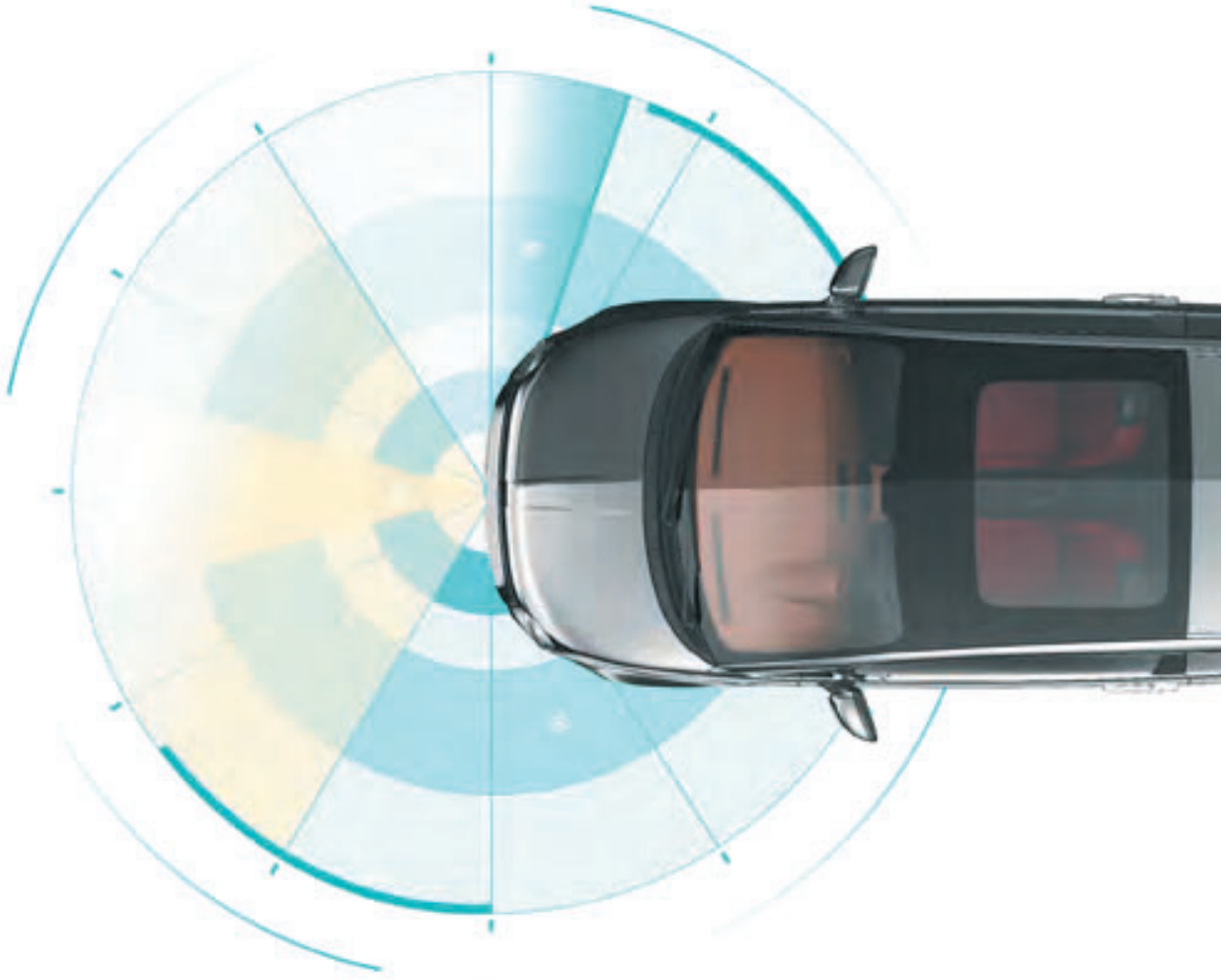
plasmatreat

FUTURE IS NOW

The future of the automobile has begun and with it, the way in which vehicles are manufactured. The Plasmatreat process for the pretreatment of surfaces paves the way for entirely new manufacturing opportunities in all sectors of the industry – from drives to lightweight construction and sensor systems.



Plasma technologies for the **Automotive** industry



Innovative Applications

FOR THE MOBILITY REVOLUTION

At Plasmatreat we harness the dynamics and power of plasma energy to change surfaces! This results in new, fast and environmentally friendly processes.

We enable residue-free fine cleaning and make surfaces reactive with plasma. Our innovative Plasma-Plus® coating technology creates bondings of previously incompatible materials and protects surfaces.

Our plasma processes accompany the changes in automotive engineering. Whether new chassis structures without a single welded joint, cold-formable, coil-coated sheets for the outer skin or functional battery coatings: Our Openair-Plasma® pretreatment has been established as a key technology in more and more applications within the last 20 years. **Our plasma technologies are instrumental in driving progress in areas such as sensor technology and e-mobility.**

With **34 international locations**, Plasmatreat is **the world's leading manufacturer of atmospheric plasma systems and equipment.**

Our vision:
Every surface a plasmatreated surface.

New vehicle concepts

REVOLUTIONARY WITH PLASMA

Mobility is changing: technological transformations such as **electrification, connectivity and autonomous driving** call for new vehicle concepts.

Our contribution: We ensure that compounds do not become fractures, that surfaces are pre-treated in an environmentally friendly manner and that they are safely protected from environmental influences.

Plasmatreat coatings completely replace VOCs and thus support production processes free of environmentally harmful emissions.

With this technology we create long-lasting connections for safety-sensitive areas such as vehicle sensors or battery modules. Leading automotive manufacturers have long experience of integrating our plasma treatments into their production chains to create fully automated and controlled inline systems. **For reliable and reproducible processes.**

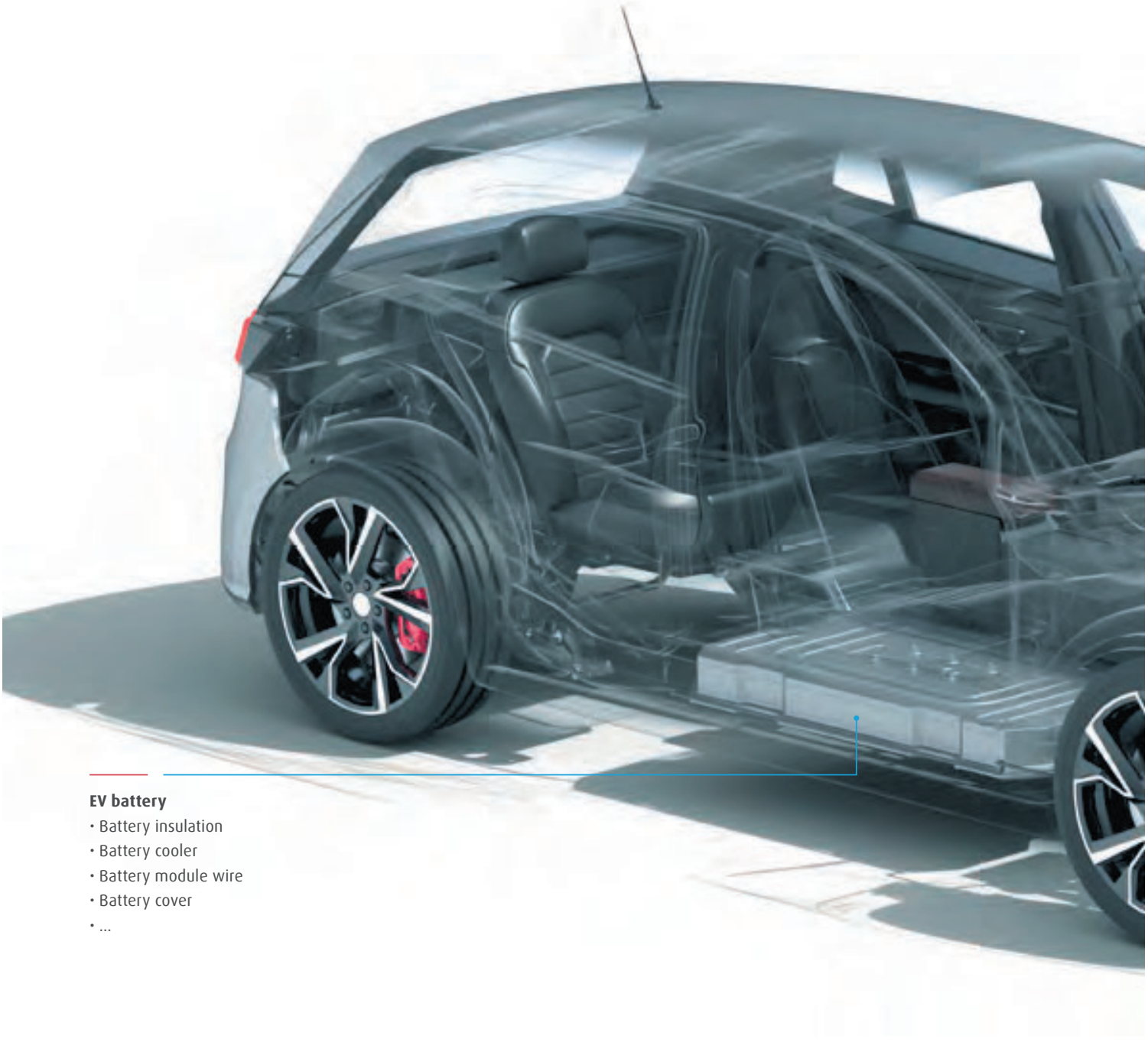
Pretreatment with Openair-Plasma® for structural bonding, for example in the chassis.

PlasmaPlus® for highly effective functional nanocoatings such as corrosion protection.



Over 100 applications

Over 100 differentiated applications used by major OEMs globally: From activating bumper plastic to treating sensitive electronics and displays. Plasma treatment has a wide variety of improving reliability in automotive manufacturing.



EV battery

- Battery insulation
- Battery cooler
- Battery module wire
- Battery cover
- ...

Interior
- Car seat
- Loud speaker
- Dashboard
- Airbag cover
- Display and touchscreen
- Push buttons
- Interior decoration
- Seat belt buckle
- Roof console
- Footrest
- Headrest
- Glove box
- Spare wheel well
- ...

Exterior
- Bumper
- Spoiler
- Door handle
- Door lock
- Door reinforcement
- Mirror cover
- Windscreen
- Sunroof
- EPDM profiles
- Wheel rim cover
- Brake pad
- Entrance trim
- Wheel cover
- Trunk door
- Emblem
- Wiper profiles
- Rocker panel
- B and C pillar cover
- AL-Rims
- ...

Electronics & Box
- Rear camera
- Park assistant
- Rain sensor
- Pressure sensor
- Door sensor
- Collision prevention sensor
- ABS control unit
- ESP control unit
- Electronic control unit
- Throttle valve
- Anti-crushing sensor
- Heat exchanger
- Air filter
- Transmission housing
- Radar housing
- Cables
- ...



Headlights
- Headlight
- Taillight
- ...

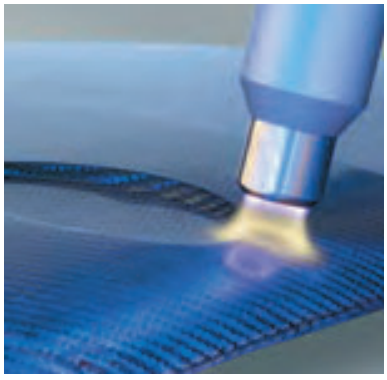
Engine & drive
- Gear housing
- Engine pump
- Engine block
- Turbo
- Steering system
- ...



Exterior vehicle parts



EPDM pre-treatment



Openair-Plasma® pre-treatment before bonding

STABLE BONDS FOR LIGHTWEIGHT CONSTRUCTION

When it comes to the range of electric vehicles, every kilogram counts. But the use of **lightweight materials** also has a favorable impact on the fuel consumption of vehicles with conventional drive systems.

So nowadays vehicle components are made from complex material combinations ranging from glass fiber-reinforced plastic (GFRP) to plastic-metal composites.

The reliable adhesive bonds required to join these composite materials can be achieved using **structural bonding and plasma-assisted hybrid manufacturing concepts** such as multi-component injection molding. Openair-Plasma® can be used to good effect here in the same way that it is used in the production of high-quality surfaces to ensure reliable paint adhesion.

APPLICATION EXAMPLES

- Surface activation before bonding roof modules with built-in sunroof
- Plasma microfine cleaning and activation before bonding windscreens
- Surface activation before coating PP bumpers and wing mirrors
- Cleaning PP or PBT door lock housings before foaming
- Cleaning and activating EPDM profiles before bonding



Interior vehicle parts

HIGH-QUALITY DECORATIVE TRIMS – COST-EFFECTIVE PRODUCTION

Inside the vehicle, functionality and aesthetics are equally important. To enhance the aesthetic appeal, interior parts may be trimmed with leather or entire sections such as the door module may be clad in leather or other textiles. But to achieve the highest quality finish, the materials must first be pretreated to ensure reliable adhesion. This is where our **plasma technologies** come into their own, providing **long-term stability and a flawless finish without using solvents.** Plasma nozzles mounted on industrial robots can also be used for the high-precision, rapid and environmentally friendly pretreatment of large interior vehicle components before coating, wrapping or backmolding. Complex parts such as instrument panels can be prepared in-line using a robot-assisted Openair-Plasma® system.



Openair-Plasma® pre-treatment of door modules



Plasma activation of dashboards

APPLICATION EXAMPLES

- Activation before wrapping interior components, e.g. door module
- Activation before bonding leather laminates to interior vehicle components
- Activation of the instrument panel to improve adhesion before foaming
- Activation of interior components made from ABS, PP, PC – e.g. the central console – before coating
- Activation of control elements before printing
- Plasma activation of the structural bond between the metal and CFRP in the vehicle seat





Openair-Plasma® coating of cameras



Openair-Plasma® activation of EPS modules



Openair-Plasma® activation of rain sensors

Electronics, sensors and box

OPTIMAL PROTECTION FOR SENSITIVE ELECTRONICS

Vehicle automation is on the brink of a quantum leap that could make driverless cars a reality thanks to smart sensors and connected high-tech electronics such as infrared, radar, laser and camera systems. But the driver assistance systems widely used today also require a multitude of sensors. These sensors must be protected from harmful environmental influences to keep them working without interruption.

Moisture, condensation, ice and chemicals combined with vibrations and extreme temperature fluctuations present a challenge to all materials used and to joint areas in particular. Metals have an affinity for water, unlike plastics.

Consequently, composite materials are highly susceptible to subsurface migration. This applies to components ranging from the microprocessor to the housing and is an even greater concern with live components.

Insulating, adhesion-promoting PlasmaPlus® coatings offer reliable solutions to this problem. For example, insulating and vibration-dampening potting for distance sensors; a wide variety of seals for battery and motor management systems and anti-fog coatings which enable cameras to operate even in extremely wet conditions.

APPLICATION EXAMPLES

- Cleaning and activating electronic control units and sensors
- Activating displays and touchscreens before optical bonding
- Treating the housing and electronics of reversing cameras
- Cleaning and activating the ECU control box before sealing
- Cleaning and activating before potting
- Activating the AdBlue sensor before sealing

Battery

STABLE PROCESSES – DURABLE MODULES

As the demand for electric vehicles rises, so too does the demand for reliable batteries to drive them. Furthermore, the market demands ever more efficient cells and at the same time, a reduction in the price per energy density.

Openair-Plasma® technology offers a range of solutions for the battery module assembly.

Intensive **microfine cleaning with Openair-Plasma®** is the ideal surface preparation to ensure the durable adhesion of seals, insulating foils and coatings. Activating foil-wrapped prismatic battery cells with Openair-Plasma® increases the precision of adhesive bonds. The potential-free microfine cleaning of contact surfaces effectively eliminates error messages during the final testing of the battery pack. This results in stable processes and long-lasting, high-performance batteries.

APPLICATION EXAMPLES

- Cleaning and activating cells and cell stacks before bonding
- Cleaning contact surfaces before wire-bonding
- Bonding the battery thermal management system
- Sealing the aluminum battery housing



Openair-Plasma® activation of prismatic cells



Plasma cleaning before wire bonding

YouTube video: Module production of the BMW i3 high-voltage battery





Engine and drive

SAFETY FOR ALL DRIVE SYSTEMS

From new, low-emission combustion engines – some running on alternative fuels – and hybrids to full EVs (electric vehicles) powered by batteries or fuel cells: the greatest changes in automotive engineering can be found in the drive system.

But modern drive systems have one thing in common – intelligent engine management systems which ensure that they perform within the optimum operating range. Sensors record concentrations, emissions, fuel consumption and electric charge status together with environmental conditions and road handling to give a safe, comfortable drive with low emissions.

Severe environmental impacts can adversely affect the drivetrain sensors and actuators. However, the function of these components is vital for the safe control and operation of the vehicle.

Extreme temperature fluctuations from severe frosts to maximum temperature rises and humidity ranging from dry conditions to 100% humidity are a major challenge when it comes to protecting the electronics. And this applies at all component levels: from the protective coating on integrated circuits and circuit boards to the seals on the electronics housing.

Today, Openair-Plasma® is an indispensable part of these applications. **Effective sealing of the surfaces between composite materials** ensures a consistently high quality bonded joint and so avoids production run failures and costly recalls.

APPLICATION EXAMPLES

- Cleaning the aluminum housing of engine and transmission seals
- Protecting sensors in the throttle valve
- Applying PlasmaPlus® corrosion protection to prevent seal migration
- Improving the seal of contact bushings in sensitive sensors
- Sealing engine control housings

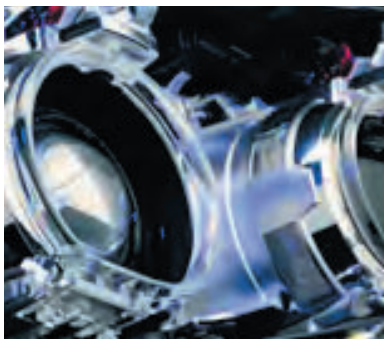




Headlights

APPLICATION EXAMPLES

- Cleaning before applying UV hard coating
- Applying a hydrophilic coating to polycarbonate substrates
- Removing the flash line on the PMMA panel (rear light)
- Activating the surface of the headlight groove before bonding the diffusing lens
- Pretreating high-performance LEDs before potting



PLASMA FOR LONG-LASTING RADIANCE

If modern headlights are to last for the lifetime of the vehicle, they must be permanently protected from moisture ingress. This means that the adhesive, which combines polypropylene and polycarbonate elements, must also perform an important sealing function.

Openair-Plasma® treatment applied with pinpoint precision activates the non-polar materials to ensure long-term adhesion – and so lasting protection against moisture damage and ageing. All leading headlight manufacturers now rely on Openair-Plasma® technology from Plasmatreat, making the treatment of headlights one of the most successful industrial plasma applications ever.

The new InMould-Plasma® process – the direct integration of the plasma pretreatment into the injection mold – has fundamentally changed the manufacturing process. Without the need for an additional treatment alongside automation, the component can undergo further processing straightaway.



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