

Company Presentation 2018

electronic
diener

www.plasma.com



Diener electronic GmbH + Co. KG

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diener

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Diener electronic GmbH & Co. KG is a leading international producer of

- low pressure plasma systems
- plasma generators
- atmospheric plasma systems
- parylene systems



Company Profile

www.plasma.com

Company name	Diener electronic GmbH & Co. KG
Founded	1993 (as Diener electronic)
Employees	approx. 110
Location	Ebhausen, Germany
Product range	<ul style="list-style-type: none">- Low pressure and atmospheric pressure plasma systems- Process development- Contract plasma treatment- Parylene
Installed systems worldwide	> 9.000

The four most important Applications of Diener Products

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Cleaning

Low- and atmospheric pressure plasma

Practically every kind of material can be precision cleaned with plasma

Etching

Low pressure plasma

Plastics, semiconductors, glass, ceramics, hybrid materials

Activation

Low- and atmospheric pressure plasma

Practically every material can be activated with plasma

Coating

Low pressure plasma

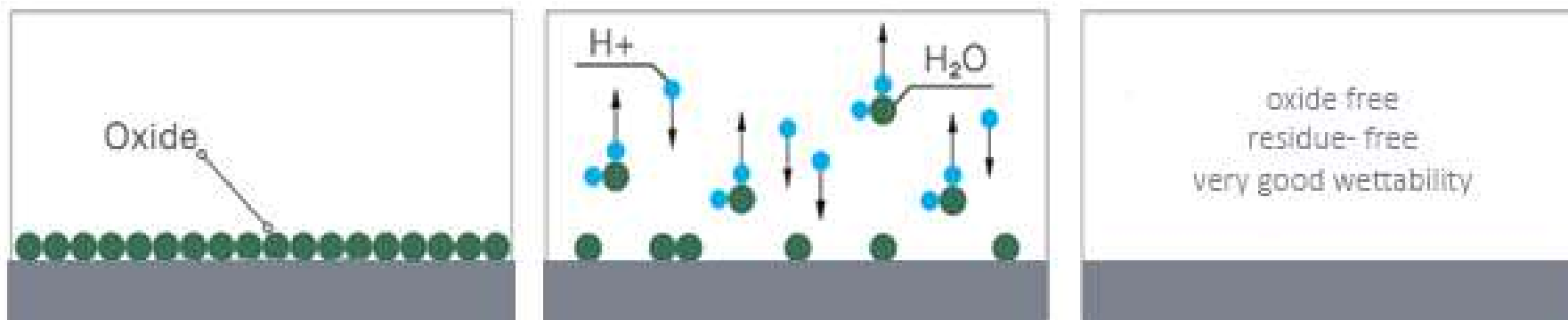
All technical materials, metals, glass, ceramics

<https://www.youtube.com/watch?v=g1LLzRJWrc>

Cleaning — Low- and atmospheric pressure plasma

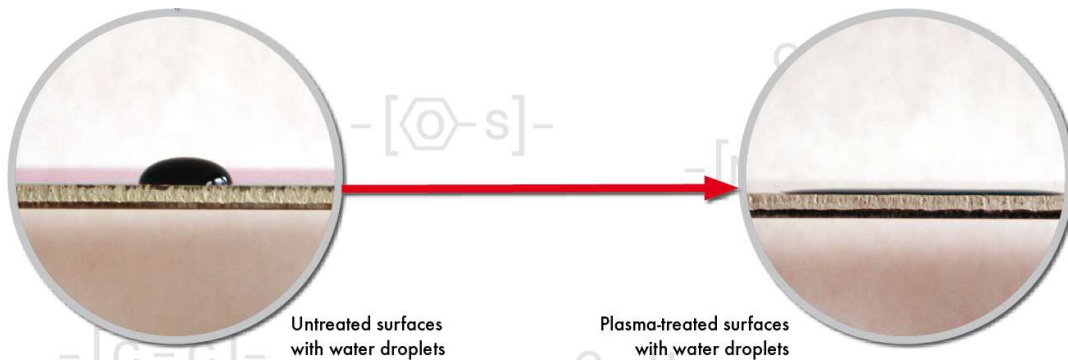
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The surface of the component is physically cleaned by ion bombardment and – depending on the type of gas – also cleaned by chemical reactions. The contamination is converted into the gas phase and pumped away or removed by an active gas jet. Plasma cleaning is generally used for ablation of fine layers of organic contaminants, e.g. plasma can remove the grease when cleaning finger prints, but not the salts.



Cleaning — Low- and atmospheric pressure plasma

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Applications

e.g. removal of grease, oil, oxides, fibres

Components

e.g. electronic devices, plastic parts, etc.

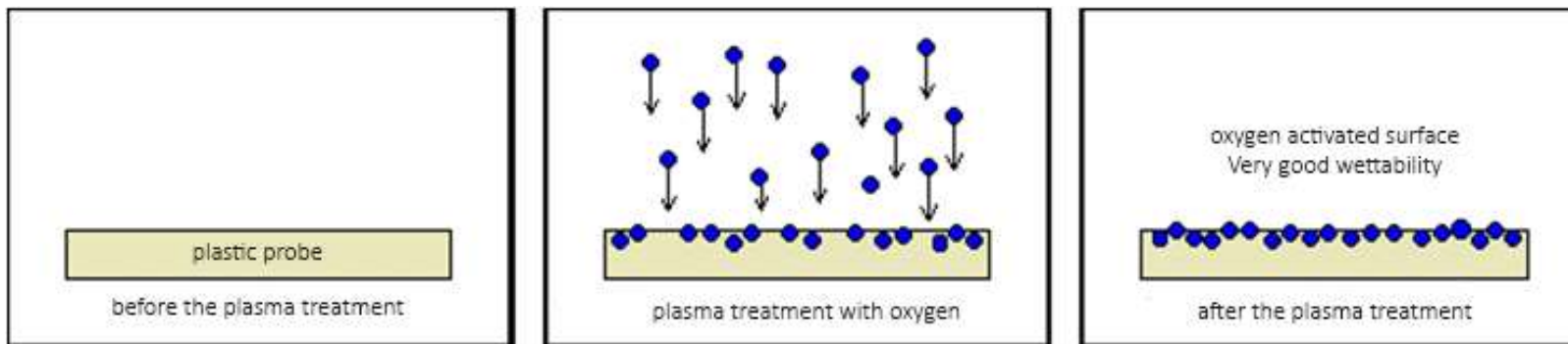
Users

e.g. automotive

Activation — Low- and atmospheric pressure plasma

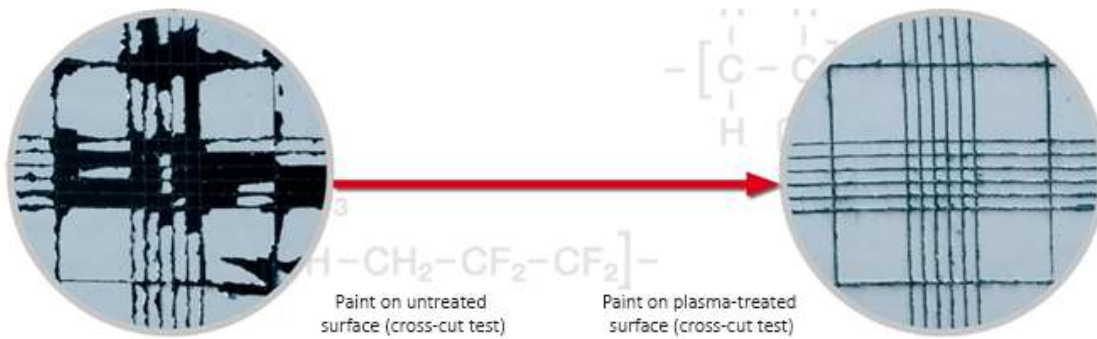
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The surfaces of the parts are activated with oxygen or air. Radical sites and oxidized or polar chemical groups are created to which the paint or glue systems adhere well. The lifetime of the plasma activation depends on the material to be treated, storage conditions and the parameters used to treat the part.



Activation — Low- and atmospheric pressure plasma

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Applications

e.g. pretreatment before gluing

Materials

e.g. plastics, rubber, etc.

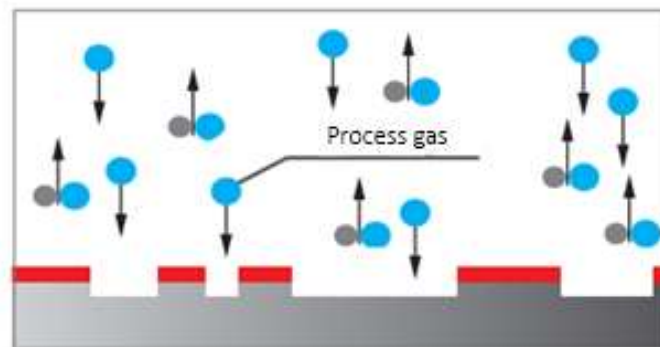
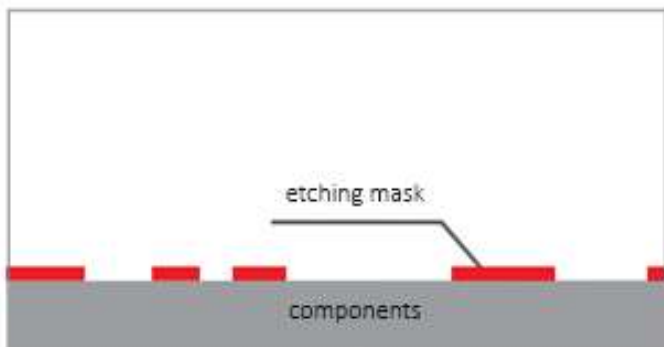
Users

e.g. electronics industry, medical, automotive, etc.

Etching — Low- pressure plasma

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The surface of the part is etched with a reactive process gas. The etched material is removed into to the gas phase and pumped away. The surface is enlarged and is very easily wettable. Etching is used before printing, glueing and painting, as well as for „roughening up“ the material.



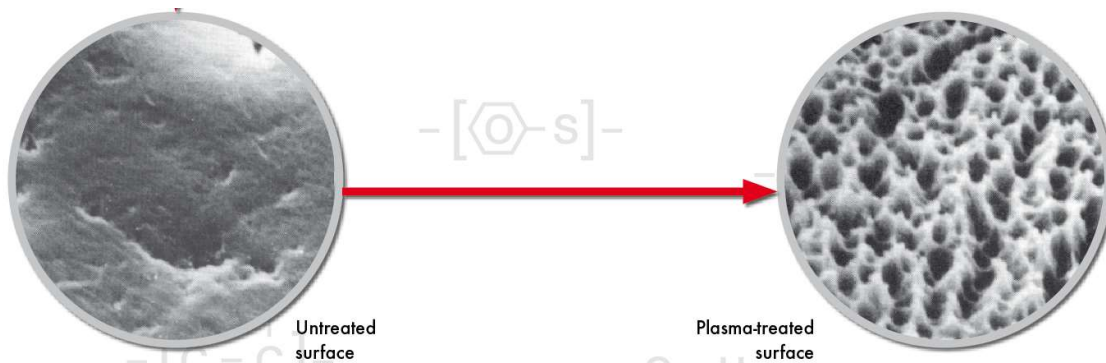
during the plasma treatment



after the plasma treatment

Etching — Low- pressure plasma

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Application

e.g. etching PTFE, FR4, Silicon

Components

e.g. PCB, Sensors

Users

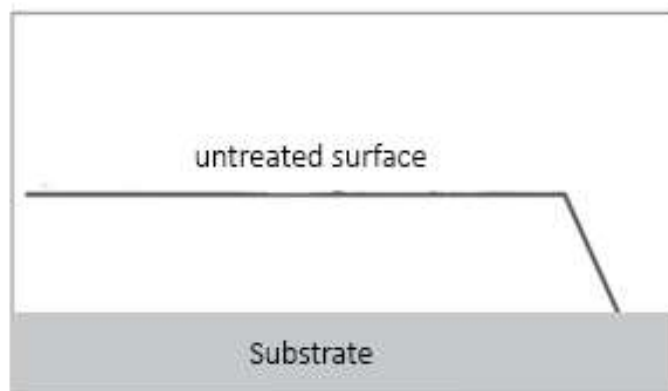
e.g. electronic, automotive

Coating — Low- pressure plasma

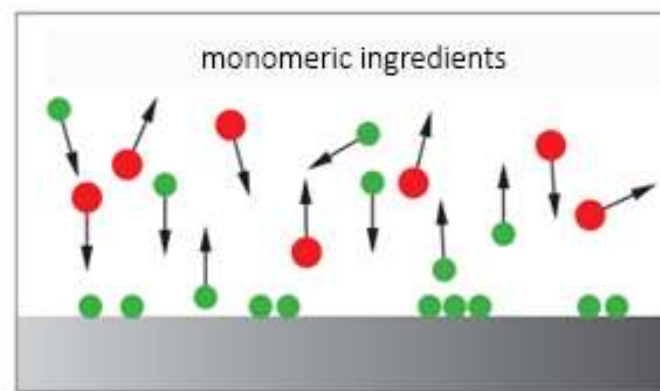
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Plasma deposition (polymerization)

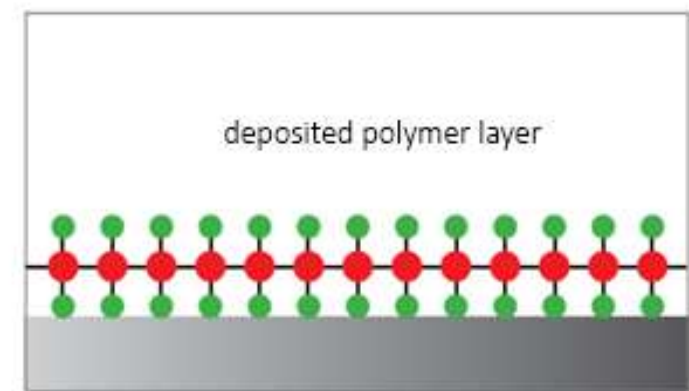
An organic, inorganic or metal organic precursor substance is introduced into the plasma chamber as a gas or vapour. The gas is ionized in the chamber and the fragments reacts on the surface to form a very stable layer with good adhesion to the surface.



before the plasma treatment



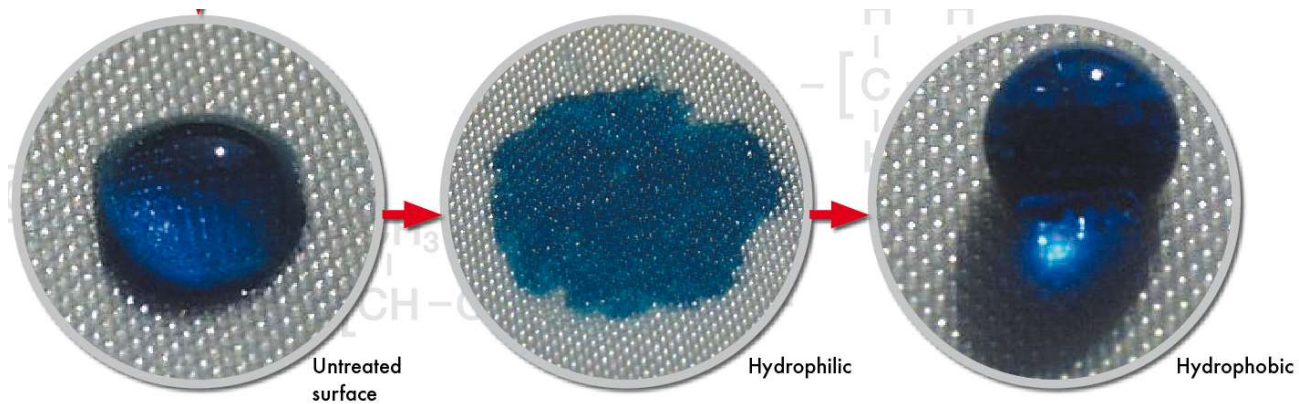
during the plasma treatment



after the plasma treatment

Coating — Low- pressure plasma

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Components

e.g. deposition of hydrophobic layers

Components

e.g. special membranes

Users

e.g. medical technology

Low Pressure or Atmospheric Plasma Technology?

Atmospheric pressure plasma systems



Low pressure plasma systems



Generally cleaning/activation

Especially suitable for treatment of 2D components

Integration in existing automated systems possible

Continuous in-line processes / endless products like cables and fibers

High speed treatment (e.g. few m/min in food packing industry)

Compressed air as process gas (other gases upon request)

Economical and low-maintenance

Cleaning/activation/etching/coating

Especially suitable for 2D and 3D systems, also small batch sizes – no adaption of automation required

Suitable for bulk materials (sealings, screws etc..)

Batch processes

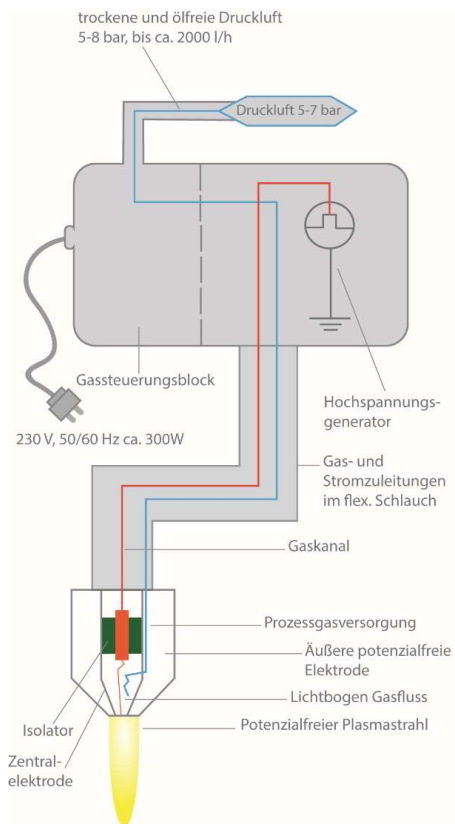
More sophisticated optimization of the processes possible

All solid materials can be treated

Higher initial investment including vacuum-technology (pump etc..)

Atmospheric Plasma System

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Gas is excited by means of a high voltage in such a way that an arc discharge ignites. Excited state reactive gas particles are blown out of the plasma nozzle with compressed air.

In an **atmospheric plasma** there are two different plasma effects

- chemical reaction
- blowing effect by active gas/plasma jet

<https://www.youtube.com/watch?v=buuL0AAgoIU>

Atmospheric Plasma System

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PlasmaBeam PC (new design, world wide voltage input 100-240 V)



Double nozzle arrangement (PlasmaBeam^{DUO})

PlasmaBeam

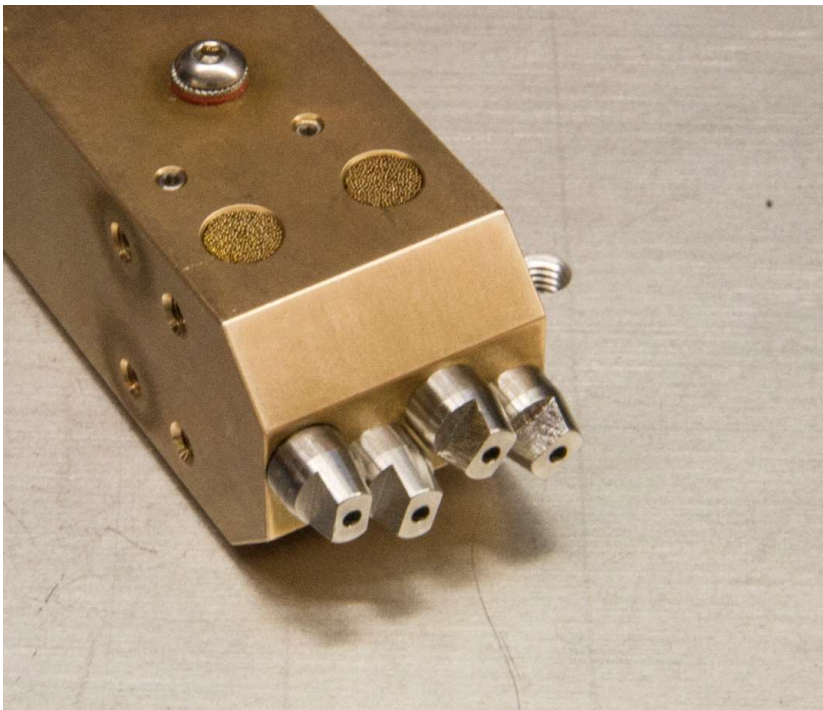


New Plasma Systems

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PlasmaBeam^{Quattro}



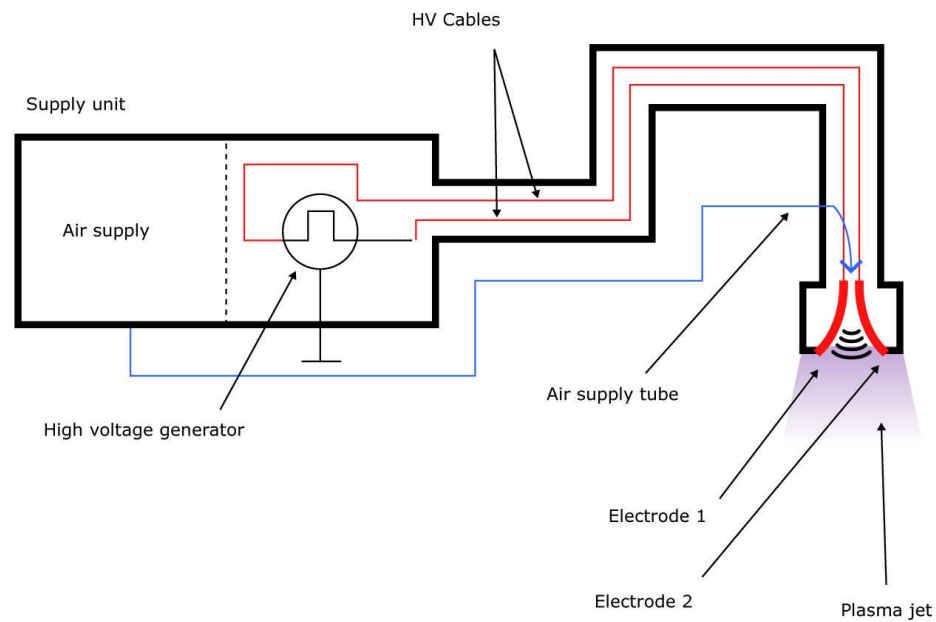
Features:

- Width of treatment: max. 32 mm
- Multiple head`s installation possible
- Reduced cooling air flow: approx. 12l/min per nozzle instead of 20l/min
- For high speed applications: 100-800mm/

Atmospheric Plasma System

Gliding Arc System / PlasmaAPC 500

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Atmospheric Plasma System

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Plasma head with plasma



PlasmaAPC 500



PlasmaAPC 500^{DUO} available
from IIQ 2018

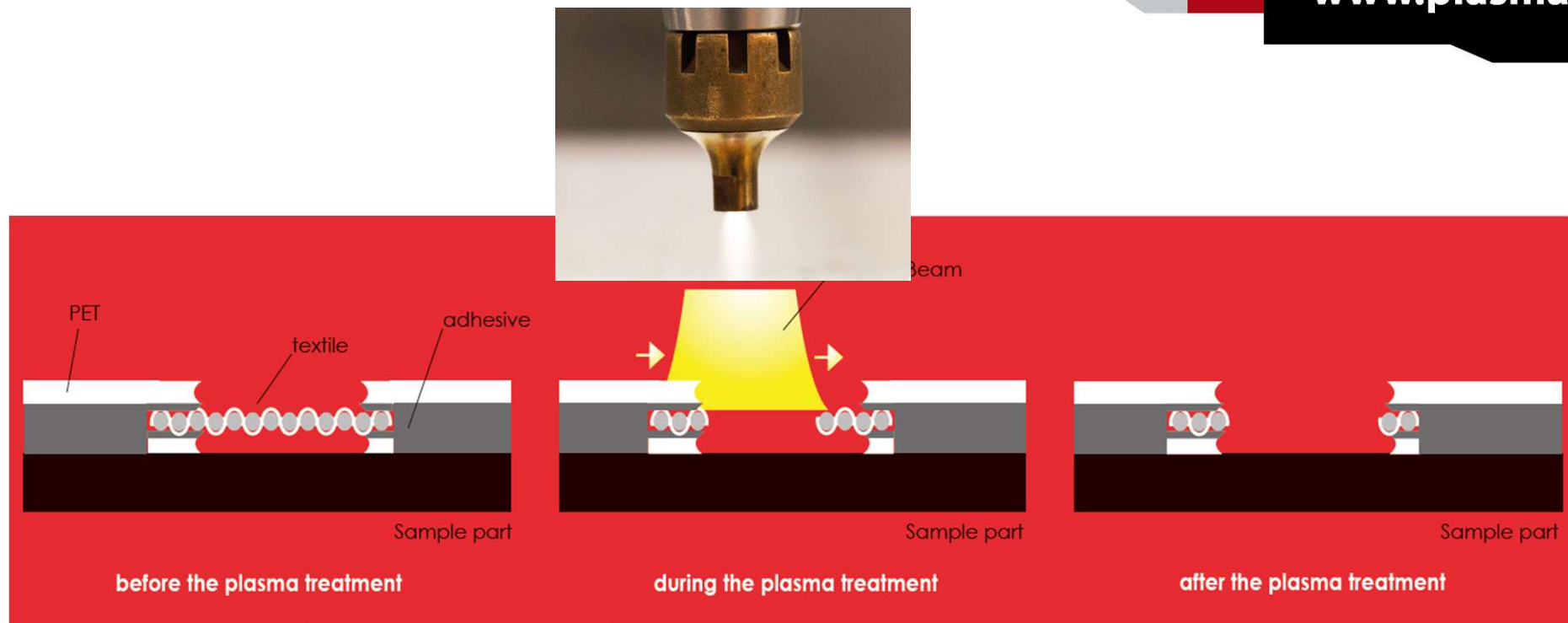
Comparison Plasmabeam vs. APC500 (gliding arc)

Plasmabeam	APC 500 (gliding arc)
	
Requires compressed air	Working with ambient air
Concentrated beam (single beam max D= 10mm)	Wide-spread treatment (several cm)
Power density high	Power density low
Higher temperature	Lower temperature
Suitable also for conductive materials (metals)	Only for non-conductive materials (plastics etc...)
Cleaning, activation	Cleaning, activation
Maintenance-free except plasma nozzle	Maintenance-free, economical

Our Products

Atmospheric Plasma Indicators

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Our Products

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Atmospheric Plasma Indicators



ADP-INDIKATOR

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Plasma-Surface-Technology

before the plasma treatment

Gas types:
oxygen, nitrogen, hydrogen, air, mixture of hydrogen and nitrogen ...

Accuracy of the labels: $\pm 10\%$

Storage:
15 - 35 ° C, dry and dark, protect from sunlight

Material label:
Polyethyleneterephthalate

Temperature range:
Up to 60 ° C without restriction
Up to 80 ° C maximum 10 min
Up to 90 ° C maximum 5 min
Up to 100 ° C max. 2 min
Up to 150 ° C maximum 1 min

Hazard warning: non-toxic



ADP-INDIKATOR

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Plasma-Surface-Technology

after the plasma treatment



Plasma Indicator

Plasma indicators are adhesive labels equipped with a special textile.

If the plasma process succeeds, the textile dissolves. This is the first time that a successful plasma treatment can be demonstrated at a glance. Until now, this was only achieved with a high technical effort.

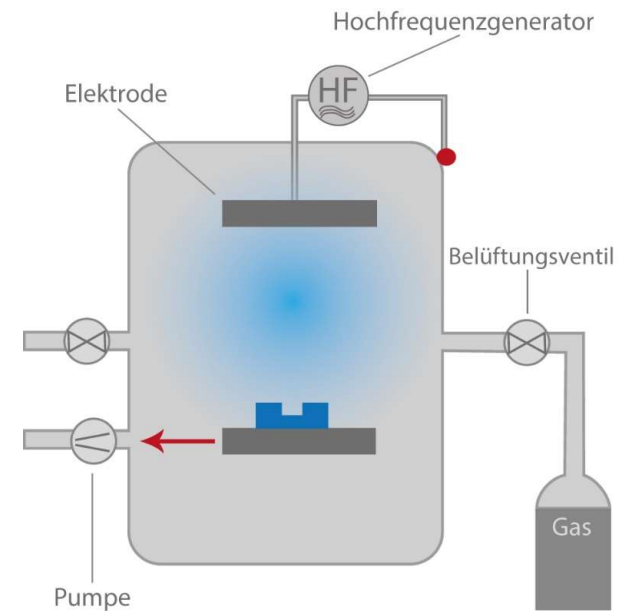
Low Pressure Plasma System

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In low pressure plasma system a voltage is applied in order to excite the process gas. Energy-rich ions and electrons are created along with other reactive particles that form the plasma. Through the interaction of these species with the surface it can be modified effectively.

There are three basic low pressure plasma effects

- „micro sandblasting“
- chemical reaction
- UV radiation



Plasmasystems

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Industrial System Type Tetra 150



Laboratory System Type Femto



Special System Type Tetra-4400-LF-PC



New Plasma Systems

Industrial System for Powder and Small
Parts Treatment

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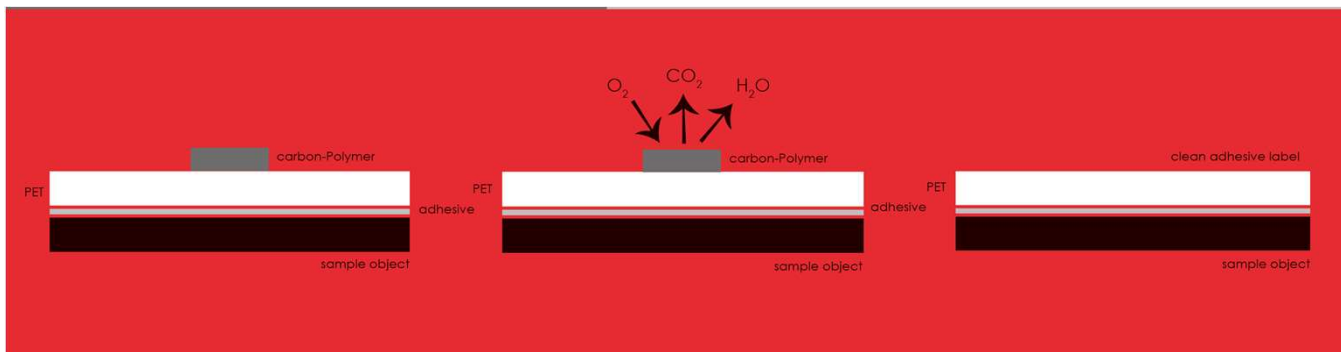
Features:

- Volume of chamber: approx. 120 l
- Full PC control with touch screen
- Movement safety sensors integrated
- Material of chamber : stainless steel
- Materials to be treated: rubber gaskets

Our Products

Low Pressure Plasma Indicators

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Functional Principle

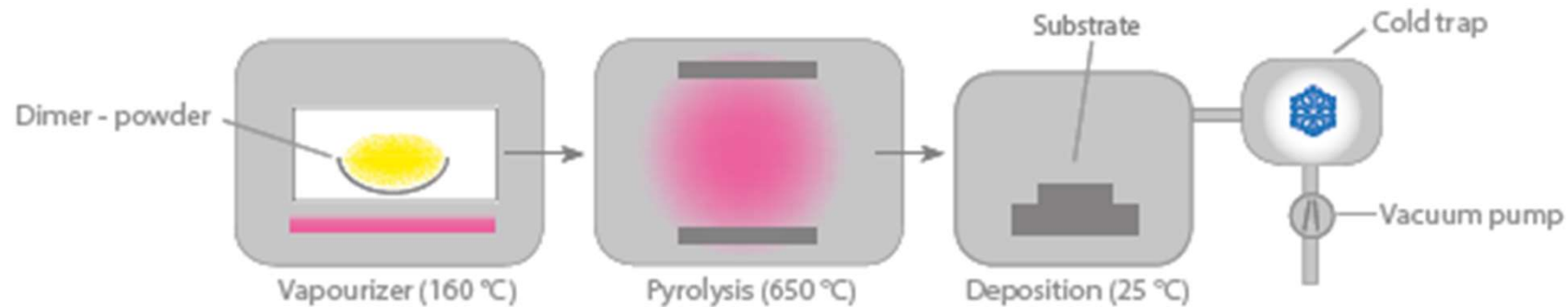
The adhesive label is adhered to a component or dummy. This is placed in the chamber as a reference and exposed to the plasma. The indicator has no effect whatsoever on the actual plasma process or the component itself. The organic layer will be removed during the plasma treatment.

Parylene Coating Systems

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Process description:

The deposition takes place by **polymerization** through a vacuum assisted coating process, the so-called **chemical vapor deposition – CVD**.



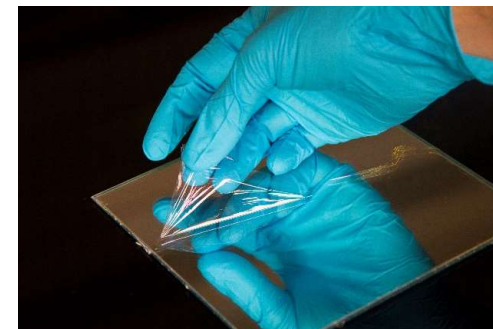
Parylene Coating Systems

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Industrial coating system P260



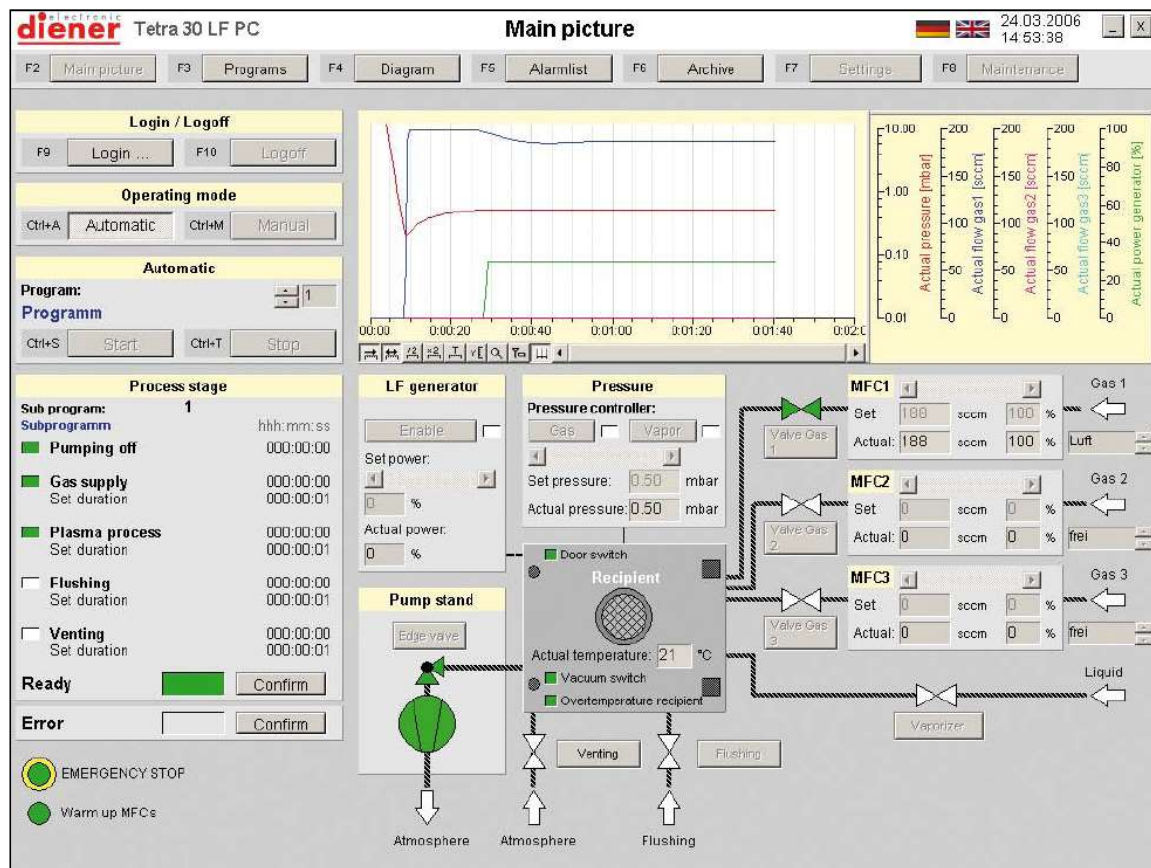
Parylene film



Laboratory coating system P6

Control - 3 different types of controls available

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- Semi automatic
- PC-Control (Windows 7/10 or CE)
- rotary switch

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Thank you for your attention!