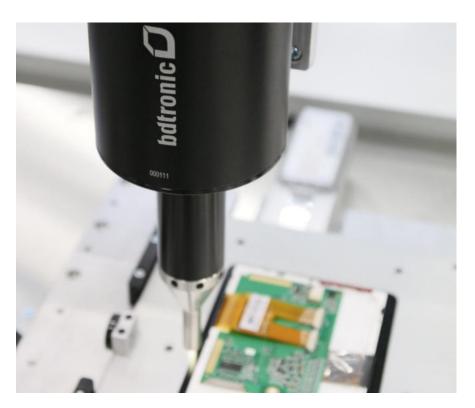


TECHNOLOGY PLASMA



TECHNOLOGY PLASMA

- Pre-treatment method for long-lasting adhesion, clean and polar surfaces with no residue
- Achieves a clean surface and sufficient surface energy
- Optimally prepares material surfaces, significantly improving bonding properties



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Surface treatment before

Potting / Vacuum potting

- Fan controllers
- Sensors

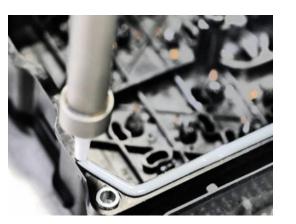


Surface treatment before

Sealing / Bonding / Printing

- Housing covers

- Housings



Surface treatment before

Spraying / Coating / Painting

- Circuit boards



Surface treatment before

Conductive paste application

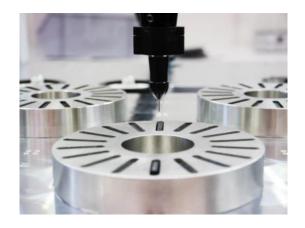
- Engine control units



Surface treatment before

Bonding

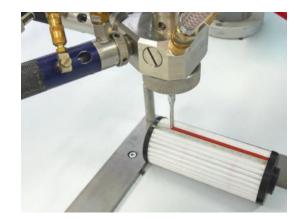
- Headlamps
- Door handles



Surface treatment before

Foaming

- Filters
- Vehicle windows

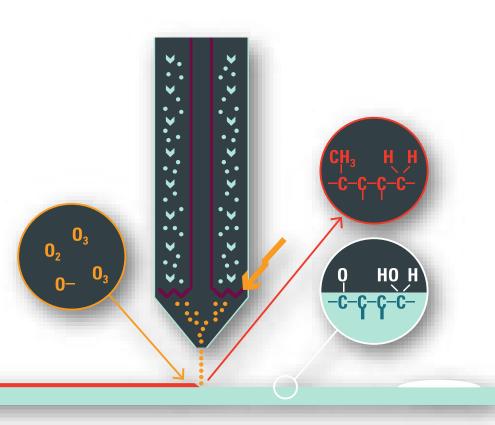




PLASMA WHAT IS PLASMA?

- "4th state of matter"
- Partially ionized gas (ions + electrons)
- Physical pre-treatment method
- 99.9 percent of the universe
- Artificially generated in an electrical field

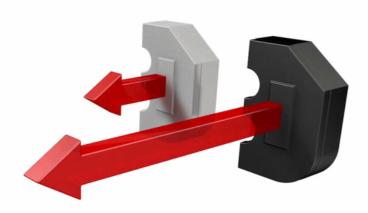






- Long-lasting bond and very high strength
- Clean surface with no residue
- Improved adhesion
- Secure bonding process
- 100 percent seal

→ LONG-LASTING ADHESION, CLEAN AND POLAR SURFACES WITHOUT RESIDUE!







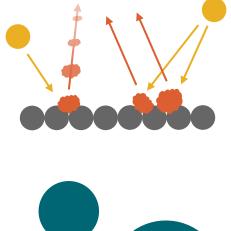
Cleaning

- Remove adsorbates
- Remove organic contaminants/separating layers
- (Ultra-)Precise cleaning

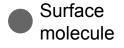
Activation

- Increasing surface energy
- Improving wettability

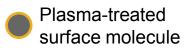


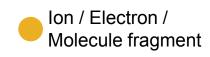












Water drop



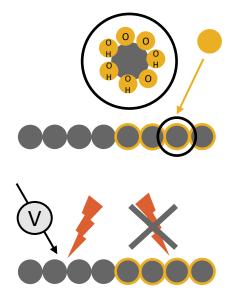
Functionalization

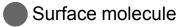
- Creating functional groups on the surface
- Increasing the concentration of oxygen molecules on the surface

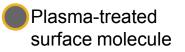
Neutralization

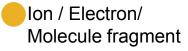
- Discharging electrostatic charge











PLASMA TECHNICAL SPECIFICATIONS

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Advantages of atmospheric-pressure plasma

- Environmentally-friendly
- User-friendly
- Cost-effective
- Non-contact
- Space-saving

VP4 process monitoring and analysis

All relevant process parameters

– Wear

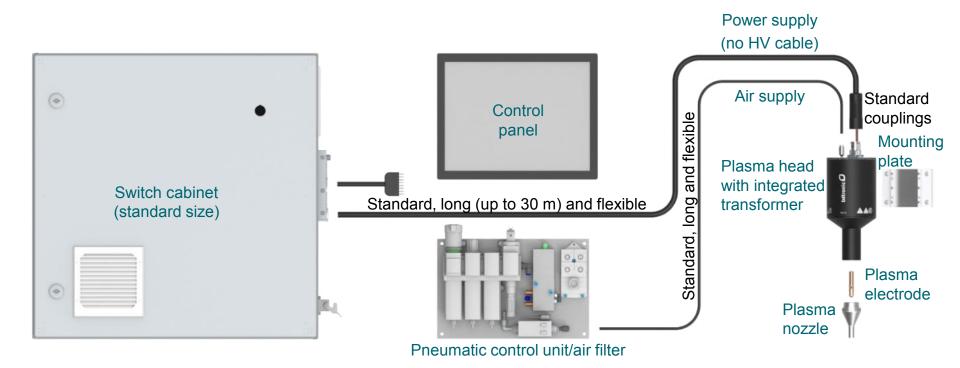
VP4 Properties

- Suitable for electronics
- High system availability
- Can be integrated into continuous line production or robots
- Suitable for all kinds of plasma applications
- Continuous process monitoring



PLASMA TECHNICAL SPECIFICATIONS



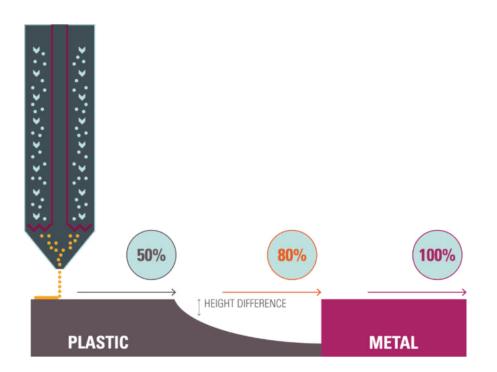


11.05.2023



Dynamic, continuous and variable performance adjustment (approx. 50 - 100%)

- Infinite performance adjustment during the process
- Suitable for plastics and metals
- Can be adjusted in parallel with the dispensing process
- Automatic setting of air intake, current and limit values



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PLASMA KEY FEATURES

Transformer integrated into the plasma head (no high voltage cable)

- Rugged, no danger of HV cable breakage
- No loss of power due to high voltage cable
- High energy efficiency
- Silicone free
- Rugged, vibration-resistant structure due to full potting
- Active cooling of the plasma head





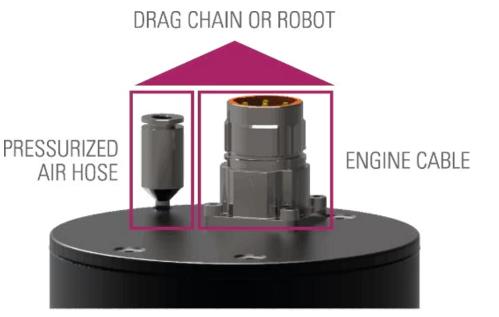
PLASMA KEY FEATURES

Quick exchange system with standard couplings

- Plug & play
- Variable cable length
- Robot handling (weight 4.5 kg)
- Cable suitable for robot or drag chain
- Plug-in connections



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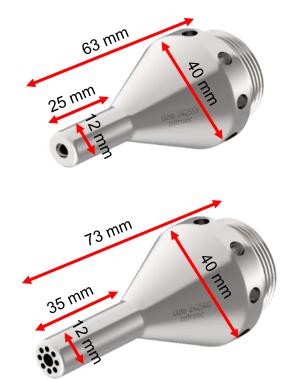
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Standard nozzle

- Suitable for ~ 600 1000 W
- Low temperature
- Large range of handling

Low-potential nozzle

- Suitable for ~ 500 1000 W
- Suitable for electronics
- Larger distances possible to the surface



PLASMA VISUALIZATION

Process visualization

- Gas flow (l/min)
- Power (W)
- Gas intake pressure (mbar)
- Voltage (V)

Process control

- Power adjustment (%)
- Ignition and wear monitoring (A)
- Operating hours counter for wear analysis (h)

Other process settings and limit values are corrected automatically when the power changes





PLASMA PROCESS CONTROL







- Gas flow monitoring
- Gas pressure monitoring
- Automatic flow regulation

- Operating hours counter
- Wear monitoring

- Power control
- Ignition monitoring
- Working voltage monitoring

 User level management

- **?**
- Remote maintenance

PLASMA STANDARD INTEGRATION



VP4 Master

Integration unit incl. switch cabinet, touch panel and digital handshake / Profibus

B5000-VP4

Integration system incl. switch cabinet, touch panel and digital handshake / Profibus, frame, tabletop, 3axis system





PLASMA STANDARD MACHINES

B2000-VP4

Stand-alone plasma machine for small series production with program change and manual loading and unloading





PLASMA STANDARD MACHINES

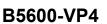
B5200-VP4

Fully-automatic plasma machine for high production rates with fullyautomatic component handling, suitable for plasma and dispensing combinations



B5080/5090-VP4

Fully-automatic plasma system for high production rates with fullyautomatic component handling, slim design, suitable for plasma and dispensing combinations



Fully-automatic plasma system with larger operating range, suitable for plasma and dispensing combinations

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PLASMA REFERENCE PROJECT



Product description & function	Display for the electronics industry	
Project description	 Cleaning and activation of a groove (PBT-GF30) upstream of the bonding process (2K) Component consists of a circuit board and flexible connection 	
Process	Cleaning and activationLow-potential nozzle	
Machine	B2000-P	

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THANK YOU VERY MUCH FOR YOUR ATTENTION.

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PLASMA MEASUREMENT EQUIPMENT

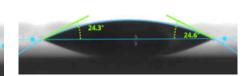
Measurement of the surface tension using a contact angle measurement method with drop shape analyzer DSA25 (Krüss)

- Precise method for determining surface energy before and after plasma treatment
- Measurement of the dispersion and polar percentage of the surface energy
- Flat surface required
- Display of increase in polarity (good for bonding processes)





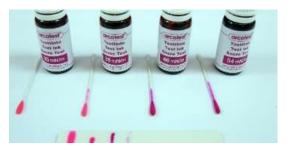




PLASMA MEASUREMENT EQUIPMENT



Other measurement and testing methods, for instance with temperature sensors, oscilloscopes and microscopes...



Measurement of surface tension using the test ink method

- Simple method for determining surface energy for a wide range of materials
- Suitable for quick measurements



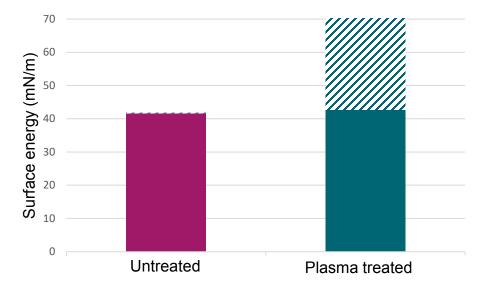
Fluorescence measurement

- Testing method for metal contamination
- In relative fluorescence units (RFU) or cleanliness in %



Tensile testing

 Tensile testing of bonded components





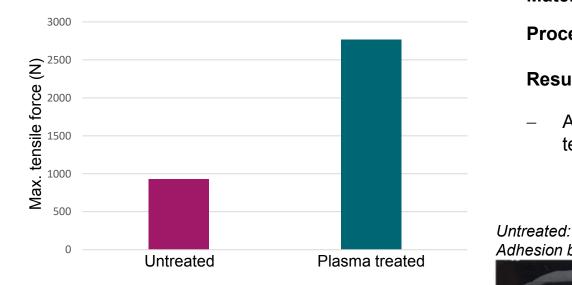
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Material: Typical automotive plastic housing

Process: Activation/cleaning (separating agent)

Results:

- Approx. 70 percent increase in surface energy
- More than a 10-fold increase in surface polarity



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Material: Typical automotive plastic housing

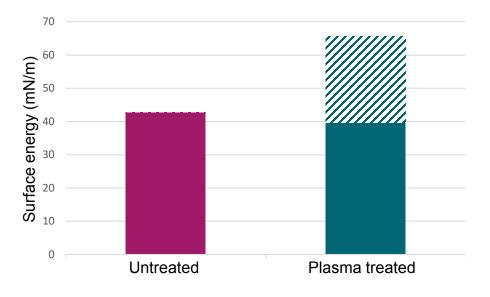
Process: Activation/cleaning (separating agent)

Results:

Approx. 300 percent increase in maximum _ tensile force



Plasma treated: Cohesive failure



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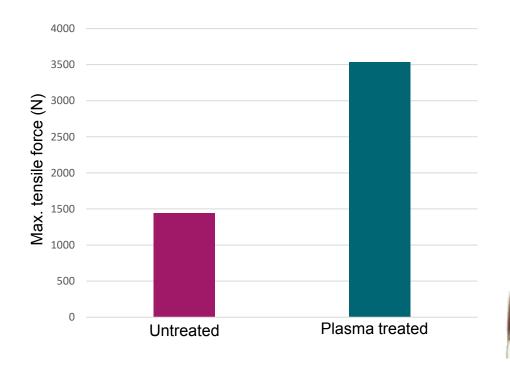
Material: Typical metal used in the automotive industry

Process: Cleaning/activation

Results:

- Increase in surface energy to approx. 150 percent
- Significant increase in surface polarity





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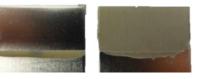
Material: Typical metal used in the automotive industry

Process: Cleaning/activation

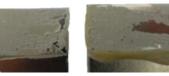
Results:

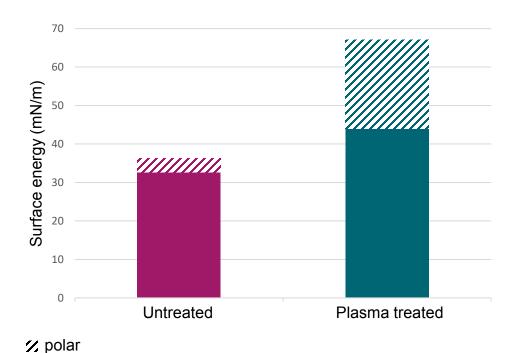
 Approx. 230 percent increase in maximum tensile force

Untreated: Adhesion breakage



Plasma treated: Cohesive failure





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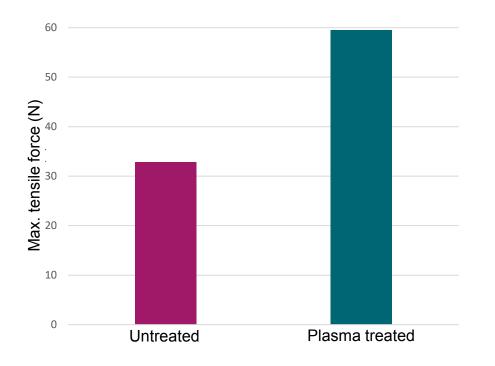
Material: Circuit board with solder resist

Process: Activation

Results:

- Increase in surface energy by approx. 80 percent
- Increase in surface polarity

dispersion



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Material: Circuit board with solder resist

Process: Activation

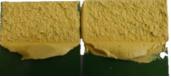
Results:

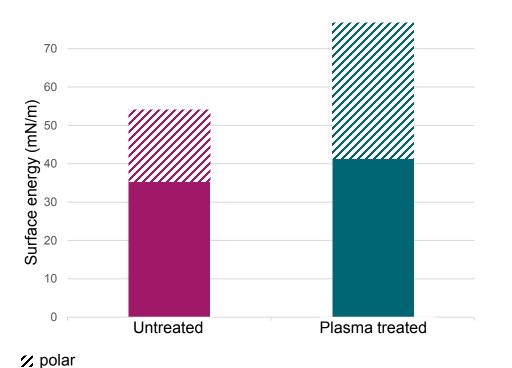
Approx. 80 percent increase in maximum tensile force

Untreated: Adhesion breakage



Plasma treated: Cohesive failure





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Material: Glass

Process: Cleaning (fine cleaning) / activation

Results:

- Increasing surface energy
- Increase in surface polarity