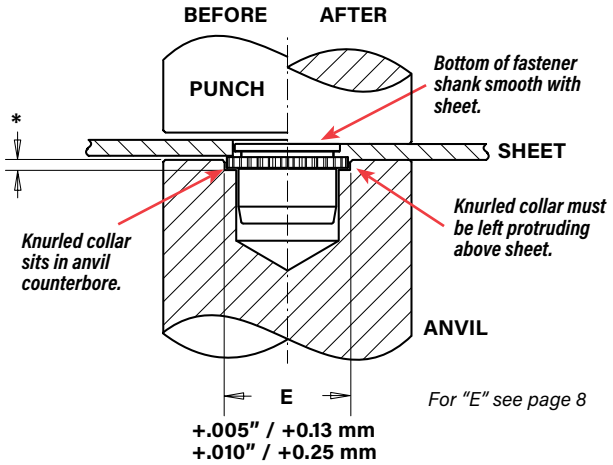
For "D" see page 8

PEMSERTER® Installation Tooling

Type	Thread Code	Anvil Part Number	Punch Part Number
PL/PLC	440/M3	975200011	975200048
PL/PLC	632	975200012	975200048
PL/PLC	832/M4	975200013	975200048
PL/PLC	032/M5	975200014	975200048

Sheet thickness .040" to .060" / 1 mm to 1.53 mm

1. Prepare properly sized mounting hole in sheet. Do not perform any secondary operations such as deburring.
2. Insert fastener into the anvil hole and place the mounting hole over the shank of the fastener (preferably the punch side) as shown in drawing.
3. With the punch and anvil surfaces parallel, apply a squeezing force until the fastener shank is flush with the underside of the sheet. This should be accomplished by setting the depth of the counterbore in the anvil to the difference between the "A" dimension and the sheet thickness*. When this method is used, care must be taken to protect the fastener against crushing which would damage the threads. This method will also result in reduced pushout and torque-out values.

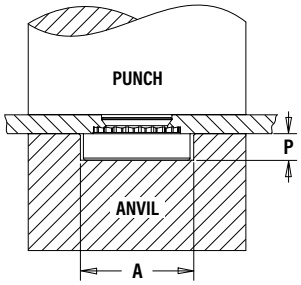


For "E" see page 8

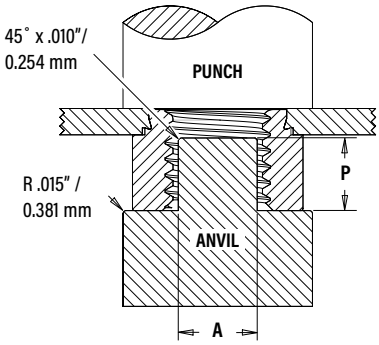
SL™ NUTS

1. Prepare properly sized mounting hole in sheet. Do not perform any secondary operations such as deburring.
2. Insert fastener into the anvil hole and place the mounting hole over the shank of the fastener (preferably the punch side) as shown in drawing.
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 #2-56 to 5/16 and M2 to M8



PROTRUSION ANVIL
CLS/S Nuts Thread Sizes 3/8,1/2, M10 and M12



PEMSERTER® Installation Tooling

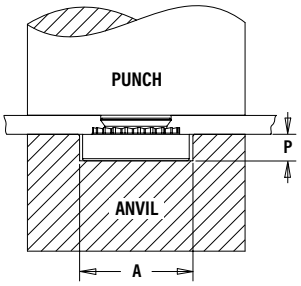
	Thread Code	Anvil Dimensions (in.) A ±.002	Anvil Dimensions (in.) P ±.005	Anvil Part Number	Punch Part Number
UNIFIED	440	.267	.045	975200034	975200048
	632	.298	.045	975200035	975200048
	832	.330	.070	975200036	975200048
	032	.361	.070	975200037	975200048
	0420	.454	.150	975200038	975200048
	0518	.515	.200	975200039	975200048
	0616	.280	.250	975200045(1)	975200048

	Thread Code	Anvil Dimensions (mm) A ±0.05	Anvil Dimensions (mm) P ±0.13	Anvil Part Number	Punch Part Number
METRIC	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

(1) Large nut anvils use protrusion to locate part instead of counterbore.

S-RT™ NUTS

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.



PEMSERTER® Installation Tooling

	Thread Code	Anvil Dimensions (in.) A ±.002	Anvil Dimensions (in.) P ±.005	Anvil Part Number	Punch Part Number
UNIFIED	RT440	.267	.045	975200034	975200048
	RT632	.298	.045	975200035	975200048
	RT832	.330	.070	975200036	975200048
	RT032	.361	.070	975200037	975200048
	RT0420	.454	.150	975200038	975200048
	RT0518	.517	.200	975200039	975200048

	Thread Code	Anvil Dimensions (mm) A ±0.05	Anvil Dimensions (mm) P ±0.13	Anvil Part Number	Punch Part Number
METRIC	RTM3	6.78	1.14	975200034	975200048
	RTM4	8.38	1.78	975200036	975200048
	RTM5	9.17	1.78	975200037	975200048
	RTM6	11.53	3.81	975200038	975200048

CLINCH FASTENER PERFORMANCE DATA

CFN™ NUTS (1)

UNIFIED	Thread Locking Specifications		Test Sheet Material		
Thread Code	Max. First On Prevailing Torque (in. lbs.)	Min. First Off Prevailing Torque (in. lbs.)	.040" Cold-rolled Steel		
			Installation (lbs.)	Pushout (lbs.)	Torque-out (in. lbs.)
440	3	0.38	1000	10	4

METRIC	Thread Locking Specifications		Test Sheet Material		
Thread Code	Max. First On Prevailing Torque (N·m)	Min. First Off Prevailing Torque (N·m)	1 mm Cold-rolled Steel		
			Installation (kN)	Pushout (N)	Torque-out (N·m)
M3	0.339	0.042	4.45	44.5	0.45

FE™/FEO™/UL™ NUTS (1)(2)

UNIFIED			Test Sheet Material					
			5052-H34 Aluminum			Cold-rolled Steel		
Type	Thread Code		Installation (lbs.)	Pushout (lbs.)	Torque-out (in. lbs.)	Installation (lbs.)	Pushout (lbs.)	Torque-out (in. lbs.)
FEO	440		900	88	12	1500	140	12
FE				135	12		210	12
FEO	632		1200	105	20	2100	185	20
FE			1300	175			255	
FEO	832		1500	155	48	2500	260	48
FE				255			360	
FEO	032		1500	155	48	2500	260	48
FE				255			360	
FE	0420		2100	320	110	3500	420	110
	0428							

METRIC			Test Sheet Material					
			5052-H34 Aluminum			Cold-rolled Steel		
Type	Thread Code		Installation (kN)	Pushout (N)	Torque-out (N·m)	Installation (kN)	Pushout (N)	Torque-out (N·m)
FEO	M3		4	391	1.35	6.7	622	1.35
FE				600			934	
FEO	M4		6.7	689	5.42	11.1	1156	5.42
FE				1134			1601	
FEO	M5		6.7	689	5.42	11.1	1156	5.42
FE				1134			1601	
FE	M6		9.4	1423	12.43	15.6	1868	12.43

UNIFIED				Test Sheet Material					
				5052-H34 Aluminum			Cold-rolled Steel		
Type	Thread Code	Shank Code		Installation (lbs.)	Pushout (lbs.)	Torque-out (in. lbs.)	Installation (lbs.)	Pushout (lbs.)	Torque-out (in. lbs.)
UL	080	0		750	20	2	1000	30	2
	164	0		750	20	3	1000	30	3
	256	0		1000	20	4	1300	30	4
		1							

METRIC				Test Sheet Material					
				5052-H34 Aluminum			Cold-rolled Steel		
Type	Thread Code	Shank Code		Installation (kN)	Pushout (N)	Torque-out (N·m)	Installation (kN)	Pushout (N)	Torque-out (N·m)
UL	M2	1		4	89	0.45	5.8	133	0.45

(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) For FE and FEO fasteners, thread locking performance is equivalent to applicable NASM25027 specifications. For details, see chart on page 21.

LAS™/LAC™ NUTS (1)(2)

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

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

LA4™ NUTS (1)(2)

	Thread Code	Test Sheet Material		
		300 Series Stainless Steel		
		Installation (lbs.)	Retainer Pushout (lbs.)	Retainer Torque-out (in. lbs.)
UNIFIED	440	9000	200	85
	632	10000	200	85
	832	12000	200	85
	032	13000	250	125

	Thread Code	Test Sheet Material		
		300 Series Stainless Steel		
		Installation (kN)	Retainer Pushout (N)	Retainer Torque-out (N·m)
METRIC	M3	40	890	9.6
	M4	53	890	9.6
	M5	57	1100	14.1

(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) Thread locking performance is equivalent to applicable NASM25027 specifications. For details, see chart on page 21.

LK™/LKS™/LKA™ NUTS (1)(2)

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

	Thread Code	Shank Code	Test Sheet Material					
			5052-H34 Aluminum			Cold-rolled Steel		
			Installation (kN)	Pushout (N)	Torque-out (N·m)	Installation (kN)	Pushout (N)	Torque-out (N·m)
METRIC	M2.5	1	7.1	578	2.3	13.3	667	2.3
		2	8.9	667	3.4	13.3	711	2.3
	M3	1	7.1	578	2.8	13.3	667	3.4
		2	8.9	890	4	13.3	1112	4.5
	M4	1	12	667	5.1	17.8	845	5.6
		2	13.3	1112	5.7	19.1	1334	7.9
	M5	1	14.2	667	10.2	17.8	1112	11.3
		2	14.2	1112	11.9	19.1	1334	13.6

PL™/PLC™ NUTS (1)(2)

	Thread Code	Test Sheet Material											
		.060" 5052-H34 Aluminum			.040" 5052-H34 Aluminum			.060" Cold-rolled Steel			.048" Cold-rolled Steel		
		Installation (lbs.)	Pushout (lbs.)	Torque-out (in. lbs.)	Installation (lbs.)	Pushout (lbs.)	Torque-out (in. lbs.)	Installation (lbs.)	Pushout (lbs.)	Torque-out (in. lbs.)	Installation (lbs.)	Pushout (lbs.)	Torque-out (in. lbs.)
UNIFIED	440	2000	225	20	1500	160	20	3000	260	20	3000	225	20
	632	2000	285	30	1500	180	25	3000	290	30	3000	270	30
	832	2000	290	60	1500	180	28	3000	290	60	3000	270	60
	032	2000	300	70	1500	180	40	3000	350	70	3000	310	70

	Thread Code	Test Sheet Material											
		1.5 mm 5052-H34 Aluminum			1 mm 5052-H34 Aluminum			1.5 mm Cold-rolled Steel			1.2 mm Cold-rolled Steel		
		Installation (kN)	Pushout (N)	Torque-out (N • m)	Installation (kN)	Pushout (N)	Torque-out (N • m)	Installation (kN)	Pushout (N)	Torque-out (N • m)	Installation (kN)	Pushout (N)	Torque-out (N • m)
METRIC	M3	8.9	1000	2.25	6.67	710	2.25	13.34	1156	2.25	13.34	1000	2.25
	M4	8.9	1290	6.77	6.67	800	3.16	13.34	1290	6.77	13.34	1200	6.77
	M5	8.9	1330	7.9	6.67	800	4.51	13.34	1557	7.9	13.34	1380	7.9

(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) Thread locking performance is equivalent to applicable NASM25027 specifications. For details, see chart on page 21.

SL™ NUTS (1)

	Thread Code	Shank Code	Thread Locking Specifications		Test Sheet Material					
					5052-H34 Aluminum			Cold-rolled Steel		
			Max. Prevailing Torque (1st thru 3rd) (in. lbs.)	Min. Prevailing Torque (1st thru 3rd) (in. lbs.)	Installation (lbs.)	Pushout (lbs.)	Torque-out (in. lbs.)	Installation (lbs.)	Pushout (lbs.)	Torque-out (in. lbs.)
UNIFIED	440	1	5.75	0.4	1500 - 2000	90	10	2500 - 3500	125	15
		2				170	13		230	18
	632	1	10.5	0.8	2500 - 3000	95	17	3000 - 6000	130	20
		2				190	22		275	28
	832	1	18	1.2	2500 - 3000	105	23	4000 - 6000	145	35
		2				220	35		285	45
	032	1	21	1.65	2500 - 3000	110	32	4000 - 9000	180	40
		2				190	50		250	60
	0420	1	35	3.75	4000 - 7000	360	90	6000 - 9000	400	150
		2				360	125		400	150
	0518	1	53	4.75	4000 - 7000	380	120	6000 - 8000	420	165
		2				380	160		420	180
	0616	1	95	6.3	5000 - 8000	400	270	7000 - 11000	460	320
		2				400	270		460	320

	Thread Code	Shank Code	Thread Locking Specifications		Test Sheet Material					
					5052-H34 Aluminum			Cold-rolled Steel		
			Max. Prevailing Torque (1st thru 3rd) (N·m)	Min. Prevailing Torque (1st thru 3rd) (N·m)	Installation (kN)	Pushout (N)	Torque-out (N·m)	Installation (kN)	Pushout (N)	Torque-out (N·m)
METRIC	M3	1	0.67	0.04	6.7 - 8.9	400	1.13	11.2 - 15.6	550	1.7
		2				750	1.47		1010	2.03
	M3.5	1	1.2	0.08	11.2 - 13.5	400	1.92	13.4 - 26.7	570	2.3
		2				840	2.5		1210	2.3
	M4	1	2.1	0.13	11.2 - 13.4	470	2.6	18 - 27	645	4
		2				970	4		1250	5.1
	M5	1	2.4	0.18	11.2 - 15.6	480	3.6	18 - 38	800	4.5
		2				845	5.7		1112	6.8
	M6	1	4	0.3	18 - 32	1580	10.2	27 - 36	1760	17
		2				1580	14.1		1760	17
	M8	1	6	0.5	18 - 32	1570	13.6	27 - 36	1870	18.7
		2				1570	18.1		1870	20.3
	M10	1	12	0.8	22 - 36	1760	32.7	32 - 50	2020	36.2
		2				1760	32.7		2020	36.2

(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.

S-RT™ NUTS (1)

UNIFIED

Type	Thread Code	Shank Code	Test Sheet Material	Installation (lbs.)	Pushout (lbs.)	Torque-out (in. lbs.)
S	RT440	0	5052-H34 Aluminum	1500-2000	63	8
		1			90	10
		2			170	13
		0	Cold-rolled Steel	2500-3500	105	13
		1			125	15
		2			230	18
S	RT632	0	5052-H34 Aluminum	2500-3000	63	16
		1			95	17
		2			190	22
		0	Cold-rolled Steel	3000-6000	110	16
		1			130	20
		2			275	28
S	RT832	0	5052-H34 Aluminum	2500-3000	68	21
		1			105	23
		2			220	35
		0	Cold-rolled Steel	4000-6000	110	26
		1			145	35
		2			285	45
SS	RT032	0	5052-H34 Aluminum	2500-3500	68	26
		1			110	32
		2			190	50
		0	Cold-rolled Steel	4000-9000	120	32
		1			180	40
		2			320	60
S	RT0420	0	5052-H34 Aluminum	4000-7000	220	70
		1			360	90
		2				125
		0	Cold-rolled Steel	6000-8000	315	115
		1			400	150
		2				
S	RT0518	1	5052-H34 Aluminum	4000-7000	380	120
		2				160
		1	Cold-rolled Steel	6000-8000	420	165
		2				180

METRIC

Type	Thread Code	Shank Code	Test Sheet Material	Installation (kN)	Pushout (N)	Torque-out (N·m)
S	RTM3	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
S	RTM4	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
SS	RTM5	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			1112	6.8
S	RTM6	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				

(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.

AXIAL STRENGTH AND TIGHTENING TORQUE COMPARISON

Increasing Axial Strength →

	Thread Code	Types UL-0/FEO			Types UL-1/FE			Types PL/PLC			Type SL			Types LK/LKA/LKS/LAC/LAS/LA4		
		Locknut	Mating Screw		Locknut	Mating Screw		Locknut	Mating Screw		Locknut	Mating Screw		Locknut	Mating Screw	
		Min. Axial Strength (lbs.) (1)	Strength Level (ksi) (2)	Tightening Torque (in. lbs.) (3)	Min. Axial Strength (lbs.) (1)	Strength Level (ksi) (2)	Tightening Torque (in. lbs.) (3)	Min. Axial Strength (lbs.) (1)	Strength Level (ksi) (2)	Tightening Torque (in. lbs.) (3)	Min. Axial Strength (lbs.) (4)	Strength Level (ksi) (4)	Tightening Torque (in. lbs.) (5)	Min. Axial Strength (lbs.) (7)	Strength Level (ksi) (7)	Tightening Torque (in. lbs.) (5)
UNIFIED	080	125	69	1.0	—	—	—	—	—	—	—	—	—	—	—	—
	164	125	49	1.2	—	—	—	—	—	—	—	—	—	—	—	—
	256	169	46	1.9	316	85	3.5	—	—	—	—	—	—	—	—	—
	440	465	77	6.8	705	117	10.3	897	149	13.1	1,085	180	15.8	1,085	180	15.8
	632	546	60	9.8	847	93	15.2	1,036	114	18.6	1,636	180	29.4	1,636	180	29.4
	832	779	56	16.6	1,213	87	25.9	1,179	84	25.1	2,270 (6)	180	48.4	2,522	180	53.8
	032	779	39	19.2	1,213	61	30.0	1,246	62	30.8	2,880 (6)	180	71.1	3,600	180	88.9
	0420	—	—	—	1,412	44	45.9	—	—	—	5,728	180	186	5,728	180	186
	0518	—	—	—	—	—	—	—	—	—	9,437	180	383	—	—	—
	0616	—	—	—	—	—	—	—	—	—	13,948	180	680	—	—	—

Increasing Axial Strength →

	Thread Code	Types UL-0/FEO			Types UL-1/FE			Types PL/PLC			Type SL			Types LK/LKA/LKS/LAC/LAS/LA4		
		Locknut	Mating Screw		Locknut	Mating Screw		Locknut	Mating Screw		Locknut	Mating Screw		Locknut	Mating Screw	
		Min. Axial Strength (kN) (1)	Strength Level (MPa) (2)	Tightening Torque (N·m) (3)	Min. Axial Strength (kN) (1)	Strength Level (MPa) (2)	Tightening Torque (N·m) (3)	Min. Axial Strength (kN) (1)	Strength Level (MPa) (2)	Tightening Torque (N·m) (3)	Min. Axial Strength (kN) (4)	Strength Level (MPa) (4)	Tightening Torque (N·m) (5)	Min. Axial Strength (kN) (7)	Strength Level (MPa) (7)	Tightening Torque (N·m) (5)
METRIC	M2	—	—	—	1.39	432	0.36	—	—	—	—	—	—	—	—	—
	M3	2.08	267	0.81	3.16	405	1.23	4.03	517	1.57	6.14	1220	2.39	6.14	1220	2.39
	M4	3.48	255	1.81	5.42	398	2.82	5.21	382	2.71	9.64 (6)	1220	5.01	10.71	1220	5.57
	M5	3.48	158	2.26	5.42	246	3.52	5.6	255	3.64	12.63 (6)	1220	8.21	17.3	1220	11.2
	M6	—	—	—	6.28	201	4.9	—	—	—	24.55	1220	19.1	24.55	1220	19.1
	M8	—	—	—	—	—	—	—	—	—	44.66	1220	46.5	—	—	—
	M10	—	—	—	—	—	—	—	—	—	70.75	1220	92	—	—	—

(1) Axial strength for UL, FEO, FE, PL and PLC locknuts are limited by knurled ring strength.

(2) Screw strength level shown is the minimum needed to develop full nut strength, higher strength screws may be used.

(3) Tightening torque shown will induce preload of 65% of locknut min axial strength with K or nut factor is equal to 0.20. In some applications tightening torque may need to be adjusted based on the actual K value. If heat treated steel screw strength is less than the value shown, tightening torque should be proportionately reduced by multiplying the torque shown by the actual screw strength over the screw strength shown. For screws of other materials, never exceed the lower of this reduced torque or the tightening torque recommended for the screw. If higher strength screws are used, torque is not adjusted upward because assemble strength is still limited by locknut strength.

(4) Unless otherwise noted, (see note 6) SL locknuts have axial strength exceeding the min tensile strength of 180 ksi/Property Class 12.9 screws. Contact tech support regarding assemble strength for higher strength screws.

(5) Tightening torque shown will induce preload of 65% of locknut min axial strength with K or nut factor is equal to 0.20. In some applications tightening torque may need to be adjusted based on the actual K value. All tightening torques shown are based on 180 ksi/ Property Class 12.9 screws. For lower strength heat treated steel screws the tightening torque is proportionately less. For example, for 120 ksi screws (Grade 5), torque is 67% of value shown. For 900 MPa screws (Property Class 9.8) torque value is 74% of value shown. For screws of other materials, never exceed the lower of this reduced torque or the tightening torque recommended for the screw.

(6) Due to limited nut height in this size, failure mode is screw stripping and axial strength value shown is slightly less than min tensile strength of 180 ksi/ Property class 12.9 screw.

(7) All LK, LKS, LKA, LAC, LAS and LA4 locknuts have axial strength exceeding the min tensile strength of 180 ksi/Property Class 12.9 screws. Contact tech support regarding assemble strength for higher strength screws.

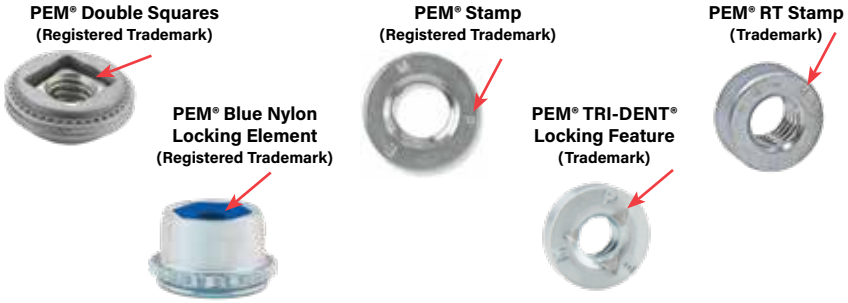
NASM25027 AS APPLIED TO PEM® SELF-CLINCHING, SELF-LOCKING NUTS

PEM FE, FEO, LAS, LAC, LA4, LK, LKS, LKA, PL and PLC locknuts are produced to meet the prevailing locking torque requirements of NASM25027. Specification NASM25027 is a rather lengthy spec which includes many requirements for attributes such as tensile strength and wrenching strength which are not applicable to PEM self-clinching, self-locking nuts. It is difficult for those not familiar with the specification to determine exactly which portions of it apply to the locking torque of PEM self-clinching, self-locking nuts. This matter is further complicated by the fact that many of the requirements in the specification that do apply, apply only to qualification and are not so called "quality conformance inspections" which need to be applied to every lot of product. The fact of the matter is that only one test (room ambient temperature locking torque per the first row of Table IV) needs to be applied on a regular basis of PEM self-clinching, self-locking nuts. This requirement is defined by Table XIV and the permanent set test is not required per footnote 1. The requirements for this test are given in Paragraphs 3.8.2.2.1 and 3.8.2.2.2. The test method is specified in paragraphs 4.5.3.3. and 4.5.3.3.4.1. For convenience of those who do not have access to this specification and/or are not familiar with specification language, these test requirements and test methods are re-stated below in layman's terms.

The one required test is a 15 cycle re-usability test. There are two values of torque which are required by specification. The first is a maximum torque value which dare not be exceeded anytime during the 15 installation and removal cycles. The second is a minimum breakaway torque which must be met during the 15th removal cycle. These torque values are shown in Table III of specifications NASM25027. They are also listed below for PEM fastener sizes only and also for metric sizes.

Details of the test procedure and significant definitions can be found on our web site at:
http://www.pemnet.com/files/design_info/techsheets/NASM25027.pdf

	Maximum Locking Torque (Any Cycle)		Minimum 15th Cycle Breakaway Torque	
Thread Size	**in. lbs.**	**N•m**	**in. lbs.**	**N•m**
#2-56	2.5	0.28	0.2	0.023
#4-40	5	0.57	0.5	0.057
#6-32	10	1.13	1.0	0.113
#8-32	15	1.7	1.5	0.17
#10-24	18	2.03	2.0	0.226
#10-32	18	2.03	2.0	0.226
1/4-20	30	3.39	4.5	0.509
1/4-28	30	3.39	3.5	0.396
M2.5	3.8	0.43	0.38	0.043
M3	5	0.56	0.5	0.056
M3.5	10	1.13	1.0	0.113
M4	15	1.7	1.5	0.17
M5	18	2.03	2.0	0.22
M6	28.3	3.2	3.3	0.37



To be sure that you are getting genuine PEM® brand fasteners, look for the unique PEM product markings and identifiers.

Fastener drawings and models are available at www.pemnet.com

All PEM® products meet our stringent quality standards. If you require additional industry or other specific quality certifications, special procedures and/or part numbers are required. Please contact your local sales office or representative for further information.

Regulatory compliance information is available in Technical Support section of our website. Specifications subject to change without notice. See our website for the most current version of this bulletin.

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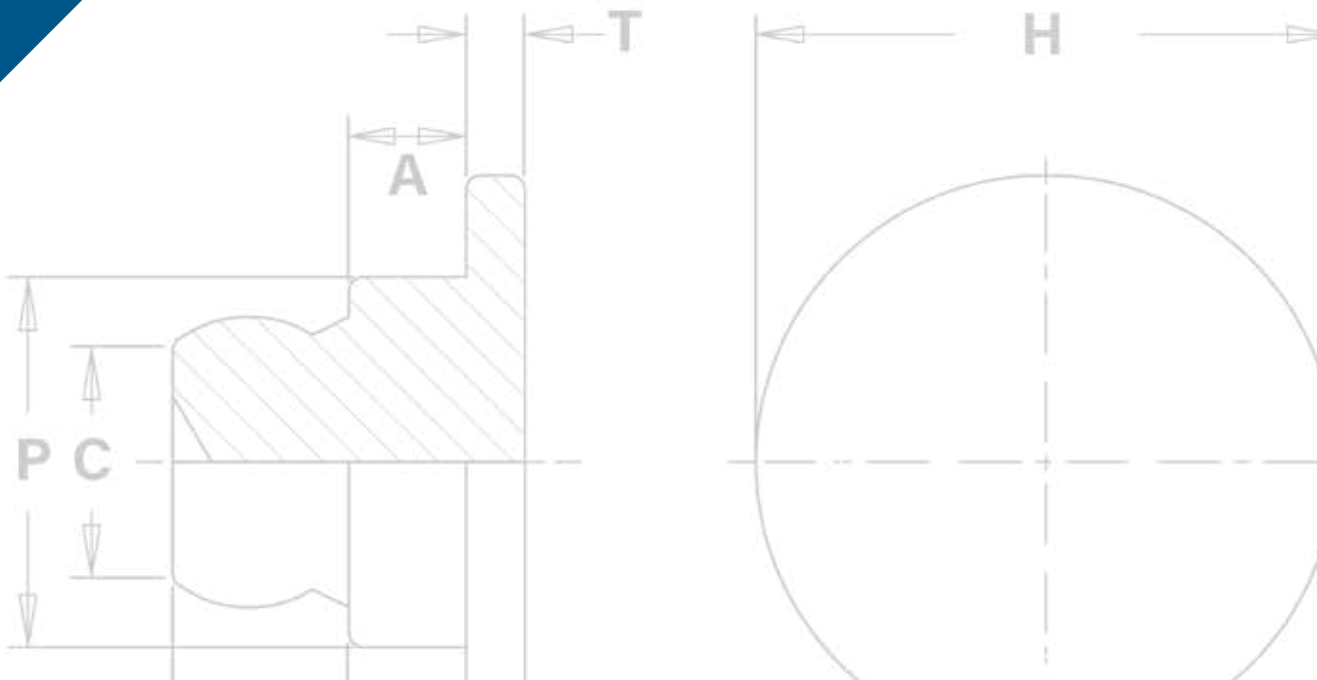

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- Wearables (smart watches, cameras, fitness bands, headphones, etc.)
- Laptops
- Tablets/eReaders
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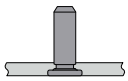
- Infotainment/Automotive Electronics

- Thread code as small as M0.8.
- Pin diameters as small as 0.7 mm.
- Standoff lengths as short as .028" / 0.7 mm.
- Clinches flush into sheets as thin as .012" / 0.3 mm.
- Attach sheets as thin as .008" / 0.2 mm.

Parts for smaller and/or thinner applications have been designed. Please contact us for more information.

MPP™ microPEM® Self-clinching Pins
Ideal for micro positioning and alignment applications - PAGE 3

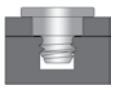


MSO4™ microPEM® Self-clinching Standoffs
Designed for mounting and/or spacing in extremely limited space applications - PAGE 3

TA™/T4™ microPEM® TackPin® Fasteners
Enable sheet-to-sheet attachment, replacing costly screw installation in applications where disassembly is not required - PAGE 4

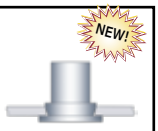
TKA™/TK4™ microPEM® TackSert® Pins
Designed with diagonal knurl to hold a top panel to a bottom panel or chassis by broaching into the bottom panel/chassis. Type TKA pins are suitable for broaching into plastic applications, and Type TK4 pins are suitable for broaching into castings and brittle materials - PAGE 5

TS4™ microPEM® TackScrew™ Fasteners
Enable cost effective sheet-to-sheet attachment by simply pressing into place. Can be removed by simply unscrewing, similar to other threaded fasteners - PAGE 6



MSIA™/MSIB™ microPEM® Inserts For Plastics
Designed for use in straight or tapered holes. The symmetrical design eliminates the need for orientation. They are installed by pressing them into the mounting hole with ultrasonic equipment or with a thermal press - PAGE 7

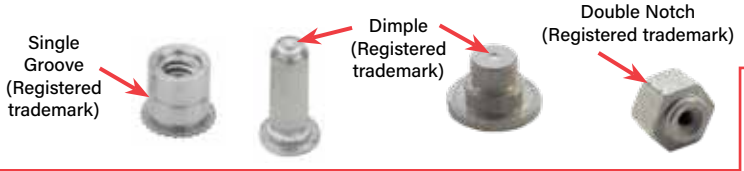
MSOFS™ microPEM® Flaring Standoffs
Attach permanently in any type of panel, including metal, plastic and P.C. Board. Flaring feature allows for installation into multiple panels - PAGE 8



SMTSO™ microPEM® Surface Mount Fasteners
These fasteners for compact electronic assemblies attach to P.C. Boards for nut/standoff applications. These fasteners mount on P.C. Boards in the same manner and at the same time as other surface mount components prior to the automated reflow solder process - PAGE 9

microPEM® Screws
Available in sizes as small as M0.8 and lengths as short as 1 mm / .039" - PAGE 10

To be sure you are getting genuine PEM® brand fasteners, look for the unique PEM product markings and identifiers



Fastener drawings and models are available at www.pemnet.com

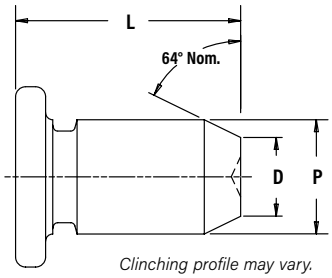
MPP™ microPEM® SELF-CLINCHING PINS

- Satisfy demanding micro positioning and alignment applications.
- Head mounts flush into panels as thin as 0.5 mm / .02".
- Chamfered end makes mating hole alignment easy.
- Can be installed into stainless steel sheets.
- Excellent corrosion resistance.
- Can be installed automatically.

PART NUMBER DESIGNATION

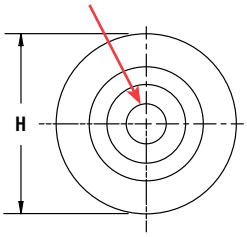
MPP - 1MM - 2

MPP	1MM	2
Type & Material	Pin Diameter Code	Length Code



Clinching profile may vary.

Look for the PEM "Dimple" registered trademark



Pin Diameter P ±0.038mm	Type Stainless Steel	Pin Diameter Code	Length Code "L" ± 0.15 mm (Length Code in millimeters)							Min. Sheet Thickness		Hole Size In Sheet +0.025 mm / +.001"		D ±0.1 mm / ±.004"		H ±0.25 mm / ±.01"		Min. Distance Hole ℄ to Edge	
										mm	in.	mm	in.	mm	in.	mm	in.	mm	in.
1	MPP	1MM	2	3	4	5	–	–	–	0.5	.02	1.05	.041	0.7	.028	1.6	.063	2.05	.081
1.5	MPP	1.5MM	–	3	4	5	6	8	–	0.5	.02	1.55	.061	1.03	.041	2.24	.088	2.6	.102
2	MPP	2MM	–	–	4	5	6	8	10	0.5	.02	2.05	.081	1.36	.054	3.02	.119	4.4	.173

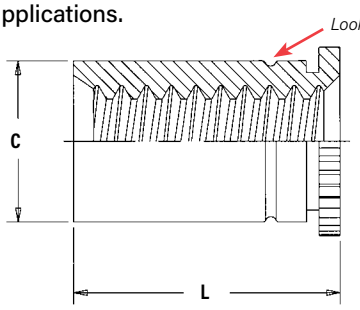
MSO4™ microPEM® SELF-CLINCHING STANDOFFS

- Designed for mounting and/or spacing in extremely limited space applications.
- Can be installed into stainless steel sheets.(1)
- Have stronger threads than weld standoffs because they are made from heat-treated 400 Series Stainless Steel.
- Can be installed automatically.

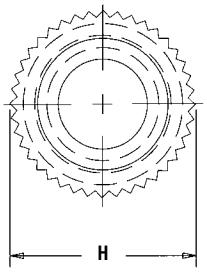
PART NUMBER DESIGNATION

MSO 4 - 080 - 3

MSO	4	080	3
Type	Material Code	Thread Code	Length Code



Look for the "single groove" trademark



Clinching profile may vary.

All dimensions are in inches.

	Thread Size	Type Stainless Steel	Thread Code	Length Code	Min. Sheet Thickness	Hole Size In Sheet +.002 -.000	C Max.	H Nom.	L +.002 -.003	Min. Dist. Hole ℄ To Edge
UNIFIED	.060-80 (#0-80) (2)	MSO4	080	3	.012	.095	.094	.125	.094	.090
				4					.125	
	.086-56 (#2-56) (2)	MSO4	256	3	.012	.125	.124	.156	.094	.120
				4					.125	

All dimensions are in millimeters.

	Thread Size	Type Stainless Steel	Thread Code	Length Code	Min. Sheet Thickness	Hole Size In Sheet +0.05	C Max.	H Nom.	L +0.05 - 0.08	Min. Dist. Hole ℄ To Edge
METRIC	M1 x 0.25 (3)	MSO4	M1	2	0.3	2.41	2.39	3.18	2	2.3
				3					3	
	M1.2 x 0.25 (3)	MSO4	M1.2	2	0.3	2.41	2.39	3.18	2	2.3
				3					3	
	M1.4 x 0.3 (4)	MSO4	M1.4	2	0.3	2.41	2.39	3.18	2	2.3
				3					3	
	M1.6 x 0.35 (5)	MSO4	M1.6	2	0.3	2.41	2.39	3.18	2	2.3
				3					3	
	M2 x 0.4 (5)	MSO4	M2	2	0.3	3.18	3.16	3.96	2	3
				3					3	

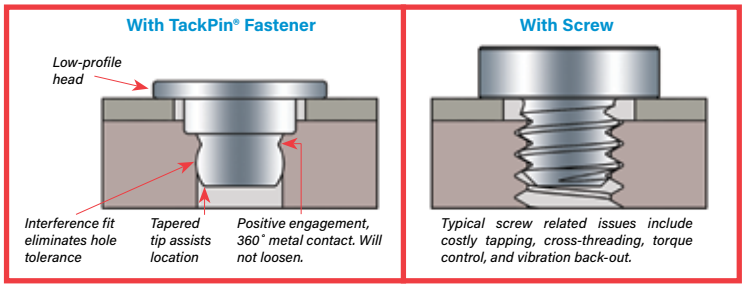
(1) MSO4 standoffs are designed for use in sheet hardness HRB 88 / HB 183 or less. For installation into harder sheets (up to HRC 36), contact our Tech Support line or your local representative.
(2) Unified ASME B1.1, 2B
(3) Miniature ISO 68-1, 5H
(4) Miniature ISO 68-1, 6H
(5) Metric ASME B1.13M, 6H

TA™/T4™ microPEM® TackPin® FASTENERS

- Advantages over micro screws: eliminates costly tapping, cross threading, torque control, vibration back-out and installation time.
- Interference fit minimizes hole tolerance issues.
- Tapered tip assists location.
- Low-profile head provides space savings.
- Top sheet can be any material.
- Can be installed automatically.

Patented.

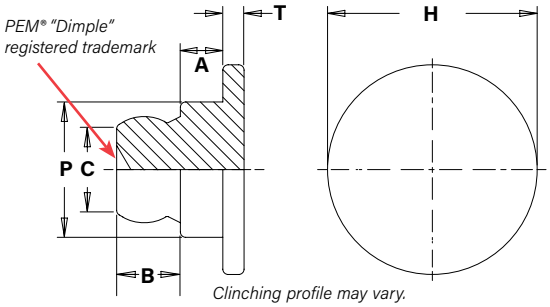
Comparison of TackPin® fastener to screw installation.

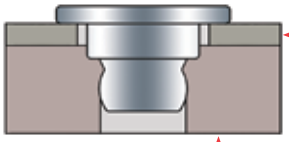


PART NUMBER DESIGNATION

TA - 10 - 025
T4 - 10 - 025

- Type & Material
- Base Panel Hole Size Code
- Top Sheet Thickness Code



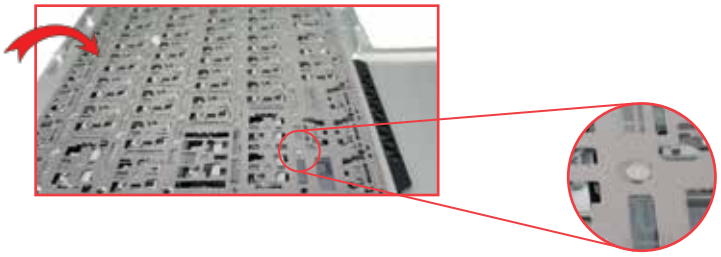


Base panel.
TackPin fastener installs into blind or through hole applications.

Type		Base Panel Hole Size Code	Top Sheet Thickness Code	Top Sheet Thickness		Base Panel Min. Sheet Thickness (1)		Top Sheet Hole Size ±0.05 mm / ±.002"		Base Panel Hole Size -0.05 mm / -.002"		A ±0.025 mm / ±.001"		B ±0.075 mm / ±.003"		C Max.		H ±0.1 mm / ±.004"		P ±0.05 mm / ±.002"		T ±0.1 mm / ±.004"		Min. Dist. Hole ℄ To Edge	
Alumi-num	Stain-less Steel			mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.
TA	T4	10	025	0.2-0.28	.008-.011	0.89	.035	1.47	.058	1.02	.040	0.406	.016	0.610	.024	0.89	.035	2	.079	1.3	.051	0.2	.008	1	.039
TA	T4	10	050	0.48-0.56	.019-.022	0.89	.035	1.47	.058	1.02	.040	0.686	.027	0.610	.024	0.89	.035	2	.079	1.3	.051	0.2	.008	1	.039
TA	–	10	075	0.71-0.79	.028-.031	0.89	.035	1.47	.058	1.02	.040	0.914	.036	0.610	.024	0.89	.035	2	.079	1.3	.051	0.2	.008	1	.039

(1) 0.89 mm / .035" for blind holes and 0.5 mm / .020" for through holes.

In one notable application, TackPin® fasteners have been specified to replace screws to attach a super-thin membrane to a very thin substrate in keyboards. The switch to TackPin® fasteners significantly reduced assembly costs.



CUSTOM microPEM® TackPin® FASTENER SOLUTIONS

Countersunk TackPin® Fastener

- Installs into a countersunk hole, replacing countersunk screws.
- Offers flush or near flush appearance.

Large Head TackPin® Fastener

- TackPin with a large head installed into boss of bottom panel.
- Holds down top panel that is free to rotate around the boss.

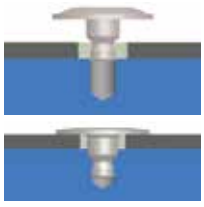
Flush-head TackPin® Fastener

- TackPin installed into a thicker, softer top-sheet and pressed flush.

Thin Sheet TackPin™ Fastener

- Simple, press-in installation.
- Enables sheet-to-sheet attachment of multiple layers.
- Flush or sub-flush on both sides of sheet.
- Head mounts flush into top sheets as thin as .008" / 0.2 mm.

FlexTack™ Fastener

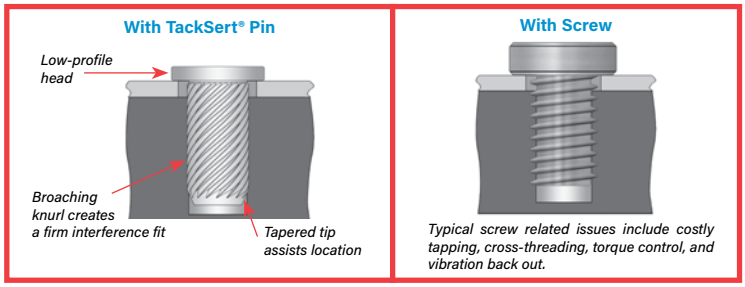


- The belleville shaped head flattens upon a simple press-in installation.
- Draws panels together to accomodate vertical stack tolerances.

TKA™/TK4™ microPEM® TackSert® PINS

- Secure panels to common cast materials such as magnesium and aluminum. Also appropriate for attaching panels to plastics such as ABS and to P.C. Boards.
- Simple, press-in installation. Does not require heat or ultrasonics.
- Alternative to micro screws, eliminating the need to tap or use threaded inserts.
- Top sheet can be any material.
- Low-profile head.
- Eliminates the following:
  - Cost of screw
  - Cost of patch to prevent loosening
  - Cost of threaded insert or tapped hole
  - Cost of driver bits
  - Cost of rework due to cross-threading and driver bit "cam-out".
- Can be installed automatically.

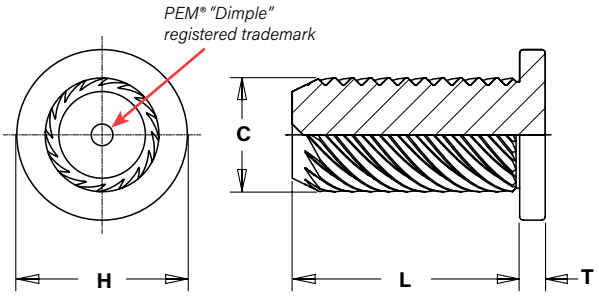
Comparison of TackSert® pin to screw installation.

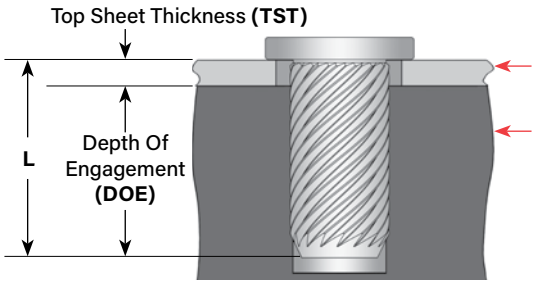


PART NUMBER DESIGNATION

TKA - 10 - xxx
TK4 - 10 - xxx

- Type & Material
- Base Panel Hole Size Code
- Length Code





DOE = L - TST **DOE ≥ 0.8 mm / .0315"**

For through hole applications
DOE - 0.25 mm / .010" = Min. Sheet

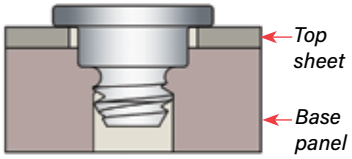
For blind hole applications
DOE + 0.25 mm / .010" = Min. Blind Hole Depth

Type		Base Panel Hole Size Code	Length Code	Top Sheet Hole Size ±0.05 mm/±.002"		Base Panel Hole Size -0.05 mm/-.002"		Top Sheet Thickness Max.		C Max.		H ±0.08 mm/ ±.003"		L ±0.06 mm/ ±.002"		T ±0.08 mm/ ±.003"		Min. Dist. Hole ℄ To Edge (1)	
Fastener Material																			
Aluminum	400 series stainless steel			mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.
TKA	TK4	10	100	1.3	.051	1	.039	0.2	.008	1.2	.047	1.8	.071	1	.039	0.27	.011	1.18	.047
TKA	TK4	10	150	1.3	.051	1	.039	0.7	.028	1.2	.047	1.8	.071	1.5	.059	0.27	.011	1.18	.047
TKA	TK4	10	200	1.3	.051	1	.039	1.2	.047	1.2	.047	1.8	.071	2	.079	0.27	.011	1.18	.047
TKA	TK4	10	250	1.3	.051	1	.039	1.7	.067	1.2	.047	1.8	.071	2.5	.098	0.27	.011	1.18	.047
TKA	TK4	10	300	1.3	.051	1	.039	2.2	.087	1.2	.047	1.8	.071	3	.118	0.27	.011	1.18	.047

(1) Minimum boss diameter is twice centerline-to-edge value.

TS4™ microPEM® TackScrew™ FASTENERS

- Simple, press-in installation for secure attachment.
- Proven self-clinching technology resists vibrational loosening.
- Replaces micro screws, eliminating installation issues including:
  - Cost of locking patch
  - Cost of threaded insert or tapped hole
  - Cost of driver bits
  - Cost of rework due to cross-threading and driver bit "cam-out"
- Top sheet can be any material.
- Can be installed automatically.
- Twists out (unscrew) if removal is necessary. Can be reinstalled one time using a thread locking adhesive.

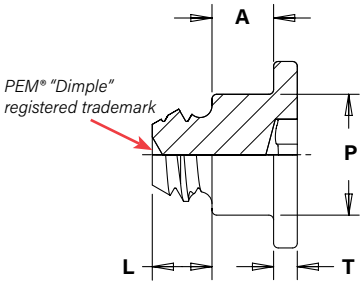


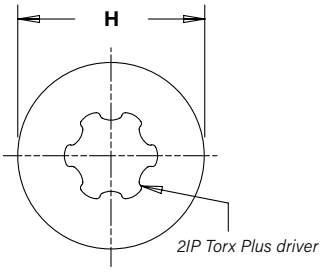
TackScrew fastener installs into blind or through hole applications.

PART NUMBER DESIGNATION

TS4 - 10 - 025

- TS4 → Type & Material
- 10 → Base Panel Hole Size Code
- 025 → Top Sheet Thickness Code



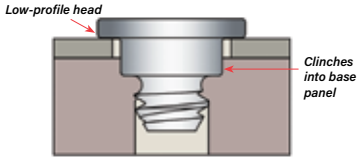


Type / Material / Hardened Stainless Steel	Base Panel Hole Size Code	Top Sheet Thickness Code	Top Sheet Thickness		Base Panel Min. Sheet Thickness (1)		Top Sheet Hole Size ±0.05 mm / ±.002"		Base Panel Hole Size ±0.025 mm / ±.001"		A ±0.05 mm / ±.002"		H ±0.1 mm / ±.004"		L ±0.1 mm / ±.004"		P ±0.05 mm / ±.002"		T ±0.1 mm / ±.004"		Min. Dist. Hole ℄ To Edge	
			mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.
TS4	10	025	0.2 - 0.28	.008 - .011	0.91	.036	1.47	.058	0.99	.039	0.406	.016	2	.079	0.64	.025	1.3	.051	0.25	.010	1	.039
TS4	10	050	0.48 - 0.56	.019 - .022	0.91	.036	1.47	.058	0.99	.039	0.686	.027	2	.079	0.64	.025	1.3	.051	0.25	.010	1	.039

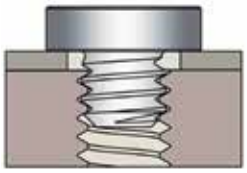
(1) Minimum sheet to prevent protrusion from through hole or minimum blind hole depth.

Comparison of TackScrew™ fastener to screw installation.

With TackScrew™ Fastener



With Screw



Typical screw related issues include costly tapping, cross-threading, torque control, and vibration back out.

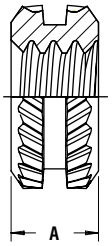
MSIA™/MSIB™ microPEM® INSERTS FOR PLASTICS

- Threads as small as M1.
- Symmetrical design eliminates the need for orientation.
- Provides excellent performance in wide range of plastics.
- Aluminum inserts offer light weight, lead-free alternative.

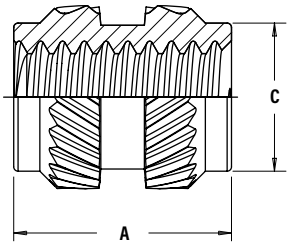
PART NUMBER DESIGNATION

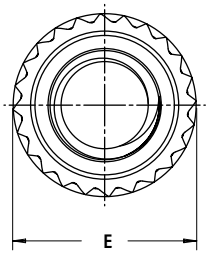
MSI	B	-	M1	-	100
↓	↓		↓		↓
Type	Material		Thread Size Code		Length Code

Style #1



Style #2





After Knurl

All dimensions are in millimeters.

	Thread Size x Pitch	Type		Thread Code	Length Code	A ±0.1	E ± 0.1	C Max.	Mounting Hole in Material		
		New Aluminum	Brass						Min. Wall Thickness (6)	Hole Depth Min.	Hole Diameter +0.05
METRIC	M1 x 0.25 (3)	MSIA	MSIB	M1	100(1)	1	2.1	—	0.7	1.77	1.75
					250(2)	2.5		1.75		3.27	
	M1.2 x 0.25 (3)	MSIA	MSIB	M1.2	100(1)	1	2.1	—	0.7	1.77	1.75
					250(2)	2.5		1.75		3.27	
	M1.4 x 0.3 (4)	MSIA	MSIB	M1.4	150(2)	1.5	2.5	2.15	0.8	2.27	2.15
					300(2)	3				3.77	
	M1.6 x 0.35 (5)	MSIA	MSIB	M1.6	150(2)	1.5	2.5	2.15	0.8	2.27	2.15
					300(2)	3				3.77	
	M2 x 0.4 (5)	MSIA	MSIB	M2	300(2)	3	3.2	2.85	1.6	3.77	2.85
					400(2)	4				4.77	

(1) Style #1 - length codes less than 150
(2) Style #2 - length codes 150 and greater
(3) Metric ISO 68-1, 5H
(4) Metric ISO 68-1, 6H
(5) Metric ASME B1.13M, 6H
(6) Refers to wall thickness of boss as tested in ABS and polycarbonate.

MSOFS™ microPEM® FLARING STANDOFFS

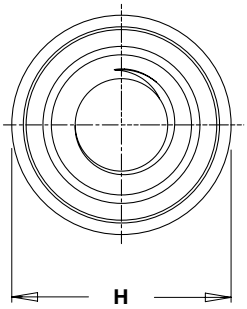
NEW!

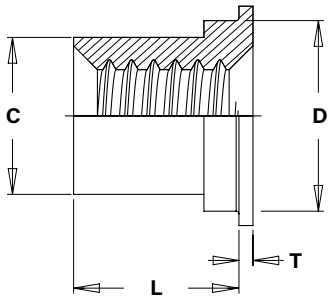
- New MSOFS™ microPEM® flaring standoffs attach permanently in panels as thin as .008"/0.2 mm of any hardness, including stainless steel.
- Can be installed into any type of panel, including metal, plastic and P.C. Board.
- Flaring feature allows for installation into multiple panels.
- Small footprint allows for reduced centerline-to-edge designs.
- Threads as small as #0-80/M1.

PART NUMBER DESIGNATION

MSOFS - 080 - 3

- MSOFS: Type and Material
- 080: Thread Code
- 3: Length Code





All dimensions are in inches.

	Thread Size	Type	Thread Code	Length Code	Sheet Thickness	Hole Size in Sheet +.002 -.000	C Max.	D Max.	H Nom.	L +.002 -.003	T ±.002	Min. Dist. Hole ℄ to Edge
UNIFIED	.060-80 (#0-80) [1]	MSOFS	080	3	.008 - .012	.118	.094	.117	.138	.093	.010	.069
				4						.125		
	.086-56 (#2-56) [1]	MSOFS	256	3	.008 - .012	.138	.113	.137	.157	.093	.010	.079
				4						.125		

All dimensions are in millimeters.

	Thread Size x Pitch	Type	Thread Code	Length Code	Sheet Thickness	Hole Size in Sheet +0.05	C Max.	D Max.	H Nom.	L +0.05 -0.08	T ±0.05	Min. Dist. Hole ℄ to Edge
METRIC	M1 x 0.25 [2]	MSOFS	M1	2	0.2 - 0.3	3	2.39	2.97	3.35	2	0.25	1.75
				3						3		
	M1.2 x 0.25 [2]	MSOFS	M1.2	2	0.2 - 0.3	3	2.39	2.97	3.35	2	0.25	1.75
				3						3		
	M1.4 x 0.3 [3]	MSOFS	M1.4	2	0.2 - 0.3	3	2.39	2.97	3.35	2	0.25	1.75
				3						3		
	M1.6 x 0.35 [4]	MSOFS	M1.6	2	0.2 - 0.3	3.5	2.87	3.48	4	2	0.25	2
				3						3		
	M2 x 0.4 [4]	MSOFS	M2	2	0.2 - 0.3	3.5	2.87	3.48	4	2	0.25	2
				3						3		

(1) Internal, ASME B1.1, 2B
(2) Metric ISO 68-1, 5H
(3) Metric ISO 68-1, 6H
(4) Metric ASME B1.13M, 6H

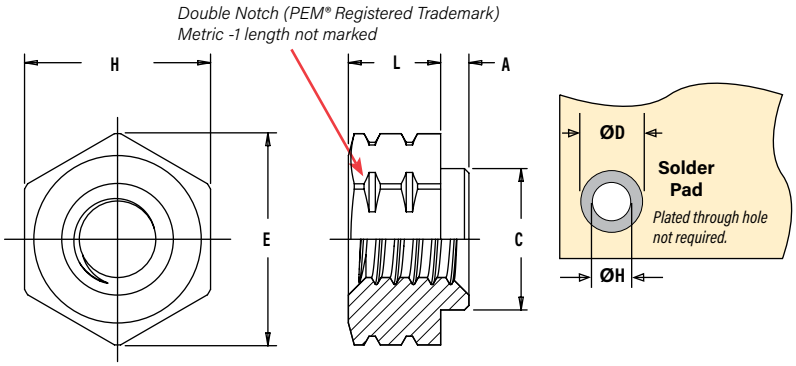
SMTSO™ microPEM® SURFACE MOUNT FASTENERS

- Hex shaped barrel provides optimal size/performance.
- Provided on tape and reel.
- Reduces board handling.
- Can be installed automatically.

PART NUMBER DESIGNATION

SMTSO 080 - 2 - ET

SMTSO	080	2	ET
Type	Thread Code	Length Code	Finish Code



All dimensions are in inches.

	Thread Size	Type	Thread Code	Length Code	Min. Sheet Thickness	A Max.	C Max.	E Ref.	H Nom.	L ±.003	ØH Hole Size In Sheet +.003 -.000	ØD Min. Solder Pad
UNIFIED	.060-80 (#0-80) (1)	SMTSO	080	2	.020	.019	.095	.144	.125	.062	.098	.165
				4						.125		

All dimensions are in millimeters.

	Thread Size	Type	Thread Code	Length Code	Min. Sheet Thickness	A Max.	C Max.	E Ref.	H Nom.	L ±0.08	ØH Hole Size In Sheet +0.08	ØD Min. Solder Pad
METRIC	S1 (2)	SMTSO	M1	1	0.5	0.48	2.41	3.66	3.18	1	2.5	4.19
				2						2		
				3						3		
	S1.2 (2)	SMTSO	M1.2	1	0.5	0.48	2.41	3.66	3.18	1	2.5	4.19
				2						2		
				3						3		
	S1.4 (2)	SMTSO	M1.4	1	0.5	0.48	2.41	3.66	3.18	1	2.5	4.19
				2						2		
				3						3		
	M1.6 x 0.35 (3)	SMTSO	M1.6	1	0.5	0.48	2.41	3.66	3.18	1	2.5	4.19
				2						2		
				3						3		

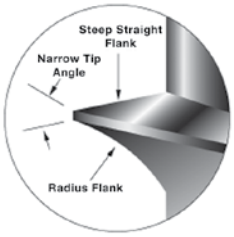
(1) Unified ASME B1.1, 2B *(2) Miniature ISO 1501, 4H6* *(3) Metric ASME B1.13M, 6H*

microPEM® SCREWS (Available on special order. Minimum quantities may apply)

- Smallest thread code: M0.8.
- Shortest length: 1 mm / .039".
- Fastener material: steel, stainless steel and aluminum.
- Driver types: Torx®/Torx Plus®/Microstix®, cross-recess/internal hex.
- Head styles: flat head/pan head/socket-head/wafer-head.
- Special features: Locking patch, REMFORM®, TAPTITE 2000®, FASTITE 2000®, PT® and DELTA PT®
- Platings: zinc, nickel, black nickel and black oxide.

Cost-effective, forged internal/external screw

REMFORM® SCREWS

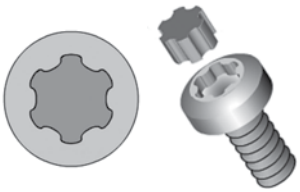


- Designed primarily for plastic applications
- Provides superior performance in a wide range of plastics
- Asymmetrical thread minimizes radial hoop stress to reduce boss bursting
- Narrow tip angle reduces stress in plastic nut member
- Suitable for other ductile materials such as wood and soft metals

DELTA PT® SCREWS

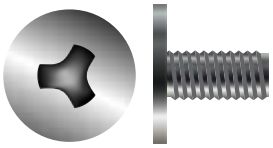
- Minimal radial tension due to optimized flank angle
- High clamp load
- High tensile and torsion strength
- Increased cycle stress stability
- High strength under vibration

TORX PLUS® DRIVE SYSTEM



- 0˚ drive angle
- Elliptical geometric configuration maximizes drive bit engagement
- Large cross-sectional area at lobes
- Vertical sidewalls
- Optimizes torque transfer
- Virtually eliminates cam-out
- Reduces end load and worker fatigue
- Reduces annual drive bit costs

MICROSTIX® ULTRA-THIN-HEAD PRECISION SCREWS



- No cam-out
- No driving force
- High workability
- High torque transmission
- High precision bits
- Tamper proof
- High durability
- Better fit between bits and screws

PennEngineering is a licensee of Acument Global Technologies (Torx®, Torx Plus®), Reminc (REMFORM®, TAPTITE 2000®, FASTITE 2000®), EJOT® (PT® and DELTA PT®) and OSG Corporation and OSG System Products Co., Ltd. (Microstix®).

MATERIAL AND FINISH SPECIFICATIONS

	Fastener Materials							Standard Finishes			For Use in Sheet Hardness: (1)						
Type	Carbon Steel	Age Hardened A286 Stainless Steel	300 Series Stainless Steel	Hardened 400 Series Stainless Steel	Hardened Aluminum	Aluminum	Free-Machining Leaded Brass	Passivated and/or Tested Per ASTM A380	Electro-Plated Tin ASTM B 545, Class A, with Clear Preservative Coating, Annealed	Plain Finish	HRB 50 / HB 89 or Less	HRB 88 / HB 183 or Less	HRB 92 / HB 202 or Less	PC Board	Plastics	Castings and Brittle Materials	Any Panel Hardness
MPP		▪						▪					▪				
MSO4				▪				▪				▪					
SMTSO	▪								▪					▪			
TA					▪					▪	▪						
T4				▪				▪				▪					
TKA					▪					▪				▪	▪		
TK4				▪				▪						▪	▪	▪	
TS4				▪				▪				▪					
MSIA						▪				▪					▪		
MSIB							▪			▪					▪		
MSOFS			▪					▪									▪
Part Number Codes For Finishes								None	ET	None							

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

A NOTE ABOUT FASTENERS FOR STAINLESS STEEL PANELS

In order for self-clinching fasteners to work properly, the fastener must be harder than the sheet into which it is being installed. In the case of stainless steel panels, fasteners made from 300 Series Stainless Steel do not meet this hardness criteria. It is for this reason that 400 series fasteners are offered (Types MSO4, T4, TK4 AND TS4). However, while these 400 Series fasteners install and perform well in 300 Series stainless sheets they should not be used if the end product:

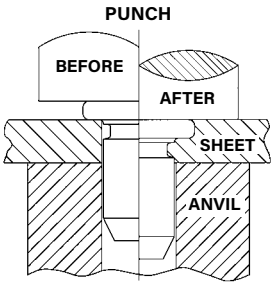
- Will be exposed to any appreciable corrosive presence.
- Requires non-magnetic fasteners.
- Will be exposed to any temperatures above 300˚F (149˚C)

If any of the these are issues, please contact techsupport@pemnet.com for other options.

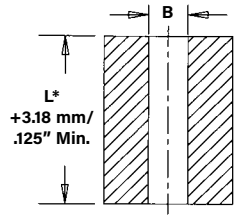
INSTALLATION

MPP PINS

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



Recommended Installation Anvil



*See page 3 for "L."

PEMSERTER® Installation Tooling

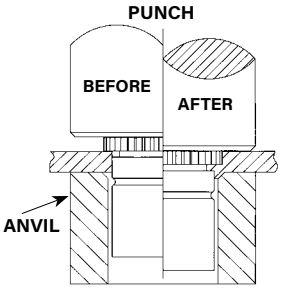
Type	Pin Diameter Code	Anvil Dimensions (mm)	Anvil Part Number	Punch Part Number
		B ±0.02		
MPP	1MM	1.07	8014168	8014167
MPP	1.5MM	1.57	8014169	8014167
MPP	2MM	2.07	8014170	8014167

Requirements for Installation into Stainless Steel

1. Sheet hardness must be less than the specified limit for the fastener.
2. Panel material should be in the annealed condition.
3. Fastener should be installed in punch side of hole.
4. Mounting hole punch should be kept sharp to minimize work hardening around hole.
5. Maintain the mounting hole punch diameter to no greater than .025 mm / .001" over the minimum recommended mounting hole.
6. When installing fastener adjacent to bends or other highly cold-worked areas, use the C/L to edge values listed in the catalog.

MSO4 STANDOFFS

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

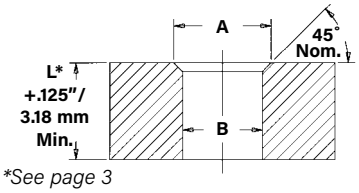


PEMSERTER® Installation Tooling

	Type	Thread Code	Anvil Dimensions (inches)		Anvil Part Number	Punch Part Number
			A	B		
UNIFIED	MS04	080	.112 - .114	.097 - .099	8015796	975200997
UNIFIED	MS04	256	.142 - .144	.127 - .129	8015797	975200997

	Type	Thread Code	Anvil Dimensions (mm)		Anvil Part Number	Punch Part Number
			A	B		
METRIC	MS04	M1	2.84 - 2.89	2.46 - 2.51	8015796	975200997
METRIC	MS04	M1.2	2.84 - 2.89	2.46 - 2.51	8015796	975200997
METRIC	MS04	M1.4	2.84 - 2.89	2.46 - 2.51	8015796	975200997
METRIC	MS04	M1.6	2.84 - 2.89	2.46 - 2.51	8015796	975200997
METRIC	MS04	M2	3.6 - 3.65	3.22 - 3.27	8015797	975200997

Recommended Installation Anvil



*See page 3 for "L."

INSTALLATION

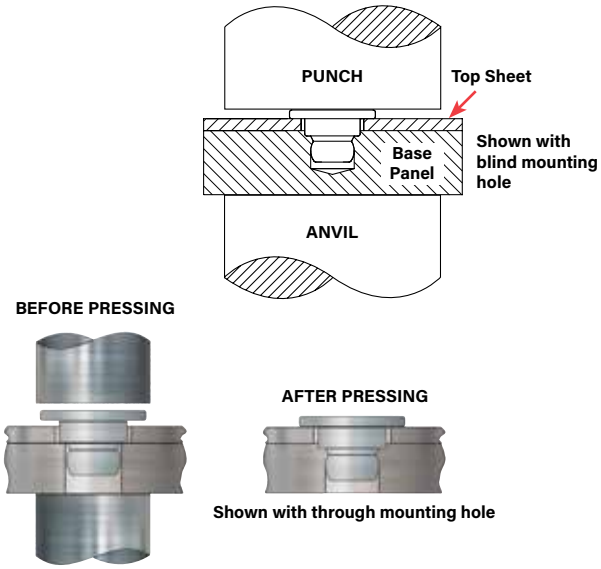
TA/T4 FASTENERS

1. Prepare properly sized mounting hole in top sheet and base panel. Base panel mounting hole can be through or blind.
2. Place top sheet and base panel in proper position.
3. Place fastener through hole in top sheet and into mounting hole (preferably the punch side) of base panel.
4. With installation punch and anvil surfaces parallel, apply squeezing force until the head of the fastener contacts the top sheet.

PEMSERTER® Installation Tooling

Size	Manual Punch Part Number	Manual Anvil Part Number
TA/T4-10-025	8014167	975200046
TA/T4-10-050		
TA/T4-10-075		

microPEM® TackPin® fasteners can be installed automatically in high volume applications. Contact your nearest Engineering representative for more information.



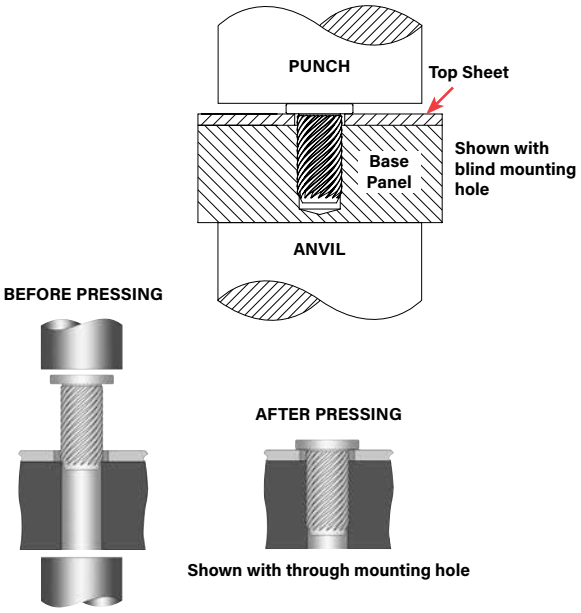
TKA/TK4 PINS

1. Prepare properly sized mounting hole in top sheet and base panel. Base panel mounting hole can be through or blind.
2. Place top sheet and base panel in proper position.
3. Place pin through hole in top sheet and into mounting hole of base panel.
4. With installation punch and anvil surfaces parallel, apply squeezing force until the head of the pin contacts the top sheet.

PEMSERTER® Installation Tooling

Size	Punch Part Number	Anvil Part Number
TKA/TK4-10-100	8014167	975200046
TKA/TK4-10-150		
TKA/TK4-10-200		
TKA/TK4-10-250		
TKA/TK4-10-300		

microPEM® TackSert® fasteners can be installed automatically in high volume applications. Contact your nearest Engineering representative for more information.



INSTALLATION NOTES

- For best results we recommend using a PEMSERTER® press for installation of PEM self-clinching fasteners. Please check our website for more information.
- Visit the Animation Library on our website to view the installation process for select products.

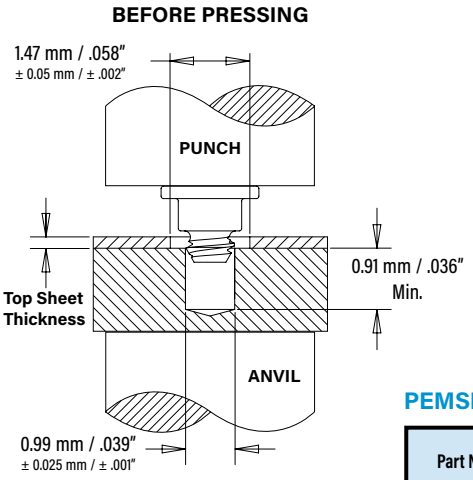
INSTALLATION

TS4 FASTENERS

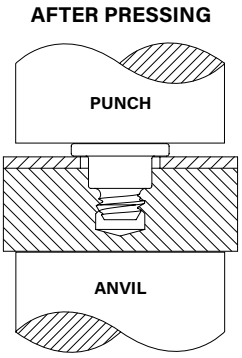
1. Prepare properly sized mounting hole in top sheet and base panel. Base panel mounting hole can be through or blind.
2. Place sheet and base panel in proper position.
3. Place fastener through hole in sheet and into mounting hole (preferably the punch side) of base panel.
4. With punch and anvil surfaces parallel, apply squeezing force until the head of the fastener contacts the top sheet.

Re-installation (if necessary)

1. Place sheet and base panel in proper position.
2. Place adhesive into base panel mounting hole.
3. Place fastener through hole in top sheet and into mounting hole of base panel.
4. Screw in fastener with 2IP Torx Plus driver.



Shown with blind mounting hole.
Can also be used with a through hole.

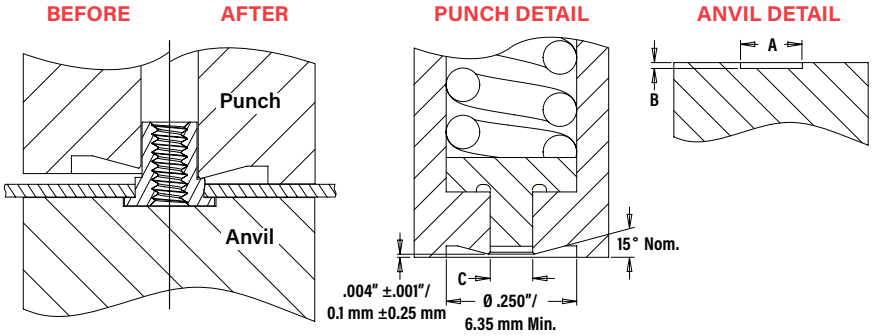


PEMSERTER® Installation Tooling

Part Number	Punch Part Number	Anvil Part Number
TS4-10-025	8014167	975200046
TS4-10-050		

MSOFS STANDOFFS

1. Prepare properly sized mounting hole in sheet. Do not perform any secondary operations such as deburring.
2. Place the standoff into anvil recess and place the mounting hole over the standoff as shown in the drawing.
3. Using a punch flaring tool and a recessed anvil, apply squeezing force until punch contacts the sheet.

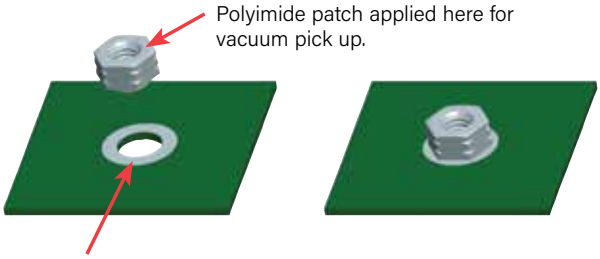


PEMSERTER® Installation Tooling

	Thread Code	Punch Dimensions (in.) C +.001	Punch Part Number	Anvil Dimensions (in.) A ±.001	Anvil Dimensions (in.) B ±.001	Anvil Part Number
UNIFIED	080	.095	8020712	.143	.006	8019720
	256	.114	8020710	.163	.006	8019722

	Thread Code	Punch Dimensions (mm) C +0.025	Punch Part Number	Anvil Dimensions (mm) A ±.025	Anvil Dimensions (mm) B ±.025	Anvil Part Number
METRIC	M1	2.41	8020712	3.64	0.15	8019720
	M1.2	2.41	8020712	3.64	0.15	8019720
	M1.4	2.41	8020712	3.64	0.15	8019720
	M1.6	2.9	8020710	4.14	0.15	8019722
	M2	2.9	8020710	4.14	0.15	8019722

SMTSO FASTENERS



Number of parts per reel/pitch (mm) for each size

Thread Code	Length Code 1	2	3	4
080	–	3500 / 8	–	2000 / 8
M1, M1.2, M1.4, M1.6	3500 / 8	2500 / 8	2000 / 8	–

Packaged on 330mm recyclable reels.
Tape width is 16mm.
Supplied with polyimide patch for vacuum pick up.
Reels conform to EIA-481.

PERFORMANCE DATA(1)

MSO4 STANDOFFS

	Type	Thread Code	Max. Rec. Tightening Torque For Mating Screw (in. lbs.)	Sheet Thickness (in.)	Test Sheet Material: 300 Series Stainless Steel — Installation (lbs.)	Pushout (lbs.)	Torque-out (in.lbs.) (2)	Pull-thru (lbs.) (2)
UNIFIED	MS04	080	.65	.013	2500	33	1.3	78
				.017	2500	45	2.2	
	MS04	256	1.3	.013	2500	33	2.2	110
				.017	2500	45	2.6	

	Type	Thread Code	Max. Rec. Tightening Torque For Mating Screw (N•m)	Sheet Thickness (mm)	Test Sheet Material: 300 Series Stainless Steel — Installation (kN)	Pushout (N)	Torque-out (N•m) (2)	Pull-thru (N) (2)
METRIC	MS04	M1	0.019	0.3	11.1	150	0.15	350
				0.43	11.1	200	0.25	
	MS04	M1.2	0.036	0.3	11.1	150	0.15	350
				0.43	11.1	200	0.25	
	MS04	M1.4	0.057	0.3	11.1	150	0.15	350
				0.43	11.1	200	0.25	
	MS04	M1.6	0.084	0.3	11.1	150	0.15	350
				0.43	11.1	200	0.25	
	MS04	M2	0.175	0.3	11.1	150	0.25	500
				0.43	11.1	200	0.3	

MPP PINS

Type	Pin Diameter Code	Test Sheet Thickness	Installation (kN)	Pushout (N)
MPP	1MM	0.5mm stainless steel HRB 88	10	320
MPP	1.5MM	0.5mm stainless steel HRB 88	12	760
MPP	2MM	0.5mm stainless steel HRB 88	18	860

TA FASTENERS

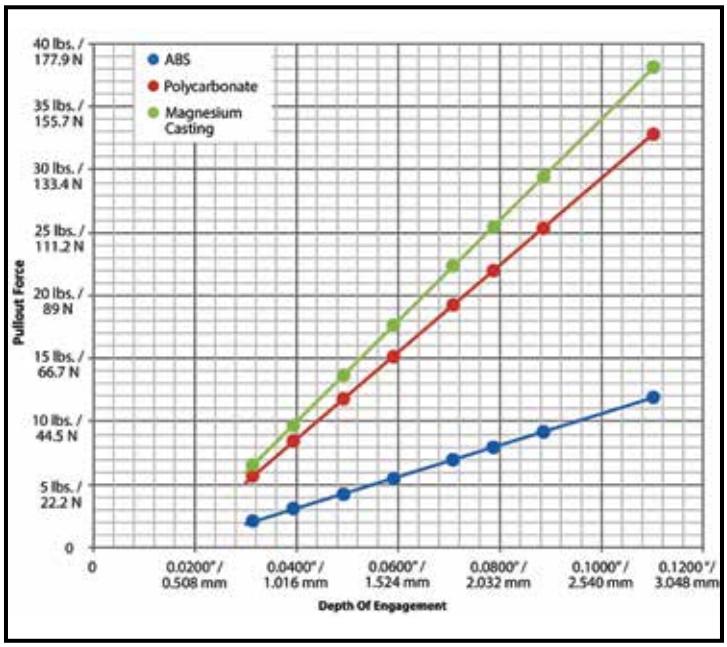
Type	5052-H34 Aluminum: Installation N	Installation lbs.	Pullout N	Pullout lbs.
TA-10-025	820	185	80	18
TA-10-050				
TA-10-075				

T4 FASTENERS

Type	300 Series Stainless Steel: Installation N	Installation lbs.	Pullout N	Pullout lbs.
T4-10-025	2020	455	200	45
T4-10-050				

TKA/TK4 PINS

Type	Test Base Panel Material	Depth Of Engagement (mm)	Depth Of Engagement (in.)	Installation (N)	Installation (lbs.)	Pullout (N)	Pullout (lbs.)
TKA-10	ABS	0.8	0.0315	133	30	9	2
		1	0.0394	133	30	14	3
		1.3	0.0492	133	30	19	4
		1.5	0.0590	178	40	24	6
		1.8	0.0708	178	40	31	7
		2	0.0787	222	50	35	8
		2.3	0.0886	222	50	41	9
		2.8	0.1102	245	55	53	12
TKA-10	Polycarbonate	0.8	0.0315	222	50	25	6
		1	0.0394	267	60	37	8
		1.3	0.0492	267	60	53	12
		1.5	0.0590	311	70	68	15
		1.8	0.0708	334	75	86	19
		2	0.0787	378	85	98	22
		2.3	0.0886	400	90	113	25
		2.8	0.1102	423	95	146	33
TK4-10	Magnesium Casting (AZ91D)	0.8	0.0315	445	100	29	7
		1	0.0394	489	110	43	10
		1.3	0.0492	534	120	61	14
		1.5	0.0590	578	130	78	18
		1.8	0.0708	623	140	99	22
		2	0.0787	667	150	113	25
		2.3	0.0886	712	160	131	29
		2.8	0.1102	801	180	169	38



TS4 FASTENERS

Part Number	Tested Top Sheet Thickness	5052-H34 Aluminum HRB 63 / HB 114: Installation (N)	Installation (lbs.)	Pullout (3) (N)	Pullout (3) (lbs.)	Torque to Remove (N•cm)	Torque to Remove (in. oz.)	304 Stainless Steel HRB 89 / HB 187: Installation (N)	Installation (lbs.)	Pullout (3) (N)	Pullout (3) (lbs.)	Torque to Remove (N•cm)	Torque to Remove (in. oz.)
TS4-10-025	0.254 mm / .01"	556	125	80	18	3.3	4.7	1423	320	125	28	4.6	6.5
TS4-10-050	0.533 mm / .021"												

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

(3) Pullout after initial installation.

PERFORMANCE DATA

MSOFS STANDOFFS

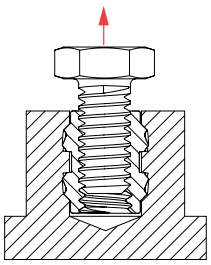
	Type	Thread Code	Max. Rec. Tightening Torque For Mating Screw (in. lbs.)	Test Sheet Material .008" 300 Series Stainless Steel		
				Installation (lbs.)	Pushout (lbs.)	Torque-out (in.lbs.)
UNIFIED	MSOFS	080	.65	1500	69.8	1.29
	MSOFS	256	1.3	1800	91.2	1.29

	Type	Thread Code	Max. Rec. Tightening Torque For Mating Screw (N·m)	Test Sheet Material 0.2 mm 300 Series Stainless Steel		
				Installation (kN)	Pushout (N)	Torque-out (N·m)
METRIC	MSOFS	M1	0.019	6.67	311	0.146
	MSOFS	M1.2	0.036	6.67	311	0.146
	MSOFS	M1.4	0.057	6.67	311	0.146
	MSOFS	M1.6	0.084	8	406	0.146
	MSOFS	M2	0.175	8	406	0.146

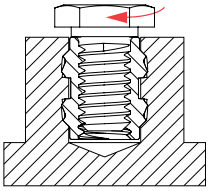
MSIA/MSIB INSERTS

	Type	Thread Code	Length Code	Test Sheet Material ABS		Polycarbonate	
				Pullout (N)	Torque-out (N·cm) [1]	Pullout (N)	Torque-out (N·cm) [1]
METRIC	MSIA/MSIB	M1	100	50	3.5	50	4.5
			250	150	10	200	12
	MSIA/MSIB	M1.2	100	50	3.5	50	4.5
			250	150	10	200	12
	MSIA/MSIB	M1.4	150	100	15	140	15
			300	330	30	400	30
	MSIA/MSIB	M1.6	150	100	15	140	15
			300	330	30	400	30
	MSIA/MSIB	M2	300	335	35	410	33
			400	470	40	595	35

For testing purposes, inserts were installed using heat stake equipment into a flat sheet.

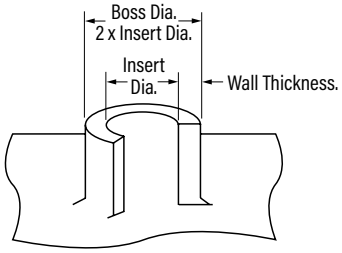


Pullout *is the force required to pull the insert from the sheet.*



Torque-out *is the torque required to turn the insert in the parent material after installation without inducing clamp load on the fastener.*

HOLE PREPARATION GUIDELINES



Thinner walls and bosses may be used but will affect performance.

SMTSO[2][3] FASTENERS

Type and Size	Test Sheet Material .062" Single Layer RF-4			
	Pushout (lbs.)	Pushout (N)	Torque-out (in. lbs.)	Torque-out (N·m)
SMTSO-080	85.1	378.7	4.94	0.56
SMTSO-M1				
SMTSO-M1.2				
SMTSO-M1.4				
SMTSO-M1.6				

SMTSO TESTING CONDITIONS

Oven	Quad ZCR convection oven with 4 zones
High Temp	518˚F / 270˚C
Board Finish	62% Sn, 38% Pb
Screen Printer	Ragin Manual Printer
Vias	None
Spokes	2 Spoke Pattern
Paste (lead-free)	Amtech NC559LF Sn96.5/3.0Ag/0.5Cu (SAC305)
Stencil	.0067" / 0.17mm thick

(1) Torque-out performance will depend on the strength and type of screw being used. In most cases, the screw threads will fail before the insert threads.
(2) 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.
(3) Further testing details can be found in our web site's literature section.

All PEM® products meet our stringent quality standards. If you require additional industry or other specific quality certifications, special procedures and/or part numbers are required. Please contact your local sales office or representative for further information.

Regulatory compliance information is available in Technical Support section of our website. Specifications subject to change without notice. See our website for the most current version of this bulletin.

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PEM®

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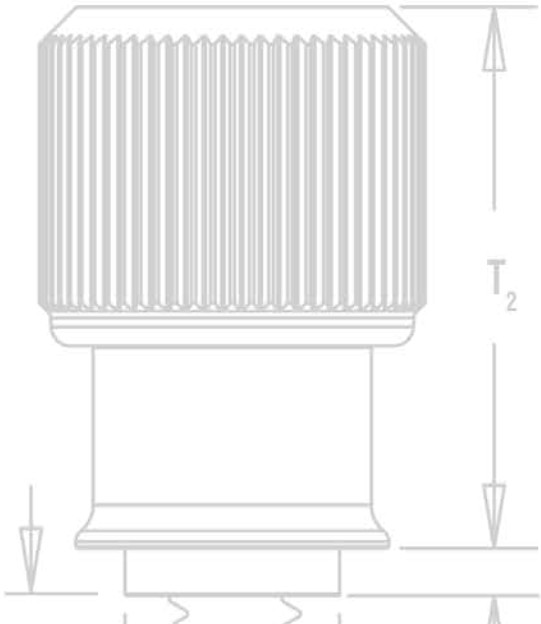
Visit our PEMNET™ Resource Center at www.pemnet.com ▪ Technical support e-mail: techsupport@pemnet.com

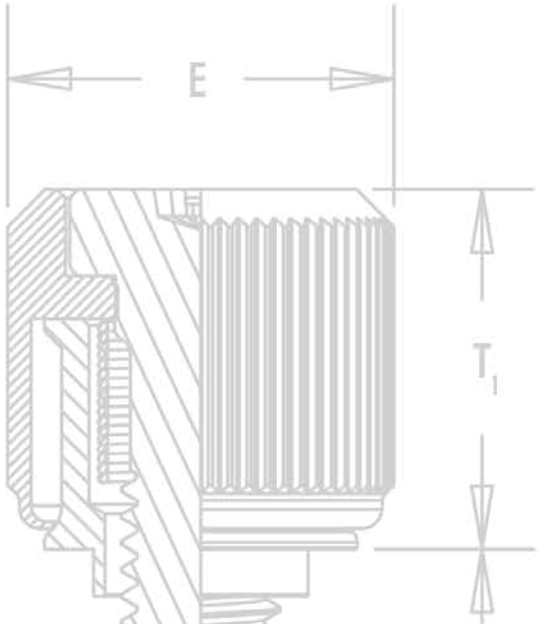
Bulletin PF-617
Rev 1217

PEM® access hardware for enclosures where the screw must remain with the door or panel.

PF™

PEM® CAPTIVE PANEL SCREWS



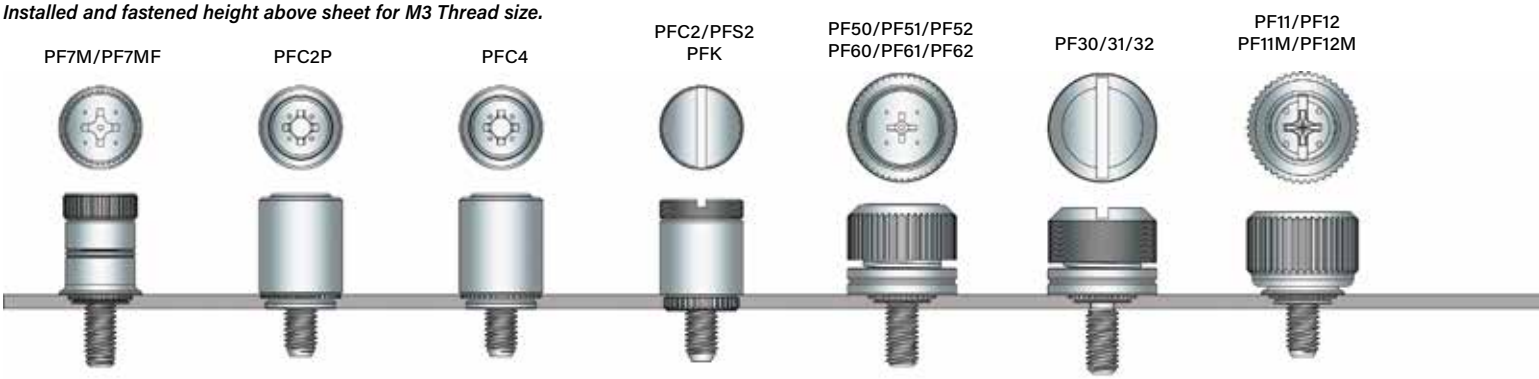


PEM® CAPTIVE PANEL SCREWS

PEM® brand captive panel screws are designed to help keep parts to a minimum and eliminate risks associated with loose hardware that could fall out and damage internal components. These panel fastener assemblies are ideal to attach metal panels or other thin material components in applications where subsequent access will be necessary.

HEIGHT COMPARISON GUIDE AND STANDARD DRIVER RECESS

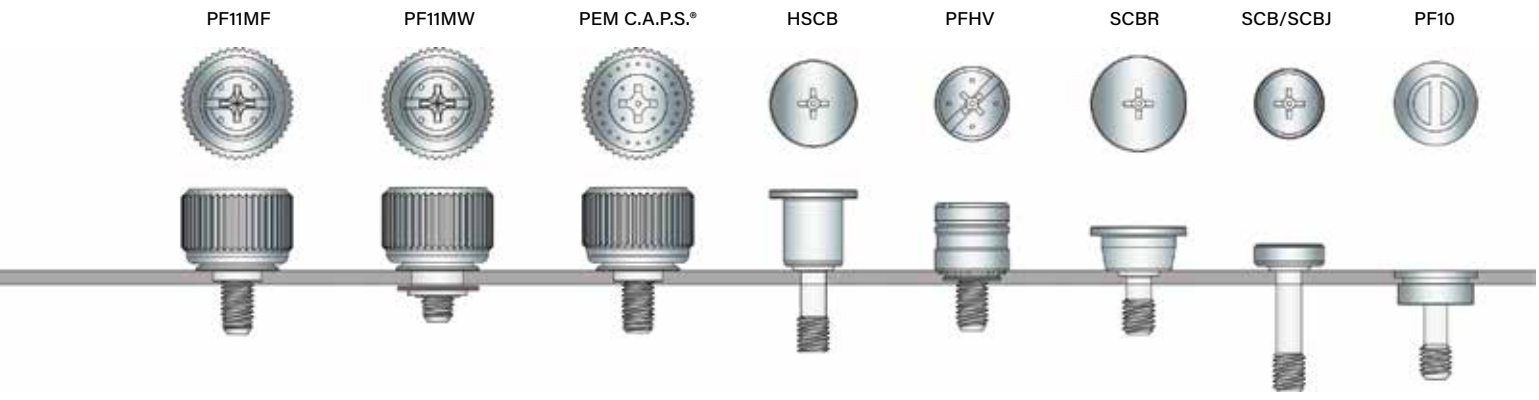
Installed and fastened height above sheet for M3 Thread size.



CAPTIVE PANEL SCREW SELECTOR GUIDE

PEM® Panel Fastener Type	Page No.	Application Requires:														
					Actuation		Installs into									
		UL Approved	High corrosion resistance	Spring loaded	Tool	Hand	Thinner sheets	Printed circuit boards	Stainless steel sheet	Painted panels and/or any hardness	Multiple screw lengths	Flush mounted top side	Available in black	Available in custom colors	Includes anti cross-threading feature	Mating hole misa-lignment
PF11	5			▪	▪	▪					▪		▪			
PF11M	5			▪	▪	▪					▪		▪		▪	
PF12	5			▪	▪						▪		▪			
PF12M	5			▪	▪						▪		▪		▪	
PF11MF	6			▪	▪	▪	▪		▪	▪	▪		▪		▪	
PF12MF	6			▪	▪		▪		▪	▪	▪		▪		▪	
PF11MW	7			▪	▪	▪	▪	▪	▪	▪	▪		▪		▪	▪
PF12MW	7			▪	▪		▪	▪	▪	▪	▪		▪		▪	▪
PEM C.A.P.S.	8			▪	▪	▪					▪		▪(1)	▪	▪	
PFHV	9				▪						▪		▪			
PF7M	10			▪	▪	▪					▪				▪	
PF7MF	11			▪	▪	▪	▪		▪	▪	▪				▪	
PF30 PF31 PF32	12			▪	▪	▪							▪			
PF50 PF51 PF52	13			▪	▪	▪					▪		▪			
PF60 PF61 PF62	13			▪	▪						▪		▪			
PFC4	14	▪		▪	▪				▪		▪					
PFC2P	15	▪		▪	▪						▪		▪			
PFC2	16		▪	▪	▪	▪					▪		▪			
PFS2	16			▪	▪	▪					▪		▪			
SCBR	18			▪	▪											
SCB/SCBJ	19				▪						▪					
HSCB	20-21			▪	▪											
PF10	22-23	▪	▪		▪							▪				
SMTPFLSM	24			▪	▪	▪		▪			▪				▪	
SMTPF	25				▪	▪		▪			▪		▪(1)	▪		
PFK	26		▪	▪	▪	▪		▪			▪		▪			

(1) Standard color is black.



PEM® PF11™/PF12™ CAPTIVE PANEL SCREWS

PEM® PF11/PF12 panel fasteners provide design flexibility by offering three styles of installation types, each having the same profile or look above the sheet or panel into which it is installed. The various mounting types include self-clinching, flare-mounted, and floating styles. Each offers a distinct advantage depending on your application. The standard selection of knobs include knurled or smooth metal caps and plastic PEM C.A.P.S.® (colored access panel screws).

Self-clinching Flare-mounted Floating

Key features include:

1) Universal Phillips/slot drive (except for plastic cap).
2) Shoulder on retainer to provide positive stop during installation.
3) Anti cross-threading feature (designated with an "M" in the part number). Eases assembly, aligns components, improves assembly line productivity, prevents jamming, and slides through clogged internal threads.

1

*Universal Phillips/ slot drive**

2

Shoulder on retainer

3 **ANTI CROSS-THREAD TECHNOLOGY - HOW IT WORKS**

PennEngineering is a licensee for MAThread® technology, a registered trademark of MAThread Inc.

-1-
MISALIGNED AXIS

-2-
THREADS CAM

-3-
THREADS DRIVE NORMALLY

** Plastic cap version has Phillips drive only.*

Standard Mounting Styles:

Self-clinching

- Installs flush on back side of panel.
- Available in three screw lengths.

Flare-mounted

- Appropriate for close centerline-to-edge applications.
- Doesn't require high installation force.
- Installs into any panel hardness.
- Installs flush on back side of panel.
- Can be installed into most any thin material.
- Appropriate for painted panels.

Flare-mounted, Floating

- Compensates for mating hole misalignment.
- Installs into any panel hardness.

Standard Cap Selection:

Metal Cap knurled
All metal cap available with knurls.

Metal Cap Un-knurled
All metal cap available without knurls.

Black Metal Cap
DuraBlack™ finish is scratch resistant. Finish is on both metal cap and screw. (finish code "BL")

Plastic Cap
Available with custom color plastic cap.
(See page 8 for colors)

Available Drive Configurations:

PF11

Phillips/slot
(Standard - except for plastic cap)

PF11P

Phillips
(Optional)

PF11LS

Torx®/Slot Combination
(Optional)

PF11S

Slotted
(Optional)

PF11L

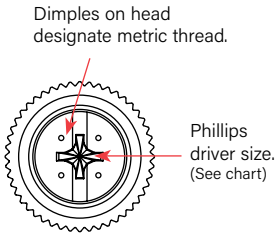
Torx®
(Optional)

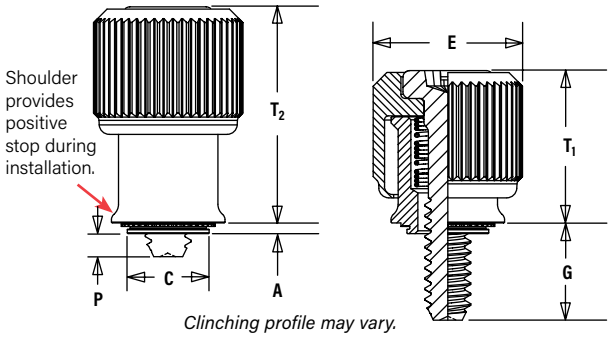
PennEngineering is a licensee for Acument Global Technologies (Torx®).

PEM® PF11™/PF12™/PF11M™/PF12M™ CAPTIVE PANEL SCREWS

PF11
Knurled Cap

PF12
Smooth Cap





Clinching profile may vary.

Float .010"/0.25mm minimum, in all directions from center, .020"/0.5mm total.

Installation Data page 28. Performance Data page 36.

Threads:
External, ASME B1.1, 2A / ASME B1.13M, 6g

Material:
Knob: Aluminum
Retainer: Hardened Carbon Steel
Screw (PF11/PF12): 400 Series Stainless Steel
Screw (PF11M/PF12M): Hardened Carbon Steel (1)
Spring: 300 Series Stainless Steel

Finish: Optional Finish (BL):
Knob: Natural Finish
Retainer: Bright nickel over copper flash per ASTM B689
Screw (PF11/PF12): Passivated and/or tested per ASTM A380
Screw: (PF11M/PF12M): Zinc plated, 5µm, colorless (3)
Spring: Natural Finish
Knob: Black anodize (2)
Screw: Black nitride, AMS2753, Section 3 (2)

For use in sheet hardness:
HRB 80 or less (Hardness Rockwell "B" Scale) / HB 150 or less (Hardness Brinell)

PART NUMBER DESIGNATION

PF11 M - 632 - 1 BL

- PF11: Type
- M: Optional Anti-cross thread feature
- 632: Thread Code
- 1: Screw Length Code
- BL: Optional DuraBlack finish

All dimensions are in inches.

	Thread Size	Type: Knurled Cap	Type: Smooth Cap	Thread Code	Screw Length Code	A Max.	Min. Sheet Thickness	Hole Size In Sheet + .003 - .000	C Max.	E ± .010	G ± .025	P ± .025	T_1 Nom.	T_2 Nom.	Driver Size	Min. Dist. Hole ℄ To Edge
UNIFIED	.112-40 (#4-40)	PF11 PF11M	PF12 PF12M	440	0	.036	.036	.219	.218	.417	.170	.000	.310	.450	#1	.28
					1						.230	.060				
					2						.290	.120				
	.138-32 (#6-32)	PF11 PF11M	PF12 PF12M	632	0	.036	.036	.250	.249	.450	.230	.000	.450	.640	#2	.29
					1						.290	.060				
					2						.350	.120				
	.164-32 (#8-32)	PF11 PF11M	PF12 PF12M	832	0	.036	.036	.312	.311	.514	.230	.000	.450	.640	#2	.33
					1						.290	.060				
					2						.350	.120				
	.190-32 (#10-32)	PF11 PF11M	PF12 PF12M	032	0	.036	.036	.312	.311	.514	.230	.000	.450	.640	#2	.33
					1						.290	.060				
					2						.350	.120				
	.250-20 (1/4-20)	PF11 PF11M	PF12 PF12M	0420	0	.036	.036	.375	.374	.575	.290	.000	.530	.790	#3	.46
					1						.350	.060				
					2						.410	.120				

All dimensions are in millimeters.

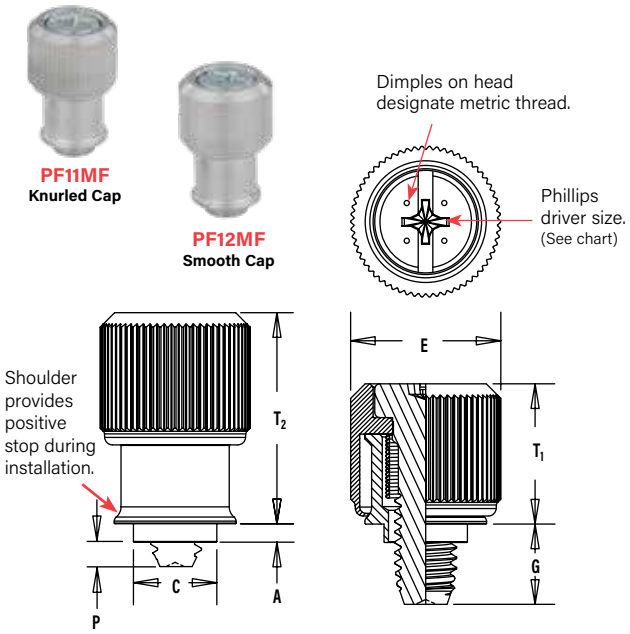
	Thread Size x Pitch	Type: Knurled Cap	Type: Smooth Cap	Thread Code	Screw Length Code	A Max.	Min. Sheet Thickness	Hole Size In Sheet + 0.08	C Max.	E ± 0.25	G ± 0.64	P ± 0.64	T_1 Nom.	T_2 Nom.	Driver Size	Min. Dist. Hole ℄ To Edge
METRIC	M3 x 0.5	PF11 PF11M	PF12 PF12M	M3	0	0.92	0.92	5.56	5.54	10.59	4.32	0	7.87	11.43	#1	7.11
					1						5.84	1.52				
					2						7.37	3.05				
	M3.5 x 0.6	PF11 PF11M	PF12 PF12M	M3.5	0	0.92	0.92	6.35	6.33	11.43	5.84	0	11.43	16.26	#2	7.37
					1						7.37	1.52				
					2						8.89	3.05				
	M4 x 0.7	PF11 PF11M	PF12 PF12M	M4	0	0.92	0.92	7.92	7.9	13.06	5.84	0	11.43	16.26	#2	8.38
					1						7.37	1.52				
					2						8.89	3.05				
	M5 x 0.8	PF11 PF11M	PF12 PF12M	M5	0	0.92	0.92	7.92	7.9	13.06	5.84	0	11.43	16.26	#2	8.38
					1						7.37	1.52				
					2						8.89	3.05				
	M6 x 1	PF11 PF11M	PF12 PF12M	M6	0	0.92	0.92	9.53	9.5	14.61	7.37	0	13.46	20.07	#3	11.68
					1						8.89	1.52				
					2						10.41	3.05				

(1) As with all Class 2A/6g external threads with an additive finish, the maximum major and pitch, after plating, may equal basic sizes and be gauged to Class 3A/4h, per ANSI B1.1, Section 8, Table 3A and ANSI B1.13M, Section 8, Paragraph 8.2.

(2) "BL" suffix will be added to part number to designate DuraBlack™ finish.

(3) See PEM Technical Support section of our website (www.pemnet.com) for related plating standards and specifications.

PEM® PF11MF™ FLARE-MOUNTED CAPTIVE PANEL SCREWS



Float .010"/0.25mm minimum, in all directions from center, .020"/0.5mm total.

Installation Data page 28. Performance Data page 36.

Threads:
External, ASME B1.1, 2A / ASME B1.13M, 6g (1)

Material:
Knob: Aluminum
Retainer: Aluminum
Screw: Hardened Carbon Steel
Spring: 300 Series Stainless Steel

Finish:
Knob: Natural Finish
Retainer: Natural Finish
Screw: Zinc plated, 5µm, colorless (3)
Spring: Natural Finish

Optional Finish (BL):
Knob: Black anodize (2)
Screw: Black nitride AMS2753, Section 3 (2)

PART NUMBER DESIGNATION

PF11 PF12	M M	F	-	632	- 1	BL
Type	Anti-cross Thread Feature	Flare-mounted Style		Thread Code	Screw Length Code	Optional DuraBlack finish

All dimensions are in inches.

	Thread Size	Type: Knurled Cap	Type: Smooth Cap	Thread Code	Screw Length Code	A Max.	Min. Sheet Thickness	Hole Size In Sheet + .005 - .000	C Max.	E ± .010	G ± .025	P ± .025	T_1 Nom.	T_2 Nom.	Driver Size
UNIFIED	.112-40 (#4-40)	PF11MF	PF12MF	440	0	.041	.031	.187	.186	.417	.170	.000	.310	.450	#1
					1						.230	.055			
					2						.290	.115			
	.138-32 (#6-32)	PF11MF	PF12MF	632	0	.072	.060	.213	.212	.450	.230	.000	.450	.640	#2
					1						.290	.024			
					2						.350	.084			
	.164-32 (#8-32)	PF11MF	PF12MF	832	0	.072	.060	.266	.265	.514	.230	.000	.450	.640	#2
					1						.290	.024			
					2						.350	.084			
	.190-32 (#10-32)	PF11MF	PF12MF	032	0	.072	.060	.266	.265	.514	.230	.000	.450	.640	#2
					1						.290	.024			
					2						.350	.084			
	.250-20 (1/4-20)	PF11MF	PF12MF	0420	0	.072	.060	.323	.322	.575	.290	.000	.530	.790	#3
					1						.350	.024			
					2						.410	.084			

All dimensions are in millimeters.

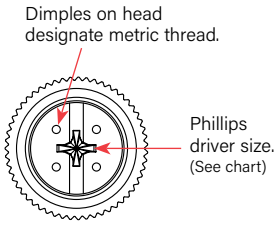
	Thread Size x Pitch	Type: Knurled Cap	Type: Smooth Cap	Thread Code	Screw Length Code	A Max.	Min. Sheet Thickness	Hole Size In Sheet + 0.1	C Max.	E ± 0.25	G ± 0.64	P ± 0.64	T_1 Nom.	T_2 Nom.	Driver Size
METRIC	M3 x 0.5	PF11MF	PF12MF	M3	0	1.05	0.79	4.75	4.73	10.59	4.32	0	7.87	11.43	#1
					1						5.84	1.4			
					2						7.37	2.92			
	M4 x 0.7	PF11MF	PF12MF	M4	0	1.83	1.52	6.76	6.74	13.06	5.84	0	11.43	16.26	#2
					1						7.37	0.61			
					2						8.89	2.13			
	M5 x 0.8	PF11MF	PF12MF	M5	0	1.83	1.52	6.76	6.74	13.06	5.84	0	11.43	16.26	#2
					1						7.37	0.61			
					2						8.89	2.13			
	M6 x 1	PF11MF	PF12MF	M6	0	1.83	1.52	8.2	8.18	14.61	7.37	0	13.46	20.07	#3
					1						8.89	0.61			
					2						10.41	2.13			

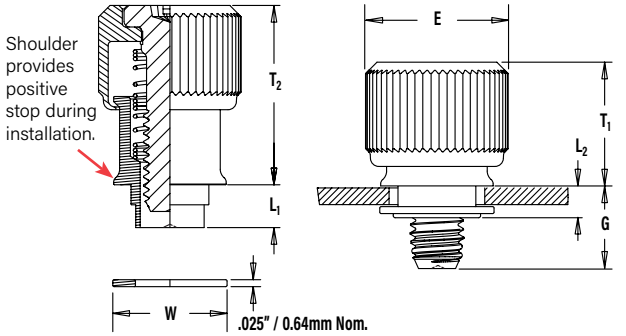
(1) As with all Class 2A/6g external threads with an additive finish, the maximum major and pitch, after plating, may equal basic sizes and be gauged to Class 3A/4h, per ANSI B1.1, Section 8, Table 3A and ANSI B1.13M, Section 8, Paragraph 8.2.

(2) "BL" suffix will be added to part number to designate DuraBlack™ finish.

(3) See PEM Technical Support section of our website (www.pemnet.com) for related plating standards and specifications.

PEM® PF11MW™ FLARE-MOUNTED, FLOATING CAPTIVE PANEL SCREW





Installation Data page 29. Performance Data page 36.

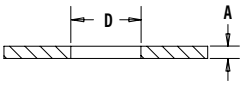
Threads:
External, ASME B1.1, 2A / ASME B1.13M, 6g (1)

Material:
Knob: Aluminum
Retainer: Aluminum
Screw: Hardened Carbon Steel
Spring: 300 Series Stainless Steel
Washer: 300 Series Stainless Steel

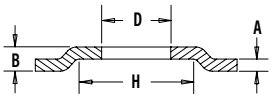
Finish:
Knob: Natural Finish
Retainer: Natural Finish
Screw: Zinc plated, 5µm, colorless (3)
Spring: Natural Finish
Washer: Natural Finish

Optional Finish (BL):
Knob: Black anodize (2)
Screw: Black nitride, AMS2753, Section 3 (2)

PANEL CONFIGURATION 1
For applications where a space between mating panels is acceptable.



PANEL CONFIGURATION 2
For applications where a space between mating panels is not acceptable.



PART NUMBER DESIGNATION

PF11 / PF12	M / M	W - 632 - 1	W - 632 - 1	1 / 1	BL
Type	Anti-cross Thread Feature	Floating style	Thread Code	Shank Code (4)	Screw Length Code (4)	Optional DuraBlack finish

PF11MW panel fasteners are shipped with mating washers.

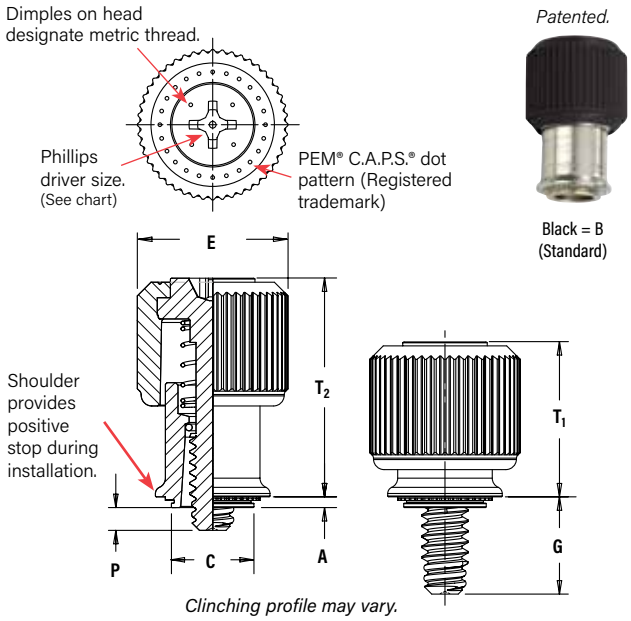
All dimensions are in inches.

	Thread Size	Type: Knurled Cap	Type: Smooth Cap	Thread Code	Shank Code (4)	Screw Length Code (4)	A Max. Sheet Thickness	B Min.	D Hole Size In Sheet +.003 -.001	E ±.010	G Nom.	H Min.	L_1 Nom.	L_2 Max.	T_1 Nom.	T_2 Nom.	Driver Size	Min. Total Float	W Nom.
UNIFIED	.112-40 (#4-40)	PF11MW	PF12MW	440	1	1	.063	.111	.250	.417	.230	.375	.137	.127	.310	.450	#1	.073	.312
						2					.290								
	.138-32 (#6-32)	PF11MW	PF12MW	632	1	1	.063	.115	.283	.450	.290	.413	.149	.127	.450	.640	#2	.076	.344
						2					.350								
	.164-32 (#8-32)	PF11MW	PF12MW	832	1	1	.063	.121	.346	.514	.290	.469	.157	.140	.450	.640	#2	.076	.407
						2					.350								
	.190-32 (#10-32)	PF11MW	PF12MW	032	1	1	.063	.121	.346	.514	.290	.469	.157	.140	.450	.640	#2	.076	.407
						2					.350								
	.250-20 (1/4-20)	PF11MW	PF12MW	0420	1	1	.063	.128	.413	.575	.350	.531	.157	.140	.530	.790	#3	.081	.468
						2					.410								

All dimensions are in millimeters.

	Thread Size x Pitch	Type: Knurled Cap	Type: Smooth Cap	Thread Code	Shank Code (4)	Screw Length Code (4)	A Max. Sheet Thickness	B Min.	D Hole Size In Sheet +0.08 -0.03	E ±0.25	G Nom.	H Min.	L_1 Nom.	L_2 Max.	T_1 Nom.	T_2 Nom.	Driver Size Float	Min. Total	W Nom.
METRIC	M3 x 0.5	PF11MW	PF12MW	M3	1	1	1.6	2.82	6.35	10.59	5.84	9.52	3.48	3.23	7.87	11.43	#1	1.85	7.92
						2					7.37								
	M3.5 x 0.6	PF11MW	PF12MW	M3.5	1	1	1.6	2.92	7.19	11.43	7.37	10.49	3.78	3.23	11.43	16.26	#2	1.93	8.74
						2					8.89								
	M4 x 0.7	PF11MW	PF12MW	M4	1	1	1.6	3.07	8.79	13.06	7.37	11.91	3.99	3.56	11.43	16.26	#2	1.93	10.34
						2					8.89								
	M5 x 0.8	PF11MW	PF12MW	M5	1	1	1.6	3.07	8.79	13.06	7.37	11.91	3.99	3.56	11.43	16.26	#2	1.93	10.34
						2					8.89								
	M6 x 1	PF11MW	PF12MW	M6	1	1	1.6	3.25	10.49	14.61	8.89	13.48	3.99	3.56	13.46	20.07	#3	2.06	11.89
						2					10.41								

(1) *As with all Class 2A/6g external threads with an additive finish, the maximum major and pitch, after plating, may equal basic sizes and be gauged to Class 3A/4h, per ANSI B1.1, Section 8, Table 3A and ANSI B1.13M, Section 8, Paragraph 8.2.*
(2) *"BL" suffix will be added to part number to designate DuraBlack™ finish.*
(3) *See PEM Technical Support section of our website (www.pemnet.com) for related plating standards and specifications.*
(4) *Other shank and screw lengths available.*



Float .010"/0.25mm minimum, in all directions from center, .020"/0.5mm total.

Installation Data page 28. Performance Data page 37.

Color Capabilities (1)

Choose a knob color code and add it to the end of the base part number.

Threads:
External, ASME B1.1, 2A / ASME B1.13M, 6g (2)

Material:
Knob: PC/ABS (UL 94V-0, halogen-free) (3)
Retainer: Hardened Carbon Steel
Screw: Hardened Carbon Steel
Spring: 300 Series Stainless Steel

Finish:
Retainer: CN - Bright nickel over copper flash per ASTM B689
Screw: Zinc plated, 5µm, colorless (4)
Spring: Natural Finish

For use in sheet hardness:
HRB 80 or less (Hardness Rockwell "B" Scale)
HB 150 or less (Hardness Brinell)

PART NUMBER DESIGNATION

PF11	P	M	- 632 -	0	B
Type	Phillips Drive	Anti-cross Thread Feature	Thread Code	Screw Length Code	Color Code (Standard Black)

Also available with flare-mounted retainer as PF11PMF or with floating style retainer as PF11PMW.

All dimensions are in inches.

	Thread Size	Type / Knurled Cap	Thread Code	Screw Length Code	A (Shank) Max.	Min. Sheet Thickness	Hole Size In Sheet +.003 -.000	C Max.	E ±.010	G ±.025	P ±.025	T_1 Nom.	T_2 Nom.	Driver Size	Min. Dist. Hole ℄ To Edge
UNIFIED	.112-40 (#4-40)	PF11PM	440	0	.036	.036	.219	.218	.417	.170	.000	.310	.450	#2	.28
				1						.230	.060				
				2						.290	.120				
	.138-32 (#6-32)	PF11PM	632	0	.036	.036	.250	.249	.450	.230	.000	.450	.640	#2	.29
				1						.290	.060				
				2						.350	.120				
	.164-32 (#8-32)	PF11PM	832	0	.036	.036	.312	.311	.514	.230	.000	.450	.640	#2	.33
				1						.290	.060				
				2						.350	.120				
	.190-32 (#10-32)	PF11PM	032	0	.036	.036	.312	.311	.514	.230	.000	.450	.640	#2	.33
				1						.290	.060				
				2						.350	.120				

All dimensions are in millimeters.

	Thread Size x Pitch	Type / Knurled Cap	Thread Code	Screw Length Code	A (Shank) Max.	Min. Sheet Thickness	Hole Size In Sheet + 0.08	C Max.	E ± 0.25	G ± 0.64	P ± 0.64	T_1 Nom.	T_2 Nom.	Driver Size	Min. Dist. Hole ℄ To Edge
METRIC	M3 x 0.5	PF11PM	M3	0	0.92	0.92	5.56	5.54	10.59	4.32	0	7.87	11.43	#2	7.11
				1						5.84	1.52				
				2						7.37	3.05				
	M4 x 0.7	PF11PM	M4	0	0.92	0.92	7.92	7.9	13.06	5.84	0	11.43	16.26	#2	8.38
				1						7.37	1.52				
				2						8.89	3.05				
	M5 x 0.8	PF11PM	M5	0	0.92	0.92	7.92	7.9	13.06	5.84	0	11.43	16.26	#2	8.38
				1						7.37	1.52				
				2						8.89	3.05				

(1) The colors shown (except for black) are non-stocked standards and available on special order. Since actual color knob may vary slightly from those represented, we recommend that you request samples for color verification. If you require a custom color or you need a "color matched" knob, please contact us.

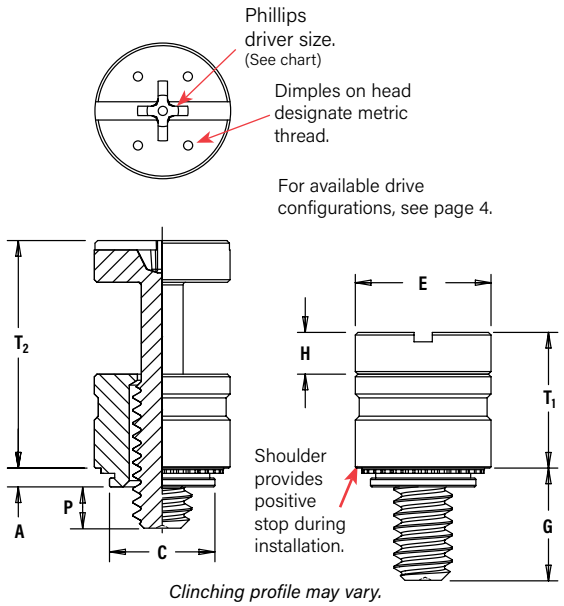
(2) As with all Class 2A/6g external threads with an additive finish, the maximum major and pitch, after plating, may equal basic sizes and be gauged to Class 3A/4h, per ANSI B1.1, Section 8, Table 3A and ANSI B1.13M, Section 8, Paragraph 8.2.

(3) Temperature limit is 210˚ F / 99˚ C.

(4) See PEM Technical Support section of our website (www.pemnet.com) for related plating standards and specifications.

PEM® PFHV™ CAPTIVE PANEL SCREWS

- Low cost captive screw design to replace loose hardware.
- Small, compact and low profile design for limited access areas.
- Two screw lengths.
- Universal slot/Phillips recess standard.
- Available with MAThread® anti cross-thread technology. (See page 4 for more information).
- Available with Torx® recess.



Clinching profile may vary.

Installation Data page 29. Performance Data page 37.

Threads:
External, ASME B1.1, 2A / ASME B1.13M, 6g (1)

Material:
Retainer: Carbon Steel
Screw: Hardened Carbon Steel

Finish:
Retainer: CN - Bright nickel over copper flash per ASTM B689
Screw: CN - Bright nickel over copper flash per ASTM B689 (1)

For use in sheet hardness:
HRB 60 or less (Hardness Rockwell "B" Scale)
HB 107 or less (Hardness Brinell)

PART NUMBER DESIGNATION

PFHV - 632 - 0 CN

- PFHV: Type
- 632: Thread Size Code
- 0: Screw Length Code
- CN: Finish Code

All dimensions are in inches.

	Thread Size	Type	Thread Code	Screw Length Code	A (Shank) Max.	Min. Sheet Thickness	Hole Size In Sheet + .003 - .000	C Max.	E ± .010	G ± .025	H ± .005	P ±.025	T_1 Nom.	T_2 Nom.	Driver Size	Min. Dist. Hole ℄ To Edge
UNIFIED	.112-40 (#4-40)	PFHV	440	0	.036	.036	.203	.202	.260	.216	.080	.000	.260	.436	#1	.21
				1						.316		.095				
	.138-32 (#6-32)	PFHV	632	0	.036	.036	.219	.218	.276	.234	.092	.000	.290	.484	#2	.23
				1						.359		.120				
	.164-32 (#8-32)	PFHV	832	0	.036	.036	.252	.251	.309	.259	.111	.000	.335	.555	#2	.26
				1						.371		.106				

All dimensions are in millimeters.

	Thread Size x Pitch	Type	Thread Code	Screw Length Code	A (Shank) Max.	Min. Sheet Thickness	Hole Size In Sheet + 0.08	C Max.	E ± 0.25	G ± 0.64	H ± 0.13	P ±0.64	T_1 Nom.	T_2 Nom.	Driver Size	Min. Dist. Hole ℄ To Edge
METRIC	M3 x 0.5	PFHV	M3	0	0.92	0.92	5.5	5.49	6.95	5.55	2.03	0	6.69	11.25	#1	5.8
				1						7.56		1.9				
	M3.5 x 0.6	PFHV	M3.5	0	0.92	0.92	6	5.98	7.45	6.01	2.34	0	7.45	12.47	#2	6.3
				1						8.42		2.3				
	M4 x 0.7	PFHV	M4	0	0.92	0.92	6.4	6.38	7.85	6.59	2.79	0	8.5	14.1	#2	6.7
				1						9.39		2.7				

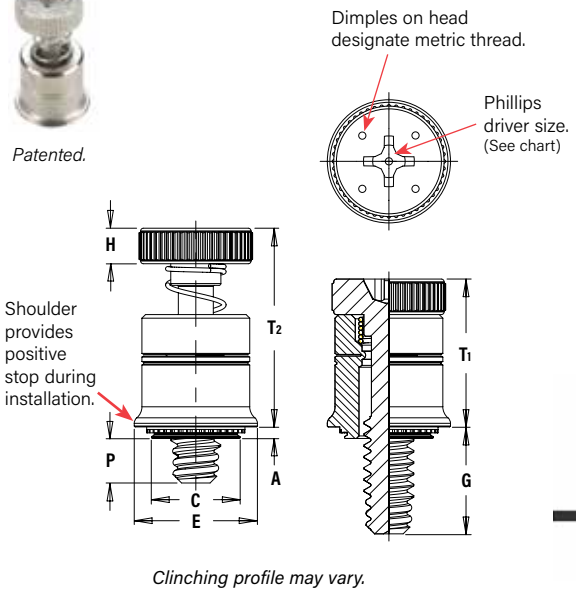
(1) As with all Class 2A/6g external threads with an additive finish, the maximum major and pitch, after plating, may equal basic sizes and be gauged to Class 3A/4h, per ANSI B1.1, Section 8, Table 3A and ANSI B1.13M, Section 8, Paragraph 8.2.

- Smallest footprint, spring-loaded panel fastener for limited access areas.
- MAThread® anti cross-thread technology. (See page 4 for more information).
- Installs flush on back side of panel.
- PF7M Self-clinching mounting design provides high pushout resistance.
- PF7M does not require special hole preparation.
- PF7MF is appropriate for close centerline-to-edge applications.
- PF7MF does not require high installation force.
- PF7MF installs into any panel hardness.
- Available with Torx® recess.

PF7M PF7MF

PF7M™ SELF-CLINCHING CAPTIVE PANEL SCREWS

Patented.



Clinching profile may vary.

Installation Data page 30. Performance Data page 37.

Threads:	External, ASME B1.1, 2A / ASME B1.13M, 6g [1]
Material:	Retainer: Carbon Steel Screw: Hardened Carbon Steel Spring: 300 Series Stainless Steel
Finish:	Retainer: CN - Bright nickel over copper flash per ASTM B689 Screw: CN - Bright nickel over copper flash per ASTM B689 Spring: Natural Finish
For use in sheet hardness:	HRB 60 or less (Hardness Rockwell "B" Scale) HB 107 or less (Hardness Brinell)

PART NUMBER DESIGNATION

PF7	M	-	632	-	0	CN
Type	Anti Cross-thread Feature		Thread Size Code		Length Code	Finish

All dimensions are in inches.

	Thread Size	Type / Fastener Material / Steel	Thread Code	Screw Length Code	A (Shank) Max.	Min. Sheet Thickness	Hole Size In Sheet +.003 -.000	C Max.	E ±.010	H ±.010	G ±.025	P ±.025	T1 Nom.	T2 Nom.	Driver Size	Min. Dist. Hole ℄ To Edge
UNIFIED	.112-40 (#4-40)	PF7M	440	0	.036	.036	.219	.218	.310	.100	.210	.000	.380	.550	#2	.28
				1							.270	.065				
	.138-32 (#6-32)	PF7M	632	0	.036	.036	.250	.249	.342	.100	.240	.000	.410	.610	#2	.29
				1							.300	.065				
	.164-32 (#8-32)	PF7M	832	0	.036	.036	.312	.311	.405	.120	.240	.000	.430	.630	#2	.33
				1							.300	.065				

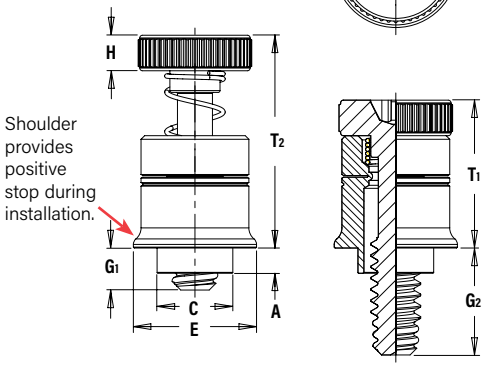
All dimensions are in millimeters.

	Thread Size x Pitch	Type / Fastener Material / Steel	Thread Code	Screw Length Code	A (Shank) Max.	Min. Sheet Thickness	Hole Size In Sheet +0.08	C Max.	E ±0.25	H ±0.25	G ±0.64	P ±0.64	T1 Nom.	T2 Nom.	Driver Size	Min. Dist. Hole ℄ To Edge
METRIC	M3 x 0.5	PF7M	M3	0	0.92	0.92	5.56	5.54	7.87	2.5	5.33	0	9.65	13.97	#2	7.11
				1							6.86	1.65				
	M4 x 0.7	PF7M	M4	0	0.92	0.92	7.92	7.9	10.29	3	6.1	0	10.92	16	#2	8.38
				1							7.62	1.65				

(1) As with all Class 2A/6g external threads with an additive finish, the maximum major and pitch, after plating, may equal basic sizes and be gauged to Class 3A/4h, per ANSI B1.1, Section 8, Table 3A and ANSI B1.13M, Section 8, Paragraph 8.2.

PF7MF™ FLARE-MOUNTED CAPTIVE PANEL SCREWS

Patented.



Threads:
External, ASME B1.1, 2A / ASME B1.13M, 6g (1)

Material:
Retainer: Aluminum
Screw: Hardened Carbon Steel
Spring: 300 Series Stainless Steel
Spring: Natural Finish

Finish:
Retainer: Natural finish
Screw: CN - Bright nickel over copper flash per ASTM B689

PART NUMBER DESIGNATION

PF7	M	F	-	632	-	0
Type	Anti Cross-thread Feature	Flaring		Thread Size Code		Length Code

Installation Data page 30. Performance Data page 37.

All dimensions are in inches.

	Thread Size	Type Fastener Material Steel	Thread Code	Screw Length Code	A (Shank) Max.	Min. Sheet Thickness	Hole Size In Sheet +.005 -.000	C Max.	E ±.010	H ±.010	G1 ±.025	G2 ±.025	T1 Nom.	T2 Nom.	Driver Size
UNIFIED	.112-40 (#4-40)	PF7MF	440	0	.041	.031	.187	.186	.310	.100	.040	.210	.380	.550	#2
				1							.100	.270			
	.138-32 (#6-32)	PF7MF	632	0	.072	.060	.213	.212	.342	.100	.040	.240	.410	.610	#2
				1							.100	.300			
	.164-32 (#8-32)	PF7MF	832	0	.072	.060	.266	.265	.405	.120	.040	.240	.430	.630	#2
				1							.100	.300			

All dimensions are in millimeters.

	Thread Size x Pitch	Type Fastener Material Steel	Thread Code	Screw Length Code	A (Shank) Max.	Min. Sheet Thickness	Hole Size In Sheet +0.13	C Max.	E ±0.25	H ±0.25	G1 ±0.64	G2 ±0.64	T1 Nom.	T2 Nom.	Driver Size
METRIC	M3 x 0.5	PF7MF	M3	0	1.05	0.79	4.75	4.73	7.87	2.5	1.02	5.33	9.65	13.97	#2
				1							2.54	6.86			
	M4 x 0.7	PF7MF	M4	0	1.83	1.52	6.76	6.74	10.29	3	1.02	6.1	10.92	16	#2
				1							2.54	7.62			

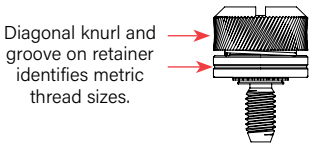
(1) As with all Class 2A/6g external threads with an additive finish, the maximum major and pitch, after plating, may equal basic sizes and be gauged to Class 3A/4h, per ANSI B1.1, Section 8, Table 3A and ANSI B1.13M, Section 8, Paragraph 8.2.

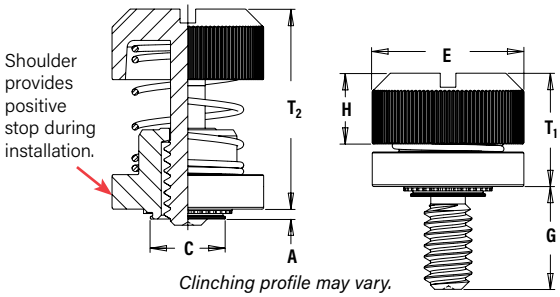
- Low-profile design satisfies many functional and cosmetic requirements.
- Convenient large head for tool or finger operation.
- PF50/PF60 are available with Torx® recess.
- PF50/PF60 are available with MAThread® anti cross-thread technology. (See page 4 for more information).

PF30 Knurled Cap | **PF50** Knurled Cap | **PF60** Smooth Cap

PF30™ LOW-PROFILE CAPTIVE PANEL SCREWS

Available with DuraBlack™ finish (Finish Code "BN")





Installation Data page 31. Performance Data page 38.

Threads:
External, ASME B1.1, 2A / ASME B1.13M, 6g (1)

Material:
Retainer: Carbon Steel
Screw: Hardened Carbon Steel (#4-40 and M3 sizes only)
Carbon Steel (all other sizes)
Spring: 300 Series Stainless Steel

Finish:
Retainer: CN - Bright nickel over copper flash per ASTM B689
Screw: CN - Bright nickel over copper flash per ASTM B689
Spring: Natural Finish

Optional Finish:
Retainer: BN - Black nitride, AMS2753, Section 3
Screw: BN - Black nitride, AMS2753, Section 3

For use in sheet hardness:
HRB 60 or less (Hardness Rockwell "B" Scale)
HB 107 or less (Hardness Brinell)

PART NUMBER DESIGNATION

PF30	-	832	-	30	CN
Type and Shank Code		Thread Size Code		Screw Length Code	Finish Code

All dimensions are in inches.

	Thread Size	Type	Thread Code	Screw Length Code	A (Shank) Max.	Min. Sheet Thickness	Hole Size In Sheet + .003 - .000	C Max.	E ±.010	G ± .015	H ± .005	T_1 Max.	T_2 Nom.	Min. Dist. Hole ℄ To Edge
UNIFIED	.112-40 (#4-40)	PF30	440	30	.030	.030	.203	.202	.406	.300	.202	.325	.595	.26
		PF31			.038	.040								
		PF32			.058	.060								
	.138-32 (#6-32)	PF30	632	30	.030	.030	.219	.218	.438	.300	.202	.325	.595	.28
		PF31			.038	.040								
		PF32			.058	.060								
	.164-32 (#8-32)	PF30	832	30	.030	.030	.250	.249	.468	.300	.207	.330	.600	.29
		PF31			.038	.040								
		PF32			.058	.060								
	.190-32 (#10-32)	PF30	032	30	.030	.030	.312	.311	.530	.300	.220	.335	.605	.33
		PF31			.038	.040								
		PF32			.058	.060								
	.250-20 (1/4-20)	PF32	0420	35	.058	.060	.375	.374	.625	.350	.242	.385	.675	.38

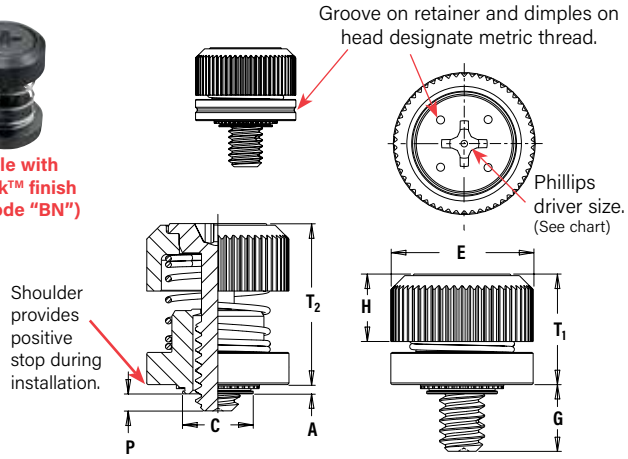
All dimensions are in millimeters.

	Thread Size x Pitch	Type	Thread Code	Screw Length Code	A (Shank) Max.	Min. Sheet Thickness	Hole Size In Sheet + 0.08	C Max.	E ±0.25	G ± 0.4	H ± 0.13	T_1 Max.	T_2 Nom.	Min. Dist. Hole ℄ To Edge
METRIC	M3 x 0.5	PF31	M3	30	0.97	1	5.5	5.48	10.31	7.62	5.13	8.26	15.11	6.6
		PF32			1.48	1.5								
	M4 x 0.7	PF31	M4	30	0.97	1	6.4	6.38	11.89	7.62	5.26	8.38	15.24	7.37
		PF32			1.48	1.5								
	M5 x 0.8	PF31	M5	30	0.97	1	8	7.98	13.46	7.62	5.59	8.51	15.37	8.38
		PF32			1.48	1.5								
	M6 x 1	PF32	M6	35	1.48	1.5	9.5	9.48	15.88	8.89	6.12	9.78	17.15	9.65

(1) As with all Class 2A/6g external threads with an additive finish, the maximum major and pitch, after plating, may equal basic sizes and be gauged to Class 3A/4h, per ANSI B1.1, Section 8, Table 3A and ANSI B1.13M, Section 8, Paragraph 8.2.

PF50™ AND PF60™ LOW-PROFILE CAPTIVE PANEL SCREWS

Available with DuraBlack™ finish (Finish Code "BN")



Clinching profile may vary.

Installation Data page 31. Performance Data page 39.

Threads:
External, ASME B1.1, 2A / ASME B1.13M, 6g (1)

Material:
Knob: Carbon Steel — Retainer: Carbon Steel
Screw: Carbon Steel — Spring: 300 Series Stainless Steel

Finish:
Knob: CN - Bright nickel over copper flash per ASTM B689
Retainer: CN - Bright nickel over copper flash per ASTM B689
Screw: CN - Bright nickel over copper flash per ASTM B689
Spring: Natural Finish

Optional Finish:
Knob: BN - Black Nitride, AMS2753, Section 3
Retainer: BN - Black Nitride, AMS2753, Section 3
Screw: BN - Black Nitride, AMS2753, Section 3

For use in sheet hardness:
HRB 60 or less (Hardness Rockwell "B" Scale)
HB 107 or less (Hardness Brinell)

PART NUMBER DESIGNATION

PF50	-	440	-	1		CN	
PF60	-	440	-	1		CN	
↓		↓		↓		↓	
Type and Shank Code		Thread Size Code		Screw Length Code		Finish Code	

All dimensions are in inches.

	Thread Size	Type: Knurled Cap	Type: Smooth Cap	Thread Code	Screw Length Code	A (Shank) Max.	Min. Sheet Thickness	Hole Size In Sheet +.003 -.000	C Max.	E +.015 -.005	G ±.025	H ±.008	P ±.025	T_1 Max.	T_2 Nom.	Driver Size	Min. Dist Hole ℄ To Edge
UNIFIED	.112-40 (#4-40)	PF50	PF60	440	0	.030	.030	.203	.202	.406	.230	.207	.000	.340	.520	#1	.26
					1						.290		.060				
		PF51	PF61	440	0	.038	.040	.203	.202	.406	.230	.207	.000	.340	.520	#1	.26
					1						.290		.052				
		PF52	PF62	440	0	.058	.060	.203	.202	.406	.230	.207	.000	.340	.520	#1	.26
					1						.290		.032				
	.138-32 (#6-32)	PF50	PF60	632	0	.030	.030	.219	.218	.438	.230	.207	.000	.340	.520	#2	.28
					1						.290		.060				
		PF51	PF61	632	0	.038	.040	.219	.218	.438	.230	.207	.000	.340	.520	#2	.28
					1						.290		.052				
		PF52	PF62	632	0	.058	.060	.219	.218	.438	.230	.207	.000	.340	.520	#2	.28
					1						.290		.032				
	.164-32 (#8-32)	PF50	PF60	832	0	.030	.030	.250	.249	.468	.230	.217	.000	.340	.520	#2	.29
					1						.290		.060				
		PF51	PF61	832	0	.038	.040	.250	.249	.468	.230	.217	.000	.340	.520	#2	.29
					1						.290		.052				
		PF52	PF62	832	0	.058	.060	.250	.249	.468	.230	.217	.000	.340	.520	#2	.29
					1						.290		.032				
	.190-32 (#10-32)	PF50	PF60	032	0	.030	.030	.312	.311	.530	.230	.225	.000	.340	.530	#2	.33
					1						.290		.060				
		PF51	PF61	032	0	.038	.040	.312	.311	.530	.230	.225	.000	.340	.530	#2	.33
					1						.290		.052				
		PF52	PF62	032	0	.058	.060	.312	.311	.530	.230	.225	.000	.340	.530	#2	.33
					1						.290		.032				
	.250-20 (1/4-20)	PF52	PF62	0420	0	.058	.060	.375	.374	.625	.280	.246	.000	.395	.600	#2	.38
					1						.340		.060				

All dimensions are in millimeters.

	Thread Size x Pitch	Type: Knurled Cap	Type: Smooth Cap	Thread Code	Screw Length Code	A (Shank) Max.	Min. Sheet Thickness	Hole Size In Sheet + 0.08	C Max.	E +0.4 -0.13	G ±0.64	H ±0.2	P ±0.64	T_1 Max.	T_2 Nom.	Driver Size	Min. Dist Hole ℄ To Edge
METRIC	M3 x 0.5	PF50	PF60	M3	0	0.77	0.8	5.5	5.48	10.3	5.84	5.26	0	8.64	13.21	#1	6.6
					1						7.37		1.52				
		PF51	PF61	M3	0	0.97	1	5.5	5.48	10.3	5.84	5.26	0	8.64	13.21	#1	6.6
					1						7.37		1.32				
		PF52	PF62	M3	0	1.48	1.5	5.5	5.48	10.3	5.84	5.26	0	8.64	13.21	#1	6.6
					1						7.37		0.81				
	M3.5 x 0.6	PF50	PF60	M3.5	0	0.77	0.8	5.56	5.54	11.1	5.84	5.26	0	8.64	13.21	#2	7.1
					1						7.37		1.52				
		PF51	PF61	M3.5	0	0.97	1	5.56	5.54	11.1	5.84	5.26	0	8.64	13.21	#2	7.1
					1						7.37		1.32				
		PF52	PF62	M3.5	0	1.48	1.5	5.56	5.54	11.1	5.84	5.26	0	8.64	13.21	#2	7.1
					1						7.37		0.81				
	M4 x 0.7	PF50	PF60	M4	0	0.77	0.8	6.4	6.38	11.9	5.84	5.51	0	8.64	13.46	#2	7.4
					1						7.37		1.52				
		PF51	PF61	M4	0	0.97	1	6.4	6.38	11.9	5.84	5.51	0	8.64	13.46	#2	7.4
					1						7.37		1.32				
		PF52	PF62	M4	0	1.48	1.5	6.4	6.38	11.9	5.84	5.51	0	8.64	13.46	#2	7.4
					1						7.37		0.81				
	M5 x 0.8	PF50	PF60	M5	0	0.77	0.8	8	7.98	13.5	5.84	5.72	0	8.64	13.46	#2	8.4
					1						7.37		1.52				
		PF51	PF61	M5	0	0.97	1	8	7.98	13.5	5.84	5.72	0	8.64	13.46	#2	8.4
					1						7.37		1.32				
		PF52	PF62	M5	0	1.48	1.5	8	7.98	13.5	5.84	5.72	0	8.64	13.46	#2	8.4
					1						7.37		0.81				
	M6 x 1	PF52	PF62	M6	0	1.48	1.5	9.5	9.48	15.9	7.11	6.25	0	10.04	15.24	#2	9.7
					1						8.64		1.52				

(1) As with all Class 2A/6g external threads with an additive finish, the maximum major and pitch, after plating, may equal basic sizes and be gauged to Class 3A/4h, per ANSI B1.1, Section 8, Table 3A and ANSI B1.13M, Section 8, Paragraph 8.2.

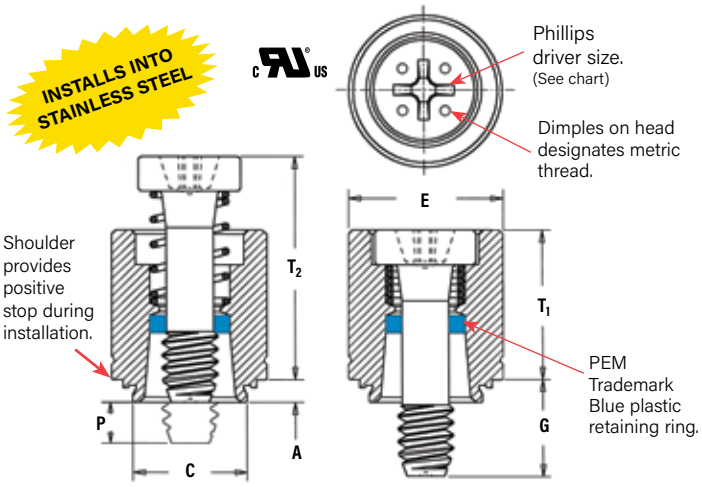
PEM® PFC4™/PFC2P™ CAPTIVE PANEL SCREWS

- PFC4/PFC2P have fully concealed-head for tool only access.
- PFC4/PFC2P comply with UL 60950 standards.
- PFC4 installs into stainless steel sheets HRB 88 or less.
- PFC4/PFC2P are available with MAThread® anti cross-thread technology. (See page 4 for more information).
- PFC4/PFC2P available with Torx® recess.


PFC4

PFC2P

PFC4™ RECESSED-HEAD CAPTIVE PANEL SCREWS



Clinching profile may vary.

Installation Data page 32. Performance Data page 39.

Threads:
External, ASME B1.1, 2A / ASME B1.13M, 6g

Material:
Retainer: 400 Series Stainless Steel
Screw: 400 Series Stainless Steel
Spring: 300 Series Stainless Steel
Retaining Ring: Nylon, temperature limit 200˚ F / 93˚ C

Finish:
Retainer: Passivated and/or tested per ASTM A380
Screw: Passivated and/or tested per ASTM A380
Spring: Natural Finish

For use in sheet hardness:
HRB 88 or less (Hardness Rockwell "B" Scale)
HB 183 or less (Hardness Brinell)

PART NUMBER DESIGNATION

PFC4 - 832 - 50

- PFC4 → Type and Material
- 832 → Thread Size Code
- 50 → Screw Length Code

All dimensions are in inches.

	Thread Size	Type	Thread Code	Screw Length Code	A (Shank) Max.	Min. Sheet Thickness	Hole Size In Sheet +.003 -.000	C Max.	E ±.010	G ±.016	P ±.025	T_1 Max.	T_2 Nom.	Driver Size	Min. Dist. Hole ℄ To Edge
UNIFIED	.112-40 (#4-40)	PFC4	440	40	.060	.060	.265	.264	.344	.250	.000	.370	.540	#1	.25
				62						.375	.125				
	.138-32 (#6-32)	PFC4	632	40	.060	.060	.281	.280	.375	.250	.000	.380	.540	#2	.28
				62						.375	.125				
				84						.500	.250				
	.164-32 (#8-32)	PFC4	832	50	.060	.060	.312	.311	.406	.312	.000	.480	.705	#2	.31
				72						.437	.125				
				94						.562	.250				
	.190-32 (#10-32)	PFC4	032	50	.060	.060	.344	.343	.437	.312	.000	.490	.705	#2	.34
				72						.437	.125				
				94						.562	.250				

All dimensions are in millimeters.

	Thread Size x Pitch	Type	Thread Code	Screw Length Code	A (Shank) Max.	Min. Sheet Thickness	Hole Size In Sheet + 0.08	C Max.	E ± 0.25	G ± 0.4	P ±0.64	T_1 Max.	T_2 Nom.	Driver Size	Min. Dist Hole ℄ To Edge
METRIC	M3 x 0.5	PFC4	M3	40	1.53	1.53	6.73	6.71	8.74	6.4	0	9.4	13.72	#1	6.35
				62						9.5	3.2				
	M4 x 0.7	PFC4	M4	50	1.53	1.53	7.92	7.9	10.31	7.9	0	12.19	17.91	#2	7.87
				72						11.1	3.2				
				94						14.3	6.4				
	M5 x 0.8	PFC4	M5	50	1.53	1.53	8.74	8.72	11.1	7.9	0	12.45	17.91	#2	8.63
				72						11.1	3.2				
				94						14.3	6.4				

A NOTE ABOUT FASTENERS FOR STAINLESS STEEL PANELS

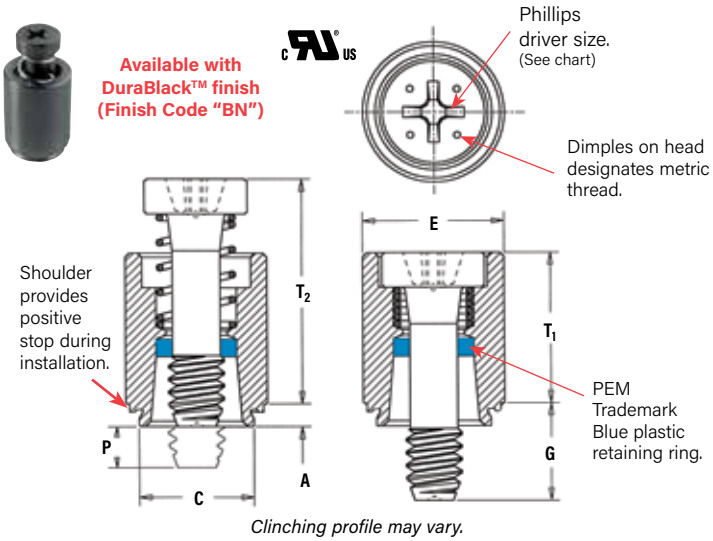
In order for self-clinching fasteners to work properly, the fastener must be harder than the sheet into which it is being installed. In the case of stainless steel panels, fasteners made from 300 Series Stainless Steel do not meet this hardness criteria. It is for this reason that 400 series fasteners are offered (PFC4). However, while these 400 Series fasteners install and perform well in 300 Series stainless sheets they should not be used if the end product:

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

If any of the these are issues, please contact techsupport@pemnet.com for other options.

PFC2P™ RECESSED-HEAD CAPTIVE PANEL SCREWS

Available with DuraBlack™ finish (Finish Code "BN")



Clinching profile may vary.

Installation Data page 32. Performance Data page 39.

Threads:
External, ASME B1.1, 2A / ASME B1.13M, 6g

Material:
Retainer: 300 Series Stainless Steel
Screw: 400 Series Stainless Steel
Spring: 300 Series Stainless Steel
Retaining Ring: Nylon, temperature limit 200˚ F / 93˚ C

Finish:
Retainer: Passivated and/or tested per ASTM A380
Screw: Passivated and/or tested per ASTM A380
Spring: Natural Finish

Optional Finish:
Retainer: BN - Black nitride, AMS2753, Section 3
Screw: BN - Black nitride, AMS2753, Section 3

For use in sheet hardness:
HRB 70 or less (Hardness Rockwell "B" Scale)
HB 125 or less (Hardness Brinell)

PART NUMBER DESIGNATION

PFC2P - 832 - 50

- PFC2P: Type and Material
- 832: Thread Size Code
- 50: Screw Length Code

All dimensions are in inches.

	Thread Size	Type	Thread Code	Screw Length Code	A (Shank) Max.	Min. Sheet Thickness	Hole Size In Sheet +.003 -.000	C Max.	E ±.010	G ±.016	P ±.025	T_1 Max.	T_2 Nom.	Driver Size	Min. Dist. Hole ℄ To Edge
UNIFIED	.112-40 (#4-40)	PFC2P	440	40	.060	.060	.265	.264	.312	.250	.000	.370	.540	#1	.25
				62						.375	.125				
	.138-32 (#6-32)	PFC2P	632	40	.060	.060	.281	.280	.344	.250	.000	.380	.540	#2	.28
				62						.375	.125				
				84						.500	.250				
	.164-32 (#8-32)	PFC2P	832	50	.060	.060	.312	.311	.375	.312	.000	.480	.705	#2	.31
				72						.437	.125				
				94						.562	.250				
	.190-32 (#10-32)	PFC2P	032	50	.060	.060	.344	.343	.406	.312	.000	.490	.705	#2	.34
				72						.437	.125				
				94						.562	.250				
	.250-20 (1/4-20)	PFC2P	0420	60	.060	.060	.413	.412	.468	.375	.000	.620	.905	#3	.38
				82						.500	.125				
				04						.625	.250				

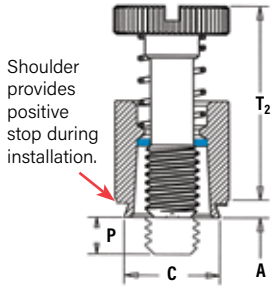
All dimensions are in millimeters.

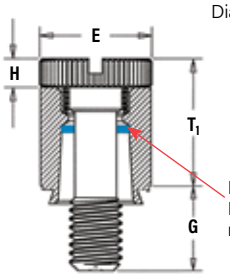
	Thread Size x Pitch	Type	Thread Code	Screw Length Code	A (Shank) Max.	Min. Sheet Thickness	Hole Size In Sheet + 0.08	C Max.	E ± 0.25	G ± 0.4	P ±0.64	T_1 Max.	T_2 Nom.	Driver Size	Min. Dist Hole ℄ To Edge
METRIC	M3 x 0.5	PFC2P	M3	40	1.53	1.53	6.73	6.71	7.92	6.4	0	9.4	13.72	#1	6.35
				62						9.5	3.2				
	M4 x 0.7	PFC2P	M4	50	1.53	1.53	7.92	7.9	9.53	7.9	0	12.19	17.91	#2	7.87
				72						11.1	3.2				
				94						14.3	6.4				
	M5 x 0.8	PFC2P	M5	50	1.53	1.53	8.74	8.72	10.31	7.9	0	12.45	17.91	#2	8.63
				72						11.1	3.2				
				94						14.3	6.4				
	M6 x 1	PFC2P	M6	60	1.53	1.53	10.49	10.47	11.89	9.5	0	15.75	22.99	#3	9.65
				82						12.7	3.2				
				04						15.9	6.4				

PFC2/PFS2

PFS2 is available with DuraBlack™ finish (Finish Code "BN")

PFC2	PFS2
Threads: External, ASME B1.1, 2A / ASME B1.13M, 6g	**Threads:** External, ASME B1.1, 2A / ASME B1.13M, 6g (1)
Material: Retainer: 300 Series Stainless Steel (2) Screw: 300 Series Stainless Steel Spring: 300 Series Stainless Steel Retaining Ring: Nylon, temperature limit 200° F / 93° C	**Material:** Retainer: Hardened Carbon Steel (2) Screw: Carbon Steel Spring: 300 Series Stainless Steel Retaining Ring: Nylon, temperature limit 200° F / 93° C
Finish: Retainer: Passivated and/or tested per ASTM A380 Screw: Passivated and/or tested per ASTM A380 Spring: Natural Finish	**Finish:** Retainer: CN - Bright nickel over copper flash per ASTM B689 Screw: CN - Bright nickel over copper flash per ASTM B689 Spring: Natural Finish
Optional Finish: Retainer: BN - Black nitride, AMS2753, Section 3 Screw: BN - Black nitride, AMS2753, Section 3	**Optional Finish:** Retainer: BN - Black nitride, AMS2753, Section 3 Screw: BN - Black nitride, AMS2753, Section 3
For use in sheet hardness: HRB 70 or less (Hardness Rockwell "B" Scale) HB 125 or less (Hardness Brinell)	**For use in sheet hardness:** HRB 80 or less (Hardness Rockwell "B" Scale) HB 150 or less (Hardness Brinell)





Diagonal knurl identifies metric thread sizes.

Clinching profile may vary.

PART NUMBER DESIGNATION

PFC2 - 832 - 50

PFS2 - 832 - 50 CN

Type and Material	Thread Size Code	Screw Length Code	Finish Code

Installation Data page 33. Performance Data page 39.

All dimensions are in inches.

	Thread Size	Type: Stainless Steel	Type: Steel	Thread Code	Screw Length Code	A (Shank) Max.	Min. Sheet Thickness	Hole Size In Sheet +.003 -.000	C Max.	E ±.010	G ±.016	H ±.005	P ±.025	T_1 Max.	T_2 Nom.	Min. Dist. Hole ℄ To Edge
UNIFIED	.112-40 (#4-40)	PFC2	PFS2	440	40	.060	.060	.265	.264	.312	.250	.072	.000	.360	.540	.25
					62						.375		.125			
	.138-32 (#6-32)	PFC2	PFS2	632	40	.060	.060	.281	.280	.344	.250	.072	.000	.360	.540	.28
					62						.375		.125			
					84						.500		.250			
	.164-32 (#8-32)	PFC2	PFS2	832	50	.060	.060	.312	.311	.375	.312	.082	.000	.450	.690	.31
					72						.437		.125			
					94						.562		.250			
	.190-32 (#10-32)	PFC2	PFS2	032	50	.060	.060	.344	.343	.406	.312	.082	.000	.450	.690	.34
					72						.437		.125			
					94						.562		.250			
	.250-20 (1/4-20)	PFC2	PFS2	0420	60	.060	.060	.413	.412	.468	.375	.097	.000	.580	.880	.38
					82						.500		.125			
					04						.625		.250			

All dimensions are in millimeters.

	Thread Size x Pitch	Type: Stainless Steel	Type: Steel	Thread Code	Screw Length Code	A (Shank) Max.	Min. Sheet Thickness	Hole Size In Sheet + 0.08	C Max.	E ±.25	G ± 0.4	H ± 0.13	P ±0.64	T_1 Max.	T_2 Nom.	Min. Dist. Hole ℄ To Edge
METRIC	M3 x 0.5	PFC2	PFS2	M3	40	1.53	1.53	6.73	6.71	7.92	6.4	1.83	0	9.14	13.72	6.35
					62						9.5		3.2			
	M4 x 0.7	PFC2	PFS2	M4	50	1.53	1.53	7.92	7.9	9.53	7.9	2.08	0	11.43	17.53	7.87
					72						11.1		3.2			
					94						14.3		6.4			
	M5 x 0.8	PFC2	PFS2	M5	50	1.53	1.53	8.74	8.72	10.31	7.9	2.08	0	11.47	17.53	8.63
					72						11.1		3.2			
					94						14.3		6.4			
	M6 x 1	PFC2	PFS2	M6	60	1.53	1.53	10.49	10.47	11.89	9.5	2.46	0	14.73	22.35	9.65
					82						12.7		3.2			
					04						15.9		6.4			

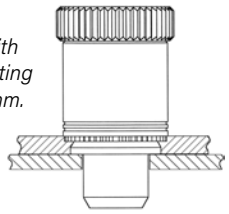
(1) As with all Class 2A/6g external threads with an additive finish, the maximum major and pitch, after plating, may equal basic sizes and be gauged to Class 3A/4h, per ANSI B1.1, Section 8, Table 3A and ANSI B1.13M, Section 8, Paragraph 8.2.

(2) The blue plastic retaining rings are a PEM trademark. The temperature limit is 200° F / 93° C.

PEM® PTL2™/PSL2™ SPRING-LOADED PLUNGER ASSEMBLIES

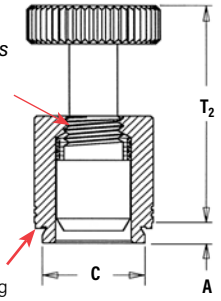
- Used as positioning pins for sliding components such as drawer slides and equipment consoles.
- Fast installation and removal of components.
- Reverse side of sheet is flush when plunger is retracted.
- PTL2 has quick lockout feature to hold plunger in fully retracted position.
- For use in sheets of HRB 80 or less.
- Available as PSL2 without lockout feature on special order.

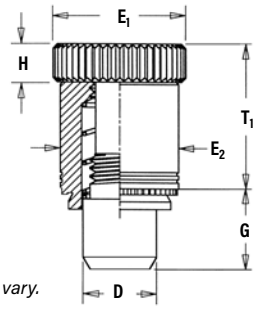
PTL2/PSL2 installed and with mating panel. Minimum mating hole diameter .251" / 6.38 mm.



Lockout feature holds plunger in retracted position. Simply retract and twist to engage lockout feature.

Shoulder provides positive stop during installation.





Clinching profile may vary.

Material:
Plunger: Hardened Carbon Steel
Retainer: Hardened Carbon Steel
Spring: 300 Series Stainless Steel

Finish:
Plunger: CN - Bright nickel over copper flash per ASTM B689
Retainer: CN - Bright nickel over copper flash per ASTM B689
Spring: Natural Finish

For use in sheet hardness:
HRB 80 or less (Hardness Rockwell "B" Scale)
HB 150 or less (Hardness Brinell)

PART NUMBER DESIGNATION

PTL2	-	04	-	4	CN
Type		Plunger Diameter Code		Plunger Length Code	Finish Code

Installation Data page 33. Performance Data page 39.

All dimensions are in inches.

	Type	Plunger Diameter Code	Plunger Length Code	A (Shank) Max.	Min. Sheet Thickness	Hole Size In Sheet +.003 -.000	C Max.	D +.000 -.005	E_1 ±.010	E_2 ±.010	G ±.010	H ±.010	T_1 ±.010	T_2 Nom.	Min. Dist. Hole ℄ To Edge
UNIFIED	PTL2	04	4	.058	.060	.328	.327	.250	.50	.406	.310	.17	.595	.895	.34
	PSL2 (1)	04	4	.058	.060	.328	.327	.250	.50	.406	.310	.17	.510	.780	.34

All dimensions are in millimeters.

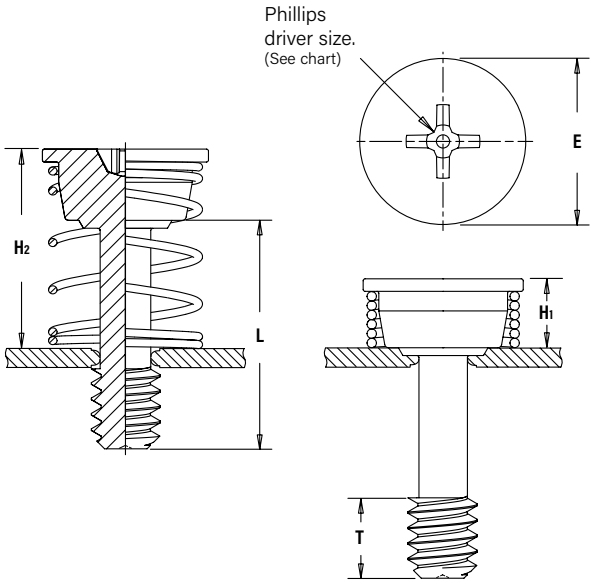
	Type	Plunger Diameter Code	Plunger Length Code	A (Shank) Max.	Min. Sheet Thickness	Hole Size In Sheet + 0.08	C Max.	D - 0.13	E_1 ± 0.25	E_2 ± 0.25	G ± 0.25	H ± 0.25	T_1 ± 0.25	T_2 Nom.	Min. Dist. Hole ℄ To Edge
METRIC	PTL2	04	4	1.47	1.53	8.33	8.31	6.35	12.7	10.3	7.87	4.32	15.11	22.73	8.64
	PSL2 (1)	04	4	1.47	1.53	8.33	8.31	6.35	12.7	10.3	7.87	4.32	12.95	19.81	8.64

(1) Without lockout feature. Available on special order.

- Permanently captivates into sheets as thin as .040" / 1.02 mm and greater.
- Lowest cost captive screw design to replace loose hardware.
- Available with self-retracting (SCBR), axial float (SCB), or jacking feature (SCBJ).
- Appropriate for close centerline-to-edge applications.

SCBR SCB SCBJ

SCBR™ SPINNING CLINCH BOLT WITH SELF-RETRACTING FEATURE



Installation Data page 34. Performance Data page 40.

SCBR retracted ***SCBR engaged***

Threads: External, ASME B1.1, 2A / ASME B1.13M, 6g (1)
Material: Screw - Hardened Carbon Steel Spring - 300 series stainless steel
Finish: Screw - ZI - Zinc plated, 5µm, colorless (standard) (2) Spring: Natural Finish
For use in sheet hardness: HRB 80 or less (Hardness Rockwell "B" Scale) HB 150 or less (Hardness Brinell)

PART NUMBER DESIGNATION

SCBR - 632 - 8 ZI

Type | Thread Size Code | Length Code | Finish

All dimensions are in inches.

	Thread Size	Type	Thread Code	Length Code "L" ±.015 (Length Code in 16ths of an inch) .500	Min. Sheet Thickness	Hole Size in Sheet +.003 -.000	E +.005 -.010	H_1 ±.005	H_2 Ref.	T Nom.	Driver Size	Min. Dist Hole ℄ To Edge
UNIFIED	.112-40 (#4-40)	SCBR	440	8	.040	.112	.348	.165	.495	.130	#1	.175
	.138-32 (#6-32)	SCBR	632	8	.040	.138	.381	.170	.500	.130	#2	.190
	.164-32 (#8-32)	SCBR	832	8	.040	.164	.410	.175	.505	.130	#2	.205

All dimensions are in millimeters.

	Thread Size x Pitch	Type	Thread Code	Length Code "L" ±0.4 (Length Code in millimeters)	Min. Sheet Thickness	Hole Size in Sheet +0.08	E +0.13 -0.25	H_1 ±0.13	H_2 Ref.	T Nom.	Driver Size	Min. Dist Hole ℄ To Edge
METRIC	M3 x 0.5	SCBR	M3	12	1.02	3	9.1	4.2	11.8	3.3	#1	4.5
	M4 x 0.7	SCBR	M4	12	1.02	4	10.7	4.5	12.1	3.3	#2	5.4

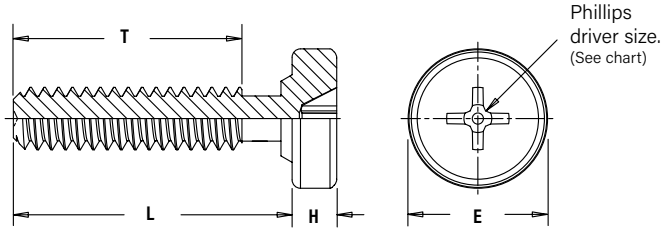
(1) As with all Class 2A/6g external threads with an additive finish, the maximum major and pitch, after plating, may equal basic sizes and be gauged to Class 3A/4h, per ANSI B1.1, Section 8, Table 3A and ANSI B1.13M, Section 8, Paragraph 8.2.

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

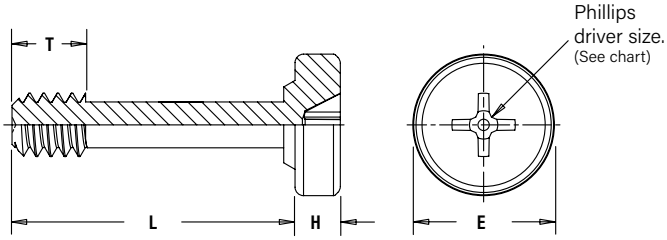
NOTE: SCBR screws are shipped with mating springs.
For designs requiring a specific spring rate, contact our PEM Technical Support group at techsupport@pemnet.com.

SCB™/SCBJ™ SPINNING CLINCH BOLTS

SCBJ



SCB



Threads:	External, ASME B1.1, 2A / ASME B1.13M, 6g (1)
Material:	Hardened Carbon Steel
Finish:	ZI - Zinc plated, 5µm, colorless (standard) (2)
For use in sheet hardness:	HRB 80 or less (Hardness Rockwell "B" Scale) HB 150 or less (Hardness Brinell)

PART NUMBER DESIGNATION

SCB	J	-	632	-	6	ZI
Type	Jacking (If applicable)		Thread Size Code		Length Code	Finish

Installation Data page 34. Performance Data page 40.

All dimensions are in inches.

	Thread Size	Type		Thread Code	Length Code "L" ±.015 (Length Code in 16ths of an inch)			Min. Sheet Thickness	Hole Size in Sheet +.003 -.000	E ±.010	H Nom.	T Nom.			Nom. Axial Float	Driver Size	Min. Dist. Hole ℄ To Edge
		Jacking	Non-jacking		.250	.375	.500					-4	-6	-8			
UNIFIED	.112-40 (#4-40)	SCBJ	—	440	4	6	8	.040	.112	.250	.080	.160	.285	.410	—	#1	.13
		—	SCB		—	—	8					—	—	.130	.330		
	.138-32 (#6-32)	SCBJ	—	632	4	6	8	.040	.138	.291	.080	.160	.285	.410	—	#2	.15
		—	SCB		—	—	8					—	—	.130	.330		

All dimensions are in millimeters.

	Thread Size x Pitch	Type		Thread Code	Length Code "L" ±0.4 (Length Code in millimeters)				Min. Sheet Thickness	Hole Size in Sheet +0.08	E ±0.25	H Nom.	T Nom.				Nom. Axial Float	Driver Size	Min. Dist. Hole ℄ To Edge
		Jacking	Non-jacking										-6	-10	-12	-14			
METRIC	M3 x 0.5	SCBJ	—	M3	6	10	12	14	1.02	3	6.6	2.03	3.7	7.7	9.7	11.7	—	#1	3.3
		—	SCB		—	—	12	14					—	—	3.3	5.3	7.67		
	M4 x 0.7	SCBJ	—	M4	6	10	12	14	1.02	4	8.28	2.03	3.7	7.7	9.7	11.7	—	#2	5
		—	SCB		—	—	12	14					—	—	3.3	5.3	7.67		

(1) As with all Class 2A/6g external threads with an additive finish, the maximum major and pitch, after plating, may equal basic sizes and be gauged to Class 3A/4h, per ANSI B1.1, Section 8, Table 3A and ANSI B1.13M, Section 8, Paragraph 8.2.

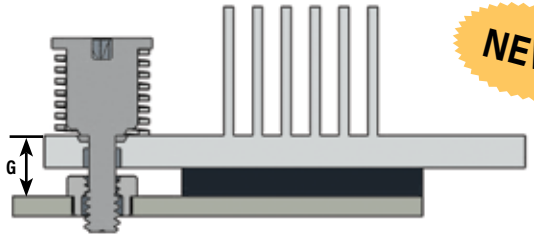
(2) See PEM Technical Support section of our website (www.pemnet.com) for related plating standards and specifications.

PEM® HSCB™ HEAT SINK MOUNTING SYSTEM

The new HSCB™ engineered mounting system provides secure attachment of a heat sink to the circuit board while providing firm contact to the chip component allowing optimum heat dissipation. The three-piece fastening system, sold individually, includes the screw, spring and receptacle nut. The clamp load created is determined by the spring rate and the amount of deflection that is designed into the joint of the hardware. The system also allows for slight expansion and contraction of the joint components without stress to the delicate circuitry. The unique "click" feature lets the user know when the fastener is completely installed.

Patented

- Screw can not be overtightened. Audible "click" when fully engaged.
- Screw and spring mount together permanently into the heat sink.
- Spring determines clamp force.
- Receptacle nut mounts permanently to the PC board.
- Provides even, constant contact of heat sink to chip component.
- Allows removal of heat sink if desired.



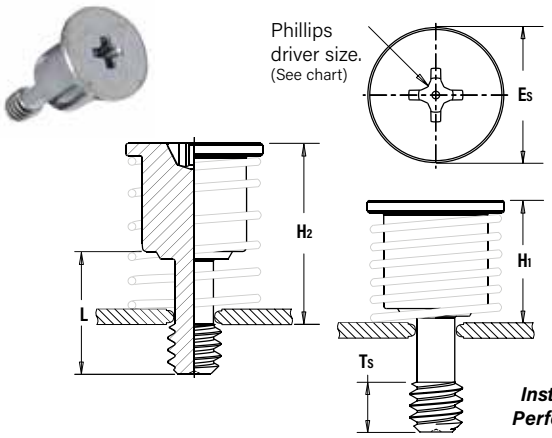
NEW!

To select proper length code of nut/standoff:

1) Determine "G", the distance from the top surface of the heat sink to the top of the P.C. Board.
2) Find the combination of Screw (HSCB) and Nut (HSR) whose sum of Screw Factor (SF) plus Nut Factor (NF) are closest to G.
3) Find D = G – SF – NF. The D value must be a negative number between zero and 1mm or 1/32" (1 dash length of HSR nut).
4) The actual working load is equal to the Spring (HSL) Working Load + (D x spring rate k). Lower D value results in lower force.

If this or any standard product does not meet your application needs, contact our PEM Technical Support group at techsupport@pemnet.com to develop a special product that matches your specific application.

HSCB™ SELF-CAPTIVATING SCREW



Installation Data page 35.
Performance Data page 40.

Threads:	External, ASME B1.1, 2A / ASME B1.13M, 6g (1)
Material:	Hardened carbon steel
Finish:	Screw - ZI - Zinc plated, 5µm, colorless (2)
For use in sheet hardness:	HRB 80 / HB150 or less (3)

PART NUMBER DESIGNATION

HSCB	-	440	-	4	ZI
Type		Thread Size Code		Length Code	Finish

All dimensions are in inches.

	Thread Size	Type	Thread Code	Length Code "L" ±.015	Min. Sheet Thickness	Hole Size in Sheet +.003 -.000	Es ±.010	H1 Ref.	H2 Ref.	Ts Min.	Screw Factor (SF)	Driver Size	Min. Dist Hole ℄ To Edge
				.320									
UNIFIED	.112-40 (#4-40)	HSCB	440	4	.040	.112	.312	.300	.470	.130	.170	#1	.156
	.138-32 (#6-32)	HSCB	632	4	.040	.138	.352	.300	.470	.130	.170	#2	.178

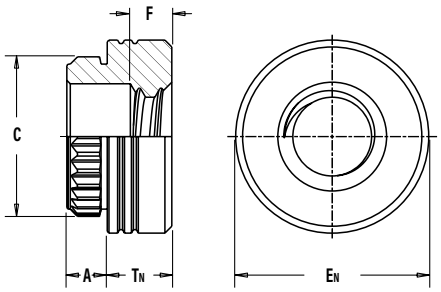
All dimensions are in millimeters.

	Thread Size x Pitch	Type	Thread Code	Length Code "L" ±0.4	Min. Sheet Thickness	Hole Size in Sheet +0.08	Es ±0.25	H1 Ref.	H2 Ref.	Ts Min.	Screw Factor (SF)	Driver Size	Min. Dist Hole ℄ To Edge
				8.13									
METRIC	M3 x 0.5	HSCB	M3	3	1	3	8.18	7.67	12	3.3	4.32	#1	4.13

NOTE: HSCB screws, HSR nuts and HSL springs are sold separately.

(1) As with all Class 2A/6g external threads with an additive finish, the maximum major and pitch, after plating, may equal basic sizes and be gauged to Class 3A/4h, per ANSI B1.1, Section 8, Table 3A and ANSI B1.13M, Section 8, Paragraph 8.2.
(2) See PEM Technical Support section of our website (www.pemnet.com) for related plating standards and specifications.
(3) HRB - Hardness Rockwell "B" Scale. HB - Hardness Brinell.

HSR™ BROACHING NUT/STANDOFF



Threads:	Internal, ASME B1.1, 2B / ASME B1.13M, 6H
Material:	Carbon steel
Finish:	ET - Electro-plated tin ASTM B 545, class B with clear preservative coating, annealed (1)
For use in sheet hardness:	HRB 60 / HB 107 or less (2)

HSR nuts are available for surface mounting. Contact our PEM technical support group at techsupport@pemnet.com.

Installation Data page 35. Performance Data page 40.

PART NUMBER DESIGNATION

HSR - 440 - 2 - ET

HSR	440	2	ET
Type	Thread Size Code	Length Code	Finish

All dimensions are in inches.

	Thread Size	Type	Thread Code	Length Code	A (Shank) Max.	Min. Sheet Thickness	Hole Size In Sheet +.003 -.000	C ±.003	EN ±.005	F ±.010	TN ±.005	Nut Factor (NF)	Min. Dist. Hole ℄ To Edge
UNIFIED	.112-40 (#4-40)	HSR	440	2	.060	.060	.166	.184	.219	.060	.065	.000	0.17
				3							.093	.031	
	.138-32 (#6-32)	HSR	632	2	.060	.060	.213	.231	.281	.060	.065	.000	0.22
				3							.093	.031	

All dimensions are in millimeters.

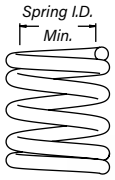
	Thread Size x Pitch	Type	Thread Code	Length Code	A (Shank) Max.	Min. Sheet Thickness	Hole Size In Sheet +0.08	C ±0.08	EN ±0.13	F ±0.25	TN ±0.13	Nut Factor (NF)	Min. Dist. Hole ℄ To Edge
METRIC	M3 x 0.5	HSR	M3	2	1.53	1.53	4.22	4.68	5.56	1.3	2	.75	4.4
				3							3	1.75	

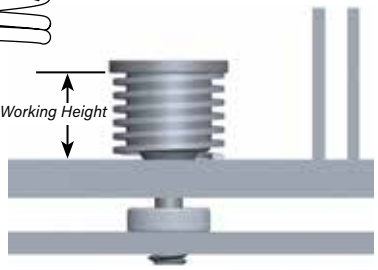
NOTE: HSCB screws, HSR nuts and HSL springs are sold separately.

(1) See PEM Technical Support section of our website (www.pemnet.com) for related plating standards and specifications.
(2) HRB - Hardness Rockwell "B" Scale. HB - Hardness Brinell.

HSL™ SPRINGS

HSL springs are engineered to provide a reliable and repeatable spring rate when assembled with mating PEM hardware. The spring rate is critical to the successful assembly of your heat sink. Clamp load will be determined by the spring rate and deflection that is designed into the joint.





Part Number	Minimum Inside Dia. (in.)	Minimum Inside Dia. (mm)	Load at Working Height ±10% (lbs.)	Load at Working Height ±10% (N)	Working Height Ref. (in.)	Working Height Ref. (mm)	Spring Rate k (lb/in)	Spring Rate k (N/mm)	Spring Material
HSL-574-35	.226	5.74	7.87	35	.270	6.86	74	12.96	17-7 Stainless Steel, Natural Finish
HSL-701-35	.276	7.01	7.87	35	.270	6.86	39	6.84	17-7 Stainless Steel, Natural Finish

NOTE: HSCB screws, HSR nuts and HSL springs are sold separately. HSL-574-35 spring fits screw thread sizes #4-40 and M3 and HSL-701-35 spring fits screw thread size #6-32.

The HSL **Inside Diameter Code** is expressed in hundredths of millimeters.
Example "574" indicates a minimum inside diameter of 5.74mm or .226".

The HSL **Load Code** is expressed in Newtons developed at the working height of the spring once the joint is assembled.
Example "35" indicates working load of 35 Newtons, or approximately 8 lbs.

For designs requiring a specific spring rate, contact our PEM Technical Support group at techsupport@pemnet.com

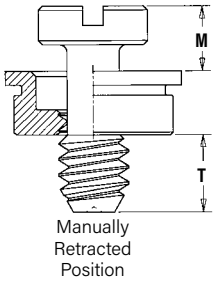
PART NUMBER DESIGNATION

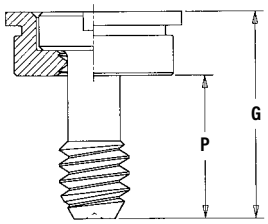
HSL - 574 - 35

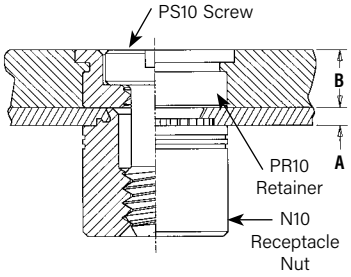
HSL	574	35
Type	Inside Diameter Code	Load Code

PEM® PF10™ FLUSH-MOUNTED CAPTIVE PANEL SCREWS

- PF10 assembly sits flush in sheets as thin as .050" / 1.27 mm or flush on both sides in .125" / 3.2 mm sheets.
- PS10 screw remains captive in retainer when disengaged.
- PR10 retainer and F10 receptacle nut is for use in sheets of HRB 70 or less.
- N10 nut is for use in sheets of HRB 80 or less.
- Complies with UL 60950 standards.







Installation Data page 36. Performance Data page 41.

All dimensions are in inches.

	A Min.	B Nom.	G ± .010	M	P	T Nom.
UNIFIED	.04	.125	.40	.16	.28	.13

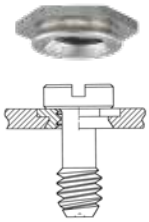
All dimensions are in millimeters.

	A Min.	B Nom.	G ± 0.25	M	P	T Nom.
METRIC	1	3.18	10.16	4.06	7.11	3.3

Floating Receptacle Nuts

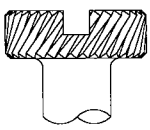
Available on special order F10 self-clinching floating receptacle nuts permit a minimum of .015"/0.38mm adjustment for mating hole misalignment.

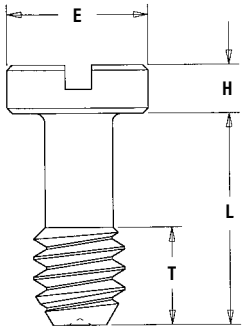
Flush Fasteners as retainers



For applications where the screw head may project above the sheet surface, PS10 screws may be used with PEMSERT® F fasteners as retainers. For dimensions and engineering data on F fasteners, see PEM Bulletin F.

PS10™ FLUSH MOUNTED SCREWS





Threads:
External, ASME B1.1, 2A / ASME B1.13M, 6g

Material:
300 Series Stainless Steel

Finish:
Passivated and/or tested per ASTM A380

PART NUMBER DESIGNATION

PS10 - 832 - 40

- PS10 — Type and Material
- 832 — Thread Size Code
- 40 — Screw Length Code

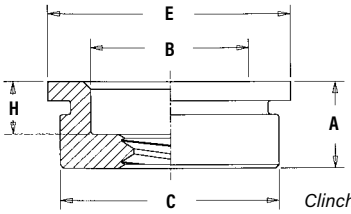
All dimensions are in inches.

	Thread Size	Type	Thread Code	Screw Length Code	E Nom.	H +.002 -.006	L ± .010	T Nom.
UNIFIED	.112-40 (#4-40)	PS10	440	40	.18	.075	.33	.13
	.138-32 (#6-32)	PS10	632	40	.21	.075	.33	.13
	.164-32 (#8-32)	PS10	832	40	.25	.075	.33	.13
	.190-32 (#10-32)	PS10	032	40	.28	.075	.33	.13

All dimensions are in millimeters.

	Thread Size x Pitch	Type	Thread Code	Screw Length Code	E Nom.	H + 0.05 - 0.15	L ± 0.25	T Nom.
METRIC	M3 x 0.5	PS10	M3	40	4.7	1.91	8.38	3.3
	M4 x 0.7	PS10	M4	40	6.3	1.91	8.38	3.3
	M5 x 0.8	PS10	M5	40	7.1	1.91	8.38	3.3

PR10™ SELF-CLINCHING FLUSH-MOUNTED RETAINERS



Clinching profile may vary.

PART NUMBER DESIGNATION

PR10 - 832

PR10: Type

832: Thread Size Code

Threads:
Internal, ASME B1.1, 2B / ASME B1.13M, 6H (1)

Material:
300 Series Stainless Steel

Finish:
Passivated and/or tested per ASTM A380

For use in sheet hardness:
HRB 70 or less (Hardness Rockwell "B" Scale)
HB 125 or less (Hardness Brinell)

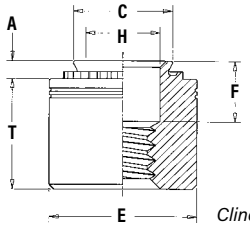
All dimensions are in inches.

	Thread Size	Type	Thread Code	A (Shank) Max.	Min. Sheet for Self-Clinching	Min. Sheet for Flush Installation	Hole Size in Sheet +.003 -.000	B Nom.	C Max.	E Nom.	H Nom.	Min. Dist. Hole ℄ to Edge
UNIFIED	.112-40 (#4-40)	PR10	440	.125	.050	.125	.281	.195	.280	.31	.075	.31
	.138-32 (#6-32)	PR10	632	.125	.050	.125	.312	.225	.311	.34	.075	.33
	.164-32 (#8-32)	PR10	832	.125	.050	.125	.344	.255	.343	.37	.075	.34
	.190-32 (#10-32)	PR10	032	.125	.050	.125	.375	.290	.374	.41	.075	.36

All dimensions are in millimeters.

	Thread Size x Pitch	Type	Thread Code	A (Shank) Max.	Min. Sheet for Self-Clinching	Min. Sheet for Flush Installation	Hole Size in Sheet + 0.08	B Nom.	C Max.	E Nom.	H Nom.	Min. Dist. Hole ℄ to Edge
METRIC	M3 x 0.5	PR10	M3	3.18	1.27	3.18	7.14	4.75	7.12	7.87	1.91	7.87
	M4 x 0.7	PR10	M4	3.18	1.27	3.18	8.74	6.48	8.72	9.53	1.91	8.64
	M5 x 0.8	PR10	M5	3.18	1.27	3.18	9.53	7.37	9.5	10.41	1.91	9.14

N10™ SELF-CLINCHING RECEPTACLE NUTS(4)



Clinching profile may vary.

PART NUMBER DESIGNATION

N10 - 832 - 1 - ZI

N10: Type

832: Thread Size Code

1: Shank Code

ZI: Finish

Threads:
Internal, ASME B1.1, 2B / ASME B1.13M, 6H (2)

Material:
Hardened Carbon Steel

Finish:
ZI - Zinc plated, 5µm, colorless (standard) (3)

For use in sheet hardness:
HRB 80 or less (Hardness Rockwell "B" Scale)
HB 150 or less (Hardness Brinell)

All dimensions are in inches.

	Thread Size	Type	Thread Code	Shank Code	A (Shank) Max.	Min. Sheet Thickness	Hole Size In Sheet +.003 -.000	C Max.	E Nom.	F ± .010	H Nom.	T ± .005	Min. Dist. Hole ℄ To Edge
UNIFIED	.112-40 (#4-40)	N10	440	1	.038	.040	.187	.186	.28	.130	.126	.24	.22
	.138-32 (#6-32)	N10	632	1	.038	.040	.213	.212	.31	.130	.156	.24	.27
	.164-32 (#8-32)	N10	832	1	.038	.040	.250	.249	.34	.130	.187	.24	.28
	.190-32 (#10-32)	N10	032	1	.038	.040	.277	.276	.37	.130	.213	.24	.31

All dimensions are in millimeters.

	Thread Size x Pitch	Type	Thread Code	Shank Code	A (Shank) Max.	Min. Sheet Thickness	Hole Size In Sheet + 0.08	C Max.	E Nom.	F ± 0.25	H Nom.	T ± 0.13	Min. Dist. Hole ℄ To Edge
METRIC	M3 x 0.5	N10	M3	1	0.97	1	4.75	4.73	7.11	3.3	3.2	6	5.59
	M4 x 0.7	N10	M4	1	0.97	1	6.35	6.33	8.64	3.3	4.75	6	7.11
	M5 x 0.8	N10	M5	1	0.97	1	7.04	7.01	9.53	3.3	5.41	6	7.87

(1) The purpose of the thread is for component screw retention only, thread may not accept 2B/6H Go threaded plug gage, but class 3A/4h screw must pass with finger torque, may not reject NoGo threaded plug gage and minor diameter may exceed 2B/6H maximum.

(2) 2B (unified) and 6H (metric) go gauge may stop at pilot end but class 3A (unified) and 4h (metric) screws will pass through with finger torque.

(3) See PEM Technical Support section of our website (www.pemnet.com) for related plating standards and specifications.

(4) Also available on special order F10 self-clinching floating receptacle nuts.

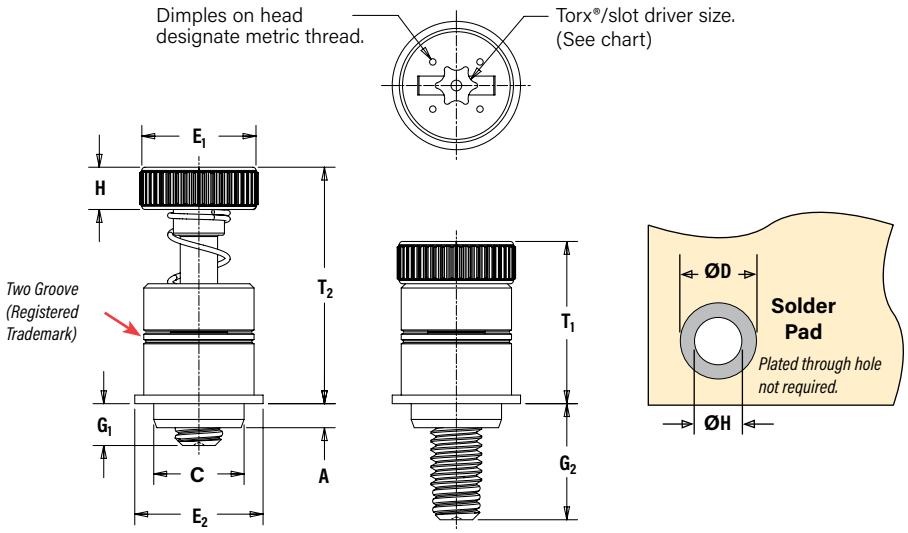
REELFAST® SMTPFLSM™ SURFACE MOUNT CAPTIVE PANEL SCREWS

- All metal captive screw assembly installs in one piece utilizing pick and place method.
- Combination drive, Torx®/slot.
- Solderable finish.

Threads:
External, ASME B1.1, 2A / ASME B1.13M, 6g (1)

Material:
Retainer: Carbon Steel
Screw: Hardened Carbon Steel
Spring: 300 Series Stainless Steel

Finish:
Retainer: ET - Electro-plated tin ASTM B545, Class B with preservative coating, annealed (2)
Screw: ZI - Zinc plated, 5µm, colorless (3)
Spring: Natural Finish



PART NUMBER DESIGNATION

SMTPF LS M - 440 - 0 ET

SMTPF	LS	M	440	0	ET
Type	Driver	Anti-cross Thread Feature	Thread Code	Length Code	Finish

Installation Data page 36. Performance Data page 41.

All dimensions are in inches.

	Thread Size	Type	Thread Code	Screw Length Code	A (Shank) Max.	Min. Sheet Thickness	C Max.	E_1 ±.010	E_2 Nom	G_1 ±.025	G_2 ±.025	H ±.010	T_1 Nom.	T_2 Nom.	ØK Hole Size in Sheet +.003 -.000	ØD Min. Solder Pad	Driver Size
UNIFIED	.112-40 (#4-40)	SMTPFLSM	440	0	.063	.063	.215	.280	.300	.040	.210	.100	.38	.55	.220	.340	T15
				1						.100	.270						
	.138-32 (#6-32)	SMTPFLSM	632	0	.063	.063	.247	.310	.320	.040	.240	.100	.42	.62	.252	.400	T15
				1						.100	.300						

All dimensions are in millimeters.

	Thread Size	Type	Thread Code	Screw Length Code	A (Shank) Max.	Min. Sheet Thickness	C Max.	E_1 ±0.25	E_2 Nom	G_1 ±0.64	G_2 ±0.64	H ±0.25	T_1 Nom.	T_2 Nom.	ØK Hole Size in Sheet +0.08	ØD Min. Solder Pad	Driver Size
METRIC	M3 x 0.5	SMTPFLSM	M3	0	1.6	1.6	5.46	7	7.6	1	5.3	2.5	9.6	14	5.6	8.6	T15
				1						2.5	6.8						
	M3.5 x 0.6	SMTPFLSM	M3.5	0	1.6	1.6	6.27	7.9	8.13	1	6.1	2.5	10.7	15.7	6.4	10.2	T15
				1						2.5	7.62						

NUMBER OF PARTS PER REEL

Thread Size	Parts Per Reel
440	200
632	150
M3	200
M3.5	150

Packaged on 330 mm recyclable reels. Tape width is 24 mm.
Supplied with polyimide patch for vacuum pick up. Reels conform to EIA-481.

(1) As with all Class 2A/6g external threads with an additive finish, the maximum major and pitch, after plating, may equal basic sizes and be gauged to Class 3A/4h, per ANSI B1.1, Section 8, Table 3A and ANSI B1.13M, Section 8, Paragraph 8.2
(2) Optimal solderability life noted on packaging.
(3) See PEM Technical Support section of our website (www.pemnet.com) for related plating standards and specifications.

REELFAST® SMTPF™ SURFACE MOUNT CAPTIVE PANEL SCREWS

- Retainer installed using conventional surface mount techniques.
- Simply snap screw into retainer to complete assembly.
- Black ABS knob standard.
- Optional molded-through colors available.
- Available with Torx® recess.

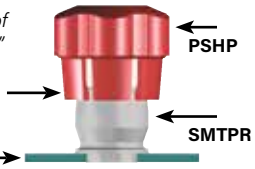
Threads:
External, ASME B1.1, 2A / ASME B1.13M, 6g (1)

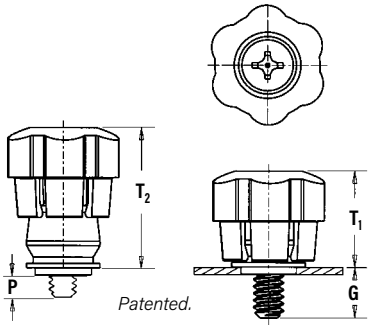
Material:
Knob: ABS (2)
Retainer: Carbon Steel
Screw: Carbon Steel

Finish:
Retainer: ET - Electro-plated tin ASTM B545, Class B with preservative coating, annealed
Screw: CN - Bright nickel over copper flash per ASTM B689

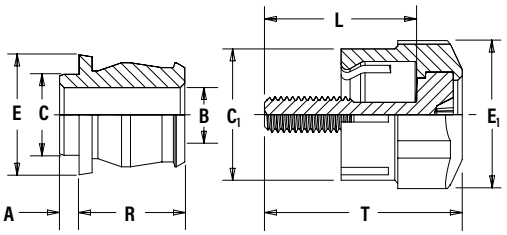
When Assembled

Spring action of plastic "fingers" holds screw in retracted position.





Patented.



Installation Data page 36.
Performance Data page 41.

All dimensions are in inches.

	Thread Size	Screw Part Number: Type	Thread Code	Screw Length Code	Retainer Part Number	Assembly Dimensions: G ±.025	P ±.025	T_1 Nom.	T_2 Nom.	Total Radial Float	Screw Dimensions: C_1 ±.010	E_1 ±.010	L ±.015	T Nom.	Retainer Dimensions: A (Shank) Max.	Min. Sheet Thick.	B ±.003	C Max.	E Nom.	R ±.005
UNIFIED	.112-40 (#4-40)	PSHP	440	0	SMTPR-6-1	.188	.000	.478	.646	.015	.440	.542	.510	.663	.060	.060	.167	.249	.375	.325
				1		.248	.026						.570	.723						
	.138-32 (#6-32)	PSHP	632	0	SMTPR-6-1	.188	.000	.478	.646	.020	.440	.542	.510	.663	.060	.060	.167	.249	.375	.325
				1		.248	.026						.570	.723						

All dimensions are in millimeters.

	Thread Size x Pitch	Screw Part Number: Type	Thread Code	Screw Length Code	Retainer Part Number	Assembly Dimensions: G ± 0.64	P ± 0.64	T_1 Nom.	T_2 Nom.	Total Radial Float	Screw Dimensions: C_1 ±0.25	E_1 ±0.25	L ±0.38	T Nom.	Retainer Dimensions: A (Shank) Max.	Min. Sheet Thick.	B ±0.08	C Max.	E Nom.	R ±0.13
METRIC	M3 x 0.5	PSHP	M3	0	SMTPR-6-1	4.78	0	12.14	16.41	.38	11.18	13.77	12.95	16.84	1.53	1.53	4.24	6.33	9.53	8.26
				1		6.3	.66						14.48	18.36						
	M3.5 x 0.6	PSHP	M3.5	0	SMTPR-6-1	4.78	0	12.14	16.41	.51	11.18	13.77	12.95	16.84	1.53	1.53	4.24	6.33	9.53	8.26
				1		6.3	.66						14.48	18.36						

RETAINER - *Packaged on 330 mm recyclable reels of 465 pieces. Tape width is 24 mm. Supplied with Kapton® patch for vacuum pick up. Reels conform to EIA-481.*

SCREW - *Packaged in bags. Retainers and screws are sold separately.*

PART NUMBER DESIGNATION FOR SCREW

PSHP	-	632	-	0	L	001
Type		Thread Code		Length Code	Cap Style (Lobed)	Color Code (Standard Black)

PART NUMBER DESIGNATION FOR RETAINER

SMTPR	-	6	-	1	ET
Type		Retainer Size		Shank Code	Finish

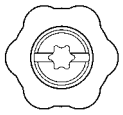
COLOR CAPABILITIES FOR PSHP SCREW

The colors shown here (codes #002 thru #007) are non-stocked standards and available on special order. Since actual cap colors may vary slightly from those shown here, we recommend that you request samples for color verification. If you require a custom color or you need a "color matched" cap, please contact us.

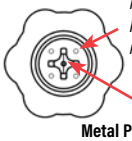
Std. Black #001 Red #002 Orange #003 Yellow #004

Green #005 Blue #006 Violet #007

Non-flammable UL 94-V0 plastic caps are available on special order.

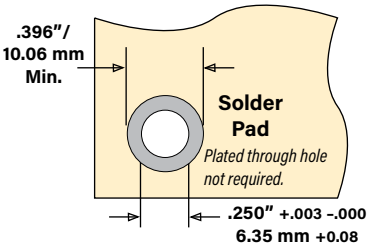


Available with Torx® recess on special order.



Four dimples on head designate metric thread.

Metal Phillips Recess
#4-40 & M3 = #1
#6-32 & M3.5 = #2



Stencil Masking Examples

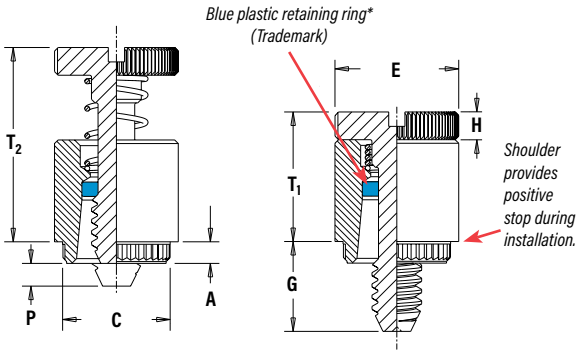
(1) *As with all Class 2A/6g external threads with an additive finish, the maximum major and pitch, after plating, may equal basic sizes and be gauged to Class 3A/4h, per ANSI B1.1, Section 8, Table 3A and ANSI B1.13M, Section 8, Paragraph 8.2.*

(2) *See PEM Technical Support section of our website (www.pemnet.com) for related plating standards and specifications.*

PFK™ BROACHING CAPTIVE PANEL SCREWS

- For permanent and reliable installation in PC boards.
- Screw assemblies remain captive for easy mounting and removal.

Diagonal knurl identifies metric thread sizes



Installation Data page 33. Performance Data page 41.

Threads:
External, ASME B1.1, 2A / ASME B1.13M, 6g

Material:
Retainer: 300 Series Stainless Steel
Screw: 300 Series Stainless Steel
Spring: 300 Series Stainless Steel
Retaining Ring: Nylon, temperature limit 200˚ F / 93˚ C

Finish:
Retainer: Passivated and/or tested per ASTM A380
Screw: Passivated and/or tested per ASTM A380
Spring: Natural Finish

For use in:
PC Boards

PART NUMBER DESIGNATION

PFK - 632 - 40

- PFK: Type
- 632: Thread Size Code
- 40: Screw Length Code

All dimensions are in inches.

	Thread Size	Type	Thread Code	Screw Length Code	A (Shank) Max.	Min. Sheet Thickness	Hole Size In Sheet +.003 -.000	C ± .003	E ±.010	G ± .016	H ± .005	P ± .025	T_1 Max.	T_2 Nom.	Min. Dist. Hole ℄ To Edge
UNIFIED	.112-40 (#4-40)	PFK	440	40	.060	.060	.265	.283	.312	.250	.072	.000	.36	.54	.20
				62						.375		.125			
				84						.500		.250			
	.138-32 (#6-32)	PFK	632	40	.060	.060	.281	.299	.344	.250	.072	.000	.36	.54	.26
				62						.375		.125			
				84						.500		.250			

All dimensions are in millimeters.

	Thread Size x Pitch	Type	Thread Code	Screw Length Code	A (Shank) Max.	Min. Sheet Thickness	Hole Size In Sheet +0.08	C ± 0.08	E ±.25	G ± 0.4	H ± 0.13	P ± 0.64	T_1 Max.	T_2 Nom.	Min. Dist. Hole ℄ To Edge
METRIC	M3 x 0.5	PFK	M3	40	1.53	1.53	6.73	7.19	7.92	6.4	1.83	0	9.14	13.72	5.08
				62						9.5		3.2			
				84						12.7		6.4			

VALUE-ADDED CAPABILITIES

ATCA Solutions

Use PF11PM captive panel screw and TPXS pin in conjunction to satisfy the requirements of the PICMG 3.0 of the Advanced TCA®.

Tight Seal Solutions

Consider adding an o-ring to our PEM C.A.P.S.® captive panel screw. When fastened, it provides a tight seal above the panel.

Nylon Locking Patch

Nylon locking patch is available to be added to any of PEM captive panel screws for applications requiring a locking element.

Thread-forming Opportunity

PennEngineering is official licensee for REMFORM®, TAPTITE®, PT®, and DELTA PT® fastener products.

REMFORM® and TAPTITE® are trademarks of REMINC®.
PT® and DELTA PT® are trademarks of EJOT®.

MAThread® Anti Cross-thread Technology

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

MAThread® is a registered trademark of MAThread inc.

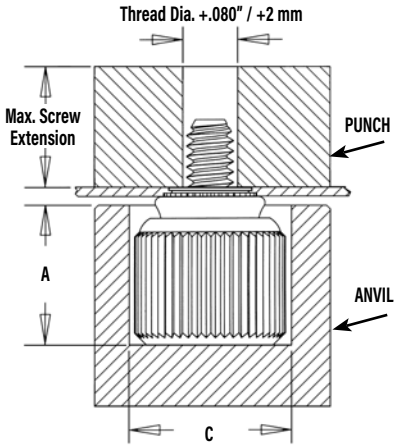
Anti Cross-Thread Feature

INSTALLATION NOTES

- For best results we recommend using a PEMSERTER® press for installation of PEM self-clinching fasteners. Please check our website for more information.
- Visit the Animation Library on our website to view the installation process for select products.

PF11™/PF12™/PF11M™/PF12M™/PEM C.A.P.S.® FASTENERS

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



PEMSERTER® Installation Tooling(1)

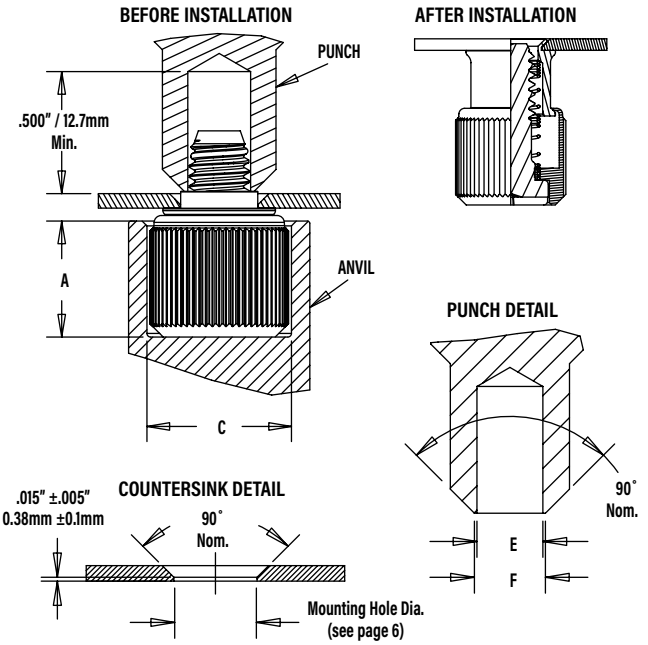
	Thread Code	Anvil Dimensions (in.) A ±.002	Anvil Dimensions (in.) C ±.002	Anvil Part Number	Punch Part Number
UNIFIED	440	.260	.437	8003521	8003518
	632	.390	.468	8003522	8003519
	832	.390	.531	8003523	8003520
	032	.390	.531	8003523	8004350
	0420	.480	.598	8004351	8004352

	Thread Code	Anvil Dimensions (mm) A ±0.05	Anvil Dimensions (mm) C ±0.05	Anvil Part Number	Punch Part Number
METRIC	M3	6.6	11.1	8003521	8003518
	M3.5	9.91	11.89	8003522	8003519
	M4	9.91	13.49	8003523	8003520
	M5	9.91	13.49	8003523	8004350
	M6	12.19	15.19	8004351	8004352

(1) Punches and anvils should be hardened.

PF11MF™/PF12MF™ FASTENERS (flare-mount installation)

1. Prepare properly sized mounting hole in sheet with countersink.
2. Place fastener into recessed anvil, and place workpiece over shank of fastener.
3. With installation punch and anvil surfaces parallel, apply squeezing force to flare the retainer of the fastener.



PEMSERTER® Installation Tooling(1)

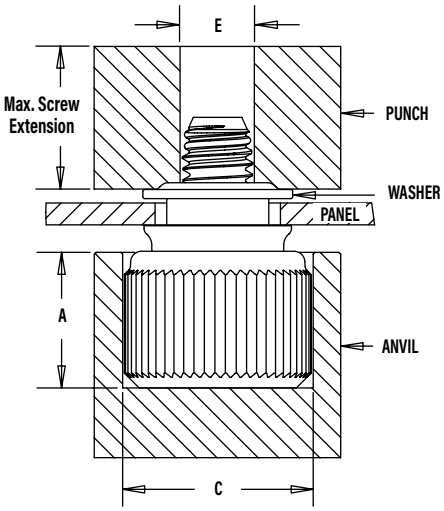
	Thread Code	Anvil Dimensions (in.) A ±.002	Anvil Dimensions (in.) C ±.002	Punch Dimensions (in.) E +.003 -.000	Punch Dimensions (in.) F ±.002	Anvil Part No.	Punch Part No.
UNIFIED	440	.260	.437	.123	.133	8003521	8013670
	632	.390	.468	.143	.156	8003522	8013671
	832	.390	.531	.202	.210	8003523	8013672
	032	.390	.531	.202	.210	8003523	8013672
	0420	.480	.598	.255	.264	8004351	8013674

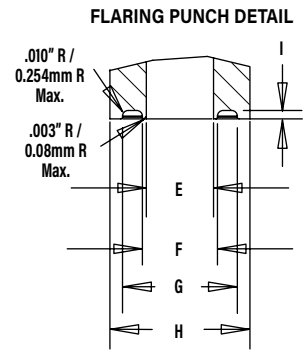
	Thread Code	Anvil Dimensions (mm) A ±0.05	Anvil Dimensions (mm) C ±0.05	Punch Dimensions (mm) E +0.08	Punch Dimensions (mm) F ±0.05	Anvil Part No.	Punch Part No.
METRIC	M3	6.6	11.1	3.12	3.38	8003521	8013670
	M4	9.91	13.49	5.13	5.33	8003523	8013672
	M5	9.91	13.49	5.13	5.33	8003523	8013672
	M6	12.19	15.19	6.48	6.71	8004351	8013674

(1) Punches and anvils should be hardened.

PF11MW™/PF12MW™ FASTENERS

1. Prepare properly sized mounting hole in sheet.
2. Place fastener into recessed anvil, place workpiece over shank of fastener, then place the washer over the shank of the fastener.
3. With installation punch and anvil surfaces parallel, apply squeezing force with flaring punch.





PEMSERTER® Installation Tooling(1)

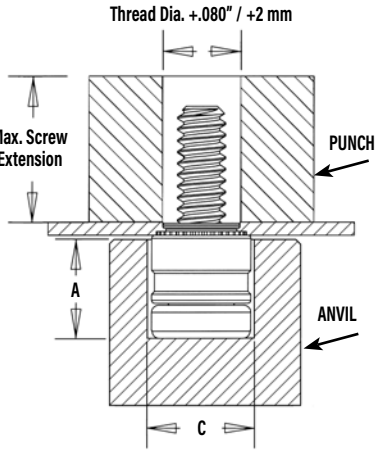
	Thread Code	Anvil Dimensions (in.) A ±.002	Anvil Dimensions (in.) C ±.001	Punch Dimensions (in.) E +.003 -.000	Punch Dimensions (in.) F ±.001	Punch Dimensions (in.) G ±.003	Punch Dimensions (in.) H Min.	Punch Dimensions (in.) I ±.004	Anvil Part No.	Punch Part No.
UNIFIED	440	.260	.437	.120	.135	.204	.250	.015	8003521	8014304
	632	.390	.468	.140	.159	.249	.300	.015	8003522	8014305
	832	.390	.531	.201	.217	.340	.400	.028	8003523	8014306
	032	.390	.531	.201	.217	.340	.400	.028	8003523	8014306
	0420	.480	.598	.252	.271	.430	.500	.028	8004351	8014307

	Thread Code	Anvil Dimensions (mm) A ±0.05	Anvil Dimensions (mm) C ±0.03	Punch Dimensions (mm) E +0.08	Punch Dimensions (mm) F ±0.03	Punch Dimensions (mm) G ±0.08	Punch Dimensions (mm) H Min.	Punch Dimensions (mm) I ±0.1	Anvil Part No.	Punch Part No.
METRIC	M3	6.6	11.1	3.05	3.43	5.18	6.35	.381	8003521	8014304
	M3.5	9.9	11.9	3.56	4.04	6.32	7.62	.381	8003522	8014305
	M4	9.9	13.5	5.11	5.51	8.64	10.16	.711	8003523	8014306
	M5	9.9	13.5	5.11	5.51	8.64	10.16	.711	8003523	8014306
	M6	12.2	15.2	6.4	6.88	10.92	12.7	.711	8004351	8014307

(1) Punches and anvils should be hardened.

PFHV™ FASTENERS

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



PEMSERTER® Installation Tooling(1)

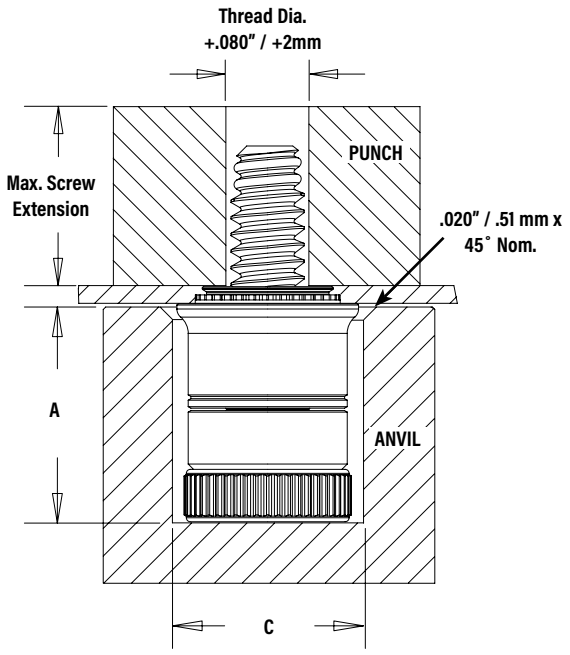
	Thread Code	Anvil Dimensions (in.) A ±.002	Anvil Dimensions (in.) C ±.002	Anvil Part Number	Punch Part Number
UNIFIED	440	.220	.285	8004688	970200009400
	632	.250	.301	8004689	8015656
	832	.285	.332	8005439	970200230400

	Thread Code	Anvil Dimensions (mm) A ±0.05	Anvil Dimensions (mm) C ±0.05	Anvil Part Number	Punch Part Number
METRIC	M3	5.59	7.24	8004688	970200020400
	M3.5	6.35	7.65	8004689	8015656
	M4	7.24	8.43	8005439	970200230400

(1) Punches and anvils should be hardened.

PF7M™ FASTENERS

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



PEMSERTER® Installation Tooling(1)

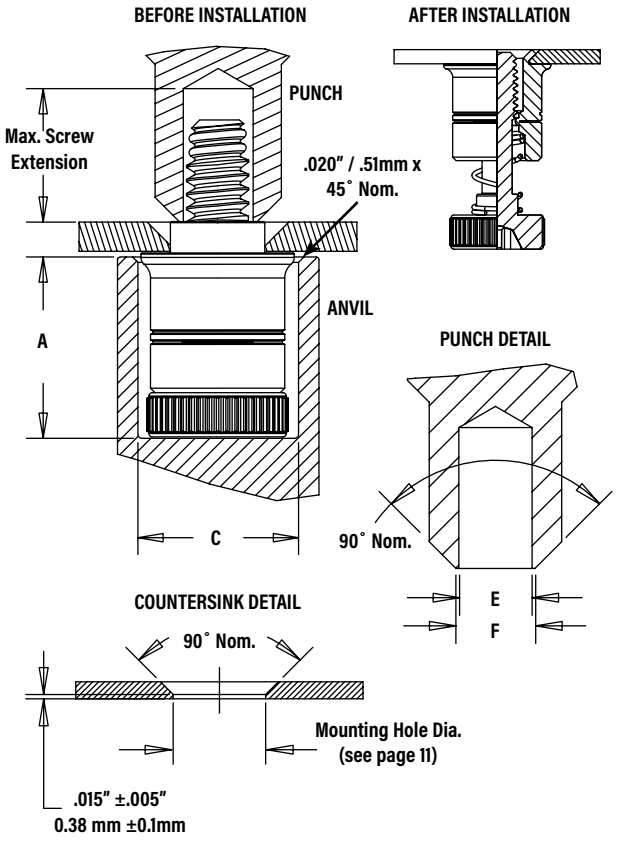
	Thread Code	Anvil Dimensions (in.) A ±.002	Anvil Dimensions (in.) C ±.002	Anvil Part Number	Punch Part Number
UNIFIED	440	.319	.290	8016175	8003518
	632	.333	.330	8016176	8003519
	832	.353	.385	8016177	8003520

	Thread Code	Anvil Dimensions (mm) A ±0.05	Anvil Dimensions (mm) C ±0.05	Anvil Part Number	Punch Part Number
METRIC	M3	8.1	7.34	8016175	8003518
	M4	8.9	9.8	8016177	8003520

(1) Punches and anvils should be hardened.

PF7MF™ FASTENERS (flare-mount installation)

1. Prepare properly sized mounting hole in sheet with countersink. Do not perform any secondary operations such as deburring.
2. Place fastener into recessed anvil, and place workpiece over the shank of fastener.
3. With installation punch and anvil surfaces parallel, apply squeezing force to flare the retainer of the fastener.



PEMSERTER® Installation Tooling(1)

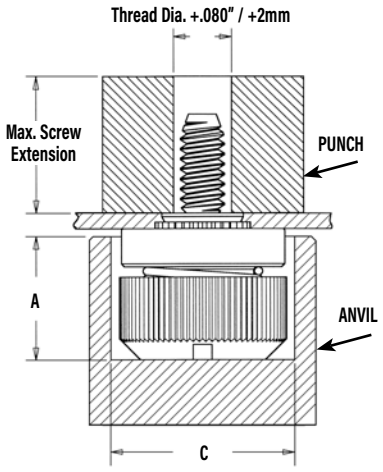
	Thread Code	Anvil Dimensions (in.) A ±.002	Anvil Dimensions (in.) C ±.002	Punch Dimensions (in.) E +.003 -.000	Punch Dimensions (in.) F ±.002	Anvil Part No.	Punch Part No.
UNIFIED	440	.319	.290	.123	.133	8016175	8013670
	632	.333	.330	.143	.156	8016176	8013671
	832	.353	.385	.202	.210	8016177	8013672

	Thread Code	Anvil Dimensions (mm) A ±0.05	Anvil Dimensions (mm) C ±0.05	Punch Dimensions (mm) E +0.08	Punch Dimensions (mm) F ±0.05	Anvil Part No.	Punch Part No.
METRIC	M3	8.1	7.34	3.12	3.38	8016175	8013670
	M4	8.9	9.8	5.13	5.33	8016177	8013672

(1) Punches and anvils should be hardened.

PF30™/PF31™/PF32™ FASTENERS

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



PEMSERTER® Installation Tooling(1)

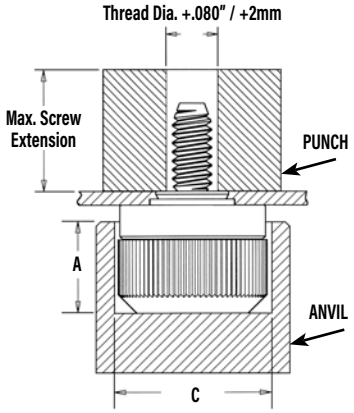
	Thread Code	Anvil Dimensions (in.) A ±.002	Anvil Dimensions (in.) C ±.002	Anvil Part Number	Punch Part Number
UNIFIED	440	.295	.421	975201060	975200060
	632	.295	.453	975201061	975200061
	832	.310	.484	975201062	975200062
	032	.310	.546	975201063	975200063
	0420	.365	.640	975201064	975200064

	Thread Code	Anvil Dimensions (mm) A ±0.05	Anvil Dimensions (mm) C ±0.05	Anvil Part Number	Punch Part Number
METRIC	M3	7.49	10.69	975201060	975200060
	M4	7.87	12.29	975201062	975200062
	M5	7.87	13.87	975201063	975200063
	M6	9.27	16.26	975201064	975200064

(1) Punches and anvils should be hardened.

PF50™/PF51™/PF52™/PF60™/PF61™/PF62™ FASTENERS

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



PEMSERTER® Installation Tooling(1)

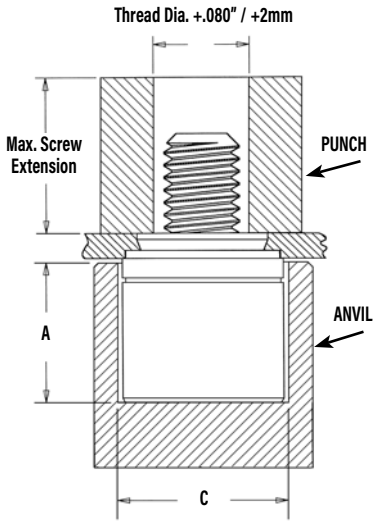
	Thread Code	Anvil Dimensions (in.) A ±.002	Anvil Dimensions (in.) C ±.002	Anvil Part Number	Punch Part Number
UNIFIED	440	.295	.421	975201060	975200060
	632	.295	.453	975201061	975200061
	832	.310	.484	975201062	975200062
	032	.310	.546	975201063	975200063
	0420	.365	.640	975201064	975200064

	Thread Code	Anvil Dimensions (mm) A ±0.05	Anvil Dimensions (mm) C ±0.05	Anvil Part Number	Punch Part Number
METRIC	M3	7.49	10.69	975201060	975200060
	M3.5	7.49	11.51	975201061	975200061
	M4	7.87	12.29	975201062	975200062
	M5	7.87	13.87	975201063	975200063
	M6	9.27	16.26	975201064	975200064

(1) Punches and anvils should be hardened.

PFC4™ FASTENERS

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



Installation Requirements

1. Sheet hardness must be less than 88 on the Rockwell "B" scale.
2. Hole punch should be kept sharp to minimize work hardening around hole.
3. Fastener should be installed in punch side of hole.
4. Fastener should not be installed near bends or other highly cold worked areas where sheet hardness may be greater than 88 on the Rockwell "B" scale.

PEMSERTER® Installation Tooling(1)

	Thread Code	Anvil Dimensions (in.) A ±.002	Anvil Dimensions (in.) C ±.002	Anvil Part Number	Punch Part Number
UNIFIED	440	.345	.358	975200027	975200060
	632	.345	.390	975201243	975200061
	832	.435	.421	975200029	975200062
	032	.435	.452	975201244	975200063

	Thread Code	Anvil Dimensions (mm) A ±0.05	Anvil Dimensions (mm) C ±0.05	Anvil Part Number	Punch Part Number
METRIC	M3	8.76	9.09	975200027	975200060
	M4	11.05	10.69	975200029	975200062
	M5	11.05	11.48	975201244	975200063

(1) Punches and anvils should be hardened.

PFC2P™ FASTENERS

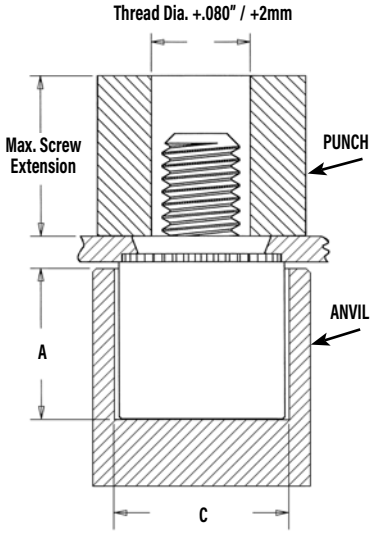
1. Prepare properly sized mounting hole in sheet. Do not perform any secondary operations such as deburring.
2. Place fastener into recessed anvil, and place workpiece (preferably the punch side) over shank of fastener.
3. With installation punch and anvil surfaces parallel, apply squeezing force until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

PEMSERTER® Installation Tooling(1)

	Thread Code	Anvil Dimensions (in.) A ±.002	Anvil Dimensions (in.) C ±.002	Anvil Part Number	Punch Part Number
UNIFIED	440	.345	.323	975200026	975200060
	632	.345	.358	975200027	975200061
	832	.435	.386	975200028	975200062
	032	.435	.421	975200029	9752000063

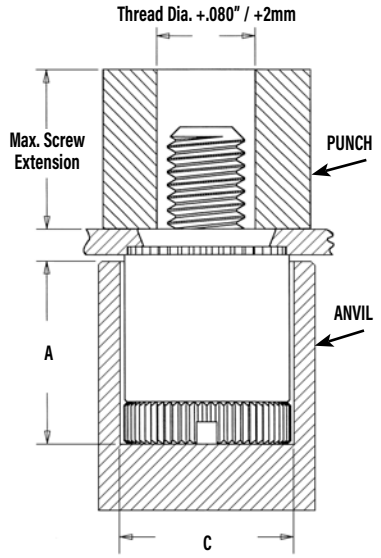
	Thread Code	Anvil Dimensions (mm) A ±0.05	Anvil Dimensions (mm) C ±0.05	Anvil Part Number	Punch Part Number
METRIC	M3	8.76	8.2	975200026	9752000060
	M4	11.05	9.8	975200028	9752000062
	M5	11.05	10.69	975200029	9752000063

(1) Punches and anvils should be hardened.



PFC2™/PFS2™ FASTENERS

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



PEMSERTER® Installation Tooling(1)

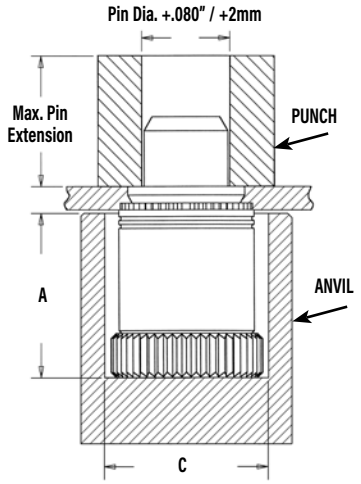
	Thread Code	Anvil Dimensions (in.) A ±.002	Anvil Dimensions (in.) C ±.002	Anvil Part Number	Punch Part Number
UNIFIED	440	.345	.323	975200026	975200060
	632	.345	.358	975200027	975200061
	832	.435	.386	975200028	975200062
	032	.435	.421	975200029	975200063
	0420	.565	.484	975200030	975200064

	Thread Code	Anvil Dimensions (mm) A ±0.05	Anvil Dimensions (mm) C ±0.05	Anvil Part Number	Punch Part Number
METRIC	M3	8.76	8.2	975200026	975200060
	M4	11.05	9.8	975200028	975200062
	M5	11.05	10.69	975200029	975200063
	M6	14.35	12.29	975200030	975200064

(1) Punches and anvils should be hardened.

PTL2™/PSL2™ FASTENERS

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



PEMSERTER® Installation Tooling(1)

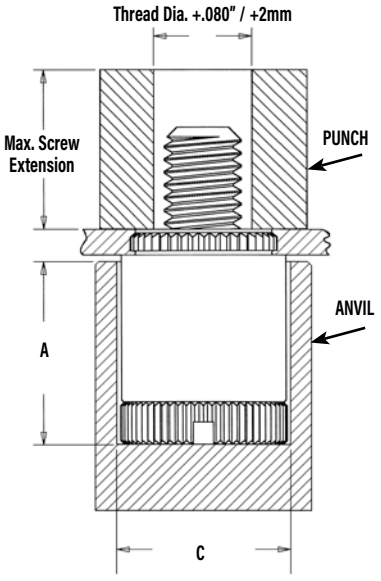
	Type	Anvil Dimensions (in.) A ±.002	Anvil Dimensions (in.) C ±.002	Anvil Part Number	Punch Part Number
UNIFIED	PTL2	.580	.520	975201245	970200013300
	PSL2	.490	.520	8021146	970200013300

	Type	Anvil Dimensions (mm) A ±0.05	Anvil Dimensions (mm) C ±0.05	Anvil Part Number	Punch Part Number
METRIC	PTL2	14.86	13.21	975201245	970200013300
	PSL2	12.47	13.21	8021146	970200013300

(1) Punches and anvils should be hardened.

PFK™ FASTENERS

1. Prepare properly sized mounting hole in board.
2. Place fastener into recessed anvil, and place workpiece over shank of fastener.
3. With installation punch and anvil surfaces parallel, apply squeezing force until the shoulder of the retainer comes in contact with the board.



PEMSERTER® Installation Tooling(1)

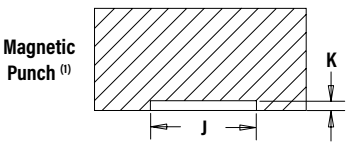
	Thread Code	Anvil Dimensions (in.) A ±.002	Anvil Dimensions (in.) C ±.002	Anvil Part Number	Punch Part Number
UNIFIED	440	.320	.323	975200026	975200060
	632	.320	.358	975200027	975200061

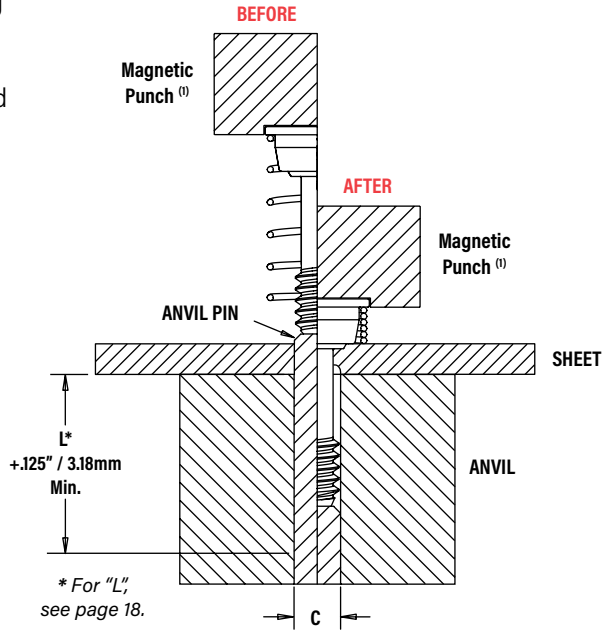
	Thread Code	Anvil Dimensions (mm) A ±0.05	Anvil Dimensions (mm) C ±0.05	Anvil Part Number	Punch Part Number
METRIC	M3	8.13	8.2	975200026	975200060

(1) Punches and anvils should be hardened.

SCBR™ FASTENERS

1. Prepare properly sized mounting hole in sheet. Do not perform any secondary operations such as deburring. If the hole is punched, be sure to install fastener into punched side of hole.
2. Assemble spring on screw by rotating spring counter clockwise and position assembly into recessed magnetic punch.
3. Position hole in workpiece over retractable anvil pin.
4. With installation punch and anvil surfaces parallel, apply squeezing force on top of the screw head and the underside of the sheet material. The squeezing action forces the displacer of the screw into the sheet, causing it to reduce the mounting hole diameter and captivate the screw.





PEMSERTER® Installation Tooling(1)

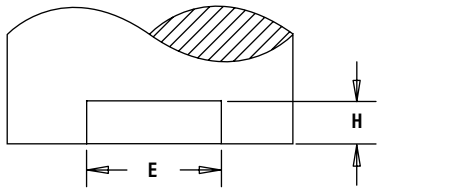
	Thread Code	Installation Tooling Dimensions (in.)			Anvil Part Number	Magnetic Punch Part Number (2)
		C	J	K		
UNIFIED	440	.113 - .116	.354 – .357	.035	970200048300	8016210
	632	.139 - .142	.387 – .390	.035	970200052300	8016211
	832	.165 - .168	.416 – .419	.035	970200054300	8016212

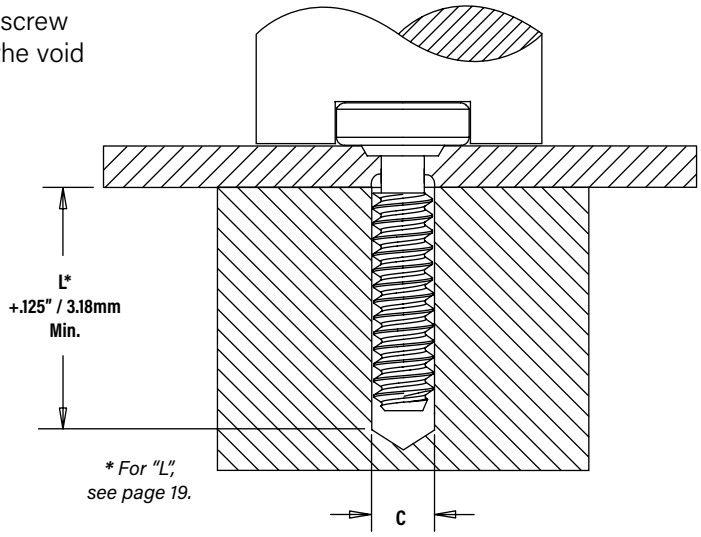
	Thread Code	Installation Tooling Dimensions (mm)			Anvil Part Number	Magnetic Punch Part Number (2)
		C	J	K		
METRIC	M3	3.03 - 3.11	9.25 – 9.32	0.89	970200049300	8016213
	M4	4.03 - 4.11	10.8 – 10.9	0.89	970200053300	8016214

(1) Punches and anvils should be hardened.
(2) Pneumatic punch may also be used. Please contact our PEMSERTER tooling division for punch part numbers.

SCB™/SCBJ™ FASTENERS

1. Prepare properly sized mounting hole in sheet.
2. Place the fastener through mounting hole and into anvil. A flat or recessed punch can be used.
3. With installation punch and anvil surfaces parallel, apply squeezing force to the top of the screw head and the underside of the sheet material. The squeezing action forces the shoulder of the screw into the sheet, displacing sheet material, causing it to fill the void under the head and shoulder of the screw.





PEMSERTER® Installation Tooling(1)

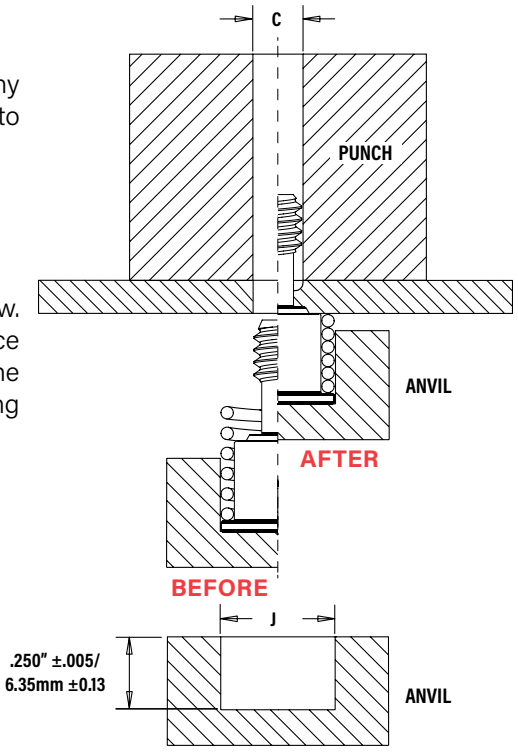
	Thread Code	Installation Tooling Dimensions (in.)		
		C	E	H
UNIFIED	440	.113 - .116	.270 - .280	.073 - .074
	632	.139 - .142	.308 - .318	.073 - .074

	Thread Code	Installation Tooling Dimensions (mm)		
		C	E	H
METRIC	M3	3.03 - 3.11	6.86 - 7.11	1.85 - 1.88
	M4	4.03 - 4.11	8.53 - 8.79	1.85 - 1.88

(1) Punches and anvils should be hardened.

HSCB™ FASTENER INTO HEAT SINK

1. Prepare properly sized mounting hole in heat sink. Do not perform any secondary operations such as deburring. If the hole is punched, be sure to install the fastener into the punch side of the hole.
2. Place the head of the screw into the recess of the installation anvil and position assembly into recessed magnetic punch.
3. Place the spring over the shoulder of the screw, maintaining concentricity.
4. Position the heat sink mounting hole over the screw.
5. Bring the heat sink down over the screw and onto the shoulder of the screw.
6. With installation punch and anvil surfaces parallel, apply a squeezing force to the heat sink and the head of the screw. The squeezing action forces the displacer of the screw into the heat sink, causing it to reduce the mounting hole diameter and captivate the screw and spring.



PEMSERTER® Installation Tooling(1)

	Thread Code	Installation Tooling Dimensions (in.) C	Installation Tooling Dimensions (in.) J	Anvil Part Number	Punch Part Number
UNIFIED	440	.113 - .116	.322 - .324	8018043	970200006300
	632	.139 - .142	.362 - .364	8018044	970200007300

	Thread Code	Installation Tooling Dimensions (mm) C	Installation Tooling Dimensions (mm) J	Anvil Part Number	Punch Part Number
METRIC	M3	3.03 - 3.11	8.43 - 8.48	8018045	970200229300

(1) Punches and anvils should be hardened.

HSR™ NUT/STANDOFF

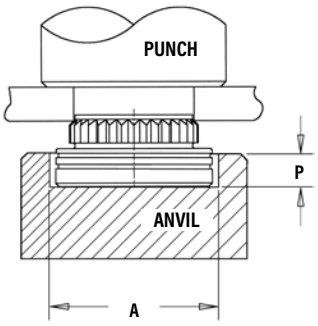
1. Prepare properly sized mounting hole in board.
2. Place fastener into the anvil hole and place the mounting hole over the shank of the fastener as shown in drawing.
3. With installation punch and anvil surfaces parallel, apply squeezing force until shoulder contacts the board.

PEMSERTER® Installation Tooling(1)

	Thread Code	Anvil Dimensions (in.) A	Anvil Dimensions (in.) P ±.005	Anvil Part Number	Punch Part Number
UNIFIED	HSR-440	.228 - .231	.115	8023699	975200048
	HSR-632	.290 - .293	.115	8023701	975200048

	Thread Code	Anvil Dimensions (mm) A	Anvil Dimensions (mm) P ±0.13	Anvil Part Number	Punch Part Number
METRIC	HSR-M3	5.8 - 5.86	2.92	8023700	975200048

(1) Punches and anvils should be hardened.

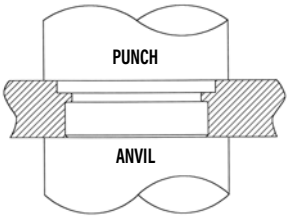


FINAL ASSEMBLY

Once the screw and spring are captivated, assemble the heat sink to the circuit board by tightening the screw into the receptacle nut or standoff until the audible "click" is heard. The screw will continue to rotate, but will no longer be engaged in the threads or continue to actively tighten.

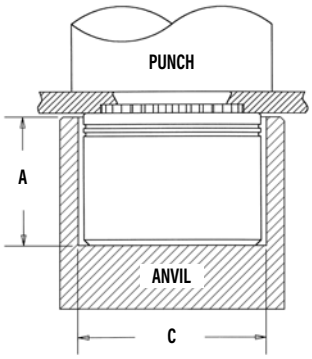
PR10™ FASTENERS

1. Prepare properly sized mounting hole in sheet. Do not perform any secondary operations such as deburring.
2. Place fastener into the mounting hole.
3. With installation punch and anvil surfaces parallel, apply squeezing force until the retainer is flush in the sheet.



N10™ FASTENERS

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



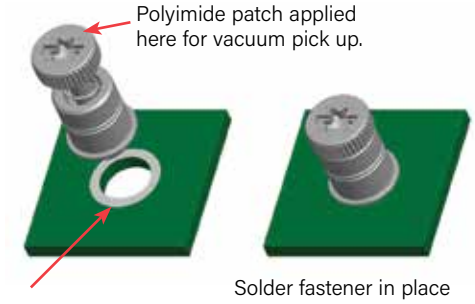
PEMSERTER® Installation Tooling(1)

	Thread Code	Anvil Dimensions (in.) A ±.002	Anvil Dimensions (in.) C ±.002	Anvil Part Number	Punch Part Number
UNIFIED	440	.225	.298	8006124	975200048
	632	.225	.329	8006735	975200048
	832	.225	.361	8006736	975200048
	032	.225	.392	8006174	975200048

	Thread Code	Anvil Dimensions (mm) A ±0.05	Anvil Dimensions (mm) C ±0.05	Anvil Part Number	Punch Part Number
METRIC	M3	5.72	7.57	8006124	975200048
	M4	5.72	9.17	8006736	975200048
	M5	5.72	9.6	8006174	975200048

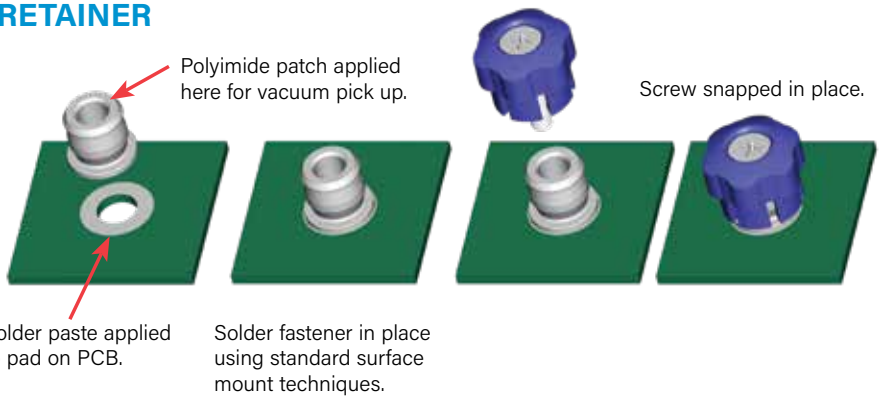
(1) Punches and anvils should be hardened.

SMTPFLSM™ CAPTIVE PANEL SCREWS



Installs in retracted/unfastened position

SMTPF™ RETAINER



CAPTIVE PANEL SCREW PERFORMANCE DATA[1]

PF11™/PF12™/PF11M™/PF12M™/PEM C.A.P.S.® FASTENERS

UNIFIED

Type	Thread Code	Test Sheet Material			
		Aluminum		Cold-Rolled Steel	
		Installation (lbs.)	Retainer Pushout (lbs.)	Installation (lbs.)	Retainer Pushout (lbs.)
PF11 PF12	440	1500	80	2500	145
	632	2000	95	3500	150
	832	3000	100	4500	160
	032	3000	100	4500	160
	0420	3500	105	5000	195

METRIC

Type	Thread Code	Test Sheet Material			
		Aluminum		Cold-Rolled Steel	
		Installation (kN)	Retainer Pushout (N)	Installation (kN)	Retainer Pushout (N)
PF11 PF12	M3	6.7	355	11.1	645
	M4	13.3	445	20	710
	M5	13.3	445	20	710
	M6	15.6	465	22.2	865

PF11MF™ FASTENERS

UNIFIED

Type	Thread Code	Installation (lbs.)	Retainer Pullout (lbs.)
PF11MF	440	250	81
	632	300	175
	832	350	180
	032	350	180
	0420	400	200

METRIC

Type	Thread Code	Installation (kN)	Retainer Pullout (N)
PF11MF	M3	1.1	360
	M4	1.5	800
	M5	1.5	800
	M6	2	890

PF11MW™ FASTENERS

UNIFIED

Type	Thread Code	Test Sheet Material	
		.060" Cold-rolled Steel	
		Swaging Force (lbs.)	Retainer Pullout (lbs.)
PF11MW	440	350	112
	632	400	138
	832	700	202
	032	700	202
	0420	900	212

METRIC

Type	Thread Code	Test Sheet Material	
		1.52mm Cold-rolled Steel	
		Swaging Force (N)	Retainer Pullout (N)
PF11MW	M3	1557	499
	M3.5	1779	612
	M4	3114	897
	M5	3114	897
	M6	4003	945

PFHV™ FASTENERS

UNIFIED

Type	Thread Code	Test Sheet Material			
		Aluminum		Cold-Rolled Steel	
		Installation (lbs.)	Retainer Pushout (lbs.)	Installation (lbs.)	Retainer Pushout (lbs.)
PFHV	440	1700	108	2200	118
	632	1850	117	2400	128
	832	2100	134	2700	147

METRIC

Type	Thread Code	Test Sheet Material			
		Aluminum		Cold-Rolled Steel	
		Installation (kN)	Retainer Pushout (N)	Installation (kN)	Retainer Pushout (N)
PFHV	M3	8.1	516	10.5	564
	M3.5	8.8	561	11.4	614
	M4	9.4	599	12.1	656

(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.

CAPTIVE PANEL SCREW PERFORMANCE DATA(1)

PF7M™ FASTENERS

	Type	Thread Code	Rec. Tightening Torque (in. lbs.) (2)	Min. Screw Tensile (lbs.)	Test Sheet Material			
					Aluminum		Cold-rolled Steel	
					Installation (lbs.)	Retainer Pushout (lbs.)	Installation (lbs.)	Retainer Pushout (lbs.)
UNIFIED	PF7M	440	4.5	580	1500	80	2500	145
	PF7M	632	8.6	855	2000	95	3500	150
	PF7M	832	15.6	1300	3000	100	4500	160

	Type	Thread Code	Rec. Tightening Torque (N • m) (2)	Min. Screw Tensile (N)	Test Sheet Material			
					5052-H34 Aluminum		Cold-rolled Steel	
					Installation (kN)	Retainer Pushout (N)	Installation (kN)	Retainer Pushout (N)
METRIC	PF7M	M3	0.66	2900	6.7	355	11.1	645
	PF7M	M4	1.57	5010	13.3	445	20	710

PF7MF™ FASTENERS

	Type	Thread Code	Rec. Tightening Torque (in. lbs.) (2)	Min. Screw Tensile (lbs.)	Installation (lbs.)	Retainer Pullout (lbs.)
UNIFIED	PF7MF	440	4.5	580	250	81
	PF7MF	632	8.6	855	300	175
	PF7MF	832	15.6	1300	350	180

	Type	Thread Code	Rec. Tightening Torque (N•m) (2)	Min. Screw Tensile (N)	Installation (kN)	Retainer Pullout (N)
METRIC	PF7MF	M3	0.66	2900	1.1	360
	PF7MF	M4	1.57	5010	1.5	800

PF30™/PF31™/PF32™ FASTENERS

	Type	Thread Code	Test Sheet Material			
			Aluminum		Cold-Rolled Steel	
			Installation (lbs.)	Retainer Pushout (lbs.)	Installation (lbs.)	Retainer Pushout (lbs.)
UNIFIED	PF30	440	2200	64	5000	90
	PF31	440	2200	105	5000	110
	PF32	440	2200	185	5000	300
	PF30	632	2400	66	5500	90
	PF31	632	2400	105	5500	130
	PF32	632	2400	190	5500	300
	PF30	832	2800	68	6000	90
	PF31	832	2800	110	6000	130
	PF32	832	2800	200	6000	300
	PF30	032	3500	72	8000	95
	PF31	032	3500	150	8000	160
	PF32	032	3500	260	8000	425
	PF32	0420	4300	320	12000	450

	Type	Thread Code	Test Sheet Material			
			Aluminum		Cold-Rolled Steel	
			Installation (kN)	Retainer Pushout (N)	Installation (kN)	Retainer Pushout (N)
METRIC	PF30	M3	9.8	285	22.2	400
	PF31	M3	9.8	465	22.2	489
	PF32	M3	9.8	823	22.2	1334
	PF30	M4	12.5	302	26.7	400
	PF31	M4	12.5	489	26.7	578
	PF32	M4	12.5	890	26.7	1334
	PF30	M5	15.6	320	35.6	423
	PF31	M5	15.6	667	35.6	712
	PF32	M5	15.6	1156	35.6	1890
	PF32	M6	19.1	1423	53.4	2002

(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) Torque values shown will produce a preload of 70% minimum tensile with nut factor "k" equal to .1

CAPTIVE PANEL SCREW PERFORMANCE DATA(1)

PF50™/PF51™/PF52™/PF60™/PF61™/PF62™ FASTENERS

	Type	Thread Code	Test Sheet Material			
			Aluminum		Cold-Rolled Steel	
			Installation (lbs.)	Retainer Pushout (lbs.)	Installation (lbs.)	Retainer Pushout (lbs.)
UNIFIED	PF50/PF60	440	2200	64	5000	90
	PF51/PF61	440	2200	105	5000	110
	PF52/PF62	440	2200	185	5000	300
	PF50/PF60	632	2400	66	5500	90
	PF51/PF61	632	2400	105	5500	130
	PF52/PF62	632	2400	190	5500	300
	PF50/PF60	832	2800	68	6000	90
	PF51/PF61	832	2800	110	6000	130
	PF52/PF62	832	2800	200	6000	300
	PF50/PF60	032	3500	72	8000	95
	PF51/PF61	032	3500	150	8000	160
	PF52/PF62	032	3500	260	8000	425
	PF52/PF62	0420	4300	320	12000	450

	Type	Thread Code	Test Sheet Material			
			Aluminum		Cold-Rolled Steel	
			Installation (kN)	Retainer Pushout (N)	Installation (kN)	Retainer Pushout (N)
METRIC	PF50/PF60	M3	9.8	285	22.2	400
	PF51/PF61	M3	9.8	465	22.2	489
	PF52/PF62	M3	9.8	823	22.2	1334
	PF50/PF60	M3.5	10.7	294	24.4	400
	PF51/PF61	M3.5	10.7	465	24.4	578
	PF52/PF62	M3.5	10.7	845	24.4	1334
	PF50/PF60	M4	12.5	302	26.7	400
	PF51/PF61	M4	12.5	489	26.7	578
	PF52/PF62	M4	12.5	890	26.7	1334
	PF50/PF60	M5	15.6	320	35.6	423
	PF51/PF61	M5	15.6	667	35.6	712
	PF52/PF62	M5	15.6	1156	35.6	1890
	PF52/PF62	M6	19.1	1423	53.4	2002

PFC4™ FASTENERS

	Type	Thread Code	Test Sheet Material	
			304 Stainless Steel	
			Installation (lbs.)	Retainer Pushout (lbs.)
UNIFIED	PFC4	440	9100	350
		632	10300	400
		832	10800	450
		032	11800	550

	Type	Thread Code	Test Sheet Material	
			304 Stainless Steel	
			Installation (kN)	Retainer Pushout (N)
METRIC	PFC4	M3	40.5	1557
		M4	48	2002
		M5	52.5	2447

PFC2™/PFS2™/PFC2P™ FASTENERS

	Type	Thread Code	Test Sheet Material			
			Aluminum		Cold-Rolled Steel	
			Installation (lbs.)	Retainer Pushout (lbs.)	Installation (lbs.)	Retainer Pushout (lbs.)
UNIFIED	PFC2 PFS2 PFC2P	440	2400	240	3000	300
		632	2700	275	3500	350
		832	2900	300	3800	400
		032	3000	400	4000	500
		0420	3500	400	5000	600

	Type	Thread Code	Test Sheet Material			
			Aluminum		Cold-Rolled Steel	
			Installation (kN)	Retainer Pushout (N)	Installation (kN)	Retainer Pushout (N)
METRIC	PFC2 PFS2 PFC2P	M3	10.7	1068	13.3	1334
		M4	12.9	1334	16.9	1779
		M5	13.3	1779	17.8	2224
		M6	15.6	1779	22.2	2669

PTL2™/PSL2™ FASTENERS

	Type	Test Sheet Material			
		Aluminum		Cold-Rolled Steel	
		Installation (lbs.)	Retainer Pushout (lbs.)	Installation (lbs.)	Retainer Pushout (lbs.)
UNIFIED	PTL2 PSL2	3000	400	4000	500

	Type	Test Sheet Material			
		Aluminum		Cold-Rolled Steel	
		Installation (kN)	Retainer Pushout (N)	Installation (kN)	Retainer Pushout (N)
METRIC	PTL2 PSL2	13.3	1779	17.8	2224

(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.

CAPTIVE PANEL SCREW PERFORMANCE DATA(1)

SCBR™ FASTENERS

	Type	Thread Code	Rec. Tightening Torque (in. lbs.) (2)	Min. Screw Tensile (lbs.)	Test Sheet Material			
					5052-H34 Aluminum		Cold-rolled Steel	
					Installation (lbs.)	Pushout (lbs.)	Installation (lbs.)	Pushout (lbs.)
UNIFIED	SCBR	440	5	590	1900	130	2600	145
	SCBR	632	9	990	2000	175	3500	200
	SCBR	832	17	1460	2250	225	3825	260

	Type	Thread Code	Rec. Tightening Torque (N • m) (2)	Min. Screw Tensile (N)	Test Sheet Material			
					5052-H34 Aluminum		Cold-rolled Steel	
					Installation (kN)	Pushout (N)	Installation (kN)	Pushout (N)
METRIC	SCBR	M3	0.74	3400	8	580	12	650
	SCBR	M4	1.7	5700	10	1000	17	1150

SCB™/SCBJ™ FASTENERS

	Type	Thread Code	Rec. Tightening Torque (in. lbs.) (2)	Min. Screw Tensile (lbs.)	Test Sheet Material			
					5052-H34 Aluminum		Cold-rolled Steel	
					Installation (lbs.)	Pushout (lbs.)	Installation (lbs.)	Pushout (lbs.)
UNIFIED	SCB / SCBJ	440	5	590	1900	130	2600	145
	SCB / SCBJ	632	9	990	2000	175	3500	200

	Type	Thread Code	Rec. Tightening Torque (N • m) (2)	Min. Screw Tensile (N)	Test Sheet Material			
					5052-H34 Aluminum		Cold-rolled Steel	
					Installation (kN)	Pushout (N)	Installation (kN)	Pushout (N)
METRIC	SCB / SCBJ	M3	0.74	3400	8	580	12	650
	SCB / SCBJ	M4	1.7	5700	10	1000	17	1150

HSCB™ FASTENERS

	Type	Thread Code	Test Sheet Material			
			Aluminum		Cold-rolled Steel	
			Installation (lbs.)	Pushout (lbs.)	Installation (lbs.)	Pushout (lbs.)
UNIFIED	HSCB	440	1900	60	2600	80
	HSCB	632	2000	90	3500	120

	Type	Thread Code	Test Sheet Material			
			Aluminum		Cold-rolled Steel	
			Installation (kN)	Pushout (N)	Installation (kN)	Pushout (N)
METRIC	HSCB	M3	8	265	12	355

HSR™ FASTENERS

	Type	Thread Code	Test Sheet Material	
			.060" FR-4 Panel	
			Installation (lbs.)	Pushout (lbs.)
UNIFIED	HSR	440	400	65
	HSR	632	500	80

	Type	Thread Code	Test Sheet Material	
			1.5mm FR-4 Panel	
			Installation (kN)	Pushout (N)
METRIC	HSR	M3	2.2	290

(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) Torque values shown will produce a preload of 70% minimum tensile (125 ksi / 935 MPa) with nut factor "k" equal to .1

CAPTIVE PANEL SCREW PERFORMANCE DATA[1]

PR10™ FASTENERS

UNIFIED				
Type	Thread Code	Test Sheet Material		
		Aluminum	Cold-Rolled Steel	
		Installation (lbs.)	Installation (lbs.)	
PR10	440	2100	3000	
	632	2100	3000	
	832	2100	3600	
	032	2400	4200	

METRIC			
Type	Thread Code	Test Sheet Material	
		Aluminum	Cold-Rolled Steel
		Installation (kN)	Installation (kN)
PR10	M3	9.3	13.3
	M4	9.3	16
	M5	10.7	18.7

N10™ FASTENERS

UNIFIED					
Type	Thread Code	Test Sheet Material			
		Aluminum		Cold-Rolled Steel	
		Installation (lbs.)	Pushout (lbs.)	Installation (lbs.)	Pushout (lbs.)
N10	440	2500	95	3600	130
	632	2500	105	4000	145
	832	3000	110	5000	180
	032	3500	120	6300	200

METRIC					
Type	Thread Code	Test Sheet Material			
		Aluminum		Cold-Rolled Steel	
		Installation (kN)	Pushout (N)	Installation (kN)	Pushout (N)
N10	M3	11.1	423	16	578
	M4	13.3	489	22.2	800
	M5	15.6	534	28	890

REELFAST® SMTPFLSM™ FASTENERS[2]

UNIFIED				
Type and Thread Size	Min. Tensile Strength (lbs.)	Rec. Tightening Torque (in. lbs.) [3]	Test Sheet Material .060" P.C. Board	
			Pull-off (lbs.) [4]	
SMTPFLSM-440	556	4.4	100	
SMTPFLSM-632	724	7.0	105	

METRIC				
Type and Thread Size	Min. Tensile Strength (N)	Rec. Tightening Torque (N·m) [3]	Test Sheet Material 1.5 mm P.C. Board	
			Pull-off (N) [4]	
SMTPFLSM-M3	2900	0.61	445	
SMTPFLSM-M3.5	3269	0.8	465	

REELFAST® SMTPR™ RETAINER[2]

Part Number	Test Sheet Material .062" Single Layer RF-4	
	Pushout (lbs.)	Pushout (N)
SMTPR-6-1ET	161.4	718

TESTING CONDITIONS FOR SMTPFLSM FASTENERS AND SMTPR RETAINER

Oven	Quad ZCR convection oven
High Temp	473˚F / 245˚C
Spokes	2 Spoke Pattern
Board Finish	62% Sn, 38% Pb
Screen Printer	Ragin Manual Printer
Vias	None
Paste	Amtech NC559LF Sn96.5/3.0Ag/0.5Cu (SAC305) **(SMTPR)** Alpha CVP-390 Sn96.5/3.0Ag/0.5Cu (SAC305) **(SMTPFLSM)**
Stencil	.0067" / 0.17 mm thick **(SMTPR)** .005" / 0.13 mm thick **(SMTPFLSM)**

PFK™ FASTENERS

UNIFIED				
Type	Thread Code	Test Sheet Material FR-4 Fiberglass		
		Installation (lbs.)	Pushout (lbs.)	
PFK	440	250	55	
	632	400	60	

METRIC			
Type	Thread Code	Test Sheet Material FR-4 Fiberglass	
		Installation (kN)	Pushout (N)
PFK	M3	1.1	245

(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) 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.

(3) Torque values shown will produce a preload of 70% minimum tensile with a nut factor "k" equal to .1.

(4) Failure occurred at the solder joint. Screw retention strength is greater than the retainer.

MOST COMMONLY USED AND RECOMMENDED CAPTIVE MATING HARDWARE FOR USE WITH CAPTIVE PANEL SCREWS

SELF-CLINCHING NUTS MATED WITH CAPTIVE PANEL SCREW

(See PEM® Bulletin CL)

- S/CLS/SS/CLSS provide load-bearing threads in thin sheets with high pushout and torque-out resistance.
- SP nuts provide load-bearing threads in stainless steel sheets with a hardness of HRB 90 (Rockwell "B" scale) / HB 192 (Hardness Brinell) or less.
- CLA aluminum nuts are recommended for aluminum sheets with a hardness of HRB 50 (Rockwell "B" scale) / HB 89 (Hardness Brinell) or less.
- SMPS nuts are for installation into ultra-thin sheets and can be mounted closer to the edge of a sheet than other self-clinching nuts.
- SL nuts have a unique TRI-DENT® locking feature which meets demanding locking performance requirements.

AS/AC/A4 FLOATING NUTS MATED WITH CAPTIVE PANEL SCREW

(See PEM® Bulletin ALA)

- AS (carbon steel) and AC (300 series stainless steel) floating nuts install into sheets with hardness up to HRB 70 / HB 125 on the Rockwell "B" scale.
- A4 (400 series stainless steel) floating nuts install into sheets with hardness up to HRB 88 / HB 183 on the Rockwell "B" scale.
- Thread locking versions also available.

B/BS BLIND NUTS MATED WITH CAPTIVE PANEL SCREW

(See PEM® Bulletin B)

- B/BS nuts are used in applications requiring closed thread ends.
- Provides barrier to protect threads against foreign matter.
- Protects internal components from intrusion of screws.

F FLUSH NUTS MATED WITH CAPTIVE PANEL SCREW

(See PEM® Bulletin F)

- Designed to be completely flush in sheets as thin as .060"/1.5mm.
- Ideal for applications where a thin sheet requires load-bearing threads but still must remain smooth, with no protrusions on either surface.
- The hexagonal head ensures high axial and torsional strength.
- F nuts can be ordered to conform to US NASM45938/4 specifications.

PC BOARD NUTS MATED WITH CAPTIVE PANEL SCREW

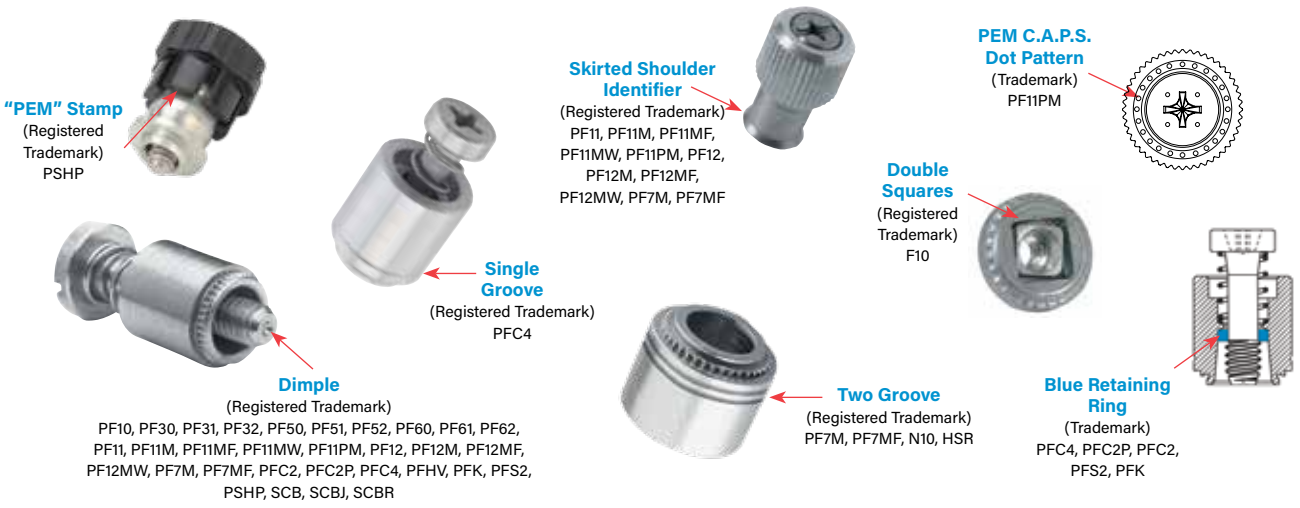
(See PEM® Bulletin K)

- KF2/KFS2 broaching nuts utilize specially formed axially groves that can be mounted into a hole to provide a permanent, strong, threaded attachment point in PC boards.
- SMTSO surface mount nuts also available.

For the best mating hardware for your application please contact our Tech Support line or your local representative.

PEM® FASTENER IDENTIFICATION AND TRADEMARKS

To be sure that you are getting genuine PEM® brand fasteners, look for the unique PEM product markings and identifiers.



These panel fastener styles are protected by U.S. patents:

No. 6,814,530

No. D656,392S

No. D603,693S

Fastener drawings and models are available at www.pemnet.com

All PEM® products meet our stringent quality standards. If you require additional industry or other specific quality certifications, special procedures and/or part numbers are required. Please contact your local sales office or representative for further information.

Regulatory compliance information is available in Technical Support section of our website. Specifications subject to change without notice. See our website for the most current version of this bulletin.

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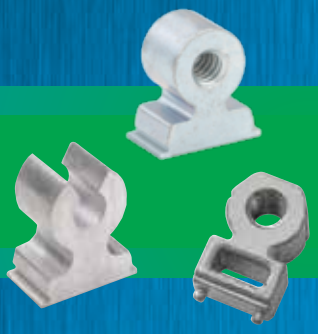
BULLETIN



RA™

RIGHT ANGLE CLINCH FASTENERS

PEM®

RIGHT ANGLE CLINCH FASTENERS

PEM® R'ANGLE® fasteners provide strong right angle attachment points in sheet metal or P.C. boards. **RAA™** and **RAS™** fasteners for metal are simply pressed into a rectangular mounting hole of the proper size. **SMTRA™** fasteners are installed onto P.C. boards using standard surface mount techniques. The holding power of the fastener is unaffected by the repeated tightening and loosening of the screw.

PEM® R'ANGLE® fasteners are cost-effective replacements for:

- Bent edge tabs
- Angle brackets
- Bent center tabs
- Tack welds
- Bent flanges
- Loose hardware

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

- More predictable designs
- Tighter design control
- Reduction of loose hardware
- Unmarred panel surfaces
- Material savings
- Improved shielding characteristics
- Fewer assembly steps

RAS™ fasteners for sheet metal is a threaded right angle fastener that accepts standard unified or metric screws - **PAGE 3**

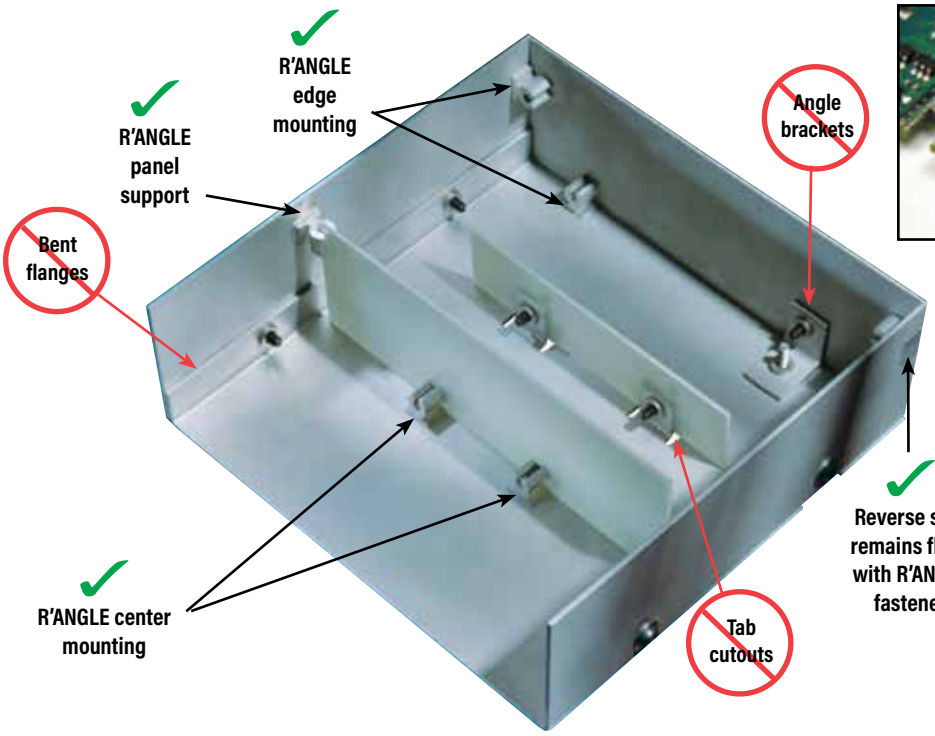
RAA™ right angle fasteners for sheet metal can accept thread forming or self-tapping screws - **PAGE 4**

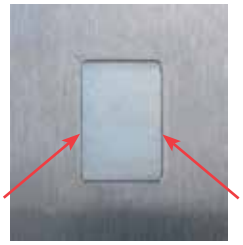
SMTRA™ right angle threaded fasteners are installed on to PC boards using standard surface mount techniques. They accept standard unified or metric screws - **PAGE 5**

Material and finish specifications - PAGE 6

Installation - PAGES 6 - 7

Performance data - PAGES 7 - 8

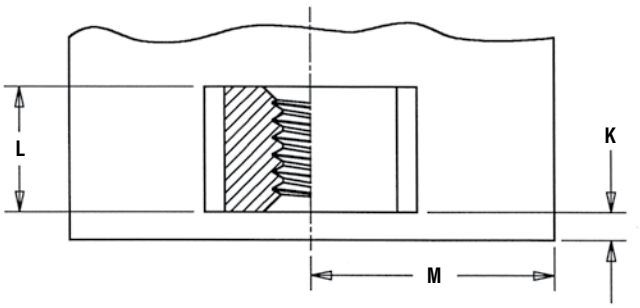


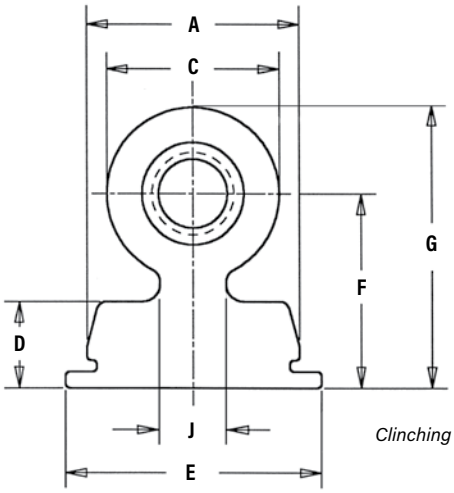


Depending on placement of the fastener within the mounting hole, a slight gap may be noticeable along the non-clinching edges of the fastener after installation.

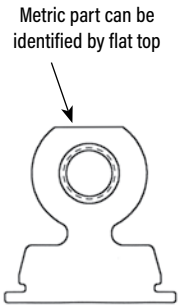
PEM® RAS™ THREADED RIGHT ANGLE FASTENER

For use with standard metric or unified screws





Clinching profile may vary.



PART NUMBER DESIGNATION

RA	S	440	-	9	-	6	ZI
Type	Material (steel)	Thread Code		Height Code		Length Code	Finish Code

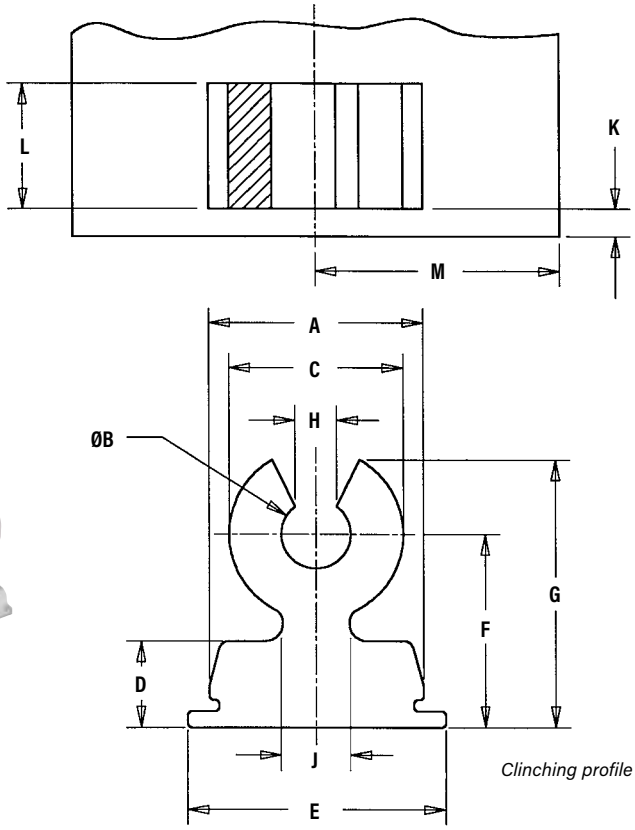
All dimensions are in inches.

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

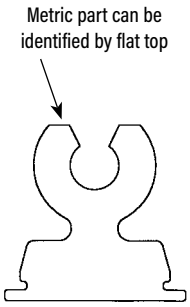
All dimensions are in millimeters.

	Thread Size x Pitch	Type	Fastener Material	Thread Code	Height Code	Length Code	Length L ±0.08	Min. Sheet Thickness	Hole Size In Sheet +0.05 -0.03	A ±0.08	C Nom.	D Nom.	E ±0.15	Height F ±0.15	G Nom.	J Nom.	Min. Part Face to Edge K	Min. Dist. Hole ℄ To Edge M
METRIC	M3 x 0.5	RA	S	M3	7	3	2.89	1	8 x 3	7.89	6.35	3.18	9.47	7	9.78	2.87	1.02	7.6
						4	3.89		8 x 4									9.1
						6	5.89		8 x 6									10.7
	M4 x 0.7	RA	S	M4	9	4	3.89	1	10 x 4	9.89	8.89	3.18	11.48	9	13.21	4.06	1.02	10
						7	6.89		10 x 7									14.7
						9	8.89		10 x 9									16.3

RAA™ RIGHT ANGLE FASTENER
For use with thread forming screws



Clinching profile may vary.



PART NUMBER DESIGNATION

RA - A 4 - 9 - 6

- RA: Type
- A: Material (aluminum)
- 4: Screw Size Code
- 9: Height Code
- 6: Length Code

All dimensions are in inches.

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

All dimensions are in millimeters.

	Thread Form Screw Size	Type	Fastener Material	Screw Size Code	Height Code	Length Code	Length L ±0.08	Min. Sheet Thickness	Hole Size In Sheet +0.05 -0.03	A ±0.08	ØB ±0.1	C Nom.	D Nom.	E ±0.15	Height F ±0.15	G Nom.	H ±0.18	J Nom.	Min. Part Face to Edge K	Min. Dist. Hole ℄ To Edge M
METRIC	M3 x 0.5	RA	A	M3	7	4	3.89	1	8 x 4	7.89	2.77	6.35	3.18	9.42	7	9.27	1.5	2.87	1.02	9.1
						6	5.89		8 x 6											10.7
	M4 x 0.7	RA	A	M4	9	7	6.89	1	10 x 7	9.89	3.68	8.89	3.18	11.43	9	12.19	1.97	4.06	1.02	14.7
						9	8.89		10 x 9											16.3

SMTRA™ ReelFast® RIGHT ANGLE FASTENERS

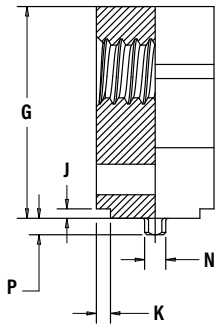
Surface mounted and threaded to accept standard unified or metric screw

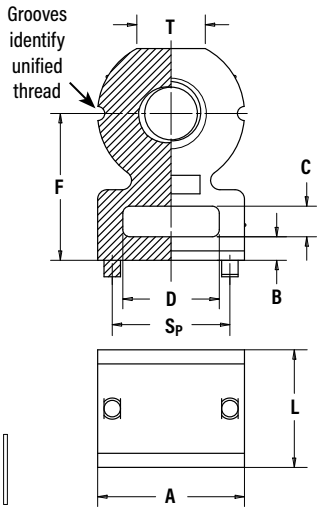
Patented

PART NUMBER DESIGNATION

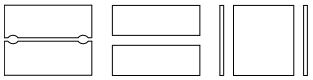
SMTRA - 256 - 8 - 6 ET

SMTRA	256	8	6	ET
Type and Material (zinc diecast)	Thread Code	Height Code	Length Code	Finish Code





Stencil Masking Examples



All dimensions are in inches.

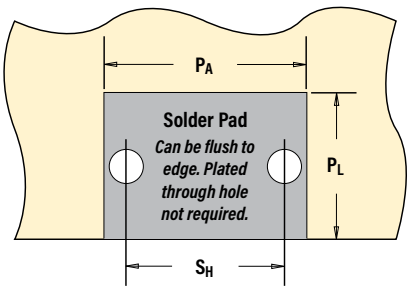
	Thread Size	Type	Thread Code	Height Code	Length Code	Length L ±.005	Min. Sheet Thickness	Hole Size In Sheet +.003 -.000	A ±.006	B ±.006	C ±.006	D ±.006	Height F ±.006	G ±.006	J Nom.	K Nom.	N Max.	P Max.	S_P ±.003	T Nom.
UNIFIED	.086-56 (#2-56)	SMTRA	256	8	6	.188	.040	.053	.218	.040	.060	.140	.250	.345	.020	.030	.048	.040	.157	.105
	.112-40 (#4-40)	SMTRA	440	9	6	.188	.040	.053	.250	.050	.065	.160	.281	.390	.020	.030	.048	.040	.188	.125
	.138-32 (#6-32)	SMTRA	632	10	8	.250	.040	.053	.312	.050	.065	.205	.312	.450	.020	.030	.048	.040	.250	.145
	.164-32 (#8-32)	SMTRA	832	12	9	.281	.040	.053	.375	.050	.075	.250	.375	.535	.020	.030	.048	.040	.312	.195

All dimensions are in millimeters.

	Thread Size x Pitch	Type	Thread Code	Height Code	Length Code	Length L ±0.13	Min. Sheet Thickness	Hole Size In Sheet +0.08	A ±0.15	B ±0.15	C ±0.15	D ±0.15	Height F ±0.15	G ±0.15	J Nom.	K Nom.	N Max.	P Max.	S_P ±0.08	T Nom.
METRIC	M2 x 0.4	SMTRA	M2	6	5	5	1	1.35	5.5	1	1.5	3.5	6	8.4	0.5	0.75	1.22	1	4	2.65
	M2.5 x 0.45	SMTRA	M25	6	5	5	1	1.35	5.5	1	1.5	3.5	6	8.4	0.5	0.75	1.22	1	4	2.65
	M3 x 0.5	SMTRA	M3	7	5	5	1	1.35	6.35	1.25	1.65	4	7	9.75	0.5	0.75	1.22	1	4.75	3.2
	M4 x 0.7	SMTRA	M4	9	7	7	1	1.35	9.53	1.25	1.65	6.35	9	13.1	0.5	0.75	1.22	1	7.9	4.8

	Thread Code	Pad Width P_A Min.	Pad Length P_L Min.	Hole Spacing S_H ±.002	Hole Size In Sheet +.003 -.000
UNIFIED	256	.262	.171	.157	.053
	440	.294	.171	.188	.053
	632	.356	.233	.250	.053
	832	.419	.264	.312	.053

	Thread Code	Pad Width P_A Min.	Pad Length P_L Min.	Hole Spacing S_H ±0.05	Hole Size In Sheet +0.08
METRIC	M2	6.62	4.57	4	1.35
	M25	6.62	4.57	4	1.35
	M3	7.47	4.57	4.75	1.35
	M4	10.65	6.57	7.9	1.35



If desired, space can be used for fast cable tie mounting.

Part Number	Parts Per Reel	Pitch (mm)	Tape Width (mm)
SMTRA256-8-6	375	16	24
SMTRA440-9-6	300	16	24
SMTRA632-10-8	200	20	32
SMTRA832-12-9	200	20	32
SMTRAM2-6-5	375	16	24
SMTRAM25-6-5	375	16	24
SMTRAM3-7-5	300	16	24
SMTRAM4-9-7	200	20	32

MATERIAL AND FINISH SPECIFICATIONS

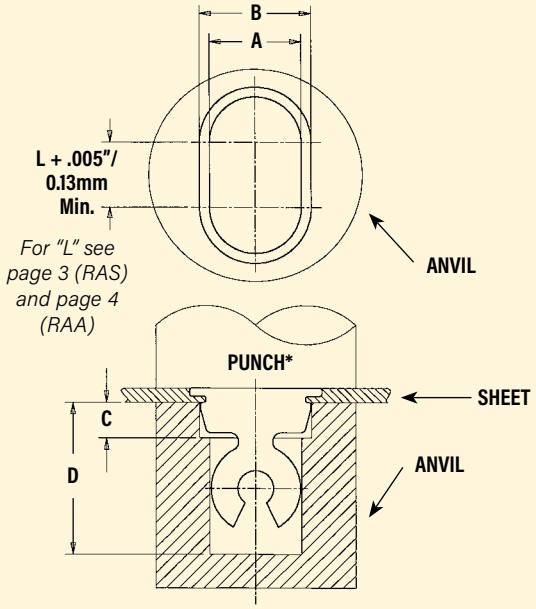
	Threads	Fastener Materials			Standard Finishes [1]			For Use In Sheet Hardness: [2]		
Type	Internal, ASME B1.1, 2B ASME B1.13M, 6H	Aluminum	Steel	Zinc Diecast	Zinc Plated, 5µm, Colorless	Natural	Electro-plated Tin ASTM B 545, Class A with Clear Preservative Coating, Annealed	HRB 45 / HB 84 or Less	HRB 60 / HB 107 or Less	P.C. Board
RAS	▪		▪		▪				▪	
RAA		▪				▪		▪		
SMTRA	▪			▪			▪			▪
Part Number Codes for Finishes					ZI	None	ET [3]			

(1) See PEM Technical Support section of our web site for related plating standards and specifications.
(2) HRB - Hardness Rockwell "B" Scale. HB - Hardness Brinell.
(3) Optimal solderability life noted on packaging.

INSTALLATION

RAS™ and RAA™ Fasteners

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



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

Installation tooling is available from PennEngineering.

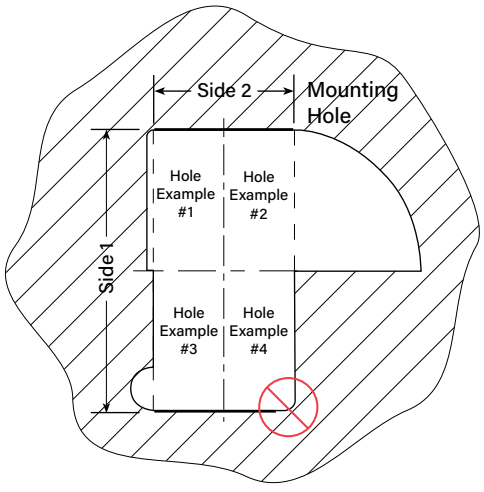
PEMSERTER® Installation Tooling

	Screw or Thread Size Code	Anvil Dimensions (in.) A ±.001	B ±.001	C ±.005	D Min.	Anvil Part Number	Punch Part Number
UNIFIED	4 / 440	.257	.313	.100	.425	8002711	8003076
	6 / 632	.307	.376	.100	.500	8002712	
	8 / 832	.357	.407	.100	.575	8003642	

	Screw or Thread Size Code	Anvil Dimensions (mm) A ±0.03	B ±0.03	C ±0.1	D Min.	Anvil Part Number	Punch Part Number
METRIC	M3	6.53	8.02	2.54	10.8	8002713	8003076
	M4	9.07	10.03	2.54	12.7	8002714	

MOUNTING HOLE EXAMPLES

The mounting hole is defined by two dimensions. The two thick lines shown must be straight for the entire length defined by "Side 2" and must be separated by the distance shown as "Side 1" (Side 1 and Side 2 are the two dimensions given for the mounting hole on pages 3 and 4). The illustration shows three examples (#1, #2, and #3) of how it can be achieved. Example #4 in the lower right side will not work.

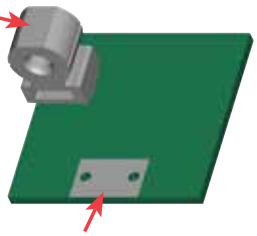


INSTALLATION NOTES

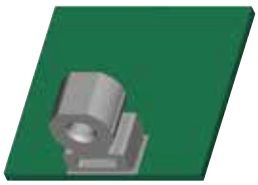
- For best results we recommend using a PEMSERTER® press for installation of PEM self-clinching fasteners. Please check our website for more information.
- Visit the Animation Library on our website to view the installation process for this product.

SMTRA™ SURFACE MOUNT FASTENERS

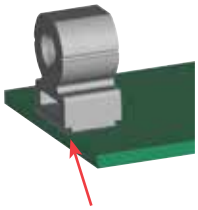
Flat top for vacuum pick up.



Solder paste applied to pad on PCB.



Solder fastener in place using standard surface mount techniques.



Undercut to accept solder fillet and permit flush to edge installation.

PERFORMANCE DATA(1)

RAS™ THREADED FASTENERS

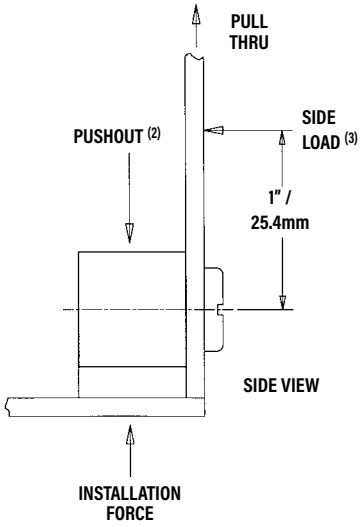
	Thread Code	Height Code	Length Code	Test Sheet Material: 5052-H34 Aluminum — Max. Rec. Tightening Torque (in. lbs.)	Installation (lbs.)	Pushout (lbs.) (2)	Side Load (lbs.) (3)	Pull Thru (lbs.)	Cold-rolled Steel — Max. Rec. Tightening Torque (in. lbs.)	Installation (lbs.)	Pushout (lbs.) (2)	Side Load (lbs.) (3)	Pull Thru (lbs.)
UNIFIED	440	9	4	13	1800	100	7	80	16	2400	180	9	80
			6	17	1800	145	8	80	17	2400	260	9	80
			8	17	2100	180	13	80	17	3000	315	15	80
	632	10	4	20	2000	100	7	85	20	2500	190	9	85
			8	21	2500	190	12	85	26	3200	335	16	85
			10	21	2800	230	16	85	26	4000	385	20	85
	832	12	6	20	2400	140	15	100	27	3200	260	11	100
			9	23	3300	195	16	100	29	4200	345	20	100
			12	30	3500	260	20	100	35	4700	420	27	100

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

RAA™ FASTENERS

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

	Screw Size Code	Height Code	Length Code	Thread Forming Torque (N·m)	Max. Rec. Tightening Torque (N·m)	Test Sheet Material	Installation (kN)	Pushout (N) (2)	Side Load (N) (3)	Pull Thru (N)
METRIC	M3	7	4	.17	.56	5052-H34	7.1	556	27	356
			6	.23	1.02	Aluminum	7.1	756	44	356
	M4	9	7	.56	2.26	5052-H34	13.3	890	76	423
			9	.56	2.83	Aluminum	13.3	1045	107	423



(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) Pushout test is conducted without side panel attached to R'ANGLE® fastener.

(3) 1" / 25.4mm from screw centerline.

PERFORMANCE DATA

SMTRA™ R'ANGLE® FASTENERS WITH ET FINISH[1][2]

UNIFIED	Part Number	Pullout (lbs.)	Side Load (lbs.)
	SMTRA256-8-6	51.7	7.1
	SMTRA440-9-6	89.5	10.8
	SMTRA632-10-8	110.3	8.4
	SMTRA832-12-9	137.2	21.2

METRIC	Part Number	Pullout (N)	Side Load (N)
	SMTRAM2-6-5	418.2	56.8
	SMTRAM25-6-5	216.5	36.9
	SMTRAM3-7-5	257.6	41.3
	SMTRAM4-9-7	369.3	73.3

TESTING CONDITIONS

Oven	Quad ZCR convection oven with 4 zones
Vias	None
High Temp	518˚F / 270˚C
Board Finish	62% Sn, 38% Pb
Paste	Amtech NC559LF Sn96.5/3.0Ag/0.5Cu (SAC305) Lead-free
Board	.062" thick, Single Layer FR-4
Stencil	.0067" / 0.17 mm thick
Screen Printer	Ragin Manual Printer

(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 the literature section on our web site.

Fastener drawings and models are available at www.pemnet.com

PEM® "Circle on Pedestal" (Registered Trademark)

All PEM® products meet our stringent quality standards. If you require additional industry or other specific quality certifications, special procedures and/or part numbers are required. Please contact your local sales office or representative for further information.

Regulatory compliance information is available in Technical Support section of our website. Specifications subject to change without notice. See our website for the most current version of this bulletin.

PennEngineering®

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

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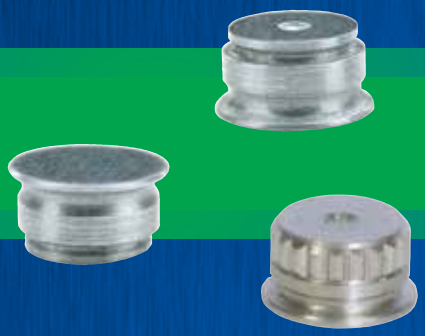
SPOTFAST® FASTENERS

BULLETIN **SF**



PEM®

1115

SPOTFAST® FASTENERS

Allows permanent joining in metal to metal and metal to PCB/plastic panels

- Alternative to riveting and spot welding.
- No special installation equipment required.
- Flush or sub-flush on both sides.
- Minimal space requirements.
- No countersinking or other hole treatment required.
- Can be installed blind into bottom (panel 2) sheet.
- Can be concealed with paints and powder coatings.
- RoHS compliant.

Unlike rivets that "bulb" during installation, the ultimately flush profile of SpotFast® fasteners allows for unobtrusive attachment requiring minimal space. A smooth surface is retained for finishing and fasteners can be concealed easily with paints or powder coatings.

Type SF fasteners create a permanent, flush joining of two sheets. Squeezing the fastener into place causes a cold-flow of panel material into the fastener's two separate clinch profiles. Type SF is **designed for joining metal to metal.** They install smooth with the top sheet, and flush or sub-flush with the bottom sheet. Fasteners can attach two metal sheets too difficult to weld; fasten sheets of unequal thicknesses; join dissimilar metals unable to be welded; and even attach ultra-thin metal sections.	
Type SFP fasteners offer the same benefits as Type SF but are made from precipitation hardened stainless steel **for installation into stainless steel sheets**.	
Type SFW fasteners offer the same benefits as Type SF but are specifically **designed to allow pivoting of two sheets of metal.** A wave washer provides the consistent torsion to allow repeatable rotation.	
Type SFK flush joining of metal to PCB/plastic panels	

SpotFast fasteners shown actual size.

PART NUMBER DESIGNATION

SF	-	3	-	1.0	-	ZI
SFP	-	3	-	1.0		
SFW	-	3	-	1.0	-	LZ
SFK	-	3	-	1.0	-	ZI
		↓		↓		↓
		Type		Size (Panel 1 Mounting Hole Code)		Thickness Code		Finish

Can be installed blind into bottom (panel 2) sheet.

SPOTFAST® FASTENER SELECTOR GUIDE

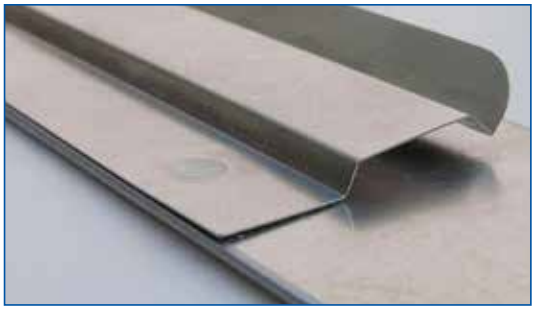
Type	Primary Use				
	Joining two panels of similar or dissimilar metals	Joining two panels when one or more is stainless steel	Joining a metal panel to a PCB or plastic panel	Single point hinging applications	Offers highest corrosion resistance in product family
SF	▪			▪ (1)	
SFP	▪ (1)	▪		▪ (1)	▪
SFW	▪ (1)			▪	
SFK	▪ (1)		▪	▪ (1)	

(1) Not primary use.

METAL TO METAL

Type SF fastener installed into unequal thickness sheets. Fastener is smooth with top of panel 1.

Type SF fastener installed sub-flush with panel 2. Fastener will be flush at minimum sheet thickness.

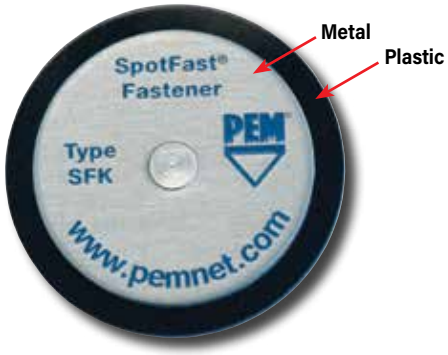


Sheets as thin as .005" / 0.13 mm may be attached to thicker sheets using a PEM® SpotFast® fastener. The thin sheet must be panel 1 and the "L" dimension must be equal to or less than the combined panel thicknesses. Consult our Applications Engineering department for more information.

HINGING APPLICATIONS

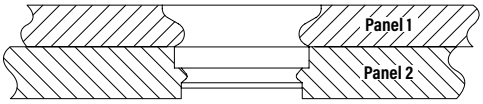
Type SFW fastener offers flush-mounted, smooth pivot point.

METAL TO PCB/PLASTIC

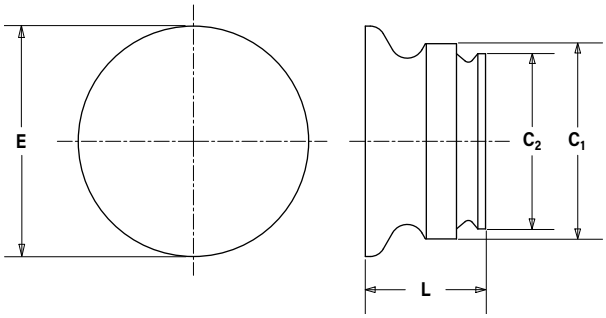


Type SFK fastener joining metal to plastic.

TYPES SF AND SFP FOR PERMANENT JOINING OF TWO METAL SHEETS



Types SF & SFP installed in sheets.



Patented.

Type SF

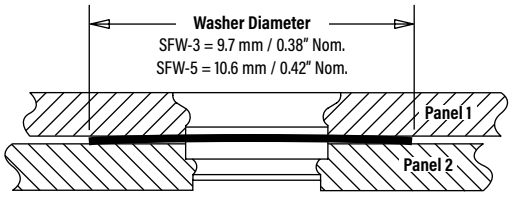
Type and Size	Thickness Code	Panel 1 Thickness ±0.08 mm / ±.003"		Panel 1 Mounting Hole +0.08 mm / +.003" -.000"		Panel 2 Thickness Min. (1)		Panel 2 Mounting Hole +0.08 mm / +.003" -.000"		C_1 Max.		C_2 Max.		E Max.		L Max.		Min. Dist. Hole ℄ To Edge	
		mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.
SF-3	0.8	0.8	.031	3	.118	0.8	.031	2.5	.098	2.98	.117	2.48	.097	3.53	.139	1.5	.059	2.54	.1
SF-3	1.0	1	.039	3	.118	1	.039	2.5	.098	2.98	.117	2.48	.097	3.76	.148	1.9	.075	2.54	.1
SF-3	1.2	1.2	.047	3	.118	1.2	.047	2.5	.098	2.98	.117	2.48	.097	3.76	.148	2.31	.091	2.54	.1
SF-3	1.6	1.6	.063	3	.118	1.6	.063	2.5	.098	2.98	.117	2.48	.097	3.76	.148	3.12	.123	2.54	.1
SF-5	0.8	0.8	.031	5	.197	0.8	.031	4	.157	4.98	.196	3.97	.156	5.56	.219	1.5	.059	3.56	.14
SF-5	1.0	1	.039	5	.197	1	.039	4	.157	4.98	.196	3.97	.156	5.56	.219	1.9	.075	3.6	.14
SF-5	1.2	1.2	.047	5	.197	1.2	.047	4	.157	4.98	.196	3.97	.156	5.56	.219	2.31	.091	3.6	.14
SF-5	1.6	1.6	.063	5	.197	1.6	.063	4	.157	4.98	.196	3.97	.156	5.56	.219	3.12	.123	3.6	.14

Type SFP for Installation Into Stainless Steel Sheets

Type and Size	Thickness Code	Panel 1 Thickness ±0.08 mm / ±.003"		Panel 1 Mounting Hole +0.08 mm / +.003" -.000"		Panel 2 Thickness Min. (1)		Panel 2 Mounting Hole +0.08 mm / +.003" -.000"		C_1 Max.		C_2 Max.		E Max.		L Max.		Min. Dist. Hole ℄ To Edge	
		mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.
SFP-3	1.0	1	.039	3	.118	1	.039	2.5	.098	2.98	.117	2.48	.097	3.76	.148	1.9	.075	2.54	.1
SFP-3	1.2	1.2	.047	3	.118	1.2	.047	2.5	.098	2.98	.117	2.48	.097	3.76	.148	2.31	.091	2.54	.1
SFP-3	1.6	1.6	.063	3	.118	1.6	.063	2.5	.098	2.98	.117	2.48	.097	3.76	.148	3.12	.123	2.54	.1
SFP-5	1.0	1	.039	5	.197	1	.039	4.5	.177	4.98	.196	4.47	.176	5.56	.219	1.9	.075	3.6	.14
SFP-5	1.2	1.2	.047	5	.197	1.2	.047	4.5	.177	4.98	.196	4.47	.176	5.56	.219	2.31	.091	3.6	.14
SFP-5	1.6	1.6	.063	5	.197	1.6	.063	4.5	.177	4.98	.196	4.47	.176	5.56	.219	3.12	.123	3.6	.14

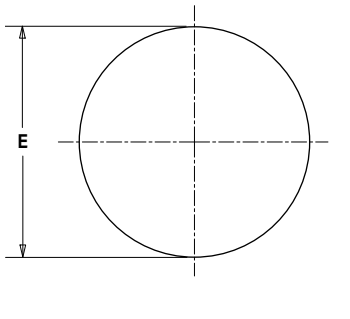
(1) Fastener will provide flush application at minimum sheet thickness.

TYPE SFW WITH WAVE WASHER FOR SINGLE POINT HINGING APPLICATIONS



Type SFW with wave washer installed in sheets.

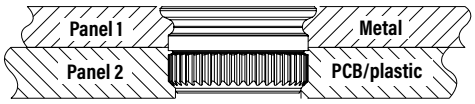
Washer Compressed Thickness
SFW-3 = 0.2 mm / .008" Nom.
SFW-5 = 0.3 mm / .012" Nom.



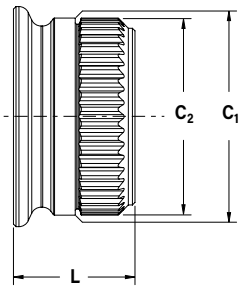
Type and Size (2)	Thickness Code	Panel 1 Thickness ±0.08 mm / ±.003"		Panel 1 Mounting Hole +0.08 mm / +.003" -.000"		Panel 2 Thickness Min. (1)		Panel 2 Mounting Hole +0.08 mm / +.003" -.000"		C_1 Max.		C_2 Max.		E Max.		L Max.		Min. Dist. Hole ℄ To Edge	
		mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.
SFW-3	0.8	0.8	.031	3	.118	0.8	.031	2.5	.098	2.98	.117	2.48	.097	3.53	.139	2.09	.082	2.54	.1
SFW-3	1.0	1	.039	3	.118	1	.039	2.5	.098	2.98	.117	2.48	.097	3.76	.148	2.49	.098	2.54	.1
SFW-3	1.2	1.2	.047	3	.118	1.2	.047	2.5	.098	2.98	.117	2.48	.097	3.76	.148	2.90	.114	2.54	.1
SFW-3	1.6	1.6	.063	3	.118	1.6	.063	2.5	.098	2.98	.117	2.48	.097	3.76	.148	3.71	.146	2.54	.1
SFW-5	0.8	0.8	.031	5	.197	0.8	.031	4	.157	4.98	.196	3.97	.156	5.56	.219	1.98	.078	3.6	.14
SFW-5	1.0	1	.039	5	.197	1	.039	4	.157	4.98	.196	3.97	.156	5.56	.219	2.39	.094	3.6	.14
SFW-5	1.2	1.2	.047	5	.197	1.2	.047	4	.157	4.98	.196	3.97	.156	5.56	.219	2.79	.110	3.6	.14
SFW-5	1.6	1.6	.063	5	.197	1.6	.063	4	.157	4.98	.196	3.97	.156	5.56	.219	3.61	.142	3.6	.14

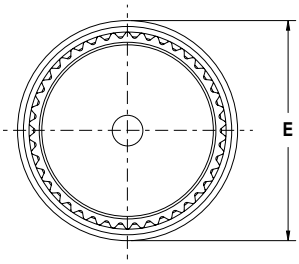
(1) Fastener will provide flush application at minimum sheet thickness. *(2) Type SFW fasteners are shipped with mating washers.*

TYPE SFK FOR JOINING METAL TO PCB/PLASTIC PANELS



Type SFK joining metal to PCB/plastic.





Patented.

Type and Size	Thickness Code	Panel 1 Thickness ±0.08 mm / ±.003"		Panel 1 Mounting Hole +0.08 mm / +.003" -.000"		Panel 2 Thickness Min. (1)		Panel 2 Mounting Hole +0.08 mm / +.003" -.000"		C_1 Max.		C_2 ±0.08 mm / ±.003"		E Max.		L Max.		Min. Dist. Hole ℄ To Edge	
		mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.
SFK-3	0.8	0.8	.031	3	.118	1.6	.063	2.5	.098	2.98	.117	2.9	.114	3.53	.139	2.31	.091	3	0.12
SFK-3	1.0	1	.039	3	.118	1.6	.063	2.5	.098	2.98	.117	2.9	.114	3.76	.148	2.51	.099	3	0.12
SFK-3	1.2	1.2	.047	3	.118	1.6	.063	2.5	.098	2.98	.117	2.9	.114	3.76	.148	2.72	.107	3	0.12
SFK-3	1.6	1.6	.063	3	.118	1.6	.063	2.5	.098	2.98	.117	2.9	.114	3.76	.148	3.12	.123	3	0.12
SFK-5	0.8	0.8	.031	5	.197	1.6	.063	4.5	.177	4.98	.196	4.9	.193	5.56	.219	2.31	.091	5.1	0.20
SFK-5	1.0	1	.039	5	.197	1.6	.063	4.5	.177	4.98	.196	4.9	.193	5.56	.219	2.51	.099	5.1	0.20
SFK-5	1.2	1.2	.047	5	.197	1.6	.063	4.5	.177	4.98	.196	4.9	.193	5.56	.219	2.72	.107	5.1	0.20
SFK-5	1.6	1.6	.063	5	.197	1.6	.063	4.5	.177	4.98	.196	4.9	.193	5.56	.219	3.12	.123	5.1	0.20

(1) Fastener will provide flush application at minimum sheet thickness.

MATERIAL AND FINISH SPECIFICATIONS

	Fastener Materials		Standard Finishes			For Use in Sheet Hardness: (2)	
Type	Hardened Carbon Steel	Precipitation Hardening Grade Stainless Steel	Passivated and/or Tested Per ASTM A380	Zinc Plated, 5µm, Colorless (1)	Zinc Plated, 5µm, Colorless with Lubricant (1)	HRB 80 / HB 150 or Less	HRB 88 / HB 183 or Less
SF	▪			▪		▪	
SFP		▪	▪				▪
SFW	▪			(Washer)	▪ (Fastener)	▪	
SFK	▪			▪		▪	
Part Number Code For Finishes		None	ZI	LZ			

(1) See PEM Technical Support section of our web site for related plating standards and specifications.
(2) HRB - Hardness Rockwell "B" Scale. HB - Hardness Brinell.

INSTALLATION

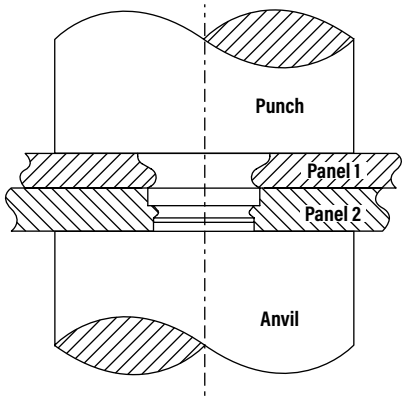
TYPE SF AND SFP

Step 1. Prepare properly sized mounting hole in both panels. Do not perform any secondary operations such as deburring. If the hole is punched, be sure to install fastener into punched side of hole.

Step 2. Place Panel 2 with smaller mounting hole on anvil and align Panel 1 mounting hole with the mounting hole of Panel 2. Place the smaller diameter end of the fastener through the mounting holes as shown in the drawing to the right. (See figure SF-1).

Step 3. With the punch and anvil surfaces parallel, apply squeezing force until the fastener is flush with the top of Panel 1. (See figure SF-1).

Figure SF-1



NOTE: *To use Type SF or SFP as a flush-mounted pivot point, for best results, install SpotFast fastener into Panel 1 first, then place Panel 2 over fastener and squeeze again.*

PEMSERTER® Installation Tooling

Size	Punch Part No.	Anvil Part No.
SF-3 / SF-5	975200048	975200046

TYPE SFW

Step 1. Prepare properly sized mounting hole in both panels. Do not perform any secondary operations such as deburring. If the hole is punched, be sure to install fastener into punched side of hole.

Step 2. Using only Panel 1, with the punch and anvil surfaces parallel, apply squeezing force until the fastener is flush with the top of Panel 1. (See figure SFW-1).

Step 3. To ensure proper function of washer, place washer over installed fastener (concave side facing up), then place Panel 2 over fastener. Apply squeezing force. Keep gap between Panel 2 and anvil. (See "G" in figure SFW-2).

Figure SFW-1

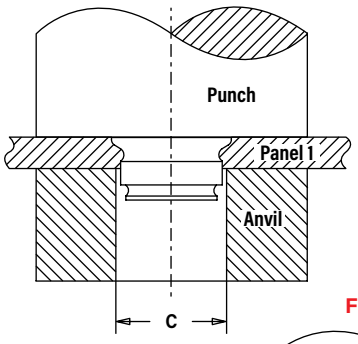
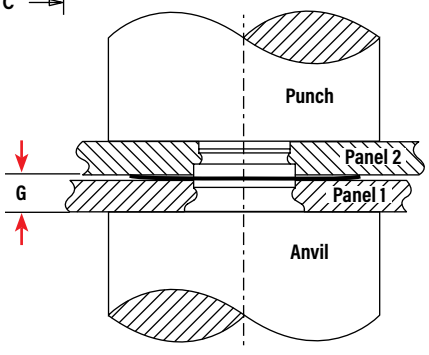


Figure SFW-2



PEMSERTER® Installation Tooling

Size	C +0.08/+.003 (mm) / (in.)	Punch Part No.	Part Number For Anvil Used In Step 2	Part Number For Anvil Used In Step 3
SFW-3	3.05 / .120	975200048	970200229300	975200046
SFW-5	5.05 / .199	975200048	970200020300	975200046

Size	G (mm) / (in.)
SFW-3-0.8	1.09-1.25 / .043-.049
SFW-5-0.8	
SFW-3-1.0	1.3-1.44 / .051-.057
SFW-5-1.0	
SFW-3-1.2	1.5-1.65 / .059-.065
SFW-5-1.2	
SFW-3-1.6	1.91-2.06 / .075-.081
SFW-5-1.6	

INSTALLATION

TYPE SFK

Step 1. Prepare properly sized mounting hole in both panels. Do not perform any secondary operations such as deburring. If the hole is punched, be sure to install fastener into punched side of hole.

Step 2. Using only Panel 1, with the punch and anvil surfaces parallel, apply squeezing force until the fastener is flush with the top of Panel 1. (See figure SFK-1).

Step 3. Place Panel 2 over fastener and apply squeezing force. (See figure SFK-2).

Figure SFK-1

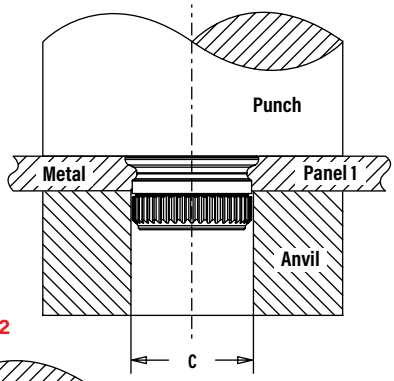
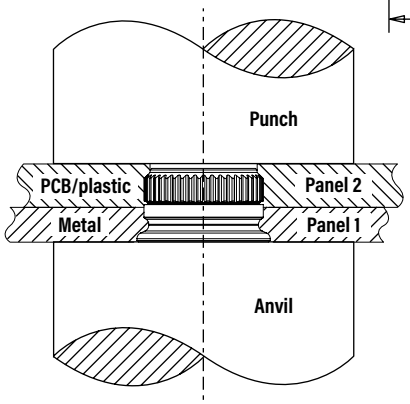


Figure SFK-2



PEMSERTER® Installation Tooling

Size	C +0.08/+.003 (mm) / (in.)	Punch Part No.	Part Number For Anvil Used In Step 2	Part Number For Anvil Used In Step 3
SFW-3	3.05 / .120	975200048	970200229300	975200046
SFW-5	5.05 / .199	975200048	970200020300	975200046

PERFORMANCE DATA(1)

TYPE SF

Type and Size	Thickness Code	Installation				Pushout of Panel 2 (2)			
		Cold-rolled Steel		Aluminum		Cold-rolled Steel		Aluminum	
		kN	lbs.	kN	lbs.	N	lbs.	N	lbs.
SF-3	0.8	8	1800	6	1350	360	80	200	45
SF-3	1.0	9	2025	6.5	1475	525	115	250	55
SF-3	1.2	11	2475	7	1575	555	125	310	70
SF-3	1.6	13	2925	7.5	1700	920	205	550	125
SF-5	0.8	11	2475	8	1800	625	140	310	70
SF-5	1.0	12	2700	9.5	2150	800	180	515	115
SF-5	1.2	18	4050	10	2250	1200	270	770	170
SF-5	1.6	20	4500	12.5	2825	1500	335	1145	255

TYPE SFP

Type and Size	Thickness Code	Stainless Steel			
		Installation		Pushout of Panel 2 (2)	
		kN	lbs.	N	lbs.
SFP-3	1.0	13.5	3000	620	140
SFP-3	1.2	20	4500	830	186
SFP-3	1.6	22	5000	1500	340
SFP-5	1.0	18	4000	990	222
SFP-5	1.2	27	6000	1158	260
SFP-5	1.6	33	7500	3117	701

(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) In most applications, pullout strength of the SpotFast fastener in Panel 1 exceeds pushout strength of Panel 2.

PERFORMANCE DATA(1)

TYPE SFW

Type and Size	Thickness Code	Installation into Panel 1				Installation into Panel 2				Pushout of Panel 2 (2)			
		Cold-rolled Steel		Aluminum		Cold-rolled Steel		Aluminum		Cold-rolled Steel		Aluminum	
		kN	lbs.	kN	lbs.	kN	lbs.	kN	lbs.	N	lbs.	N	lbs.
SFW-3	0.8	4.5	1010	2.5	560	3	675	2	450	350	78	85	19
SFW-3	1.0	5.5	1240	3.5	780	4.5	1010	2	450	375	84	140	31
SFW-3	1.2	6	1350	3.5	780	5	1125	2	450	500	112	250	56
SFW-3	1.6	7	1575	4	900	6	1350	2.5	560	780	175	340	76
SFW-5	0.8	7	1575	3.5	780	8	1800	4	900	350	78	270	61
SFW-5	1.0	7	1575	3.5	780	8.5	1910	5	1125	380	153	425	96
SFW-5	1.2	7	1575	4	900	8.5	1910	5	1125	925	208	510	115
SFW-5	1.6	9	2025	5	1125	10	2250	5	1125	1450	326	600	135

TYPE SFK

Type and Size	Thickness Code	Installation into Panel 1		Installation into Panel 2		Pushout of Panel 2 (2)	
		Cold-rolled Steel		FR-4 Fiberglass			
		kN	lbs.	kN	lbs.	N	lbs.
SFK-3	0.8	6.2	1400	1.8	400	200	45
SFK-3	1.0	8	1800	1.8	400	200	45
SFK-3	1.2	8.9	2000	1.8	400	200	45
SFK-3	1.6	10.2	2300	1.8	400	200	45
SFK-5	0.8	11.1	2500	1.8	400	400	90
SFK-5	1.0	13.5	3000	1.8	400	400	90
SFK-5	1.2	15.6	3500	1.8	400	400	90
SFK-5	1.6	17.8	4000	1.8	400	400	90

(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) In most applications, pullout strength of the SpotFast fastener in Panel 1 exceeds pushout strength of Panel 2.

Regulatory compliance information is available in Technical Support section of our website.

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

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KEYHOLE® STANDOFFS AND FASTENERS

BULLETIN **SK**

PEM®

KEYHOLE® STANDOFFS AND FASTENERS

PEM® KEYHOLE® Standoffs (Type SKC™) and sheet joining fasteners (Type SKC-F™) are designed so that a PC board or panel can be quickly slipped into place and then removed from an assembly by simply sliding the board sideways and lifting it off. PEM KEYHOLE fasteners can save valuable time and dramatically reduce the amount of loose hardware required. Type SKC can be used for spacing or mounting of replaceable components. Typically, several SKC standoffs are used with one standard PEM threaded standoff which accepts a screw to secure the board or component against any unwanted movement. Type SKC-F is designed so that two sheets can be quickly joined flat against each other. Typically, several Type SKC-F fasteners are used with one standard PEM® threaded Type F flush nut which accepts a screw to secure the sheets against any unwanted movement.

Type SKC - Allows detachable spacing of two sheets

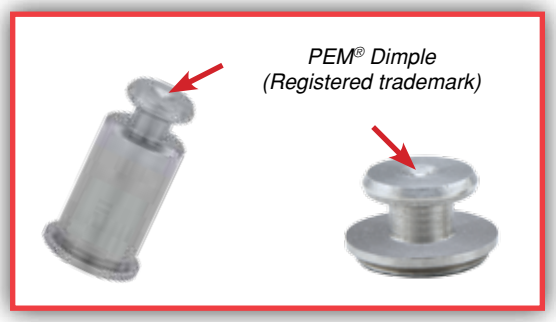
- Clinch feature mounts fastener permanently into metal sheet.
- Unique barrel design allows for quick attachment and detachment.
- Head is flush with one side of metal sheet.
- Makes horizontal or vertical component mounting possible.

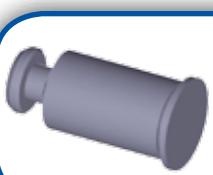
Type SKC-F - Allows detachable joining of two sheets

- Clinch feature mounts fastener permanently into metal sheet.
- Unique barrel design allows for quick “panel-on-panel” attachment and detachment.
- Head is flush or sub-flush with one side of metal sheet.
- Can be clinched into blind hole where concealed head is required.
- Makes horizontal or vertical component mounting possible.

Type SKC

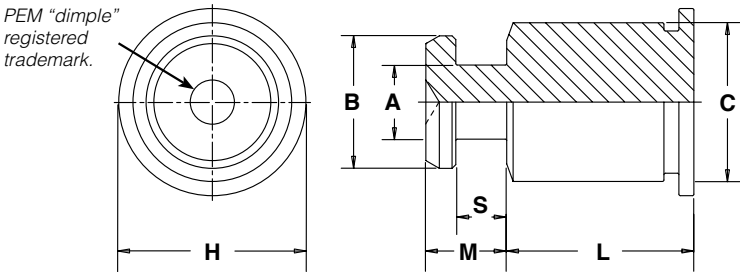
Type SKC-F





Fastener drawings and models are available at www.pemnet.com

TYPE SKC DIMENSIONAL DATA



Clinching profile may vary.

PART NUMBER DESIGNATION

SK	C	–	6	060	–	12
Type	Material Code		Body Size Code	Sheet Thickness Code		Length Code

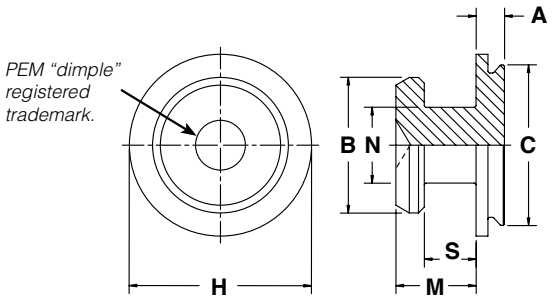
All dimensions are in inches.

	Type / Stainless Steel (1)	Body Size - Sheet Code	Length "L" ± .005 (Length Code in 32nds of an inch)													A ± .003	B ± .003	C Max.	S ± .003	M Max.	H Nom.
UNIFIED			.063	.125	.188	.250	.312	.375	.437	.500	.562	.625	.750	.875	1.00						
	SKC	6060	2	4	6	8	10	12	14	16	18	20	24	28	32	.099	.177	.212	.068	.108	.250

All dimensions are in millimeters.

	Type / Stainless Steel (1)	Body Size - Sheet Code	Length "L" ± 0.13 (Length Code in millimeters)											A ± 0.08	B ± 0.08	C Max.	S ± 0.08	M Max.	H Nom.
METRIC			2	4	6	8	10	12	14	16	18	20	22	25						
	SKC	61.5													2.51	4.5	5.39	1.73	2.75	6.35

TYPE SKC-F DIMENSIONAL DATA



Clinching profile may vary.

PART NUMBER DESIGNATION

SK	C	–	F	1.5
Type	Material Code		Face Mounting Designation Code	Sheet Thickness Code

All dimensions are in inches.

	Type / Stainless Steel (1)	Face Mounting Designation Code	Sheet Thickness Code	A Max.	B ± .003	C Max.	H Nom.	M Max.	N ± .003	S ±.003
UNIFIED	SKC	F	1.5	.039	.177	.212	.237	.108	.099	.068

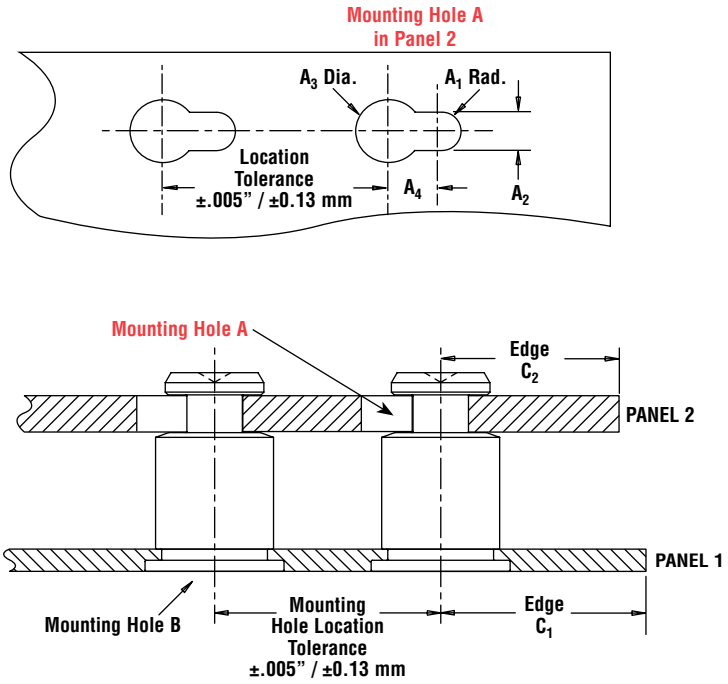
All dimensions are in millimeters.

	Type / Stainless Steel (1)	Face Mounting Designation Code	Sheet Thickness Code	A Max.	B ± 0.08	C Max.	H Nom.	M Max.	N ± 0.08	S ±0.08
METRIC	SKC	F	1.5	1	4.5	5.39	6.02	2.75	2.5	1.73

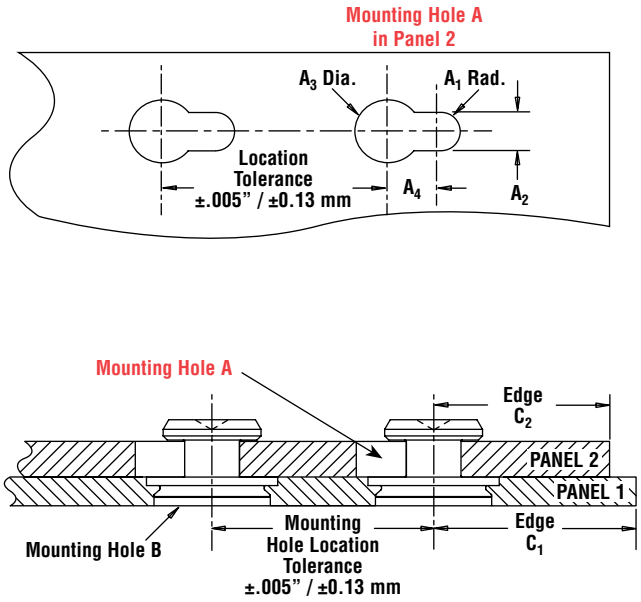
(1) 300 Series stainless steel. Passivated and/or tested per ASTM A380.

APPLICATION DATA

TYPE SKC



TYPE SKC-F



All dimensions are in inches.

		PANEL 1				PANEL 2						
						Top Mounting Hole A						
UNIFIED	Type	Bottom Mounting Hole B + .003 - .000	Sheet Hardness Max. (1)	Min. Sheet Thickness	Edge Distance C_1 Min.	A_1 Nom.	A_2 ± .003	A_3 ± .003	A_4 Min.	Material	Thickness Range	Edge Distance C_2 Min.
	SKC	.213	HRB 70 / HB 125	.040	.260	.059	.118	.197	.148	ANY	.057 - .064	.160
	SKC-F	.213	HRB 70 / HB 125	.039 (2)	.150	.059	.118	.197	.148	ANY	.057 - .064	.160

All dimensions are in millimeters.

		PANEL 1				PANEL 2						
						Top Mounting Hole A						
METRIC	Type	Bottom Mounting Hole B +0.08	Sheet Hardness Max. (1)	Min. Sheet Thickness	Edge Distance C_1 Min.	A_1 Nom.	A_2 ± 0.08	A_3 ± 0.08	A_4 Min.	Material	Thickness Range	Edge Distance C_2 Min.
	SKC	5.41	HRB 70 / HB 125	1.02	6.6	1.5	3	5	3.75	ANY	1.45 - 1.62	4.1
	SKC-F	5.41	HRB 70 / HB 125	1 (2)	3.8	1.5	3	5	3.75	ANY	1.45 - 1.62	4.1

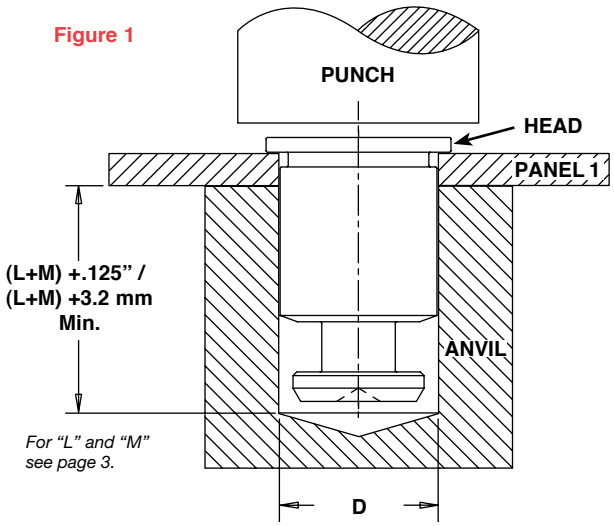
(1) HRB - Hardness Rockwell "B" Scale. HB - Hardness Brinell.
(2) Type SKC-F may also be installed into a .043" / 1.1 mm deep blind milled hole in a .062" / 1.6 mm minimum sheet thickness.

INSTALLATION

TYPE SKC

1. Prepare properly sized mounting hole in Panel 1.
2. Place the barrel of the fastener through (punched side of) mounting hole and into anvil as shown in figure 1.
3. With installation punch and anvil surfaces parallel, apply only enough squeezing force to embed the head flush with the panel.

Figure 1



PEMSERTER® Installation Tooling

	Body Size Sheet Code	Anvil Dimension (in.) D +.003 -.000	Anvil Part Number	Punch Part Number
UNIFIED	6060	.216	970200012300	975200048

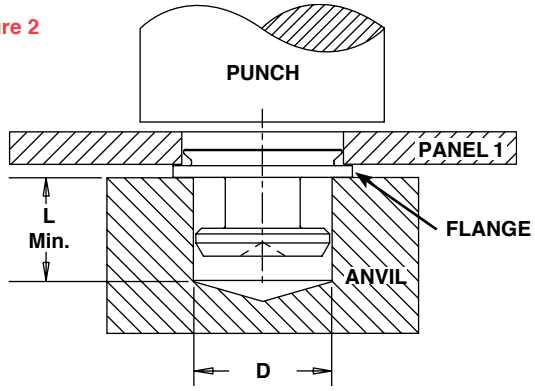
	Body Size Sheet Code	Anvil Dimension (mm) D +0.08	Anvil Part Number	Punch Part Number
METRIC	61.5	5.49	970200012300	975200048

TYPE SKC-F

Through Hole Installation Procedure

1. Prepare properly sized mounting hole in Panel 1.
2. Place the fastener into anvil hole as shown in Figure 2.
3. Place the (punch side of) mounting hole over the shank of the fastener.
4. With installation punch and anvil surfaces parallel, apply only enough squeezing force until flange is flush with panel.

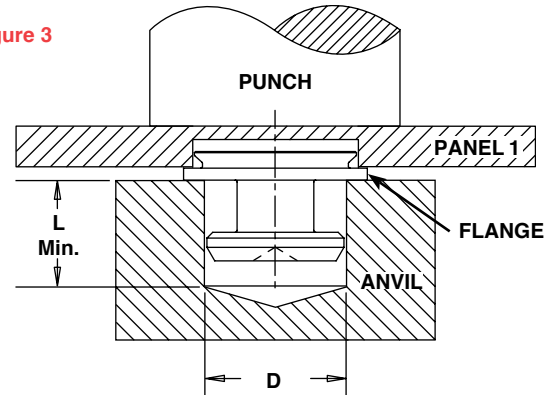
Figure 2



Blind Hole Installation Procedure

1. Mill a properly sized blind hole to .043" / 1.1 mm minimum depth.
2. Place the fastener into anvil hole as shown in Figure 3.
3. Place the panel mounting hole over the shank of the fastener.
4. With installation punch and anvil surfaces parallel, apply only enough squeezing force to embed the flange flush with the panel.

Figure 3



PEMSERTER® Installation Tooling

	Sheet Thickness Code	Anvil Dimensions (in.) L Min.	Anvil Dimensions (in.) D +.003 -.000	Anvil Part Number	Punch Part Number
UNIFIED	1.5	.233	.184	8012608	975200048

	Sheet Thickness Code	Anvil Dimensions (mm) L Min.	Anvil Dimensions (mm) D +0.08	Anvil Part Number	Punch Part Number
METRIC	1.5	5.95	4.67	8012608	975200048

PEMSERTER® PRESSES

For best results we recommend using a PEMSERTER® press for installation of PEM Types SKC and SKC-F fasteners. Please check our website for more information.

End Mill Information

Double-ended, two-flute H.S.S. center-cutting end mills are available from stock. PennEngineering does not manufacture center-cutting end mills, but we do keep a supply in stock for your convenience.

Fastener Type	Required Size End Mill	PEM Part No.
SKC-F	.213"	CHM-213

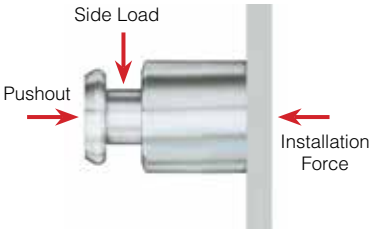
PERFORMANCE DATA(1)

TYPE SKC

Installation and Pushout

	Test Sheet Material →	.060" 5052-H34 Aluminum		.060" Cold-Rolled Steel	
UNIFIED	Body Size - Sheet Code	Installation (lbs.)	Pushout (lbs.)	Installation (lbs.)	Pushout (lbs.)
	6060	1600	250	3200	600

	Test Sheet Material →	1.52 mm 5052-H34 Aluminum		1.52 mm Cold-Rolled Steel	
METRIC	Body Size - Sheet Code	Installation (kN)	Pushout (N)	Installation (kN)	Pushout (N)
	61.5	7.1	1100	14.2	2600



Side-Load

	Test Sheet Material →	5052-H34 Aluminum											Cold-Rolled Steel										
	Test Sheet Thick. →	.040" (2)	.060"										.040" (2)	.060"									
UNIFIED	Body Size - Sheet Code	Length Codes											Length Codes										
		-2	-4	-6	-8	-10	-12	-14	-16	-20	-24	-32	-2	-4	-6	-8	-10	-12	-14	-16	-20	-24	-32
		Side-Load Force Max. (lbs.)											Side-Load Force Max. (lbs.)										
	6060	130	95	82	63	52	44	38	34	27	22	17	185	120	197	153	126	106	92	81	66	55	42

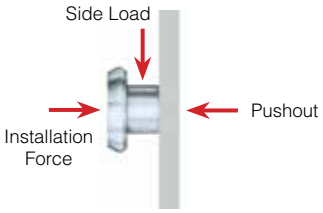
	Test Sheet Material →	5052-H34 Aluminum											Cold-Rolled Steel										
	Test Sheet Thick. →	1 mm (2)	1.5 mm										1 mm (2)	1.5 mm									
METRIC	Body Size - Sheet Code	Length Codes											Length Codes										
		-2	-4	-6	-8	-10	-12	-14	-16	-18	-20	-22	-25	-2	-4	-6	-8	-10	-12	-14	-16	-18	-20	-22	-25
		Side-Load Force Max. (N)											Side-Load Force Max. (N)										
	61.5	545	370	296	228	184	156	136	116	104	96	88	76	735	490	696	540	440	372	320	280	252	228	208	184

TYPE SKC-F

Installation, Pushout and Side-Load

	Test Sheet Material →	.060" 5052-H34 Aluminum			.060" Cold-Rolled Steel		
UNIFIED	Type	Installation (lbs.)	Pushout (lbs.)	Side-Load Force Max. (lbs.)	Installation (lbs.)	Pushout (lbs.)	Side-Load Force Max. (lbs.)
	SKC-F	1100	120	120	2100	160	185

	Test Sheet Material →	1.52 mm 5052-H34 Aluminum			1.52 mm Cold-Rolled Steel		
METRIC	Type	Installation (kN)	Pushout (N)	Side-Load Force Max. (N)	Installation (kN)	Pushout (N)	Side-Load Force Max. (N)
	SKC-F	4.9	533	533	9.3	711	822



(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) .040" / 1 mm test sheet material thickness was used for the -2 and -4 SKC standoffs due to the short length of the parts.

Regulatory compliance information is available in Technical Support section of our website.

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

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PennEngineering®

SELF-CLINCHING STANDOFFS

BULLETIN **SO**

PEM®

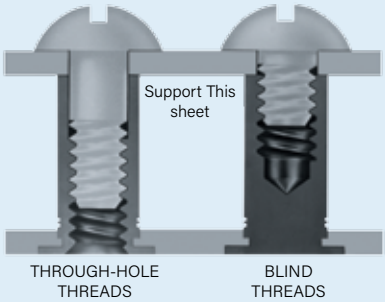
1116
REV 517

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 .025"/0.63mm.

Specially designed Types SO4, BSO4 and TSO4 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 web site for Tech Sheet PEM® - REF/Standoff Basics.



HEAD SIDE OF SHEET AFTER INSTALLATION

Types SO/SOS/SOA/SO4
Types TSO/TSOS/TSOA/TSO4 (Styles 1 & 2)
Types SOSG/SOAG

Types BSO/BSOS/BSOA/BSO4
Types TSO/TSOS/TSOA/TSO4 (Style 3)

Types DSOS/DSO

Types SO/SOS/SOA/SO4 through hole threaded self-clinching standoffs - PAGE 3

Types BSO/BSOS/BSOA/BSO4 Blind hole, threaded self-clinching standoffs - PAGE 4

Types SO/SOS/SOA/SO4 Through hole, unthreaded self-clinching standoffs - PAGE 5

Types TSO/TSOS/TSOA/TSO4 Through hole threaded standoffs **for clinching into thinner sheets** than type SO standoffs - PAGE 6

Types DSOS/DSO Through hole, threaded standoffs with round, knurled head **allowing closer-to-edge clinch installation** - PAGE 7

Types SOSG/SOAG Through hole, threaded grounding standoffs with **"gripping teeth" on end of barrel** - PAGE 7

Material and finish specifications - PAGE 8

Installation - PAGES 8 & 9

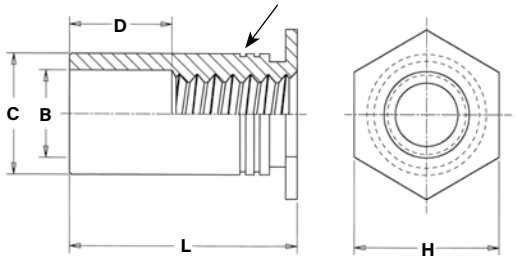
Performance data - PAGES 10 & 11

PEM Standoff Type	Application Requires:								
	Installation into stainless steel	Corrosion resistance	Threads at barrel end	Closed-end for flush appearance	Gripping teeth on barrel end	Closest-to-edge distance mounting	Available Unthreaded	Thinnest minimum sheet	Most varied standard length increments
BSO			▪	▪					
BSOA			▪	▪					
BSOS		▪	▪	▪					
BSO4	▪	(2)	▪	▪					
DSOS						▪			
SO							▪		
SOA							▪		
SOS		▪					▪		
SO4	▪	(2)					▪		
SOAG					▪				
SOSG	▪				▪				
TSO			▪	▪ (1)				▪	▪
TSOA			▪	▪ (1)				▪	▪
TSOS		▪	▪	▪ (1)				▪	▪
TSO4	▪	(2)	▪	▪ (1)				▪	▪

(1) Style #3 only. *(2) When used with optional nickel plating.*

TYPES SO/SOS/SOA/SO4 - THROUGH-HOLE THREADED STANDOFFS

"Single" or "Two Groove" Registered Trademark



Clinching profile may vary.

Types SO/SOS/SOA

Type SO4
Installs into stainless steel

PART NUMBER DESIGNATION

SO		-	440	-	8	ZI
SO	S	-	440	-	8	
SO	A	-	440	-	8	
SO	4	-	440	-	8	NC*
↓	↓		↓		↓	↓
Type	Material Code		Thread Code		Length Code	Finish

GENERAL DIMENSIONAL DATA

All dimensions are in inches.

	Thread Code	Min. Sheet Thickness	Hole Size In Sheet +.003 -.000	B Counter-Bore Dia. ±.005	C +.000 -.005	H Nom.	Min. Dist. Hole ℄ To Edge	D ±.010
UNIFIED	440	.040	.166	.125	.165	.187	.23	Varies according to length. See length charts below.
	6440	.040	.213	.125	.212	.250	.27	
	632	.040	.213	.156	.212	.250	.27	
	8632	.050	.281	.156	.280	.312	.31	
	832	.050	.281	.188	.280	.312	.31	
	032	.050	.281	.203	.280	.312	.31	

All dimensions are in millimeters.

	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	

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

THREAD SIZE AND LENGTH SELECTION DATA

All dimensions are in inches.

	Thread Size	Type: Fastener Material: Steel	Stainless Steel	Aluminum	Hardened Stainless Steel	Thread Code	Length "L" +.002 -.005 (Length Code in 32nds of an inch) .125	.187	.250	.312	.375	.437	.500	.562	.625	.687	.750	.812	.875	.937	1.00	1.062
UNIFIED	.112-40 (#4-40)	SO	SOS	SOA	SO4	440 / 6440[1]	4	6	8	10	12	14	16	18	20	22	24	-	-	-	-	-
	.138-32 (#6-32)	SO	SOS	SOA	SO4	632 / 8632[1]	4	6	8	10	12	14	16	18	20	22	24	26	28	30	32	34
	.164-32 (#8-32)	SO	SOS	SOA	SO4	832	4	6	8	10	12	14	16	18	20	22	24	26	28	30	32	34
	.190-32 (#10-32)	SO	SOS	SOA	SO4	032	4	6	8	10	12	14	16	18	20	22	24	26	28	30	32	34
	D Dimension ±.010						None				.187				.312				.437			

All dimensions are in millimeters.

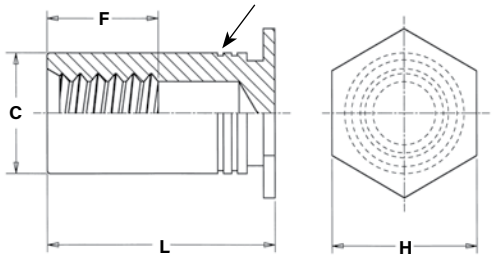
	Thread Size x Pitch	Type: Fastener Material: Steel	Stainless Steel	Aluminum	Hardened Stainless Steel	Thread Code	Length "L" +0.05 -0.13 (Length Code in millimeters) 3	4	6	8	10	12	14	16	18	20	22	25
METRIC	M3 x 0.5	SO	SOS	SOA	SO4	M3 / 3.5M3[1]	3	4	6	8	10	12	14	16	18	-	-	-
	M3.5 x 0.6	SO	SOS	SOA	SO4	M3.5	3	4	6	8	10	12	14	16	18	20	22	25
	M4 x 0.7	SO	SOS	SOA	SO4	M4	3	4	6	8	10	12	14	16	18	20	22	25
	M5 x 0.8	SO	SOS	SOA	SO4	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 codes 6440, 8632, and 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.

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

TYPES BSO/BSOS/BSOA/BSO4 - BLIND THREADED STANDOFFS

"Single" or "Two Groove" Registered Trademark



Clinching profile may vary.

Types BSO/BSOS/BSOA

Type BSO4
Installs into stainless steel

PART NUMBER DESIGNATION

BSO		-	440	-	12	ZI
BSO	S	-	440	-	12	
BSO	A	-	440	-	12	
BSO	4	-	440	-	12	NC*
↓	↓		↓		↓	↓
Type	Material Code		Thread Code		Length Code	Finish

GENERAL DIMENSIONAL DATA

All dimensions are in inches.

	Thread Code	Min. Sheet Thickness	Hole Size In Sheet +.003 -.000	C +.000 -.005	H Nom.	Min. Dist. Hole ℄ To Edge	F Min.
UNIFIED	440	.040	.166	.165	.187	.23	Varies according to length. See length charts below.
	6440	.040	.213	.212	.250	.27	
	632	.040	.213	.212	.250	.27	
	8632	.050	.281	.280	.312	.31	
	832	.050	.281	.280	.312	.31	
	032	.050	.281	.280	.312	.31	

All dimensions are in millimeters.

	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	

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

THREAD SIZE AND LENGTH SELECTION DATA

All dimensions are in inches.

	Thread Size	Type				Thread Code	Length "L" +.002 -.005 (Length Code in 32nds of an inch)												
		Steel	Stainless Steel	Aluminum	Hardened Stainless Steel		.312	.375	.437	.500	.562	.625	.687	.750	.812	.875	.937	1.00	1.062
UNIFIED	.112-40 (#4-40)	BSO	BSOS	BSOA	BSO4	440	10	12	14	16	18	20	22	24	26	28	30	32	34
						6440[1]													
	.138-32 (#6-32)	BSO	BSOS	BSOA	BSO4	632	10	12	14	16	18	20	22	24	26	28	30	32	34
						8632[1]													
	.164-32 (#8-32)	BSO	BSOS	BSOA	BSO4	832	10	12	14	16	18	20	22	24	26	28	30	32	34
	.190-32 (#10-32)	BSO	BSOS	BSOA	BSO4	032	10	12	14	16	18	20	22	24	26	28	30	32	34
	F Dimension Min.						.156		.187	.250			.375						

All dimensions are in millimeters.

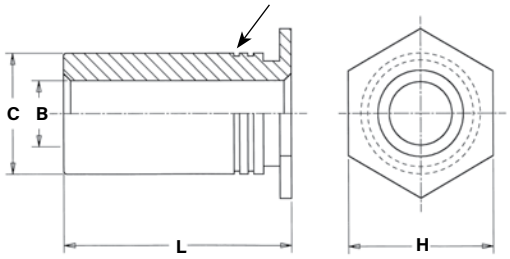
	Thread Size x Pitch	Type				Thread Code	Length "L" +0.05 -0.13 (Length Code in millimeters)									
		Steel	Stainless Steel	Aluminum	Hardened Stainless Steel											
METRIC	M3 x 0.5	BSO	BSOS	BSOA	BSO4	M3	6	8	10	12	14	16	18	20	22	25
						3.5M3[1]										
	M3.5 x 0.6	BSO	BSOS	BSOA	BSO4	M3.5	6	8	10	12	14	16	18	20	22	25
	M4 x 0.7	BSO	BSOS	BSOA	BSO4	M4	6	8	10	12	14	16	18	20	22	25
	M5 x 0.8	BSO	BSOS	BSOA	BSO4	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 codes 6440, 8632, and 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.

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

TYPES SO/SOS/SOA/SO4 - THROUGH-HOLE UNTHREADED STANDOFFS

"Single" or "Two Groove" Registered Trademark



Clinching profile may vary.

Types SO/SOS/SOA

Type SO4
Installs into stainless steel

PART NUMBER DESIGNATION

SO		- 4116 -	8		ZI
SO	S	- 4116 -	8		
SO	A	- 4116 -	8		
SO	4	- 4116 -	8		NC*
↓ Type	↓ Material Code		↓ Thru-hole Code	↓ Length Code	↓ Finish

** 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 inches.

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

All dimensions are in millimeters.

	Thru-hole Code	Min. Sheet Thickness	Hole Size In Sheet +0.08	C -0.13	H Nom.	Min. Dist. Hole ℄ To Edge
METRIC	43.1	1	4.22	4.2	4.8	6
	63.1	1	5.41	5.39	6.4	6.8
	63.6	1	5.41	5.39	6.4	6.8
	83.6	1.27	7.14	7.12	7.9	8
	84.1	1.27	7.14	7.12	7.9	8
	85.1	1.27	7.14	7.12	7.9	8

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

THROUGH-HOLE AND LENGTH SELECTION DATA

All dimensions are in inches.

	B Thru-hole Diameter +.004 -.003	Type				Thru-hole Code	Length "L" +.002 -.005 (Length Code in 32nds of an inch)										
		Steel	Stainless Steel	Aluminum	Hardened Stainless Steel		.125	.187	.250	.312	.375	.437	.500	.562	.625	.687	.750
UNIFIED	.116	SO	SOS	SOA	SO4	4116	4	6	8	10	12	14	16	18	20	22	24
						6116(1)											
	.143	SO	SOS	SOA	SO4	6143	4	6	8	10	12	14	16	18	20	22	24
						8143(1)											
	.169	SO	SOS	SOA	SO4	8169	4	6	8	10	12	14	16	18	20	22	24
	.194	SO	SOS	SOA	SO4	8194	4	6	8	10	12	14	16	18	20	22	24

All dimensions are in millimeters.

	B Thru-hole Diameter +0.1 -0.08	Type				Thru-hole Code	Length "L" +0.05 -0.13 (Length Code in millimeters)									
		Steel	Stainless Steel	Aluminum	Hardened Stainless Steel		3	4	6	8	10	12	14	16	18	20
METRIC	3.1	SO	SOS	SOA	SO4	43.1	3	4	6	8	10	12	14	16	18	20
						63.1(1)										
	3.6	SO	SOS	SOA	SO4	63.6	3	4	6	8	10	12	14	16	18	20
						83.6(1)										
	4.1	SO	SOS	SOA	SO4	84.1	3	4	6	8	10	12	14	16	18	20
	5.1	SO	SOS	SOA	SO4	85.1	3	4	6	8	10	12	14	16	18	20

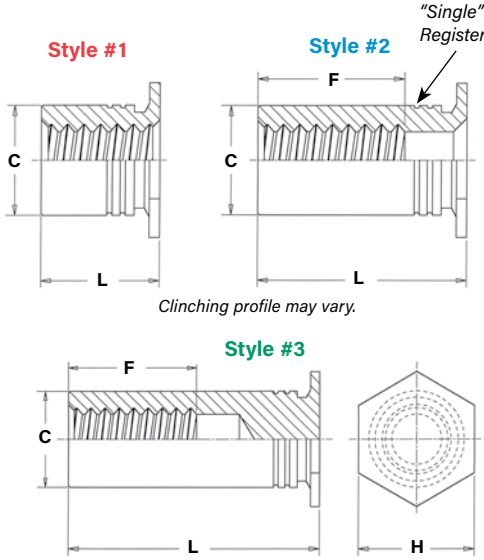
(1) Standoffs with thru-hole codes 6116, 8143, 63.1 and 83.6 have a thicker wall to provide more bearing surface for the mating component or panel reducing the chance of cracking or cutting into the board.

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

TYPES TSO/TSOS/TSOA/TSO4 THREADED STANDOFFS FOR SHEETS AS THIN AS .025"/0.63mm

Types TSO/TSOS/TSOA

Type TSO4
Installs into stainless steel



GENERAL DIMENSIONAL DATA

All dimensions are in inches.

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

All dimensions are in millimeters.

	Thread Code	Min. Sheet Thickness	Hole Size In Sheet +0.08	C -0.13	F Min. Thread Depth	H Nom.	Min. Dist. Hole ℄ To Edge
METRIC	M25	0.63	4.22	4.2	5.2	4.8	5.8
	6M25	0.63	5.41	5.39		6.4	7.1
	M3	0.63	4.22	4.2	6.2	4.8	5.8
	6M3	0.63	5.41	5.39		6.4	7.1
	M35	0.63	5.41	5.39	7	6.4	7.1

THREAD SIZE AND LENGTH SELECTION DATA

All dimensions are in inches.

	Thread Size	Type: Steel	Type: Stainless Steel	Type: Aluminum	Type: Hardened Stainless Steel	Thread Code	Length "L" ±.003 For other lengths / thread depth data see chart at bottom of page.											
							.090	.125	.187	.250	.312	.375	.437	.500	.562	.625	.687	.750
							Length Code (Length "L" without decimal point)											
UNIFIED	.086-56 (#2-56)	TSO	TSOS	TSOA	TSO4	256 / 6256(4)	090(1)	125(1)	187(1)	250(1)	312(2)	375(2)	437(3)	500(3)	562(3)	625(3)	687(3)	750(3)
	.112-40 (#4-40)	TSO	TSOS	TSOA	TSO4	440 / 6440(4)	090(1)	125(1)	187(1)	250(1)	312(2)	375(2)	437(2)	500(3)	562(3)	625(3)	687(3)	750(3)
	.138-32 (#6-32)	TSO	TSOS	TSOA	TSO4	632	–	125(1)	187(1)	250(1)	312(1)	375(2)	437(2)	500(2)	562(3)	625(3)	687(3)	750(3)

All dimensions are in millimeters.

	Thread Size x Pitch	Type: Steel	Type: Stainless Steel	Type: Aluminum	Type: Hardened Stainless Steel	Thread Code	Length "L" ±0.08 For other lengths / thread depth data see chart at bottom of page.									
							2.00	3.00	4.00	6.00	8.00	10.00	12.00	14.00	16.00	18.00	19.00
							Length Code (Length "L" without decimal point)										
METRIC	M2.5 x 0.45	TSO	TSOS	TSOA	TSO4	M25 / 6M25(4)	200(1)	300(1)	400(1)	600(1)	800(2)	1000(3)	1200(3)	1400(3)	1600(3)	1800(3)	1900(3)
	M3 x 0.5	TSO	TSOS	TSOA	TSO4	M3 / 6M3(4)	200(1)	300(1)	400(1)	600(1)	800(2)	1000(2)	1200(3)	1400(3)	1600(3)	1800(3)	1900(3)
	M3.5 x 0.6	TSO	TSOS	TSOA	TSO4	M35	–	300(1)	400(1)	600(1)	800(1)	1000(2)	1200(2)	1400(3)	1600(3)	1800(3)	1900(3)

*(1) **Style #1.** Thru-threaded.*
*(2) **Style #2.** Screw might not pass through unthreaded end. Tapped to minimum full thread depth shown. Incomplete threads on tap may allow screw to pass through.*
*(3) **Style #3.** Blind.*
(4) Standoffs with thread codes 6256, 6440, 6M25 and 6M3 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.

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

LENGTH/STYLE DATA

All dimensions are in inches.
(Length can be specified in .001" increments.)

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

All dimensions are in millimeters.
(Length can be specified in 0.02 mm increments.)

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

PART NUMBER DESIGNATION

TSO		-	440	-	250	ZI
TSO	S	-	440	-	250	
TSO	A	-	440	-	250	
TSO	4	-	440	-	250	NC*
↓ Type	↓ Material Code		↓ Thread Code		↓ Length Code	↓ Finish

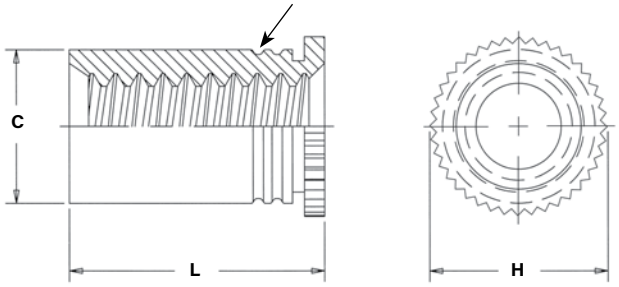
** NC suffix is required if optional nickel plating (for corrosion resistance) is desired. Otherwise, no suffix is necessary.*

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

PART NUMBER DESIGNATION

DSO	S	-	440	-	250	
DSO		-	440	-	250	ZI
↓ Type	↓ Material Code		↓ Thread Code		↓ Length Code	↓ Finish

"Two Groove" Registered Trademark



Clinching profile may vary.

All dimensions are in inches.

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

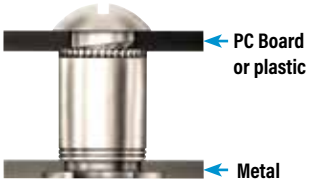
All dimensions are in millimeters.

	Thread Size x Pitch	Type		Thread Code	Length Code	Sheet Thickness	Hole Size In Sheet +0.08	C Max.	H Nom.	L (1) +0.05 -0.13	Min. Dist. Hole ℄ To Edge
		Stainless Steel	Steel								
METRIC	M3 x 0.5	DSOS	DSO	M3	6.35	0.94 - 6.35	4.22	4.2	4.92	6.35	3.2
					7					7	

(1) Available in other lengths on special order.

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

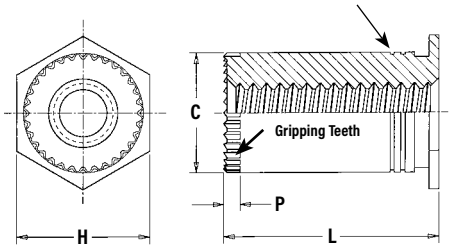
TYPES SOSG/SOAG GROUNDING STANDOFFS



PART NUMBER DESIGNATION

SO	S		G	-	6440	-	10
SO	A		G	-	6440	-	10
↓ Type	↓ Material Code		↓ Gripping		↓ Thread Code		↓ Length Code

"Two Groove" Registered Trademark



Clinching profile may vary.

All dimensions are in inches.

	Thread Size	Type		Thread Code	Length "L" +.010 -.000 (2) (Length Code is in 32nds of an inch)							Min. Sheet Thick-ness	Hole Size In Sheet +.003 -.000	C +.000 -.005	H ±.005	P Nom.	Min. Dist. Hole ℄ To Edge
		Stainless Steel	Aluminum		.125	.187	.250	.312	.375	.437	.500						
UNIFIED	.112-40 (#4-40)	SOSG	SOAG	6440	4	6	8	10	12	14	16	.040	.213	.212	.250	.030	.27
	.138-32 (#6-32)	SOSG	SOAG	8632	4	6	8	10	12	14	16	.050	.281	.280	.312	.030	.31

All dimensions are in millimeters.

	Thread Size x Pitch	Type		Thread Code	Length "L" +0.25 (2) (Length Code is in millimeters)						Min. Sheet Thick-ness	Hole Size In Sheet +0.08	C -0.13	H ±0.25	P Nom.	Min. Dist. Hole ℄ To Edge
		Stainless Steel	Aluminum													
METRIC	M3 x 0.5	SOSG	SOAG	3.5M3	3	4	6	8	10	12	1	5.4	5.39	6.4	0.76	6.8

(2) For special lengths greater than .500" / 12 mm, Types SOSG and SOAG are blind threaded.

MATERIAL AND FINISH SPECIFICATIONS

	Threads [1]	Fastener Materials					Standard Finishes			Optional Finish	For Use In Sheet Hardness: [4]				
Type	Internal, ASME B1.1, 2B ASME B1.13M, 6H	Hardened Carbon Steel	Non-heat Treated Carbon Steel	Aluminum	300 Series Stainless Steel	Hardened 400 Series Stainless Steel	Zinc Plated 5µm, Colorless (2)	Passivated and/or Tested Per ASTM A380	No Finish	Electroless Nickel over Copper over Nickel Strike Per ASTM B733 (2) (3)	HRB 88 / HB 183 or Less	HRB 80 / HB 150 or Less	HRB 70 / HB 125 or Less	HRB 60 / HB 107 or Less	HRB 50 / HB 89 or Less
SO	■	■					■					■			
SOA	■			■					■						■
SOS	■				■			■					■		
SO4	■					■		■		■	■				
BSO	■	■					■					■			
BSOA	■			■					■						■
BSOS	■				■			■					■		
BSO4	■					■		■		■	■				
TSO	■		■				■							■	
TSOS	■				■			■					■		
TSOA	■			■					■						■
TSO4	■					■		■		■	■				
DSO	■	■					■					■			
DSOS	■				■			■					■		
SOAG	■			■					■						■
SOSG	■				■			■					■		
Part Number Codes For Finishes							ZI	None	None	NC					

(1) Where applicable.
(2) See PEM Technical Support section of our web site for related plating standards and specifications.
(3) Not stocked, available on special order. Minimum quantities apply. Contact your local PEM distributor for details.
(4) HRB - Hardness Rockwell "B" Scale. HB - Hardness Brinell.

A NOTE ABOUT FASTENERS FOR STAINLESS STEEL PANELS

In order for self-clinching fasteners to work properly, the fastener must be harder than the sheet into which it is being installed. In the case of stainless steel panels, fasteners made from 300 Series Stainless Steel do not meet this hardness criteria. It is for this reason that 400 series fasteners are offered (Types SO4, BSO4, and TSO4). However, while these 400 Series fasteners install and perform well in 300 Series stainless sheets they should not be used if the end product:

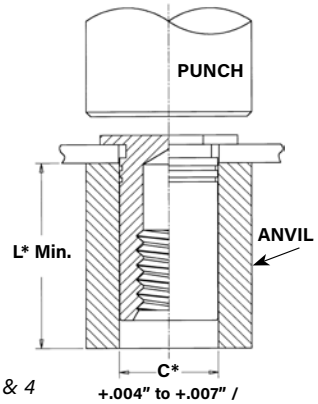
- Will be exposed to any appreciable corrosive environment (unless finished with optional nickel plating).
- Requires non-magnetic fasteners.
- Will be exposed to any temperatures above 300˚F (149˚C)

If any of the these are issues, please contact techsupport@pemnet.com for other options.

INSTALLATION

TYPES SO/SOS/SOA/SO4/BSO/BSOS/BSOA/BSO4

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.



**See pages 3 & 4 for "C" and "L".*

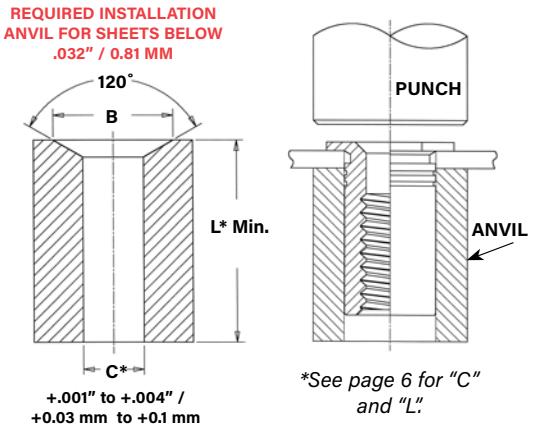
PEMSERTER® Installation Tooling

Thread Code	Anvil Part Number	Punch Part Number
440/M2/M2.5/M3	970200487300	975200048
632/6440/3.5M3/M3.5	970200012300	
832/8632/M4	970200013300	
032/M5	970200013300	
0420/M6	970200393300	

INSTALLATION

TYPES TSO/TSOS/TSOA/TSO4

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 required installation anvil for sheet thickness of .025" to .032" / 0.63 mm to 0.81 mm. A chamfered anvil is not required for sheets over .032" / 0.81 mm.



*See page 6 for "C" and "L".

PEMSERTER® Installation Tooling

UNIFIED	Thread Code	Anvil Dimensions (in.) For Sheets Below .032"		Anvil Part No. For Sheets Over .032"	Punch Part Number
		B	Anvil Part No.		
	256/440	.187 - .194	8003291	970200487300	975200048
	6256/6440/632	.250 - .257	8003292	970200012300	975200048

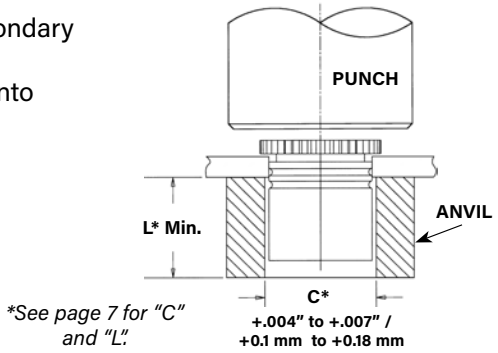
METRIC	Thread Code	Anvil Dimensions (mm) For Sheets Below 0.81 mm		Anvil Part No. For Sheets Over 0.81 mm	Punch Part Number
		B	Anvil Part No.		
	M2.5/M3	4.75 - 4.93	8003291	970200487300	975200048
	6M25/6M3/M35	6.35 - 6.53	8003292	970200012300	975200048

TYPES DSOS/DSO

1. Prepare properly sized mounting hole in sheet. Do not perform any secondary operations such as deburring.
2. Insert fastener through mounting hole (preferably the punch side) 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.

PEMSERTER® Installation Tooling

Thread Code	Anvil Part Number	Punch Part Number
440/M3	970200487300	975200048
6440/3.5M3	970200012300	
8632	970200013300	



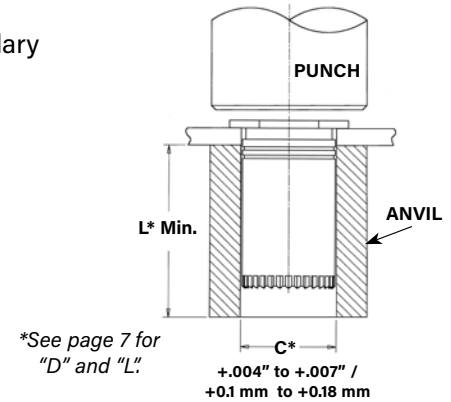
*See page 7 for "C" and "L".

TYPES SOSG/SOAG

1. Prepare properly sized mounting hole in sheet. Do not perform any secondary operations such as deburring.
2. Insert fastener through mounting hole (preferably the punch side) 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.

PEMSERTER® Installation Tooling

Thread Code	Anvil Part Number	Punch Part Number
440/M3	970200487300	975200048
6440/3.5M3	970200012300	
8632	970200013300	



*See page 7 for "D" and "L".

INSTALLATION NOTES

- For best results we recommend using a PEMSERTER® press for installation of PEM standoffs. Please check our website for more information.
- Visit the Animation Library on our website to view the installation process for this product.

PERFORMANCE DATA(1)

TYPES SO/SOS/SOA/BSO/BSOS/BSOA

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

	Thread Code	Standoff Material	Max. Rec. Tightening Torque For Mating Screw (N·m)	Test Sheet Material							
				1.5 mm 5052-H34 Aluminum				1.5 mm Cold-rolled Steel			
				Installation (kN)	Pushout (N)	Torque-out (N·m) (2)	Pull-thru (N) (2)	Installation (kN)	Pushout (N)	Torque-out (N·m) (2)	Pull-thru (N) (2)
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	–	–	–	–

TYPES SO4/BSO4

	Thread Code	Max. Rec. Tightening Torque For Mating Screw (in. lbs.)	Test Sheet Material			
			.050" 300 Series Stainless Steel			
			Installation (lbs.)	Pushout (lbs.)	Torque-out (in. lbs.) (2)	Pull-thru (lbs.) (2)
UNIFIED	440	4.75	5500	336	17	600
	6440	4.75	9500	647	30	680
	632	8.75	9500	647	30	680
	8632	8.75	10500	900	71	1392
	832	18	10500	900	71	1517
	032	32	10500	900	71	1368

	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) (2)	Pull-thru (N) (2)
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) 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.

PERFORMANCE DATA(1)

TYPES TSO/TSOS/TSOA

Standoff "C" Dimension	Standoff Material	Test Sheet Material											
		.025" / 0.64 mm 5052-H34 Aluminum						.025" / 0.64 mm Cold-rolled Steel					
		Installation		Pushout		Torque-out (2)		Installation		Pushout		Torque-out (2)	
		(lbs.)	(kN)	(lbs.)	(N)	(in. lbs.)	(N•m)	(lbs.)	(kN)	(lbs.)	(N)	(in. lbs.)	(N•m)
.165" / 4.2 mm	Steel	1500	6.7	70	311	6	0.68	2000	8.9	100	445	9	1
	Stainless Steel	1500	6.7	70	311	6	0.68	2000	8.9	100	445	9	1
	Aluminum	1500	6.7	70	311	6	0.68	—	—	—	—	—	—
.212" / 5.39 mm	Steel	1800	8	90	400	11	1.24	2500	11.1	150	667	15	1.7
	Stainless Steel	1800	8	90	400	11	1.24	2500	11.1	150	667	15	1.7
	Aluminum	1800	8	90	400	11	1.24	—	—	—	—	—	—

TYPE TSO4

Standoff "C" Dimension	Test Sheet Material					
	.025" / 0.64 mm 300 series stainless steel					
	Installation		Pushout		Torque-out (2)	
	(lbs.)	(kN)	(lbs.)	(N)	(in. lbs.)	(N•m)
.165" / 4.2 mm	5700	25.4	125	555	13	1.5
.212" / 5.39 mm	6800	30.3	160	710	22	2.5

TYPES DSOS/DSO

	Thread Code	Max. Rec. Tightening Torque For Mating Screw (in. lbs.)	Test Sheet Material					
			.040" 5052-H34 Aluminum			.040" Cold-rolled Steel		
			Installation (lbs.)	Pushout (lbs.)	Torque-out (in. lbs.) (2)	Installation (lbs.)	Pushout (lbs.)	Torque-out (in. lbs.) (2)
UNIFIED	440	3.8	1000	50	10	1300	75	10

	Thread Code	Max. Rec. Tightening Torque For Mating Screw (N•m)	Test Sheet Material					
			1 mm 5052-H34 Aluminum			1 mm Cold-rolled Steel		
			Installation (kN)	Pushout (N)	Torque-out (N•m) (2)	Installation (kN)	Pushout (N)	Torque-out (N•m) (2)
METRIC	M3	0.44	4.5	223	1.1	5.8	334	1.1

TYPES SOSG/SOAG

	Thread Code	Test Sheet Thickness and Test Sheet Material	Installation (lbs.)	Pushout (lbs.)	Torque-out (in. lbs.) (2)
UNIFIED	6440	.064" 5052-H34 Aluminum	1700	300	25
	8632	.064" 5052-H34 Aluminum	1700	400	45

	Thread Code	Test Sheet Thickness and Test Sheet Material	Installation (kN)	Pushout (N)	Torque-out (N•m) (2)
METRIC	3.5M3	1.6 mm 5052-H34 Aluminum	7.6	1330	2.82

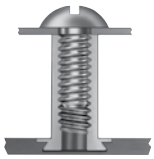
(1) Published installation forces are for general reference. Actual set-up and confirmation of complete installation should be made by observing proper seating of fastener as described in the installation steps. Other performance values reported are averages when all proper installation parameters and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

SELF-CLINCHING STANDOFFS

If you require a standoff which we do not offer in this bulletin, please contact us. We will be happy to work with you to satisfy your special need. For other types of standard PEM® brand standoffs and spacers see:

Bulletin CH



PEM® concealed-head standoffs.

Bulletin K

PEM® broaching and surface mount standoffs for printed circuit boards.

Bulletin SK

PEM® KEYHOLE® standoffs.

Bulletin SSA

PEM® brand SNAP-TOP® standoffs.

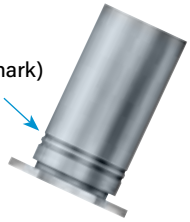
Bulletin MPF

PEM® brand microPEM® standoffs.

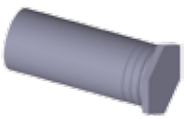
For more information on how to use PEM® self-clinching standoffs, see Tech Sheet "PEM®-Ref/Standoff Basics" on our web site.

Single Groove
(registered trademark)
Parts that install into stainless steel

Two Groove
(registered trademark)



On actual parts, location of grooves on barrel may be different than shown in photo.



Fastener drawings and models are available at www.pemnet.com

All PEM® products meet our stringent quality standards. If you require additional industry or other specific quality certifications, special procedures and/or part numbers are required. Please contact your local sales office or representative for further information.

Regulatory compliance information is available in Technical Support section of our website. Specifications subject to change without notice. See our website for the most current version of this bulletin.

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

Technical support e-mail: techsupport@pemnet.com

PennEngineering®

FASTENERS FOR USE IN STAINLESS STEEL SHEETS

BULLETIN **SS**

PEM®

416
REV 517

FASTENERS FOR USE IN STAINLESS STEEL SHEETS

One of the very basics of self-clinching is that the fastener must always be harder than the host sheet to ensure proper and permanent installation. This is particularly challenging when installing fasteners into stainless steel sheets. Therefore we have developed this line of specially hardened stainless steel fasteners for installation into stainless steel. **Refer to "Dos and Don'ts" on page 24 for further information.**

Fasteners made from precipitation hardened grade stainless including A286 stainless are particularly useful in applications such as outdoor equipment, medical devices and chemical and food processing equipment or anywhere corrosive element exposure is possible.

Type SP™ PEM 300® nuts provide **strong load-bearing internal threads** in stainless steel sheets as thin as .030"/0.8mm - PAGE 3

Type SMPP™ nuts install into stainless steel sheets as thin as .025"/0.64mm. Reduced outer dimensions and thinner sheet capabilities compared to Type SP thread sizes - PAGE 4

Types A4™ and LA4™ internally threaded floating nuts allow for **mating hole misalignment** and **locking threads** if desired. - PAGE 5

Type F4™ fasteners are ideal for **flush applications** where a stainless steel sheet requires load-bearing threads - PAGE 6

Types SO4™ and BSO4™ standoffs provide internally threaded fasteners for **stacking or spacing** applications - PAGES 7 and 8

Type TSO4™ Through hole threaded standoffs **for clinching into thinner sheets** than Type SO4. Install into sheets as thin as .025"/0.63mm. Also, threaded at the barrel end minimizing length of screw required - PAGE 9

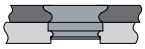
Types FH4™ and FHP™ offer **externally threaded attachment points** in two stainless materials, depending on the level of corrosion resistance required. (See page 24 for other non-clinching stud solutions) - PAGE 10

SGPC™ Swaging Collar Studs can install into most panel material and accommodate multiple panels as long as the total thickness does not exceed the maximum sheet thickness - PAGE 11

Type TP4™ pins provide an **unthreaded solution** for a wide range of positioning, pivot and alignment applications. - PAGE 12

Type PFC4™ provides a self-clinching, tool only, **captive screw solution** for stainless steel sheets. (See page 24 for other non-clinching captive screw solutions) - PAGE 13

Type SFP™ SpotFast® fasteners provide a solution for **flush "face-on-face" sheet attachment** in stainless steel - PAGE 14

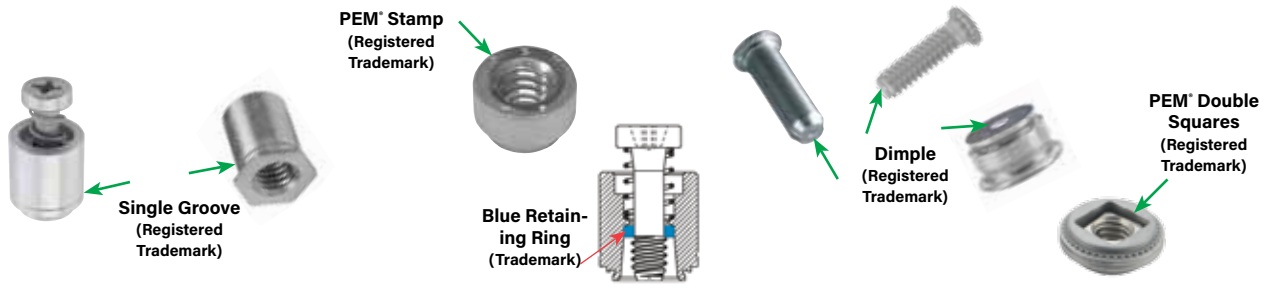


Material and finish specifications - PAGE 15

Installation - PAGES 16 - 20

Performance data - PAGES 21 - 23

For more information on these and other PEM® products, visit our PEMNET™ Resource Center at www.pemnet.com



To be sure that you are getting genuine PEM® brand fasteners, look for the unique PEM® product markings and identifiers. On actual parts, location of groove on fastener may be different than shown in photo.

TYPE SP™ PEM 300® SELF-CLINCHING NUTS

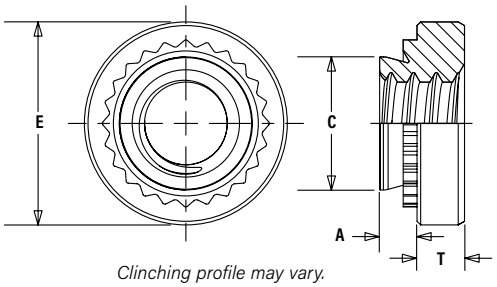
- After installation, reverse side of sheet remains flush and smooth.
- For use in stainless steel sheets HRB 90 / HB 192 or less.
- Corrosion resistance similar to 300 series stainless steel.

The PEM 300® Identification Marks

PART NUMBER DESIGNATION

SP - 440 - 2

- SP: Type and Material
- 440: Thread Code
- 2: Shank Code



Clinching profile may vary.

All dimensions are in inches.

	Thread Size	Type	Thread Code	Shank Code	A (Shank) Max.	Rec. Min. Sheet Thickness	Hole Size In Sheet +.003 -.000	C Max.	E ±.010	T ±.010	Min. Dist. Hole ℄ To Edge (1)
UNIFIED	.086-56 (#2-56)	SP	256	0	.030	.030	.166	.165	.250	.070	.19
				1	.038	.040					
				2	.054	.056					
	.112-40 (#4-40)	SP	440	0	.030	.030	.166	.165	.250	.070	.19
				1	.038	.040					
				2	.054	.056					
	.138-32 (#6-32)	SP	632	0	.030	.030	.1875	.187	.280	.070	.22
				1	.038	.040					
				2	.054	.056					
	.164-32 (#8-32)	SP	832	0	.030	.030	.213	.212	.310	.090	.27
				1	.038	.040					
				2	.054	.056					
	.190-24 (#10-24)	SP	024	0	.030	.030	.250	.249	.340	.090	.28
				1	.038	.040					
				2	.054	.056					
	.190-32 (#10-32)	SP	032	0	.030	.030	.250	.249	.340	.090	.28
				1	.038	.040					
				2	.054	.056					
	.250-20 (1/4-20)	SP	0420	1	.054	.056	.344	.343	.440	.170	.34
				2	.087	.090					
	.313-18 (5/16-18)	SP	0518	1	.054	.056	.413	.412	.500	.230	.38
				2	.087	.090					
	.313-24 (5/16-24)	SP	0524	1	.054	.056	.413	.412	.500	.230	.38
				2	.087	.090					
	.375-16 (3/8-16)	SP	0616	1	.087	.090	.500	.499	.560	.270	.44
				2	.120	.125					
	.375-24 (3/8-24)	SP	0624	1	.087	.090	.500	.499	.560	.270	.44
				2	.120	.125					

All dimensions are in millimeters.

	Thread Size x Pitch	Type	Thread Code	Shank Code	A (Shank) Max.	Rec. Min. Sheet Thickness	Hole Size In Sheet +0.08	C Max.	E ±0.25	T ±0.25	Min. Dist. Hole ℄ To Edge (1)
METRIC	M2 x 0.4	SP	M2	1	0.97	1	4.22	4.2	6.35	1.5	4.8
				2	1.38	1.4					
	M2.5 x 0.45	SP	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	SP	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					
	M4 x 0.7	SP	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	SP	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	SP	M6	1	1.38	1.4	8.75	8.73	11.18	4.08	8.6
				2	2.21	2.29					
	M8 x 1.25	SP	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	SP	M10	1	2.21	2.29	14	13.97	17.35	7.48	13.5

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

The increased hardness of stainless steel panels requires careful consideration when installing self-clinching fasteners.
Refer to Dos and Don'ts on page 24 for further information.

TYPE SMPP™ SELF-CLINCHING NUTS

- Installs into stainless steel sheets as thin as .025"/0.64mm.
- Corrosion resistance similar to 300 series stainless steel.
- Reduced outer dimensions and thinner sheet capabilities compared to Type SP thread sizes.
- Recommended for use in stainless steel sheets HRB 90 / HB 192 or less.

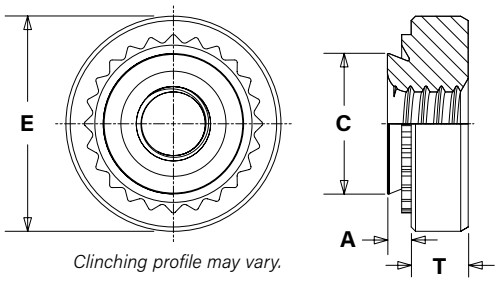
NEW

PART NUMBER DESIGNATION

SMPP - 440

SMPP: Type and Material

440: Thread Code



Clinching profile may vary.

All dimensions are in inches.

	Thread Size	Type / Fastener Material / Hardened Stainless Steel	Thread Code	A (Shank) Max.	Min. Sheet Thickness	Hole Size In Sheet +.003 -.000	C Max.	E ±.010	T ±.010	Min. Dist. Hole ℄ To Edge
UNIFIED	.086-56 (#2-56)	SMPP	256	.024	.025	.136	.135	.220	.065	.16
	.112-40 (#4-40)	SMPP	440	.024	.025	.166	.165	.220	.065	.20
	.138-32 (#6-32)	SMPP	632	.024	.025	.187	.186	.252	.065	.22

All dimensions are in millimeters.

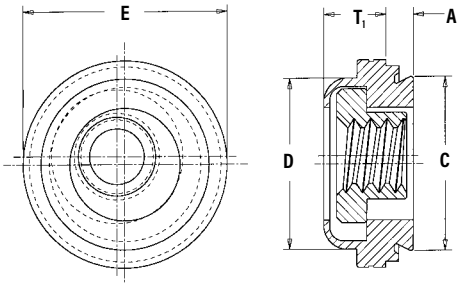
	Thread Size x Pitch	Type / Fastener Material / Hardened Stainless Steel	Thread Code	A (Shank) Max.	Min. Sheet Thickness	Hole Size In Sheet +0.08	C Max.	E ±0.25	T ±0.25	Min. Dist. Hole ℄ To Edge
METRIC	M2.5 x 0.45	SMPP	M2.5	0.61	0.64	3.8	3.79	5.6	1.4	3.9
	M3 x 0.5	SMPP	M3	0.61	0.64	4.24	4.22	5.6	1.4	5.1
	M3.5 x 0.6	SMPP	M3.5	0.61	0.64	4.75	4.73	6.4	1.4	5.5

The increased hardness of stainless steel panels requires careful consideration when installing self-clinching fasteners.
Refer to Dos and Don'ts on page 24 for further information.

TYPE A4™/LA4™ FLOATING SELF-CLINCHING FASTENERS

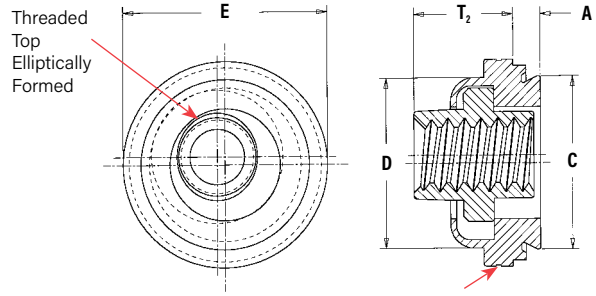
- Speeds assembly by compensating for mating hole misalignment.
- Permanent installation into stainless steel sheets as thin as .038"/0.97mm and greater.
- Provides high torque-out and pushout resistance in stainless panels.
- Type LA4 thread locking torque performance is equivalent to applicable NASM25027 specifications.(1)
- For use in stainless steel sheets HRB 88 / HB 183 or less.

NON-LOCKING
Type A4™



Clinching profile may vary.

SELF-LOCKING
Type LA4™



Clinching profile may vary. Single "groove" identifier.

Float – .015"/0.38mm minimum, in all directions from center, .030"/0.76mm total.

PART NUMBER DESIGNATION

A4	- 440	- 1	MD
LA4	- 440	- 1	MD
↓	↓	↓	↓
Type and Material	Thread Code	Shank Code	Finish (if applicable)

All dimensions are in inches.

	Thread Size	Type: Non-Locking	Type: Self-Locking	Thread Code	Shank Code	A (Shank) Max.	Min. Sheet Thickness	Hole Size in Sheet +.003 -.000	C Max.	D Max.	E ± .015	T_1 Max.	T_2 Max.	Min. Dist. Hole ℄ To Edge
UNIFIED	.112-40 (#4-40)	A4	LA4	440	1	.038	.038	.290	.289	.290	.360	.130	.190	.30
	.138-32 (#6-32)	A4	LA4	632	1	.038	.038	.328	.327	.335	.390	.130	.200	.32
	.164-32 (#8-32)	A4	LA4	832	1	.038	.038	.368	.367	.365	.440	.130	.210	.34
	.190-32 (#10-32)	A4	LA4	032	1	.038	.038	.406	.405	.405	.470	.170	.270	.36

All dimensions are in millimeters.

	Thread Size x Pitch	Type: Non-Locking	Type: Self-Locking	Thread Code	Shank Code	A (Shank) Max.	Min. Sheet Thickness	Hole Size in Sheet + 0.08	C Max.	D Max.	E ± 0.38	T_1 Max.	T_2 Max.	Min. Dist. Hole ℄ To Edge
METRIC	M3 x 0.5	A4	LA4	M3	1	0.97	0.97	7.37	7.35	7.37	9.14	3.31	4.83	7.62
	M4 x 0.7	A4	LA4	M4	1	0.97	0.97	9.35	9.33	9.28	11.18	3.31	5.34	8.64
	M5 x 0.8	A4	LA4	M5	1	0.97	0.97	10.31	10.29	10.29	11.94	4.32	6.86	9.14

The increased hardness of stainless steel panels requires careful consideration when installing self-clinching fasteners. Refer to Dos and Don'ts on page 24 for further information.

(1) To meet national aerospace standards and to obtain testing documentation, product must be ordered to US NASM45938/11 specifications. Check our web site for a complete Military Specification and National Aerospace Standards Reference Guide (Bulletin NASM). Screws for use with PEM self-clinching locking fasteners should be Class 3A/4h fit or no smaller than Class 2A/6g.

TYPE F4™ PEMSERT® SELF-CLINCHING FLUSH FASTENERS

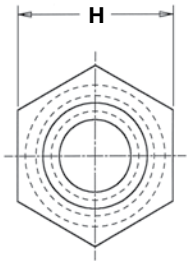
- Can be installed into sheets as thin as .060"/1.53mm.
- Ideal for flush applications where a stainless steel sheet requires load-bearing threads.
- Can be installed before bending and forming to provide strong threads while still remaining flat with no protrusions on either surface.
- For use in stainless steel sheets HRB 88 / HB 183 or less.

NEW

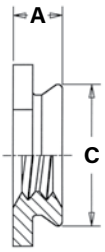
PART NUMBER DESIGNATION

F4 - 440 - 1

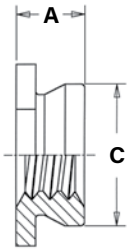
- F4: Type and Material
- 440: Thread Code
- 1: Shank Code



Profile for -1 shank code.



Profile for -2, -3, -4, & -5 shank codes.



Clinching profile may vary.

All dimensions are in inches.

	Thread Size	Type	Thread Code	Shank Code	A (Shank) Max.	Sheet Thickness	Hole Size In Sheet +.003 -.000	C Max.	H Nom.	Min. Dist. Hole ℄ To Edge
UNIFIED	.086-56 (#2-56)	F4	256	1	.060	.060-.090	.172	.171	.188	.23
				2	.090	.091 Min.				
	.112-40 (#4-40)	F4	440	1	.060	.060-.090	.172	.171	.188	.23
				2	.090	.091 Min.				
	.138-32 (#6-32)	F4	632	1	.060	.060-.090	.213	.212	.250	.27
				2	.090	.091 Min.				
	.164-32 (#8-32)	F4	832	1	.060	.060-.090	.290	.289	.312	.28
				2	.090	.091 Min.				
	.190-32 (#10-32)	F4	032	1	.060	.060-.090	.312	.311	.343	.31
				2	.090	.091 Min.				
	.250-20 (1/4-20)	F4	0420	3	.120	.125-.155	.344	.343	.375	.34
				4	.151	.156-.186				
				5	.182	.187 Min.				

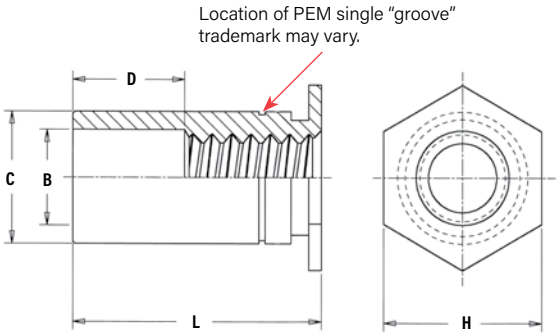
All dimensions are in millimeters.

	Thread Size x Pitch	Type	Thread Code	Shank Code	A (Shank) Max.	Sheet Thickness	Hole Size In Sheet +0.08	C Max.	H Nom.	Min. Dist. Hole ℄ To Edge
METRIC	M2 x 0.4	F4	M2	1	1.53	1.53-2.3	4.37	4.35	4.8	6
				2	2.3	2.32 Min.				
	M2.5 x 0.45	F4	M2.5	1	1.53	1.53-2.3	4.37	4.35	4.8	6
				2	2.3	2.32 Min.				
	M3 x 0.5	F4	M3	1	1.53	1.53-2.3	4.37	4.35	4.8	6
				2	2.3	2.32 Min.				
	M4 x 0.7	F4	M4	1	1.53	1.53-2.3	7.37	7.35	7.9	7.2
				2	2.3	2.32 Min.				
	M5 x 0.8	F4	M5	1	1.53	1.53-2.3	7.92	7.9	8.7	8
				2	2.3	2.32 Min.				
	M6 x 1	F4	M6	3	3.05	3.18-3.94	8.74	8.72	9.5	8.8
				4	3.84	3.96-4.72				
				5	4.63	4.75 Min.				

The increased hardness of stainless steel panels requires careful consideration when installing self-clinching fasteners.
Refer to Dos and Don'ts on page 24 for further information.

TYPE SO4™ THRU-HOLE THREADED STANDOFFS

- Ideal for stacking or spacing.
- Installed with head flush with one surface of the mounting sheet.
- For use in stainless steel sheets HRB 88 / HB 183 or less.



Clinching profile may vary.

PART NUMBER DESIGNATION

SO4 - 440 - 8

- SO4 — Type and Material
- 440 — Thread Code
- 8 — Length Code

GENERAL DIMENSIONAL DATA

All dimensions are in inches.

	Thread Code	Min. Sheet Thickness	Hole Size In Sheet +.003 -.000	B Counter-Bore Dia. ±.005	C +.000 -.005	H Nom.	Min. Dist. Hole ℄ To Edge (1)	D ±.010
UNIFIED	440	.040	.166	.125	.165	.187	.23	Varies according to length. See length charts below.
	6440	.040	.213	.125	.212	.250	.27	
	632	.040	.213	.156	.212	.250	.27	
	8632	.050	.281	.156	.280	.312	.31	
	832	.050	.281	.188	.280	.312	.31	
	032	.050	.281	.203	.280	.312	.31	

All dimensions are in millimeters.

	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 (1)	D ±0.25
METRIC	M3	1	4.22	3.25	4.2	4.8	6	Varies according to length. See length charts below.
	3.5M3	1	5.41	3.25	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	

THREAD SIZE AND LENGTH SELECTION DATA

All dimensions are in inches.

	Thread Size	Type	Thread Code	Length "L" +.002 -.005 (Length Code in 32nds of an inch)															
				.125	.187	.250	.312	.375	.437	.500	.562	.625	.687	.750	.812	.875	.937	1.00	1.062
UNIFIED	.112-40 (#4-40)	SO4	440	4	6	8	10	12	14	16	18	20	22	24	—	—	—	—	—
			6440(2)																
	.138-32 (#6-32)	SO4	632	4	6	8	10	12	14	16	18	20	22	24	26	28	30	32	34
			8632(2)																
	.164-32 (#8-32)	SO4	832	4	6	8	10	12	14	16	18	20	22	24	26	28	30	32	34
	.190-32 (#10-32)	SO4	032	4	6	8	10	12	14	16	18	20	22	24	26	28	30	32	34
	D Dimension ±.010			None				.187				.312				.437			

All dimensions are in millimeters.

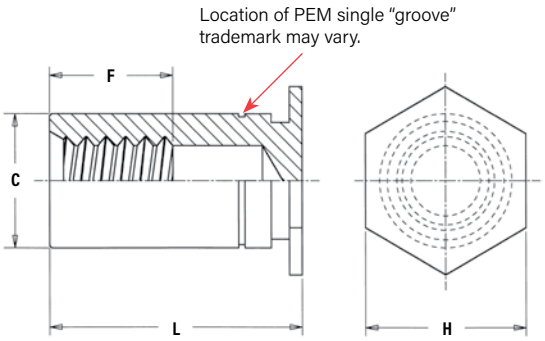
	Thread Size x Pitch	Type	Thread Code	Length "L" +0.05 -0.13 (Length Code in millimeters)											
METRIC	M3 x 0.5	SO4	M3	3	4	6	8	10	12	14	16	18	—	—	—
			3.5M3(2)												
	M3.5 x 0.6	SO4	M3.5	3	4	6	8	10	12	14	16	18	20	22	25
	M4 x 0.7	SO4	M4	3	4	6	8	10	12	14	16	18	20	22	25
	M5 x 0.8	SO4	M5	3	4	6	8	10	12	14	16	18	20	22	25
	D Dimension ±0.25			None				4			8			11	

(1) To minimize sheet distortion and maximize product performance, use a centerline-to-edge value greater or equal to the value specified.
(2) Standoffs with thread codes 6440, 8632, and 3.5M3 offer greater wall thickness for thread sizes 440, 632, and M3 respectively.

The increased hardness of stainless steel panels requires careful consideration when installing self-clinching fasteners.
Refer to Dos and Don'ts on page 24 for further information.

TYPE BSO4™ BLIND THREADED STANDOFFS

- Ideal for stacking or spacing.
- Installed with closed end head flush with one surface of the mounting sheet.
- For use in stainless steel sheets HRB 88 / HB 183 or less.



Clinching profile may vary.

PART NUMBER DESIGNATION

BSO4 - 440 - 8

- BSO4 — Type and Material
- 440 — Thread Code
- 8 — Length Code

GENERAL DIMENSIONAL DATA

All dimensions are in inches.

	Thread Code	Min. Sheet Thickness	Hole Size In Sheet +.003 -.000	C +.000 -.005	H Nom.	Min. Dist. Hole ℄ To Edge (1)	F Min.
UNIFIED	440	.040	.166	.165	.187	.23	Varies according to length. See length charts below.
	6440	.040	.213	.212	.250	.27	
	632	.040	.213	.212	.250	.27	
	8632	.050	.281	.280	.312	.31	
	832	.050	.281	.280	.312	.31	
	032	.050	.281	.280	.312	.31	

All dimensions are in millimeters.

	Thread Code	Min. Sheet Thickness	Hole Size In Sheet +0.08	C -0.13	H Nom.	Min. Dist. Hole ℄ To Edge (1)	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 inches.

	Thread Size	Type	Thread Code	Length "L" +.002 -.005 (Length Code in 32nds of an inch)												
				.312	.375	.437	.500	.562	.625	.687	.750	.812	.875	.937	1.00	1.062
UNIFIED	.112-40 (#4-40)	BSO4	440 / 6440(2)	10	12	14	16	18	20	22	24	26	28	30	32	34
	.138-32 (#6-32)	BSO4	632 / 8632(2)	10	12	14	16	18	20	22	24	26	28	30	32	34
	.164-32 (#8-32)	BSO4	832	10	12	14	16	18	20	22	24	26	28	30	32	34
	.190-32 (#10-32)	BSO4	032	10	12	14	16	18	20	22	24	26	28	30	32	34
	F Dimension Min.			.156		.187	.250			.375						

All dimensions are in millimeters.

	Thread Size x Pitch	Type	Thread Code	Length "L" +0.05 -0.13 (Length Code in millimeters)									
METRIC	M3 x 0.5	BSO4	M3 / 3.5M3(2)	6	8	10	12	14	16	18	20	22	25
	M3.5 x 0.6	BSO4	M3.5	6	8	10	12	14	16	18	20	22	25
	M4 x 0.7	BSO4	M4	6	8	10	12	14	16	18	20	22	25
	M5 x 0.8	BSO4	M5	6	8	10	12	14	16	18	20	22	25
	F Dimension Min.			3.2	4		5	6.5		9.5			

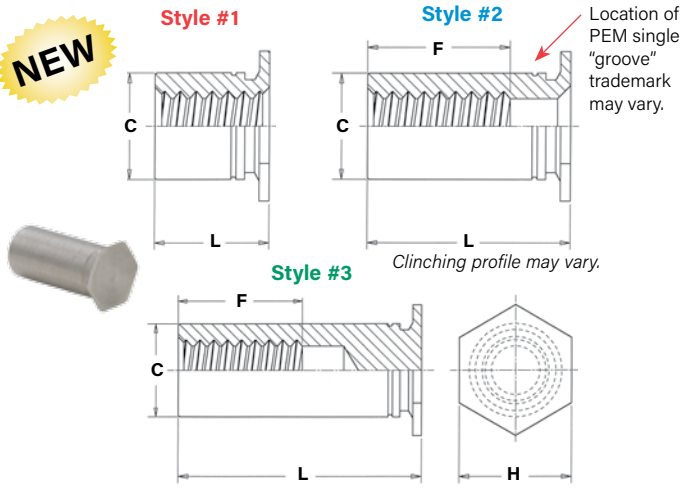
(1) To minimize sheet distortion and maximize product performance, use a centerline-to-edge value greater or equal to the value specified.
(2) Standoffs with thread codes 6440, 8632, and 3.5M3 offer greater wall thickness for thread sizes 440, 632, and M3 respectively.

The increased hardness of stainless steel panels requires careful consideration when installing self-clinching fasteners.
Refer to Dos and Don'ts on page 24 for further information.

TYPE TSO4™ STANDOFFS FOR INSTALLATION INTO ULTRA-THIN STAINLESS STEEL SHEETS

- For installation into ultra-thin stainless steel sheets as thin as .025"/0.63mm.
- Threads on barrel end eliminate the need for long screws.
- For use in stainless steel sheets HRB 88 / HB 183 or less.

NEW



GENERAL DIMENSIONAL DATA

All dimensions are in inches.

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

All dimensions are in millimeters.

	Thread Code	Min. Sheet Thickness	Hole Size In Sheet +0.08	C -0.13	F Min. Thread Depth	H Nom.	Min. Dist. Hole ℄ To Edge
METRIC	M25	0.63	4.22	4.2	5.2	4.8	5.8
	6M25	0.63	5.41	5.39		6.4	7.1
	M3	0.63	4.22	4.2	6.2	4.8	5.8
	6M3	0.63	5.41	5.39		6.4	7.1
	M35	0.63	5.41	5.39	7	6.4	7.1

THREAD SIZE AND LENGTH SELECTION DATA

All dimensions are in inches.

	Thread Size	Type	Thread Code	Length "L" ±.003 For other lengths / thread depth data see chart at bottom of page.											
				.090	.125	.187	.250	.312	.375	.437	.500	.562	.625	.687	.750
				Length Code (Length "L" without decimal point)											
UNIFIED	.086-56 (#2-56)	TSO4	256 / 6256(4)	090(1)	125(1)	187(1)	250(1)	312(2)	375(2)	437(3)	500(3)	562(3)	625(3)	687(3)	750(3)
	.112-40 (#4-40)	TSO4	440 / 6440(4)	090(1)	125(1)	187(1)	250(1)	312(2)	375(2)	437(2)	500(3)	562(3)	625(3)	687(3)	750(3)
	.138-32 (#6-32)	TSO4	632	–	125(1)	187(1)	250(1)	312(1)	375(2)	437(2)	500(2)	562(3)	625(3)	687(3)	750(3)

All dimensions are in millimeters.

	Thread Size x Pitch	Type	Thread Code	Length "L" ±0.08 For other lengths / thread depth data see chart at bottom of page.										
				2.00	3.00	4.00	6.00	8.00	10.00	12.00	14.00	16.00	18.00	19.00
				Length Code (Length "L" without decimal point)										
METRIC	M2.5 x 0.45	TSO4	M25 / 6M25(4)	200(1)	300(1)	400(1)	600(1)	800(2)	1000(3)	1200(3)	1400(3)	1600(3)	1800(3)	1900(3)
	M3 x 0.5	TSO4	M3 / 6M3(4)	200(1)	300(1)	400(1)	600(1)	800(2)	1000(2)	1200(3)	1400(3)	1600(3)	1800(3)	1900(3)
	M3.5 x 0.6	TSO4	M35	–	300(1)	400(1)	600(1)	800(1)	1000(2)	1200(2)	1400(3)	1600(3)	1800(3)	1900(3)

*(1) **Style #1.** Thru-threaded.*
*(2) **Style #2.** Screw might not pass through unthreaded end. Tapped to minimum full thread depth shown. Incomplete threads on tap may allow screw to pass through.*
*(3) **Style #3.** Blind.*
(4) Standoffs with thread codes 6256, 6440, 6M25 and 6M3 offer oversized body for increased bearing surface, wall thickness and performance.
Please contact your local PEM® distributor for availability, minimum quantity, and pricing information.

LENGTH/STYLE DATA

All dimensions are in inches.
(Length can be specified in .001" increments.)

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

All dimensions are in millimeters.
(Length can be specified in .02 mm increments.)

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

PART NUMBER DESIGNATION

TSO4 - 440 - 250

- TSO4: Type and Material
- 440: Thread Code
- 250: Length Code

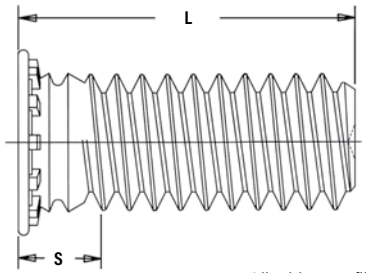
The increased hardness of stainless steel panels requires careful consideration when installing self-clinching fasteners. Refer to Dos and Don'ts on page 24 for further information.

TYPE FH4™/FHP™ FLUSH-HEAD STUDS

- Permanent installation into stainless steel sheets as thin as .040"/1mm.
- Type FHP offers highest corrosion resistance and ideal for medical, food service, and marine applications.
- For use in stainless steel sheets HRB 92 / HB 202 or less.

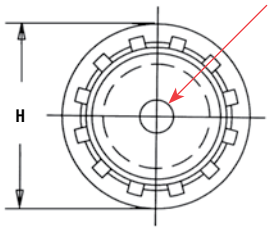
PART NUMBER DESIGNATION

FH4	-	632	-	6
FHP	-	632	-	6
↓		↓		↓
Type and Material		Thread Code		Length Code



unthreaded length

Look for the PEM "Dimple" trademark.



Clinching profile may vary.

All dimensions are in inches.

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

All dimensions are in millimeters.

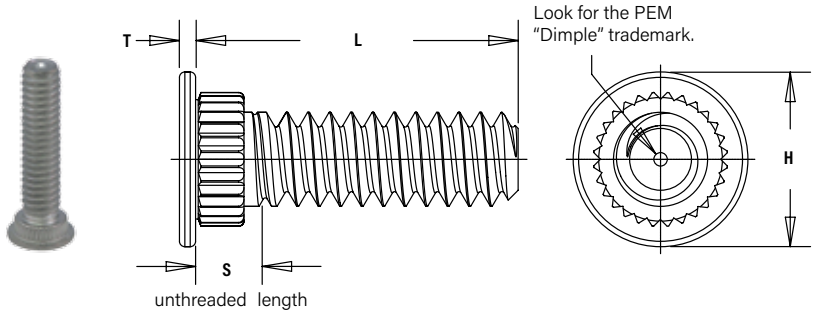
	Thread Size x Pitch	Type		Thread Code	Length Code "L" ±0.4 (Length Code in millimeters)										Sheet Thickness (1)	Hole Size in Sheet +0.08	Max. Hole in Attach. parts	H ±0.4	S Max. (2)	Min. Dist. Hole ℄ to Edge
METRIC	M3 x 0.5	FH4	FHP	M3	6	8	10	12	15	18	20	25	—	—	1 - 2.4	3	3.3	4.6	2.1	5.6
	M4 x 0.7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

(1) Performance may be reduced for studs installed into thicker sheets.
(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.

The increased hardness of stainless steel panels requires careful consideration when installing self-clinching fasteners.
Refer to Dos and Don'ts on page 24 for further information.

TYPE SGPC™ SWAGING COLLAR STUDS

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



PART NUMBER DESIGNATION

SGPC - 632 - 8

- SGPC: Type and Material
- 632: Thread Code
- 8: Length Code

All dimensions are in inches.

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

All dimensions are in millimeters.

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

(1) When using the fastener to attach more than one sheet or panel, the stud may seem slightly loose after installation. This is a normal condition in some applications and will not affect the stud's performance.

(2) See installation data for tooling requirements. Contact Technical Support (techsupport@pemnet.com) for other thicknesses.

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

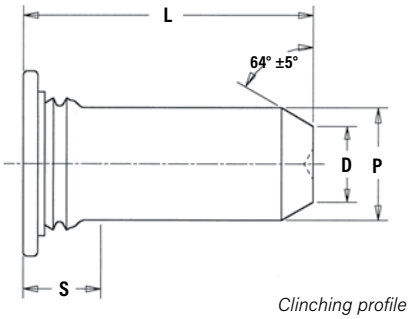
TYPE TP4™ FLUSH-HEAD PINS

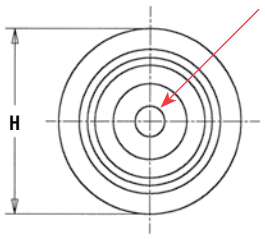
- Permanent installation into stainless steel sheets as thin as .040"/1mm.
- Satisfies a wide range of positioning, pivot, and alignment applications.
- Chamfered end makes mating hole location easy.
- For use in stainless steel sheets HRB 92 / HB 202 or less.

PART NUMBER DESIGNATION

TP4 - 125 - 8

- TP4 → Type and Material
- 125 → Pin Diameter Code
- 8 → Length Code





Clinching profile may vary.

All dimensions are in inches.

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

All dimensions are in millimeters.

	Pin Diameter P ±0.05	Type	Pin Diameter Code	Length Code "L" ± 0.4 (Length Code in millimeters)					Min. Sheet Thickness	Hole Size in Sheet +0.08	D ±0.15	H ±0.4	S Max. (1)	Min. Distance Hole Ⓒ to Edge
METRIC	3	TP4	3MM	8	10	12	16	—	1	3.5	2.05	5.2	2.29	6.4
	4	TP4	4MM	8	10	12	16	—	1	4.5	2.82	6.12	2.29	7.1
	5	TP4	5MM	—	10	12	16	20	1	5.5	3.53	7.19	2.29	7.6
	6	TP4	6MM	—	—	12	16	20	1	6.5	4.24	8.13	2.29	7.9

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

The increased hardness of stainless steel panels requires careful consideration when installing self-clinching fasteners. Refer to Dos and Don'ts on page 24 for further information.

TYPE PFC4™ PANEL FASTENERS

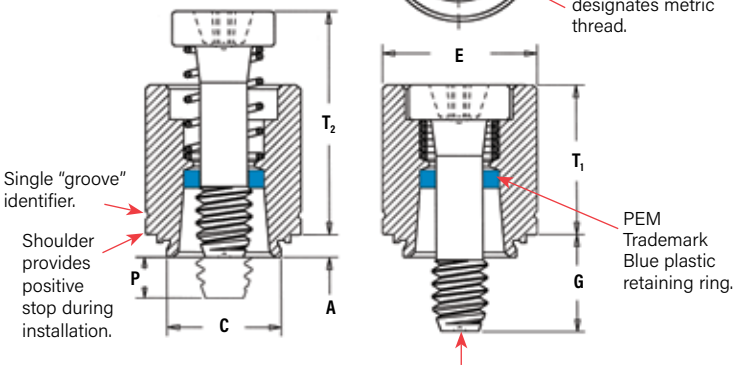
- Tool only access meets UL 1950 "service area access" requirements and provides fixed screw solutions for the EC Machinery Directive.
- Assorted screw lengths for most applications.
- For use in stainless steel sheets HRB 88 / HB 183 or less.

c UL us

PART NUMBER DESIGNATION

PFC4 – 832 – 50

- PFC4 – Type and Material
- 832 – Thread Code
- 50 – Screw Length Code



Clinching profile may vary.

PEM "Dimple" trademark on end of screw.

All dimensions are in inches.

	Thread Size	Type	Thread Code	Screw Length Code	A (Shank) Max.	Min. Sheet Thickness	Hole Size In Sheet + .003 - .000	C Max.	E ± .010	G ± .016	P ±.025	T_1 Max.	T_2 Nom.	Driver Size	Min. Dist. Hole ℄ To Edge (1)
UNIFIED	.112-40 (#4-40)	PFC4	440	40	.060	.060	.265	.264	.344	.250	.000	.370	.540	#1	.25
				62						.375	.125				
	.138-32 (#6-32)	PFC4	632	40	.060	.060	.281	.280	.375	.250	.000	.380	.540	#2	.28
				62						.375	.125				
				84						.500	.250				
	.164-32 (#8-32)	PFC4	832	50	.060	.060	.312	.311	.406	.312	.000	.480	.705	#2	.31
				72						.437	.125				
				94						.562	.250				
	.190-32 (#10-32)	PFC4	032	50	.060	.060	.344	.343	.437	.312	.000	.490	.705	#2	.34
				72						.437	.125				
				94						.562	.250				

All dimensions are in millimeters.

	Thread Size x Pitch	Type	Thread Code	Screw Length Code	A (Shank) Max.	Min. Sheet Thickness	Hole Size In Sheet + 0.08	C Max.	E ± 0.25	G ± 0.4	P ±0.64	T_1 Max.	T_2 Nom.	Driver Size	Min. Dist Hole ℄ To Edge (1)
METRIC	M3 x 0.5	PFC4	M3	40	1.53	1.53	6.73	6.71	8.74	6.4	0	9.4	13.72	#1	6.35
				62						9.5	3.2				
	M4 x 0.7	PFC4	M4	50	1.53	1.53	7.92	7.9	10.31	7.9	0	12.19	17.91	#2	7.87
				72						11.1	3.2				
				94						14.3	6.4				
	M5 x 0.8	PFC4	M5	50	1.53	1.53	8.74	8.72	11.1	7.9	0	12.45	17.91	#2	8.63
				72						11.1	3.2				
				94						14.3	6.4				

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

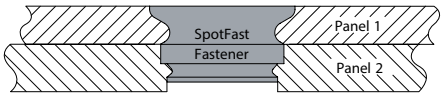
The increased hardness of stainless steel panels requires careful consideration when installing self-clinching fasteners.
Refer to Dos and Don'ts on page 24 for further information.

TYPE SFP™ SPOTFAST® FASTENERS

- Allows permanent joining of two metal sections.
- Offers high corrosion resistance.
- Can be used as single flush-mounted pivot point.
- Installs smooth with top sheet and flush or sub-flush with the bottom sheet.
- For use in sheets of HRB 88 / HB 183 or less.

SpotFast® fastener used as a single flush-mounted pivot point. Top panel rotates about the SpotFast fastener.

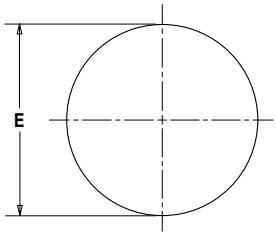
Patented



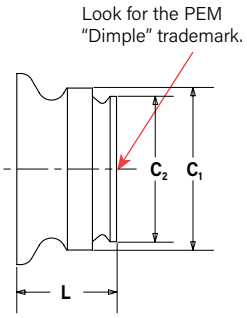
PART NUMBER DESIGNATION

SFP - 3 - 1.0

- SFP: Type and Material
- 3: Panel 1 Mounting Hole Code
- 1.0: Thickness Code



Clinching profile may vary.



Type and Size	Thickness Code	Panel 1 Thickness ±0.08 mm / ±.003"		Panel 1 Mounting Hole +0.08 mm / +.003" -.000"		Panel 2 Thickness Min. (1)		Panel 2 Mounting Hole +0.08 mm / +.003" -.000"		C_1 Max.		C_2 Max.		E Max.		L Max.		Min. Dist. Hole ℄ To Edge	
		mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.
SFP-3	1.0	1	.039	3	.118	1	.039	2.5	.098	2.98	.117	2.48	.097	3.76	.148	1.9	.075	2.54	.1
SFP-3	1.2	1.2	.047	3	.118	1.2	.047	2.5	.098	2.98	.117	2.48	.097	3.76	.148	2.31	.091	2.54	.1
SFP-3	1.6	1.6	.063	3	.118	1.6	.063	2.5	.098	2.98	.117	2.48	.097	3.76	.148	3.12	.123	2.54	.1
SFP-5	1.0	1	.039	5	.197	1	.039	4.5	.177	4.98	.196	4.47	.176	5.56	.219	1.9	.075	3.6	.14
SFP-5	1.2	1.2	.047	5	.197	1.2	.047	4.5	.177	4.98	.196	4.47	.176	5.56	.219	2.31	.091	3.6	.14
SFP-5	1.6	1.6	.063	5	.197	1.6	.063	4.5	.177	4.98	.196	4.47	.176	5.56	.219	3.12	.123	3.6	.14

(1) Fastener will provide flush application at minimum sheet thickness.

The increased hardness of stainless steel panels requires careful consideration when installing self-clinching fasteners. Refer to Dos and Don'ts on page 24 for further information.

MATERIAL AND FINISH SPECIFICATIONS

	Threads			Fastener Materials				Finish		For Use in Sheet Hardness [1]					
Type	Internal, ASME B1.1 2B/ ASME B1.13M, 6H	External, ASME B1.1 2A/ ASME B1.13M, 6g	Self-locking, Internal ASME B1.1, 3B/ ASME B1.13M, 6H	Precipitation Hardening Grade Stainless Steel	Heat-Treated 400 Series Stainless Steel	300 Series Stainless Steel	Age Hardened A286 Stainless Steel	Passivated and/or Tested per ASTM A380	Black Dry-film Lubricant	HRB 92 / HB 202 or less	HRB 90 / HB 192 or less	HRB 88 / HB 183 or less	Any Sheet Hard-ness	Corrosion Resistance	Magnetic
SP	▪						▪	▪			▪			Excellent	No
SMPP	▪						▪	▪			▪			Excellent	No
A4	▪				▪ (retainer)	▪ (insert)		▪				▪		Fair	Yes
LA4			▪		▪ (retainer)	▪ (insert)		▪ (retainer)	▪ (insert)			▪		Fair	Yes
F4	▪				▪			▪				▪		Fair	Yes
SO4	▪				▪			▪				▪		Fair	Yes
BSO4	▪				▪			▪				▪		Fair	Yes
TSO4	▪				▪			▪				▪		Fair	Yes
FH4		▪			▪			▪		▪				Fair	Yes
FHP		▪					▪	▪		▪				Excellent	No
SGPC		▪				▪		▪					▪	Excellent	No
TP4	Not threaded				▪			▪		▪				Fair	Yes
PFC4 (Retainer)					▪			▪				▪		Fair	Yes
(Screw)		▪			▪			▪							
(Spring)						▪									
SFP	Not threaded			▪				▪				▪		Excellent	Yes
Part number codes for finishes								None	MD						

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

A NOTE ABOUT FASTENERS FOR STAINLESS STEEL PANELS

In order for self-clinching fasteners to work properly, the fastener must be harder than the sheet into which it is being installed. In the case of stainless steel panels, fasteners made from 300 Series Stainless Steel do not meet this hardness criteria. It is for this reason that 400 series fasteners are offered (Types A4, LA4, F4, SO4, BSO4, TSO4, FH4, TP4, and PFC4). However, while these 400 Series fasteners install and perform well in 300 Series stainless sheets they should not be used if the end product:

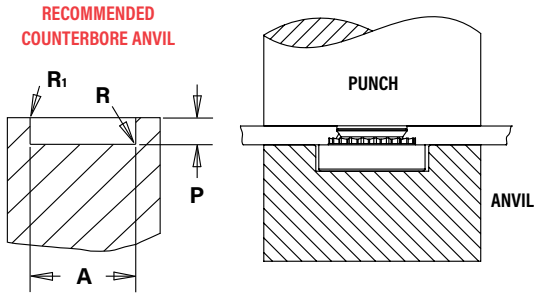
- Will be exposed to any appreciable corrosive presence.
- Requires non-magnetic fasteners.
- Will be exposed to any temperatures above 300˚F (149˚C)

If any of the these are issues, please contact techsupport@pemnet.com for other options.

INSTALLATION

TYPES SP/SMPP[1]

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 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.



PEMSERTER® Installation Tooling

SP

	Thread Code	Anvil Dimensions (in.) A ±.002	P +.000 -.001	R Max.	R1 +.005	Anvil Part Number	Punch Part Number
UNIFIED	440	.255	.064	.010	.005	8012821	975200048
	632	.286	.064	.010	.005	8012822	
	832	.317	.082	.010	.005	8012823	
	024/032	.348	.082	.010	.005	8012824	
	0420	.443	.163	.010	.005	8012825	8003076
	0518	.505	.230	.010	.005	8015359	
	0616/0624	.570	.263	.010	.005	8015863	

	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	

SMPP

	Thread Code	Anvil Dimensions (in.) A ±.002	P +.000 -.001	R Max.	R1 +.005	Anvil Part Number	Punch Part Number
UNIFIED	256	.223	.060	.010	.005	8020023	975200048
	440	.233	.060	.010	.005	8021386	
	632	.255	.060	.010	.005	8020024	

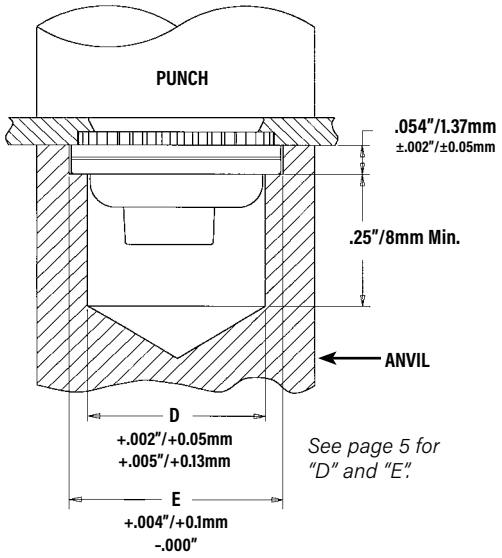
	Thread Code	Anvil Dimensions (mm) A ±0.05	P -0.03	R Max.	R1 +0.13	Anvil Part Number	Punch Part Number
METRIC	M2.5	5.66	1.27	0.25	0.13	8020025	975200048
	M3	5.66	1.27	0.25	0.13	8021474	
	M3.5	6.48	1.27	0.25	0.13	8020026	

(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.*

TYPES A4/LA4

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.
3. With installation punch and anvil surfaces parallel, apply sufficient squeezing force until the flange contacts the sheet material.



See page 5 for "D" and "E".

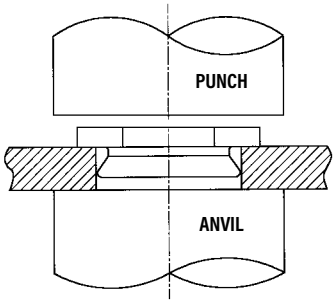
PEMSERTER® Installation Tooling

Thread Code	Anvil Part Number	Punch Part Number
440/M3	8013889	975200048
632	8013890	
832/M4	8013891	
032/M5	8013892	

INSTALLATION

TYPE F4

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



PEMSERTER® Installation Tooling

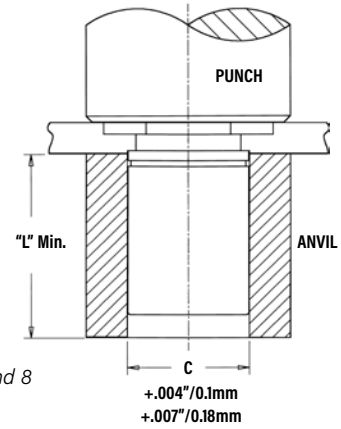
Thread Code	Anvil Part Number	Punch Part Number
256/M2/M2.5	8006193	975200048
440/M3	975200040	
632	975200041	
832/M4	975200042	
1032/M5	975200043	
0420/M6	975200044	

TYPES SO4/BSO4

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

PEMSERTER® Installation Tooling

Thread Code	Anvil Part Number	Punch Part Number
440/M3	970200487300	975200048
632/6440/M3.5/3.5M3	970200012300	
832/8632/M4	970200013300	
032/M5	970200013300	

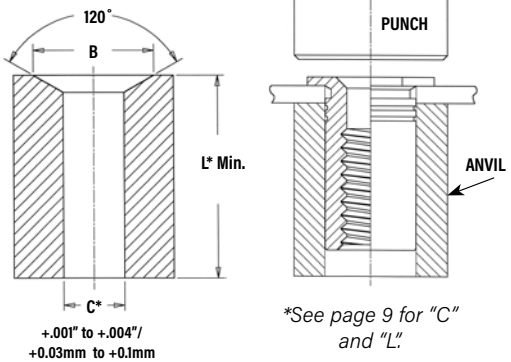


See pages 7 and 8 for "C" and "L".

TYPE TSO4

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 required installation anvil for sheet thickness of .025" to .032"/0.63 to 0.81mm. A chamfered anvil is not required for sheets over .032"/0.81mm.

REQUIRED INSTALLATION ANVIL FOR SHEETS BELOW .032"/0.81MM



See page 9 for "C" and "L".

PEMSERTER® Installation Tooling

	Thread Code	Anvil Dimensions (in.) For Sheets Below .032"		Anvil Part No. For Sheets Over .032"	Punch Part Number
		B	Anvil Part No.		
UNIFIED	256/440	.187 - .194	8003291	970200487300	975200048
	6256/6440/632	.250 - .257	8003292	970200012300	975200048

	Thread Code	Anvil Dimensions (mm) For Sheets Below 0.63 mm		Anvil Part No. For Sheets Over 0.63 mm	Punch Part Number
		B	Anvil Part No.		
METRIC	M2.5/M3	4.75 - 4.93	8003291	970200487300	975200048
	6M25/6M3/M35	6.35 - 6.53	8003292	970200012300	975200048

INSTALLATION

TYPES FH4/FHP

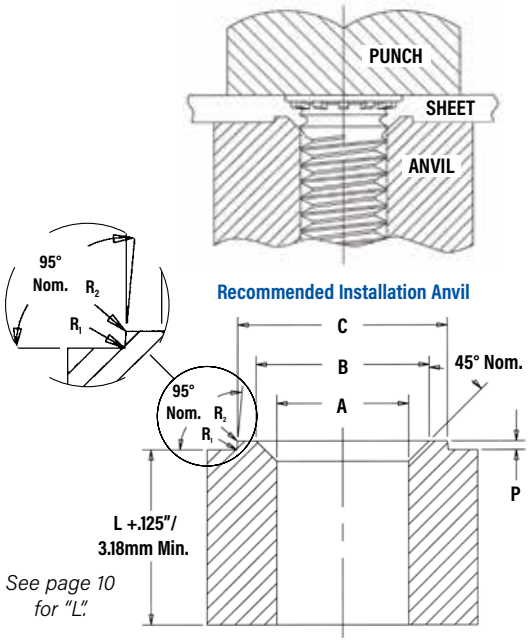
1. Prepare properly sized mounting hole in sheet. Do not perform any secondary operations such as deburring.
2. Insert stud through mounting hole (punch side) of sheet and into anvil hole.
3. With punch and anvil surfaces parallel, apply squeezing force to embed the head of the stud flush in the sheet.

For Type FH4/FHP studs, a special anvil with a raised ring is required to create a proper installation. The raised ring acts as a second displacer of the stainless sheet material, thereby ensuring that the annular groove is filled. Please see page 10 for recommended sheet thickness range.
The special anvils are available from PEM stock or can be machined from suitable tool steel. A hardness of HRC 55 / HB 547 minimum is required to provide long anvil life. We recommend measuring the "P" dimension every 5000 installations to ensure that the anvil remains within specification.

PEMSERTER® Installation Tooling

	Thread Code	Anvil Dimensions (in.) A +.003 -.000	B ±.002	C ±.002	P ±.001	R_1 Max.	R_2 Max.	Anvil Part Number	Punch Part Number
UNIFIED	440	.113	.144	.174	.010	.003	.005	8001645	975200048
	632	.140	.170	.200	.010	.003	.005	8001644	
	832	.166	.202	.236	.010	.003	.005	8001643	
	032	.191	.235	.275	.010	.003	.005	8001642	
	0420	.252	.324	.360	.020	.003	.005	8002535	

	Thread Code	Anvil Dimensions (mm) A +0.08	B ±0.05	C ±0.05	P ±.025	R_1 Max.	R_2 Max.	Anvil Part Number	Punch Part Number
METRIC	M3	3.05	3.81	4.57	0.25	0.08	0.13	8001678	975200048
	M4	4.04	4.95	5.82	0.25	0.08	0.13	8001677	
	M5	5.08	6.15	7.16	0.25	0.08	0.13	8001676	
	M6	6.05	7.87	8.79	0.51	0.08	0.13	8002536	



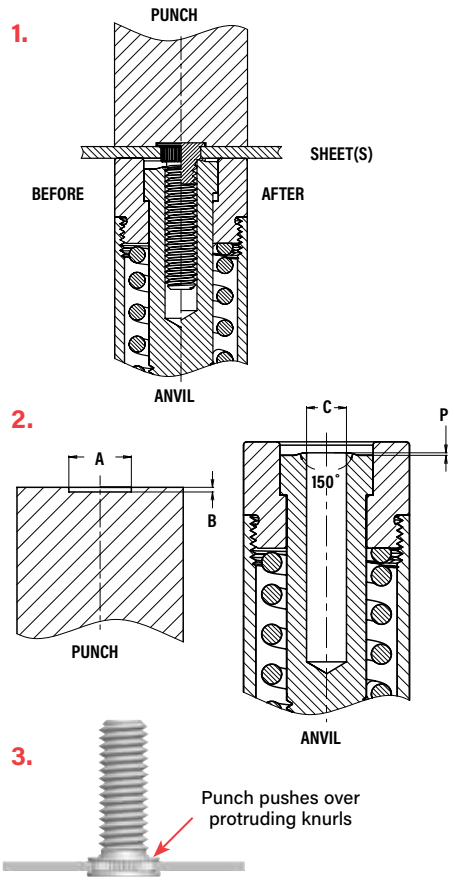
Recommended Installation Anvil

See page 10 for "L".

INSTALLATION

TYPE SGPC

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



PEMSERTER® Installation Tooling

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

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

NOTE: *For panel design information, go to* http://www.pemnet.com/SGPC_Panel_Designs.pdf

TYPE TP4

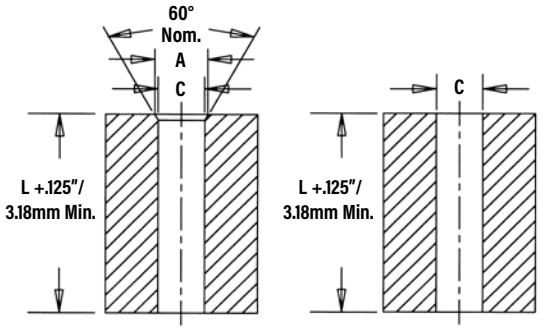
1. Prepare properly sized mounting hole in sheet. Do not perform any secondary operations such as deburring.
2. Place pin end through (punched side of) mounting hole in sheet and into anvil as shown
3. With installation punch and anvil surfaces parallel, apply squeezing force to embed the pin's head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

PEMSERTER® Installation Tooling

	Pin Dia. Code	Test Sheet Thickness (in.)	Anvil Dimensions (in.) Anvil Part A ±.002	C ±.002	Punch Part Number	Number
UNIFIED	125	.040 - .060	.160	.130	8003284	975200048
		Over .060	(1)		8003278	
	187	.040 - .065	.220	.192	8003285	
		Over .065	(1)		8003279	
	250	.040 - .075	.285	.255	8003286	
		Over .075	(1)		8003280	

	Pin Dia. Code	Test Sheet Thickness (mm)	Anvil Dimensions (mm) A ±0.05	C ±0.05	Anvil Part Number	Punch Part Number
METRIC	3MM	1 - 1.7	3.88	3.11	8008096	975200048
		Over 1.7	(1)		8008095	
	4MM	1 - 1.7	4.88	4.11	8003287	
		Over 1.7	(1)		8003281	
	5MM	1 - 1.8	5.89	5.13	8003288	
		Over 1.8	(1)		8003282	
	6MM	1 - 1.9	6.89	6.12	8003289	
		Over 1.9	(1)		8003283	

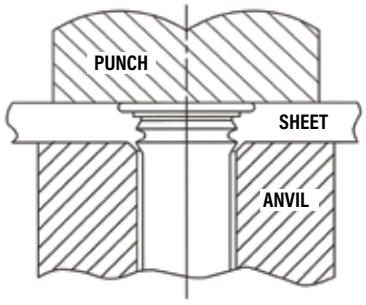
(1) Chamfered anvil not required.



Recommended tooling when a chamfered anvil is required.

Recommended tooling when a chamfered anvil is not required.

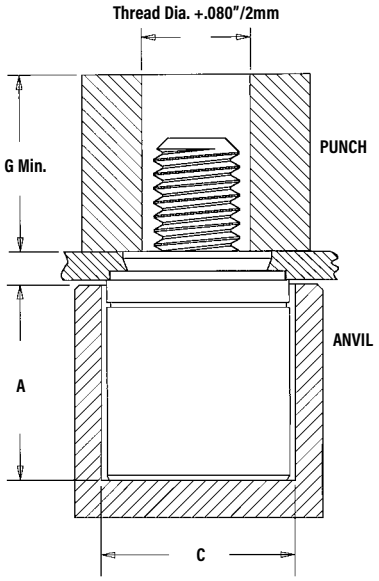
See page 12 for "L".



INSTALLATION

TYPE PFC4

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 (punch side of) mounting hole over the shank of the fastener retainer.
3. With installation punch and anvil surfaces parallel, apply squeezing force until the shoulder of the retainer comes in contact with the sheet material.



See page 13 for "G".

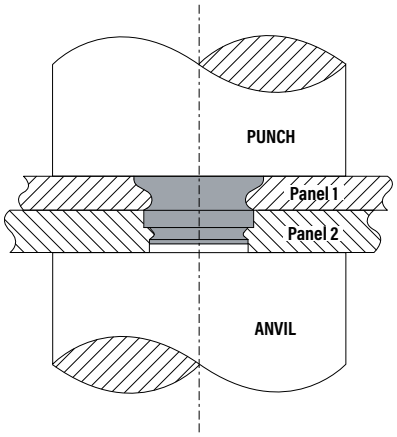
PEMSERTER® Installation Tooling

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

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

TYPE SFP

1. Prepare properly sized mounting hole in both panels. Do not perform any secondary operations such as deburring.
2. Place Panel 2 with smaller mounting hole on anvil and align Panel 1 mounting hole with the mounting hole of Panel 2. Place the smaller diameter end of the fastener through the mounting holes as shown in the drawing to the right.
3. With installation punch and anvil surfaces parallel, apply squeezing force until the fastener is flush with the top of Panel 1.



NOTE: *To use as a flush-mounted pivot point, for best results, install SpotFast fastener into Panel 1 first, then place Panel 2 over fastener and squeeze again.*

PEMSERTER® Installation Tooling

Size	Anvil Part Number	Punch Part Number
SF-3 / SF-5	975200046	975200048

PERFORMANCE DATA(1)

TYPE SP

	Type	Thread Code	Shank Code	Test Sheet Material	Installation (lbs.)	Pushout (lbs.)	Torque-out (in. lbs.)
UNIFIED	SP	256	0	304 Stainless Steel	8000	130	14
			1		9000	165	17
			2		10000	290	18
	SP	440	0	304 Stainless Steel	8000	130	14
			1		9000	165	17
			2		10000	290	18
	SP	632	0	304 Stainless Steel	8500	140	18
			1		9500	170	24
			2		10500	340	28
	SP	832	0	304 Stainless Steel	9000	145	30
			1		10000	180	37
			2		11000	360	45
	SP	024/032	0	304 Stainless Steel	9500	180	35
			1		10500	230	45
			2		11500	400	60
	SP	0420	1	304 Stainless Steel	13500	450	150
			2		13500	600	170
	SP	0518	1	304 Stainless Steel	14800	470	170
			2		14800	750	250
	SP	0524	1	304 Stainless Steel	14800	470	170
			2		14800	750	250
	SP	0616/0624	1	304 Stainless Steel	16000	600	300
			2		20000	700	370

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

TYPE SMPP

	Thread Code	Max. Nut Tightening Torque (in. lbs.) (2) (3)	Test Sheet Thickness and Material (in.)	Sheet Hardness HRB	Installation (lbs.) (4)	Pushout (lbs.)	Torque-out (in. lbs.)	Tensile Strength (lbs.) (2) (3)	Test Bushing Hole Size For Pull Thru Tests (in.)
UNIFIED	256	7.5	.029" 304 Stainless Steel	89	4500	50	10	640	.104
	440	13	.029" 304 Stainless Steel	89	4500	75	15	850	.112
	632	20	.029" 304 Stainless Steel	89	6000	75	20	1020	.138

	Thread Code	Max. Nut Tightening Torque (N-m) (2) (3)	Test Sheet Thickness and Material (mm)	Sheet Hardness HRB	Installation (kN) (4)	Pushout (N)	Torque-out (N·m)	Tensile Strength (kN) (2) (3)	Test Bushing Hole Size For Pull Thru Tests (mm)
METRIC	M2.5	1.05	0.7 mm 304 Stainless Steel	89	20	200	1.35	3.05	3
	M3	1.5	0.7 mm 304 Stainless Steel	89	20	300	1.85	3.63	3.5
	M3.5	2.1	0.7 mm 304 Stainless Steel	89	27	300	1.9	4.25	4

TYPES A4/LA4

	Thread Code	Test Sheet Material: 300 Series Stainless Steel Installation (lbs.)	Retainer Pushout (lbs.)	Retainer Torque-out (in. lbs.)
UNIFIED	440	9000	200	85
	632	10000	200	85
	832	12000	200	85
	032	13000	250	125

	Thread Code	Test Sheet Material: 300 Series Stainless Steel Installation (kN)	Retainer Pushout (N)	Retainer Torque-out (N·m)
METRIC	M3	40	890	9.6
	M4	53	890	9.6
	M5	57	1100	14.1

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

(3) Tightening torque shown will induce preload of 70% of nut min axial strength with K or nut factor is equal to 0.20. In some applications tightening torque may need to be adjusted based on the actual K value. All tightening torques shown are based on 180 ksi/ Property Class 12.9 screws. For lower strength screws the tightening torque is proportionately less. For example, for 120 ksi screws, torque is 67% value shown. For 900 MPa screws (Property Class 9.8) torque value is 74% of value shown.

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

PERFORMANCE DATA

TYPE F4

	Thread Code	Shank Code	Axial Tensile Strength (lbs.) (1)	Max. Screw Tightening Torque (2) (in. lbs.)	Test Sheet Material: 300 Series Stainless Steel	
					Installation (lbs.)	Pushout (lbs.)
UNIFIED	256	1	130	1.50	7200	270
		2				
	440	1	165	2.50	7200	270
		2				
	632	1	190	3.50	7200	290
		2				
	832	1	230	5.25	9000	450
		2				
	032	1	280	7.50	9000	450
		2				
	0420	3	1035	36	14000	1000
		4				
		5				

	Thread Code	Shank Code	Axial Tensile Strength (kN) (1)	Max. Screw Tightening Torque (2) (N·m)	Test Sheet Material: 300 Series Stainless Steel	
					Installation (kN)	Pushout (N)
METRIC	M2	1	0.57	0.16	32	1200
		2				
	M2.5	1	0.68	0.23	32	1200
		2				
	M3	1	0.85	0.36	32	1200
		2				
	M4	1	1	0.58	40	2000
		2				
	M5	1	1.3	0.88	40	2000
		2				
	M6	3	4.5	3.7	65	4500
		4				
		5				

TYPES SO4/BSO4

	Thread Code	Max. Rec. Tightening Torque For Mating Screw (in. lbs.)	Test Sheet Material: .050" 300 Series Stainless Steel			
			Installation (lbs.)	Pushout (lbs.)	Torque-out (in. lbs.) (3)	Pull-thru (lbs.) (3)
UNIFIED	440	4.75	5500	336	17	600
	6440	4.75	9500	647	30	680
	632	8.75	9500	647	30	680
	8632	8.75	10500	900	71	1392
	832	18	10500	900	71	1517
	032	32	10500	900	71	1368

	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

TYPE TSO4

Standoff "C" Dimension	Test Sheet Material: .025" / 0.64 mm 300 series stainless steel					
	Installation		Pushout		Torque-out (3)	
	(lbs.)	(kN)	(lbs.)	(N)	(in. lbs.)	(N·m)
.165" / 4.2 mm	5700	25.4	125	555	13	1.5
.212" / 5.39 mm	6800	30.3	160	710	22	2.5

TYPE FH4

	Thread Code	Max. Rec. Tightening Torque For Mating Screw (in. lbs.)	Sheet Hardness HRB	Test Sheet Material: .060" Stainless Steel (4)			
				Installation (lbs.)	Pushout (lbs.)	Torque-out (in. lbs.)	Pull-thru (lbs.)
UNIFIED	440	6	87	9000	450	16	800
	632	11	87	9500	540	27	1350
	832	21	86	11200	780	58	1800
	032	33	86	12000	800	95	2250
	0420	70	86	23000	1600	156	3900

	Thread Code	Max. Rec. Tightening Torque For Mating Screw (N·m)	Sheet Hardness HRB	Test Sheet Material: 1.5 mm Stainless Steel (4)			
				Installation (kN)	Pushout (N)	Torque-out (N·m)	Pull-thru (N)
METRIC	M3	0.9	87	40	2220	1.8	3500
	M4	2.1	86	50	3210	6.5	8000
	M5	4.3	86	53	3560	10.7	10000
	M6	7.2	86	71	4200	15.9	14900

(1) Failure occurs in screw stripping using a 60 ksi screw and the shortest shank length fastener.

(2) Torque values shown will produce a preload of 70% of axial tensile strength with nut factor "k" equal to .2. Threads may strip or head of the nut may bend and/or fail if screw is over-torqued beyond these values or if actual k value is less than .2.

(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.

(4) Performance may be reduced for studs installed into thicker sheets.

PERFORMANCE DATA

TYPE FHP

	Thread Code	Max. Rec. Tightening Torque For Mating Screw (in. lbs.)	Sheet Hardness HRB	Test Sheet Material .060" Stainless Steel (1)			
				Installation (lbs.)	Pushout (lbs.)	Torque-out (in. lbs.)	Pull-thru (lbs.)
UNIFIED	440	6	86	9000	520	10.6	605
	632	11	86	9500	670	19.5	940
	832	21	86	11200	785	37.5	1415
	032	33	86	12000	800	59.5	1500

	Thread Code	Max. Rec. Tightening Torque For Mating Screw (N·m)	Sheet Hardness HRB	Test Sheet Material 1.5 mm (for M4&M5) 2 mm (for M3) Stainless Steel (1)			
				Installation (kN)	Pushout (N)	Torque-out (N·m)	Pull-thru (N)
METRIC	M3	1.3	86	40	2500	1.6	3500
	M4	2.1	86	50	3000	3.9	6000
	M5	4.3	86	53	3560	7.35	7320

TYPE SGPC

	Thread Code	Max. Rec. Tightening Torque For Mating Nut (in. lbs.)	Test Sheet Material Single sheet of .039" 300 Series Stainless Steel			
			Installation (lbs.)	Pushout (lbs.)	Torque-out (in. lbs.)	Pull-thru (lbs.)
UNIFIED	256	2.3	4000	425	5.2	415
	440	5	5000	450	8	512
	632	9	5500	460	15.8	811
	832	17	6500	480	29.3	1133
	032	27	7300	545	42.8	1273
	0420	58	10000	565	76.7	1721

	Thread Code	Max. Rec. Tightening Torque For Mating Nut (N·m)	Test Sheet Material Single sheet of 1 mm 300 Series Stainless Steel			
			Installation (kN)	Pushout (N)	Torque-out (N·m)	Pull-thru (N)
METRIC	M2.5	0.41	20.1	2546	0.86	2561
	M3	0.74	21.8	2051	1.35	2851
	M4	1.7	28.5	2396	2.66	4000
	M5	3.5	35.6	3200	5.96	4284
	M6	5.9	42.3	3262	9.19	6311

TYPE TP4

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

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

TYPE PFC4

	Thread Code	Test Sheet Material 300 Series Stainless Steel	
		Installation (lbs.)	Retainer Pushout (lbs.)
UNIFIED	440	9100	350
	632	10300	400
	832	10800	450
	032	11800	550

	Thread Code	Test Sheet Material 300 Series Stainless Steel	
		Installation (kN)	Retainer Pushout (N)
METRIC	M3	40.5	1557
	M4	48	2002
	M5	52.5	2447

TYPE SFP

Type and Size	Thickness Code	Test Sheet Material Stainless Steel			
		Installation		Pushout of Panel 2 (2)	
		kN	lbs.	N	lbs.
SFP-3	1.0	13.5	3000	620	140
SFP-3	1.2	20	4500	830	186
SFP-3	1.6	22	5000	1500	340
SFP-5	1.0	18	4000	990	222
SFP-5	1.2	27	6000	1158	260
SFP-5	1.6	33	7500	3117	701

(1) Performance may be reduced for studs installed into thicker sheets.
(2) In most applications, pullout strength of the SpotFast fastener in Panel 1 exceeds pushout strength of Panel 2.

OTHER FASTENERS FOR CONSIDERATION TO USE IN STAINLESS STEEL SHEETS

Type PF11MW™

Floating captive panel screw with unique flare-mount feature allows fastener to "float" in mounting hole and compensate for mating thread alignment.
(See PEM® Bulletin PF)

Type PF11MF™

Flare-mounted captive panel screw that installs into any panel material and is flush on back side of panel.
(See PEM® Bulletin PF)

Type MPP™

Self-clinching microPEM® pins that can be installed into stainless steel sheets as thin as .02"/0.5mm.
(See PEM® Bulletin MPF)

Type MSO4™

Self-clinching microPEM® standoffs that can be installed into stainless steel sheets as thin as .016"/0.4mm.
(See PEM® Bulletin MPF)

Type T4™

microPEM® TackPin® fasteners enable sheet-to-sheet attachment in stainless steel sheets in applications where disassembly is not required.
(See PEM® Bulletin MPF)

Type WN/WNS

Designed to overcome many problems such as burn-outs, complicated electrodes and pilots, indexing and re-tapping to remove weld spatter.
(See PEM® Bulletin WN)

ATLAS® BLIND THREADED INSERTS

Attach to panels of any hardness and provide strong and reusable permanent threads in sheet materials where only one side is accessible.
(See ATLAS® Catalog)

Fastener drawings and models are available at www.pemnet.com

INSTALLATION INTO STAINLESS STEEL SHEETS DOS AND DON'TS

"Dos"

- **DO** *select the proper fastener material to meet corrosion requirements.*
- **DO** *make certain that panel material is in the annealed condition.*
- **DO** *make certain that hole punch is kept sharp to minimize work hardening around hole.*
- **DO** *provide mounting hole of specified size for each fastener.*
- **DO** *maintain the hole punch diameter to no greater than +.001"/.025 mm over the minimum recommended mounting hole.*
- **DO** *make certain that fastener is properly positioned within hole before applying installation force.*
- **DO** *make certain that fastener is not installed adjacent to bends or other highly cold-worked areas.*
- **DO** *apply squeezing force between parallel surfaces.*
- **DO** *utilize recommended installation tooling when installing fasteners.*
- **DO** *install fastener in punched side of hole.*
- **DO** *apply sufficient force to totally embed clinching ring (where applicable) around entire circumference and to bring shoulder squarely in contact with sheet. For all other fasteners, installation will be complete when the head is flush with the panel surface.*

"Don'ts"

- **DON'T** *attempt to install a 300 series stainless steel fastener into a stainless steel sheet.*
- **DON'T** *deburr mounting holes on either side of sheet before installing fasteners – deburring will remove metal required for clinching fastener into sheet.*
- **DON'T** *install fastener closer to edge of sheet than minimum edge distance – unless a special fixture is used to restrict bulging of sheet edge.*
- **DON'T** *install fastener near bends or other highly cold worked areas where sheet hardness may be greater than the limit for the fastener.*
- **DON'T** *over-squeeze. It will crush the head, distort threads, and buckle the sheet. Be certain to determine optimum installation force by test prior to production runs.*
- **DON'T** *attempt to insert fastener with a hammer blow – under any circumstances. A hammer blow won't permit the sheet metal to flow and develop an interlock with the fastener's contour.*
- **DON'T** *install screw in the head side of fastener. Install from opposite side so that the fastener load is toward sheet. The clinching force is designed only to hold the fastener during handling and to resist torque during assembly.*

Regulatory compliance information is available in Technical Support section of our website.

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

PennEngineering®

PEM®

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

Technical support e-mail: techsupport@pemnet.com

Bulletin SSA-516
REV 817

PEM® brand SNAP-TOP® standoffs are designed for permanent installation into metal panels or PC Boards

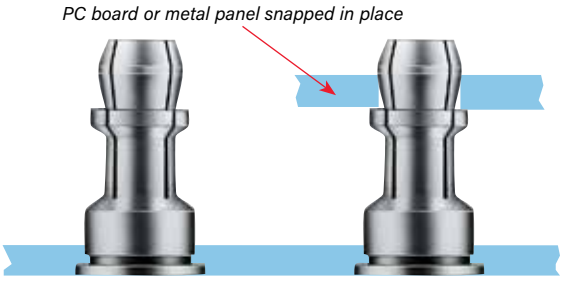
SSA™

SNAP-TOP® STANDOFFS

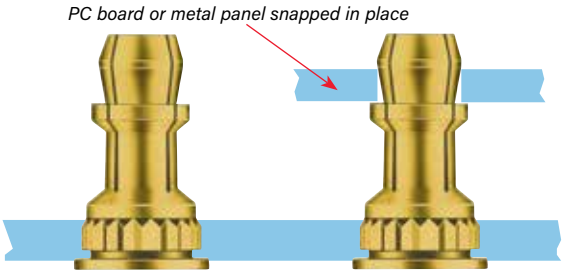
PEM SNAP-TOP® Standoffs are designed for permanent installation into metal panels or PC boards.

- Spring action to hold PC Boards and subassemblies securely.
- Allows for quick removal.
- Eliminates screws and other threaded hardware.
  - Less parts to handle during assembly.
  - Less risk of damaging delicate circuitry because of loose parts falling into your equipment.
- Available in three different mounting styles:
  - Self-clinching
  - Broaching
  - Surface mount
- Permanently installed in the panel.

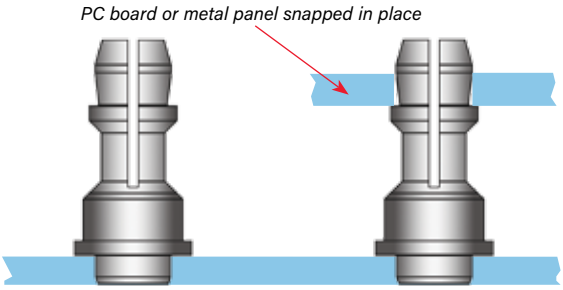
Installation forces, pushout and snap forces are listed on page 7.



*SSA™/SSS™/SSC™ standoffs **clinched** into a metal panel*



*KSSB™ standoffs **broached** into a PC board*

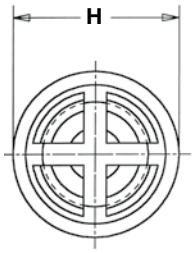


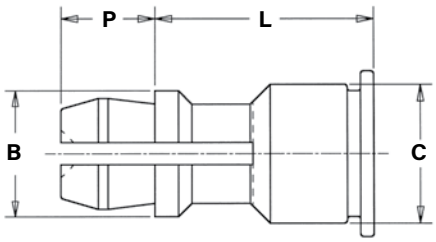
*SSTSS™ standoffs **surface mounted** into PC Board*

To be sure that you are getting genuine PEM® brand SNAP-TOP® standoffs, look for the "dimple" registered trademark.

Fastener drawings and models are available at www.pemnet.com

SSA™/SSS™/SSC™ STANDOFFS FOR CLINCHING INTO METAL SHEETS





PART NUMBER DESIGNATION

SS	A	-	156	-	10	
SS	S	-	156	-	10	ZI
SS	C	-	156	-	10	
Type	Material		Mounting Hole A Diameter Code		Length Code	Finish

FASTENER MATERIAL:
SSA: Aluminum
SSS: Lead-free Carbon Steel
SSC: 400 Series Stainless Steel

FINISH:
SSA: Natural
SSS: ZI - Zinc plated, 5µm, colorless, plus clear chromate (1)
SSC: Passivated and/or tested per ASTM A380

All dimensions are in inches.

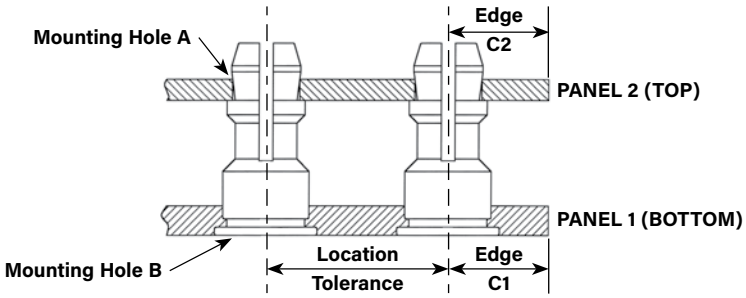
	Type			Panel 2 (Top) Mounting Hole Diameter Code	Length Code "L" ±.005 (Length Code in 32nds of an inch)										B ±.005	C Max.	H ±.005	P ±.005
	Fastener Material				.250	.312	.375	.437	.500	.562	.625	.750	.875	1.00				
UNIFIED	Aluminum	Carbon Steel	Stainless Steel															
	SSA	SSS	SSC	156	8	10	12	14	16	18	20	24	28	32	.188	.212	.250	.141

All dimensions are in millimeters.

	Type			Panel 2 (Top) Mounting Hole Diameter Code	Length Code "L" ±0.13 (Length Code in millimeters)								B ±0.13	C Max.	H ±0.13	P ±0.13
	Fastener Material															
METRIC	Aluminum	Carbon Steel	Stainless Steel													
	SSA	SSS	SSC	4MM	8	10	12	14	16	18	20	22	25	4.78	5.39	6.35	3.58

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

APPLICATION DATA



All dimensions are in inches.

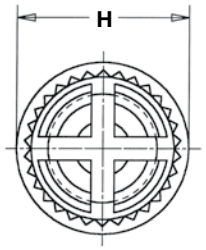
		Panel 1						Panel 2				
	Type	Hardness Max. (2)	Bottom Mounting Hole B +.003 -.000	Panel Material	Thickness Min.	Edge Distance C_1 Min.	Location Tolerance	Hardness Max.	Top Mounting Hole A +.003 -.000	Panel Material	Thickness Range (3)	Edge Distance C_2 Min.
UNIFIED	SSA	HRB 50 / HB 82	.213	Metal	.040	.260	±.005	No Limit	.156	PC Board or Metal	.040 - .070	.100
	SSS	HRB 60 / HB 107										
	SSC	HRB 70 / HB 125										

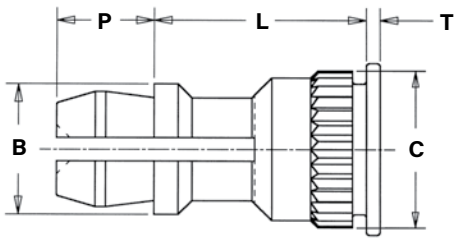
All dimensions are in millimeters.

		Panel 1						Panel 2				
	Type	Hardness Max. (2)	Bottom Mounting Hole B +0.08	Panel Material	Thickness Min.	Edge Distance C_1 Min.	Location Tolerance	Hardness Max.	Top Mounting Hole A +0.08	Panel Material	Thickness Range (3)	Edge Distance C_2 Min.
METRIC	SSA	HRB 50 / HB 82	5.41	Metal	1	6.6	±0.13	No Limit	4	PC Board or Metal	1 - 1.8	2.54
	SSS	HRB 60 / HB 107										
	SSC	HRB 70 / HB 125										

(2) HRB - Hardness Rockwell "B" Scale. HB - Hardness Brinell.
(3) Available for thicker boards on special order.

KSSB™ STANDOFFS FOR BROACHING INTO PC BOARDS





PART NUMBER DESIGNATION

KSS B - 156 - 10 X

Type | Material | Mounting Hole A Diameter Code | Length Code | Finish

FASTENER MATERIAL:
Free Machining Brass

FINISH:
Standard: X - Plain
Optional: ET - Electro-plated Tin, ASTM B545 Class B (5µm) with preservative coating, annealed (1)
(Optional ET finish is available on special order with additional charge.)

All dimensions are in inches.

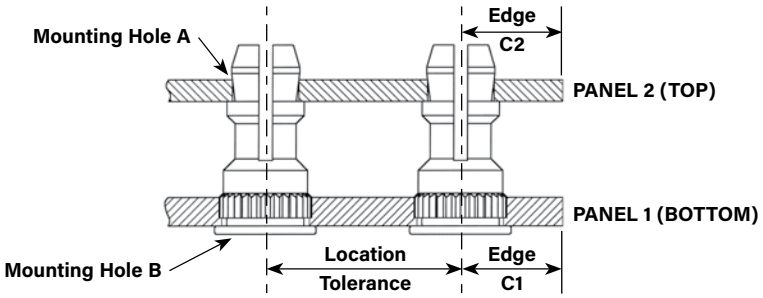
	Type	Panel 2 (Top) Mounting Hole Diameter Code	Length Code "L" ±.005 (Length Code in 32nds of an inch)									B ±.005	C ±.003	H ±.005	P ±.005	T ±.005
			.250	.312	.375	.437	.500	.562	.625	.750	.875	1.00					
UNIFIED	KSSB	156	8	10	12	14	16	18	20	24	28	32	.188	.226	.250	.141	.020

All dimensions are in millimeters.

	Type	Panel 2 (Top) Mounting Hole Diameter Code	Length Code "L" ±0.13 (Length Code in millimeters)									B ±0.13	C ±0.08	H ±0.13	P ±0.13	T ±0.13
METRIC	KSSB	4MM	8	10	12	14	16	18	20	22	25	4.78	5.74	6.35	3.58	0.51

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

APPLICATION DATA



All dimensions are in inches.

		Panel 1						Panel 2				
	Type	Hardness Max. (2)	Bottom Mounting Hole B +.003 -.000	Panel Material	Thickness Min.	Edge Distance C_1 Min.	Location Tolerance	Hardness Max.	Top Mounting Hole A +.003 -.000	Panel Material	Thickness Range (3)	Edge Distance C_2 Min.
UNIFIED	KSSB	HRB 65 / HB 116	.213	PC Board	.050	.220	±.005	No Limit	.156	PC Board or Metal	.040 - .070	.100

All dimensions are in millimeters.

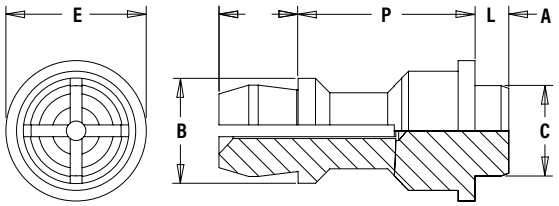
		Panel 1						Panel 2				
	Type	Hardness Max. (2)	Bottom Mounting Hole B +0.08	Panel Material	Thickness Min.	Edge Distance C_1 Min.	Location Tolerance	Hardness Max.	Top Mounting Hole A +0.08	Panel Material	Thickness Range (3)	Edge Distance C_2 Min.
METRIC	KSSB	HRB 65 / HB 116	5.41	PC Board	1.27	5.59	±0.13	No Limit	4	PC Board or Metal	1 - 1.8	2.54

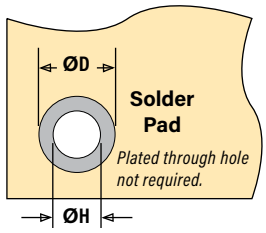
(2) HRB - Hardness Rockwell "B" Scale. HB - Hardness Brinell.
(3) Available for thicker boards on special order.

SMTSS™ REELFAST® SNAP-TOP® STANDOFFS

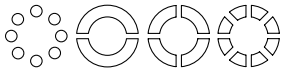
NEW!

NOTE: ***REELFAST® SNAP-TOP® SMTSS™ standoffs are for on-only applications. For removal applications, mounting hole A can be increased to reduce removal force.***





Stencil Masking Examples



FASTENER MATERIAL:
Lead-free Carbon Steel

FINISH:
ET - Electro-plated Tin, ASTM B545 Class A with clear preservative coating, annealed (1)(2)

(1) See PEM Technical Support section of our web site for related plating standards and specifications.
(2) Optimal solderability life noted on packaging.

All dimensions are in inches.

	Top Board Mounting Hole Diameter Code	Type and Material	Length Code "L" ±.005 (Length Code in 32nds of an inch)		Min. Sheet Thickness	A Max.	C Max.	E ±.005	B ±.005	P ±.005	ØH Hole Size in Sheet +.003 -.000	ØD Min. Solder Pad
			.250	.375								
UNIFIED	156	SMTSSS	8	12	.060	.060	.161	.250	.188	.141	.166	.276

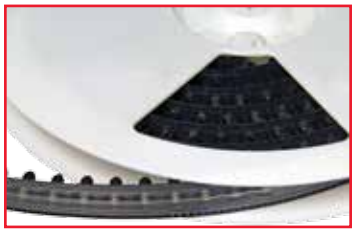
All dimensions are in millimeters.

	Top Board Mounting Hole Diameter Code	Type and Material	Length Code "L" ±0.13 (Length Code in millimeters)			Min. Sheet Thickness	A Max.	C Max.	E ±0.13	B ±0.13	P ±0.13	ØH Hole Size in Sheet +0.08	ØD Min. Solder Pad
METRIC	4MM	SMTSSS	6	8	10	1.53	1.53	4.09	6.35	4.8	3.58	4.22	7

NUMBER OF PARTS PER REEL

Type, Material and Size	Length Code / Number of Parts per Reel		
SMTSS-156	-8 / 280	-12 / 220	
SMTSS-4MM	-6 / 300	-8 / 250	-10 / 200

Packaged on 330 mm recyclable reels. Tape width is 24 mm.
Supplied with polyimide patch for vacuum pick up.
Reels conform to EIA-481.

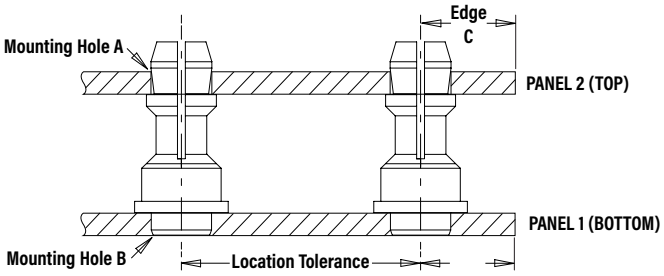


PART NUMBER DESIGNATION

SMTSS S - 156 - 12 ET

Type | Material | Mounting Hole A Diameter Code | Length Code | Finish

APPLICATION DATA



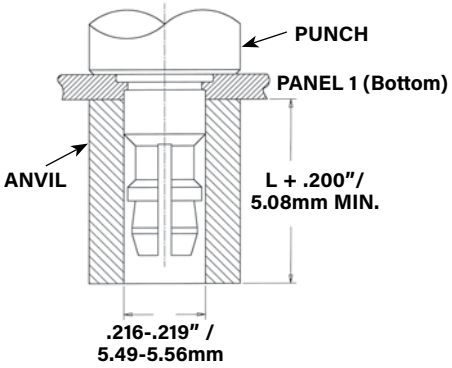
All dimensions are in inches.

		Panel 1					Panel 2				
	Type	Hardness Max.	Bottom Mounting Hole B +.003 -.000	Panel Material	Thickness Min.	Location Tolerance	Hardness Max.	Top Mounting Hole A +.003 -.000	Panel Material	Thickness Range	Edge Distance C Min.
UNIFIED	SMTSS	No Limit	.166	P.C. Board	.060	±.005	No Limit	.156	P.C. Board or Metal	.040 - .070	.100

All dimensions are in millimeters.

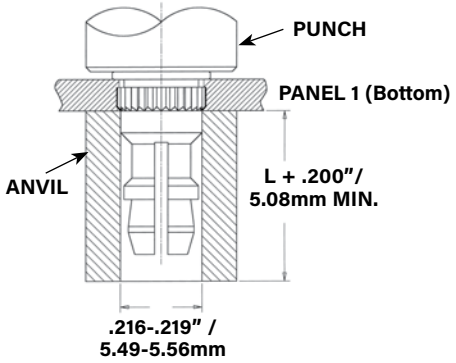
		Panel 1					Panel 2				
	Type	Hardness Max.	Bottom Mounting Hole B +0.08	Panel Material	Thickness Min.	Location Tolerance	Hardness Max.	Top Mounting Hole A +0.08	Panel Material	Thickness Range	Edge Distance C Min.
METRIC	SMTSS	No Limit	4.22	P.C. Board	1.53	±0.13	No Limit	4	P.C. Board or Metal	1 - 1.8	2.54

INSTALLATION



SSA™/SSS™/SSC™ Standoffs

1. Prepare properly sized mounting hole in Panel 1 (Bottom).
2. Place the fastener through the mounting hole (preferably the punch side) of the panel and into the anvil as shown in the drawing.
3. With punch and anvil surfaces parallel, apply only enough squeezing force to embed the head flush with the panel.



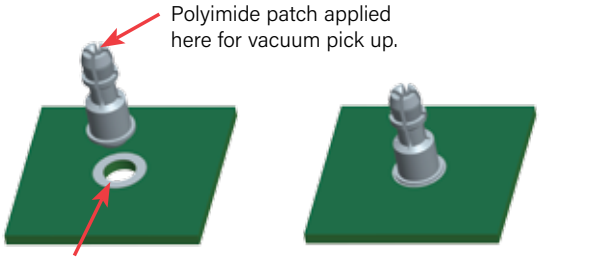
KSSB™ Standoffs

1. Prepare properly sized mounting hole in Panel 1 (Bottom).
2. Place the fastener through the mounting hole of the board and into the anvil as shown in the drawing.
3. With punch and anvil surfaces parallel, apply only enough squeezing force to bring the head into contact with the board.

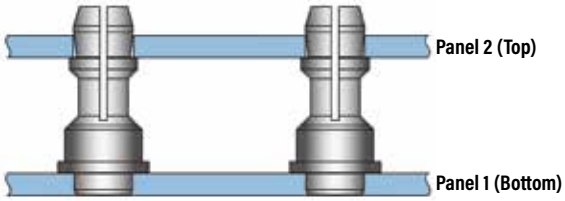
PEMSERTER® Installation Tooling

Type	Anvil Part Number	Punch Part Number
SSA, SSS, SSC, KSSB	970200015300	975200048

SMTSS™ Standoffs



PERFORMANCE DATA(1)



SSA™/SSS™/SSC™/KSSB™ Standoffs

		Panel 1 (Bottom)			Panel 2 (Top) (Removable)		
	Type	Test Sheet Material	Installation (lbs.)	Pushout (lbs.)	Max. First on Snap Force (lbs.)	Min. First off Snap Force (lbs.)	Min. 15th off Snap Force (lbs.)
UNIFIED	SSA	Aluminum	1500	200	13	3	1
	SSS	Aluminum	1500	200	20	6	2
	SSC	Aluminum	1500	200	20	6	2
	SSS	Cold-rolled Steel	3600	400	20	6	2
	SSC	Cold-rolled Steel	3600	400	20	6	2
	KSSB	FR-4 Fiberglass	500	110	13	3	1

		Panel 1 (Bottom)			Panel 2 (Top) (Removable)		
	Type	Test Sheet Material	Installation (kN)	Pushout (N)	Max. First on Snap Force (N)	Min. First off Snap Force (N)	Min. 15th off Snap Force (N)
METRIC	SSA	Aluminum	6.7	890	58	13	4
	SSS	Aluminum	6.7	890	89	27	9
	SSC	Aluminum	6.7	890	89	27	9
	SSS	Cold-rolled Steel	16	1780	89	27	9
	SSC	Cold-rolled Steel	16	1780	89	27	9
	KSSB	FR-4 Fiberglass	2.2	484	58	13	4

SMTSS™ Standoffs

	Panel 1 (Bottom)		Panel 2 (Top)
Type, Material and Size	Test Sheet Material	Pushout (2)	Max. Snap-on Force
SMTSSS-156	.062" Single Layer FR-4	113 lbs.	20 lbs.
SMTSSS-4MM	1.58 mm Single Layer FR-4	500 N	89 N

TESTING CONDITIONS

Oven	Quad ZCR convection oven with 4 zones
High Temp	473˚F / 245˚C
Board Finish	62% Sn, 38% Pb
Board	.062" / 1.58 mm thick, Single Layer FR-4
Screen Printer	Ragin Manual Printer
Vias	None
Spokes	2 Spoke Pattern
Paste	Alpha CVP-390 Sn96.5/3.0Ag/0.5Cu (SAC305)
Stencil	.0067" / 0.17 mm thick

(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) 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.

All PEM® products meet our stringent quality standards. If you require additional industry or other specific quality certifications, special procedures and/or part numbers are required. Please contact your local sales office or representative for further information.

Regulatory compliance information is available in Technical Support section of our website. Specifications subject to change without notice. See our website for the most current version of this bulletin.

PennEngineering®

PEM®

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PennEngineering®

BULLETIN TD™

SELF-CLINCHING TY-D® CABLE TIE-MOUNTS AND HOOKS

PEM®

SELF-CLINCHING TY-D® CABLE TIE-MOUNTS AND HOOKS

PEM® TY-D® self-clinching tie-mounts and hooks provide secure metal attachment points for mounting wires to electronic chassis or enclosures. All TY-D hardware installs quickly and permanently without screws and eliminates the use of adhesives that typically fail over time and temperature cycling.

TY-D hardware can be a great improvement over traditional mounting methods. They can be placed with assurance at designed locations and angles to remain secure for the life of the assembly; they will not protrude on the reverse side and will not affect the reverse side appearance or clearance; and panels remain flush.

TD™ cable tie-mounts allow users to easily slide ties through the hardware's "eye" for fast cable mounting.	
TDO™ cable tie hooks enable users to attach, remove, and return tie-bundled wires to their mounting points when components need to be accessed for service or when wires must be replaced. The hook feature allows ties to remain intact and wires to remain wrapped.	

Reverse side of TDO™ hooks installed in sheet.

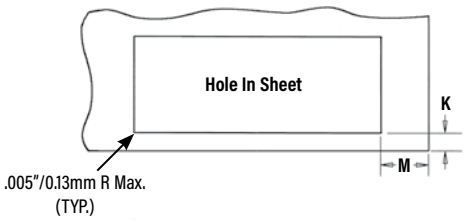
TDO™ hooks open end orientation mark.

Depending on placement of the fastener within the mounting hole, a slight gap may be noticeable along the non-clinching edges of the fastener after installation.

Reverse side of TD™ mounts installed in sheet.

Fastener drawings and models are available at www.pemnet.com

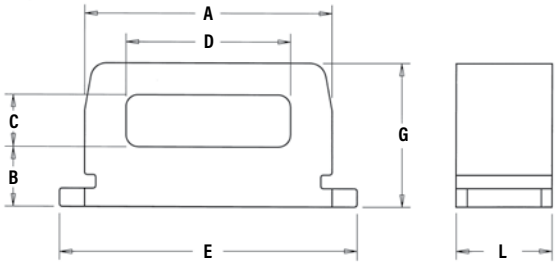
TD™ CABLE TIE-MOUNTS



PART NUMBER DESIGNATION

TD - 60 - 6 ZI

- TD: Type
- 60: Profile
- 6: Length Code
- ZI: Finish Code



Clinching profile may vary.

All dimensions are in inches.

	Type	Profile (1)	Length Code	Length L ±.003	Sheet Thickness	Hole Size In Sheet +.002 -.001	A ±.003	B ±.006	C ±.006	D ±.006	E ±.006	Height G ±.006	Min. Hole Edge To Sheet Edge K	Min. Hole Edge To Sheet Edge M
UNIFIED	TD	40	4	.121	.040 - .050	.250 x .125	.246	.055	.065	.160	.308	.150	.040	.147
	TD	60	6	.184	.040 - .070	.312 x .187	.308	.075	.065	.205	.370	.180	.040	.196
	TD	175	12	.371	.040 - .125	.500 x .375	.496	.130	.095	.360	.562	.285	.040	.262

All dimensions are in millimeters.

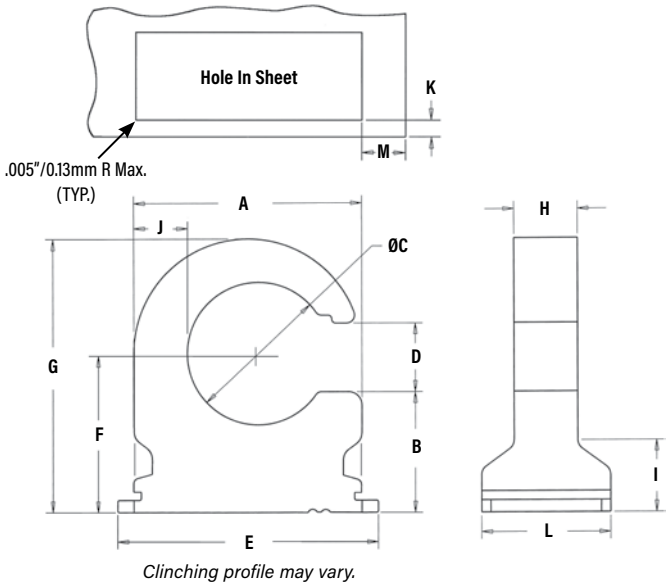
	Type	Profile (1)	Length Code	Length L ±0.08	Sheet Thickness	Hole Size In Sheet +0.05 -0.03	A ±0.08	B ±0.15	C ±0.15	D ±0.15	E ±0.15	Height G ±0.15	Min. Hole Edge To Sheet Edge K	Min. Hole Edge To Sheet Edge M
METRIC	TD	40	4	3.07	1.02 - 1.27	6.35 x 3.18	6.25	1.4	1.65	4.06	7.82	3.81	1.02	3.73
	TD	60	6	4.67	1.02 -1.78	7.93 x 4.75	7.82	1.91	1.65	5.21	9.4	4.57	1.02	4.98
	TD	175	12	9.42	1.02 - 3.18	12.7 x 9.53	12.6	3.3	2.4	9.14	14.28	7.24	1.02	6.65

(1) Reference to typical load rating (in pounds) for appropriate size nylon cable tie.

Material: Sintered Steel
Finish: ZI- Zinc plated, 5µm, colorless. See PEM Technical Support section of our website for related plating standards and specifications.
For use in sheet hardness: HRB 60 (Hardness Rockwell "B" scale) / HB 107 (Hardness Brinell) or less.

Profile Shown Actual Size.

TDO™ CABLE TIE HOOKS



Clinching profile may vary.

PART NUMBER DESIGNATION

TDO - 50 - 8 ZI

- TDO: Type
- 50: Profile
- 8: Length Code
- ZI: Finish Code

All dimensions are in inches.

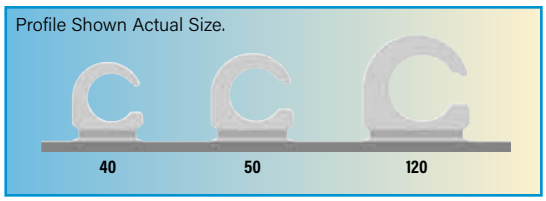
	Type	Profile (1)	Length Code	Length L ±.003	Sheet Thickness	Hole Size In Sheet +.002 -.001	A ±.003	B ±.006	ØC ±.006	D ±.006	E ±.006	F ±.005	Height G Nom.	H ±.010	I ±.010	J Nom.	Min. Hole Edge To Sheet Edge K	Min. Hole Edge To Sheet Edge M
UNIFIED	TDO	40	8	.246	.040 - .155	.250 x .375	.371	.213	.245	.130	.433	.285	.471	.12	.13	.083	.040	.147
	TDO	50	8	.246	.040 - .155	.250 x .438	.434	.228	.270	.130	.496	.300	.517	.12	.13	.102	.040	.196
	TDO	120	8	.246	.040 - .155	.250 x .562	.558	.255	.340	.140	.620	.335	.614	.12	.13	.139	.040	.262

All dimensions are in millimeters.

	Type	Profile (1)	Length Code	Length L ±0.08	Sheet Thickness	Hole Size In Sheet +0.05 -0.03	A ±0.08	B ±0.15	ØC ±0.15	D ±0.15	E ±0.15	F ±0.13	Height G Nom.	H ± 0.25	I ± 0.25	J Nom.	Min. Hole Edge To Sheet Edge K	Min. Hole Edge To Sheet Edge M
METRIC	TDO	40	8	6.25	1.02 - 3.94	6.35 x 9.53	9.42	5.41	6.22	3.3	11	7.24	11.96	3.05	3.3	2.11	1.02	3.73
	TDO	50	8	6.25	1.02 - 3.94	6.35 x 11.13	11.02	5.79	6.86	3.3	12.6	7.62	13.13	3.05	3.3	2.59	1.02	4.98
	TDO	120	8	6.25	1.02 - 3.94	6.35 x 14.27	14.17	6.48	8.64	3.56	15.75	8.51	15.6	3.05	3.3	3.53	1.02	6.65

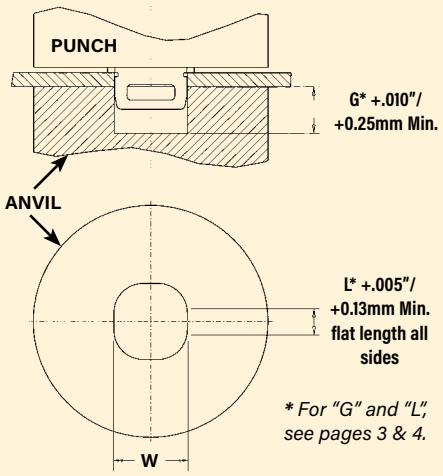
(1) Reference to typical load rating (in pounds) for appropriate size nylon cable tie.

Material: Sintered Steel
Finish: ZI- Zinc plated, 5µm, colorless. See PEM Technical Support section of our website for related plating standards and specifications.
For use in sheet hardness: HRB 60 (Hardness Rockwell "B" scale) / HB 107 (Hardness Brinell) or less.



INSTALLATION

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



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

PEMSERTER® Installation Tooling

All dimensions are in inches.

	Part Number	W ±.001	Anvil Part Number	Punch Part Number
UNIFIED	TD-40-4	.251	8006136	8003076
	TD-60-6	.313	8006137	
	TD-175-12	.501	8006138	
	TDO-40-8	.379	8006865	
	TDO-50-8	.442	8006864	
	TDO-120-8	.566	8006863	

All dimensions are in millimeters.

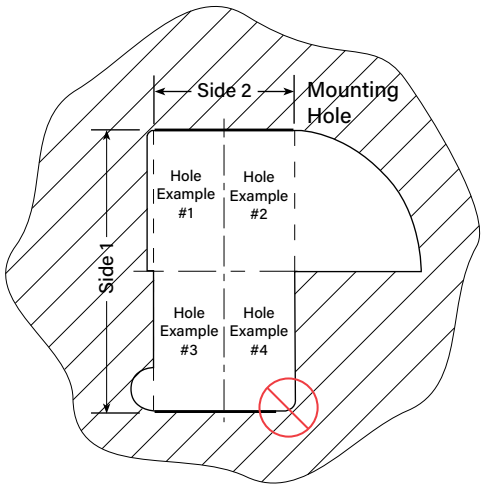
	Part Number	W ±0.03	Anvil Part Number	Punch Part Number
METRIC	TD-40-4	6.36	8006136	8003076
	TD-60-6	7.95	8006137	
	TD-175-12	12.73	8006138	
	TDO-40-8	9.63	8006865	
	TDO-50-8	11.23	8006864	
	TDO-120-8	14.38	8006863	

INSTALLATION NOTES

- For best results we recommend using a PEMSERTER® press for installation of PEM self-clinching fasteners. Please check our website for more information.
- Visit the Animation Library on our website to view the installation process for this product.

MOUNTING HOLE EXAMPLES

The mounting hole is defined by two dimensions. The two thick lines shown must be straight for the entire length defined by "Side 2" and must be separated by the distance shown as "Side 1" (Side 1 and Side 2 are the two dimensions given for the mounting hole on pages 3 and 4). The illustration shows three examples (#1, #2, and #3) of how it can be achieved. Example #4 in the lower right side will not work.

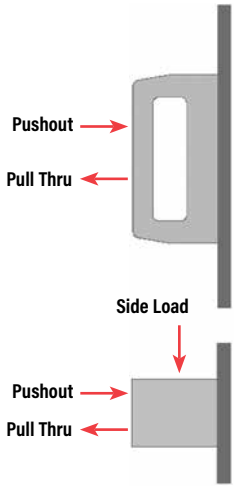


PERFORMANCE DATA(1)

TD™ CABLE TIE-MOUNTS

	Part Number	Test Sheet Material							
		Cold-rolled Steel				5052-H34 Aluminum			
		Installation (lbs.)	Pushout (lbs.)	Pull Thru (lbs.)	Side Load (lbs.)	Installation (lbs.)	Pushout (lbs.)	Pull Thru (lbs.)	Side Load (lbs.)
UNIFIED	TD-40-4	1800	175	100	90	1000	90	100	90
	TD-60-6	2500	260	160	100	1500	140	160	100
	TD-175-12	4000	350	175	140	3000	235	175	140

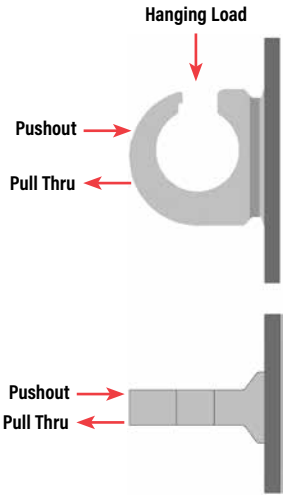
	Part Number	Test Sheet Material							
		Cold-rolled Steel				5052-H34 Aluminum			
		Installation (kN)	Pushout (N)	Pull Thru (N)	Side Load (N)	Installation (kN)	Pushout (N)	Pull Thru (N)	Side Load (N)
METRIC	TD-40-4	8	780	445	400	4.5	400	445	400
	TD-60-6	11	1160	712	445	6.7	620	712	445
	TD-175-12	17.7	1560	780	620	13.3	1040	780	620



TDO™ CABLE TIE HOOKS

	Part Number	Cable Tie Screw Size	Test Sheet Material							
			Cold-rolled Steel				5052-H34 Aluminum			
			Installation (lbs.)	Pushout (lbs.)	Pull Thru (lbs.)	Hanging Load (lbs.)	Installation (lbs.)	Pushout (lbs.)	Pull Thru (lbs.)	Hanging Load (lbs.)
UNIFIED	TDO-40-8	#8	3000	105	70	145	2000	105	70	130
	TDO-50-8	#10	3000	150	90	145	2000	130	90	130
	TDO-120-8	1/4	3000	200	110	145	2000	145	110	130

	Part Number	Cable Tie Screw Size	Test Sheet Material							
			Cold-rolled Steel				5052-H34 Aluminum			
			Installation (kN)	Pushout (N)	Pull Thru (N)	Hanging Load (N)	Installation (kN)	Pushout (N)	Pull Thru (N)	Hanging Load (N)
METRIC	TDO-40-8	M4	13.4	465	310	645	8.9	465	310	575
	TDO-50-8	M5	13.4	665	400	645	8.9	575	400	575
	TDO-120-8	M6	13.4	890	490	645	8.9	645	490	575



(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.

All PEM® products meet our stringent quality standards. If you require additional industry or other specific quality certifications, special procedures and/or part numbers are required. Please contact your local sales office or representative for further information.

Regulatory compliance information is available in Technical Support section of our website. Specifications subject to change without notice. See our website for the most current version of this bulletin.

PennEngineering®

PEM®

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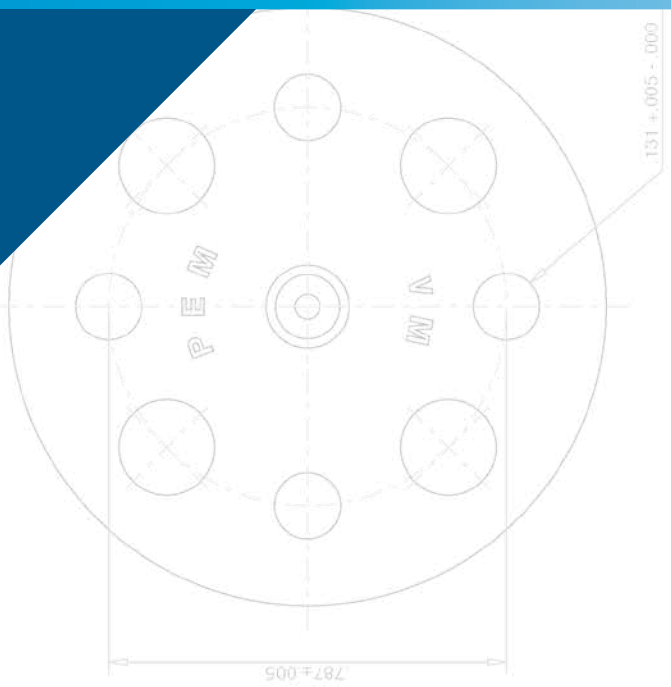
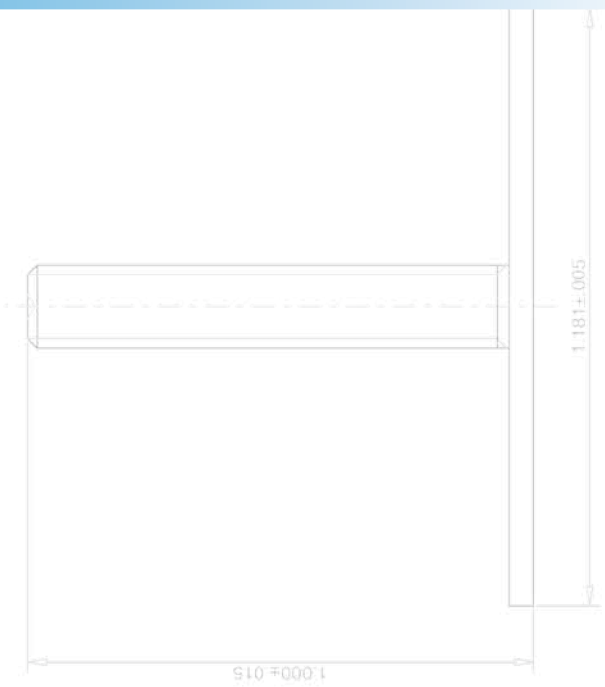
Technical support e-mail: techsupport@pemnet.com

PEM® VariMount® bonding fasteners are assemblies comprised of standard PEM® fasteners mounted permanently into base plates.

VM™

PEM® VARIMOUNT® BONDING FASTENERS





PEM® VARIMOUNT® BONDING FASTENERS

The PEM® VariMount® fastening system is an assembly comprised of a standard PEM® nuts, studs or standoffs mounted permanently into a base plate. The assembly can then be fastened or bonded to assorted panel types in a variety of ways:

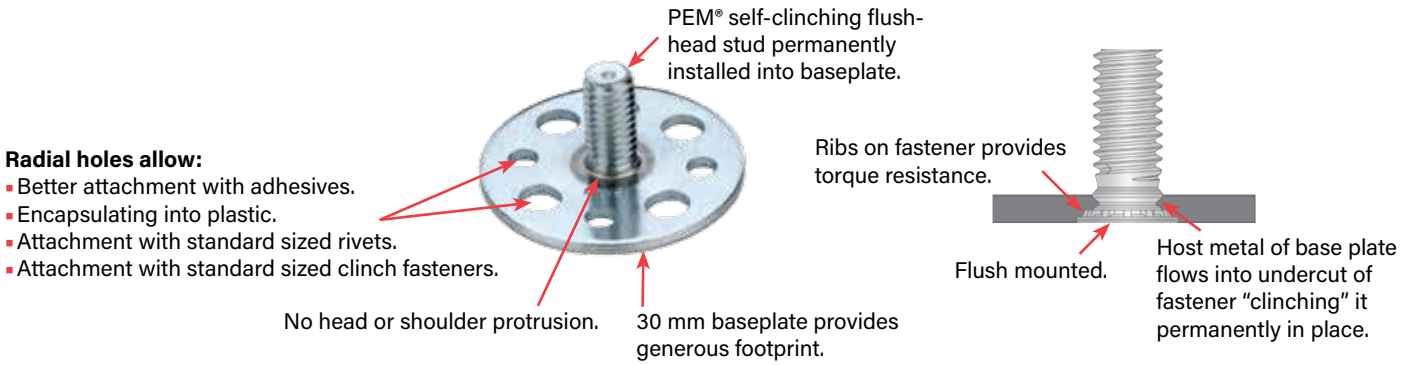
Mounting Methods:
- Mold-in
- Laminate within composite layers
- Surface bonding
- Rivets
- Loose hardware (nuts, bolts, screws)
- Self-clinching fasteners
- Blind threaded rivets
- Hollow wall anchors
- Spot welding

Mounts on or in:
- Composites
- Plastics
- Metal
- Wall board
- Any rigid material or panel

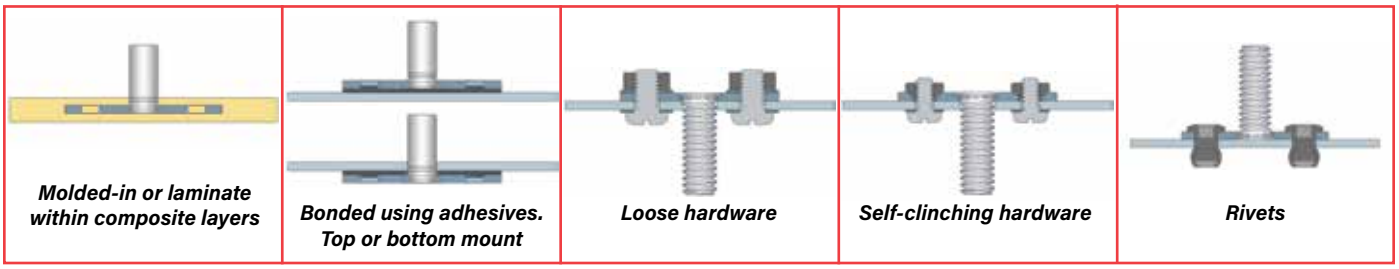
VariMount® assemblies are available with either steel or stainless steel base plates depending on the fastener that is selected. The VariMount® base plate's radial holes provide various mounting options.

Base plates can also be purchased separately. See page 5 for dimensional data and part numbers.

VARIMOUNT® ASSEMBLY USING SELF-CLINCHING TECHNOLOGY



TYPICAL MOUNTING METHODS



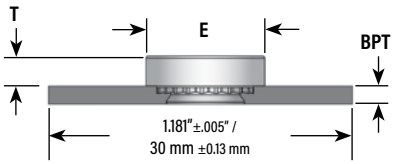
ASSEMBLY PART NUMBER DESIGNATION

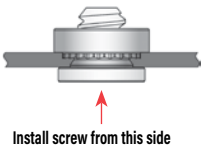
VM		30	FH	– 0420	– 16	ZI
VM	C	30	FHP	– 032	– 16	
VariMount Fastener Style	Base Plate Material Code (1)	Base Plate Diameter (2)	Fastener Type	Fastener Thread Code	Fastener Length Code	Fastener Finish Code (3) (if applicable)
Base plate prefix			PEM® fastener part number			

A VariMount® assembly part number includes a base plate prefix paired with a standard PEM® fastener part number.

(1) "Blank" equals steel base plate and "C" equals stainless steel base plate.
(2) See page 5 for complete dimensional information.
(3) Required on steel assemblies.

The charts below show PEM® fastener types/sizes that are offered as standard VariMount® assemblies.





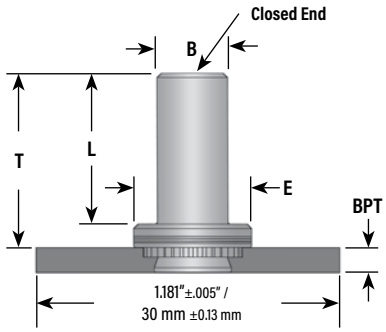
STANDARD NUTS

All dimensions are in inches.

	Thread Size	Type and Material		Thread Code	Shank Code	BPT ±.004	E ±.010	T ±.010
		Steel	Stainless Steel					
UNIFIED	.112-40 (#4-40)	VM30S-	VMC30SP-	440	1	.048	.250	.070
	.138-32 (#6-32)	VM30S-	VMC30SP-	632	1	.048	.280	.070
	.164-32 (#8-32)	VM30S-	VMC30SP-	832	1	.048	.310	.090
	.190-32 (#10-32)	VM30SS-	VMC30SP-	032	2	.063	.340	.090

All dimensions are in millimeters.

	Thread Size x Pitch	Type and Material		Thread Code	Shank Code	BPT ±0.1	E ±0.25	T ±0.25
		Steel	Stainless Steel					
METRIC	M3 x 0.5	VM30S-	VMC30SP-	M3	1	1.2	6.35	1.5
	M4 x 0.7	VM30S-	VMC30SP-	M4	1	1.2	7.87	2
	M5 x 0.8	VM30SS-	VMC30SP-	M5	2	1.6	8.64	2



BLIND NUTS

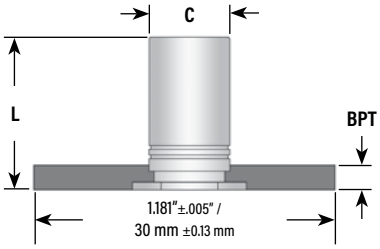
All dimensions are in inches.

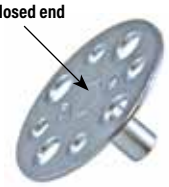
	Thread Size	Type and Material	Thread Code	Shank Code	BPT ±.004	B Max.	E ±.010	L Max.	T ±.010
		Steel							
UNIFIED	.112-40 (#4-40)	VM30B-	440	1	.048	.150	.250	.335	.380
	.138-32 (#6-32)	VM30B-	632	1	.048	.169	.280	.335	.380
	.164-32 (#8-32)	VM30B-	832	1	.048	.204	.310	.385	.440
	.190-32 (#10-32)	VM30B-	032	2	.063	.235	.340	.385	.440

All dimensions are in millimeters.

	Thread Size x Pitch	Type and Material	Thread Code	Shank Code	BPT ±0.1	B Max.	E ±0.25	L Max.	T ±0.25
		Steel							
METRIC	M3 x 0.5	VM30B-	M3	1	1.2	3.84	6.35	8.5	9.6
	M4 x 0.7	VM30B-	M4	1	1.2	5.2	7.95	9.8	11.2
	M5 x 0.8	VM30B-	M5	2	1.6	6.02	8.75	9.8	11.2

The charts below show PEM® fastener types/sizes that are offered as standard VariMount® assemblies.





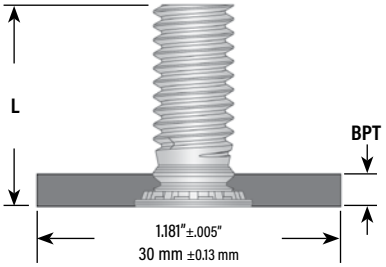
STANDOFFS

All dimensions are in inches.

	Thread Size	Type and Material: Steel	Thread Code	Length Code "L" +.002 -.005 (Length code in 32nds of an inch): .375	.437	.500	.562	.625	.687	.750	BPT ±.004	C +.000 -.005
UNIFIED	.112-40 (#4-40)	VM30BSO-	440	12	14	16	18	20	22	24	.048	.165
	.138-32 (#6-32)	VM30BSO-	632	12	14	16	18	20	22	24	.048	.212

All dimensions are in inches.

	Thread Size x Pitch	Type and Material: Steel	Thread Code	Length Code "L" +0.05 -0.13 (Length code in millimeters)				BPT ±0.1	C -0.13
METRIC	M3 x 0.5	VM30BSO-	M3	12	14	16	18	1.2	4.2
	M3.5 x 0.6	VM30BSO-	M3.5	12	14	16	18	1.2	5.39



STUDS

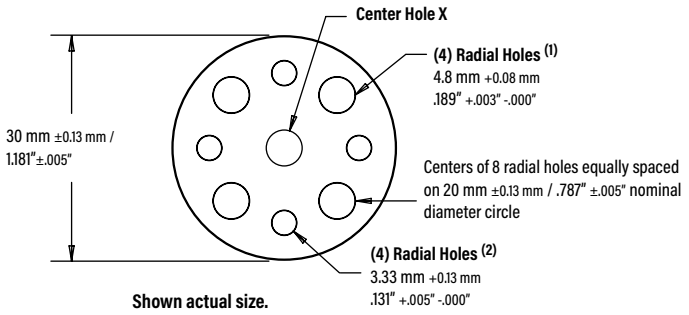
All dimensions are in inches.

	Thread Size	Type and Material: Steel	Stainless Steel	Thread Code	Length Code "L" ±.015 (Length code in 16ths of an inch): .500	.625	.750	.875	1.00	1.25	BPT ±.004
UNIFIED	.164-32 (#8-32)	VM30FH-	VMC30FHP-	832	8	10	12	14	16	20	.048
	.190-32 (#10-32)	VM30FH-	VMC30FHP-	032	8	10	12	14	16	20	.048
	.250-20 (1/4-20)	VM30FH-	—	0420	8	10	12	14	16	20	.067

All dimensions are in inches.

	Thread Size x Pitch	Type and Material: Steel	Stainless Steel	Thread Code	Length Code "L" ±0.4 (Length code in millimeters)						BPT ±0.1
METRIC	M4 x 0.7	VM30FH-	VMC30FHP-	M4	10	12	15	18	20	25	1.2
	M5 x 0.8	VM30FH-	VMC30FHP-	M5	10	12	15	18	20	25	1.2
	M6 x 1	VM30FH-	—	M6	10	12	15	18	20	25	1.7

BASE PLATE PART NUMBER, DIMENSIONS AND MATERIAL GUIDE



Shown actual size.

BASE PLATE PART NUMBER DESIGNATION

BP		1.2	- 422	- 30		ZI
BP	C	1.2	- 422	- 30		
Type	Plate Material Code (3)	Plate Thickness Code	Mounting Hole "X" Code	Base Plate Outside Dia. Code		Finish Code (for steel)

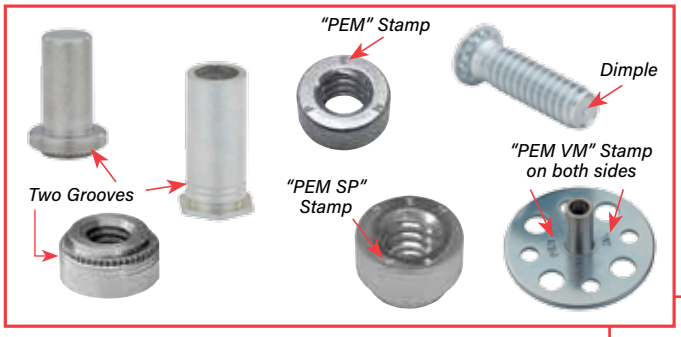
Base Plate Part Number (4)		Thickness ±0.1 mm / ±.004"	Center Hole X Diameter +0.08 mm / +.003" -.000"
Steel (5)	Stainless Steel (6)		
BP1.2-422-30ZI	BPC1.2-422-30	1.2 mm / .048"	4.22 mm / .166"
BP1.2-480-30ZI	BPC1.2-480-30	1.2 mm / .048"	4.8 mm / .189"
BP1.2-541-30ZI	BPC1.2-541-30	1.2 mm / .048"	5.41 mm / .213"
BP1.6-635-30ZI	BPC1.6-635-30	1.6 mm / .063"	6.35 mm / .250"
BP1.2-400-30ZI	BPC1.2-400-30	1.2 mm / .048"	4 mm / .1575"
BP1.2-500-30ZI	BPC1.2-500-30	1.2 mm / .048"	5 mm / .1969"
BP1.6-600-30ZI	BPC1.6-600-30	1.6 mm / .063"	6 mm / .2362"
BP1.7-600-30ZI	BPC1.7-600-30	1.7 mm / .067"	6 mm / .2362"

(1) Accepts standard M3.5 / #6-32 self-clinching nuts. Also flush-head studs #10-24 / #10-32 sizes. May also accept 4.8 mm / 3/16" rivet.
(2) Standard hole size for 3.2 mm / 1/8" rivet.
(3) "Blank" equals steel base plate and "C" equals stainless steel base plate.
(4) Use this part number if ordering base plate separately. Minimum quantities may apply.
(5) Base plate is carbon steel, zinc plated 5µm, colorless.
(6) Base plate is 300 series stainless steel, passivated and/or tested per ASTM A380.

NOTE ABOUT PERFORMANCE

General performance of PEM® fasteners in thin metal panels can be found in their respective PEM® Bulletins. Performance of the assembly (fastener and base plate) mounted to your specific material, in your application will have to be determined by testing. We recommend that you perform testing to be sure it is ideally suited to your application. We will be happy to provide technical assistance and/or samples to you for this purpose.

Look for the trademarks to identify genuine PEM® fasteners.



Drawings and models for parts listed on pages 3, 4 & 5 are available at www.pemnet.com

OTHER PEM® FASTENER TYPES AND SIZES AVAILABLE *

While we have listed the standard offering of assemblies on the charts (pages 3 and 4), other PEM® fasteners can be provided pre-installed into one of the base plates listed on page 5. The charts below give a review of these fastener types. To choose an assembly using one of these fasteners, simply create a part number as described on page 2.

PEM® Fastener Types	Standard Size Codes
Self-clinching Nuts	
BS	440 / 632 / 832 / 032 / M3 / M4 / M5
CLS	256 / 348 / 440 / 632 / 832 / M2 / M2.5 / M3 / M3.5 / M4
CLSS	024 / 032 / M5
LK, LKS	440 / M3
PL, PLC	M3
S	256 / 348 / M2 / M2.5 / M3.5
SL	440 / 632 / 832 / 032 / M3 / M3.5 / M4 / M5
SP	256/ 024
SS	024
Self-clinching Studs	
FH	024 / Non-threaded
FH4	832 / 032 / 0420 / M4 / M5 / M6
FHS	832 / 024 / 032 / 0420 M4 / M5 / M6 / Non-threaded
HFE	032 / 0420 / M5 / M6
HFH, HFHS	0420 / M6

PEM® Fastener Types	Standard Size Codes
Self-clinching Standoffs	
BSO, BSOS, ***BS04***	440 / 632 / 6440 / M3 / 3.5M3 / M3.5
DSO, DSOS	440 / M3
SO, ***S04***	6440 / 3.5M3 / M3.5 / Non-threaded
SOS	440 / 632 / 6440 / 3.5M3 / M3 / M3.5 / Non-threaded
SOSG	6440 / 3.5M3
SSC, SSS	156 / 4MM
Panel Fasteners	
N10	440 / 632 / 832 / M3
PF11, PF12, PF11M, PF12M	632
PF11MF, PF12MF	440 / M3
PF11MW, PF12MW	440 / M3
PF11PM	632
PF30	832
PF31, PF32	832 / M4
PF50, PF51, PF52, PF60, PF61, PF62	832 / M4
PF7M	632
PF7MF	440 / M3
SCB, SCBJ	M4
SCBR	832 / M4

Types shown in bold italics can be installed into stainless steel base plates. Other types are not recommended for installation into stainless steel base plates.

Micro Sized Options Available

** Other fasteners, base plate configurations and assemblies are available on special order. For questions, please contact our global technical support team using the contact information listed at the bottom of this page. Appropriate minimum quantities may apply.*

All PEM® products meet our stringent quality standards. If you require additional industry or other specific quality certifications, special procedures and/or part numbers are required. Please contact your local sales office or representative for further information.

Regulatory compliance information is available in Technical Support section of our website. Specifications subject to change without notice. See our website for the most current version of this bulletin.

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Visit our PEMNET™ Resource Center at www.pemnet.com ▪ Technical support e-mail: techsupport@pemnet.com

Bulletin WN-717

PEM® brand self-locating weld nuts feature engineered projections, round head design and a self-locating shank

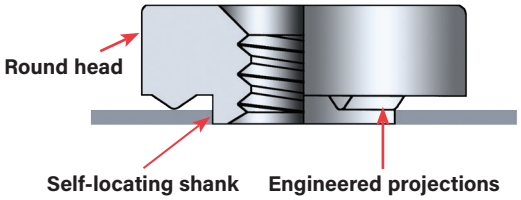
WN™

SELF-LOCATING PROJECTION WELD NUTS

SELF-LOCATING PROJECTION WELD NUTS

PEM® brand WN™/WNS™ weld nuts are designed to be welded onto another metal surface into properly sized holes. The PEM® weld nut design helps overcome many problems associated with other welded nuts:

- **Engineered projections**
  - Prevent burnout-outs in thin sheets
  - Help keep the nut from warping while welding in high current
- **Round head design**
  - Eliminates tedious time-consuming indexing
  - Speeds production using standard equipment
  - Compact design fits on narrow flanges
- **Self-locating shank**
  - Eliminates the need for complex electrodes with pilots
  - Properly positions weld nuts
  - Protects threads from weld spatter



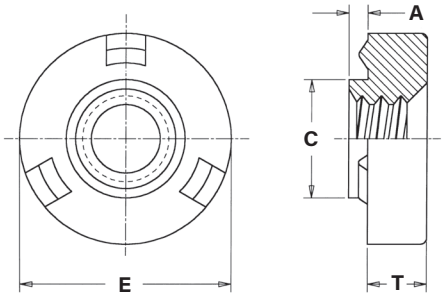
A variety of welding equipment is suitable for installation of PEM® weld nuts. Best results have been obtained with a 50KVA press-type, spot-welding machine whose upper welding head moves vertically in a straight line with the lower electrode. Flat-faced electrodes with tip diameters .125" / 3.2 mm larger than the "E" dimension of the PEM® weld nut should be used.

PEM® weld nuts are available in steel (WN™) or stainless steel (WNS™). Stainless steel nuts offer the added advantage of corrosion resistance.

PART NUMBER DESIGNATION

WN		-	632	- 0	CU
WN	S	-	632	- 0	
Type	Material Code		Thread Size Code	Shank Code	Finish

FASTENER MATERIAL:
WN – Carbon Steel
WNS – 300 Series Stainless Steel
FINISH:
WN – CU - Copper Flash (1)
WNS – Passivated and/or tested per ASTM A380
THREADS:
Internal, ASME B1.1, 2B / ASME B1.13M, 6H



All dimensions are in inches.

	Thread Size	Type		Thread Code	Shank Code	A (Shank) Max.	Min. Sheet Thickness	Hole Size In Sheet +.004 -.000	C Max.	E +.000 -.010	T ±.004	Min. Dist. Hole ℄ To Edge
		Steel	Stainless Steel									
UNIFIED	.112-40 (#4-40)	WN	WNS	440	0	.030	.030	.173	.172	.308	.065	.154
	.138-32 (#6-32)	WN	WNS	632	0	.030	.030	.193	.192	.341	.094	.171
	.164-32 (#8-32)	WN	WNS	832	0	.030	.030	.218	.217	.371	.108	.186
	.190-24 (#10-24)	WN	WNS	024	0	.030	.030	.250	.249	.440	.156	.220
	.190-32 (#10-32)	WN	WNS	032	0	.030	.030	.250	.249	.440	.156	.220
	.250-20 (1/4-20)	WN	WNS	0420	0	.048	.048	.316	.315	.522	.186	.261

All dimensions are in millimeters.

	Thread Size x Pitch	Type		Thread Code	Shank Code	A (Shank) Max.	Min. Sheet Thickness	Hole Size In Sheet +0.1	C Max.	E -0.25	T ±0.1	Min. Dist. Hole ℄ To Edge
		Steel	Stainless Steel									
METRIC	M3 x 0.5	WN	WNS	M3	0	0.77	0.77	4.39	4.36	7.82	1.49	3.91
	M4 x 0.7	WN	WNS	M4	0	0.77	0.77	5.53	5.5	9.42	2.58	4.71
	M5 x 0.8	WN	WNS	M5	0	0.77	0.77	6.35	6.32	11.17	3.78	5.59
	M6 x 1	WN	WNS	M6	0	1.22	1.24	8.04	8.01	13.25	4.56	6.63

(1) Copper Flash plating prevents surface rust, facilitates automatic feeding, and requires no preparation before painting or finishing.

INSTALLATION

1. With a PEM® weld nut inserted in the properly sized hole (see above), bring the electrode force up sufficiently to clamp the projections of the fastener firmly against the sheet without embedding any portion of the projections. Be sure the electrodes are centered, and that the electrode faces are flat so that the force is applied evenly to all three projections.

2. Set the current or heat regulator on the low side and adjust along with the weld time until a good weld is produced. For mild steel, which has a medium electrical resistance, there is a wide range of adjustments possible. For austenitic stainless steel, which has a high electrical resistance, the range is narrow at low heat.

3. Adjust squeeze time so that there is adequate time for the electrodes to close and develop proper forces (suggested initial setting 35 cycles). The weld period should be established by starting with the settings suggested in the tables on page 4. As indicated above for current adjustments, a wide range of time is possible with mild steel, but there is a limited range with stainless steel. If weld time starts too soon, and proper welding is not achieved, the squeeze time should be lengthened. Also, the electrodes should be moved closer together so that they require less travel time to close on the work. Longer squeeze times will have no effect on the quality of the weld. However, they do affect productivity and decrease the number of weld nuts that can be installed per hour. Hold time is set long enough to permit cooling and solidification of the weld before removing the electrodes. Start with 15 cycles and lengthen if necessary.

PERFORMANCE DATA(1)

	Type	Thread Code	Test Sheet Material			
			.060" Cold-rolled Steel		.060" 302 Stainless Steel	
			Pushout (lbs.)	Torque-out (in. lbs.)	Pushout (lbs.)	Torque-out (in. lbs.)
UNIFIED	WN	440	500	13	N/A	N/A
		632	640	22	N/A	N/A
		832	760	33	N/A	N/A
		032	880	56	N/A	N/A
		0420	1000	185	N/A	N/A
	WNS	440	N/A	N/A	680	13
		632	N/A	N/A	800	28
		832	N/A	N/A	850	45
		032	N/A	N/A	900	110
		0420	N/A	N/A	1000	200

	Type	Thread Code	Test Sheet Material			
			1.5 mm Cold-rolled Steel		1.5 mm 302 Stainless Steel	
			Pushout (N)	Torque-out (N-m)	Pushout (N)	Torque-out (N-m)
METRIC	WN	M3	2220	1.4	N/A	N/A
		M4	3380	3.7	N/A	N/A
		M5	3910	6.3	N/A	N/A
		M6	4445	20.9	N/A	N/A
	WNS	M3	N/A	N/A	3020	1.4
		M4	N/A	N/A	3780	5
		M5	N/A	N/A	4000	12.4
		M6	N/A	N/A	4445	22.5

SETTING GUIDES FOR PEM® WELD NUTS IN .030"/0.77 MM TO .063"/1.6 MM SHEETS

	Type	Thread Code	Test Sheet Material					
			Cold-rolled Steel			302 Stainless Steel		
			Electrode (A) Ram Force (lbs.)	Secondary (B) Current Amps ±500	Weld Time (C) Cycles/Sec.	Electrode (A) Ram Force (lbs.)	Secondary (B) Current Amps ±500	Weld Time (C) Cycles/Sec.
UNIFIED	WN	440	450-500	17,000	6 / 0.10	N/A	N/A	N/A
		632	450-500	17,000	6 / 0.10	N/A	N/A	N/A
		832	450-500	17,000	6 / 0.10	N/A	N/A	N/A
		032	500-550	18,000	10 / 0.17	N/A	N/A	N/A
		0420	550-600	20,000	10 / 0.17	N/A	N/A	N/A
	WNS	440	N/A	N/A	N/A	450-500	16,500	6 / 0.10
		632	N/A	N/A	N/A	450-500	16,500	6 / 0.10
		832	N/A	N/A	N/A	500-550	16,500	6 / 0.10
		032	N/A	N/A	N/A	550-600	18,500	6 / 0.10
		0420	N/A	N/A	N/A	650-700	20,000	6 / 0.10

	Type	Thread Code	Test Sheet Material					
			Cold-rolled Steel			302 Stainless Steel		
			Electrode (A) Ram Force (N)	Secondary (B) Current Amps ±500	Weld Time (C) Cycles/Sec.	Electrode (A) Ram Force (N)	Secondary (B) Current Amps ±500	Weld Time (C) Cycles/Sec.
METRIC	WN	M3	2000-2220	17,000	6 / 0.10	N/A	N/A	N/A
		M4	2000-2220	17,000	6 / 0.10	N/A	N/A	N/A
		M5	2220-2440	18,000	10 / 0.17	N/A	N/A	N/A
		M6	2440-2670	20,000	10 / 0.17	N/A	N/A	N/A
	WNS	M3	N/A	N/A	N/A	2000-2220	16,500	6 / 0.10
		M4	N/A	N/A	N/A	2220-2440	16,500	6 / 0.10
		M5	N/A	N/A	N/A	2440-2670	18,500	6 / 0.10
		M6	N/A	N/A	N/A	2890-3110	20,000	6 / 0.10

N/A Not Applicable.

(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.

***(A) Electrode Force** is the force exerted by the electrodes on the fastener and sheet to clamp them together and ensure good electrical contact. Electrode force also sets the weld nut down flush on the sheet as the projections melt during the welding period. Insufficient electrode force may result in flashing, spitting, burning, spatter, and discoloration. On the other hand, excessive electrode force may flatten the fastener projections before proper welding temperature is reached or may embed the projections of the cold fastener into the sheet. Excessive electrode force can also distort threads during the weld cycle.*

***(B) Secondary Current** determines the heat applied to the PEM® weld nut and sheet. Heat is in direct proportion to weld time, resistances of the materials, and the square of the current. Current should not be set so high as to cause flashing or spattering or excessive heat which will distort the threads. Low currents may produce good looking welds but pushout and torque-out strengths will not be satisfactory.*

***(C) Timing Cycle** for projection welding comprises four periods. 1) the squeeze time in which the electrodes move into position and develop the required force; 2) the weld time when the current is applied; 3) the hold time while the weld congeals and cools; and (4) the off time for positioning the work for the next weld nut.*

NOTE: The setting guides shown in the above charts are for reference only and may differ for your welding equipment.

GUIDES TO BETTER WELDING

Electrodes, weld nuts, and panels must be clean and free of grease, rust, and metal burrs. When welds appear satisfactory on installed nut, but pushout values are low, one or more of the following may be the cause:
1) Ram pressure too high. **2)** Current too low. **3)** Panel not clean. **4)** Weld nuts not centered under electrodes.
5) Hold time not long enough to allow proper cooling. **6)** Pressure regulator on welding equipment drifts.

If installed threads are distorted, the following singly or in combination may be the cause:
1) Weld time too long. **2)** Current too high. **3)** Ram pressure too high.

Should it be impossible to produce a proper weld because weld time starts before electrodes close on the work, shorten the gap between the electrodes so that they take less time to move into position and/or lengthen the squeeze time.

All PEM® products meet our stringent quality standards. If you require additional industry or other specific quality certifications, special procedures and/or part numbers are required. Please contact your local sales office or representative for further information.

Regulatory compliance information is available in Technical Support section of our website. Specifications subject to change without notice. See our website for the most current version of this bulletin.

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Visit our PEMNET™ Resource Center at www.pemnet.com ▪ Technical support e-mail: techsupport@pemnet.com

SMTSS™ REELFAST® SNAP-TOP® Standoffs

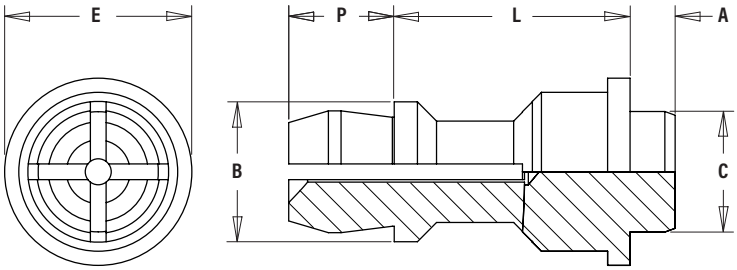
PEM® surface mounted standoffs that eliminate the need for attaching screws

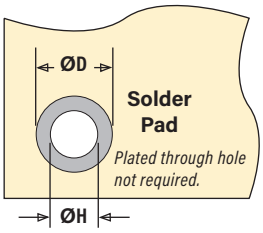
NEW!

- PEM® SMTSS™ fasteners feature a spring action to hold a P.C. Board securely without screw or threaded hardware.
- Designed for on-only applications.*
- Mount on P.C. Boards in the same manner and at the same time as other surface mount components prior to the automated reflow solder process.
- Alleviates concerns about potential damage to P.C. Boards due to improper secondary installation operations.
- Fasteners provided on tape and reel compatible with existing SMT automated installation equipment.
- Benefits include reduced scrap, reduced handling and reduced risk of board damage.

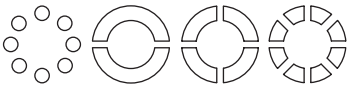
** For removal applications, mounting hole can be increased to reduce removal force. Testing this product in your application is recommended.*

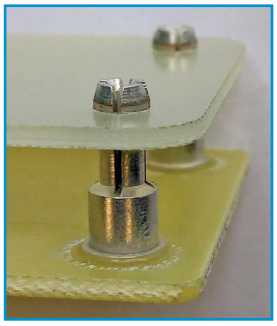
SMTSS™ REELFAST® SNAP-TOP® STANDOFFS





Stencil Masking Examples





All dimensions are in inches.

	Top Board Mounting Hole Diameter Code	Type and Material	Length Code "L" ±.005 (Length Code in 32nds of an inch)		Min. Sheet Thickness	A Max.	C Max.	E ±.005	B ±.005	P ±.005	ØH Hole Size in Sheet +.003 -.000	ØD Min. Solder Pad
			.250	.375								
UNIFIED	156	SMTSS	8	12	.060	.060	.161	.250	.188	.141	.166	.276

All dimensions are in millimeters.

	Top Board Mounting Hole Diameter Code	Type and Material	Length Code "L" ±0.13 (Length Code in millimeters)			Min. Sheet Thickness	A Max.	C Max.	E ±0.13	B ±0.13	P ±0.13	ØH Hole Size in Sheet +0.08	ØD Min. Solder Pad
METRIC	4MM	SMTSS	6	8	10	1.53	1.53	4.09	6.35	4.8	3.58	4.22	7

Fastener Material: Carbon Steel
Finish: Electro-plated tin ASTM B 545, Class A with Clear Preservative Coating, annealed (1)(2)

(1) See PEM Technical Support section of our web site for related plating standards and specifications.
(2) Optimal solderability life noted on packaging.

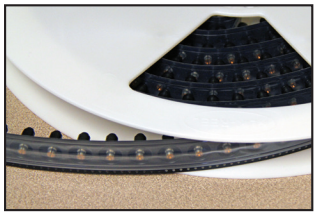
PART NUMBER DESIGNATION

SMTSS – S – 156 – 12 – ET

- SMTSS: Type
- S: Material
- 156: Panel 2 (Top) Mounting Hole Diameter Code
- 12: Length Code
- ET: Finish

NUMBER OF PARTS PER REEL

Type, Material and Size	Length Code / Number of Parts per Reel		
SMTSSS-156	-8 / 280	-12 / 220	
SMTSSS-4MM	-6 / 300	-8 / 250	-10 / 200

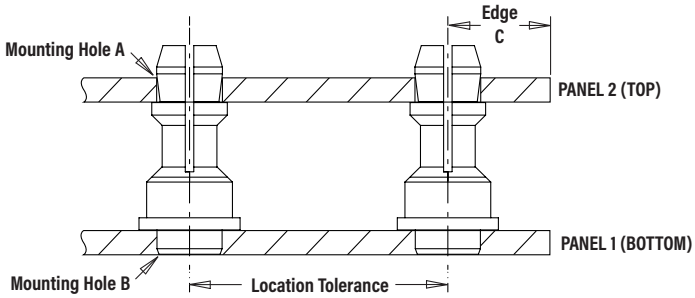


Packaged on 330 mm recyclable reels. Tape width is 24 mm.
Supplied with polyimide patch for vacuum pick up. Reels conform to EIA-481.

SMTSS™ REELFAST® SNAP-TOP® Standoffs

PEM® surface mounted standoffs that eliminate the need for attaching screws

SMTSS™ STANDOFF APPLICATION DATA



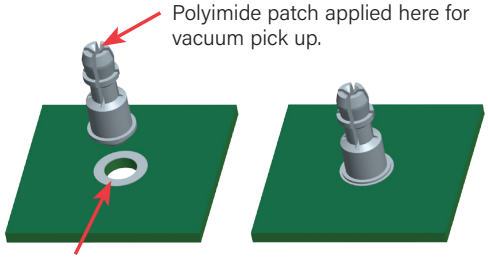
All dimensions are in inches.

		Panel 1					Panel 2				
UNIFIED	Type	Hardness Max.	Bottom Mounting Hole B +.003 -.000	Panel Material	Thickness Min.	Location Tolerance	Hardness Max.	Top Mounting Hole A +.003 -.000	Panel Material	Thickness Range	Edge Distance C Min.
	SMTSS	No Limit	.166	P.C. Board	.060	±.005	No Limit	.156	P.C. Board or Metal	.040 - .070	.100

All dimensions are in millimeters.

		Panel 1					Panel 2				
METRIC	Type	Hardness Max.	Bottom Mounting Hole B +0.08	Panel Material	Thickness Min.	Location Tolerance	Hardness Max.	Top Mounting Hole A +0.08	Panel Material	Thickness Range	Edge Distance C Min.
	SMTSS	No Limit	4.22	P.C. Board	1.53	±0.13	No Limit	4	P.C. Board or Metal	1 - 1.8	2.54

INSTALLATION



Solder paste applied to pad on PCB.

Solder fastener in place using standard surface mount techniques.

Fastener drawings and models are available at www.pemnet.com

PERFORMANCE DATA(1)

	Panel 1 (Bottom)		Panel 2 (Top)
Type, Material and Size	Test Sheet Material	Pushout (2)	Max. Snap-on Force
SMTSSS-156	.062" Single Layer FR-4	113 lbs.	20 lbs.
SMTSSS-4MM	1.58 mm Single Layer FR-4	500 N	89 N

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

(2) 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.

TESTING CONDITIONS

Oven	Quad ZCR convection oven with 4 zones	**Vias**	None
High Temp	473˚F / 245˚C	**Spokes**	2 Spoke Pattern
Board Finish	62% Sn, 38% Pb	**Paste**	Alpha CVP-390 Sn96.5/3.0Ag/ 0.5Cu (SAC305)
Board	.062" / 1.58 mm thick, Single Layer FR-4	**Stencil**	.0067" / 0.17 mm thick
Screen Printer	Ragin Manual Printer		

All PEM® products meet our stringent quality standards. If you require additional industry or other specific quality certifications, special procedures and/or part numbers are required. Please contact your local sales office or representative for further information.

Regulatory compliance information is available in Technical Support section of our website. Specifications subject to change without notice. See our website for the most current version of this bulletin.

PennEngineering®

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Technical support e-mail: techsupport@pemnet.com

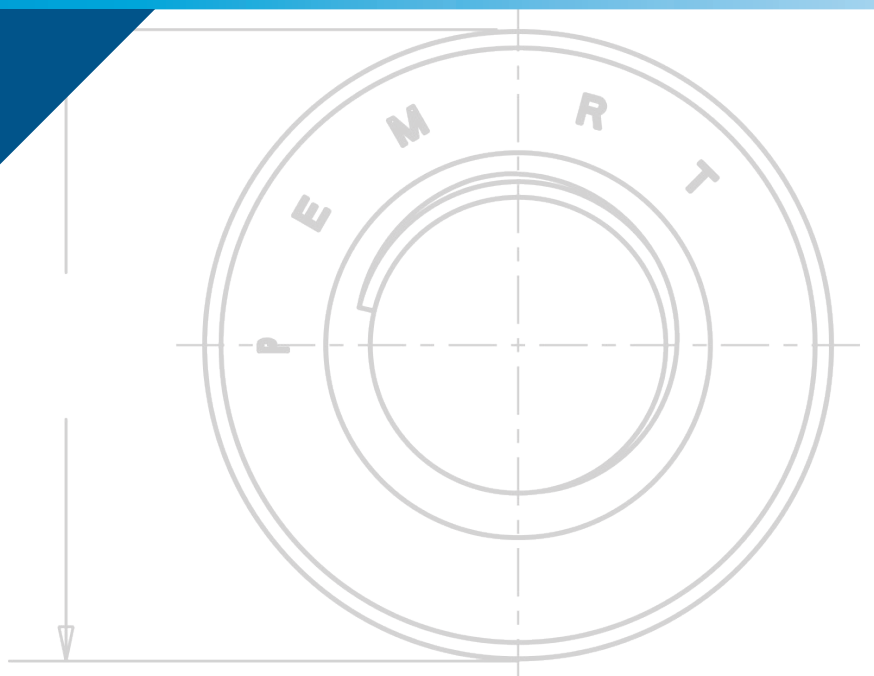
Bulletin S-RT-1017

PEM® brand RT™ free-running locknuts have a thread form that creates a lock when clamp load is applied

NEW!

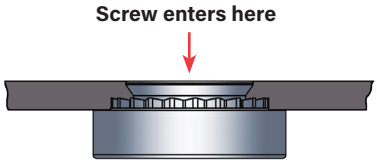
S-RT™

FREE-RUNNING LOCKNUTS

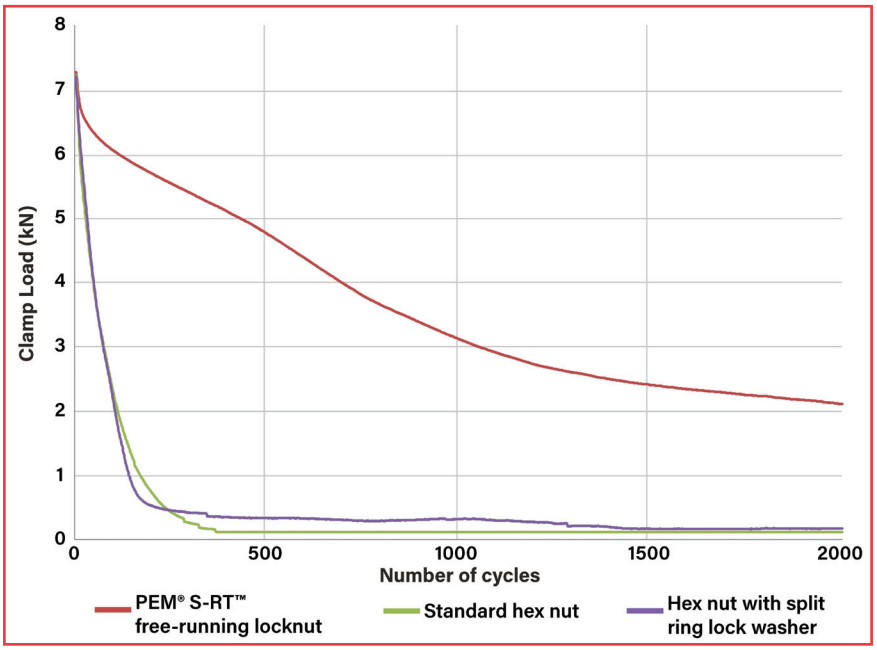


PEM® S-RT™ free-running locknuts are free-running until clamp load is induced. A modified thread angle on the loaded flank provides the vibration resistant locking feature.

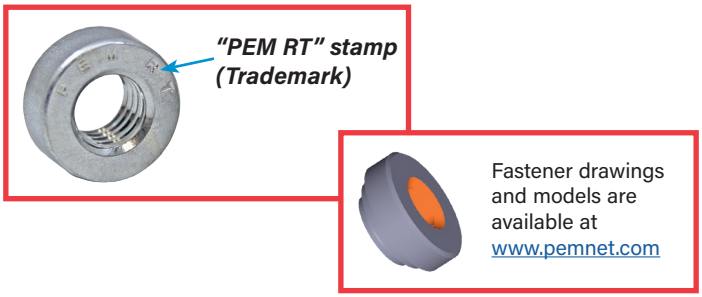
- Screw turns freely until a clamp load is applied.
- Resistant to vibrational loosening.
- Back side of panel is flush or sub-flush for screw installation.
- Locking feature reusability is not affected by number of on/off cycles.
- Uses same mounting hole and installation tooling as standard S™ nut fasteners found in PEM® Bulletin CL.



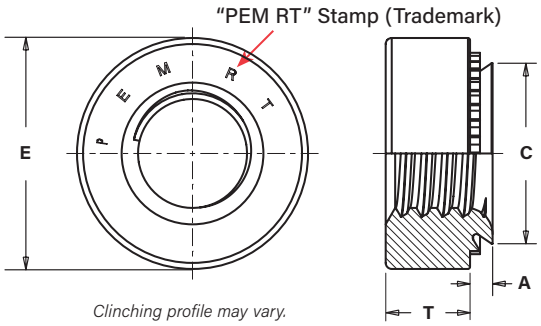
The graph below represents the clamp load of the joint versus the amount of cycles during transverse vibration testing for an S-RT™ free-running locknut, a standard hex nut and a hex nut with a split ring lock washer.



Testing conditions:
Transverse vibration testing.
M6 thread size nuts, average of 30 pieces.
Clamp load applied using metric property class 10.9 screws.
Nuts tested until loss of clamp load or 2,000 cycles is reached.



Fastener drawings and models are available at www.pemnet.com



PART NUMBER DESIGNATION

S - RT632 - 1 ZI

Type | Thread Code | Shank Code | Finish

All dimensions are in inches.

	Thread Size	Type	Thread Code	Shank Code	A (Shank) Max.	Rec. Min. Sheet Thickness (1)	Hole Size In Sheet +.003 -.000	C Max.	E +.010	T +.010	Min. Dist Hole ℄ To Edge
UNIFIED	.112-40 (#4-40)	S	RT440	0	.030	.030	.166	.165	.250	.070	.19
				1	.038	.040					
				2	.054	.056					
	.138-32 (#6-32)	S	RT632	0	.030	.030	.1875	.187	.280	.070	.22
				1	.038	.040					
				2	.054	.056					
	.164-32 (#8-32)	S	RT832	0	.030	.030	.213	.212	.310	.090	.27
				1	.038	.040					
				2	.054	.056					
	.190-32 (#10-32)	SS	RT032	0	.030	.030	.250	.249	.340	.090	.28
				1	.038	.040					
				2	.054	.056					
	.250-20 (1/4-20)	S	RT0420	0	.045	.047	.344	.343	.440	.170	.34
				1	.054	.056					
				2	.087	.090					
	.313-18 (5/16-18)	S	RT0518	1	.054	.056	.413	.412	.500	.230	.38
				2	.087	.090					

All dimensions are in millimeters

	Thread Size x Pitch	Type	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	M3 x 0.5	S	RTM3	0	0.77	0.8	4.22	4.2	6.35	1.5	4.8
				1	0.97	1					
				2	1.38	1.4					
	M4 x 0.7	S	RTM4	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	SS	RTM5	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	S	RTM6	00	0.89	0.92	8.75	8.73	11.18	4.08	8.6
				0	1.15	1.2					
				1	1.38	1.4					
				2	2.21	2.29					

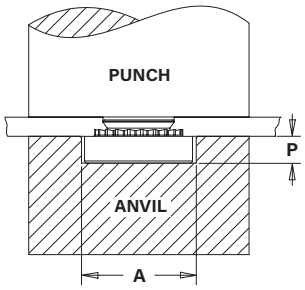
MATERIAL AND FINISH SPECIFICATIONS

THREADS: Modified thread form on loaded flank. Will accept a maximum material 6g screw
FASTENER MATERIAL: Hardened Carbon Steel
FINISH(2): Standard: ZI - Zinc plated, 5µm, colorless
Optional: ZC - Zinc plated, 5µm, yellow
FOR USE IN SHEET HARDNESS: HRB 80 (Hardness Rockwell "B" scale) / HB 150 (Hardness Brinell) or less

(1) For maximum performance, we recommend that you use the maximum shank length for your sheet thickness.
(2) See PEM Technical Support section of our website for related plating standards and specifications.

INSTALLATION

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.
3. With installation punch and anvil surfaces parallel, apply squeezing force until the head of the nut comes into contact with the sheet material.



INSTALLATION NOTES

- For best results we recommend using a PEMSERTER® press for installation of PEM self-clinching fasteners. Please check our website for more information.
- Visit the Animation Library on our website to view the installation process for select products.

PEMSERTER® Installation Tooling

	Thread Code	Anvil Dimensions (in.) A ±.002	Anvil Dimensions (in.) P ±.005	Anvil Part Number	Punch Part Number
UNIFIED	RT440	.267	.045	975200034	975200048
	RT632	.298	.045	975200035	975200048
	RT832	.330	.070	975200036	975200048
	RT032	.361	.070	975200037	975200048
	RT0420	.454	.150	975200038	975200048
	RT0518	.517	.200	975200039	975200048

	Thread Code	Anvil Dimensions (mm) A ±0.05	Anvil Dimensions (mm) P ±0.13	Anvil Part Number	Punch Part Number
METRIC	RTM3	6.78	1.14	975200034	975200048
	RTM4	8.38	1.78	975200036	975200048
	RTM5	9.17	1.78	975200037	975200048
	RTM6	11.53	3.81	975200038	975200048

PERFORMANCE DATA(1)

	Type	Thread Code	Shank Code	Test Sheet Material	Installation (lbs.)	Pushout (lbs.)	Torque-out (in. lbs.)
UNIFIED	S	RT440	0	5052-H34 Aluminum	1500-2000	63	8
			1			90	10
			2			170	13
			0	Cold-rolled Steel	2500-3500	105	13
			1			125	15
			2			230	18
	S	RT632	0	5052-H34 Aluminum	2500-3000	63	16
			1			95	17
			2			190	22
			0	Cold-rolled Steel	3000-6000	110	16
			1			130	20
			2			275	28
	S	RT832	0	5052-H34 Aluminum	2500-3000	68	21
			1			105	23
			2			220	35
			0	Cold-rolled Steel	4000-6000	110	26
			1			145	35
			2			285	45
	SS	RT032	0	5052-H34 Aluminum	2500-3500	68	26
			1			110	32
			2			190	50
			0	Cold-rolled Steel	4000-9000	120	32
			1			180	40
			2			320	60
	S	RT0420	0	5052-H34 Aluminum	4000-7000	220	70
			1			360	90
			2				125
			0	Cold-rolled Steel	6000-8000	315	115
			1			400	150
			2				
	S	RT0518	1	5052-H34 Aluminum	4000-7000	380	120
			2				160
			1	Cold-rolled Steel	6000-8000	420	165
			2				180

	Type	Thread Code	Shank Code	Test Sheet Material	Installation (kN)	Pushout (N)	Torque-out (N-m)
METRIC	S	RTM3	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
	S	RTM4	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
	SS	RTM5	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			1112	6.8
	S	RTM6	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				

(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.

All PEM® products meet our stringent quality standards. If you require additional industry or other specific quality certifications, special procedures and/or part numbers are required. Please contact your local sales office or representative for further information.

Regulatory compliance information is available in Technical Support section of our website. Specifications subject to change without notice. See our website for the most current version of this bulletin.

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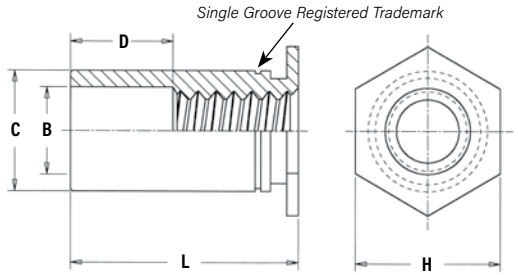
PEM® Nickel Plated, Series 400, Stainless Steel Standoffs

with improved corrosion resistance for stainless steel sheet applications

- Standoffs allow for stacking or spacing in applications where corrosion resistance is required.
- Fasteners clinch securely into stainless steel sheet with hardness up to HRB 88 / HB 183
- Available with blind or through-hole threads. Closed threads provide flush appearance on back side of sheet.
- Nickel plating presents an attractive finish to enhance overall assembly appearance.
- For complete specifications and installation data, see PEM® Bulletin SO.

NEW!

TYPE SO4™ THROUGH-HOLE THREADED STANDOFFS



Clinching profile may vary.

PART NUMBER DESIGNATION

SO	4	-	440	-	10	NC
Type	Material Code		Thread Code		Length Code	Finish

For combination thread size and length selection available, see PEM® Bulletin SO.

GENERAL DIMENSIONAL DATA

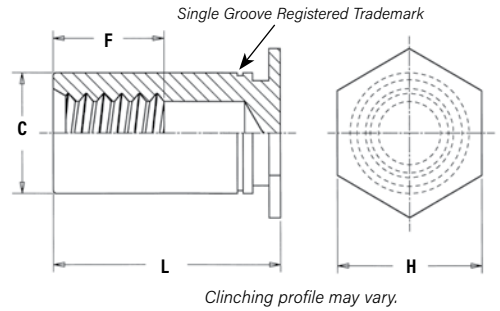
All dimensions are in inches.

	Thread Code	Min. Sheet Thickness	Hole Size In Sheet +.003 -.000	B Counter-Bore Dia. ±.005	C +.000 -.005	H Nom.	Min. Dist. Hole ℄ To Edge	D ±.010
UNIFIED	440	.040	.166	.125	.165	.187	.23	Varies according to length. See PEM® Bulletin SO.
	6440	.040	.213	.125	.212	.250	.27	
	632	.040	.213	.156	.212	.250	.27	
	8632	.050	.281	.156	.280	.312	.31	
	832	.050	.281	.188	.280	.312	.31	
	032	.050	.281	.203	.280	.312	.31	

All dimensions are in millimeters.

	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 PEM® Bulletin SO.
	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	

TYPE BSO4™ BLIND THREADED STANDOFFS



Clinching profile may vary.

PART NUMBER DESIGNATION

BSO	4	-	440	-	10	NC
Type	Material Code		Thread Code		Length Code	Finish

For combination thread size and length selection available, see PEM® Bulletin SO.

GENERAL DIMENSIONAL DATA

All dimensions are in inches.

	Thread Code	Min. Sheet Thickness	Hole Size In Sheet +.003 -.000	C +.000 -.005	H Nom.	Min. Dist. Hole ℄ To Edge	F Min.
UNIFIED	440	.040	.166	.165	.187	.23	Varies according to length. See PEM® Bulletin SO.
	6440	.040	.213	.212	.250	.27	
	632	.040	.213	.212	.250	.27	
	8632	.050	.281	.280	.312	.31	
	832	.050	.281	.280	.312	.31	
	032	.050	.281	.280	.312	.31	

All dimensions are in millimeters.

	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 PEM® Bulletin SO.
	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	

PEM® Nickel Plated, Series 400, Stainless Steel Standoffs

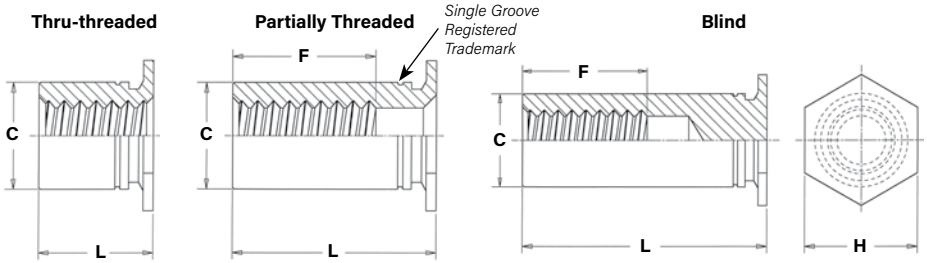
with improved corrosion resistance for stainless steel sheet applications

TYPE TSO4™ THREADED STANDOFFS FOR SHEETS AS THIN AS .025"/0.63mm

PART NUMBER DESIGNATION

TSO	4	-	440	-	250	NC
↓	↓		↓		↓	↓
Type	Material Code		Thread Code		Length Code	Finish

For combination thread size and length selection available, see PEM® Bulletin SO.



Clinching profile may vary.

GENERAL DIMENSIONAL DATA

All dimensions are in inches.

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

All dimensions are in millimeters.

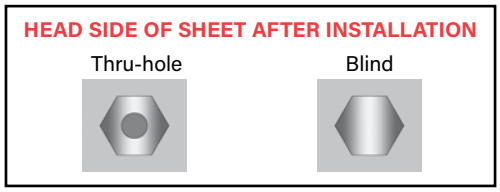
	Thread Code	Min. Sheet Thickness	Hole Size In Sheet +0.08	C -0.13	F Min. Thread Depth	H Nom.	Min. Dist. Hole ℄ To Edge
METRIC	M25	0.63	4.22	4.2	5.2	4.8	5.8
	6M25	0.63	5.41	5.39		6.4	7.1
	M3	0.63	4.22	4.2	6.2	4.8	5.8
	6M3	0.63	5.41	5.39		6.4	7.1
	M35	0.63	5.41	5.39	7	6.4	7.1

TYPES SO4/BSO4/TSO4 MATERIAL AND FINISH SPECIFICATIONS

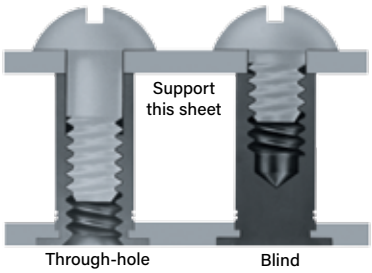
Threads: Internal, ASME B1.1, 2B ASME B1.13M, 6H
Fastener material: Hardened 400 Series Stainless Steel
Finish: NC - Electroless Nickel over Copper over Nickel strike per ASTM B733 (1)
For use in: Sheet hardness HRB 88 / HB 183 or less (2)

(1) Not stocked, available on special order. Minimum quantities apply. Contact your local PEM distributor for details. See PEM Technical Support section of our web site for related plating standards and specifications.
(2) HRB - Hardness Rockwell "B" Scale. HB - Hardness Brinell.

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 .025"/0.63mm.



For more information on how to use PEM® self-clinching standoffs, see Tech Sheet "PEM®-Ref/Standoff Basics" on our web site.



All PEM® products meet our stringent quality standards. If you require additional industry or other specific quality certifications, special procedures and/or part numbers are required. Please contact your local sales office or representative for further information.

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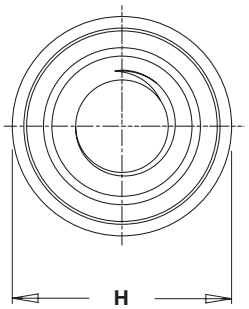
MSOFS™ microPEM® Flaring Standoffs

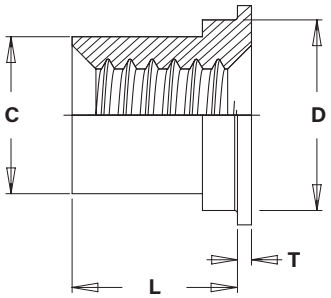
Ideal miniature fastener solution to attach components in compact electronic assemblies

- New MSOFS™ microPEM® flaring standoffs attach permanently in panels as thin as .008"/0.2 mm of any hardness, including stainless steel.
- Can be installed into any type of panel, including metal, plastic and P.C. Board.
- Flaring feature allows for installation into multiple panels.
- Small footprint allows for reduced centerline-to-edge designs.
- Threads as small as #0-80/M1.

NEW!

microPEM® FASTENERS





PART NUMBER DESIGNATION

MSOFS - 080 - 3

- MSOFS: Type and Material
- 080: Thread Code
- 3: Length Code

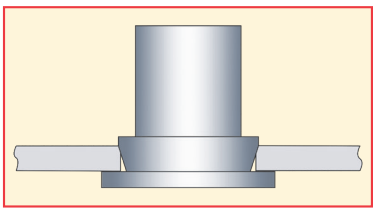
All dimensions are in inches.

	Thread Size	Type	Thread Code	Length Code	Sheet Thickness	Hole Size in Sheet +.002 -.000	C Max.	D Max.	H Nom.	L +.002 -.003	T ±.002	Min. Dist. Hole ℄ to Edge
UNIFIED	.060-80 (#0-80) (1)	MSOFS	080	3	.008 - .012	.118	.094	.117	.138	.093	.010	.069
				4						.125		
	.086-56 (#2-56) (1)	MSOFS	256	3	.008 - .012	.138	.113	.137	.157	.093	.010	.079
				4						.125		

All dimensions are in millimeters.

	Thread Size x Pitch	Type	Thread Code	Length Code	Sheet Thickness	Hole Size in Sheet +0.05	C Max.	D Max.	H Nom.	L +0.05 -0.08	T ±0.05	Min. Dist. Hole ℄ to Edge
METRIC	M1 x 0.25 (2)	MSOFS	M1	2	0.2 - 0.3	3	2.39	2.97	3.35	2	0.25	1.75
				3						3		
	M1.2 x 0.25 (2)	MSOFS	M1.2	2	0.2 - 0.3	3	2.39	2.97	3.35	2	0.25	1.75
				3						3		
	M1.4 x 0.3 (3)	MSOFS	M1.4	2	0.2 - 0.3	3	2.39	2.97	3.35	2	0.25	1.75
				3						3		
	M1.6 x 0.35 (4)	MSOFS	M1.6	2	0.2 - 0.3	3.5	2.87	3.48	4	2	0.25	2
				3						3		
	M2 x 0.4 (4)	MSOFS	M2	2	0.2 - 0.3	3.5	2.87	3.48	4	2	0.25	2
				3						3		

Threads: (1) Internal, ASME B1.1, 2B
(2) Metric ISO 68-1, 5H
(3) Metric ISO 68-1, 6H
(4) Metric ASME B1.13M, 6H
Material: 300 series stainless steel
Standard Finish: Passivated and/or tested per ASTM A380
For use in: Any panel hardness



MSOFS™ standoff installed.

Fastener drawings and models are available at www.pemnet.com

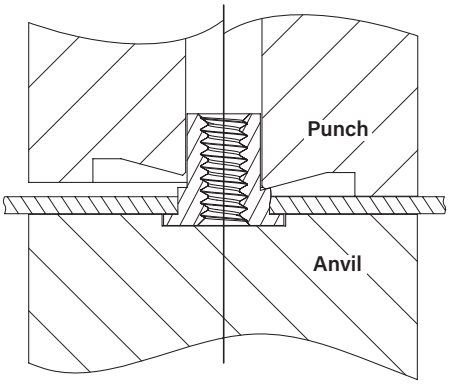
MSOFS™ microPEM® Flaring Standoffs

Ideal miniature fastener solution to attach components in compact electronic assemblies

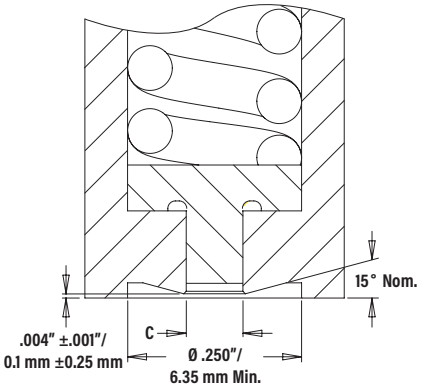
INSTALLATION

1. Prepare properly sized mounting hole in sheet. Do not perform any secondary operations such as deburring.
2. Place the standoff into anvil recess and place the mounting hole over the standoff as shown in the drawing.
3. Using a punch flaring tool and a recessed anvil, apply squeezing force until punch contacts the sheet.

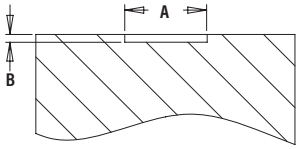
BEFORE AFTER



PUNCH DETAIL



ANVIL DETAIL



INSTALLATION NOTES

- For best results we recommend using a PEMSERTER® press for installation of PEM self-clinching fasteners. Please check our website for more information.
- Visit the Animation Library on our website to view the installation process for select products.

PEMSERTER® Installation Tooling

	Thread Code	Punch Dimensions (in.) C +.001	Punch Part Number	Anvil Dimensions (in.) A ±.001	Anvil Dimensions (in.) B ±.001	Anvil Part Number
UNIFIED	080	.095	8020712	.143	.006	8019720
	256	.114	8020710	.163	.006	8019722

	Thread Code	Punch Dimensions (mm) C +0.025	Punch Part Number	Anvil Dimensions (mm) A ±.025	Anvil Dimensions (mm) B ±.025	Anvil Part Number
METRIC	M1	2.41	8020712	3.64	0.15	8019720
	M1.2	2.41	8020712	3.64	0.15	8019720
	M1.4	2.41	8020712	3.64	0.15	8019720
	M1.6	2.9	8020710	4.14	0.15	8019722
	M2	2.9	8020710	4.14	0.15	8019722

PERFORMANCE DATA(1)

	Thread Code	Max. Rec. Tightening Torque For Mating Screw (in. lbs.)	Test Sheet Material .008" 300 Series Stainless Steel Installation (lbs.)	Pushout (lbs.)	Torque-out (in.lbs.)
UNIFIED	080	.65	1500	69.8	1.29
	256	1.3	1800	91.2	1.29

	Thread Code	Max. Rec. Tightening Torque For Mating Screw (N-m)	Test Sheet Material 0.2 mm 300 Series Stainless Steel Installation (kN)	Pushout (N)	Torque-out (N-m)
METRIC	M1	0.019	6.67	311	0.146
	M1.2	0.036	6.67	311	0.146
	M1.4	0.057	6.67	311	0.146
	M1.6	0.084	8	406	0.146
	M2	0.175	8	406	0.146

(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.

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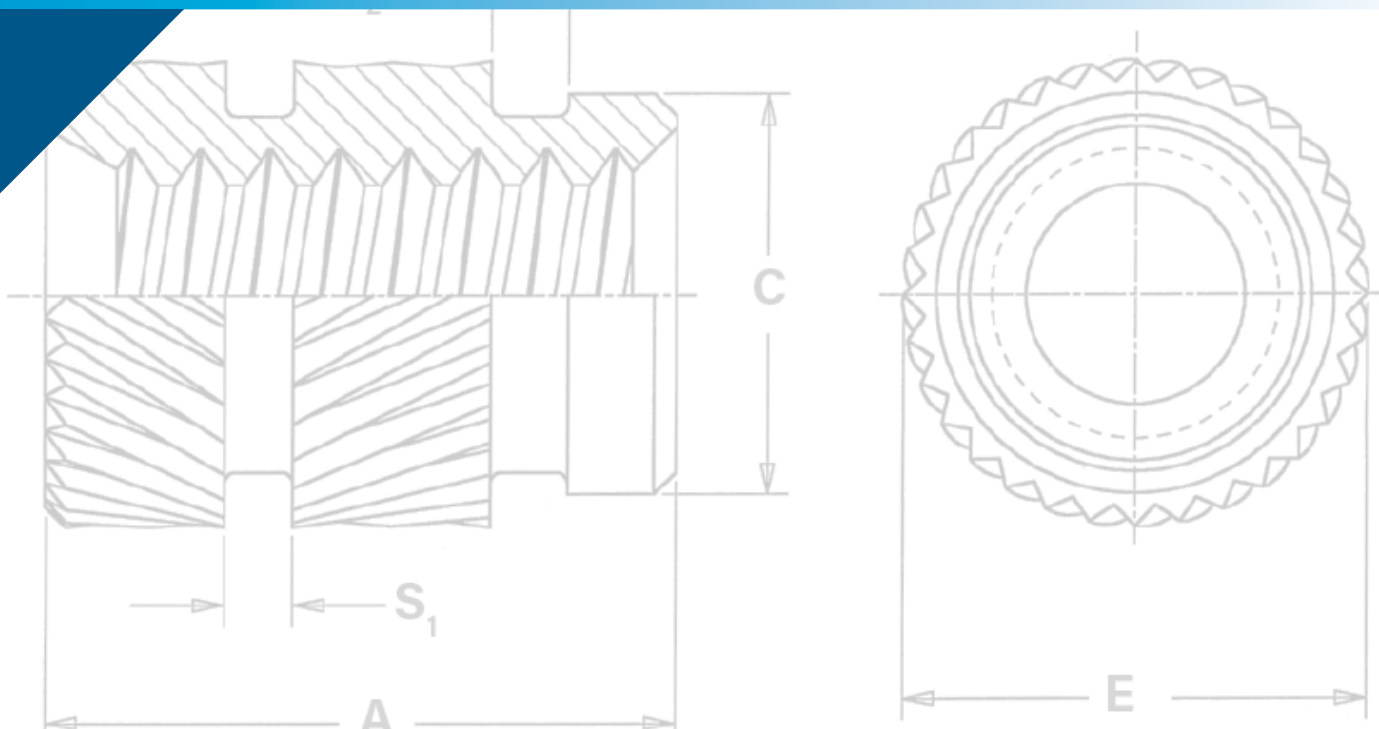
SI® brand inserts employ press-in, molded-in, or heat/ultrasonic installation methods to provide strong, reusable, permanent threads in plastic.

SI®

THREADED INSERTS FOR PLASTICS



- SI® inserts are typically specified in applications where strong, durable metal threads are required in plastic material, especially where frequent assembly and disassembly of the unit for service or repair is necessary.
- Applications for SI® products include: electronics (including wearables, smart phones and hand held devices), automotive, aerospace and defense, medical, transportation, industrial and recreational equipment.
- SI® inserts are available in brass, stainless steel and aluminum.
- SI® inserts are available in a large variety of ultrasonic / heat staking, molded-in or press-in types.
- Aluminum and stainless steel inserts for plastics offer lead-free alternatives to leaded brass typically used for brass inserts.
  - Lead-free inserts offer alternative to leaded brass to address environmental and end-of-life recycling concerns.
  - **NEW aluminum inserts** are approximately 70% lighter than brass equivalents and made from lead-free aluminum.
  - Stainless steel inserts are typically stronger than brass and may offer better protection from certain types of corrosive agents.
- SI® microPEM® inserts provide threads as small as M1.

PART NUMBER DESIGNATION AND MATERIAL AND FINISH SPECIFICATIONS

IU B - 440 - 2

Length Code (where applicable):
See individual product charts for actual corresponding dimensional lengths.

Thread Code:
Internal, ASME B1.1, 2B / ASME B1.13M, 6H (except where noted)
For PPB, PFLB, and PKB inserts collapsed slot and burrs may cause prevailing torque while thread accepts class 3A/4h screw.
See individual product charts for actual corresponding thread size.

Material Code:
B = Free-machining, leaded brass. Plain finish. Meets RoHS requirements.
C = 300 series stainless steel. Passivated and/or tested per ASTM A380.
A = Aluminum. Plain finish.

Type:
IU = Ultrasonic, tapered
IUT = Ultrasonic, straight wall
IS = Ultrasonic, symmetrical
MSI = microPEM®, Ultrasonic, symmetrical
IB = Molded-in, blind threaded
IBL = Molded-in, self-locking blind threaded
IT = Molded-in, thru-threaded
STK = Molded-in, knurled
NFP = Press-in, hexagonal
PP = Press-in, thru-threaded
PFL = Press-in, flange-head
PK = Press-in, straight knurl

ULTRASONIC / HEAT STAKING INSERTS

- Ultrasonic - Installed by pressing the insert into the mounting hole with ultrasonic insertion equipment while simultaneously applying a high frequency vibration. Frictional heat caused by the vibration melts the plastic surrounding the insert allowing easy insertion. When the vibration ceases, the plastic solidifies, locking the insert permanently in place.
- Heat Staking - Installed by pressing the insert into the mounting hole with a thermal press to melt the plastic surrounding the insert.

MOLDED-IN INSERTS

- Installed during the molding process, the inserts are located in the mold cavity by core pins. When the mold opens, the core pins are withdrawn leaving the inserts permanently encapsulated in the plastic section with only the threads exposed.
- Installing the inserts during the molding process eliminates the need for secondary steps or installation equipment.

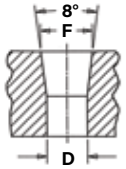
PRESS-IN INSERTS

- Installed by simply pressing the inserts into pre-molded or drilled holes. Installation is accomplished using any standard press at any time during the production process.
- Eliminates the need for molding-in inserts.
- Eliminates the need for heat or ultrasonic equipment.

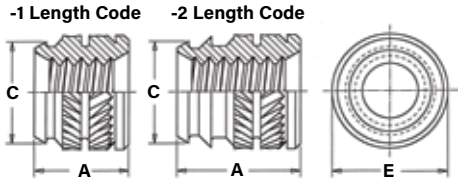
ULTRASONIC / HEAT STAKING INSERTS

Tapered Thru-Threaded, IUA™, IUB™ and IUC™ 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.

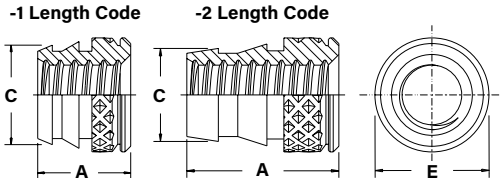


Mounting Hole



After Knurl

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



After Knurl

Diamond Knurl
Thread sizes
0-80 & 2-56

All dimensions are in inches.

	Thread Size	Type: New Aluminum	Type: Brass	Type: Stainless Steel	Thread Code (1)	Length Code	A ± .005	E ± .005	C ±.005	Hole Size in Material: Min. Hole Depth	Hole Size in Material: D ± .002	Hole Size in Material: F ± .002
UNIFIED	.060-80 (#0-80)	IUA	IUB	IUC	080	1	.115	.141	.123	.155	.118	.123
						2	.188		.115	.228	.107	
	.086-56 (#2-56)	IUA	IUB	IUC	256	1	.115	.141	.123	.155	.118	.123
						2	.188		.115	.228	.107	
	.112-40 (#4-40)	IUA	IUB	IUC	440	1	.135	.172	.157	.175	.153	.159
						2	.219		.149	.259	.141	
	.138-32 (#6-32)	IUA	IUB	IUC	632	1	.150	.219	.203	.190	.199	.206
						2	.250		.190	.290	.185	
	.164-32 (#8-32)	IUA	IUB	IUC	832	1	.185	.250	.230	.225	.226	.234
						2	.312		.213	.352	.208	
	.190-24 (#10-24)	IUA	IUB	IUC	024	1	.225	.297	.272	.265	.267	.277
						2	.375		.251	.415	.246	
	.190-32 (#10-32)	IUA	IUB	IUC	032	1	.225	.297	.272	.265	.267	.277
						2	.375		.251	.415	.246	
	.250-20 (1/4-20)	IUA	IUB	IUC	0420	1	.300	.375	.354	.340	.349	.363
						2	.500		.332	.540	.321	
	.250-28 (1/4-28)	IUA	IUB	IUC	0428	1	.300	.375	.354	.340	.349	.363
						2	.500		.332	.540	.321	
	.313-18 (5/16-18)	IUA	IUB	IUC	0518	1	.335	.469	.439	.375	.431	.448
						2	.562		.406	.602	.401	
	.375-16 (3/8-16)	IUA	IUB	IUC	0616	1	.375	.563	.532	.415	.523	.540
						2	.625		.493	.665	.488	

All dimensions are in millimeters.

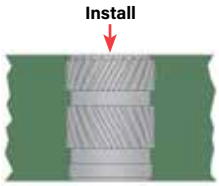
	Thread Size x Pitch	Type: New Aluminum	Type: Brass	Type: Stainless Steel	Thread Code (1)	Length Code	A ± 0.13	E ± 0.13	C ±0.13	Hole Size in Material: Min. Hole Depth	Hole Size in Material: D ± 0.05	Hole Size in Material: F ± 0.05
METRIC	M2.5 x 0.45	IUA	IUB	IUC	M2.5	1	3.43	4.37	3.99	4.44	3.89	4.04
						2	5.56		3.79	6.58	3.58	
	M3 x 0.5	IUA	IUB	IUC	M3	1	3.43	4.37	3.99	4.44	3.89	4.04
						2	5.56		3.79	6.58	3.58	
	M3 x 0.5	IUAA	IUBB	IUCC	M3	1	3.81	5.56	5.16	4.83	5.05	5.23
						2	6.35		4.83	7.42	4.7	
	M3.5 x 0.6	IUA	IUB	IUC	M3.5	1	3.81	5.56	5.16	4.83	5.05	5.23
						2	6.35		4.83	7.42	4.7	
	M4 x 0.7	IUA	IUB	IUC	M4	1	4.7	6.35	5.84	5.72	5.74	5.94
						2	7.92		5.41	8.94	5.28	
	M5 x 0.8	IUA	IUB	IUC	M5	1	5.72	7.54	6.91	6.74	6.78	7.03
						2	9.53		6.38	10.55	6.25	
	M5 x 0.8	IUAA	IUBB	IUCC	M5	1	6.71	8.33	7.83	7.72	7.7	8
						2	11.1		7.16	12.12	7.06	
	M6 x 1	IUA	IUB	IUC	M6	1	7.62	9.52	8.99	8.64	8.86	9.22
						2	12.7		8.43	13.72	8.15	
	M8 x 1.25	IUA	IUB	IUC	M8	1	8.51	11.91	11.15	9.53	10.95	11.38
						2	14.27		10.31	15.29	10.19	

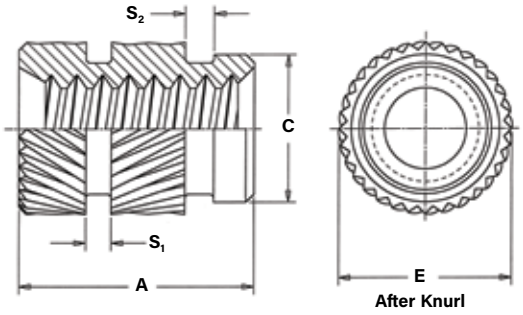
(1) Thread tapped thru, Class 3A/4h screw must pass with finger torque, but basic go gauge may stop at last thread.

ULTRASONIC / HEAT STAKING INSERTS

Straight Wall, Thru-Threaded, IUTA™, IUTB™ and IUTC™ Inserts

- Self-aligning lead-in of insert provides for accurate alignment prior to installation.
- Aluminum inserts ideal for light weight designs.
- Aluminum and stainless steel inserts offer lead-free alternative.





All dimensions are in inches.

	Thread Size	Type			Thread Code (1)	A ± .005	E ± .009	C ±.005	S_1 Nom.	S_2 Nom.	Hole Size in Material	
		New Aluminum	Brass	Stainless Steel							Min. Hole Depth	Hole Dia. + .003 - .000
UNIFIED	.086-56 (#2-56)	IUTA	IUTB	IUTC	256	.157	.147	.121	.031	.031	.187	.127
	.112-40 (#4-40)	IUTA	IUTB	IUTC	440	.226	.179	.152	.031	.031	.256	.158
	.138-32 (#6-32)	IUTA	IUTB	IUTC	632	.281	.210	.183	.031	.031	.311	.189
	.164-32 (#8-32)	IUTA	IUTB	IUTC	832	.321	.243	.217	.031	.040	.351	.223
	.190-24 (#10-24)	IUTA	IUTB	IUTC	024	.375	.273	.247	.046	.046	.405	.253
	.190-32 (#10-32)	IUTA	IUTB	IUTC	032	.375	.273	.247	.046	.046	.405	.253
	.250-20 (1/4-20)	IUTA	IUTB	IUTC	0420	.500	.342	.310	.046	.062	.530	.316
	.250-28 (1/4-28)	IUTA	IUTB	IUTC	0428	.500	.342	.310	.046	.062	.530	.316
	.375-16 (3/8-16)	IUTA	IUTB	IUTC	0616	.500	.509	.462	.046	.062	.530	.468

All dimensions are in millimeters.

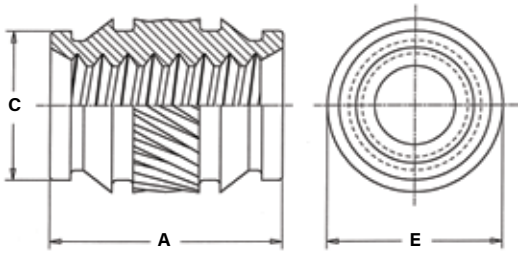
	Thread Size x Pitch	Type			Thread Code (1)	A ± 0.13	E ± 0.23	C ±0.13	S_1 Nom.	S_2 Nom.	Hole Size in Material	
		New Aluminum	Brass	Stainless Steel							Min. Hole Depth	Hole Dia. + 0.08
METRIC	M2 x 0.4	IUTA	IUTB	IUTC	M2	4	3.73	3.07	0.79	0.79	4.76	3.23
	M2.5 x 0.45	IUTA	IUTB	IUTC	M2.5	5.74	4.55	3.86	0.79	0.79	6.5	4.01
	M3 x 0.5	IUTA	IUTB	IUTC	M3	5.74	4.55	3.86	0.79	0.79	6.5	4.01
	M3.5 x 0.6	IUTA	IUTB	IUTC	M3.5	7.14	5.33	4.65	0.79	0.79	7.9	4.81
	M4 x 0.7	IUTA	IUTB	IUTC	M4	8.15	6.17	5.51	0.79	1.02	8.91	5.67
	M5 x 0.8	IUTA	IUTB	IUTC	M5	9.52	6.93	6.27	1.17	1.17	10.28	6.43
	M6 x 1	IUTA	IUTB	IUTC	M6	12.7	8.69	7.87	1.17	1.58	13.46	8.03

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

ULTRASONIC / HEAT STAKING INSERTS

Symmetrical, Thru-Threaded, ISA™, ISB™ and ISC™ Inserts

- Symmetrical design eliminates the need for orientation.
- Aluminum inserts ideal for light weight designs.
- Aluminum and stainless steel inserts offer lead-free alternative.



All dimensions are in inches.

	Thread Size	Type			Thread Code (1)	A ± .005	E ± .005	C ± .003	Hole Size in Material	
		New Aluminum	Brass	Stainless Steel					Hole Depth	Hole Dia. +.003-.000
UNIFIED	.086-56 (#2-56)	ISA	ISB	ISC	256	.157	.151	.122	.187	.126
UNIFIED	.112-40 (#4-40)	ISA	ISB	ISC	440	.226	.182	.153	.256	.157
UNIFIED	.138-32 (#6-32)	ISA	ISB	ISC	632	.281	.215	.184	.311	.188
UNIFIED	.164-32 (#8-32)	ISA	ISB	ISC	832	.321	.245	.217	.351	.221
UNIFIED	.190-32 (#10-32)	ISA	ISB	ISC	032	.375	.276	.248	.405	.252
UNIFIED	.250-20 (1/4-20)	ISA	ISB	ISC	0420	.500	.338	.311	.530	.315

All dimensions are in millimeters.

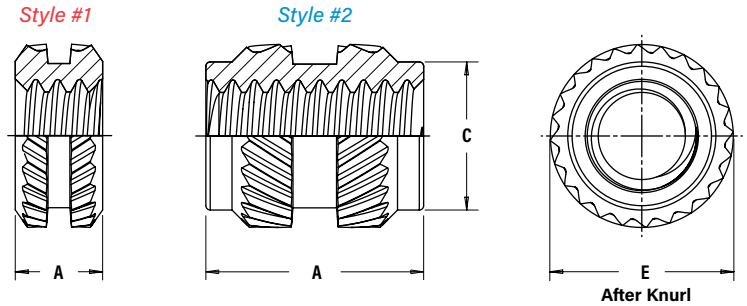
	Thread Size x Pitch	Type			Thread Code (1)	A ± 0.13	E ± 0.13	C ± 0.08	Hole Size in Material	
		New Aluminum	Brass	Stainless Steel					Hole Depth	Hole Dia. +0.08
METRIC	M3 x 0.5	ISA	ISB	ISC	M3	5.74	4.62	3.88	6.5	3.99
METRIC	M4 x 0.7	ISA	ISB	ISC	M4	8.15	6.22	5.51	8.92	5.62
METRIC	M5 x 0.8	ISA	ISB	ISC	M5	9.52	7.01	6.3	10.29	6.4
METRIC	M6 x 1	ISA	ISB	ISC	M6	12.7	8.58	7.9	13.46	8

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

ULTRASONIC / HEAT STAKING INSERTS

microPEM® Symmetrical, Thru-Threaded, MSIA™ MSIB™ Inserts

- Threads as small as M1.
- Symmetrical design eliminates the need for orientation.
- Provides excellent performance in wide range of plastics.
- Aluminum inserts ideal for light weight designs.
- Aluminum inserts offer lead-free alternative.



All dimensions are in millimeters.

	Thread Size x Pitch	Type		Thread Code	Length Code	A ±0.1	E ± 0.1	C Max.	Mounting Hole in Material		
		New Aluminum	Brass						Min. Wall Thickness (6)	Hole Depth Min.	Hole Diameter +0.05
METRIC	M1 x 0.25(3)	MSIA	MSIB	M1	100(1)	1	2.1	—	0.7	1.77	1.75
					250(2)	2.5		1.75		3.27	
	M1.2 x 0.25(3)	MSIA	MSIB	M1.2	100(1)	1	2.1	—	0.7	1.77	1.75
					250(2)	2.5		1.75		3.27	
	M1.4 x 0.3(4)	MSIA	MSIB	M1.4	150(2)	1.5	2.5	2.15	0.8	2.27	2.15
					300(2)	3				3.77	
	M1.6 x 0.35(5)	MSIA	MSIB	M1.6	150(2)	1.5	2.5	2.15	0.8	2.27	2.15
					300(2)	3				3.77	

(1) *Style #1* - length codes less than 150
(2) *Style #2* - length codes 150 and greater
(3) Metric ISO 68-1, 5H
(4) Metric ISO 68-1, 6H
(5) Metric ASME B1.13M, 6H
(6) Refers to wall diameter of boss as tested in ABS and polycarbonate.

microPEM® FASTENERS

PERFORMANCE DATA FOR ULTRASONIC / HEAT STAKING INSERTS

IUA, IUB, IUBB, IUC, and IUCC Inserts (1)

	Thread Code	ABS		Polycarbonate	
		Pullout (lbs.)	Torque-out (in. lbs.)	Pullout (lbs.)	Torque-out (in. lbs.)
UNIFIED	080-1	75	3	90	3
	256-1	75	3	90	6
	256-2	75	3	90	6
	440-1	80	4	160	7
	440-2	80	4	160	7
	632-1	145	15	165	18
	632-2	275	15	450	24
	832-1	205	18	295	20
	832-2	370	19	645	20
	024-1	270	45	430	55
	024-2	560	60	910	80
	032-1	270	45	430	55
	032-2	560	60	910	80
	0420-1	374	65	614	85
	0420-2	680	65	1415	108

	Thread Code	ABS		Polycarbonate	
		Pullout (N)	Torque-out (N·m)	Pullout (N)	Torque-out (N·m)
METRIC	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

IUTA, IUTB, IUTC Inserts(1)

	Thread Code	ABS		Polycarbonate	
		Pullout (lbs.)	Torque-out (in. lbs.)	Pullout (lbs.)	Torque-out (in. lbs.)
UNIFIED	256	90	6	112	8
	440	165	14	245	16
	632	268	25	295	31
	832	328	36	385	52
	032	385	54	565	80
	0420	480	135	600	190

	Thread Code	ABS		Polycarbonate	
		Pullout (N)	Torque-out (N·m)	Pullout (N)	Torque-out (N·m)
METRIC	M2.5/M3	730	1.58	1080	1.81
	M4	1450	4.07	1710	5.88
	M5	1710	6.1	2510	9.04
	M6	2130	15.26	2660	21.47

ISA, ISB and ISC Inserts(1)

	Thread Code	ABS		Polycarbonate	
		Pullout (lbs.)	Torque-out (in. lbs.)	Pullout (lbs.)	Torque-out (in. lbs.)
UNIFIED	256	85.5	6.14	149.4	6.37
	440	151.37	14.38	344.94	23.17
	632	320.3	21.69	405.9	18.19
	832	462.9	31.7	663.9	57.15
	032	549.6	52.3	1015.4	71.79
	0420	600.45	100.25	–	–

	Thread Code	ABS		Polycarbonate	
		Pullout (N)	Torque-out (N·m)	Pullout (N)	Torque-out (N·m)
METRIC	M3	680	1.62	1550	2.6
	M4	2080	3.58	2980	6.45
	M5	2470	5.9	4560	8.11
	M6	2700	11.1	–	–

MSIA and MSIB Inserts(1)

	Thread Code	Length Code	ABS		Polycarbonate	
			Pullout (N)	Torque-out (N·cm) (2)	Pullout (N)	Torque-out (N·cm) (2)
METRIC	M1	100	50	3.5	50	4.5
		250	150	10	200	12
	M1.2	100	50	3.5	50	4.5
		250	150	10	200	12
	M1.4	150	100	15	140	15
		300	330	30	400	30
	M1.6	150	100	15	140	15
		300	330	30	400	30

(1) The values reported are averages for ultrasonically inserted inserts when all installation specifications and procedures are followed. Variations in mounting hole size, sheet material and installation procedure will affect results. Performance testing of this product in your application is recommended. Samples can be provided for this purpose.

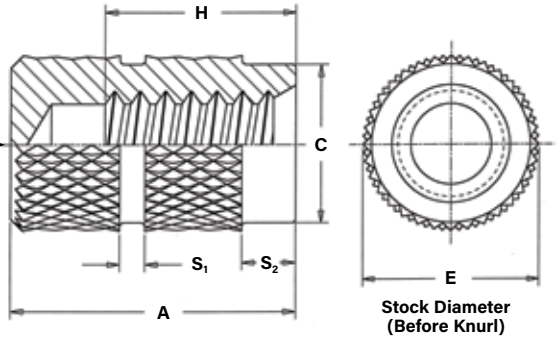
(2) Torque-out performance will depend on the strength and type of screw being used. In most cases, the screw threads will fail before the insert threads. For testing purposes, inserts were installed using heat stake equipment into a flat sheet.

MOLDED-IN INSERTS

Blind Threaded, IBA™, IBB™ and IBC™ 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.

NOTE: Manufacturing techniques may leave a slight projection a maximum of .025" / 0.65 mm beyond the "A" dimension.



All dimensions are in inches.

	Thread Size	Type			Thread Code	Length A ± .005 / H Min.					E Nom.	C ± .005	S_1 Nom.	S_2 Nom.	Minor Dia. Min./Max.
		New Aluminum	Brass	Stainless Steel		Min. No. of Full Threads									
						4	6	8	10	12					
UNIFIED	.086-56 (#2-56)	IBA	IBB	IBC	256	.156/.080	.219/.115	.250/.150	.312/.185	.344/.220	.156	.142	.03	.03	.067/.0737
	.112-40 (#4-40)	IBA	IBB	IBC	440	.205/.110	.281/.160	.344/.210	.406/.260	.438/.310	.188	.171	.03	.03	.086/.0939
	.138-32 (#6-32)	IBA	IBB	IBC	632	.250/.135	.344/.200	.406/.260	.469/.325	.531/.385	.219	.202	.03	.06	.105/.114
	.164-32 (#8-32)	IBA	IBB	IBC	832	.250/.135	.344/.200	.406/.260	.469/.325	.531/.385	.250	.226	.05	.06	.131/.139
	.190-24 (#10-24)	IBA	IBB	IBC	024	.356/.175	.438/.260	.531/.345	.625/.425	.716/.510	.281	.259	.05	.06	.146/.156
	.190-32 (#10-32)	IBA	IBB	IBC	032	.281/.135	.438/.200	.531/.260	.469/.325	.531/.385	.281	.259	.05	.06	.157/.164
	.250-20 (1/4-20)	IBA	IBB	IBC	0420	.344/.200	.531/.315	.625/.415	.719/.515	.819/.615	.344	.321	.06	.09	.197/.207
	.313-18 (5/16-18)	IBA	IBB	IBC	0518	.438/.235	.594/.345	.719/.460	.811/.570	.949/.680	.438	.404	.078	.094	.254/.265
	.375-16 (3/8-16)	IBA	IBB	IBC	0616	.500/.265	.688/.390	.812/.515	.935/.640	1.00/.765	.500	.466	.094	.094	.309/.321

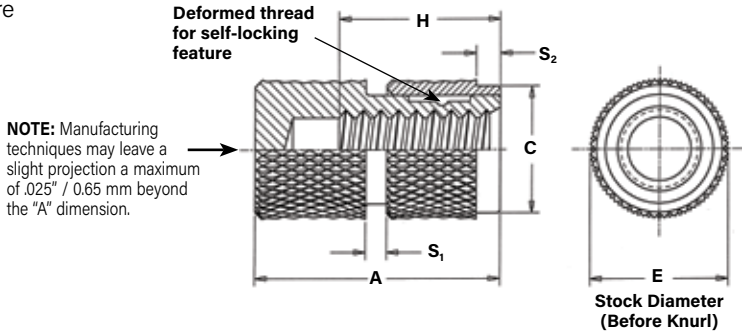
All dimensions are in millimeters.

	Thread Size x Pitch	Type			Thread Code	Length A ± 0.13 / H Min.					E Nom.	C ± 0.13	S_1 Nom.	S_2 Nom.	Minor Dia. Min./Max.
		New Aluminum	Brass	Stainless Steel		Min. No. of Full Threads									
						4	6	8	10	12					
METRIC	M2.5 x 0.45	IBA	IBB	IBC	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	IBA	IBB	IBC	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	IBA	IBB	IBC	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	IBA	IBB	IBC	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	IBA	IBB	IBC	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	IBA	IBB	IBC	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	IBA	IBB	IBC	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

MOLDED-IN INSERTS

Self-Locking, Blind Threaded, IBLC™ Inserts

- Deformed threads create prevailing torque locking feature to prevent screw loosening due to vibration.
- Blind-end protects the threads from plastic intrusion.
- Stainless steel inserts offer lead-free alternative.



NOTE: Manufacturing techniques may leave a slight projection a maximum of .025" / 0.65 mm beyond the "A" dimension.

All dimensions are in inches.

	Thread Size	Type	Thread Code	Length Code	A ± .005	E Nom.	C ± .005	S_1 ± .005	S_2 ± .005	(1) Minor Dia. Min/Max	H Min.	First Cycle on Locking Torque (in. lbs.) (2)	
												Min.	Max.
UNIFIED	.086-56 (#2-56)	IBLC	256	8	.250	.156	.150	.03	.03	.067/.0737	.150	0.2	2.5
	.112-40 (#4-40)	IBLC	440	8	.344	.188	.180	.03	.03	.086/.0939	.210	0.5	5
	.138-32 (#6-32)	IBLC	632	8	.406	.219	.200	.03	.03	.105/.114	.260	1	10
	.164-32 (#8-32)	IBLC	832	8	.406	.250	.235	.05	.06	.131/.139	.260	1.5	15
	.190-32 (#10-32)	IBLC	032	8	.531	.281	.270	.05	.06	.157/.164	.260	2	18
	.250-20 (1/4-20)	IBLC	0420	8	.625	.344	.325	.06	.09	.197/.207	.415	4.5	30

All dimensions are in millimeters.

	Thread Size x Pitch	Type	Thread Code	Length Code	A ± 0.13	E Nom.	C ± 0.13	S_1 ± 0.13	S_2 ± 0.13	(1) Minor Dia. Min/Max	H Min.	First Cycle on Locking Torque (N·m) (2)	
												Min.	Max.
METRIC	M3 x 0.5	IBLC	M3	8	8.73	4.78	4.57	0.8	0.8	2.48/2.59	4.21	0.06	0.6
	M4 x 0.7	IBLC	M4	8	10.31	6.35	5.97	1.2	1.6	3.26/3.42	5.89	0.16	1.6
	M5 x 0.8	IBLC	M5	8	13.48	7.14	6.86	1.2	1.6	4.15/4.34	6.69	0.23	2.1
	M6 x 1	IBLC	M6	8	15.87	8.73	8.26	1.6	2.4	4.95/5.15	8.37	0.37	3.2

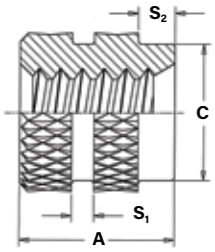
(1) Minor diameter may be below minimum in deformed thread area.

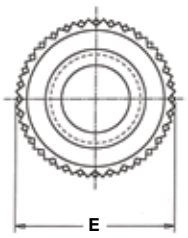
(2) Locking torque values shown apply when the mating screw has thread class of 3A for unified sizes and class 4h for metric sizes and is made from 300 series stainless steel with no additive finish. Other screws may be used, but the locking torque may not comply with the values shown.

MOLDED-IN INSERTS

Thru-Threaded, ITA™, ITB™ and ITC™ Inserts

- Pilot diameter and undercuts allow plastic to flow into grooves providing high pullout resistance.
- Aluminum inserts ideal for light weight designs.
- Aluminum and stainless steel inserts offer lead-free alternative.





Stock Diameter (Before Knurl)

All dimensions are in inches.

	Thread Size	Type: New Aluminum	Type: Brass	Type: Stainless Steel	Thread Code (1)	A ± .005	E Nom.	C ± .005	S_1 Nom.	S_2 Nom.	Minor Dia. Min./Max.
UNIFIED	.060-80 (#0-80)	ITA	ITB	ITC	080	.125	.109	.078	.03	.03	.0475/.051
	.086-56 (#2-56)	ITA	ITB	ITC	256	.125	.156	.142	.03	.03	.067/.0737
	.112-40 (#4-40)	ITA	ITB	ITC	440	.188	.188	.171	.03	.03	.086/.0939
	.138-32 (#6-32)	ITA	ITB	ITC	632	.219	.219	.202	.03	.06	.105/.114
	.164-32 (#8-32)	ITA	ITB	ITC	832	.250	.250	.226	.05	.06	.131/.139
	.190-24 (#10-24)	ITA	ITB	ITC	024	.281	.281	.259	.05	.06	.146/.156
	.190-32 (#10-32)	ITA	ITB	ITC	032	.281	.281	.259	.05	.06	.157/.164
	.250-20 (1/4-20)	ITA	ITB	ITC	0420	.375	.344	.321	.06	.09	.197/.207
	.250-28 (1/4-28)	ITA	ITB	ITC	0428	.375	.344	.321	.06	.09	.212/.220
	.313-18 (5/16-18)	ITA	ITB	ITC	0518	.469	.437	.404	.08	.09	.254/.265
	.375-16 (3/8-16)	ITA	ITB	ITC	0616	.562	.500	.466	.09	.09	.309/.321

All dimensions are in millimeters.

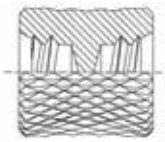
	Thread Size x Pitch	Type: New Aluminum	Type: Brass	Type: Stainless Steel	Thread Code (1)	A ± 0.13	E Nom.	C ± 0.13	S_1 Nom.	S_2 Nom.	Minor Dia. Min./Max.
METRIC	M3 x 0.5	ITA	ITB	ITC	M3	4.77	4.77	4.34	0.78	0.78	2.47/2.59
	M4 x 0.7	ITA	ITB	ITC	M4	6.35	6.35	5.74	1.16	1.57	3.25/3.42
	M5 x 0.8	ITA	ITB	ITC	M5	7.13	7.13	6.57	1.16	1.57	4.15/4.34
	M6 x 1	ITA	ITB	ITC	M6	9.53	8.74	8.15	1.57	2.38	4.94/5.16
	M10 x 1.5	ITA	ITB	ITC	M10	14.27	12.7	11.84	2.38	2.38	8.55/8.67

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

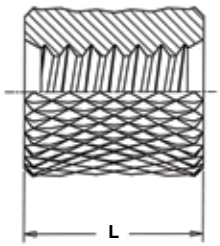
MOLDED-IN INSERTS

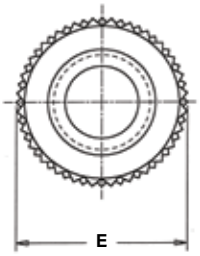
Thru-Threaded, Knurled, STKA™, STKB™ and STKC™ Inserts

- 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 STKA/STKB/STKC-256-20 and -24





Stock Diameter (Before Knurl)

All dimensions are in inches.

	Thread Size	Type: New Aluminum	Type: Brass	Type: Stainless Steel	Thread Code (1)	Length Code "L" ± .005 in 32nds of an Inch: .125	.187	.250	.312	.375	.500	.625	.750	E Nom.	Minor Dia. Min./Max.
UNIFIED	.086-56 (#2-56)	STKA	STKB	STKC	256	4	6	8	10	12	16	20	24	.156	.067/.0737
	.112-40 (#4-40)	STKA	STKB	STKC	440	4	6	8	10	12	16	20	24	.188	.086/.0939
	.138-32 (#6-32)	STKA	STKB	STKC	632	4	6	8	10	12	16	20	24	.219	.105/.114
	.164-32 (#8-32)	STKA	STKB	STKC	832	4	6	8	10	12	16	20	24	.250	.131/.139
	.190-32 (#10-32)	STKA	STKB	STKC	032	4	6	8	10	12	16	20	24	.281	.157/.164
	.250-20 (1/4-20)	STKA	STKB	STKC	0420	4	6	8	10	12	16	20	24	.375	.197/.207
	.313-18 (5/16-18)	STKA	STKB	STKC	0518	4	6	8	10	12	16	20	24	.437	.254/.265
	.375-16 (3/8-16)	STKA	STKB	STKC	0616	4	6	8	10	12	16	20	NA	.500	.309/.321

All dimensions are in millimeters.

	Thread Size x Pitch	Type: New Aluminum	Type: Brass	Type: Stainless Steel	Thread Code (1)	Length Code "L" ±0.13 in millimeters: 3	4	6	8	10	12	15	18	E Nom.	Minor Dia. Min./Max.
METRIC	M3 x 0.5	STKA	STKB	STKC	M3	3	4	6	8	10	12	15	18	4.74	2.47/2.59
	M4 x 0.7	STKA	STKB	STKC	M4	3	4	6	8	10	12	15	18	6.35	3.25/3.42
	M5 x 0.8	STKA	STKB	STKC	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.
NA Not Available.

PERFORMANCE DATA FOR MOLDED-IN INSERTS

IBA, IBB and IBC Inserts(1)

	Thread Code	Length Code	ABS		Polycarbonate	
			Pullout (lbs.)	Torque-out (in. lbs.)	Pullout (lbs.)	Torque-out (in. lbs.)
UNIFIED	256	6	148 / 140	5.8 / 5.5	165 / 158	6.2 / 5.8
		10	150 / 143	6 / 5.7	167 / 160	6.4 / 5.9
	440	6	250 / 240	6.2 / 5.7	265 / 253	6.9 / 6.5
		10	252 / 243	6.4 / 5.9	268 / 262	7 / 6.6
	632	6	425 / 415	8.5 / 8	455 / 440	9.2 / 8.7
		10	428 / 420	8.6 / 8.2	458 / 452	9.3 / 8.8
	832	6	530 / 521	15 / 14.1	545 / 536	16.1 / 15.4
		10	533 / 526	15.8 / 15	547 / 540	16.4 / 15.8
	032	6	635 / 624	57 / 52	648 / 640	59 / 56
		10	637 / 629	58 / 54	651 / 646	60 / 57
	0420	6	910 / 895	108 / 103	928 / 912	111 / 107

	Thread Code	Length Code	ABS		Polycarbonate	
			Pullout (N)	Torque-out (N·m)	Pullout (N)	Torque-out (N·m)
METRIC	M2.5/M3	6	1110 / 1060	0.7 / 0.64	1170 / 1120	0.77 / 0.73
		10	1120 / 1080	0.72 / 0.66	1190 / 1160	0.79 / 0.74
	M4	6	2350 / 2310	1.69 / 1.59	2420 / 2380	1.81 / 1.74
		10	2370 / 2330	1.78 / 1.69	2430 / 2400	1.85 / 1.79
	M5	6	2820 / 2770	6.44 / 5.87	2880 / 2840	6.66 / 6.32
		10	2830 / 2790	6.55 / 6.1	2890 / 2870	6.78 / 6.44
	M6	6	4040 / 3980	12.2 / 11.6	4120 / 4050	12.5 / 12

IBLC Inserts(1)

	Thread Code	ABS		Polycarbonate	
		Pullout (lbs.)	Torque-out (in. lbs.)	Pullout (lbs.)	Torque-out (in. lbs.)
UNIFIED	256	128 / 118	5 / 4.6	142 / 134	5.8 / 5
	440	230 / 220	6 / 5.5	238 / 226	6.8 / 6.2
	632	392 / 378	7.8 / 7	406 / 390	9 / 8.2
	832	496 / 480	11 / 9	500 / 468	14 / 13
	032	592 / 580	40 / 30	592 / 564	48 / 42
	0420	760 / 738	90 / 78	798 / 780	99 / 84

	Thread Code	ABS		Polycarbonate	
		Pullout (N)	Torque-out (N·m)	Pullout (N)	Torque-out (N·m)
METRIC	M3	1020 / 970	0.67 / 0.62	1050 / 1000	0.76 / 0.7
	M4	2200 / 2130	1.24 / 1.01	2220 / 2080	1.58 / 1.46
	M5	2630 / 2570	4.52 / 3.39	2630 / 2500	5.42 / 4.74
	M6	3380 / 3280	10.1 / 8.81	3540 / 3460	11.1 / 9.49

ITA, ITB and ITC Inserts(1)

	Thread Code	ABS		Polycarbonate	
		Pullout (lbs.)	Torque-out (in. lbs.)	Pullout (lbs.)	Torque-out (in. lbs.)
UNIFIED	080/256	104 / 96	5.6 / 5.2	115 / 106	6 / 5.6
	440	175 / 166	6 / 5.5	186 / 173	6.9 / 6.2
	632	298 / 290	8 / 7.5	318 / 302	9 / 8.5
	832	370 / 368	14 / 13.6	382 / 372	16 / 14.7
	032	444 / 432	55 / 50	454 / 445	57 / 52
	0420/0428	635 / 620	75 / 70	650 / 635	103 / 98

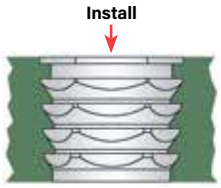
	Thread Code	ABS		Polycarbonate	
		Pullout (N)	Torque-out (N·m)	Pullout (N)	Torque-out (N·m)
METRIC	M3	770 / 730	0.67 / 0.62	820 / 760	0.77 / 0.7
	M4	1640 / 1630	1.58 / 1.53	1690 / 1650	1.8 / 1.66
	M5	1970 / 1920	6.22 / 5.65	2010 / 1970	6.44 / 5.87
	M6	2820 / 2750	8.47 / 7.91	2890 / 2820	11.6 / 11

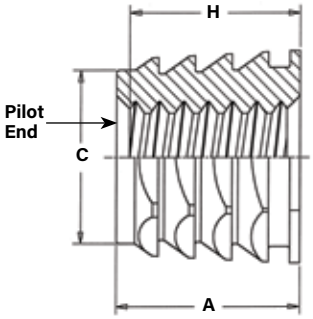
(1) The values reported are high and low ranges when all installation specifications and procedures are followed. Variations in mounting hole size, workpiece material and installation procedure will affect results. Performance testing of this product in your application is recommended. Samples can be provided for this purpose.

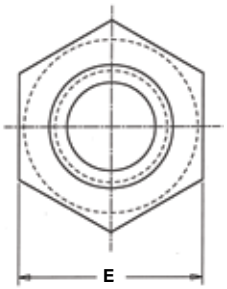
PRESS-IN INSERTS

Hexagonal, NFPA™ and NFPC™ 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 inches.

	Thread Size	Type		Thread Code	A Max.	Min. Sheet Thickness	Hole Size in Sheet + .003 - .000	C Max.	E Nom.	Min. Boss Dia.	Min. Depth Full Thread H(1)
		Aluminum	Stainless Steel								
UNIFIED	.086-56 (#2-56)	NFPA	NFPC	256	.230	.240	.187	.186	.187	.500	.212
	.112-40 (#4-40)	NFPA	NFPC	440	.230	.240	.187	.186	.187	.500	.212
	.138-32 (#6-32)	NFPA	NFPC	632	.230	.240	.187	.186	.187	.500	.212
	.164-32 (#8-32)	NFPA	NFPC	832	.265	.275	.250	.249	.250	.625	.248
	.190-24 (#10-24)	NFPA	NFPC	024	.265	.275	.250	.249	.250	.625	.248
	.190-32 (#10-32)	NFPA	NFPC	032	.265	.275	.250	.249	.250	.625	.248
	.250-20 (1/4-20)	NFPA	NFPC	0420	.315	.328	.312	.311	.312	.750	.300
	.313-18 (5/16-18)	NFPA	NFPC	0518	.365	.380	.375	.374	.375	.950	.345

All dimensions are in millimeters.

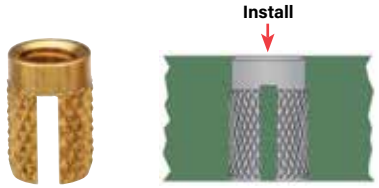
	Thread Size x Pitch	Type		Thread Code	A Max.	Min. Sheet Thickness	Hole Size in Sheet + 0.08	C Max.	E Nom.	Min. Boss Dia.	Min. Depth Full Thread H(1)
		Aluminum	Stainless Steel								
METRIC	M3 x 0.5	NFPA	NFPC	M3	5.84	6.1	4.75	4.72	4.75	12.7	5.38
	M3.5 x 0.6	NFPA	NFPC	M3.5	5.84	6.1	4.75	4.72	4.75	12.7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

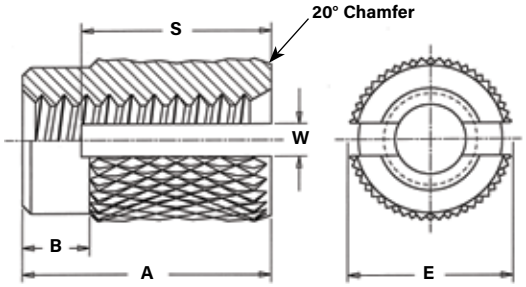
(1) Thread tapped thru, Class 3A/4h screw must pass with finger torque, but basic go gauge may stop at pilot end.

PRESS-IN INSERTS

Thru-Threaded, PPA™ and PPB™ Inserts

- Press-fit insert with strong, reusable threads. No heat or ultrasonics required.
- Slotted insert compresses allowing easy access into the mounting hole.
- Aluminum inserts ideal for light weight designs.
- Aluminum inserts offer lead-free alternative.





Stock Diameter (Before Knurl)

All dimensions are in inches.

	Thread Size	Type		Thread Code (1)	Length Code	A ± .005	E Nom.	B ± .015	S Nom.	W ± .015	Hole Size in Material	
		New Aluminum	Brass								Min. Hole Depth	Hole Dia. ± .002
UNIFIED	.086-56 (#2-56)	PPA	PPB	256	1	.156	.125	.040	.115	.020	.196	.125
	.112-40 (#4-40)	PPA	PPB	440	1	.188	.156	.045	.140	.020	.228	.156
					2	.250		.060	.190		.290	
	.138-32 (#6-32)	PPA	PPB	632	1	.250	.188	.060	.190	.031	.290	.188
					2	.313		.075	.235		.353	
	.164-32 (#8-32)	PPA	PPB	832	1	.250	.219	.060	.190	.047	.290	.219
					2	.313		.075	.235		.353	
	.190-32 (#10-32)	PPA	PPB	032	1	.313	.250	.075	.235	.062	.353	.250
					2	.375		.090	.280		.415	
	.250-20 (1/4-20)	PPA	PPB	0420	1	.438	.313	.105	.330	.078	.478	.313
					2	.500		.120	.375		.540	

All dimensions are in millimeters.

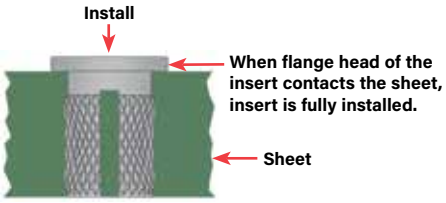
	Thread Size x Pitch	Type		Thread Code (1)	Length Code	A ± 0.13	Nom.	B ± 0.4	S Nom.	W ± 0.4	Hole Size in Material	
		New Aluminum	Brass								Min. Hole Depth	Hole Dia. ± 0.05
METRIC	M3 x 0.5	PPA	PPB	M3	1	4.77	3.96	1.14	3.56	0.5	5.79	3.96
					2	6.35		1.52	4.83		7.37	
	M4 x 0.7	PPA	PPB	M4	1	6.35	5.56	1.52	4.83	1.2	7.37	5.56
					2	7.95		1.91	5.97		8.97	
	M5 x 0.8	PPA	PPB	M5	1	7.95	6.35	1.91	5.97	1.6	8.97	6.35
					2	9.52		2.29	7.11		10.54	
	M6 x 1	PPA	PPB	M6	1	11.12	7.95	2.67	8.38	2	12.14	7.95
					2	12.7		3.05	9.53		13.72	

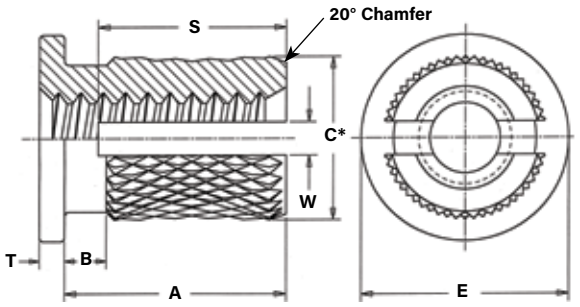
(1) Collapsed slot and burrs may cause prevailing torque while thread accepts class 3A/4h screw.

PRESS-IN INSERTS

Flange-Head, PFLA™ and PFLB™ Inserts

- Press-fit insert with strong, reusable threads. No heat or ultrasonics required.
- Flange-head eliminates direct contact of plastic with mating parts.
- Slotted insert compresses allowing easy access into the mounting hole.
- Aluminum inserts ideal for light weight designs.
- Aluminum inserts offer lead-free alternative.





*C Diameter (After Knurl)

All dimensions are in inches.

	Thread Size	Type: New Aluminum	Type: Brass	Thread Code (1)	Length Code	A ± .005	E Nom.	C Nom.	T ± .005	B ± .010	S Nom.	W ± .015	Hole Size in Material: Min. Hole Depth	Hole Size in Material: Hole Dia. ± .002
UNIFIED	.086-56 (#2-56)	PFLA	PFLB	256	1	.136	.188	.135	.020	.025	.115	.020	.176	.125
	.112-40 (#4-40)	PFLA	PFLB	440	1	.166	.219	.166	.022	.027	.140	.020	.206	.156
					2	.228					.190		.268	
	.138-32 (#6-32)	PFLA	PFLB	632	1	.222	.250	.200	.028	.033	.190	.031	.262	.188
					2	.253					.210		.293	
	.164-32 (#8-32)	PFLA	PFLB	832	1	.246	.281	.230	.035	.040	.210	.047	.286	.219
					2	.278					.235		.318	
	.190-32 (#10-32)	PFLA	PFLB	032	1	.270	.313	.262	.043	.048	.235	.062	.310	.250
					2	.332					.280		.372	
	.250-20 (1/4-20)	PFLA	PFLB	0420	1	.388	.375	.335	.050	.055	.330	.078	.428	.313
					2	.450					.375		.490	

All dimensions are in millimeters.

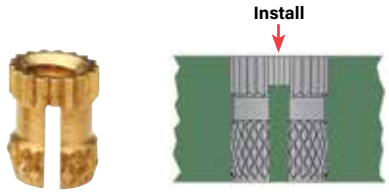
	Thread Size x Pitch	Type: New Aluminum	Type: Brass	Thread Code (1)	Length Code	A ± 0.13	E Nom.	C Nom.	T ± 0.13	B ± 0.25	S Nom.	W ± 0.4	Hole Size in Material: Min. Hole Depth	Hole Size in Material: Hole Dia. ± 0.05
METRIC	M3 x 0.5	PFLA	PFLB	M3	1	4.22	5.56	4.22	0.56	0.69	3.56	0.5	5.24	3.96
					2	5.8					4.83		6.82	
	M4 x 0.7	PFLA	PFLB	M4	1	6.25	7.14	5.84	0.89	1.02	5.33	1.14	7.27	5.56
					2	7.06					5.97		8.08	
	M5 x 0.8	PFLA	PFLB	M5	1	6.86	7.95	6.65	1.09	1.22	5.97	1.6	7.88	6.35
					2	8.43					7.11		9.45	
	M6 x 1	PFLA	PFLB	M6	1	9.86	9.53	8.51	1.27	1.40	8.38	2	10.88	7.95
					2	11.43					9.53		12.45	

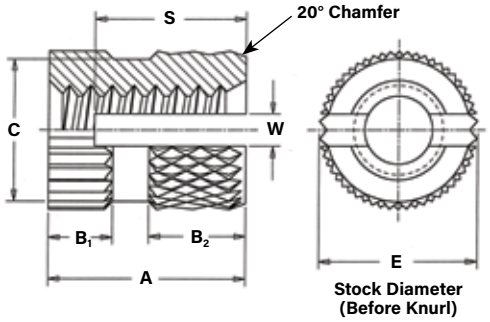
(1) Collapsed slot and burrs may cause prevailing torque while thread accepts class 3A/4h screw.

PRESS-IN INSERTS

Straight Knurl, PKA™ and PKB™ Inserts

- Press-fit insert with strong, reusable threads. No heat or ultrasonics required.
- Straight knurls at the top end of the insert offers higher torsional resistance.
- Slotted insert compresses allowing easy access into the mounting hole.
- Aluminum inserts ideal for light weight designs.
- Aluminum inserts offer lead-free alternative.





All dimensions are in inches.

	Thread Size	Type		Thread Code (1)	A ± .005	E Nom.	C ± .010	B_1 ± .010	B_2 ± .010	S Nom.	W ± .015	Hole Size in Material	
		New Aluminum	Brass									Min. Hole Depth	Hole Dia. ± .002
UNIFIED	.086-56 (#2-56)	PKA	PKB	256	.125	.125	.110	.037	.053	.095	.020	.165	.125
	.112-40 (#4-40)	PKA	PKB	440	.188	.156	.137	.056	.079	.140	.020	.228	.156
	.138-32 (#6-32)	PKA	PKB	632	.250	.188	.165	.075	.105	.190	.031	.290	.188
	.164-32 (#8-32)	PKA	PKB	832	.312	.219	.196	.094	.131	.235	.047	.352	.219
	.190-32 (#10-32)	PKA	PKB	032	.375	.250	.234	.112	.158	.280	.062	.415	.250
	.250-20 (1/4-20)	PKA	PKB	0420	.500	.312	.291	.150	.210	.375	.078	.540	.312

All dimensions are in millimeters.

	Thread Size x Pitch	Type		Thread Code (1)	A ± 0.13	E Nom.	C ± 0.25	B_1 ± 0.25	B_2 ± 0.25	S Nom.	W ± 0.4	Hole Size in Material	
		New Aluminum	Brass									Min. Hole Depth	Hole Dia. ± 0.05
METRIC	M3 x 0.5	PKA	PKB	M3	4.78	3.96	3.48	1.42	2.01	3.56	0.5	5.8	3.96
	M4 x 0.7	PKA	PKB	M4	7.92	5.56	4.98	2.39	3.33	5.97	1.19	8.94	5.56
	M5 x 0.8	PKA	PKB	M5	9.53	6.35	5.94	2.84	4.01	7.11	1.57	10.55	6.35
	M6 x 1	PKA	PKB	M6	12.7	7.92	7.39	3.81	5.33	9.53	1.98	13.72	7.92

(1) Collapsed slot and burrs may cause prevailing torque while thread accepts class 3A/4h screw.

PERFORMANCE DATA FOR PRESS-IN INSERTS

NFPA and NFPC Inserts(1)

	Thread Code	ABS			Polycarbonate		
		Install. Force (lbs.)	Pullout (lbs.)	Torque-out (in. lbs.)	Install. Force (lbs.)	Pullout (lbs.)	Torque-out (in. lbs.)
UNIFIED	440	225	125	4	600	280	16
	632	225	125	4	600	280	16
	832	300	135	10	600	380	42
	032	300	135	10	600	380	42
	0420	400	235	28	–	–	–

	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	–	–	–

PPA and PPB Inserts(1)

	Thread Code	Length Code	Phenolic		Polycarbonate	
			Pullout (lbs.)	Torque-out (in. lbs.)	Pullout (lbs.)	Torque-out (in. lbs.)
UNIFIED	256	1	60	12.8	52	7.2
	440	1	81	20.8	74	15.3
		2	193	38.6	170	25.2
	632	1	104	29.2	94	23.4
		2	221	49.6	198	35.6
	832	1	126	36.8	116	31.6
		2	249	59.8	224	45.6
	032	1	147	45.0	138	39.6
		2	276	69.6	253	55.6
	0420	1	192	61.6	182	56.0
		2	334	91.2	308	76.6

	Thread Code	Length Code	Phenolic		Polycarbonate	
			Pullout (N)	Torque-out (N · m)	Pullout (N)	Torque-out (N · m)
METRIC	M3	1	360	2.35	330	1.73
		2	860	4.36	760	2.85
	M4	1	560	4.16	520	3.57
		2	1110	6.76	1000	5.15
	M5	1	650	5.09	610	4.47
		2	1230	7.86	1130	6.28
	M6	1	850	6.96	810	6.33
		2	1490	10.31	1370	8.66

PFLA and PFLB Inserts(1)

	Thread Code	Length Code	Phenolic		Polycarbonate	
			Pullout (lbs.)	Torque-out (in. lbs.)	Pullout (lbs.)	Torque-out (in. lbs.)
UNIFIED	256	1	28	8.0	17	8.0
	440	1	40	14.7	28	14.7
		2	64	14.7	44	14.7
	632	1	53	22.0	41	22.0
		2	77	22.0	56	22.0
	832	1	64	28.8	53	28.8
		2	72	28.8	68	28.8
	032	1	76	35.6	65	35.6
		2	100	35.6	80	35.6
	0420	1	100	49.8	89	49.8
		2	125	49.8	104	49.8

	Thread Code	Length Code	Phenolic		Polycarbonate	
			Pullout (N)	Torque-out (N · m)	Pullout (N)	Torque-out (N · m)
METRIC	M3	1	180	1.66	130	1.66
		2	280	1.66	200	1.66
	M4	1	280	3.25	240	3.25
		2	320	3.25	300	3.25
	M5	1	340	4.02	290	4.02
		2	450	4.02	360	4.02
	M6	1	450	5.63	400	5.63
		2	560	5.63	460	5.63

PKA and PKB Inserts(1)

	Thread Code	Phenolic		Polycarbonate	
		Pullout (lbs.)	Torque-out (in. lbs.)	Pullout (lbs.)	Torque-out (in. lbs.)
UNIFIED	256	22	13.2	11	5.2
	440	42	22.2	32	14.4
	632	64	32.6	53	24.6
	832	84	42.0	73	33.8
	032	106	51.2	94	43.0
	0420	149	71.0	136	62.0

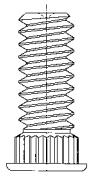
	Thread Code	Phenolic		Polycarbonate	
		Pullout (N)	Torque-out (N · m)	Pullout (N)	Torque-out (N · m)
METRIC	M3	190	2.51	140	1.63
	M4	370	4.75	320	3.82
	M5	470	5.79	420	4.86
	M6	660	8.02	610	7.01

(1) The values reported are averages when all installation specifications and procedures are followed. Variations in mounting hole size, work piece material and installation procedure will affect results. Performance testing of this product in your application is recommended. Samples can be provided for this purpose.

If you can not find a standard product in this catalog to meet your requirements, our Application Engineering Department will assist you to design a custom fastener to satisfy your requirements. Below are a few examples of custom insert designs.

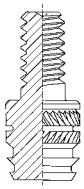
THIN SHEET STUDS

Provide external threads in material as thin as .125" / 3.175 mm. SI® studs are available in lengths from 1/4" to 3/4" / 6.35 to 19.05 mm in thread sizes #4-40 to 1/4-20 / M3 to M6. These inserts can be provided in aluminum, brass, steel and stainless steel and can be pressed into pre-molded or drilled holes.



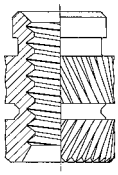
ULTRASONIC STUDS

Tapered body provides easy insertion in pre-molded or drilled holes. They are available in lengths from 1/4" to 3/4" / 6.35 to 19.05 mm in thread sizes #2-56 to 1/4-20 / M2 to M6. These inserts can be provided in aluminum, brass, steel and stainless steel.



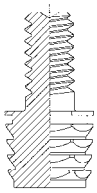
SELF-LOCKING ULTRASONIC INSERTS

The self-locking feature prevents screw loosening and is advantageous in applications where vibration is present. They are available in thread sizes #2-56 to 1/4-20 / M2 to M6 and are designed for ultrasonic installation into straight or tapered holes.



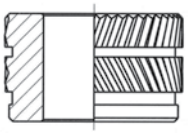
PRESS-IN STUDS

Allows for mounting a component on the external thread. They are available in lengths from 3/16" to 1" / 4.76 to 25.4 mm. Thread sizes #4-40 to 1/4-20 / M3 to M6. SI® press-in studs can be provided in aluminum, brass, steel and stainless steel and can be installed into pre-molded or drilled holes without the use of heat or ultrasonics.



COMPRESSION LIMITER

Thru-hole metal insert designed for use in plastic components. It provides bolt clearance, while the wall of the compression limiter withstands the compressive force induced during the assembly of the mating screw or bolt.

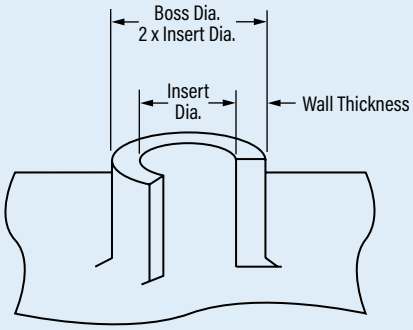


PEM® VARIMOUNT® BONDING FASTENERS

- Laminate within composite layers.
- Mold into plastics.
- Surface bond to panels from front or back side.
- Available with studs, nuts, or standoffs to meet a variety of applications.

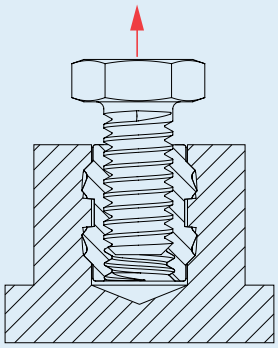
For more information, see PEM® Bulletin VM.

HOLE PREPARATION GUIDELINES



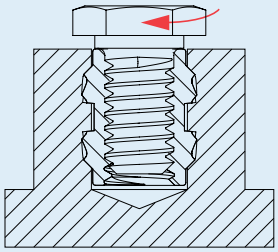
Thinner walls and bosses may be used but will affect performance.

PULLOUT



Pullout is the force required to pull the insert from the sheet.

TORQUE OUT



Torque-out is the torque required to turn the fastener in the parent material after installation without inducing clamp load on the fastener.

The SI® prototype kit contains a wide variety of SI® threaded inserts for plastics for your prototype needs. The kit contains over 1,000 ultrasonic, molded-in, and press-in inserts of various types and sizes, so you can choose the one which will best suit your specific design requirements. The kit contains both unified and metric parts.

PEM Part #PKSI-100. Price - US $50.00 (Subject to change without notice).

All specifications in this bulletin are presented as accurately and up-to-date as possible. We reserve the right to make changes to any information contained in this bulletin without notice.

We recommended that you test a particular product to be sure it is ideally suited to your application. We will be happy to provide samples for this purpose and our authorized distributors can also help you with your selection.

All PEM® products meet our stringent quality standards. If you require additional industry or other specific quality certifications, special procedures and/or part numbers are required. Please contact your local sales office or representative for further information.

Regulatory compliance information is available in Technical Support section of our website. Specifications subject to change without notice. See our website for the most current version of this bulletin.

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