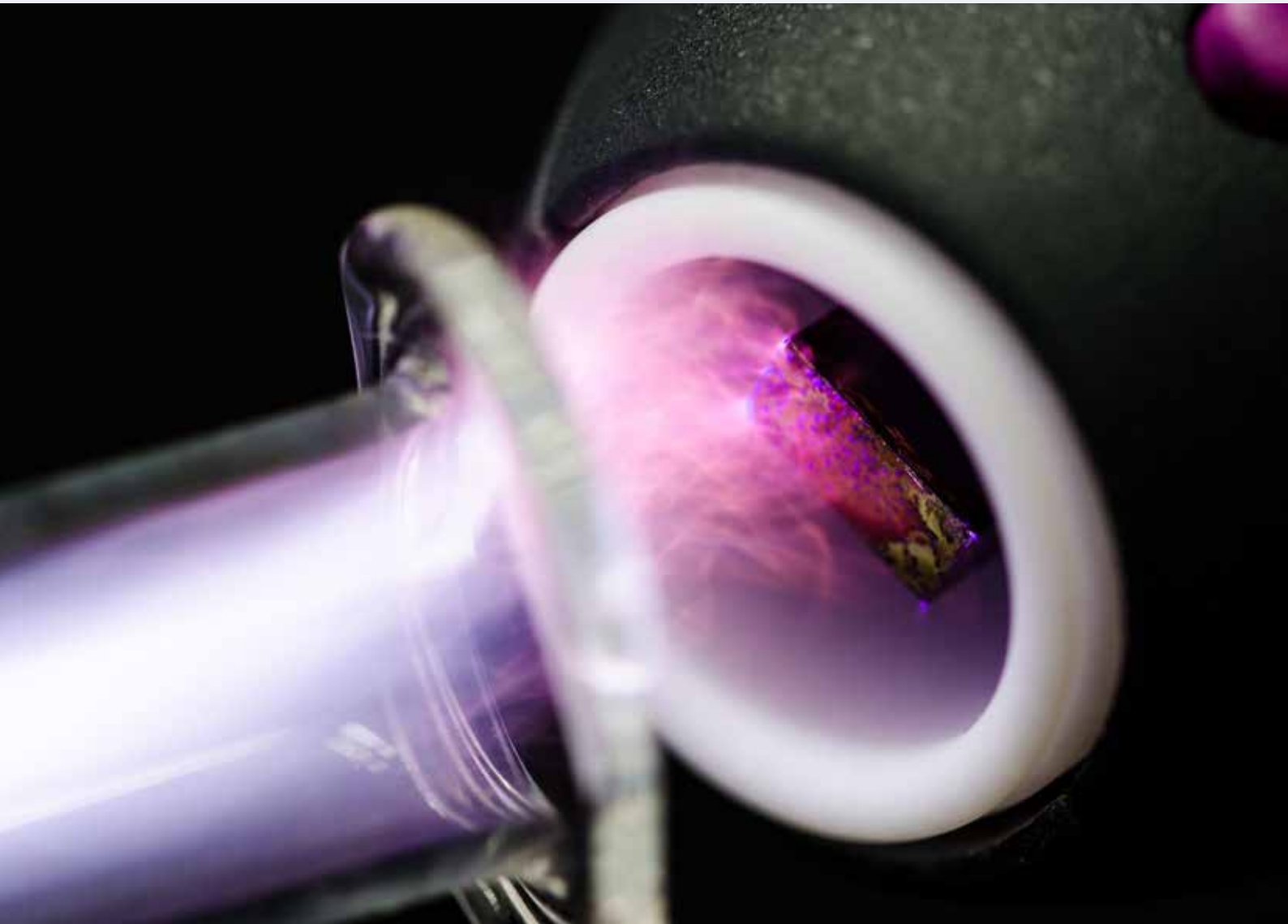




rely on plasma technology



Innovative plasma products

Efficient and reliable



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# 1. The company

Relyon Plasma GmbH based in Regensburg, Germany, is an innovative company in the field of plasma technology. As a team that works on an interdisciplinary basis, we take the many diverse possibilities offered by state-of-the-art plasma technology and apply these to your products.

With our professional sector expertise we are able to supply a broad spectrum of elegant solutions, for instance, for atmospheric plasma surface treatment.

## Our principle – advancing technology through safer processes

As a modern, technology-oriented company with a lean corporate structure, we deliver reliable plasma solutions which are "Made in Germany".

Our products have been tested both in practical applications and in our test laboratory in terms of their process capability and service life.

Every process stage is supported by consistent quality management in accordance with DIN EN 9001, which ensures maximum product functionality and safety.

– Rely on plasma –

## Our technology

Today, plasma technology is in the process of fundamentally revolutionising conventional production procedures in industry, as well as applications in the hygiene sector and in medical technology.

In accordance to a variety of different requirements, we have implemented two different technologies in our product portfolio.

Pulsed Atmospheric Arc Technology (PAA Technology®):  
for applications that require high performance and rapid processes.

Piezoelectric Direct Discharge Technology (PDD Technology®):  
for sensitive processes that require cold active plasma.

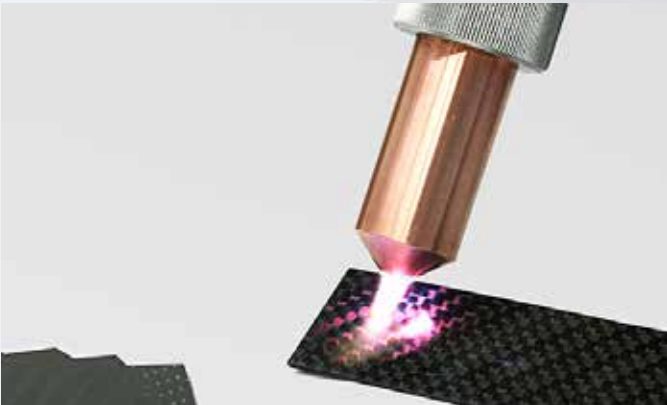
## 2. Applications



### Printing

Optimized surface wetting is the first and often decisive step towards achieving a high-quality print, an even varnish or a tightly bonded glue application. The quality of the contact at this bounding surface often determines how durable and adhesive the material pairing in question turns out to be.

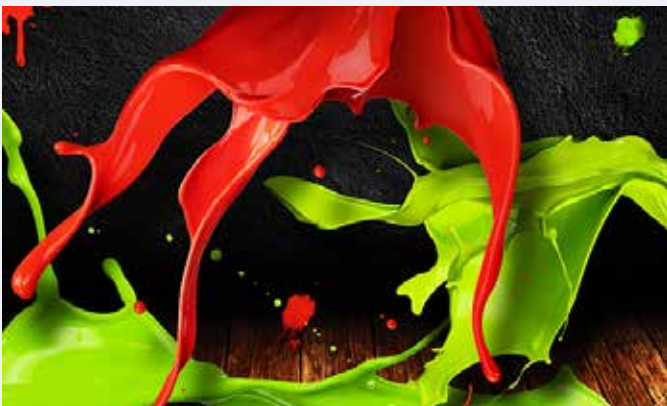
In-line processes, assembly technique, electronics.



### Bonding

In order to wet a surface, the surface energy of the polymer has to exceed that of the ink or adhesive. This can be attained by treating the surface with plasma and is called "activation" in plasma technology.

In-line processes, assembly technique, electronics.



### Varnishing, coating

In order to achieve the highest possible quality when applying coats of paint, lacquer or varnish, a homogeneously thin coat must be applied to the surface in question.

Precision mechanics, in-line processes, modelbuilding.



## Cleaning processes

Atmospheric plasma processes can be carried out with reactive gases, the goal being to substantially accelerate surface reaction kinetics. By adding a reducing gas mixture such as for example hydrogen, oxide layers on the surface of most metals can be removed.

Precision mechanics, microtechnology, in-line processes, electronics.



## Sterilization

Sterilization and disinfection are terms used for processes whereby materials and items are freed of living microorganisms, including their dormant states. The state thus achieved is called "sterile".

Precision mechanics, microtechnology, dental technology, modelbuilding.



## Surface activation

The activation of inorganic or plastic surfaces is an essential process in industry. It is often necessary to activate surfaces prior to coating, varnishing or laminating.

Laboratory techniques, dental technology, modelbuilding, precision mechanics, microtechnology, lenses, assembly technique, electronics.



## 3. PiezoBrush



### Technology

Relyon Plasma has developed PDD Technology® specially for plasma generation which is particularly compact. PDD (Piezoelectric Direct Discharge) is based on direct electrical discharge via an openly operated piezo-electric transformer (PT).

With maximum efficiency, a low input voltage is transformed in such a way that very high electrical field strengths are created and the ambient process gas, typically air, is dissociated and ionised. In the case of PDD, the gas temperature of the plasma volume is insignificantly higher than ambient temperature.

### Features

- Simple to use
- No external gas supply required
- Cold active plasma
- Maximum operational reliability
- Optimum efficiency
- Variable nozzles

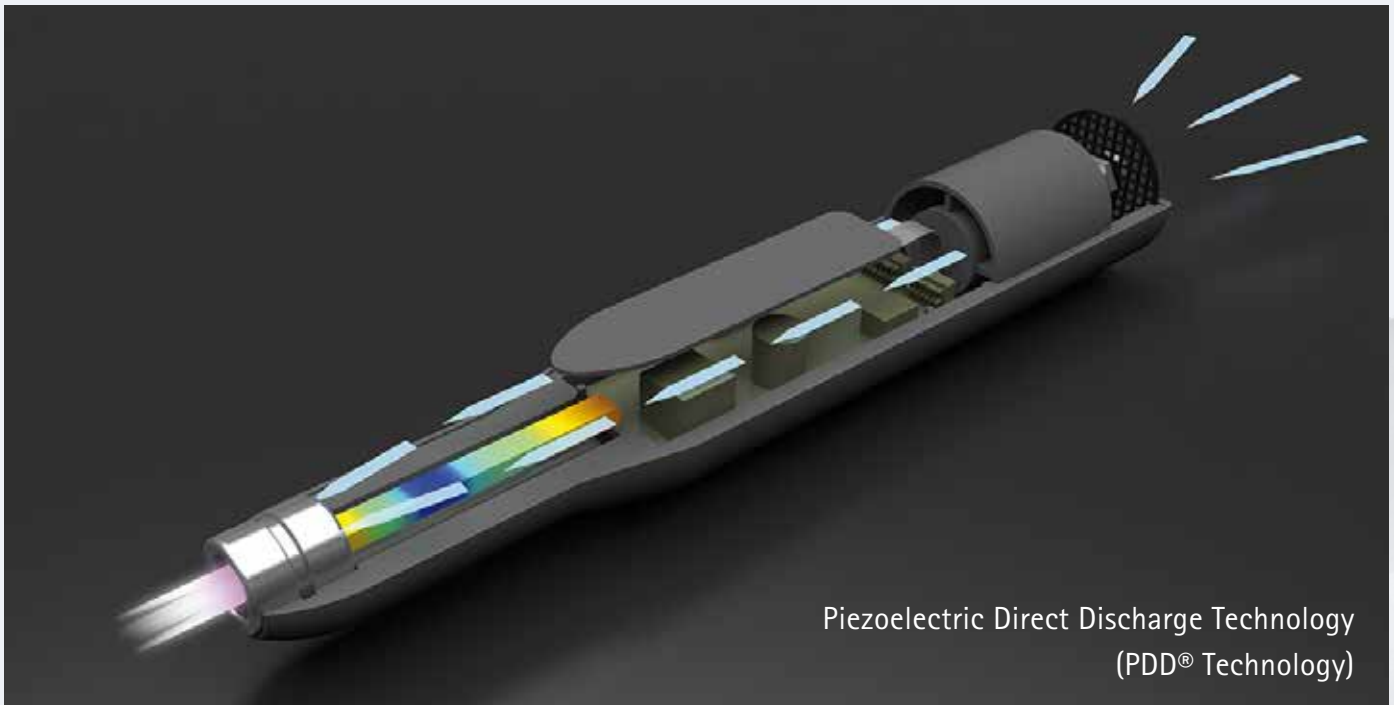
Electron densities of approx.  $10^{14}$  to  $10^{16}$  per  $m^{-3}$  are achieved. In this way, PDD produces a typical "cold" non-equilibrium plasma.

The properties of PDD therefore open up a multitude of application possibilities. PDD devices are used in medical research for germ reduction, odour reduction and in microbiology.

Typical industrial applications include surface activation for the optimisation of wetting and bonding properties in the case of plastics, e.g. in printing, coating and bonding processes.

### Applications

- Medical research
- Microbiological processes, germ reduction, odour reduction
- Pharmaceutical industry
- Biotechnology
- Food processing
- Surface activation for the optimisation of wetting and bonding properties in the case of plastics, e.g. in printing, coating and bonding processes.



## Technical information

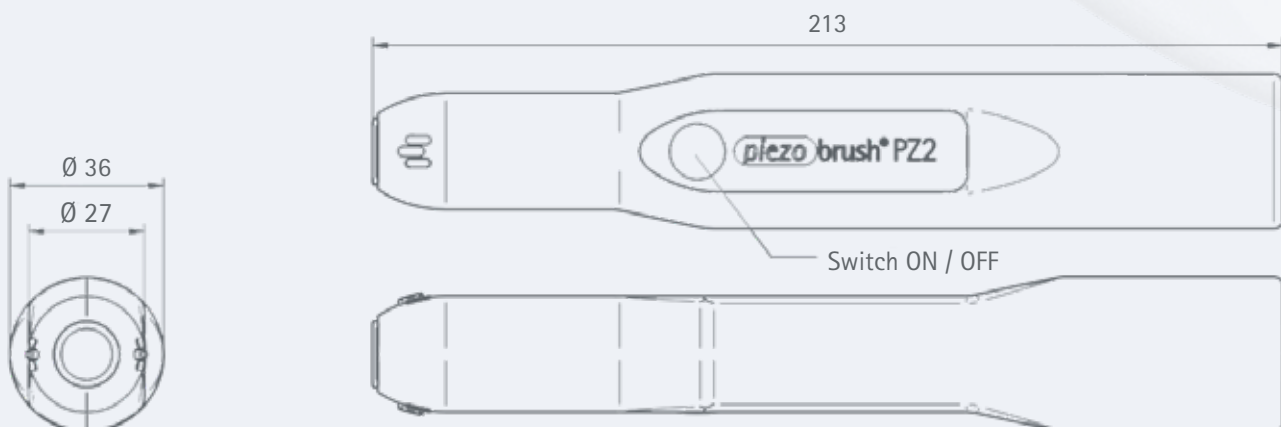
Electrical connection	110 – 240 V / 50 – 60 Hz 15 V DC
Power requirement	max. 30 W
Specification	Hand-held device with power supply unit, Integrated ventilator
Weight	170 g
Plasma temperature	< 50 °C
Typical treatment distance	2 – 10 mm
Typical treatment width	5 – 20 mm

## Set contains

- Multirange power supply unit
- Replacement nozzles
- Transport case

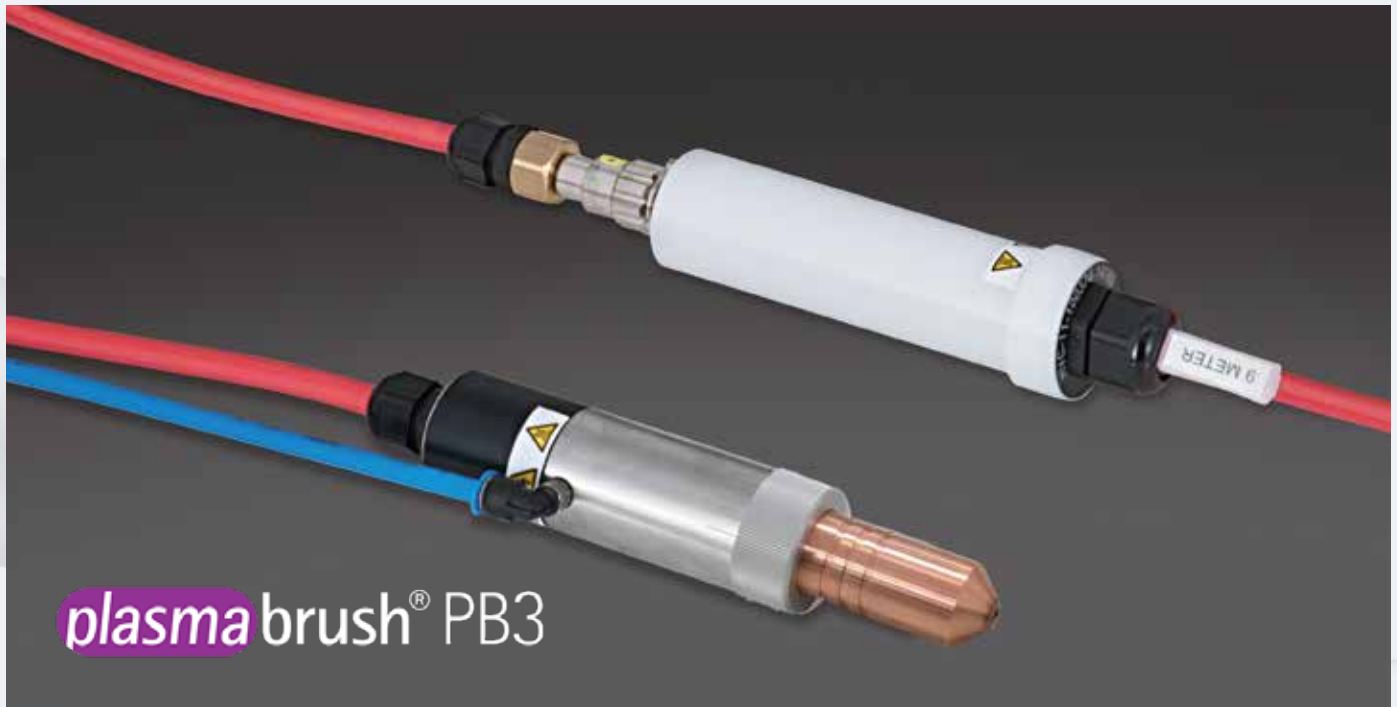
## Optional nozzles

- Nearfield nozzle
- Multigas Et Nadel nozzle



**Hand-held device for universal application**  
**Plug in, switch on and it's ready to use**

## 4. PlasmaBrush



### Technology

The nozzle-type plasma generators are particularly compact and have long-term stability due to the combination of a unipolar pulsed high voltage source and a vortex flow in the nozzle (PAA Pulsed Atmospheric Arc Technology®). In this dynamically controlled operating mode the arc is prevented from stabilising at a "hot spot" and nozzle erosion is minimised.

The arc rotates at a high frequency in the combustion chamber. Despite the high power density, there is only minimal warming of the nozzle and hardly any erosion of the electrodes.

A special advantage of the unipolar nozzle control is the asymmetrical thermal loading of the nozzle components. The interior anode is subject to a lower thermal load and also less oxidation. The exterior cathode has a larger surface area and this ensures good dissipation of heat. Therefore, no water cooling is required. In addition, the high frequency pulse excitation of the arc minimises the dielectric polarity reversal losses in the high voltage cables.

The plasma temperature can be freely adjusted in a wide range via variable nozzles, the gas flow and the pulse energy. This increases the spectrum of process gases and process gas mixtures that can be used.

Nitrogen and forming gas ( $N_2/H_2$ ) can be used, even though most industrial applications are operated using compressed air. Further process gases can also be used after consultation.

### Features

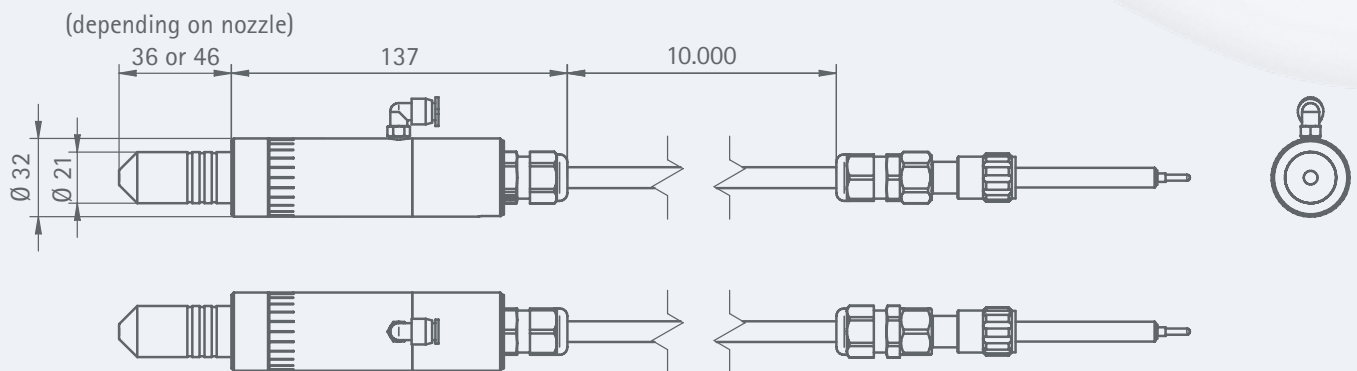
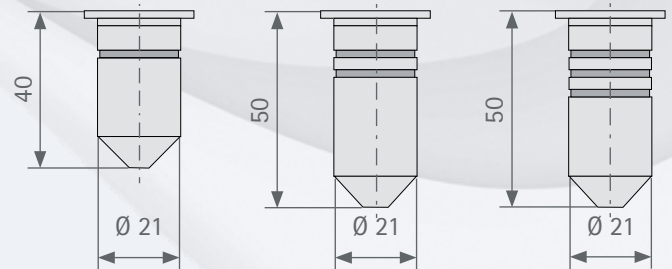
- Compact and robust
- Long life
- For compressed air, nitrogen and special gases
- Suitable for use with robots
- Wide operating range in terms of gas flow and temperature
- Minimal heating of the housing
- Variable nozzles





## Technical information

Flow range	30 to 80 L/min
Cable length	10 m
Weight	680 g
Diameter Ø	32 mm
Gas connector	6 mm
Typical treatment distance	10 – 25 mm
Typical treatment width	15 – 25 mm
to be operated with PS2000 and HVC cable extension	



**High power Plasma generator  
for industrial production processes and high speed applications**

# PS2000



Controlled high voltage source for industrial use and rack mounting.

## Technology

High voltage source optimised for Pulsed Atmospheric Arc Technology (PAA Technology®). Due to the use of a unipolar pulsed high voltage, the arc is prevented from stabilising at "hot spots" in the nozzle. The latest IGBT switching technology and the use of high quality high voltage components ensure that the source is extremely reliable and efficient.

Overloading is also not possible in continuous 24/7 operation. In the event of cable damage or short circuiting during critical operations the control unit intercepts all power fluctuations safely.

The capability of the PS2000 is particularly reflected in the fact that it can operate with variable loads and can effectively pump loads within a large potential range of up to > 12 kV. This special feature ensures continuous ignition performance across a wide power range and for different process gases.

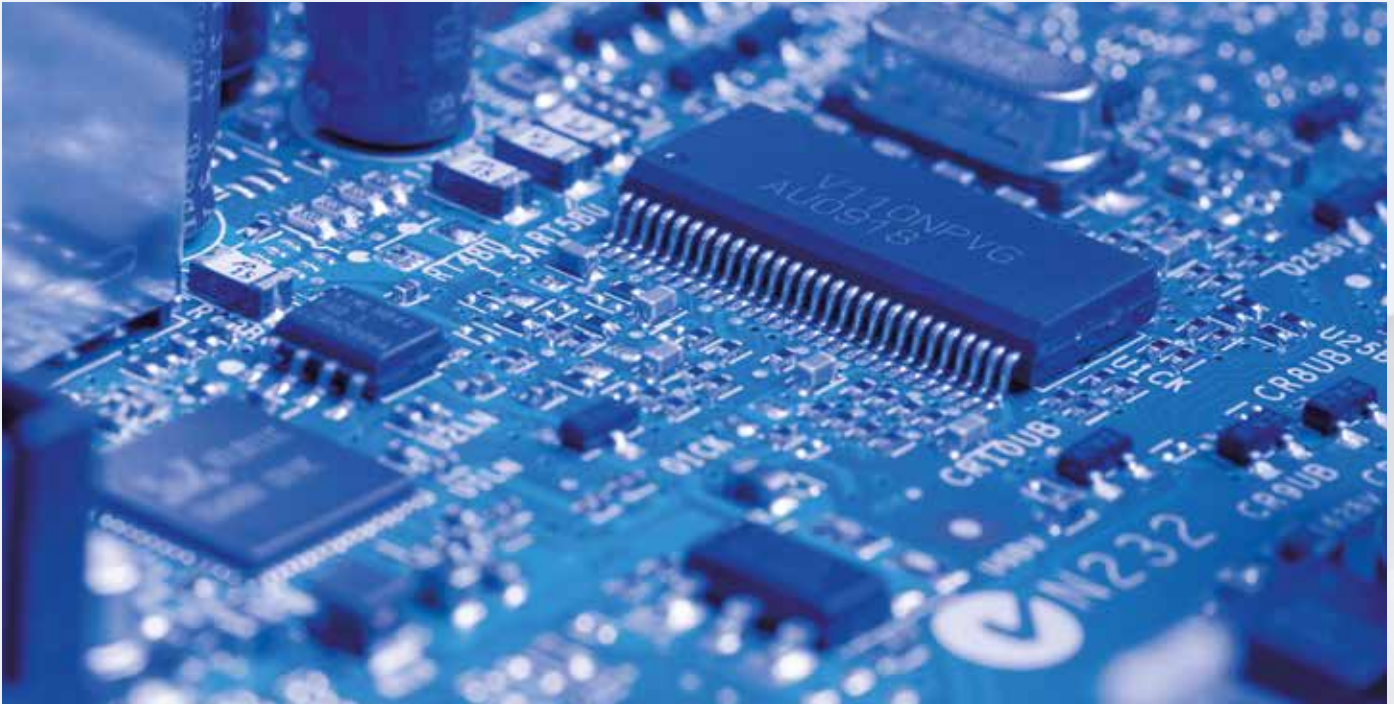
The high voltage source is switchable in a range of milliseconds at full load and therefore optimised

for timed processes where highly precise timing is beneficial.

All communication is based on the reliable and fast CAN bus. Even in the event of a fault, the communication remains active. Integration into each automated production plant is simple and standardised, even in the case of several high voltage sources.

## Features

- 19 inch industry standard
- Short circuit proof
- CANopen interface
- Controllable
- Variable working point



## Technical Information

Input voltage	220 – 240 V AC, 50 – 60 Hz
Max. input current	6 A
Fuses	6.3 A /500 V AC time-lag
High voltage	Pulsed direct current (DC)
Power	0 – 1.000 watt variable
Open circuit voltage	Up to 20 kV
Bus communication	CANopen format (CIA301)

## Ambient conditions

Protection class	
DIN EN 60529	IP20
DIN EN 61440	Class I
Temperature	10 – 40°C; 50 – 104°F
Air humidity	< 80 % (non condensing)

## Dimensions

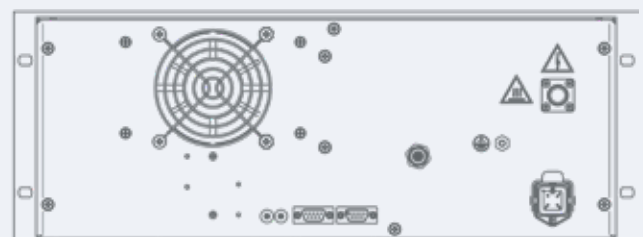
Weight	18 kg
Dimensions	W=483 mm; H=177 mm; D= 430 mm (W=19"; H= 6.96"; D=16.93")

Front view

483



Rear view



**The high performance package for 19" rack integration**

# PlasmaBrush high performance system



## Atmospheric plasma system PB3 and PS2000

Perfectly tailored components in a robust industrial design: PS2000 19 inch high voltage unit and PB3 plasma generator connected with flexible 10 m cable for simple integration into a wide range of systems.

Thanks to our many years of experience in arc dynamics, fluid mechanics and power electronics, we have developed an atmospheric plasma system which is unique in terms of power density and function.

In the development of this plasma unit which can be used for many different applications, we have placed the focus on easy integration into industrial

processes with very effective user friendly communication ability.

Whatever your requirements – from ultrafine cleaning, surface activation, coating, right through to germ reduction processes – are, our systems will fit into every processing environment: safely and reliably.

**That's all you need to construct a high performance plasma system and integrate it into your process**





## Features

- Compact design
- Simple integration
- Suitable for compressed air, nitrogen and other gases
- Variable output
- High start/stop dynamics
- Maximum operational reliability

## Applications

- Fine cleaning
- Removal of oxide layers
- Surface functionalisation
- Activation prior to bonding, sealing, casting or printing
- Coating, laminating and sealing
- Germ reduction

## Materials

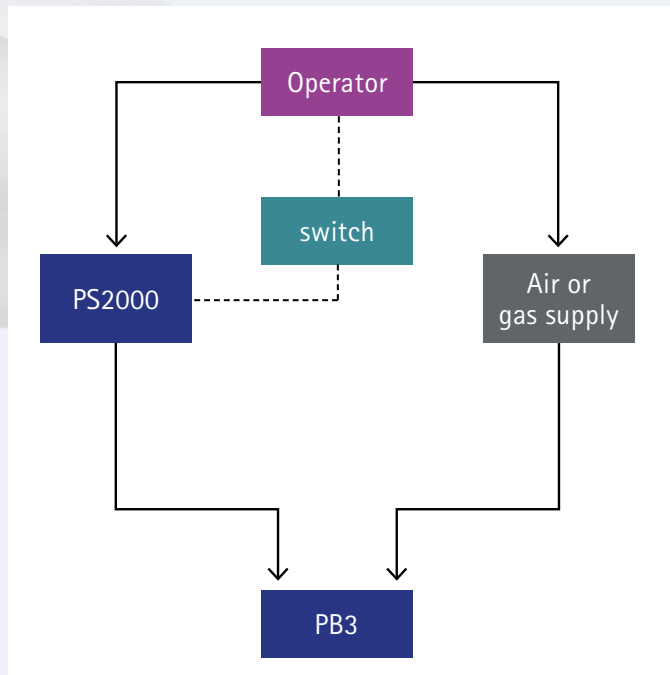
- Thermoplastics PP, ABS, PE, PET, POM
- Elastomers
- Epoxide, polyester, CFK, GFK
- Fabrics
- Paper
- Metal
- Glass and ceramics
- Natural materials

Simply connect and it's ready to use



# Integration and communication

**Easy to install:** You just need compressed air and a plug socket. The system is set up in a few steps, integrated and ready for operation. There are manifold control scenarios. All system parameters can be set individually depending on the process.

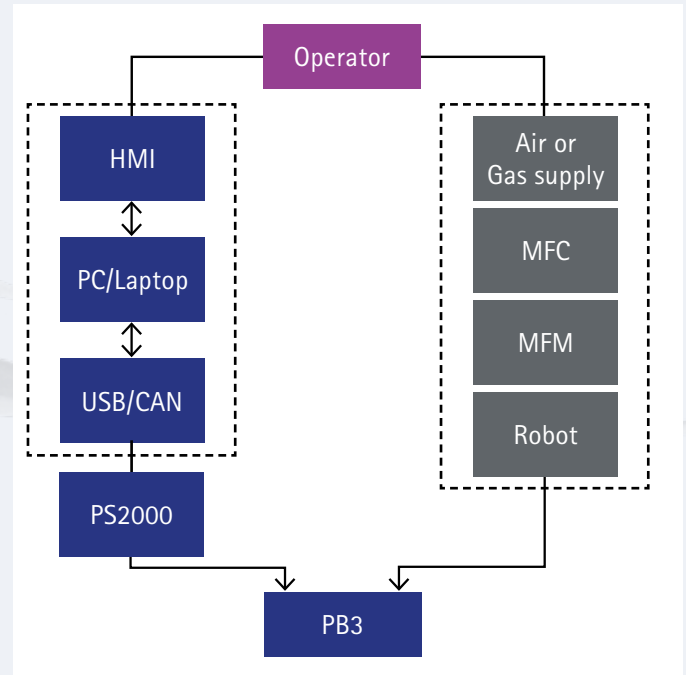


**Application scenario 1:** Basic system controlling with fixed parameters.

## Application scenario 1

Employee uses the basic system with a simple control unit or a foot switch (24V). Gas- or air supply is set to a fixed value at a constant pre-pressure or adjusted with a external trottle.

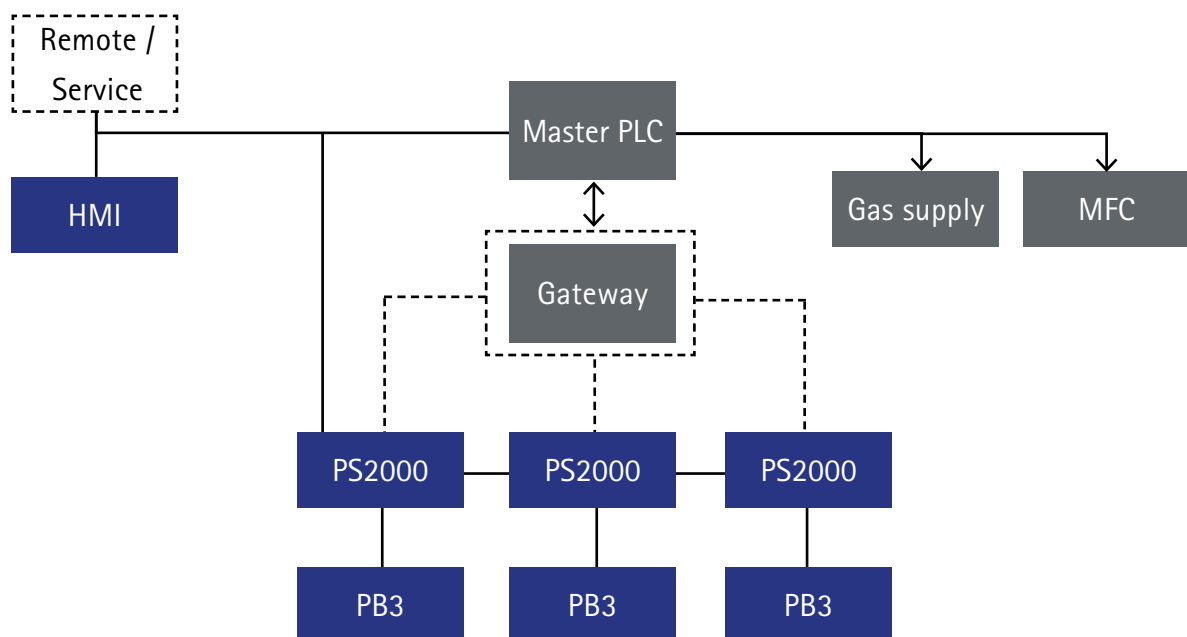
With a minimum of effort the modular plasma system can be integrated in every application. Industrial standards are always met. Subsequent examples show typical application scenarios.



**Application scenario 2:** Software-based concept with variable parameters and process data visualization and logging with random expandability.

## Application scenario 2

Providing a solution for labs, high-schools and universities, students and lecturers can work with a fully developed software in order to control the process, monitor all values and save measurement data. Safety aspects like detection of misfire or a missing high-voltage cable are implemented. All parameters can be changed inside the software as well as permanently stored inside the plasma system.



**Application scenario 3:** PLC-based multi channel system with full process control and service interface for remote diagnosis.

## Application scenario 3

The CANopen interface is the determinant advantage having the units fully integrated in industry. Multi device systems can be wired with a minimum of effort. The independence of a higher-level bus topology is solved using realtime gateways. An integration of mass flow controllers, pressure sensors, temperature probes or robotics is only limited due to the used bus topology. All variants of process monitoring, remote diagnoses, data logging and parameterization of the plasma unit can be implemented easily.

# Plasmacell



## Operation

The handling is simple and intuitive. A teach pendant, which is included in the delivery, makes the programming of treatment sequence very easy. Additionally, you can control all functions via software with an optional touchscreen. All work sequences and process parameters are displayed and stored.

## Filtration

The closed cell processing ensures a clean environment. The exhausting air is cleaned with an optional filter and an external suction device is not required.

## Air supply

You can choose an optional completely autonomous air supply as compact and quiet 19 inch rack. This option makes you independent from air supply.

## Installation

The system is tested and fully installed. Simply plug and play. All options can be upgraded easily.

The base system is consistently optimized for ergonomics and safety through the modularity. The well proven plasma system PlasmaBrush PB3 is characterized by low weight and compact design of the plasma head. Thereby, the full range of motion dynamics is exhausted. The efficient high-voltage source PS2000 provides the power for all practical requirements. Depending on the application, the accessories and options can be selected.



### Technical information

Power supply	400 V or 220 -240 V AC, 50 – 60 Hz
Max Input circuit	6 A
Security	6.3 A /500 V AC time-lag
High voltage	Pulsed direct current (DC)
Output power	0 – 1.000 Watt variable
Open circuit voltage	up to 20 kV
Bus communication	CANopen format (CIA301)
Work area	300 mm x 300 mm x 100 mm

### Ambient conditions

Protection classification	
DIN EN 60529	IP54
DIN EN 61440	Class I
Temperatur	10 – 40°C; 50 – 104°F
Air humidity	< 80 % (not condensed)

### Dimensions

Weight	up to 350 kg
Measurements	180 cm Standard. 195 cm with supporting arm.

**The universal working environment for an efficient plasma treatment of your work material**

# Plasmatool



## Operation

Surface optimizing prior to gluing or printing is important. The Plasmatool makes chemical primers or mechanical treatments unnecessary. Improved wettability and adhesive force can be achieved at components, which cannot be handled automatically due to size or mobility.

The handling of the Plasmatool is optimized for easy usage and maximum operator's safety.

The Plasmatool can be used everywhere thanks to the trolley design. Two-handed operation and a signal lamp protect and warn the operators and third parties. The Plasmatool is supplied by a single 230 V power source. An integrated air compressor supplies the plasma generator. No external gas supplied has to be present.

## Gas supply

Completely autonomous air supply is integrated inside the device. The operator is independent of any compressed air supply.

## Features

- Different processes / substrates / geometries
- No PLC necessary
- Stand-Alone unit, no compressed air or mass flow control required
- Single person handling thanks to trolley design
- Two-handed operation and signal lamp for advanced safety
- Robust and easy to use
- Only power outlet needed





Flexible handling and perfect quality at large structures.

High-efficient plasma handheld device for surface treatment. Ergonomically optimized for safe operation in industrial environments.

The handheld device with pulsed atmospheric arc technology.

## Technical information

Electric connection	220 - 240 V AC / 50 - 60 Hz
Max input current	6 A
Power consumption	1.300 W

## Ambient conditions

Protection classification IEC 61140	Class I
Protection classification EN 60529	IP 23
Sound pressure level	< 60 dB (A) by 1 meter distance

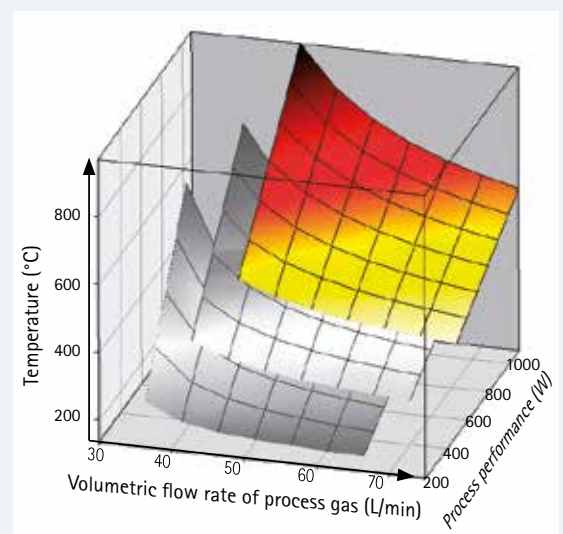
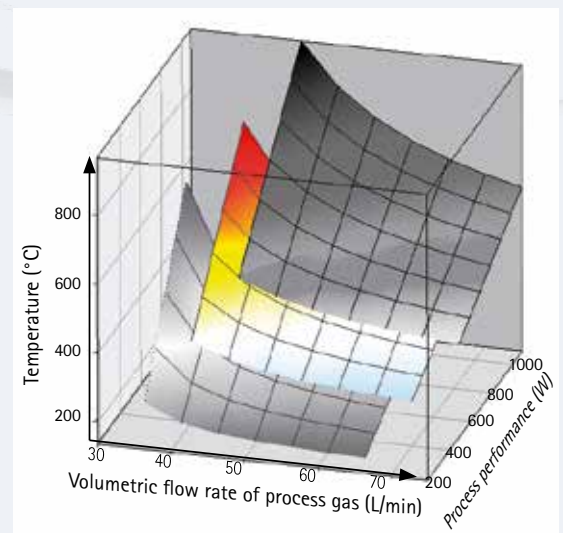
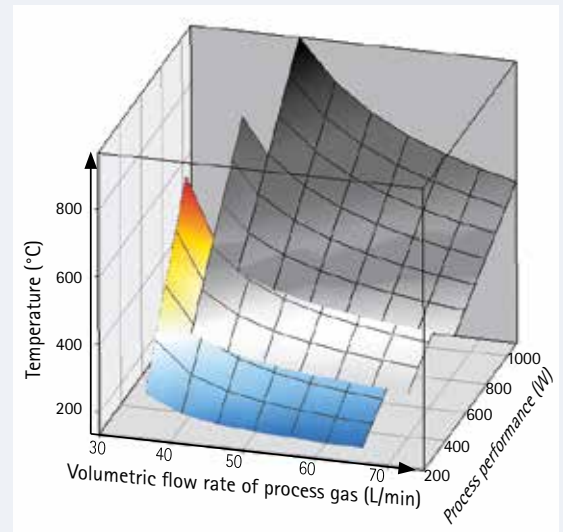
## Dimensions

Weight	approx. 60 kg
Measurements	800 mm x 540 mm x 430 mm

**The perfect tool for flexible and easy surface treatment in industrial environments**

# Nozzles

Temperature (°C)



A suitable nozzle for every process. The fine adjustment is derived from the characteristic diagrams which here depicts the relationship between gas flow and input power.

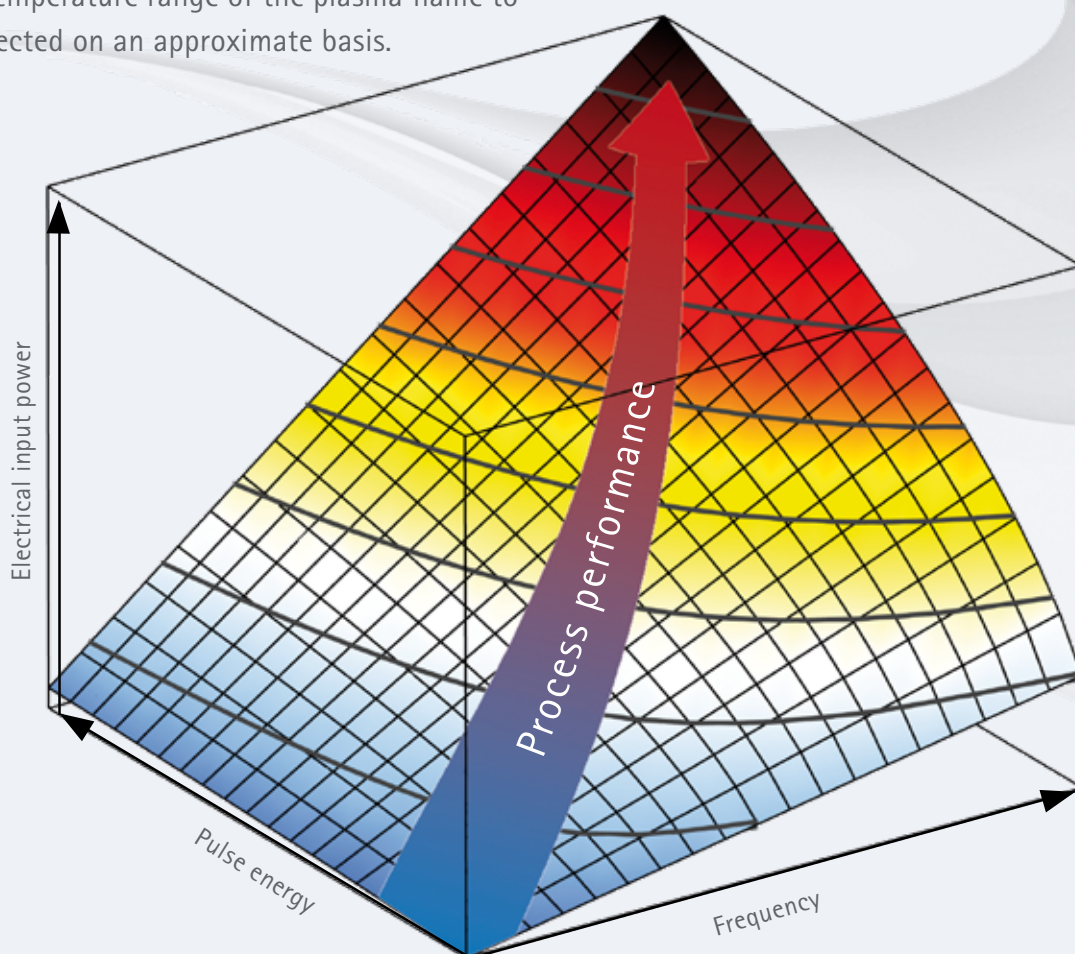
Process variability is the keyword leading to the success of surface treatment using the Relyon Plasma system. The processing of metals, glass, organic materials, textiles or polymers requires process control that is adapted to the specific application. An equally important feature is the range of possible applications, e.g. cleaning, activation, coating, bleaching or bonding. Further parameters include the cycle time required by the application, process speed, product geometry and working distance.

For different applications, a variety of nozzle attachments can be selected, which enable the geometry and temperature range of the plasma flame to be pre-selected on an approximate basis.

All nozzles can be changed quickly and easily. In addition, each nozzle enables optimum adaptation to the process by the choice of the process gas, in the simple case "air", and mass flow setting.

A fine tuning of the process takes place via the pulse energy and frequency, which can be set within a broad range at the high voltage source.

Extensive practical experience exists for most applications, or alternatively Relyon Plasma can provide a recommendation in advance using numerical process simulation with regard to the selection of suitable components and the optimum process control.



The characteristic diagram of power which is fed into the arc in relationship to pulse energy and frequency.

**Plasma generator with interchangeable nozzles  
– tailored to your process optimised for maximum service life**

## 5. Services



### Product consulting

The basic functions of our products can be understood intuitively. If you are interested in optimizing your results, why not profit from our years of experience?

We are glad to consult you either on our premises or directly at your production site, by demonstrating practical examples as well as prepared applications and by sharing references given about us.

### Process consulting

Our wealth of experience allows us to optimize your processes in close collaboration with you. Aspects of safety and quality are as important as cost control (TCO: total cost of ownership). The question of profitability will be analyzed comprehensively and discussed with clarity and transparency.

### Sampling

In our applications lab, we can process and ana-

lyze your samples for you or together with you. The desired effects are thus verified and documented. At the same time, you receive practical training in how to use our plasma devices and can see for yourself how easily they are handled.

### Rental devices and equipment

We are able to provide you at short notice complete units for rental. These units can be implemented into your production process, whether for temporary hire or for permanent use. The introduction and commissioning of our products is very easy.

### Service

The reliability of our plasma devices is our first and foremost goal. We offer you comprehensive customer service at short notice. Therefore, we keep all important spare parts in stock as far as possible. When you put our units into service, we support you either by phone or email, through remote maintenance or on-site on your premises.



## Expert advice for your individual requirements...



### ...in application technology

Our interdisciplinary development teams work with goal-oriented efficiency, benefitting from our own mechanics and design departments as well as an ideally equipped laboratory.



### ...in system technology

We will advise you on the configuration of the components required for implementation of the optimum process.



### Our philosophy: "KISS – Keep it simple and smart"

If you have already defined specific requirements in your system environment or in your equipment, we will be delighted to advise you on which solution will be the best and most cost-effective for you.

Your Relyon Plasma Management





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