

A collage of four diamond-shaped images arranged in a larger diamond pattern. The top diamond is solid blue. The right diamond shows a close-up of a white electric vehicle charging port with a black cable plugged in, illuminated by green light. The bottom-left diamond shows a hand interacting with a futuristic, glowing blue digital interface with the text "Self-Driving" visible. The bottom-right diamond shows a stack of black server racks with green indicator lights.

PEMEdge™ TECHNICAL CLEANLINESS

*Exceptional Performance Through
Clean Processes and Analysis*

Automotive Electronics | Electric Vehicles | Medical | Pharmaceutical | Semiconductor | Consumer Electronics | Industrial



SEE HOW THE INNOVATIVE THINKING BEHIND PEM® FASTENERS CAN TAKE YOU FURTHER.

With PEM® brand fastening solutions, you get 75+ years of industry innovation, global manufacturing locations, high-quality catalog and custom parts, and expert support to help you go further and solve tomorrow's most significant challenges.

Whatever the application, our fasteners can provide bigger cost savings, greater reliability, and critical clean performance.

Lightweighting
Reduced Fastener Footprint
Faster Installation
Safety Critical Reliability
Clean Performance

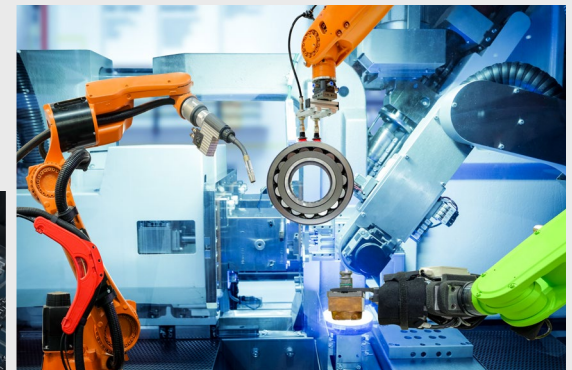
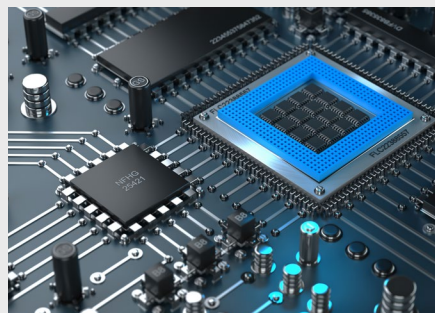
TECHNICAL CLEANLINESS STARTS WITH PEM® FASTENING SOLUTIONS

The demand for technical cleanliness has risen sharply in recent years. What started out as a quality control process for the automotive market has become a priority for many industries including medical, semiconductor, consumer electronics, and electric vehicles.

As market systems grow in complexity, the components going into them have become smaller and more compact. The risk of assembly damage or system failure from particle contamination is higher than ever.

To ensure technical cleanliness and the exceptional performance of our PEM® fastening solutions, PennEngineering® uses the most sophisticated cleaning and testing processes found in the industry.

Clean starts here.



DEFINING TECHNICAL CLEANLINESS

Particle contamination can have immediate or long-term effects on system performance and reliability. While most contamination occurs during manufacturing, it can also happen during material handling, cleaning, packaging, and storage.

To achieve the absence of particulate contamination is to achieve technical cleanliness.

In 2005, standards pertaining to technical cleanliness for the automotive industry were introduced. These standards, along with new guidelines defined specifically for other industries, are the foundation for how PennEngineering® measures the technical cleanliness of their fastening products.

CLEAN STANDARDS

PEM® fastening solutions are compliant with the following industry and international standards for technical cleanliness:

VDA 19 Part 1 - Inspection of Technical Cleanliness

Describes the inspection methods and conditions that determine and quantify particulate contamination. Also states the method for documenting cleanliness specifications for components.

VDA 19 Part 2- Technical Cleanliness in Assembly

Guides the planning of processes for the removal and prevention of particles during the assembly process.

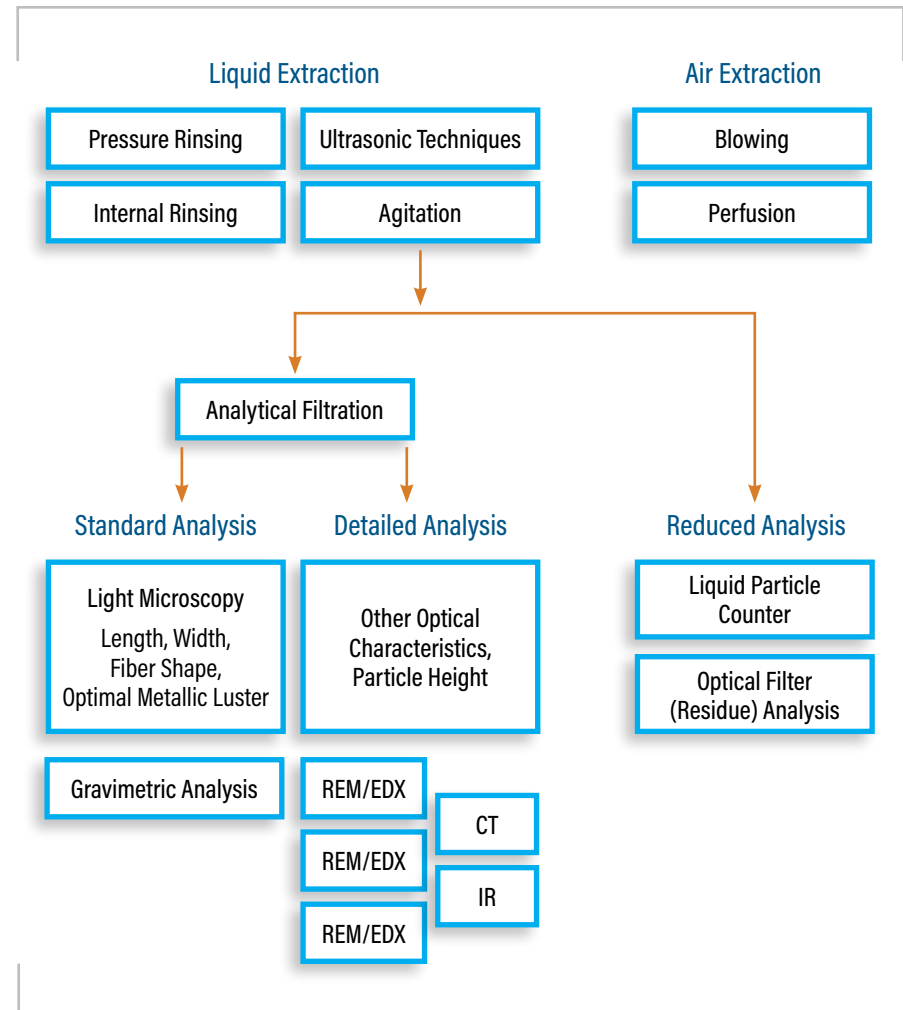
ISO 16232

International counterpart standard to VDA 19 that determines particulate contamination through cleanliness inspection.

ZVEI: Technical Cleanliness in Electrical Engineering

VDA 19/ISO 16232 compliant guidelines for technical cleanliness from German Electrical and Electronic Manufacturer's Assoc.

FIG. 1: TEST METHOD AS PER VDA 19 PART 1



PEM® CLEAN LAB

The technical cleanliness of a component ensures its quality and ability to contribute to the long lifespan of a product. Even the smallest particle contamination can put performance at risk.

Launched in 2020, the new PEM® Clean Lab provides comprehensive cleaning and testing capabilities using the most advanced equipment in the industry.

Clean Lab operations give us the ability to achieve technical cleanliness of PEM® fastening products in accordance with customer specifications and ISO 61232 and VDA volume 19 standards.

Processing

Extraction - Filtration - Drying and Weighing

Our extraction system provides thorough particle analysis of components, suitable for very small and small sizes (up to 30 cm). An innovative alternative to reducing membrane drying time by nearly 90% compared to conventional membrane preparation.

Cleanliness Analysis

Reliable - Reproducible - Documented Results

Complete system for visual inspection and standardized analysis of particle sizes 5/15/35 µm. Fully automatic, allowing for higher sampling rate. Led-/POL-lighting capability for faster, more precise detection of metallic and non-metallic particles from 5 µm.



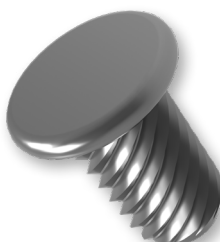
MEET YOUR CLEAN REQUIREMENTS WITH PEM® FASTENING SOLUTIONS

Our portfolio of innovative PEM® fastening solutions is one of the largest and most diverse you can find. In addition to meeting the clean requirements that many of today's industries demand, our fasteners can provide significant value and cost savings to your most complex applications.



Blind Nut and Standoff Range

Protects internal components from intrusion of screws and will contain particles when mating screw is not removed after final assembly.



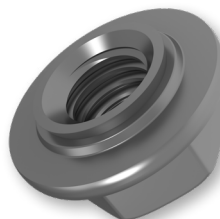
Microproduct Range

microPEM® TackSert® pins and fasteners are easy to install and ideal for highly-compact consumer electronics applications.



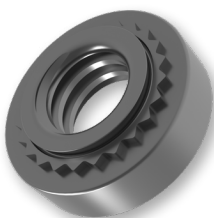
Stud Range

Most commonly used in busbar assemblies, the forming manufacturing process of our stud range reduces the risk of contamination.



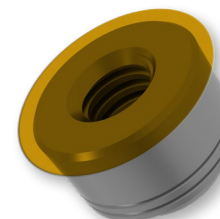
Self-Clinching Spinning Nut Range

PEM® SCN Spinning Clinch Nuts minimize the number of parts in an assembly, reducing risk of contamination from loose hardware.



Nut Range

PEM® S™ Nuts are self-clinching and provide load-bearing threads in thin steel or aluminum sheets with high pushout and torque-out resistance.



SMTSO™ Nut and Standoff Range

Mount on PC boards in the same manner and at the same time as other surface mount components, reducing handling and risk of board damage.



GET PEM® SUPPORT ANYTIME, ANYWHERE

No matter where you are in the world, PEM® support services are there. Our locations throughout North America, Asia, and Europe provide complete global support at the local level.

PEM® support services that are accessible around the world include:

- Engineering & Application Support
- PEMEdge™ Teardown Services
- Product Testing
- Technical Support
- Training



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