



**M**INIATURE

**S**ELF-CLINCHING

**F**ASTENERS

**BULLETIN**



**FE** 605

Revised 506

# MINIATURE SELF-CLINCHING FASTENERS

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

Types FE, FEO and UL are self-locking. Types FE and FEO meet locking torque requirements of NASM25027 for 250°F nuts. Type UL self-locking nuts meet locking torque requirements specified herein. Some sizes of FE, FEO, and UL can be ordered to NASM45938/7 specifications.\* Types FEX, FEOX and U have free-running class 2B/6H threads.

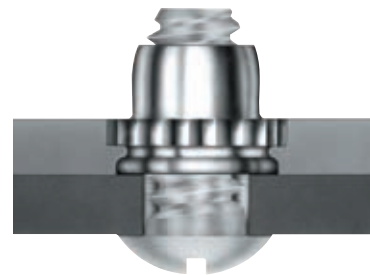
PEM miniature fasteners provide immediate visual indication when proper installation has been accomplished.

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

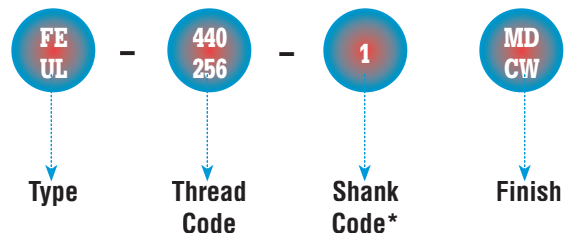
When this collar is embedded in the sheet, the undercut cavity beneath the collar is filled with displaced sheet material thereby developing pushout resistance.

A dry-film lubricant applied to these fasteners provides the smooth, non-galling prevailing torque performance necessary for reliable locking and for reusability. In accordance with NASM25027 specifications, screws for use with PEM self-locking fasteners should be Class 3A/4h fit or no smaller than Class 2A/6g. Screws should be long enough so that at least two threads project through the PEM fasteners when tightened.

\*To meet national aerospace standards and to obtain testing documentation, product must be ordered to NASM45938/7 specifications. For a complete Military Specification and National Aerospace Standards Reference Guide (Bulletin NASM) consult our Marketing Department or check our web site.

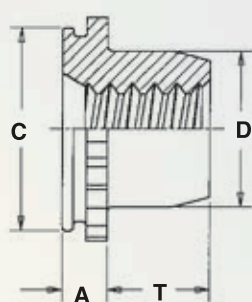


## Part Number Designation



\*This suffix applicable only to types U and UL fasteners.

# TYPES U, UL, FE, FEO, FEOX, FEX



TYPES U, FEX, FEOX ROUND

TYPES FE, FEO & UL TOPS ELLIPTICALLY SQUEEZED

All dimensions are in inches.

	Thread Size	Type		Thread Code	Shank Code	A (Shank) Max.	Sheet Thickness (1)	Hole Size In Sheet +.003 - .000	C +.000 - .005	D Max.	E ±.005	T +.015 - .000	Weight Lbs./K	Min. Dist. Hole C/L To Edge	Max. Hole In Attached Parts
		Non-locking(2)	Self-locking												
UNIFIED	.060-80 (#0-80)	U	UL	080 <sup>NS</sup>	0	.020	.019-.022	.110	.1095	.076	.125	.050	.068	.09	.080
	.073-64 (#1-64)	U	UL	164 <sup>NS</sup>	0	.020	.019-.022	.110	.1095	.090	.125	.050	.070	.09	.093
	.086-56 (#2-56)	U	UL	256	0	.020	.019-.022	.144	.1435	.106	.160	.065	.125	.11	.106
					1	.031	.030-.036						.184		
	.112-40 (#4-40)	FEOX	FEO	440	(4)	.040	.039-.045	.172	.171	.145	.192	.065	.31	.14	.132
		FEX	FE			.060	.059-.070						.37		
	.138-32 (#6-32)	FEOX	FEO	632	(4)	.040	.039-.045	.213	.212	.180	.244	.075	.47	.17	.158
		FEX	FE			.060	.059-.070						.68		
	.164-32 (#8-32)	FEOX	FEO	832	(4)	.040	.039-.045	.290	.289	.215	.322	.090	.98	.20	.184
		FEX	FE			.060	.059-.070						1.24		
	.190-32 (#10-32)	FEOX	FEO	032	(4)	.040	.039-.045	.290	.289	.245	.322	.110	1.04	.20	.210
		FEX	FE			.060	.059-.070						1.20		
1/4-20	FEX <sup>NS</sup>	FE	0420	(4)	.060	.059-.070	.344	.343	.318	.384	.120	2.08	.28	.270	
1/4-28			0428									1.58			

All dimensions are in millimeters.

	Thread Size x Pitch	Type		Thread Code	Shank Code	A (Shank) Max.	Sheet Thickness (1)	Hole Size In Sheet +0.08	C -0.13	D Max.	E ±0.13	T +0.4	Weight Kg./K	Min. Dist. Hole C/L To Edge	Max. Hole In Attached Parts
		Non-locking(3)	Self-locking												
METRIC	M2 x 0.4	U	UL	M2 <sup>NS</sup>	1	0.76	0.76-0.91	3.61	3.6	2.5	4.07	1.65	0.08	2.8	2.5
	M3 x 0.5	FEOX	FEO	M3	(4)	1.02	0.99-1.14	4.39	4.37	3.96	4.88	1.9	0.13	3.6	3.5
		FEX	FE			1.53	1.5-1.78						0.17		
	M4 x 0.7	FEOX	FEO	M4	(4)	1.02	0.99-1.14	7.39	7.37	5.23	8.17	2.55	0.5	5.2	4.5
		FEX	FE			1.53	1.5-1.78						0.54		
	M5 x 0.8	FEOX	FEO	M5	(4)	1.02	0.99-1.14	7.39	7.37	6.48	8.17	3.05	0.55	5.2	5.5
		FEX	FE			1.53	1.5-1.78						0.59		
	M6 x 1	FEX	FE	M6 <sup>NS</sup>	(4)	1.53	1.5-1.78	8.74	8.72	7.72	9.74	3.3	0.95	7.1	6.5

(1) In applications between the sheet thicknesses for your thread size, see last paragraph of installation data on page FE-6.

(2) 2B Go Gauge may stop at barrel end but class 3A screw will pass thru with finger torque.

(3) 6H Gauge may stop at barrel but 4h screw will pass thru with finger torque.

(4) Not Applicable.

NS Not Stocked. Available on special order.

# MATERIAL & FINISH SPECIFICATIONS

Type	Threads		Thread Locking Performance	Fastener Material	Standard Finishes			Optional Finish	For Use In Sheet Hardness:
	Internal, ANSI B1.1, 2B / ANSI / ASME B1.13M, 6H	Internal, MIL-S-8879, UNJ-3B, ANSI B1.21M, MJ 4H6H 4H5H (M6 thread)	NASM25027 (as applicable)	303 Stainless Steel	Passivated and/or Tested Per ASTM A380	Passivated Plus Clear Dry-film Lubricant	Black Dry-film Lubricant	Black Dry-film Lubricant Per MIL-PRF-46010, Over Cadmium Chromate Prime	70 or Less on the Rockwell "B" Scale
U	•			•	•				•
UL		•		•		•			•
FE		•	•	•			•	•	•
FEX	•			•	•				•
FEO		•	•	•			•	•	•
FEOX	•			•	•				•
Part number codes for finishes					None	CW	MD <sup>(4)</sup>	EF <sup>(4)</sup>	

## PERFORMANCE DATA<sup>(1)</sup>

UNIFIED	Type	Thread Code	Shank Code	Max. Rec. Tightening Torque (in. lbs.) <sup>(2)</sup>	Type UL Locking Torque (in. oz.) <sup>(3)</sup>	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.)
U & UL	080	0	0	1	1 To 12	750	20	2	1000	30	2
						750	20	3	1000	30	3
	256	0	1	1.8	3 To 24	1000	20	4	1300	30	4
		1	3								

METRIC	Type	Thread Code	Shank Code	Max. Rec. Tightening Torque (N•m) <sup>(2)</sup>	Type UL Locking Torque (N•m) <sup>(3)</sup>	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)
U & UL	M2	1	1	.3	0.02 To 0.2	4	89	0.45	5.8	133	0.45

- The values above are representative of pushout and torque-out resistance between the shank of the fastener and the sheet. The installation, pushout and torque-out values reported are averages when all installation specifications and procedures are followed. Variations in mounting hole size, sheet material and installation procedure will affect this data. These torques will ensure that induced preload will not exceed shear strength of knurled collar. Performance testing of this product in your application is recommended. We will be happy to provide samples for this purpose.
- These torques consider nut strength only. User must consider screw strength also. When type U/UL is installed in sheets thicker than .025" / 0.64 mm, tightening torque must be controlled so that induced preload does not exceed these values.
- The maximum locking torque and the minimum breakaway will fall within these values for five cycles when tested in accordance with the locking torque test procedure specified in NASM25027.
- Consult our Engineering department or visit our web site for details on EF and MD finish specifications.

# PERFORMANCE DATA<sup>(1)</sup>

Continued...

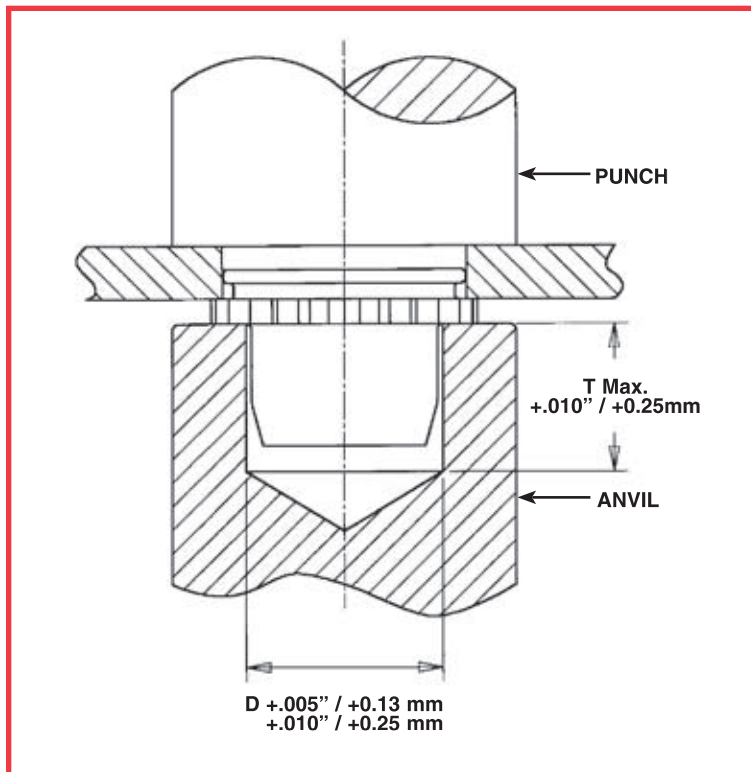
UNIFIED	Type	Thread Code	Max. Rec. Tightening Torque (in. lbs.) <sup>(2)</sup>	Test Sheet Material					
				5052-H34 Aluminum			Cold-rolled Steel		
				Installation (lbs.)	Pushout (lbs.)	Torque-out (in. lbs.)	Installation (lbs.)	Pushout (lbs.)	Torque-out (in. lbs.)
FEO, FEOX	440	6.3	900	88	12	1500	140	12	
		10		135	12		210	12	
FEO, FEOX	632	10	1200	105	20	2100	185	20	
		15	1300	175			255		
FEO, FEOX	832	16	1500	155	48	2500	260	48	
		25		255			360		
FEO, FEOX	032	19	1500	155	48	2500	260	48	
		30		255			360		
FE, FEX	0420	45	2100	320	110	3500	420	110	
	0428								

METRIC	Type	Thread Code	Max. Rec. Tightening Torque (N•m) <sup>(2)</sup>	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)
FEO, FEOX	M3	.76	4	391	1.35	6.7	622	1.35	
		1.13		600			934		
FEO, FEOX	M4	1.8	6.7	689	5.42	11.1	1156	5.42	
		2.8		1134			1601		
FEO, FEOX	M5	2.2	6.7	689	5.42	11.1	1156	5.42	
		3.5		1134			1601		
FE, FEX	M6	4.8	9.4	1423	12.43	15.6	1868	12.43	

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

(2) These torques will ensure that induced preload will not exceed shear strength of knurled collar. These torques consider nut strength only. User must consider screw strength also. When type FE/FEX is installed in sheets thicker than .070" / 1.78 mm or when type FEO/FEOX is installed in sheets thicker than .045" / 1.14 mm, tightening torque must be controlled so that induced preload does not exceed these values.

# INSTALLATION



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 FE-3.

1. Punch or drill properly sized mounting hole in sheet. Do not perform any secondary operations such as deburring.
2. Insert fastener into the anvil hole and place the mounting hole over the shank of the fastener as shown in the drawing.
3. With punch and anvil surfaces parallel, apply squeezing force 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 type FE/FEO.

In applications for sheet thicknesses between the two ranges (see "Sheet Thickness" on page FE-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 type FE or FEX. 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® PRESSES

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

RoHS compliance information can be found on our website.

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

PennEngineering®



North America: Danboro, PA 18916 USA • E-mail: info@pemnet.com • Tel: +1-215-766-8853 • Fax: +1-215-766-0143 • 800-237-4736 (USA Only)  
U.K. And Europe: Doncaster, England • E-mail: uk@pemnet.com Tel: +44 (0)1302 765700 • Fax: +44 (0)1302 367580  
Asia/Pacific: Singapore • E-mail: singapore@pemnet.com • Tel: +65-6-745-0660 • Fax: +65-6-745-2400  
Shanghai, China • E-mail: china@pemnet.com • Tel: +86-21-5868-3688 • Fax: +86-21-5868-3988

Visit our PEMNET™ Resource Center at [www.pemnet.com](http://www.pemnet.com)

CAGE-46384