



# MPF™

## microPEM®

### Fasteners



PEM® brand microPEM® fasteners are ideal for today's and tomorrow's compact electronics.

#### NEW!

Type TMSO4™ standoffs install flush in sheets as thin as .008"/0.2mm.



## Ideal For Today's And Tomorrow's Compact Electronics

- Wearables (smart watches, cameras, fitness bands, headphones, etc.)
- Laptops
- Tablets/eReaders
- Cell/Smart Phones
- Gaming/Hand Held Devices/Virtual Reality
- Infotainment/Automotive Electronics

Fastener drawings and models are available at [www.pemnet.com](http://www.pemnet.com). Custom sizes are available on special order. [Contact us](#) for more information.



### MPP™ microPEM® Self clinching Pins

Ideal for positioning and alignment applications — [PAGE 3](#)



### TMSO4™ microPEM® Self clinching Standoffs

Installs flush into half hard .008"/0.2mm stainless steel sheets — [PAGE 4](#)



### MSO4™ microPEM® Self clinching Standoffs

Designed for mounting and/or spacing in extremely limited space applications — [PAGE 5](#)



### TA™/T4™ microPEM® TackPin® Fasteners

Enable sheet-to-sheet attachment, replacing costly screw installation in applications where disassembly is not required — [PAGE 6](#)



### TKA™/TK4™ microPEM® TackSert® Pins

Enables attachment of metal sheets to plastic, replacing costly screw installation in applications where disassembly is not required — [PAGE 7](#)



### TFA™ microPEM® FlexTack™ Fasteners

Bellville washer shaped head of the microPEM® FlexTack™ fastener draws panels together to adapt to panel tolerance variations — [PAGE 8](#)



### 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 8](#)



### CDS™ microPEM® ClampDisk® Fasteners

Press straight onto a 1 mm pin to replace threads, adhesive, rivets and other small fasteners — [PAGE 9](#)



### 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 10](#)



### MSOFS™ microPEM® Flaring Standoffs

Attach permanently in any type of panel, including metal, plastic and PC board. Flaring feature allows for captivation of multiple panels — [PAGE 11](#)



### SMTSO™ microPEM® Surface Mount Fasteners

These fasteners for compact electronic assemblies attach to PC boards for nut/standoff applications. These 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 — [PAGE 12](#)



### microPEM® Screws

Available in thread codes as small as M0.8 and lengths as short as 1 mm / .039" — [PAGE 13](#)



### Material and finish specifications — [PAGE 14](#)

### Installation — [PAGES 15-19](#)

### Performance data — [PAGES 20-22](#)

Custom sizes are available on special order. [Contact us](#) for more information.

## MPP™ microPEM® Self Clinching Pins

- Satisfy demanding micro positioning and alignment applications
- Head mounts flush into panels as thin as 0.5 mm / .020"
- Chamfered end makes mating hole alignment easy
- Can be installed into stainless steel sheets
- Excellent corrosion resistance
- Can be installed automatically



### Part Number Designation

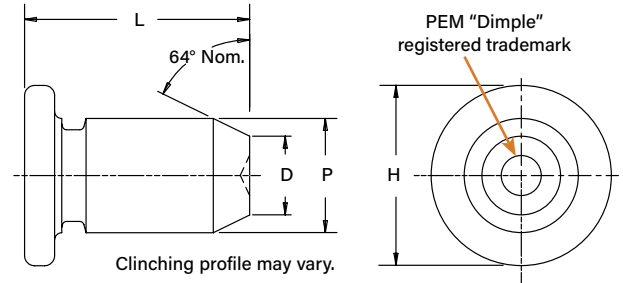
**MPP - 1MM - 2**

↓                      ↓                      ↓

Type &          Pin                      Length

Material       Diameter       Code

                    Code



Pin Diameter P ±0.038mm	Type	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 / ±.010"		Min. Dist. Hole C/L to Edge (6)	
	Stainless Steel									mm	in.	mm	in.	mm	in.	mm	in.	mm	in.
1	MPP	1MM	2	3	4	5	-	-	-	0.5	.020	1.05	.041	0.7	.028	1.6	.063	2.05	.081
1.5	MPP	1.5MM	-	3	4	5	6	8	-	0.5	.020	1.55	.061	1.03	.041	2.24	.088	2.6	.102
2	MPP	2MM	-	-	4	5	6	8	10	0.5	.020	2.05	.081	1.36	.054	3.02	.119	4.4	.173



Parts for smaller and/or thinner applications have been designed. Please [contact us](#) for more information.



Fastener drawings and models are available at [www.pemnet.com](http://www.pemnet.com)



## TMSO4™ microPEM® Self-Clinching Standoffs for Thin Sheets - **NEW!**

Designed for use in harder sheets, hardness HRC 37/HB 340 or less

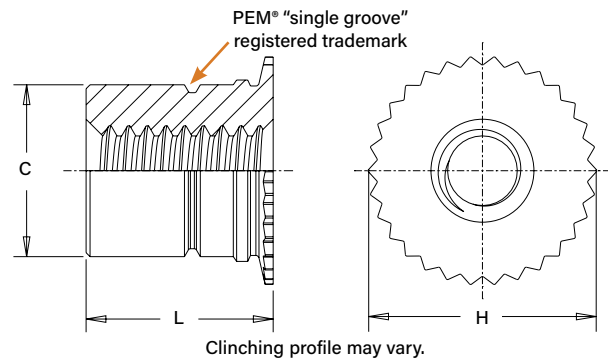
- Installs flush into half hard .008"/0.2mm stainless steel sheets
- Installs into round holes without any special mounting hole preparation, eliminating adhesives and laser welding
- Allows for light weighting and optimizing designs
- Can be installed automatically



### Part Number Designation

**TMSO 4 - M1 - 200**

↓      ↓      ↓      ↓  
Type   Material   Thread   Length  
Code   Code   Code   Code



All dimensions are in inches.

Unified	Thread Size	Type	Thread Code	Length Code	Min. Sheet Thickness	Hole Size in Sheet +.002 -.000	C Max.	H Nom.	L +.002 -.003	Min. Dist. Hole C/L to Edge <sup>(5)</sup>
		Stainless Steel								
	.060-80 (#0-80) <sup>(1)</sup>	TMSO4	080	094	.008	.128	.125	.159	.094	.125
				125					.125	
	.086-56 (#2-56) <sup>(1)</sup>	TMSO4	256	094	.008	.158	.156	.189	.094	.170
				125					.125	

All dimensions are in millimeters.

Metric	Thread Size x Pitch	Type	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 C/L to Edge <sup>(5)</sup>
		Stainless Steel								
	M1 x 0.25 <sup>(2)</sup>	TMSO4	M1	200	0.2	2.24	2.18	2.97	2	2.64
				300					3	
	M1.2 x 0.25 <sup>(2)</sup>	TMSO4	M1.2	200	0.2	2.59	2.51	3.39	2	2.85
				300					3	
	M1.4 x 0.3 <sup>(3)</sup>	TMSO4	M1.4	200	0.2	2.87	2.79	3.67	2	2.87
				300					3	
	M1.6 x 0.35 <sup>(4)</sup>	TMSO4	M1.6	200	0.2	3.25	3.16	4.04	2	3.18
				300					3	
	M2 x 0.4 <sup>(4)</sup>	TMSO4	M2	200	0.2	4	3.96	4.8	2	4.32
				300					3	

(1) Unified ASME B11, 2B

(2) Metric ISO 68-1, 5H

(3) Metric ISO 68-1, 6H

(4) Metric ASME B1.13M, 6H

(5) For more information on proximity to bends and distance to other clinch hardware, see [PEM® Tech Sheet C/L To Edge](#).

## MSO4™ microPEM® Self-Clinching Standoffs

- Designed for mounting and/or spacing in extremely limited space applications
- Can be installed into stainless steel sheets<sup>(1)</sup>
- Have stronger threads than weld standoffs because they are made from heat-treated 400 Series Stainless Steel
- Can be installed automatically



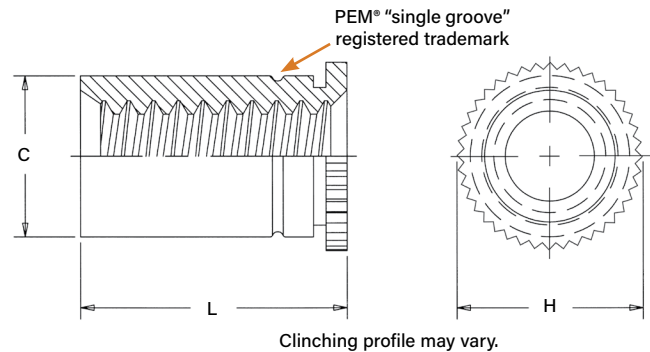
### Part Number Designation

MSO 4 - 080 - 3

↓      ↓      ↓      ↓

Type   Material   Thread   Length

Code   Code   Code   Code



All dimensions are in inches.

Unified	Thread Size	Type	Thread Code	Length Code	Min. Sheet Thickness	Hole Size in Sheet +.002 -.000	C Max.	H Nom.	L +.002 -.003	Min. Dist. Hole C/L to Edge <sup>(5)</sup>
		Stainless Steel								
	.060-80 (#0-80) <sup>(1)</sup>	MS04	080	3	.012	.095	.094	.25	.094	.090
				4					.125	
	.086-56 (#2-56) <sup>(1)</sup>	MS04	256	3	.012	.125	.124	.156	.094	.120
				4					.125	

All dimensions are in millimeters.

Metric	Thread Size x Pitch	Type	Thread Code	Length Code	Min. Sheet Thickness	Hole Size in Sheet +.05	C Max.	H Nom.	L +.05 -.08	Min. Dist. Hole C/L to Edge <sup>(5)</sup>
		Stainless Steel								
	M1 x 0.25 <sup>(2)</sup>	MS04	M1	2	0.3	2.41	2.39	3.18	2	2.3
				3					3	
	M1.2 x 0.25 <sup>(2)</sup>	MS04	M1.2	2	0.3	2.41	2.39	3.18	2	2.3
				3					3	
	M1.4 x 0.3 <sup>(3)</sup>	MS04	M1.4	2	0.3	2.41	2.39	3.18	2	2.3
				3					3	
	M1.6 x 0.35 <sup>(4)</sup>	MS04	M1.6	2	0.3	2.41	2.39	3.18	2	2.3
				3					3	
	M2 x 0.4 <sup>(4)</sup>	MS04	M2	2	0.3	3.18	3.16	3.96	2	3
				3					3	

(1) Unified ASME B11, 2B

(2) Metric ISO 68-1, 5H

(3) Metric ISO 68-1, 6H

(4) Metric ASME B1.13M, 6H

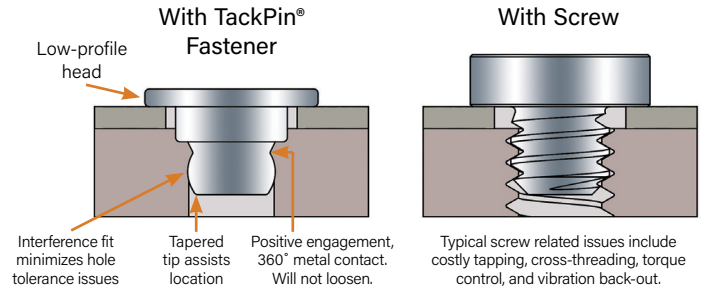
(5) For more information on proximity to bends and distance to other clinch hardware, see [PEM® Tech Sheet C/L To Edge](#).

## TA™/T4™ microPEM® TackPin® Fasteners

- Reduce installation time vs. a screw
- Simple, press in installation eliminates many costs and concerns associated with micro screws:
  - Cross threading
  - Tapping
  - Tightening torque control
  - Vibrational back-out
- Low profile head provides space savings
- Tapered tip aligns fastener in hole
- Interference fit minimizes hole tolerance issues
- Easily installed automatically

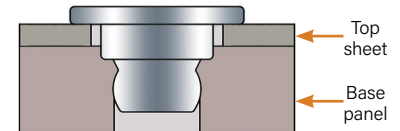
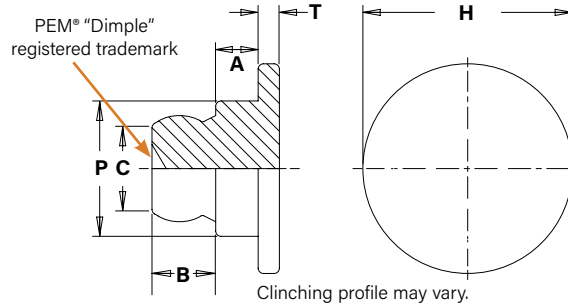


### Comparison of TackPin® fastener to screw installation.



### Part Number Designation

TA	-	10	-	025
T4	-	10	-	025
<div> <div>↓</div>Type &amp; Material           </div> <div> <div>↓</div>Base Panel Hole Size Code           </div> <div> <div>↓</div>Top Sheet Thickness Code           </div>				



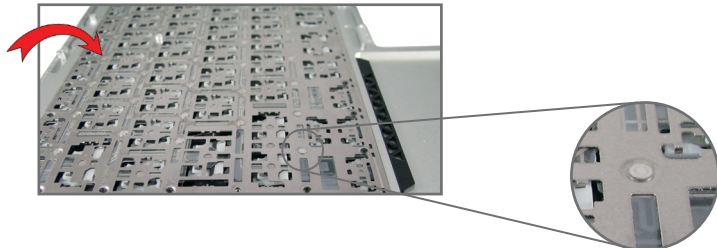
Can be installed into blind or through hole application.

Type		Base Panel Hole Size Code	Top Sheet Thickness Code	Top Sheet Thickness		Base Panel Min. Sheet Thickness <sup>(1)</sup>		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 C/L to Edge <sup>(2)</sup>	
				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.

(2) For more information on proximity to bends and distance to other clinch hardware, see [PEM® Tech Sheet C/L To Edge](#).

TackPin® and TackSert® 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.



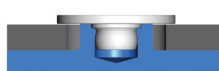
### Flush-head TackPin® Fastener

- TackPin installed into a thicker, softer top-sheet and pressed flush.



### 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.



### 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.



## TKA™/TK4™ microPEM® TackSert® Pins

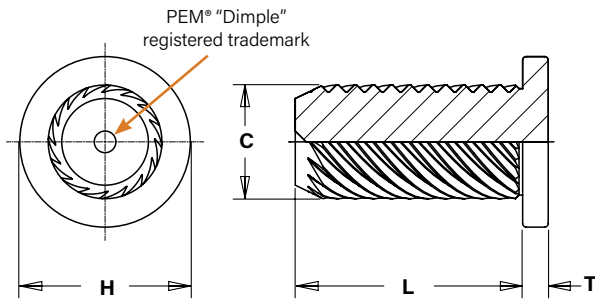
- Suitable for installation into plastics, metal castings and other brittle materials
- Reduce installation time vs. a screw
- Simple, press in installation (does not require heat or ultrasonics) eliminates many costs and concerns associated with micro screws:
  - Cross threading
  - Use of inserts / tapping
  - Tightening torque control
  - Vibrational back-out
- Low profile head provides space savings
- Tapered tip aligns fastener in hole
- Easily installed automatically

## Part Number Designation

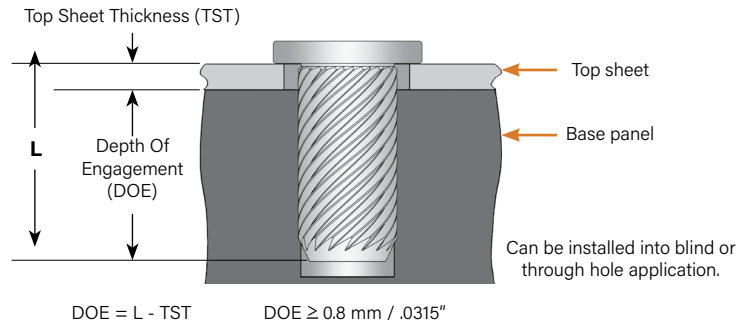
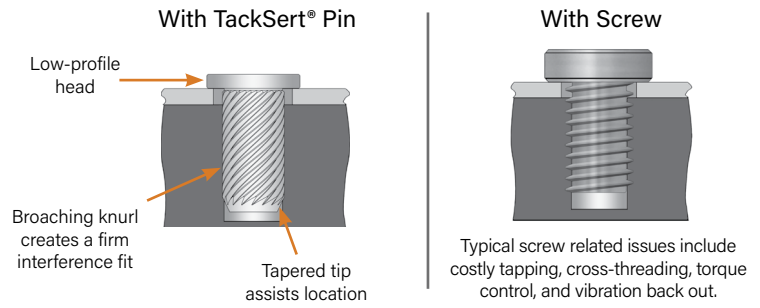
TKA - 10 - xxx  
TK4 - 10 - xxx

↓                      ↓                      ↓

Type & Material    Base Panel Hole Size Code    Length Code



## Comparison of TackSert® pin to screw installation.



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/-0.002"		Top Sheet Thickness Max.		C Max.		H ±0.08 mm/±.003"		L ±0.06 mm/±.002"		T ±0.08 mm/±.003"		Min. Dist. Hole C/L to Edge (1) (2)	
Fastener Material				mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.
Aluminum	400 series stainless steel																		
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.

(2) For more information on proximity to bends and distance to other clinch hardware, see [PEM® Tech Sheet C/L To Edge](#).



## TFA™ microPEM® FlexTack™ Fasteners

The Belleville washer shaped head of the microPEM® FlexTack™ fastener draws panels together to adapt to panel thickness tolerance variations.

- Alternative to using micro-screws, eliminating the need to tap or use threaded inserts.
- Installation time to simply press the part in (1.5 seconds) is less than the time to thread a screw in, equals less total installed cost.
- The Belleville-shaped head allows for stack-up tolerance relief in a design.
- Lowers overall total installed costs from the elimination of the following:
  - Cost of screw, patch to prevent loosening, threaded insert or tapped hole and driver bits
  - Cost of rework due to cross-threading or driver bit "cam-out"



Patented

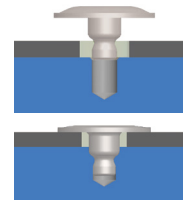
### Part Number Designation

**TFA - 10 - 025**

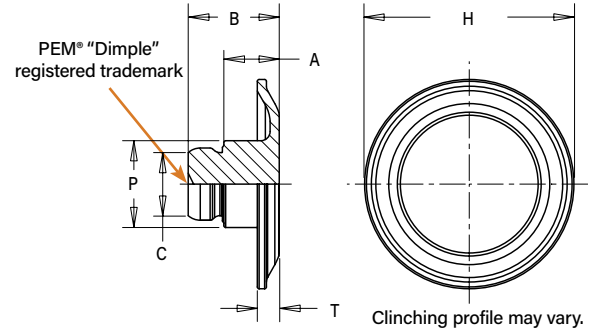
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Type &              Base Panel              Top Sheet

Material              Hole Size Code              Thickness Code



The Belleville shaped head flattens upon a simple press-in installation and draws panels together to accommodate vertical stack tolerances.



Type	Base Panel Hole Size Code	Top Sheet Thickness Code	Top Sheet Thickness		Base Panel Min. Sheet Thickness <sup>(1)</sup>		Top Sheet Hole Size ±0.05 mm / ±.002"		Base Panel Hole Size -0.05 mm / -.002"		A ±0.04 mm / ±.0015"		B ±0.08 mm / ±.003"		C Max.		H ±0.1 mm / ±.004"		P ±0.05 mm / ±.002"		T ±0.1 mm / ±.004"		Min. Dist. Hole C/L to Edge <sup>(2)</sup>	
			mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.
TFA	10	025	0.18 - 0.28	.007 - .011	0.89	.035	1.47	.058	1.02	.040	0.67	.026	1.16	.046	0.89	.035	2.91	.115	1.21	.048	0.3	.012	1	.039
TFA	10	035	0.28 - 0.38	.011 - .015	0.89	.035	1.47	.058	1.02	.040	0.77	.030	1.26	.050	0.89	.035	2.91	.115	1.21	.048	0.3	.012	1	.039
TFA	10	045	0.38 - 0.48	.015 - .019	0.89	.035	1.47	.058	1.02	.040	0.87	.034	1.37	.054	0.89	.035	2.91	.115	1.21	.048	0.3	.012	1	.039
TFA	10	055	0.48 - 0.58	.019 - .023	0.89	.035	1.47	.058	1.02	.040	0.97	.038	1.47	.058	0.89	.035	2.91	.115	1.21	.048	0.3	.012	1	.039

(1) 0.89 mm / .035" for blind holes and 0.5 mm / .020" for through holes.

(2) For more information on proximity to bends and distance to other clinch hardware, see [PEM® Tech Sheet C/L To Edge](#).

## TS4™ microPEM® TackScrew™ Fasteners

- Allows for 1-cycle re-usability by unscrewing and then reinstallation with thread locking adhesive
- Reduce installation time vs. a screw
- Simple, press in installation eliminates many costs and concerns associated with micro screws:
  - Cross threading
  - Tapping
  - Tightening torque control
  - Vibrational back-out
- Low profile head provides space savings
- Tapered tip aligns fastener in hole
- Interference fit minimizes hole tolerance issues
- Easily installed automatically



Patented

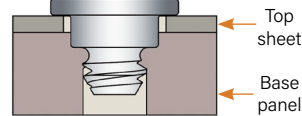
### Part Number Designation

**TS4 - 10 - 025**

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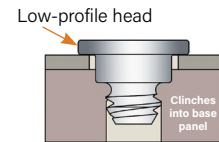
Type &              Base Panel              Top Sheet

Material              Hole Size Code              Thickness Code

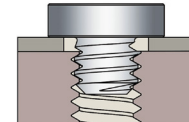


Can be installed into blind or through hole applications.

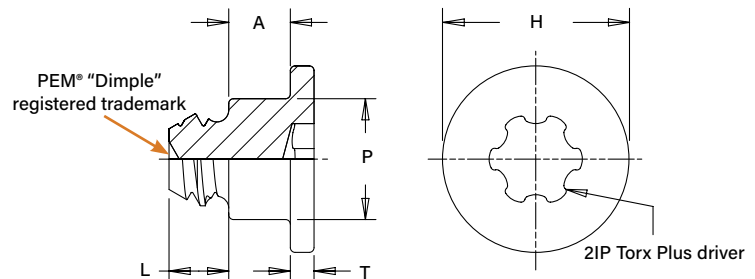
### With TackScrew™ Fastener



### With Screw



Typical screw related issues include costly tapping, cross-threading, torque control, and vibration back out



Type	Base Panel Hole Size Code	Top Sheet Thickness Code	Top Sheet Thickness		Base Panel Min. Sheet Thickness <sup>(3)</sup>		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 C/L to Edge <sup>(4)</sup>	
			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

(3) Minimum sheet to prevent protrusion from through hole or minimum blind hole depth.

(4) For more information on proximity to bends and distance to other clinch hardware, see [PEM® Tech Sheet C/L To Edge](#).



## CDS™ microPEM® ClampDisk® Fasteners

The CDS™ microPEM® ClampDisk® fastener presses straight onto a 1 mm pin to replace threads, adhesive, rivets and other small fasteners. The upward flanges of the disk grip onto the pin and prevent push-off while the downward flanges flex and generate clamp load.

- Clamp load generation
- Simple installation
- Removability
- Works with multiple panels of any material
- Limited installation stress to assemble
- Tamper resistant

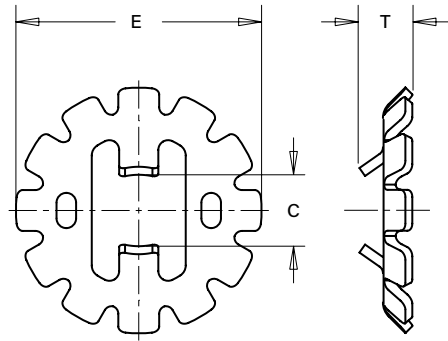


### Part Number Designation

**CD**      **S**      **- 100**

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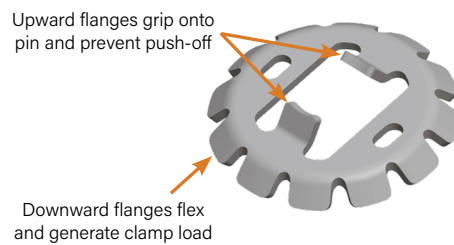
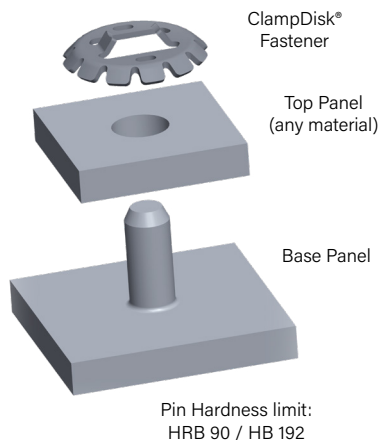
Type      Material      Pin Diameter Code



The ClampDisk® fastener can be used with a self-clinching pin. Contact [techsupport@pemnet.com](mailto:techsupport@pemnet.com) for information on pin material options.

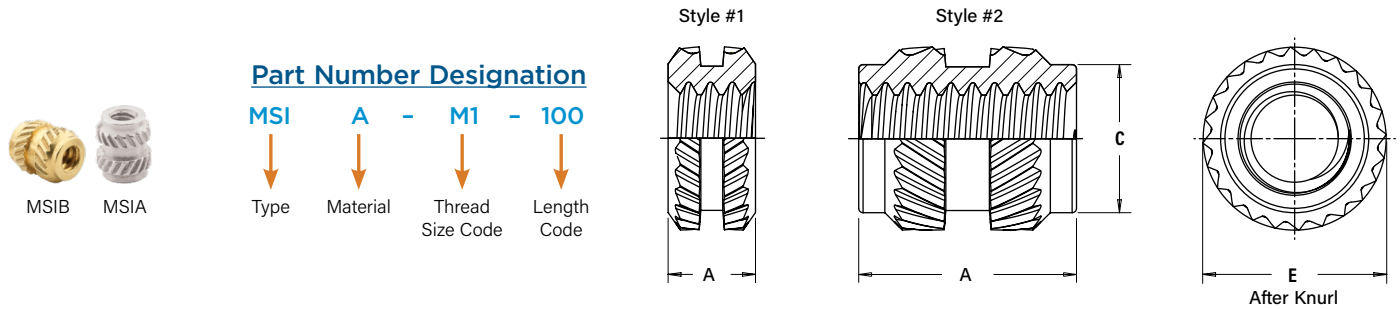
All dimensions are in millimeters.

Metric	Type and Material	Pin Diameter Code	Pin Diameter +0.05 -0.03	Pin Length Min.	C Nom.	E Nom.	T Nom.
	CDS	100	1	0.8	0.91	3.2	0.69



## MSIA™/MSIB™ microPEM® Inserts For Plastics

- Symmetrical design eliminates the need for orientation
- Provides excellent performance in wide range of plastics
- Aluminum inserts offer light weight, lead-free alternative



All dimensions are in millimeters.

Metric	Thread Size x Pitch	Type		Thread Code	Length Code	A ±0.1	E ± 0.1	C Max.	Mounting Hole in Material		
		Aluminum	Brass						Min. Wall Thickness (6)	Hole Depth Min.	Hole Diameter +0.05
		MSIA	MSIB	M1							
	M1 x 0.25 <sup>(3)</sup>	MSIA	MSIB	M1	100 <sup>(1)</sup>	1	2.1	—	0.7	1.77	1.75
					250 <sup>(2)</sup>	2.5		1.75		3.27	
	M1.2 x 0.25 <sup>(3)</sup>	MSIA	MSIB	M1.2	100 <sup>(1)</sup>	1	2.1	—	0.7	1.77	1.75
					250 <sup>(2)</sup>	2.5		1.75		3.27	
	M1.4 x 0.3 <sup>(4)</sup>	MSIA	MSIB	M1.4	150 <sup>(2)</sup>	1.5	2.5	2.15	0.8	2.27	2.15
					300 <sup>(2)</sup>	3		2.15		3.77	
	M1.6 x 0.35 <sup>(5)</sup>	MSIA	MSIB	M1.6	150 <sup>(2)</sup>	1.5	2.5	2.15	0.8	2.27	2.15
					300 <sup>(2)</sup>	3		2.15		3.77	
	M2 x 0.4 <sup>(5)</sup>	MSIA	MSIB	M2	300 <sup>(2)</sup>	3	3.2	2.85	1.6	3.77	2.85
					400 <sup>(2)</sup>	4		2.85		4.77	

(1) Style #1 - length codes less than 150

(2) Style #2 - length codes 150 and greater

(3) Metric ISO 68-1, 5H

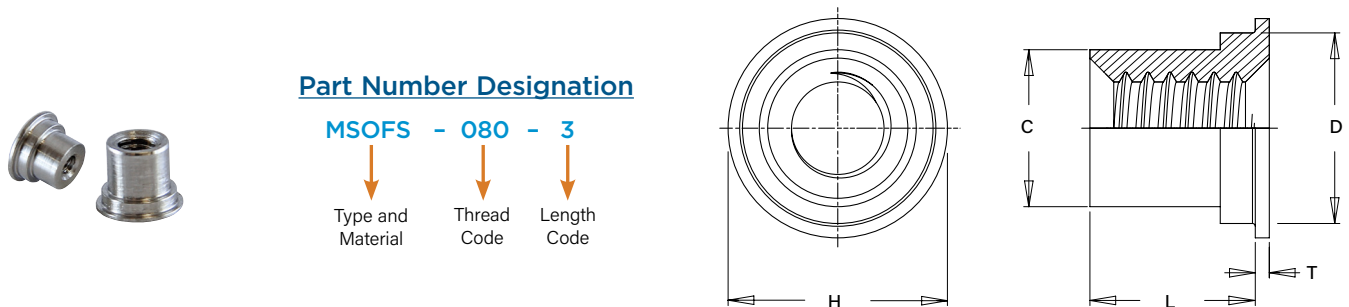
(4) Metric ISO 68-1, 6H

(5) Metric ASME B113M, 6H

(6) Refers to wall thickness of boss as tested in ABS and polycarbonate.

## MSOFS™ microPEM® Flaring Standoffs

- MSOFS™ microPEM® flaring standoffs attach permanently in thin panels of any hardness, including stainless steel
- Minimum sheet thickness .008"/0.2mm of any Hardness
- Can be installed into any type or hardness of panel, including metal, plastic and PC board
- Flaring feature allows for captivation of multiple panels
- Fastener captivation method allows for reduced centerline-to-edge designs



All dimensions are in inches.

Unified	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 C/L to Edge (5)
	.060-80 (#0-80) <sup>(1)</sup>	MSOFS	080	3	.008 - .012	.118	.094	.117	.138	.093	.010	.069
				4						.125		
	.086-56 (#2-56) <sup>(1)</sup>	MSOFS	256	3	.008 - .012	.138	.113	.137	.157	.093	.010	.079
				4						.125		

All dimensions are in millimeters.

Metric	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 C/L to Edge (5)
	M1 x 0.25 <sup>(2)</sup>	MSOFS	M1	2	0.2 - 0.3	3	2.39	2.97	3.5	2	0.25	1.75
				3						3		
	M1.2 x 0.25 <sup>(2)</sup>	MSOFS	M1.2	2	0.2 - 0.3	3	2.39	2.97	3.5	2	0.25	1.75
				3						3		
	M1.4 x 0.3 <sup>(3)</sup>	MSOFS	M1.4	2	0.2 - 0.3	3	2.39	2.97	3.5	2	0.25	1.75
				3						3		
	M1.6 x 0.35 <sup>(4)</sup>	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 <sup>(4)</sup>	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

(5) For more information on proximity to bends and distance to other clinch hardware, see [PEM® Tech Sheet C/L To Edge](#).

### Alternative thin sheet clinch fastener solution

Standoff for sheets  
as thin as 0.1 mm

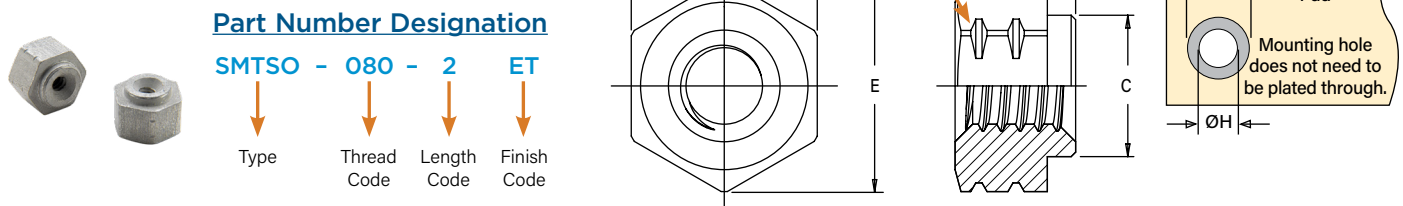


Patent pending

Contact [techsupport@pemnet.com](mailto:techsupport@pemnet.com) for more information.

## SMTSO™ microPEM® Surface Mount Fasteners

- Hex shaped barrel provides optimal size/performance
- Provided on tape and reel
- Reduces board handling
- Can be installed automatically



All dimensions are in inches.

Unified	Thread Size	Type	Thread Code	Length Code	Min. Sheet Thickness	A Max.	C Max.	E Ref.	L $\pm .003$	X Nom.	ØH Hole Size In Sheet $+.003 -.000$	ØD Min. Solder Pad
	.060-80 (#0-80) <sup>(1)</sup>	SMTSO	080	2 4	.020	.019	.095	.144	.062 .125	.125	.098	.165

All dimensions are in millimeters.

Metric	Thread Size	Type	Thread Code	Length Code	Min. Sheet Thickness	A Max.	C Max.	E Ref.	L $\pm 0.08$	X Nom.	ØH Hole Size In Sheet $+0.08$	ØD Min. Solder Pad
	S1 <sup>(2)</sup>	SMTSO	M1	1 2 3	0.5	0.48	2.41	3.66	1 2 3	3.18	2.5	4.19
				1 2 3					1 2 3			
				1 2 3					1 2 3			
	S1.2 <sup>(2)</sup>	SMTSO	M1.2	1 2 3	0.5	0.48	2.41	3.66	1 2 3	3.18	2.5	4.19
				1 2 3					1 2 3			
				1 2 3					1 2 3			
	S1.4 <sup>(2)</sup>	SMTSO	M1.4	1 2 3	0.5	0.48	2.41	3.66	1 2 3	3.18	2.5	4.19
				1 2 3					1 2 3			
				1 2 3					1 2 3			
	M1.6 x 0.35 <sup>(3)</sup>	SMTSO	M1.6	1 2 3	0.5	0.48	2.41	3.66	1 2 3	3.18	2.5	4.19
				1 2 3					1 2 3			
				1 2 3					1 2 3			

(1) Unified ASME B11, 2B

(2) Miniature ISO 1501, 4H6

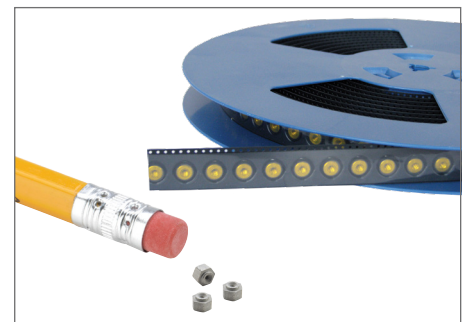
(3) Metric ASME B1.13M, 6H

## 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	—	—	—	—
M1, M1.2, M1.4, M1.6	3500 / 8	2500 / 8	2000 / 8	—	—	—	—	—

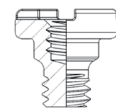
A polyimide patch is supplied to allow for reliable vacuum pickup. Fasteners are also available without a patch which may provide a lower cost alternative, depending on your installation methods/requirements.

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



**microPEM® Screws** (Available on special order. Minimum quantities may apply)

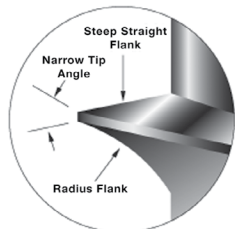
- Smallest thread code: M0.8
- Shortest length: 1 mm / .039"
- Fastener material: steel, stainless steel and aluminum
- Driver types: Torx®/Torx Plus®/Microstix®, cross-recess/internal hex
- Head styles: flat head/pan head/socket-head/wafer-head
- Special features: Locking patch, TAPTITE 2000®, FASTITE 2000®, PT® and DELTA PT®
- Platings: zinc, nickel, black nickel and black oxide



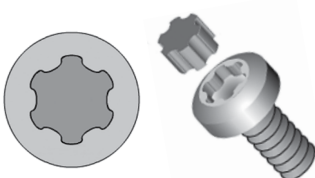
Cost-effective, forged  
internal/external screw

**DELTA PT® Screws**

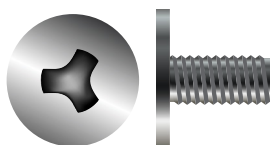
- Minimal radial tension due to optimized flank angle
- High clamp load
- High tensile and torsion strength
- Increased cycle stress stability
- High strength under vibration

**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

**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

Type	Fastener Material							Standard Finish <sup>(1)</sup>			For Use in Sheet Hardness: <sup>(2)</sup>							
	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 <sup>(3)</sup>	Plain Finish	HRB 50/ HB 89 or less	HRB 88/ HB 183 or less	HRB 92/ HB 202 or less	HRC 37/ HB 340 or less	PC Board	Plastics	Castings and Brittle materials	Any Panel Material
MPP		.						.					.					
TMS04				.				.						.				
MS04				.				.				.						
SMTS0	.								.						.			
TA					.					.	.							
T4				.				.				.						
TKA					.					.					.	.		
TK4				.				.							.	.	.	
TFA					.					.	.							
TS4				.				.				.						
CDS			.					.										.(4)
MSIA						.				.						.		
MSIB							.			.						.		
MFOFS			.					.										.
Part Number Code for Finishes								None	ET	None								

(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.

(4) The top panel can be any material and the pin must be under a max hardness of HRB 90 / HB 192.

### A Note About Hardened 400 Series Stainless Steel

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 (MS04, TMS04, T4, TK4 and TS4) are offered. However, while these 400 Series fasteners install and perform well in 300 Series stainless sheets they should not be used if the end product:

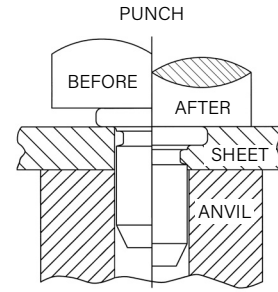
- Will be exposed to any appreciable corrosive presence
- Requires non-magnetic fasteners
- Will be exposed to any temperatures above 300°F (149°C)

If any of these are issues, please contact [techsupport@pemnet.com](mailto:techsupport@pemnet.com) for other options.

## 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.

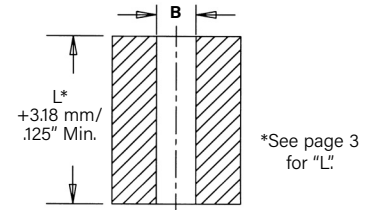


### PEMSERTER® Installation Tooling <sup>(1)</sup>

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

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

Recommended Installation Anvil



### 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\"/>

### TMSO4 Standoffs

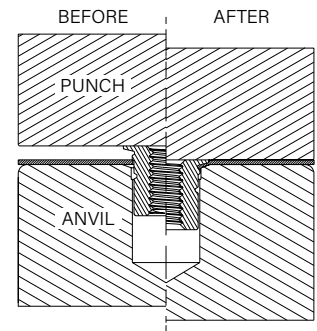
1. Prepare properly sized mounting hole in sheet. Do not perform any secondary operations such as deburring.
2. Insert standoff through mounting hole (preferably the punch side) and into anvil as shown in drawing.
3. With installation punch and anvil surfaces parallel, apply only enough squeezing force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

**Note:** Haeger® and PEMSERTER® punches are spring-loaded. A spring-loaded punch is not required. However, depending on the application it may prevent warping/bending of the panel after installation.

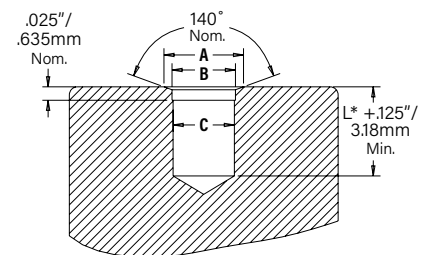
### Installation Tooling

Unified	Type	Thread Code	Anvil Dimensions (in.)			HAEGER® Part Number		PEMSERTER® Part Number	
			A	B	C	Lower Tool	Upper Tool	Anvil	Punch
	TMSO4	080	.163 - .165	.131 - .133	.126 - .128	H-190-M1.6	H-3359	8026969	8026971
	TMSO4	256	.199 - .201	.169 - .171	.163 - .165	H-190-M2	H-3359	8026970	8026971

Metric	Type	Thread Code	Anvil Dimensions (in.)			HAEGER® Part Number		PEMSERTER® Part Number	
			A	B	C	Lower Tool	Upper Tool	Anvil	Punch
	TMSO4	M1	3.02 - 3.07	2.36 - 2.41	2.26 - 2.31	H-190-M1	H-3359	8026966	8026971
	TMSO4	M1.2	3.45 - 3.51	2.69 - 2.74	2.59 - 2.64	H-190-M1.2	H-3359	8026967	8026971
	TMSO4	M1.4	3.73 - 3.78	2.97 - 3.02	2.87 - 2.92	H-190-M1.4	H-3359	8026968	8026971
	TMSO4	M1.6	4.14 - 4.19	3.33 - 3.38	3.20 - 3.25	H-190-M1.6	H-3359	8026969	8026971
	TMSO4	M2	4.88 - 4.93	4.13 - 4.18	4.04 - 4.09	H-190-M2	H-3359	8026970	8026971



Recommended Installation Anvil



\*See page 4 for "L".



## MSO4 Standoffs

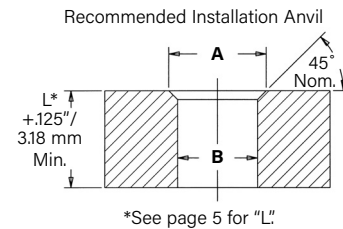
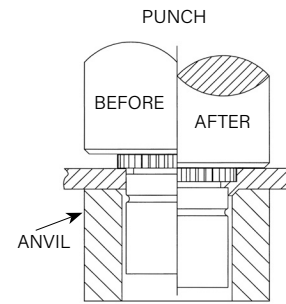
1. Prepare properly sized mounting hole in sheet. Do not perform any secondary operations such as deburring.
2. Insert standoff through mounting hole (preferably the punch side) and into anvil as shown in drawing.
3. With installation punch and anvil surfaces parallel, apply only enough squeezing force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

## PEMSERTER® Installation Tooling <sup>(1)</sup>

Unified	Type	Thread Code	Anvil Dimensions (inches)		Anvil Part Number	Punch Part Number
			A	B		
	MSO4	080	.112 - .114	.097 - .099	8015796	975200997
	MSO4	256	.142 - .144	.127 - .129	8015797	975200997

Metric	Type	Thread Code	Anvil Dimensions (mm)		Anvil Part Number	Punch Part Number
			A	B		
	MSO4	M1	2.84 - 2.89	2.46 - 2.51	8015796	975200997
	MSO4	M1.2	2.84 - 2.89	2.46 - 2.51	8015796	975200997
	MSO4	M1.4	2.84 - 2.89	2.46 - 2.51	8015796	975200997
	MSO4	M1.6	2.84 - 2.89	2.46 - 2.51	8015796	975200997
	MSO4	M2	3.6 - 3.65	3.22 - 3.27	8015797	975200997

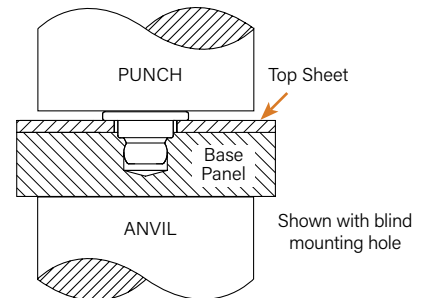
(1) [Click here](#) for a quote on Haeger® custom installation tooling.



## Installation

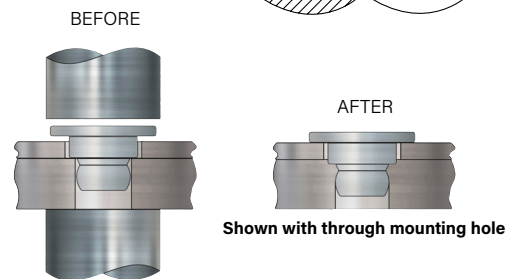
### TA/T4 Fasteners

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.



### Installation Tooling

Size	HAEGER® Part Number		PEMSERTER® Part Number	
	Anvil	Punch	Anvil	Punch
TA/TA4-10-025	H-108-0019L	H-108-0018L	975200046	8014167
TA/TA4-10-050	H-108-0019L	H-108-0018L	975200046	8014167
TA/TA4-10-075	H-108-0019L	H-108-0018L	975200046	8014167

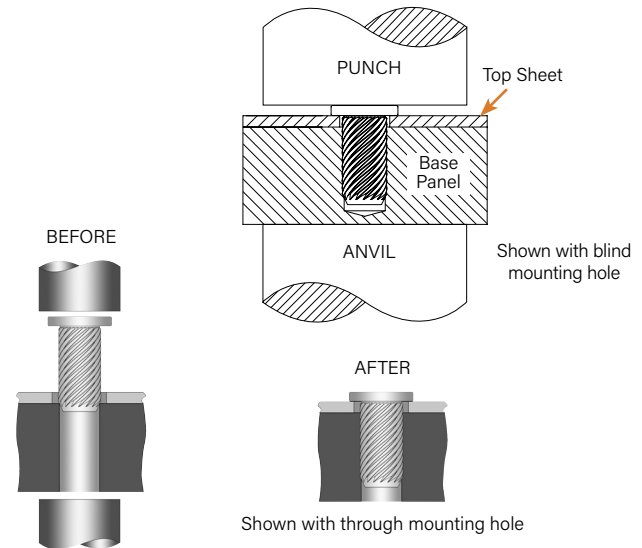


### TKA/TK4 Pins

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.

### Installation Tooling

Size	HAEGER® Part Number		PEMSERTER® Part Number	
	Anvil	Punch	Anvil	Punch
TKA/TK4-10-100	H-108-0019L	H-108-0018L	975200046	8014167
TKA/TK4-10-150	H-108-0019L	H-108-0018L	975200046	8014167
TKA/TK4-10-200	H-108-0019L	H-108-0018L	975200046	8014167
TKA/TK4-10-250	H-108-0019L	H-108-0018L	975200046	8014167
TKA/TK4-10-300	H-108-0019L	H-108-0018L	975200046	8014167

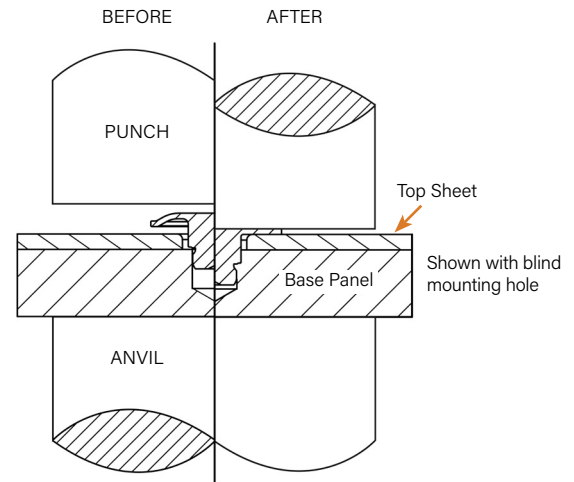


### TFA Fasteners

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 flattens and contacts the top sheet.

### Installation Tooling

Size	HAEGER® Part Number		PEMSERTER® Part Number	
	Anvil	Punch	Anvil	Punch
TFA-10-025	H-108-0019L	H-108-0018L	975200046	8014167
TFA-10-035	H-108-0019L	H-108-0018L	975200046	8014167
TFA-10-045	H-108-0019L	H-108-0018L	975200046	8014167
TFA-10-055	H-108-0019L	H-108-0018L	975200046	8014167



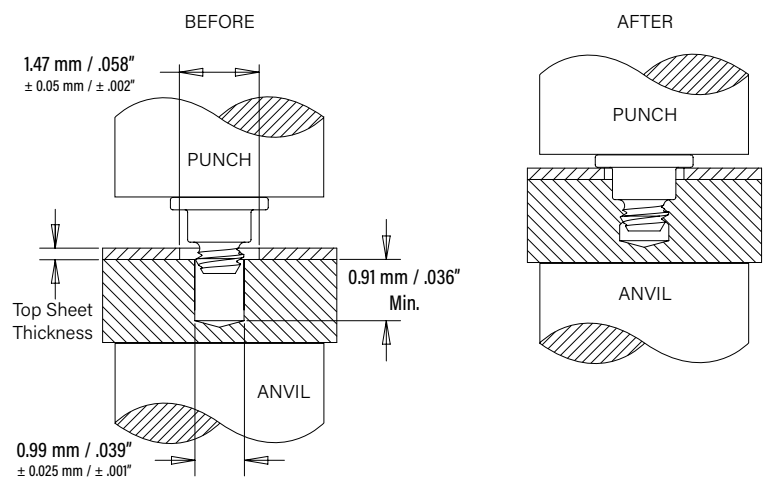
## Installation

### 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.

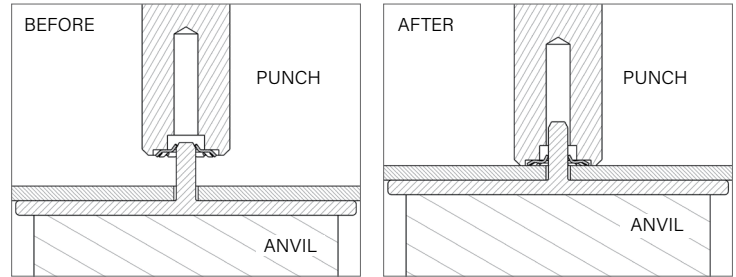


### Installation Tooling

Size	HAEGER® Part Number		PEMSERTER® Part Number	
	Anvil	Punch	Anvil	Punch
TS4-10-025	H-108-0019L	H-108-0018L	975200046	8014167
TS4-10-050	H-108-0019L	H-108-0018L	975200046	8014167

## CDS Fasteners

1. Place ClampDisk® fastener over a pin.
2. With the installation punch and anvil surfaces parallel, apply squeezing force until the punch contacts the mounting sheet. The drawings at the right indicate suggested tooling for applying these forces.



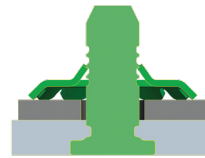
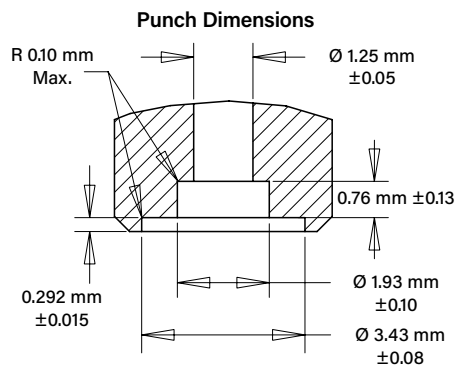
## Removal

For service or maintenance, the ClampDisk® fastener can be easily removed with a sharp edge tool. For reassembly, simply install a new fastener.

## PEMSERTER® Installation Tooling<sup>(1)</sup>

Fastener Part Number	Punch Part Number	Anvil Part Number
CDS-100	8025386	975200046

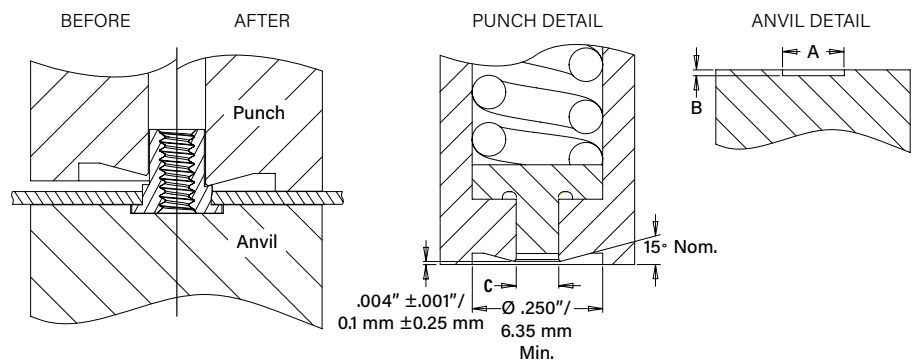
(1) [Click here](#) for a quote on Haeger® custom installation tooling.



The PEM® ClampDisk® fastener can be installed onto a grooved pin for increase strength and allow installation onto any material. For more information, contact [techsupport@pemnet.com](mailto:techsupport@pemnet.com).

## 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.



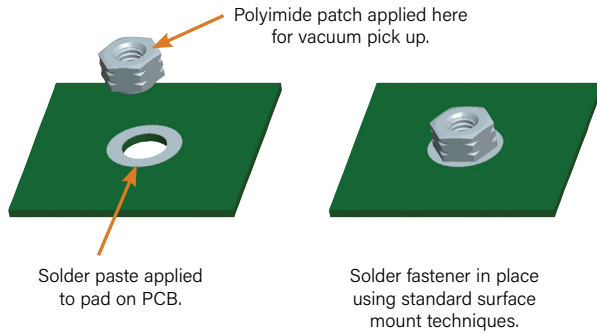
## PEMSERTER® Installation Tooling<sup>(1)</sup>

Unified	Thread Code	Punch Dimensions (in.)	Punch Part Number	Anvil Dimensions (in.)		Anvil Part Number
		C +.001		A ±.001	B ±.001	
	080	.095	8020712	.143	.006	8019720
	256	.114	8020710	.163	.006	8019722

Metric	Thread Code	Punch Dimensions (mm)	Punch Part Number	Anvil Dimensions (mm)		Anvil Part Number
		C +0.025		A ±.025	B ±.025	
	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

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

## 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.

## Installation Notes

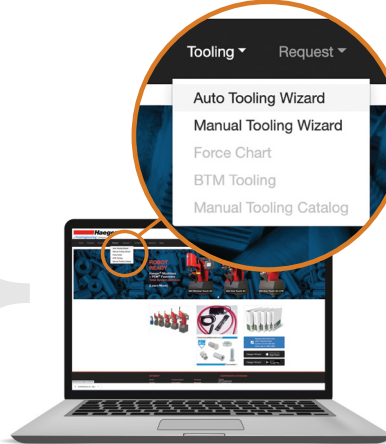
- For best results we recommend using a HAEGER® or PEMSERTER® machine for installation of PEM self-clinching fasteners. Please check our website for more information.
- Visit the Animation Library on our website to view the installation process [for select products](#).

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

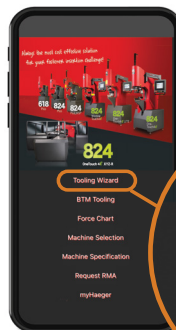


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PEMSERTER® MANUAL TOOLING CATALOG

PEMSERTER® AUTO TOOLING CATALOG

Performance Data<sup>(1)</sup>

## TMSO4 Standoffs

Unified	Type	Thread Code	Test Sheet Material - .008" 304 Stainless Steel HRC 37 / HV 360			
			Installation (lbs.)	Pushout (lbs.)	Torque-out (in. lbs.)	Pull-thru (lbs.)
	TMSO4	080	2600	30	4.0 <sup>(2)</sup>	137
	TMSO4	256	3000	40	4.4	193

Metric	Type	Thread Code	Test Sheet Material - 0.2mm 304 Stainless Steel HRC 37 / HV 360			
			Installation (kN)	Pushout (N)	Torque-out (N-m)	Pull-thru (N)
	TMSO4	M1	8.2	130	0.07 <sup>(2)</sup>	440
	TMSO4	M1.2	9.9	130	0.14 <sup>(2)</sup>	525
	TMSO4	M1.4	11.1	130	0.21 <sup>(2)</sup>	590
	TMSO4	M1.6	11.6	130	0.45 <sup>(2)</sup>	610
	TMSO4	M2	13.4	175	0.5	860

## MSO4 Standoffs

Unified	Type	Thread Code	Max. Rec. Tightening Torque for Mating Screw (in. lbs.)	Sheet Thickness (in.)	Test Sheet Material - 304 Stainless Steel			
					Installation (lbs.)	Pushout (lbs.)	Torque-out (in. lbs.) <sup>(2)</sup>	Pull-Thru (lbs.) <sup>(2)</sup>
	MSO4	080	.65	.013	2500	33	1.3	78
				.017		45	2.2	
	MSO4	256	1.3	.013	2500	33	2.2	110
				.017		45	2.6	

Metric	Type	Thread Code	Max. Rec. Tightening Torque for Mating Screw (N-m)	Sheet Thickness (mm)	Test Sheet Material - 304 Stainless Steel			
					Installation (kN)	Pushout (N)	Torque-out (N-m) <sup>(2)</sup>	Pull-Thru (N) <sup>(2)</sup>
	MSO4	M1	0.019	0.3	11.1	150	0.15	350
				0.43		200	0.25	
	MSO4	M1.2	0.036	0.3	11.1	150	0.15	350
				0.43		200	0.25	
	MSO4	M1.6	0.057	0.3	11.1	200	0.15	350
				0.43		150	0.25	
	MSO4	M1.6	0.084	0.3	11.1	200	0.15	350
				0.43		150	0.25	
	MSO4	M2	0.175	0.3	11.1	150	0.25	500
				0.43		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

## T4 Fasteners

Type	300 Series Stainless Steel			
	Installation		Pullout	
	N	lbs.	N	lbs.
T4-10-025	2020	455	200	45
T4-10-050				

## TA Fasteners

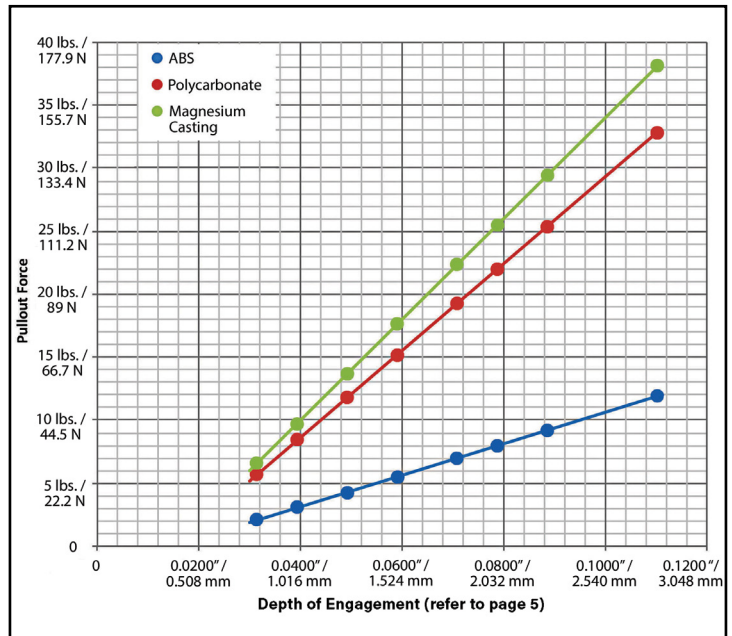
Type	5052-H34 Aluminum			
	Installation		Pullout	
	N	lbs.	N	lbs.
TA-10-025	820	185	80	18
TA-10-050				
TA-10-075				

- (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.

## Performance Data

## TKA/TK4 Pins

Type	Test Base Panel Material	Depth Of Engagement		Installation		Pullout	
		(mm)	(in.)	(N)	(lbs.)	(N)	(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
TKA-10	Polycarbonate	2.3	0.0886	222	50	41	9
		2.8	0.1102	245	55	53	12
		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
TK4-10	Magnesium Casting (AZ91D)	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
		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



## TFA Fasteners

Type	5052-H34 Aluminum			
	Installation		Pullout	
	N	lbs.	N	lbs.
TFA-10-025	450	101	40	9
TFA-10-035				
TFA-10-045				
TFA-10-055				

## TS4 Fasteners

Part Number	Tested Top Sheet Thickness	5052-H34 Aluminum HRB 63 / HB 114						304 Stainless Steel HRB 89 / HB 187					
		Installation		Pullout (l)		Torque to Remove		Installation		Pullout (l)		Torque to Remove	
		(N)	(lbs.)	(N)	(lbs.)	(N-cm)	(in. oz.)	(N)	(lbs.)	(N)	(lbs.)	(N-cm)	(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"												

CDS Fasteners<sup>(2)</sup>

Part Number	Test Pin Material	Installation (kN) <sup>(1)</sup>	Pull-off (N)	Clamp Load (N)
CDS-100	6061-T6 Aluminum	0.33	18.1	7

## MSOFS Standoffs

Unified	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.) <sup>(3)</sup>
Metric	MSOFS	080	.65	1500	69.8	1.29
	MSOFS	256	1.3	1800	91.2	1.29
	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

(1) Pullout after initial installation.

(2) Specially designed installation punch prevents over-installation and damage to the fastener.

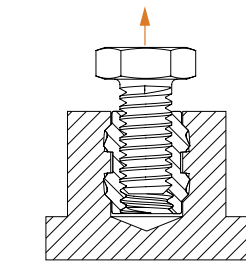
(3) Torque-out performance will depend on the strength and type of screw being used. In most cases, the screw threads will fail before the insert threads.

## Performance Data

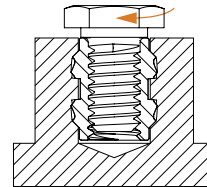
### MSIA/MSIB Inserts

Metric	Type	Thread Code	Length Code	Test Sheet Material			
				ABS		Polycarbonate	
				Pullout (N)	Torque-out (N-cm) <sup>(1)</sup>	Pullout (N)	Torque-out (N-cm) <sup>(1)</sup>
	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.

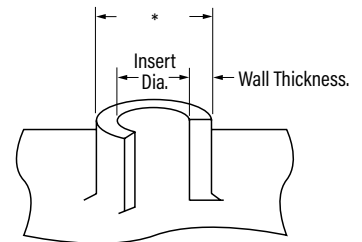


**Pullout** is the force required to pull the insert from the sheet.



**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.

\* see page 10 for wall thickness and hole preparation recommendations

### SMTSO<sup>(2)(3)</sup> 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

<b>Oven</b>	Quad ZCR convection oven with 4 zones
<b>High Temp</b>	518°F / 270°C
<b>Board Finish</b>	62% Sn, 38% Pb
<b>Screen Printer</b>	Ragin Manual Printer
<b>Vias</b>	None
<b>Spokes</b>	2 Spoke Pattern
<b>Paste (lead-free)</b>	Amtech NC559LF Sn96.5/3.0Ag/0.5Cu (SAC305)
<b>Stencil</b>	.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.

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