Plasma Surface Technology

Femto

Plasmabeam

Tetra-30-LF-PC

Precision engineering

Semiconductor technology

Electrical engineering

Elastomer technology

Plastics technology

Medical technology
Plasma technology – so many possibilities

Plasma is used in areas where joining of materials, or precise modification of their surfaces, is important. This forward-looking technology enables the most varied surfaces to be modified. As a result it offers diverse possible applications like, for example:

- **Precision cleaning** of small and micro components
- **Activation** of plastic components before gluing, painting, etc.
- **Etching** and, in some cases, removal of different materials such as PTFE, photoresist paint finish, silicon etc.
- **Coating** of components with PTFE-like layers, barrier layers, hydrophobic and hydrophilic layers, friction reducing coatings, etc.

Plasma technology is now firmly established in almost all industrial sectors. New applications are emerging all the time.

Plasma technology – winning advantages

Compared with other processes like flame treatment or wet chemical treatment, for example, plasma technology demonstrates significant advantages:

- Many **surface properties** can only be achieved with this process
- Universally applicable process: can be used online and fully automated
- Extremely environmentally friendly process
- Powders, small parts, plate material, fleeces, textiles, hoses, hollow parts, printed circuit boards, etc. can all be handled, virtually irrespective of their geometry
- Components are **not mechanically modified**
- **Very little heating** of components
- Very **low running costs**
- **High process reliability and occupational safety**
- Highly **efficient** process
– a general overview

Special system Tetra-5600-LF-PC-D
How does a plasma system work and what types of system are there?

There are two different types – low pressure and atmospheric pressure plasma systems.

**Low pressure plasma technology**

In low pressure plasma technology, gas in a vacuum is excited by a supply of energy. Energy-rich ions and electrons are created along with other reactive particles that form the plasma. So surfaces can be modified very effectively. There are three different plasma effects:

- **Micro sandblasting**: the surface is sputtered by the ion bombardment
- **Chemical reaction**: the ionised gas chemically reacts with the surface
- **UV radiation**: the UV radiation breaks down long-chain complex carbon compounds.

Varying the process parameters such as pressure, power, process time, gas flow and gas composition changes the operating characteristics of the plasma. So a number of effects can be achieved in a single process step.

**Atmospheric plasma technology**

In atmospheric plasma technology, gas at atmospheric pressure is excited by means of a high voltage in such a way that a plasma ignites. Compressed air then forces the plasma out of the nozzle. There are two different plasma effects:

- **Activation and precision cleaning**: carried out by the reactive particles contained in the plasma beam
- **Chemical reaction**: the ionised gas chemically reacts with the surface
- **UV radiation**: the UV radiation breaks down long-chain complex carbon compounds.

Varying the process parameters such as treatment time and distance from the substrate surface allows the results of the treatment to be influenced in different ways.

**Diener plasma surface technology – winning systems**

Our comprehensive programme includes standard and special systems for all plasma applications. We offer tailored solutions that we design and produce individually if required. And we give a comprehensive product warranty, of course.

Key features of our systems:

- Customised adaptation
- High availability, long service life
  - Downtimes are reduced to a minimum by selecting high grade components. The service life is practically unlimited. Our above average level of vertical integration means that we can respond to breakdowns promptly.
- Simple operation
  - We have continuously improved our controllers so that our plasma systems are easy to operate.
- Semi automatic, fully automatic, or PC control
  - Customers can choose from semi-automatic, fully automatic, or convenient PC control.
- Universally applicable
  - We have the right system concept for every application. Whether you want to operate on a laboratory scale or in full-scale 3-shift production, chamber volumes from 2l to 12,600l have already been successfully implemented.
Low pressure plasma system

1. Evacuation of the chamber
2. Admission of the process gas and ignition of the plasma
3. Ventilation and removal of the workpieces

Atmospheric pressure plasma system

- Compressed air connection
- Dry, oil free compressed air, 5-8 bar, up to approx. 1,500 l/h
- HT generator
- Gas and electricity supplies in the flexible tube
- Gas control block
- 230 V, 50/60 Hz approx. 300 W
- Gas duct
- Insulator
- Central electrode
- Arc
- Gas flow
- Voltage-free plasma beam (active gas beam)
- External volt free electrode

Low pressure plasma technology or atmospheric plasma technology?

<table>
<thead>
<tr>
<th>Low pressure plasma system</th>
<th>Atmospheric pressure plasma system</th>
</tr>
</thead>
<tbody>
<tr>
<td>Especially suitable for treatment of 2D and 3D components</td>
<td>Especially suitable for treatment of 2D components</td>
</tr>
<tr>
<td>Bulk materials can be treated</td>
<td>Can be integrated in existing automated systems</td>
</tr>
<tr>
<td>Batch processes</td>
<td>Continuous processes possible</td>
</tr>
</tbody>
</table>

Plasma flame
Success through advanced solutions

Diener electronic is a young, high-tech company in the growth market of plasma surface technology. Operating at a number of locations in Baden-Württemberg (Germany), we design and produce innovative solutions for economic, precise and environmentally-friendly plasma treatment of surfaces – and with great success. Since the company was set up in 1993, we have grown continuously and are now one of the world’s leading manufacturers of plasma systems.

Total competence from a single source

Our customers benefit from the experience and know-how of a dedicated and committed staff and a state-of-the-art production facility.

Above-average level of vertical integration

We design, produce and constantly optimise all main components and the control software. As a result, we can respond to quality defects immediately. Special requests can be put into practice quickly and simply.

Fast service and spare parts service

When it comes to maintenance and service, our customers can count on short response times. The right spare parts are in stock, ready for immediate despatch.

Short lead times

Standard systems can always be built within a few weeks. The important components for all standard types of system are always in stock.
Innovation power
to solve new problems

We operate quickly and flexibly. We see new technical developments, changing market demands and special customer requests as a welcome challenge, rather than a problem. That’s how we continuously improve our products, broaden their spectrum of use and open up completely new fields of application.
In **cleaning**

Practically every material can be precision cleaned with plasma

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 to the gas phase and sucked away.

**Applications**

- Removal of grease, oil, oxides, fibres
- Removal of silicones (LABS-free)
- Pretreatment before bonding, soldering or gluing
- Pretreatment of metal parts before painting etc.

**Components**

- Electronic devices
- Rubber-metal joints
- Switches
- Sensors
- Implants
- Stents
- Micro-components
- ‘O’ rings
- Screws
- Laser components
- Silicon-contaminated seals
- etc.

**Users**

- Automotive technology
- Electronics industry
- Filter manufacturers
- Research institutes
- Rubber processors
- Semiconductor manufacturers
- Industrial painters
- Paint manufacturers
- Medical technology
- Sensor technology
- etc.

Before plasma treatment

Component with contamination

After plasma treatment

Surface is free from residues and easily wettable

Users

- Automotive technology
- Electronics industry
- Filter manufacturers
- Research institutes
- Rubber processors
- Semiconductor manufacturers
- Industrial painters
- Paint manufacturers
- Medical technology
- Sensor technology
- etc.

Users
The four most important possible applications

In activation
Practically every material can be activated with plasma

The surfaces of the component are activated with oxygen or air, for example. Radical sites are created to which the paint or glue systems adhere very well.

**Applications**
- Pretreatment before gluing
- Pretreatment before painting
- Treatment before printing

**Components**
- Sensors
- Switches
- Catheters
- Headlight reflectors
- etc.

**Users**
- Aluminium coaters
- Automotive technology
- Seal/gasket manufacturers
- Electronics industry
- Research institutes
- Rubber manufacturers
- Industrial painters
- Adhesives manufacturers
- Paint manufacturers
- Medical technology
- Sensor technology
- Textile manufacturers
- Watch and clock makers
- etc.

Component before plasma treatment

Plasma treatment

After plasma treatment
The surface of the component is **etched** with a reactive **process gas**. Material is precisely sputtered off, converted to the **gas phase** and sucked away. The surface is enlarged and is very easily wettable. Etching is used before printing, gluing and painting, as well as for “roughening up” the material.

### Applications
- Structuring silicon
- Etching PTFE
- For good paint and glue adhesion with high temperature resistant plastics, such as PTFE, PFA and FEP, for example
- Photoresist ashing

### Components
- Component openers (semiconductor)
- Brackets (dental technology)
- Pacemakers
- Sensors

### Users
- Automotive technology
- Seal/gasket technology
- Electronics industry
- Research institutes
- Semiconductor technology
- Medical technology
- Micromechanical manufacturers
- Sensor technology
- etc.
Plasma polymerization

A monomer is introduced to the plasma chamber. The gas is atomised by the plasma and deposited on the surface of the component.

Applications

- Deposition of hydrophobic layers
- Deposition of hydrophilic layers
- Deposition of protective or insulating layers
- Use as a diffusion barrier, for example

Components

- Precision gears
- Dish-washers
- Medical equipment
- Headlight reflectors
- Video heads
- etc.

Users

- Biochip manufacturers
- Precision engineers
- Dish-washer manufacturers
- Medical technology
- Sensor manufacturers

Before Plasma treatment

Plasma treatment

After plasma treatment
You are the centre of attention at Diener

Our strengths lie in the competent advice and individual support we give our customers. We always endeavour to find the optimal solution for your special requirements, because we don’t see ourselves as a manufacturer and supplier of plasma systems, but as primarily a service provider and problem-solver in the field of plasma surface treatment.

You can play it safe with us - test it first, then decide

We’ll tell you exactly which system is best suited for your application or particular problem. To be absolutely certain, you can send your samples to us for free treatment, or we’ll provide you with a test system. On top of this we offer surface analyses and preparation of system concepts. When you’ve decided on a system, we provide on-site support during the commissioning and process development stages.

We’re permanently on standby – you call, we’ll come

Both before and after the purchase of a system – we are always there for you. If you have a breakdown, the important spare parts are in stock here. We offer a fast, reliable customer service, standing by with help and advice at any time, to ensure that you are back in full production as quickly as possible.

You’re in the best possible hands with Diener electronic

Benefit from our long experience in the application, design and construction of plasma systems. Our specialists will help you optimise your working processes. You can also take advantage of our know-how and unique product and service package in the field of plasma surface technology.

Buy, rent, subcontract treatment – the choice is yours

If it’s uneconomic to buy a plasma system, you can also rent one from us. And if you don’t want to take on the surface treatment of your components yourself, we can offer you our in-house subcontract treatment. Various plasma systems are available for this, together with qualified, experienced staff, who will ensure an optimal surface quality for your parts and components.

Can we offer you something more?

A service package that meets all expectations!
Amorphous diamond-like carbon films (a-C:H, DLC = „diamond-like carbon“)

What are amorphous diamond-like carbon films?
Amorphous diamond-like carbon films consist of a highly cross-linked hydrocarbon matrix and are deposited by means of PVD (Physical Vapour Deposition) or PACVD (Plasma Activated Chemical Vapour Deposition) processes.

Main field of application
Coating of all kinds of machine parts and tools

Purpose:
- Extending service life and tool life
- Lubricant-free applications

Typical features:
- Film thickness: 0.5 – 5 µm, high hardness
- Low surface roughness
- Extremely friction and wear-reducing
- Highly resilient and impact resistant
- Chemically resistant
- Biocompatible
Our customers include, among others, prestigious companies from the fields of automotive, semiconductor and plastics technology, electrical engineering, as well as institutes and research facilities.
our references
You can benefit too

Just get in contact with us and describe your surface problem. We'll be happy to advise you on possible solutions.

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