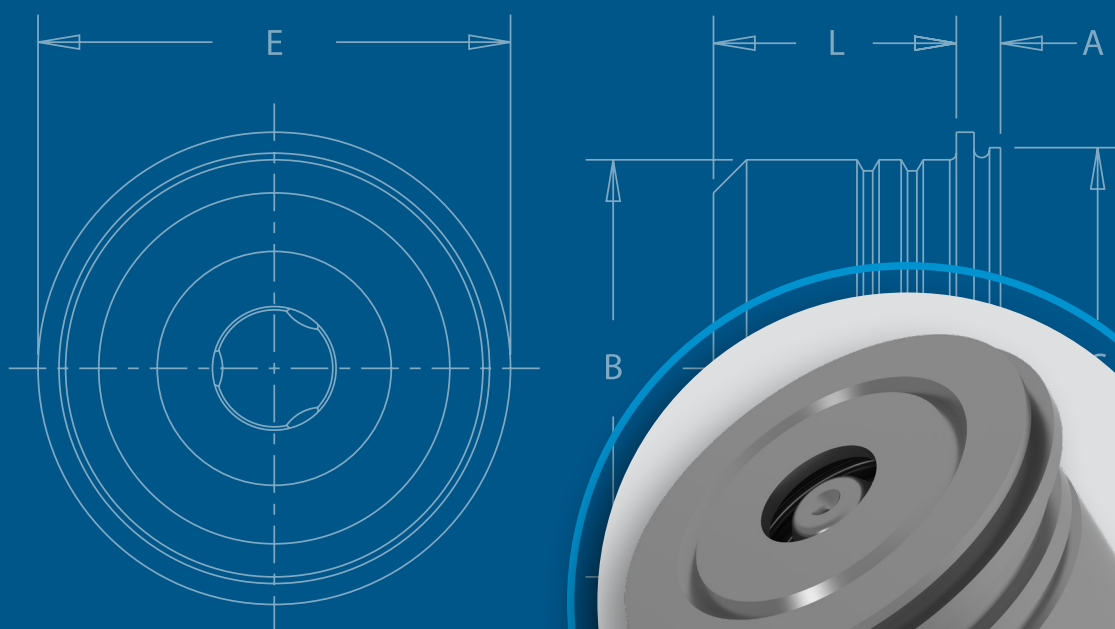




MRF™

PEM® GHOST™ MAGNETIC RELEASE FASTENERS



Fully concealed fastener with
zero visible evidence of how to
disassemble once engaged

PEM® GHOST™ FASTENERS

Magnetic Release Fastening Technology

GHOST™ Fastening Technology is ideal for achieving tight security and sleek aesthetics. This new PEM® capability produces a fully concealed fastener with zero visible evidence of position or disassembly method once engaged.

GHOST™ Fastening Technology At-a-Glance

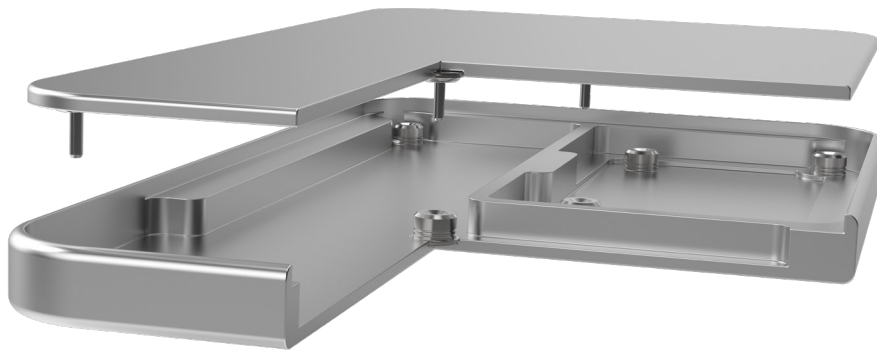
- Near-instant release and disassembly using magnetic tool
- Ample float accommodates tolerance and assembly imprecisions
- Ultra-smooth design for sleek aesthetics
- Concealed product makes new design avenues possible across a variety of industries and market sectors
- Can replace many types of small external screw/nut assemblies

There are two floating pin styles available for the MRFS™ retainer, the MRPS™ smooth floating pin which accommodates variable engagement depth and/or tolerance stack-up and the MRHPS™ grooved floating pin which provides greater performance and decreased deflection under loading.



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

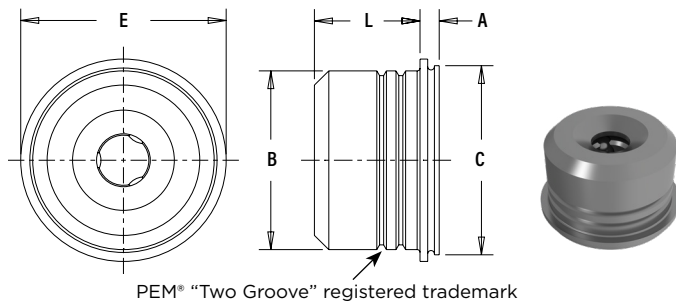
Custom sizes are available on special order. [Contact us](#) for more information.



Fully enclosed device utilizing PEM® Ghost™ fasteners.

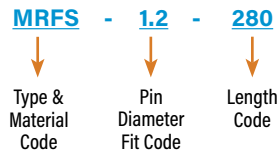
Custom sizes are available on special order.
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MRFS™ Retainer Assembly



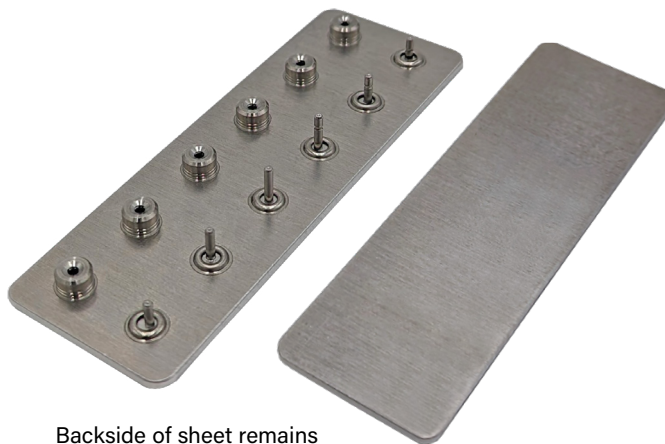
PEM® "Two Groove" registered trademark

Part Number Designation



| Type | Pin Dia. Fit Code | Length Code | Min. Sheet Thickness (1) | | Max. Sheet Thickness for Release (2) | | Blind Mounting Hole Dia. +.003 -.000/ +0.08mm | | Min. Depth of Blind Hole (3) | | A (Shank) Max. | | B Max. | | C Max. | | E Nom. | | L Length Nom. | | Min. Dist. Hole C/L to Edge (4) | |
|------|-------------------|-------------|--------------------------|-----|--------------------------------------|----|---|------|------------------------------|------|----------------|------|--------|------|--------|-----|--------|------|---------------|-----|---------------------------------|-----|
| | | | in. | mm | in. | mm | in. | mm | in. | mm | in. | mm | in. | mm | in. | mm | in. | mm | in. | mm | in. | mm |
| MRFS | 1.2 | 280 | .071 | 1.8 | .079 | 2 | .201 | 5.11 | .023 | 0.59 | .022 | 0.56 | .190 | 4.83 | .200 | 5.1 | .214 | 5.44 | .110 | 2.8 | .142 | 3.6 |

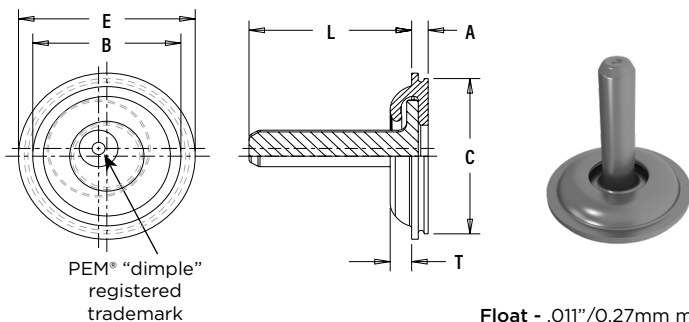
- (1) When "Min Sheet Thickness" value is observed, cosmetic impact to the exposed panel surface is unlikely. Mechanical attachment is viable in panel thicknesses as low as 1 mm, however, the likelihood of visible / cosmetic impact will increase.
- (2) The maximum sheet thickness for magnetic release using minimum magnet specification shown on page 6.
- (3) Blind mounting holes may be deeper than minimums except where sheet material is at or near minimum thickness. Fasteners should always be installed so the flange is flush with the surface of the sheet.
- (4) For more information on proximity to bends and distance to other clinch hardware, see [PEM® Tech Sheet C/L To Edge](#).



Backside of sheet remains smooth and unmarred.

MRPS™ and MRHPS™ Floating Pins

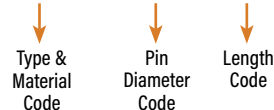
MRPS Smooth Pin



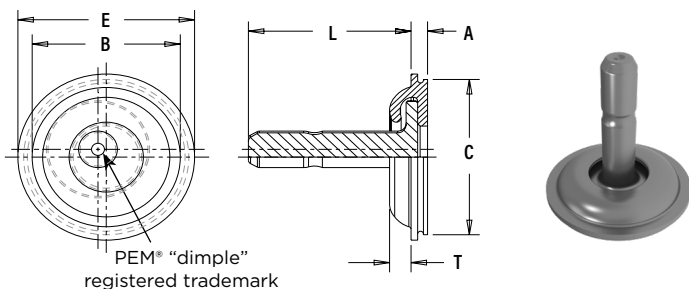
Float - .011"/0.27mm minimum, in all directions from center, .022"/0.54mm total.

Part Number Designation

MRPS - 1.2MM - 400
MRHPS - 1.2MM - 400

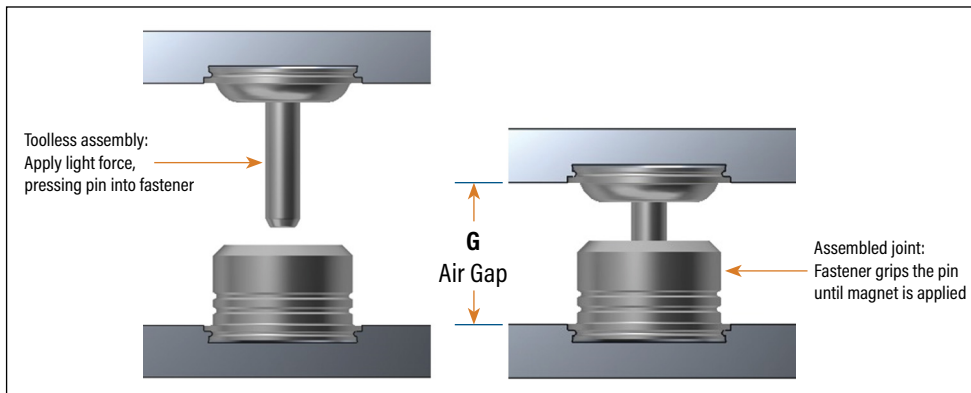


MRHPS Grooved Pin



| Type | Pin Dia. Code | Length Code | Min. Sheet Thickness (1) | | Blind Mounting Hole Dia. +.003 -.000/ +0.08mm | | Min. Depth of Blind Hole (2) | | A (Shank) Max. | | B Max. | | C Max. | | E Nom. | | G Air Gap (3) MRPS: +.015" -.007" / +0.38 -0.18mm MRHPS: ±.004" / ±0.10mm | | L Length ±.008" ± 0.2mm | | T Max. | Min. Dist. Hole C/L to Edge (4) | | |
|-------|---------------|-------------|--------------------------|-----|---|------|------------------------------|------|----------------|------|--------|------|--------|-----|--------|------|---|------|-------------------------|----|--------|---------------------------------|------|-----|
| | | | in. | mm | in. | mm | in. | mm | in. | mm | in. | mm | in. | mm | in. | mm | in. | mm | in. | mm | | | | |
| MRPS | 1.2MM | 400 | | | | | | | | | | | | | | | | | | | | | | |
| | | 500 | .071 | 1.8 | .201 | 5.11 | .023 | 0.59 | .022 | 0.56 | .183 | 4.65 | .200 | 5.1 | .214 | 5.44 | .148 | 3.75 | .157 | 4 | .029 | 0.74 | .142 | 3.6 |
| | | 600 | | | | | | | | | | | | | | | .226 | 5.75 | .236 | 6 | | | | |
| MRHPS | 1.2MM | 400 | | | | | | | | | | | | | | | | | | | | | | |
| | | 500 | .071 | 1.8 | .201 | 5.11 | .023 | 0.59 | .022 | 0.56 | .183 | 4.65 | .200 | 5.1 | .214 | 5.44 | .148 | 3.75 | .157 | 4 | .029 | 0.74 | .142 | 3.6 |
| | | 600 | | | | | | | | | | | | | | | .226 | 5.75 | .236 | 6 | | | | |

- (1) When "Min Sheet Thickness" value is observed, cosmetic impact to the exposed panel surface is unlikely. Mechanical attachment is viable in panel thicknesses as low as 1 mm, however, the likelihood of visible / cosmetic impact will increase.
- (2) Blind mounting holes may be deeper than minimums except where sheet material is at or near minimum thickness. Fasteners should always be installed so the flange is flush with the surface of the sheet.
- (3) Air Gap dimension required to achieve intended function and fastening performance shown on page 8.
- (4) For more information on proximity to bends and distance to other clinch hardware, see [PEM® Tech Sheet C/L To Edge](#).



Material and Finish Specifications

| Type | | Component Material | | | | Standard Finishes | | For Use in Sheet Hardness HRB 70 / HB 125 or less (6) |
|-------|----------------------|----------------------------|---|----------------------|---------|--|----------------|---|
| | | 300 Series Stainless Steel | Precipitation Hardening Grade Stainless Steel | 2000 Series Aluminum | Ceramic | Passivated and/or Tested per ASTM A380 (5) | Natural Finish | |
| MRFS | Retainer | ▪ | | | | ▪ | | ▪ |
| | Assembly Cap | | | ▪ | | | ▪ | |
| | Internal Component 1 | | ▪ | | | ▪ | | |
| | Internal Component 2 | ▪ | | | | ▪ | | |
| | Internal Component 3 | | | | ▪ | | | |
| MRPS | Retainer | ▪ | | | | ▪ | | ▪ |
| | Smooth Pin | | | | | | | |
| MRHPS | Retainer | ▪ | | | | ▪ | | ▪ |
| | Grooved Pin | | | | | | | |

(5) See PEM® [Technical Support](#) section of our website for related plating standards and specifications.

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

Usage & Design Guidance

Functionality

- Primary function of Ghost parts is axial retention; mated parts do not resist torque to any significant degree.
- Floating Pins are not intended to provide structural support for shear/transverse loading. If this is applied, it should be relieved prior to magnetic release.
- If the joint sees a constant load, it is recommended that this load be relieved to better facilitate magnetic release.
- There exists some amount of axial compliance in the floating pin: .006"/0.15mm NOM.

Gasketing Design & Application

- While gasketing is not technically required in all cases, it is highly recommended for the following reasons.
 - Reduces radial and axial compliance in the joint.
 - Magnetic release is aided by some amount of compression toward the joint; relieving of axial load.
 - Some small amount of preload can be induced.
- Common gasket materials are viable, and should tend toward the soft range on the "Shore A Hardness Scale".
- Gasket thickness will vary with application-specific considerations. A nominal thickness of 1mm is viable, and compression levels should be roughly as follows:
 - 25-30% mated compression (this value should be factored into Air Gap/engagement dimension)
 - 15-20% additional compression during magnetic release (do not factor into Air Gap/engagement dimension)

Structural Support

- Structural features and/or supplemental components are recommended to provide support for various types/directions of loading. (For example: shear pins, hinge points, perimeter walls).

Magnetic Release

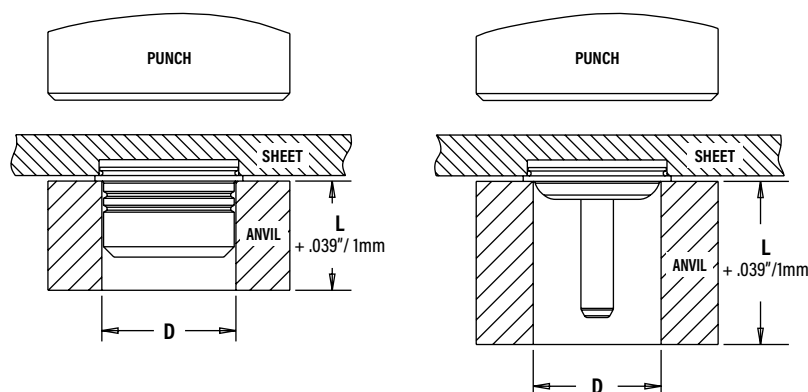
- To facilitate effective release of mated parts:
 - Relieve any shear/transverse load on the joint.
 - Relieve axial load if possible; best achieved with gasket compression toward the joint.

Installation

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

| Type | Pin Diameter Code | Anvil Dimensions | | HAEGER® Part Number | | PEMSERTER® Part Number | |
|-------|-------------------|------------------|-------------|---------------------|-------------|------------------------|-----------|
| | | D | | Anvil | Punch | Anvil | Punch |
| | | in. +.003 | mm +0.08 | | | | |
| MRFS | 1.2 | .194 | 4.93 | H-187-GB194 | H-108-0019L | 8026789 | 975200048 |
| MRPS | 1.2MM | .185 | 4.7 | H-187-GB185 | | 8026790 | |
| MRHPS | | | | | | | |

Note: Tooling described is for machines capable of installation forces below 500 lbs./2.2 kN. Custom tooling can be designed for machines with installation forces of 500 lbs./2.2 kN or above to install the PEM® GHOST™ fastener. These fasteners can also be installed with Haeger® machines that have the optional positive stop system or with the PEMSERTER® Series P3® press when the provided shims are used with the installation tooling to create a positive stop. [Contact us](#) for more information.

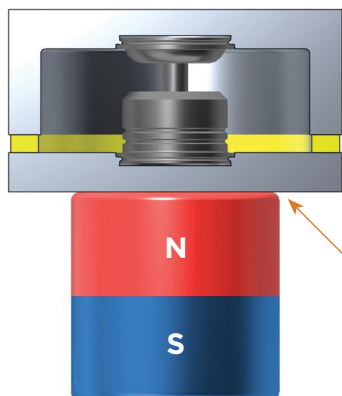


Recommended Magnet Specifications (minimum)

| Shape | Material | Diameter | Thickness | Magnet Grade | Pull Force Nom. | Magnetized | Plating |
|----------|-----------|---------------|---------------|--------------|-----------------|-------------------|----------|
| Cylinder | Neodymium | .50" / 12.7mm | .50" / 12.7mm | N52 | 18 lbs. / 80 N | Through Thickness | Optional |

Notes:

- Optional adjustment for increased magnetic release range and reliability: 2.0mm nominal thickness steel back plate mounted to magnet base.
- Alternative magnet materials may be used; Separate validation is recommended when deviating from minimum specification shown.
- Alternative magnet configurations are available which may improve magnetic release range and reliability. Please contact [techsupport](#) for more information.



Benefits of gasket interface:

- Reduced radial and axial compliance when mated
- Improves release reliability with compression toward the joint
- Provides nominal preload and improves stability

Magnet application:
Flush to panel surface.
North-south orientation not required



For Additional HAEGER®
and PEMSERTER® Tooling
Information/Part Numbers
visit our [tooling wizard](#)



Performance Data⁽¹⁾

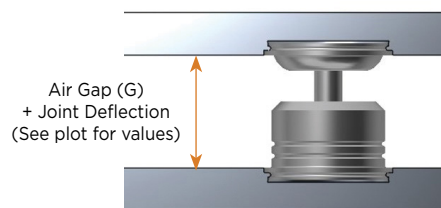
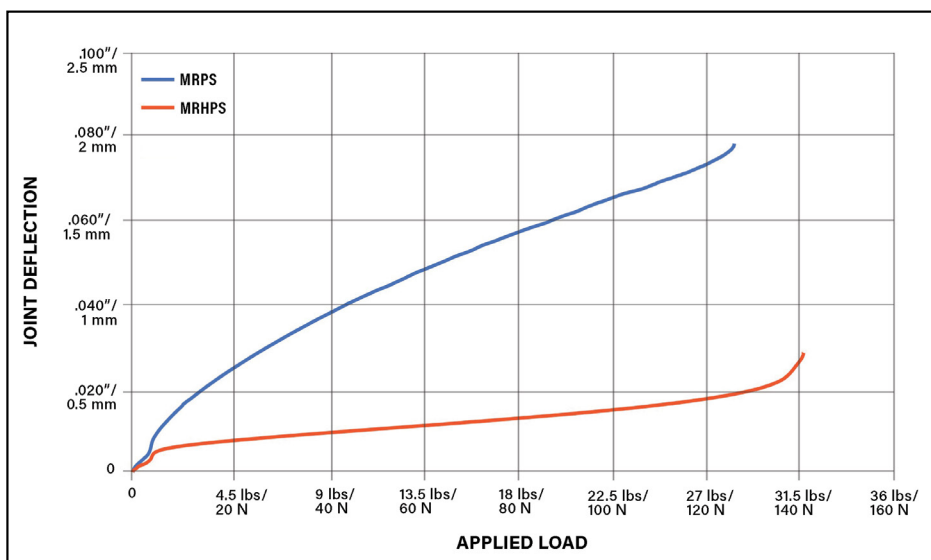
Self Clinching Data

| Floating Pin Type | Pin Diameter Fit Code / Code | Test Sheet Material | | | |
|-------------------|------------------------------|--------------------------------|------|---------|-----|
| | | .061"/1.56mm 5052-H34 Aluminum | | | |
| | | Installation (2) | | Pullout | |
| | | (lbs.) | (kN) | (lbs.) | (N) |
| MRFS | 1.2 | 450 | 2 | 39.5 | 175 |
| MRPS | 1.2MM | | | | |
| MRHPS | 1.2MM | | | | |

Fastening Data

| Retainer Type | Pin Type | Pin Diameter Code | Pull-apart (3) | |
|---------------|----------|-------------------|----------------|-----|
| | | | (lbs.) | (N) |
| MRFS | MRPS | 1.2MM | 29 | 129 |
| | MRHPS | | 32 | 142 |

Loading Curves⁽³⁾



- (1) Published installation forces are for general reference. Actual set-up and confirmation of complete installation should be made by observing proper seating of fastener as described in the installation steps. Other performance values reported are averages when all proper installation parameters and procedures are followed. Variations in mounting hole size, sheet material, and installation procedure may affect performance. Performance testing this product in your application is recommended. We will be happy to provide technical assistance and/or samples for this purpose.
- (2) Installation force values shown will provide optimal fastener performance. Installation force as low as 400lbs./1.78kN may help the side of the sheet opposite installation remain smooth. Separate validation is recommended when deviating from the specification shown.
- (3) Loading curves show average deflection profile under load for each pin type. Pull-apart performance values represent the force required to pull the fastened components completely apart.

NOTE: The GHOST™ fastener may not be purchased for use in consumer electronics products. Please contact us if you have any questions.

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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