

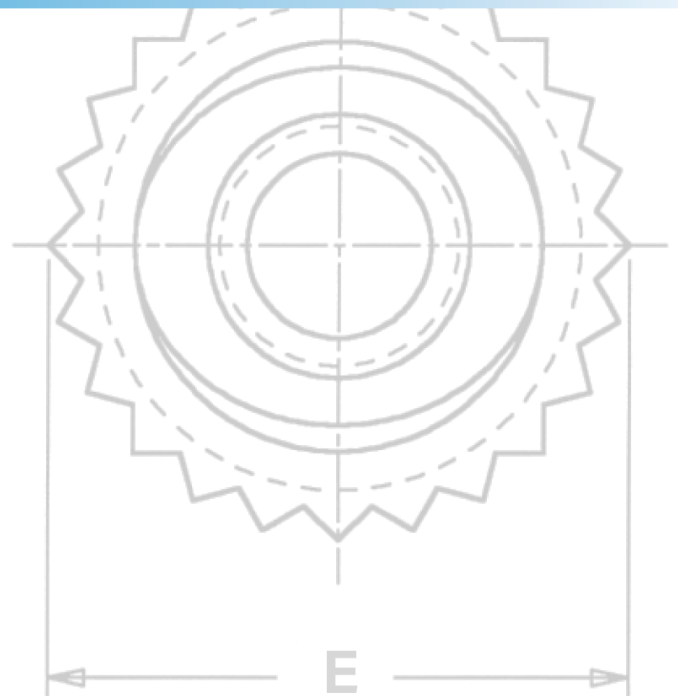
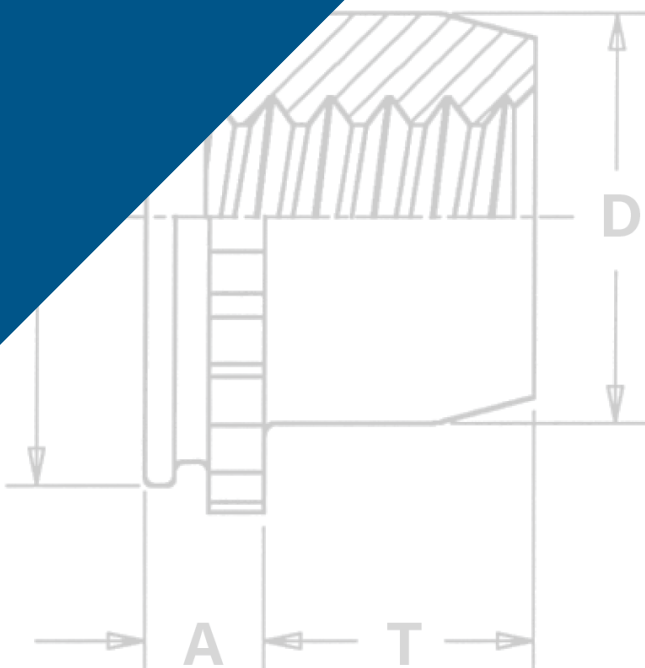


PEM® brand miniature fasteners fit into a minimal space and provide strong, reusable threads.



**FE™**

## **MINIATURE SELF-CLINCHING FASTENERS**



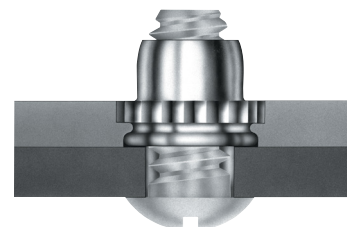
# MINIATURE SELF-CLINCHING FASTENERS

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

PEM miniature fasteners provide 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.<sup>(1)</sup> 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 <sup>(2)</sup>. 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™** non-locking nuts have 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 <sup>(2)</sup>.



(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).

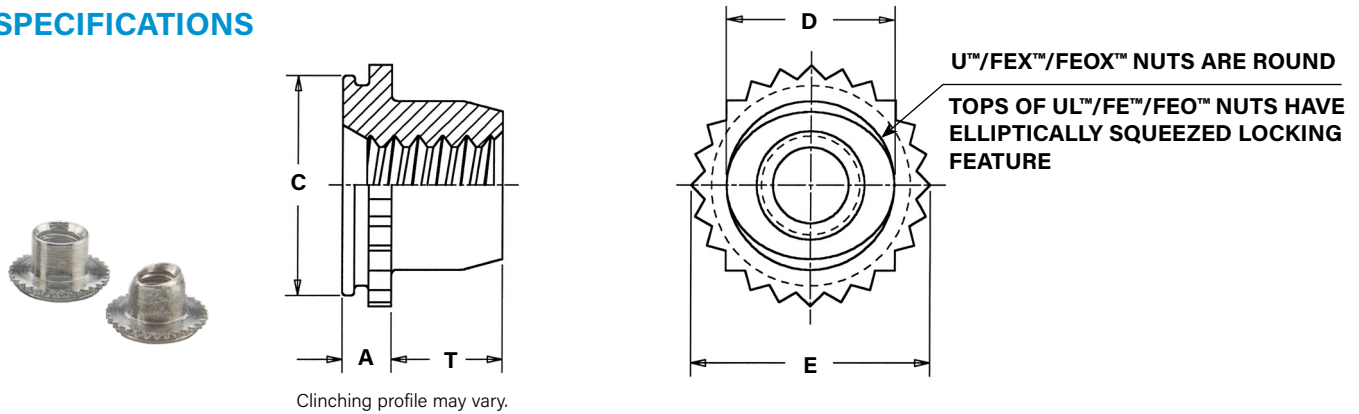
## PART NUMBER DESIGNATION

|             |   |             |            |             |           |
|-------------|---|-------------|------------|-------------|-----------|
| <b>U</b>    | - | <b>080</b>  | -          | <b>0</b>    |           |
| <b>UL</b>   | - | <b>080</b>  | -          | <b>0</b>    | <b>CW</b> |
| <b>FE</b>   | - | <b>440</b>  | -          |             | <b>MD</b> |
| <b>FEX</b>  | - | <b>440</b>  |            |             |           |
| <b>FEO</b>  | - | <b>440</b>  | -          |             | <b>MD</b> |
| <b>FEOX</b> | - | <b>440</b>  |            |             |           |
| ↓           |   | ↓           | ↓          | ↓           |           |
| Type        |   | Thread Code | Shank Code | Finish Code |           |



# MINIATURE SELF-CLINCHING FASTENERS

## SPECIFICATIONS



All dimensions are in inches.

|         | Thread Size      | Type           |              | 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 |
|---------|------------------|----------------|--------------|-------------|----------------|----------------|---------------------|---------------------------------|----------------|--------|---------|----------------|-------------------------|-----------------------------|
|         |                  | Non-locking(1) | Self-locking |             |                |                |                     |                                 |                |        |         |                |                         |                             |
| 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                        |
|         | .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           |              | 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 |
|--------|---------------------|----------------|--------------|-------------|----------------|----------------|---------------------|--------------------------|---------|--------|---------|--------|-------------------------|-----------------------------|
|        |                     | Non-locking(4) | Self-locking |             |                |                |                     |                          |         |        |         |        |                         |                             |
| 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 <sup>(1)</sup> |                           |              |                                    |
|--------------------------------|---|--|----------------------------|--|--|--------------------------|--|---------------------------|--------------|------------------------------------|
|                                | 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 <sup>(2)</sup> |
| U                              | ▪   |  | ▪                          | ▪                                      |  |                          | ▪  |                           |              | ▪                                  |
| UL                             |   | ▪  | ▪                          |  | ▪  |                          | ▪  | 400 ° F / 204 ° C         | ▪            | ▪                                  |
| FE                             |   | ▪  | ▪                          | ▪                                      |  | ▪                        | ▪  | 400 ° F / 204 ° C         | ▪            | ▪                                  |
| FEX                            | ▪   |  | ▪                          | ▪                                      |  |                          | ▪  |                           |              | ▪                                  |
| FEO                            |   | ▪  | ▪                          | ▪                                      |  | ▪                        | ▪  | 400 ° F / 204 ° C         | ▪            | ▪                                  |
| FE0X                           | ▪   |  | ▪                          | ▪                                      |  |                          | ▪  |                           |              | ▪                                  |
| Part number codes for finishes |   |  |                            | None                                   | CW <sup>(3)</sup>                        | MD <sup>(4)</sup>        |  |                           |              |                                    |

(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).

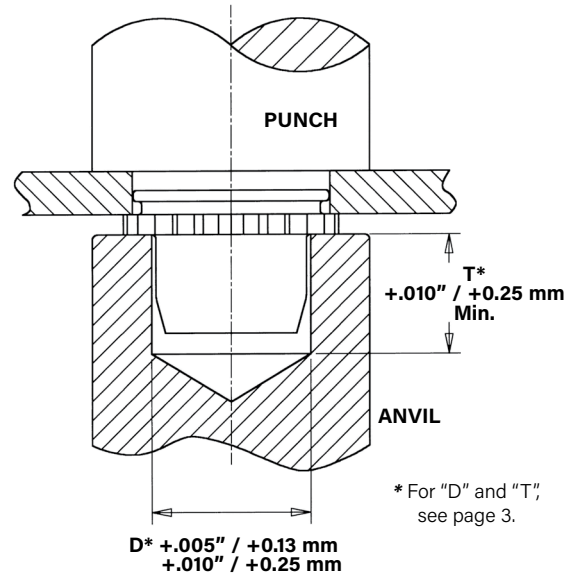
(3) See PEM Technical Support section of our web site for related plating standards and specifications.

(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.
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.



## Installation Tooling - U, UL, FE, FEO, FEX and FEOX Nuts

| Type            | Thread Code | HAEGER® Part Number |             | PEMSERTER® Part Number |           |
|-----------------|-------------|---------------------|-------------|------------------------|-----------|
|                 |             | Anvil               | Punch       | Anvil                  | Punch     |
| U/UL            | 080         | H-133-0L            | H-108-0019L | 8008451                | 975200048 |
| U/UL            | 164         | H-133-1L            | H-108-0019L | 970200300300           | 975200048 |
| U/UL            | 256/M2      | H-133-2L            | H-108-0019L | 975200020              | 975200048 |
| FE/FEO/FEX/FE0X | 440/M3      | H-133-4L            | H-108-0019L | 975200021              | 975200048 |
| FE/FEO/FEX/FE0X | 632         | H-133-6L            | H-108-0019L | 975200022              | 975200048 |
| FE/FEO/FEX/FE0X | 832/M4      | H-133-8L            | H-108-0019L | 975200023              | 975200048 |
| FE/FEO/FEX/FE0X | 032/M5      | H-133-10L           | H-108-0019L | 975200024              | 975200048 |
| FE/FEO/FEX/FE0X | 0420        | H-133-04L           | H-108-0019L | 975200025              | 975200048 |
| FE/FEO/FEX/FE0X | M6          | —                   | —           | 8013143                | 975200048 |

## Installation Notes

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

## 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.

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



The diagram illustrates the resources available for HAEGER and PEMSERTER tooling. On the left is a red HAEGER machine. In the center is a laptop displaying the HAEGER website, with a circular callout showing the 'Tooling' menu options: Auto Tooling Wizard, Manual Tooling Wizard, Force Chart, BTM Tooling, and Manual Tooling Catalog. Below the laptop is a smartphone displaying the HAEGER Wizzard app, with a circular callout showing the 'Tooling Wizard' and 'BTM Tooling' options. On the right is a blue PEMSERTER machine. Below each machine are labels for their respective manual and auto tooling catalogs.

Go to [haeger.com](http://haeger.com) to access the Auto and Manual Tooling Wizards

Or download the HAEGER WIZZARD Phone App

HAEGER® MANUAL TOOLING CATALOG

HAEGER® AUTO TOOLING CATALOG

PEMSERTER® MANUAL TOOLING CATALOG

PEMSERTER® AUTO TOOLING CATALOG



# MINIATURE SELF-CLINCHING FASTENERS

## PERFORMANCE DATA FOR U™/UL™ FASTENERS<sup>(1)</sup>

| UNIFIED | 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.) |
|         | 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          |                     |                |                       |                     |                |                       |

| METRIC | 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) |
|        | U/UL | M2          | 1          | 4                   | 89          | 0.45             | 5.8               | 133         | 0.45             |

## PERFORMANCE DATA FOR FE™/FEO™/FEX™/FEOX™ FASTENERS<sup>(1)(2)</sup>

| UNIFIED | 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.) |
|         | 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        |                     |                |                       |                     |                |                       |

| METRIC | 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) |
|        | 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

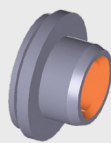
| UNIFIED | Thread Code | Increasing Axial Strength →                       |                                     |   |   |                                     |   |
|---------|-------------|---|-------------------------------------|---|---|-------------------------------------|---|
|         |             | U-0/UL-0/FE0X/FE0 Nuts                            |                                     |   | U-1/UL-1/FE1X/FE1 Nuts                            |                                     |   |
|         |             | Locknut Min. Axial Strength (lbs.) <sup>(1)</sup> | Mating Screw                        |   | Locknut Min. Axial Strength (lbs.) <sup>(1)</sup> | Mating Screw                        |   |
|         |             |   | Strength Level (ksi) <sup>(2)</sup> | Tightening Torque (in. lbs.) <sup>(3)</sup> |   | Strength Level (ksi) <sup>(2)</sup> | Tightening Torque (in. lbs.) <sup>(3)</sup> |
|         | 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  |

| METRIC | Thread Code | Increasing Axial Strength →                     |                                     |  |   |                                     |  |
|--------|-------------|---|-------------------------------------|--|---|-------------------------------------|--|
|        |             | U-0/UL-0/FE0X/FE0 Nuts                          |                                     |  | U-1/UL-1/FE1X/FE1 Nuts                          |                                     |  |
|        |             | Locknut Min. Axial Strength (kN) <sup>(1)</sup> | Mating Screw                        |  | Locknut Min. Axial Strength (kN) <sup>(1)</sup> | Mating Screw                        |  |
|        |             |   | Strength Level (MPa) <sup>(2)</sup> | Tightening Torque (N-m) <sup>(3)</sup> |   | Strength Level (MPa) <sup>(2)</sup> | Tightening Torque (N-m) <sup>(3)</sup> |
|        | 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.



Drawings and models  
are available at  
[www.pemnet.com](http://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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