

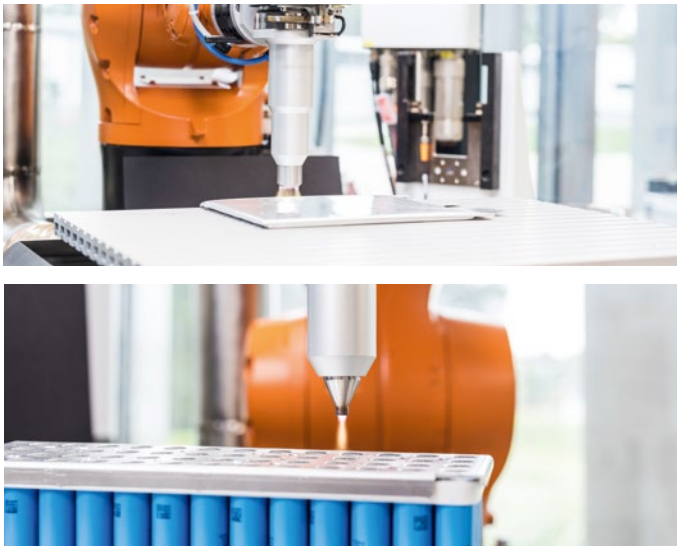
APPLICATION INFORMATION

Openair-Plasma® a reliable solution for the assembly of battery modules

Cleaning and activation with Openair-Plasma® – fast, functional and reliable

The growing electromobility market is ensuring steadily rising demand in the electric vehicle sector. The battery lies at the heart of every electric car, alongside the electric motor. In response to demands both for higher volumes and longer ranges, battery producers are striving to increase cell efficiency and achieve the level of process stability required to meet quality assurance standards.

While energy density is certainly of great importance, ensuring effective thermal transfer from the battery and good electrical connections between the individual cells are essential for today's battery modules. In terms of design, cylindrical, prismatic and pouch cells are currently dominating the electromobility sector.



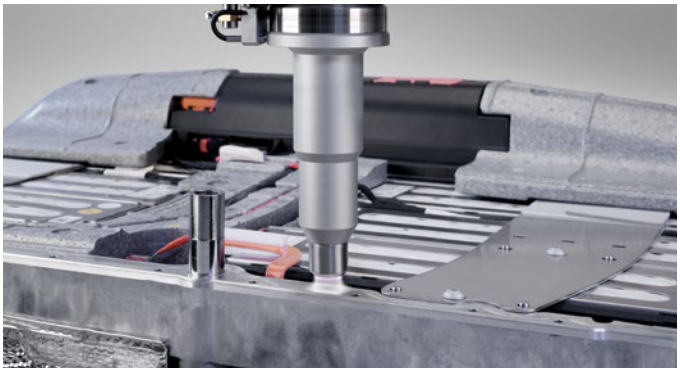
Openair-Plasma® treatment of cylindrical and pouch cells

Structure of a battery module

The choice of battery cell design is determined by energy density, thermal management and packaging considerations. It is important to ensure that cell production and subsequent integration into a battery pack can be automated. A wide variety of different battery formats have already been produced in high-speed production lines, however, each of these design variables presents particular challenges in terms of production integration. Plasmatreat offers solutions to several of these problems to make your battery more reliable.

Openair-Plasma® technology offers a variety of applications for use in battery production. It is important to ensure that the battery housing is protected from moisture and other media. Plasma technology can be used to deep-clean the surface to a microfine level to obtain a strong adhesive bond when the seal is subsequently applied. The long-time stability of a battery pack is one of the most important factors when it comes to electromobility today. The thermal management system and cell insulation have a particular bearing on the prevention of short-circuits in the event of failure. Individual cell insulation is provided by applying a coating or insulating film. To ensure process reliability, the surface must be precleaned to a specified level before the insulating coating or film is applied.

Openair-Plasma® technology can be used to ultra-fine clean the outer casing of the cell in preparation for applying the insulating foil or chosen coating. This cleaning process is fully monitored to ensure that a reproducibly clean surface is obtained even with high production volumes.



Microfine cleaning of the surface with Openair-Plasma® ensures strong seal adhesion.

Benefits of the Openair-Plasma® process

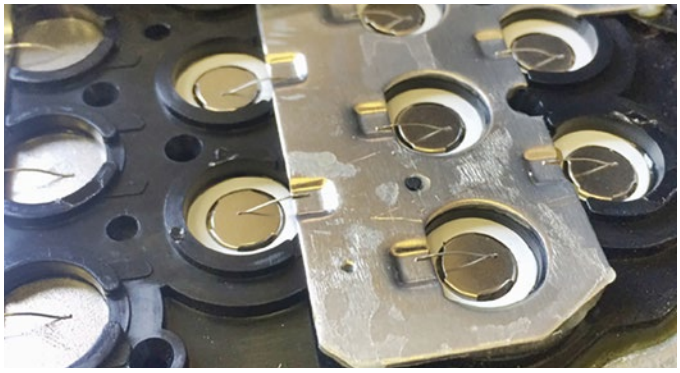
The use of Openair-Plasma® technology in the production process optimizes workflows:

- lean production processes
- significant cost reduction
- substantial increase in LIB cycle stability
- increased battery efficiency
- fully monitored industrial fine cleaning

To maintain the nominal power of the battery cell, after wrapping, the cells must be tightly bonded with precision to prevent air gaps. For this reason it is important to use Openair-Plasma® technology again to activate the foil- wrapped prismatic battery cells. Air pockets can prevent heat dissipation, thus causing the battery management system to reduce the amount of available power.

The next step is to ensure reliable connection between the cell and the collector plate. While the connecting of cylindrical cells is usually achieved with ultrasonic wire bonding, the pouch cells are usually connected by using laser welding. With either connection method it is vital to ensure that the bonding areas are free from contamination.

Any contamination which is left can cause an incorrect bond which with lead to a fault during the final testing of the battery pack. To avoid this, Openair-Plasma® technology offers various options for the potential-free microfine cleaning of surfaces.



Bonding pad: Microfine cleaning of the contact surfaces with Openair- Plasma®.
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The potential of PlasmaPlus® coating

Active corrosion protection can be applied to the sealing surface of the battery housing with the aid of PlasmaPlus® technology. Climatic loads and positional constraints in- crease the requirements placed on the battery housing. In the electromobility sector, a media-tight seal is critical. A PlasmaPlus® coating may be required to provide additional protection for sealing systems that incorporate a seal insert or an FIPG (liquid seal) that may be prone to corrosion.



Comparison after 960 hours salt spray test:
AlSi12 alloy without (left) and with PlasmaPlus® coating (right)

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AIUS180_2024_05_16 Battery modules
Subject to technical changes and misprints.