

# The Design Engineers Fastener Guide



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**For many design engineers, the challenge with fasteners is to navigate an ever-growing list of products and innovations with confidence about which component to use for the best overall design.**

This guide outlines the essentials of what you need to know when choosing fasteners. PEM® fasteners are widely used in the following industries:

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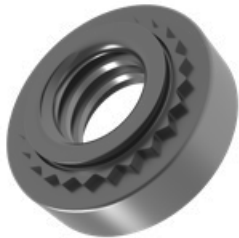


# Fasteners in the Automotive Electronics Industry

The overall performance and reliability of a vehicle's components are dependent on the type and quality of the fastener specified at the design stage.



# Common Fastener Types for Automotive Electronics



## Self-Clinching Nuts

Self-clinching nuts provide strong load bearing threads in steel and aluminium sheets and copper busbars, as thin as 0.64mm. PEM® clinch technology prevents rotation after installation.



## Self-Clinching Studs and Pins

Self-Clinching studs are available for steel and aluminium sheets and copper busbars. Standard flush-head studs are designed to be installed in sheets as thin as 1mm.



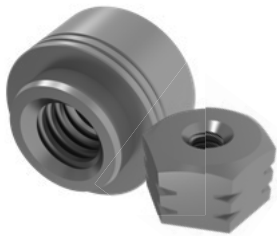
## Self-Clinching Standoffs

Self-clinching standoffs are ideal solutions for applications where mounting, spacing or stacking of panels, boards or components are required. Standoffs used are generally steel plated, installed into steel, aluminum sheets or copper busbars. Pressed into round holes, these fasteners mount permanently into metal sheets as thin as 0.3mm.



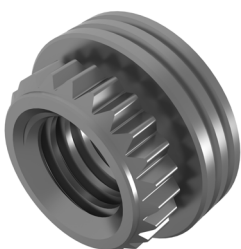
### **Self-Clinching Blind Fasteners**

Providing permanently mounted blind threads in metal sheets as thin as 1mm, self-clinching blind fasteners provide a barrier to protect threads against foreign matter. They also limit screw penetration to protect internal components from damage and help reduce loose debris in the application to improve cleanliness.



### **Surface Mount Fasteners**

Surface mount fasteners on PC boards become another board component. This alleviates potential damage to PC boards due to improper secondary installation operations. Provided on tape and reel compatible with existing SMT automated installation equipment, the benefits of using SMT fasteners include faster assembly, reduced scrap, reduced handling and reduced risk of board damage.



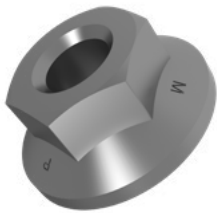
### **Broaching Fasteners**

Broaching fasteners offer practical alternatives to “loose” hardware. They’re a knurled-shank fastening device that can be pressed into a hole to provide a permanent, strong, threaded or unthreaded attachment point in non-ductile materials such as printed circuit boards or cast components.



### SI® Fasteners

SI® inserts are typically used in applications where strong, reusable, permanent threads are required in plastic materials, especially when the unit requires frequent assembly and disassembly.



### Spinning Flare Nuts

Spinning flare nuts are installed by simply pressing them into an appropriately sized, pre-punched mounting hole. These fasteners are permanently captivated in the panel but can still spin freely within the sheet.

## What Are the Common Materials?

Metals such as copper, steel, aluminium and plastic are the most widely used panel materials within automotive electronics. The usual size of standard clinch parts in automotive electronics varies from M2 to M8 sizes. The most common fasteners for this are:

**Metal Fasteners:** Typically more durable and reusable, most fasteners are covered in zinc for rust protection and durability. Iron or aluminium alloy is the most common material in automotive projects, with all materials made out of metal.

**Over-Moulded Fasteners:** A multi-step injection moulding process where two or more components mould over each other. It's a two-step process often referred to as over-moulding.

**Plastic Fasteners:** Crafted with vinyl, plastic fasteners are manufactured through injection moulding. It has notable advantages over metal fasteners, as the materials cost less and don't rust or conduct heat or electricity. Provides touch protection of electrical connections.

# Top Considerations in Automotive Design Projects

No matter how sophisticated or advanced, electronic components must be attached reliably and securely to deliver optimum performance. Fasteners for use with PC boards satisfy component-to-board, board-to-board and board-to-chassis attachment needs.

Many factors must be considered when designing automotive projects to ensure longevity, conductivity, technical cleanliness and structural integrity, including:



### Corrosion

Corrosion resistance is critical when selecting fastener materials. Vehicle parts can corrode due to adverse weather conditions which can lead to safety issues.



### Strength

A proper assembly will be supported by the load capacity of the fastener.



### Costs

Incorrect material selection and poor assembly can dramatically reduce the product's lifespan and incur high replacement costs. In addition, decreased installation cycle times and costs can be achieved through in-die installation.

## PEM® FASTENERS DRIVE SUCCESSFUL DESIGNS

As a leading manufacturer for the automotive electronics industry, PEM®'s self-clinching fastener solutions are commonly used to provide a stronger, cleaner and more reliable solution for your design needs. PEM® developed eConnect™, the world's first current-carrying fastener technology, to solve our customers' most challenging electrical applications. Check out our Automotive Electronics design guide to find out more.

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# Fasteners in the Electric Vehicle and Charging Industry

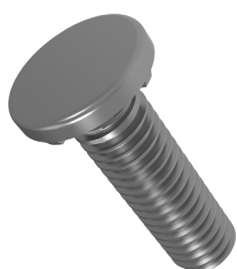
It was reported that electric car sales — including fully electric and plug-in hybrids — doubled in 2021 to a record 6.6 million.





# Common Fastener Types for Electric Vehicle and Charging Industry

Similar to materials used in the automotive electronics industry, copper, steel and aluminium are the most widely used panel materials in electric vehicle projects. Standard fasteners used are:



## HFE/HFH/THFE Heavy Duty Studs

HFE (heavy-duty) studs are designed with an enlarged head diameter that projects above the sheet material and provides maximum pull-through in sheets as thin as 0.8mm” — recommended for use in steel or aluminium sheets.

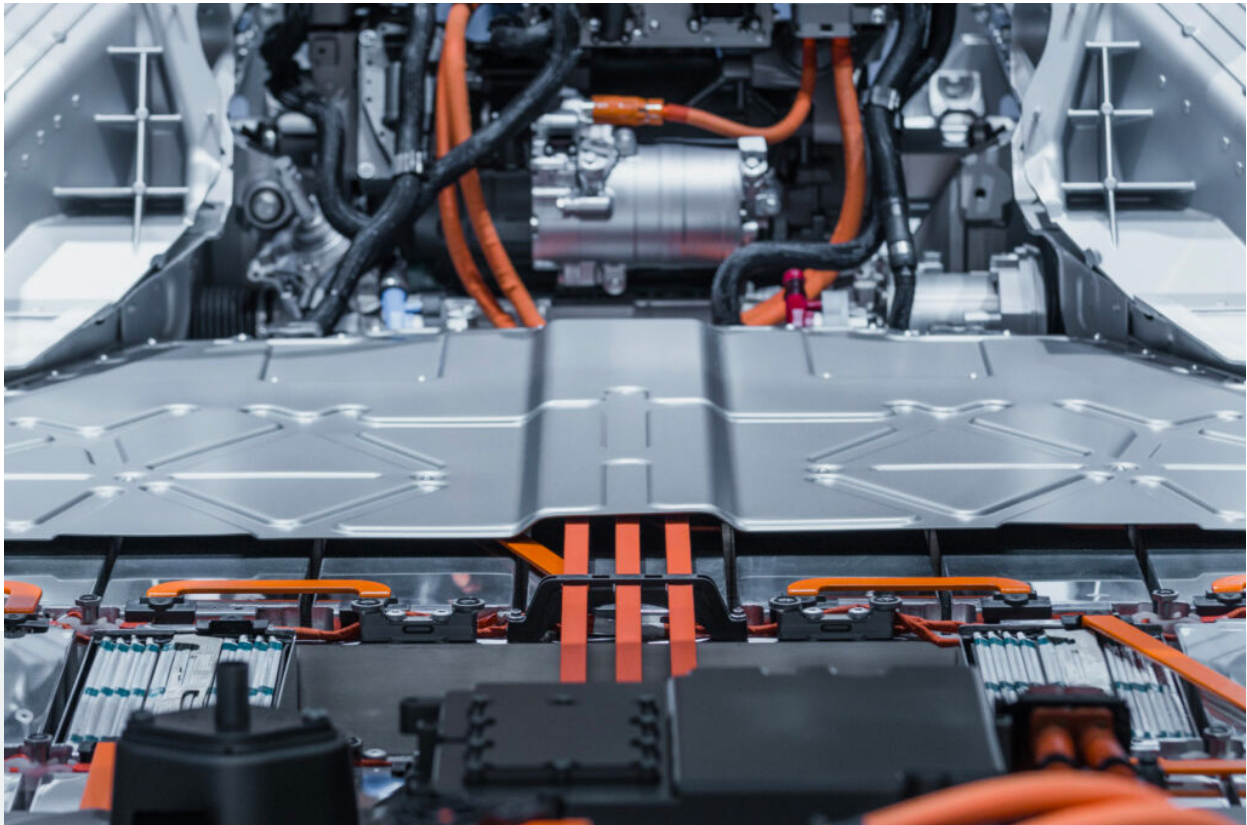


## Blind Rivet Nuts

Blind threaded inserts (rivet nuts or blind threaded rivets) provide strong and reusable permanent threads in sheet materials where only one side is accessible for hardware installation.

## What Are the Common Materials?

Copper has the highest electrical conductivity rating above all other common metals and is the most utilised material in electric vehicles.



## PEM<sup>®</sup> Fasteners Provide EV and Battery Innovation

As one of the only dedicated fastener manufacturers in the EV industry, PEM<sup>®</sup>'s self-clinching fastener solutions are commonly used to provide a better alternative when designing vital electrically powered vehicle components. To learn more, check out our EV services page.

[VISIT THE SERVICE PAGE](#)



# Fasteners in Data Communications and Telecommunications

The datacom and telecom industries are pressured to put more technology into smaller spaces in a shorter life cycles with reduced budgets. Proper fasteners can play an important part in facilitating this demand.

Using the right fastener can keep equipment strong, yet compact.



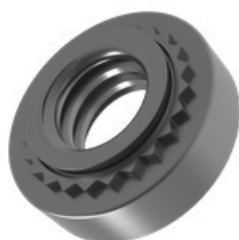
# Common Fastener Types for Data Communications and Telecommunications

Specific types of fasteners and applications used in this industry include:



## Captive Panel Fasteners

Captive panel screws are designed to help keep parts to a minimum and eliminate risks associated with loose hardware that could fall out and damage internal components. Panel fastener assemblies are ideal to attach metal panels or thin material components in applications where subsequent access will be necessary.



## Self-Clinching Fasteners

Self-Clinching fasteners provide strong threads in thin steel and aluminium panels, especially in telecommunications. They can be installed into a pre-prepared hole and work with a special clinch feature. When the part is clinched into the hole, it allows for strong torque-out and push-out performance.



### Surface Mount Technology

Surface mount technology can be used to apply fasteners to printed circuit boards. This uses a system in which various types of fasteners are adhered directly onto a solder pad on the surface of the PCB, using the same soldering processes as the board's other electronic components. This can increase productivity as well as saving costs and reducing scrap.

## Top Considerations in Designing Data and Telecoms Projects



**Product performance:** A project is only as strong as the components inside. The network and technology involved need to be robust for the structure to work as intended.

## PEM<sup>®</sup>'s RELIABLE DATA AND TELECOMS FASTENING SOLUTIONS

PEM<sup>®</sup>'s innovative self-clinching fastening solutions can improve any datacom or telecom application. Check out our Data and Telecom design guide to learn more about the specifications and logistics.

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# Fasteners in Consumer Electronics

The demand for complex, compact and lightweight electronic products continues to grow daily. Consumer electronics use a variety of compact and adaptable fastening solutions depending on the product, including wearable, handheld, computing and Internet of Things (IoT) products.



# Common Fastener Types for Consumer Electronics

Micro-fasteners are the most common type used in consumer electronics and can be installed automatically in mass production.

Fasteners used in consumer electronics include:



## Threaded Self-Clinching and Flaring Micro Standoffs

Mount and/or space components in applications with limited footprint for attachment hardware. Flaring micro standoffs attach permanently to any thin panel, including metal or stainless steel, plastics and printed circuit boards.



## Micro TackPins and FlexTacks

Micro TackPins and FlexTacks will accommodate those sheet-to-sheet attachment applications where disassembly won't be required. These fasteners can be installed in either aluminium or stainless steel sheets and the top sheet can be made from any material.



## Threaded Self-Clinching Micro TackScrews

Enable cost effective sheet-to-sheet attachment by simply pressing into place. Can be removed by simply unscrewing, similar to other threaded fasteners.



### Micro TackSerts

Enables attachment of sheet metals to plastics or other non-ductile materials, like cast magnesium or aluminium.



### Threaded Micro Inserts for Plastics

Used for plastic components, micro insert fasteners can be installed using heat-staking, ultrasonic or in-mold processes.



### Self-Clinching Pins

Self-clinching pins have chamfered ends that make mating hole alignment easy. This satisfies demanding micro positioning and alignment applications.

**Other fastening solutions are available for plastic and PC board applications.**



## What Are the Common Materials?

Fastening in consumer electronics can include self-clinching, flaring, broaching, or surface mount processes. Due to the specifications of many consumer projects, such as laptops and wearables, micro thread fasteners are available as small as M0.8.

Materials needed when designing and manufacturing fasteners in electronics include:

- Various stainless steels
- Carbon steel
- Aluminium

## Top Considerations in Consumer Electronics Production

**The design and engineering requirements of the application:** Extremely small micro fasteners aren't scaled-down versions of larger counterparts. Unique features engineered into a micro fastener are critical to the project's overall design.

### ENSURING IOT INNOVATION WITH FASTENER RELIABILITY

For the full specifications and product descriptions of all PEM® Micro-fasteners, take a look at our Consumer Electronics design guide.

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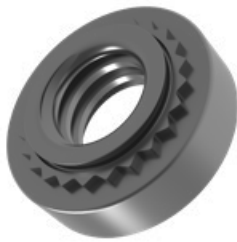
# Fasteners in the Medical Sector

Effective fastener solutions in the medical sector is an essential part of facilitating medical innovation. The right fastening technology must be applied to new medical and clinical systems.



# Common Fasteners for the Medical Sector

Types of fasteners used in the medical sector include:



## Self-Clinching Fasteners

Self-clinching fasteners provide strong threads in thin steel and aluminium panels, this is suited for medical device installation. They can be installed into a pre-prepared hole and work with a special clinch feature. When the part is clinched into the hole, it allows for strong torque-out and push-out performance.



## Inserts for Plastic

Employing press-in, molded-in or heat/ultrasonic installation, inserts provide strong and reusable permanent threads in plastic.

## What Are the Common Materials and Specifications?

Various materials work well in fastening processes when designing medical devices and equipment. These include:

- Brass
- Stainless Steel
- Aluminium

# How PEM<sup>®</sup> Provides Solutions for Design Engineers

**Unsure about which provider to turn to for reliable fasteners? With more than 80 years of industry-leading innovation, the PEM<sup>®</sup> design guide will expand your design options.**

The main benefits of our fastening products include:

- **High strength and reliability:** Stronger threads and/or attachments in metal as thin as 0.2mm.
- **Process installation:** Parts are installed into a plain round hole with no secondary operations required.
- **Cost-saving solutions:** Decreased installation cycle times and product quality for effective long term reliability. No matter the challenge, PEM can deliver customised solutions.
- **Design flexibility:** Can be installed into dissimilar metals.
- **Clean process:** Self-clinching fasteners are the most environmentally-friendly option on the market, with no concerns from welding.

To learn more about our range of solutions, check out our catalogue below, which covers all our fastening products to suit your needs.

[DOWNLOAD THE PEM CATALOG](#)



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