Product portfolio

Interior · Exterior
New Mobility · Autoneum Pure.
Measurement Systems · Simulation Tools
**Autoneum** is the global market and technology leader in acoustic and thermal management for vehicles and partner for automobile manufacturers around the world.

The Company develops and produces components that enhance a quiet and comfortable driving experience with a low environmental impact at the same time.
Interior Floor

Autoneum’s interior floor products make the vehicle lighter, more comfortable and environmentally-friendly – while providing optimum acoustic performance at the same time. In addition, these multi-functional components also meet the increased requirements for comfortable vehicle interiors thanks to their outstanding cleanability, low odor and high durability.

For further information, please contact:
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Needlepunch carpets have until now been seen as cost effective textile surfaces but prone to flattening and wear over lifetime. With Di-Light, Autoneum now offers a more durable non-woven carpet thanks to its great abrasion resistance and resilience. The technology additionally allows an attractive esthetics even in highly shaped carpet areas due to its uniform surface appearance. The needlepunch carpet absorbs noise entering the passenger compartment from the road or engine bay, thereby contributing to enhanced driving comfort.

The enhanced resistance-to-weight ratio and the homogeneous look and feel of the carpet are based on newly developed fibers. Depending on the product variant, they consist of up to 97% of recycled PET which is reflected in the carpet’s excellent environmental performance.

**BENEFITS**
- Homogeneous look and feel
- Highly resilient and wear-resistant
- 97% Made from up to 97% recycled PET

With Relive-1, Autoneum offers an innovative tufted carpet for the compact to premium class that meets the highest requirements of sustainable mobility. Relive-1 carpets are particularly eco-friendly: Only recycled PET bottles are used to manufacture the carpet yarns.

At the same time, Relive-1 carpets have a significantly higher abrasion resistance compared to standard carpets in compact to large class vehicles. Thanks to the vertical alignment of the filaments and the water repellency of polyester, they are also easy to clean and particularly stain-resistant. Small particles and liquids can be removed with no residual traces, which is a key benefit for recreational vehicles like SUVs.

**BENEFITS**
- Easy to clean from dirt
- Improved stain resistance
- 97% Made from up to 97% recycled PET
Hybrid-Acoustics provides automobile manufacturers with a versatile acoustic solution for inner dashes, floor insulators and inner wheelhouse insulators. This hybrid technology for vehicle interiors offers a unique performance-to-weight ratio: Hybrid-Acoustics is up to 50% lighter than conventional solutions, thus the lightest hybrid technology on the market. Furthermore, it consists largely of recycled materials, which reduces CO₂ emissions during the production process.

Thanks to the dynamic stiffness-controlled layer (DSL), the acoustic properties of Hybrid-Acoustics parts can be locally tuned to maximize absorption or insulation performance. As a result, Autoneum’s Hybrid-Acoustics parts can be designed to tackle any acoustic challenges in vehicles. Statistical energy analysis (SEA) simulations that take the available packaging space into account, the acoustic loads and the part’s environment are used to find the most optimum material configuration before a physical prototype of the car is available.

Prime-Light is a further advancement of Autoneum’s successful Ultra-Light technology. Components based on this innovative technology can be formed into a wide variety of different shapes and sizes. This way they adjust optimally to the individual body-in-white shapes and take account of increasingly complex production processes in vehicle construction.

Prime-Light also convinces with low weight while maintaining the same level of acoustic protection. Thanks to a 30% weight reduction compared with previous models, Prime-Light-based inner dashes and floor insulators save more than two kilos of a vehicle’s weight on average. Prime-Light-based components consist of thermoplastic cotton felt blends in which the share of recycled materials is more than 60% depending on the application-specific composition.
Injection Fiber Process (IFP-R2)
Technology for optimal acoustic performance

Autoneum is setting new standards in felt technology. The fully-automated IFP-R2 production systems are based on the Rotating Injection Fiber process which is an innovative, patented manufacturing process from Autoneum used for manufacturing tailor-made felt blanks for inner dashes and floor insulators in vehicles. These blanks with locally adjusted area weight are then molded into the shape required for the final product.

The advanced process leads to better acoustics, lower weight and the possibility to locally increase the compressional stiffness of carpet systems for improved quality perception. Autoneum also achieves a higher environmental performance of the production process, as up to 75% of recycled fibers are possible and fewer fiber scrap is generated, which then can additionally be immediately recycled by the line.

**BENEFITS**
- Optimized part weight and acoustics
- Increased compression hardness
- Up to 75% recycled fibers
Exterior
Engine Bay

Engine bay is the vehicle area where most of the noise and heat sources are concentrated. With innovative lightweight and multifunctional components, Autoneum helps automobile manufacturers to address new regulations for pass-by noise and CO₂ emissions.
Hybrid-Acoustics PET
Sustainable noise protection in the engine bay

Hybrid-Acoustics PET is used to encapsulate electric motors, thereby reducing noise directly at the source and particularly attenuating high-frequency sounds of the electric drive unit. This key technology accordingly ensures optimum noise protection in the passenger cabin and greater driving comfort.

At the same time, components made of Hybrid-Acoustics PET convince with their low weight. Compared to conventional insulators, they are up to 40% lighter, thereby contributing to a greater driving range. They are also flameproof and find application as powertrain-mounted insulators for combustion engines thanks to their temperature resistance of up to 180°C.

The parts, which consist to a large extent of recycled PET fibers, are produced waste-free and are completely recyclable – an outstanding life cycle assessment compared to equivalent components in the engine bay.

Innovative engine encapsulations enhance the efficiency and sustainability of vehicles. The heat storage in the engine bay achieved with the encapsulations reduces fuel consumption at the next cold start, which in turn leads to lower vehicle emissions.

Theta-FiberCell, the key technology for engine encapsulations, combines the benefits of the fiber carrier Theta-Fiber and foam absorber Theta-Cell and is based on Autoneum’s long-standing experience. It takes into account customer-specific product requirements such as optimum noise protection and integrated thermal insulation. For instance, Theta-FiberCell is barely flammable and can withstand temperatures of up to 200°C.

As well as the acoustic absorption of interior (by up to 4 decibel) and exterior (by up to 8 decibel) noise, the fiber-foam solution enables heat to be stored for long periods after the vehicle has been parked. After having been switched off for 12 hours, the temperature of an engine with Theta-FiberCell encapsulation is up to six degrees higher than one without this special insulation.
Theta-Cell is an innovative polyurethane foam material developed by Autoneum. It is used for different applications such as lightweight and multifunctional hoodliners, outer dashes, tunnel insulators and battery covers. Compared with conventional acoustic absorbers, Theta-Cell components can be used to achieve weight reductions of up to 60% as well as high thermal insulation.

Products based on Theta-Cell are able to withstand temperatures of up to 180°C at peak; they meet customer requirements and legal provisions with regard to the non-flammability of components for the engine bay. They are also oil- and water-repellent and help to reduce the interior and exterior noise of vehicles.

The engine bay compartment is a major source of heat and noise in any vehicle. Therefore, it has to be acoustically and thermally isolated in order to increase passengers’ comfort. For that, Autoneum offers Theta-Fiber, a robust and multifunctional non-woven material.

Theta-Fiber stands out against conventional non-woven components, above all thanks to its high temperature resistance: While traditional thermoplastic materials are able to withstand temperatures of up to 150°C, noise and thermal insulation parts based on Theta-Fiber can also be applied at temperatures of up to 200°C.

Compared to traditional heavy engine covers made of solid plastic, Theta-Fiber engine covers achieve weight savings of up to 60%, reduce the interior and exterior noise of vehicles and insulate heat generated by the engine.
Underbody

Textile-based and correspondingly lightweight underbody systems of Autoneum absorb noise and therefore simultaneously reduce the interior and exterior noise of cars. They also enhance the aerodynamics of a vehicle. This leads to lower fuel consumption and reduced vehicle emissions.

For further information, please contact:
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**Ultra-Silent**

The lightest textile underbody system

With underbody systems made of Ultra-Silent, Autoneum offers the most lightweight textile under floor systems for vehicles. They are up to 50% lighter compared with equivalent plastic components. Underbody systems made of Ultra-Silent also convince with a high degree of impact resistance and optimum stone chip protection. The PET-based, glass-free mono-material is resistant against water and heat and fully recyclable.

At the same time, Ultra-Silent absorbs sound and in doing so reduces the vehicle noise by up to 2 decibels. In addition, under floor systems made of Ultra-Silent enhance the aerodynamics of vehicles by reducing their air resistance. This contributes to lower fuel consumption and thereby reduces CO₂ emissions. The sophisticated engineering behind Ultra-Silent helps reduce mass, the number of fixation points, part numbers, overall complexity and costs. This makes Ultra-Silent a convincing value offer for car makers.

In electric cars, undercovers made of Ultra-Silent are installed underneath the battery casing, providing the battery cells with the best possible protection against extreme ambient conditions.

**Benefits**

- Lightest textile underbody technology
- Absorbs sound, thereby reducing vehicle noise
- Optimum stone chip protection
- 100% PET and completely recyclable

**Mono-Liner**

Meets highest sustainability standards

Mono-Liner is Autoneum’s latest technology for wheelhouse outer liners. Mono-Liner-based components convince thanks to their lightweight construction, thereby contributing to lower vehicle weight with correspondingly less fuel consumption and CO₂ emissions. They also ensure a greater driving range for electric vehicles.

Mono-Liner-based wheelhouse outer liners are made completely out of PET, of which up to 70% are recycled fibers. All in all, more than 70 PET bottles are reused in one set of these sustainable components. The excellent life cycle assessment is also based on their particularly resource-saving manufacturing. Production cut-offs of Mono-Liner can be processed into pellets and completely returned to the manufacturing process as fibers.

**Benefits**

- 50% lighter than equivalent parts made of plastic
- Reduces interior and exterior noise
- Excellent flammability resistance
- Consists of up to 70% recycled PET fibers
Heatshields are used in vehicles primarily to provide protection against the heat that arises in the engine bay and the exhaust system. In order to shelter this radiant warmth, these shields resist heat up to 500°C. Acoustic heatshields based on Autoneum’s RIMIC technology additionally reduce the noise emission of the vehicle thanks to their integrated acoustic function. The noise reduction is achieved by means of a special perforation developed by Autoneum. It converts the airborne sound into thermal energy and absorbs it. Using in-house production processes, these perforations are applied specifically only in predefined areas to ensure optimal heat protection and durability. The acoustic performance of heatshields is controlled by the number and density of openings per shield. RIMIC can be used as a single layer, with glass fiber mats or in combination with the Theta-Cell acoustic absorption technology in order to facilitate the absorption of high-frequency sounds of between 2 – 6 kHz.

**BENEFITS**
- Maximized tunable acoustic performance
- High durability thanks to optimized design of perforation area
- High heat protection
Major industry trends such as electromobility are raising the requirements on future vehicles. There is a growing demand for components designed to make vehicles significantly lighter, quieter and environmentally-friendly while enhancing driving comfort. As innovation leader in acoustic and thermal management, Autoneum is manufacturing products and technologies that meet the requirements of modern mobility.
Optimized product portfolio for e-mobility

Frunk based on Ultra-Silent
Higher driving range for electric vehicles

With its innovative front trunk for electric vehicles, Autoneum offers the optimal solution for more storage space and longer driving pleasure. Thanks to its textile fibers, the multifunctional frunk made of Ultra-Silent is particularly light and replaces heavier plastic solutions common in electric vehicles today, thereby contributing to less electric energy consumption and a higher driving range.

At the same time, the component improves vehicle acoustics by reducing annoying noises at the source due to its sound-absorbing material composition. The Ultra-Silent-based frunk is highly sustainable as well. It is made entirely of PET and contains up to 70% recycled material.

IN THE SPOTLIGHT

Electromobility
Autonomous driving
Shared mobility

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Components

- Carpet systems
- Inner dashes
- Wheelhouse outer liners
- Underbody systems
Autoneum Pure.

Technologies with an excellent environmental performance throughout the entire product life cycle – that is what „Autoneum Pure.” stands for. Components carrying this label are made partially or entirely of recycled materials, which have a significantly low environmental footprint. Moreover, the production waste can be reclaimed during the manufacturing process and reused again. Being lightweight, „Autoneum Pure.” technologies also reduce vehicle weight, thereby lowering both fuel consumption and CO₂ emissions.

**Hybrid-Acoustics PET**
- 40% lighter than conventional insulators
- Mono-material and fully recyclable

**Di-Light**
- Up to 97% recycled PET
- 20% lighter than standard needlepunch carpets

**Prime-Light**
- Made of more than 50% recycled organic cotton fibers
- Fully recyclable

**Ultra-Silent**
- 50% lighter than plastic underbodies
- Made of 100% PET

**Mono-Liner**
- Up to 70% recycled fibers
- 50% lighter than plastic components

**Relive-1**
- Up to 97% recycled PET
- Allows closed material loop in production

**IFP-R2**
- Made of up to 80% recycled cotton fibers
- Allows closed material loop in production

**Prime-Light**
- 80% recycled PET
- 50% lighter than plastic underbodies

**Mono-Liner**
- Up to 70% recycled fibers
- 50% lighter than plastic components

**Relive-1**
- Up to 97% recycled PET
- Allows closed material loop in production
Autoneum has been the leading supplier of specialized measurement tools in automotive acoustics for 50 years. The innovative systems can be used to assess and compare noise-reducing components in next to no time. This facilitates the compilation of sound packages for vehicle manufacturers, while at the same time ensuring that customers receive a product that is optimally tailored to their needs. Autoneum’s measurement systems have become globally recognized industry standards that are successfully used by vehicle manufacturers, suppliers and research institutes alike.

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AFR

The AFR (Airflow Resistance Measurement) system was designed to measure the airflow resistance of porous materials in an easy way without compromising measurement quality. The results comply with ISO standard 9053-1:2018.

**Dimensions**
- **600 x 600 x 2 260 mm (L x W x H)**
- **Sample diameter:** 100 mm
- **Airflow Source:** Vacuum pump or compressed air
- **Standards:** ISO standard 9053-1:2018
- **Output:** Airflow resistance, airflow resistivity

**Benefits**
- Extremely robust, stable and durable construction
- Easy and intuitive operation
- Measurement of thin materials (fabrics or non-wovens)

Alpha Cabin

Alpha Cabin is the leading system to measure acoustic absorption properties of materials and components that contribute to noise reduction in vehicles. The system is particularly suitable for validation and quality assurance of the measured data. A recognized standard by car makers, the system is used in over 20 countries worldwide.

**Dimensions**
- **3 220 x 2 370 x 2 030 mm (L x W x H)**
- **Volume:** 6.44 m³
- **Sample surface area:** 1.2 m² (standard sample), 0.6 – 2.6 m²
- **Frequency range:** 400 – 10 000 Hz
- **Standards:** Based on ISO 354:2003
- **Output:** Absorption coefficient, equivalent absorption area

**Benefits**
- Results enable specifications for the absorption properties of NVH products
- Fast and repeatable measurement processes
- Significantly smaller than normal reverberation rooms

APAMAT II

APAMAT II compares and classifies the complex range of soundproofing solutions currently used in the automotive industry. For instance, the system evaluates the effectiveness of NVH materials in terms of noise control, noise damping and noise insulation in just one system. Optionally, the system is compatible with the airborne excitation only, allowing the installation of loudspeakers in the excitation chamber.

**Dimensions**
- **1 760 x 1 180 x 1 865 mm (L x W x H)**
- **Sample size:** 840 x 840 mm
- **Frequency range:** 100 – 10 000 Hz
- **Output:** Overall acoustic efficiency

**Benefits**
- Measurement of acoustic efficiency by reproducing material performance in the car
- Combination of structure-borne and airborne excitation
- Quick and easy measurement

ARTIS3

The innovative ARTIS3 system features an optimized experimental set-up for the performance assessment of structure-borne noise of acoustic packages. The dedicated software for testing, archiving and analysis makes it easy for the user to find the best solution in terms of performance, weight or cost.

**Dimensions**
- **920 x 920 x 1 490 mm (L x W x H)**
- **Frequency range:** 100 – 800 Hz
- **Sample size:** 963 x 565 mm
- **Output:** Structure-borne insertion loss

**Benefits**
- Robust evaluation of the acoustic effectiveness of a passive treatment versus structure-borne noise
- Immediate and easy measurement process
- Easy to transport thanks to comparatively small size

CAR+ (Concentric Airflow Resistance Evaluator)

The control of airflow resistance in the production of materials and components is a growing requirement in the automotive industry. CAR+ is an apparatus designed to measure the airflow resistance of materials and parts.

**Dimensions**
- **1 500 x 950 x 1 800 mm (L x W x H)**
- **Dimensions of standard sample:** 180 x 620 mm
- **Suction head speed:** 7 m/min
- **Output:** Cleanability index, dirt repellency index

**Benefits**
- Works with all carpet surfaces (tufted and non-woven)
- Repeatability of the results ensured
- Quantitative assessment of carpet cleanliness

Carpet Cleanability Analyzer

Autoneum developed the Carpet Cleanability Analyzer measuring system to conceptualize carpet systems during predevelopment of new vehicle models. The underlying process enables the cleanability and dirt resistance of different carpet surfaces to be analyzed and compared. It can be supplied together with standardized soiling particles and tools for sample soiling preparation.
ELWIS

ELWIS (Evaluation of Light Weight Impedance System) offers a full, reliable and rapid characterization of the physical parameters of the porous materials (Biot-Allard parameters). The system consists of the ELWIS-A and ELWIS-S devices, which can be used independently from each other, although both applications are needed for a complete material modeling.

**BENEFITS**

- Rapid, easy and reliable data evaluation
- Adaptable to a wide range of materials and parts
- Easy-to-operate

Isokell

Isokell offers a flexible method geared specifically to the needs of the automotive industry for measuring airborne noise insulation and the transmission loss of vehicle components. The system is easier to use and less costly than traditional transmission loss suites.

**BENEFITS**

- Measurement of flat samples or components
- Fast and easy measurement procedure
- Used in combination with Alpha Cabin, it can also measure absorption

PORPOS

PORPOS measures the porosity (ratio of air to overall volume) of felts and foams on the basis of the so-called air-based method. Via a process of alternately compressing and decompressing air, the porosity of the sample under analysis can be derived from the resulting pressure changes.

**BENEFITS**

- Fast and easy measurement procedure
- Automatic evaluation of the measurement results
- Suitable for a wide range of porous materials such as felts and foams

ATLAS

New testing standard for measurement of acoustic insulation

ATLAS – short for “Airborne Transmission Loss Analysis System” – measures the acoustic insulation and transmission loss of interior components such as carpets, inner dashes and floor insulators. While developers previously had to analyze the NVH behavior of interior parts using material samples of around one square meter in size, ATLAS makes this process faster, cheaper and more environmentally-friendly. It enables measurements of small samples with a diameter of no more than ten centimeters, which substantially decreases the amount of material used. Thanks to four highly sensitive microphones, only two trials are required to collect precise and valid test data, making the system especially suitable for quality assurance and repeatability of the results obtained. Users also benefit from time savings of up to 50% compared to the previous testing standard.

**BENEFITS**

- Overcomes limitations of current methods
- Measures insertion loss of single layers and multilayers on small samples
- Rapid, easy and reliable data evaluation
Simulation Tools

Autoneum provides a full range of simulation tools based on our long-standing expertise in vehicle acoustics and thermal management. These tools predict and optimize NVH in the concept phase in order to provide our customers with cost-effective solutions and reduced lead times. Thanks to our broad range of measurement systems, the data for this process can be evaluated thoroughly.

For further information, please contact:
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Optimizing the vehicle body structure and acoustic trim

Autoneum has developed a complete tool portfolio for state-of-the-art computer-aided engineering (CAE) for vibroacoustics, focusing on body vibration and acoustic trim performance. Our tools predict and optimize NVH in the concept phase in order to provide our customers with cost effective solutions and reduced lead times.

GOLD

GOLD is a unique simulation tool for the simultaneous improvement of a damping package and vehicle body panel shape. It exploits the Finite Elements (FE) analysis performed with NASTRAN (Superelement Technique for full body optimization) and uses an Autoneum modeling technique to simulate the application of damping material on vehicle body panels. GOLD automatically updates the FE model with possible shape modifications as set by the user: beadings, ribs and soapfilms.

SILVER

SILVER is a simulation tool which predicts the shape and ideal location of dampers based on a single vibration Finite Elements (FE) simulation performed with NASTRAN. SILVER rationalizes and simplifies the design process of a damping package by optimizing the overall weight and the distribution of pads among the different areas of the vehicle, making it possible to efficiently evaluate a particular damping solution (e.g. reference damping configuration versus a proposed modification). It is applied directly on the same FE models used by automobile manufacturers for NVH optimization.

Example
Reduction of damping package weight by 20% in floor area.
Same or better performance as original (same panel vibration).

Example
Refinement of baseline damping package with 15% weight reduction

11 design variables for the position and the thickness of damping patches.
27 design variables for the shape modifications on the panels: 20 beadings, 7 soap films.
Full vehicle simulation: 7 uncorrelated loading conditions.

BENEFITS

• Handles high number of design variables
• Customized shape modification

• Rationalized and simplified design process
• Provides ranking of damping package parts
Enhancing the acoustic performance of vehicle parts

High-performance software programs are used for the analysis, optimization and validation of the isolation and insulation properties of components for the vehicle interior floor, including carpet systems, inner dashes and floor insulators. The aim is to achieve the perfect balance between acoustic performance and product weight.

VisualSISAB

VisualSISAB calculates the absorption and insulation of sound package components with complex geometries and a wide range of different materials. It exploits the transfer matrix technique to represent the wave propagation through layers of porous materials, hard layers, foils or spacers. VisualSISAB enables material compositions and thicknesses of press-molded components already to be reviewed with respect to NVH requirements and adjusted if necessary during the CAD stage by means of computer-controlled simulations. This is a prerequisite for the development and manufacture of effective, lightweight and cost-efficient noise protection components.

Example

Area split to simulate transmission loss of dashes

Example

Workflow to link parts performance to vehicle targets

REVAMP

REVAMP can predict the impact of trim parts inside the passenger compartment. It is based on the existing Statistical Energy Analysis (SEA) theory. REVAMP is based on over 20 years’ experience in SEA modeling and is specifically designed to carry out typical sound package development and optimization tasks in the mid- and high-frequency range.

Example

Target cascading: Vehicle target

Improved dash design

Trim simulation

Import trim into SEA model

Component split

• Supports the building and analysis of SEA models of vehicles
• Allows determination of dominating acoustic transfer paths
• Cascades vehicle noise level targets down to acoustic component TL and ABS targets
• Compatible with other commercial SEA tools

Benefits

• Used for components in the vehicle interior, engine bay and body-in-white
• Fast design modifications and analysis on parts
• Performance result comparison with target curves
• Fast multilayer 3D constructions from CAD data

BENEFITS
Thermal management for the next vehicle generation

At global research and development centers, Autoneum carries out material testing on components as well as in vehicles and uses unique simulation software to design innovative packages that are tailored to customer needs.

Autoneum provides full engineering services for thermal performance, safety and storage from concept selection and material choice to part design and optimization by using computer aided engineering (CAE) software. Thanks to these solutions, the Company’s experts can analyze better design options faster and earlier in the vehicle development process.

Case study: E-motor and engine encapsulation pre-development workflow

Based on a smart and accelerated combination of Star-CCM+ and TAITherm, the cooldown duration and efficiency of engine encapsulations is evaluated in shorter time.

Case study: Improving battery performance and protection

With its specialized CAE software developed in-house, Autoneum supports customers in optimizing the thermal management of the battery. This includes the design of the battery structure with coolant circuits among others to calibrate temperature resistance. These simulations thereby help to improve battery performance and correspondingly result in lower energy consumption.

Assessment of interior parts for greater thermal comfort

In order to develop carpet systems, inner dashes and floor insulators that not only provide noise protection, but also optimal thermal comfort inside the passenger cabin, Autoneum offers state-of-the-art simulation tools. These programs factor parameters such as external and internal convection, surface and solar radiation, cabin conduction, heat storage or varying part insulation properties to simulate components that meet the special requirements for thermal management of vehicles. This is also key for electric cars as such components are needed to shield the passenger cabin from cooling or heating, thereby reducing the energy required for temperature regulation. Applying Autoneum’s simulation tools in predevelopment thus supports a higher driving range.

Case study: Carpet part simulation and mechanical testing

Combining virtual calculations with the Company’s mechanical testing expertise in the predevelopment of carpet systems also enables Autoneum to evaluate the compression performance of the floor system. This is crucial for enhancing part quality.
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