

Piezo transformers and plasma generators

TDK cooperates with relyon plasma to develop and manufacture cutting-edge plasma solutions

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TDK Corporation is cooperating with relyon plasma GmbH on the joint development and manufacture of application-specific plasma components and systems. Based in Regensburg, Germany, relyon plasma is a European R&D leader and manufacturer in plasma technologies. The key component in the jointly developed systems will be the TDK CeraPlas™, a new kind of piezo-based cold plasma generator. “The close cooperation with relyon plasma will enable TDK to accelerate the establishment and market penetration of its piezo technology,” explains Dr. Georg Kuegerl, CTO of TDK’s Piezo and Protection Devices Business Group. “Together, we will be able to introduce innovative plasma generation components and systems much more quickly onto the market and ramp up the volume production reliably and more cost-effectively.” Dr. Stefan Nettesheim, managing director of relyon plasma, also expects major benefits from piezo-based plasma generation. “CeraPlas technology is an ideal starting point for a new class of plasma generation solutions. Thanks to its superior reliability and outstanding power density, it will enable us to design slim, lightweight tools that are easy to operate, safe to touch and cleanroom-compatible.”

New and promising business opportunities

The broad range of innovative applications for piezo-based plasma technology includes surface treatment of all kinds of materials, the sterilization of food processing machines and medical devices, or even the direct treatment of wounds, just to name a few.

Relyon plasma’s piezobrush® PZ2, which was introduced in 2014 already, is the world’s first product based on CeraPlas. This product is a handheld, cold atmospheric pressure plasma source that needs no external processing gas. As the key component CeraPlas enables an especially efficient generation of cold atmospheric pressure plasma.

CeraPlas: voltage transformation and plasma generation in a single component

CeraPlas™ uniquely combines the voltage transformation and plasma generation in a single component. This new technology is based on a PZT (lead zirconate titanate) ceramic material which can be co-fired with the internal copper electrodes. The resulting material set offers a high and stable performance over a wide strain range as well as a good electro-mechanical coupling and low losses. CeraPlas features many advantages: compact size, low weight, low power consumption, a low input voltage and a high output voltage.

CeraPlas is a high-performance component that can be integrated into different plasma source designs without the need for special high-voltage safety measures, giving it a high degree of application flexibility.

In comparison with conventional plasma generation techniques, CeraPlas achieves high surface activation at very low power. For example, voltages of up to 15 kV can be reached at the output of the CeraPlas with a sinusoidal input voltage of only 12 to 24 V_{pp}, which is high enough to generate a discharge in air and other industrial gases such as nitrogen or argon. The plasma itself has a low temperature of below 50 °C and is thus suitable for treating the surface of nearly all temperature sensitive materials, including human skin.

Glossary

- Plasma: As one of the four fundamental states of matter, plasma is formed when air or gas is ionized. Plasma possesses conductive properties that are similar to those of metals and depend on the input parameters such as energy, pressure, process gas composition, or the addition of primer substances. Plasma not only enables one to manipulate the surface properties of materials in a multitude of ways without causing damage or destruction, it can be used to clean and disinfect surfaces and spaces. A cold (non-thermal) atmospheric pressure plasma is required for an increasing number of applications.

Main applications

- Surface treatment of textiles and plastics
- Sterilization of food processing machines and medical devices,
- Direct treatment of wounds
- Disinfection of spaces
- Neutralization or reduction of odors

Main features and benefits

- Compact size
- Low weight
- Low power consumption
- Low input voltage and a high output voltage
- Low plasma temperature
- Outstanding performance regarding plasma generation and surface activation

Key data of the CeraPlas™ piezo transformer and plasma generator

Operating voltage [V _{pp}]	12 to 24
Operating frequency [kHz]	~ 50
Output voltage [kV]	Up to 15 (depending on load)
Transferred power [W]	10 (max.)
Plasma temperature [°C]	<50
Processing gas	Air, industrial gases such as N ₂ , Ar, He
Ozone generation rate [ppm] (at 8 W with customized measurement set up)	20
Dimensions [mm]	72 × 6 × 2.8
Material set	Hard PZT with co-fired copper electrodes

About TDK Corporation

TDK Corporation is a leading electronics company based in Tokyo, Japan. It was established in 1935 to commercialize ferrite, a key material in electronic and magnetic products. TDK's portfolio includes electronic components, modules and systems* marketed under the product brands TDK and EPCOS, power supplies, magnetic application products as well as energy devices, flash memory application devices, and others. TDK focuses on demanding markets in the areas of information and communication technology and consumer, automotive and industrial electronics. The company has a network of design and manufacturing locations and sales offices in Asia, Europe, and in North and South America. In fiscal 2015, TDK posted total sales of USD 9.0 billion and employed about 88,000 people worldwide.

* The product portfolio includes ceramic, aluminum electrolytic and film capacitors, ferrites, inductors, high-frequency components such as surface acoustic wave (SAW) filter products and modules, piezo and protection components, and sensors.

About relyon plasma GmbH

relyon plasma, based in Regensburg, Germany, is an innovative research, development and production company in the field of plasma technology. The company offers a broad spectrum of modular components for surface pretreatment such as activation and ultrafine cleaning, as well as for sterilization, tissue stimulation and odor neutralization in laboratories and the medical sector.

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