

A universal cutting process for lightweight construction

Ultrasonic cutting of high-strength and tough materials

PLASTIC WELDING

METAL WELDING

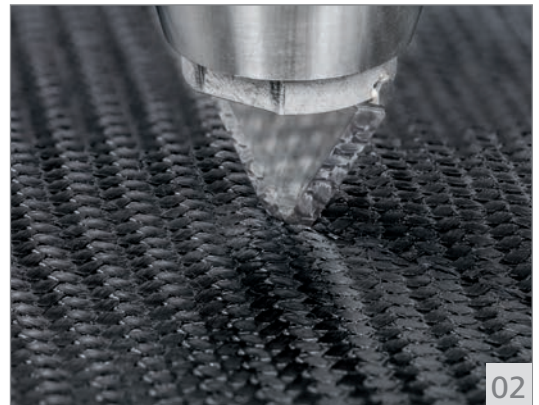
CUTTING

CLEANING

SCREENING



01



02

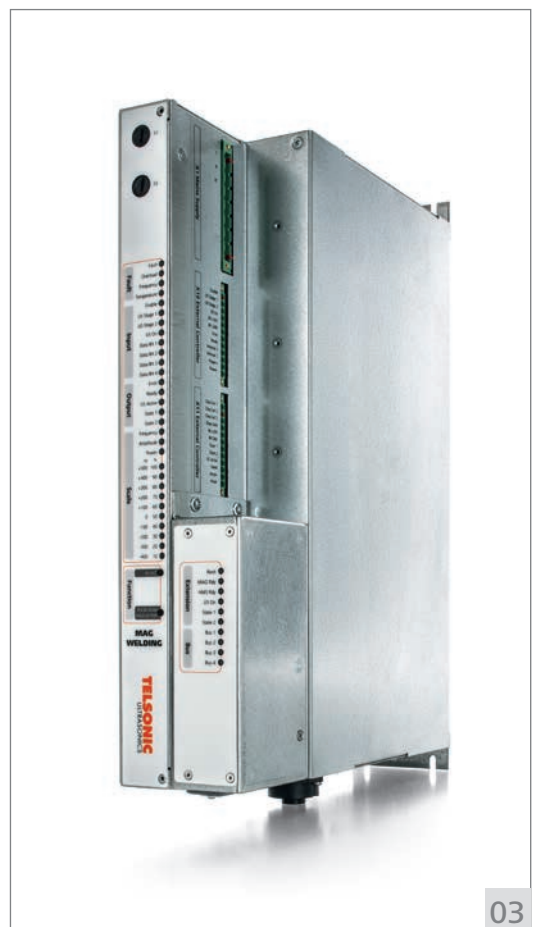
Bronschhofen (CH), 10/2017

Nowadays, cutting down on weight is considered an innovation driver in many industries, particularly automotive engineering, aviation and aerospace and medical technology. Ultrasonic cutting offers excellent prerequisites for machining materials that are increasingly used in lightweight construction. Thanks to interchangeable blade attachments, it is now possible to cut a wide range of different materials efficiently, e.g. glass- or carbon-fibre-reinforced fabrics, Kevlar, foamed materials, leather, artificial leather, rubber, cardboard or paper.

The term "ultrasonics" is used to describe sound frequencies above the hearing threshold, i.e. above around 20 kHz. Frequencies in the range of 20 kHz and 30 kHz are used for cutting. They are produced by a piezo-converter that causes a blade to vibrate at high frequency, which is particularly effective in resonance yet requires little power at the same time. This produces clean cuts with a low thermal load on the environment, and the product does not stick to the blade. Furthermore, this process also offers additional advantages which make it particularly suitable for cutting the materials used in lightweight construction.

A process with sharp advantages

In contrast to mechanical milling, for example, ultrasonic cutting does not cause any material loss. There are no chips and the cut edges are smooth and clean, so there is no need to rework the product. No cutting medium is required – as is the case with water jet cutting, for example – which means that the material being cut remains dry and clean. The cutting depth can be adjusted as required (scoring) and ultrasonic cutting is also quiet, eliminating the need for any noise protection measures. In addition, in contrast to laser cutting, the surface of the material being cut does not have to fulfil any special quality criteria; the process does not produce burnt cut edges or combustion gases. Furthermore, acquisition and operating costs are extremely low compared to other processes, making ultrasonic cutting a practical solution for many lightweight applications.



03

- 01 Various cutting tools
- 02 Cutting carbon-fibre parts (prepreg)
- 03 MAG ultrasonic generator

As a pioneer in ultrasonic technology, Telsonic AG has been developing and selling production-ready ultrasonic solutions worldwide for the past fifty years. This now also includes ultrasonic cutting systems, which have already proven their worth in practical applications in fields such as automotive engineering, aviation, body construction, machine building, packaging, textiles and the consumer goods industry. The powerful and flexible systems are designed for use in automation lines, special installations and robotic systems. In addition, application laboratories can be fitted with the cutting components in order to perform basic research and cutting tests.

Modular design increases flexibility

The cutting systems feature a modular design and can easily be adapted to the specific application: the generator generating the ultrasonic vibrations is designed for installation in control cabinets and communicates with the system control. The cutting systems are usually operated with the MAG generator which is easily controlled via I/Os. The MAG generator is designed with the clear aim of accomplishing complex cutting tasks in special-purpose systems and production lines and supports nearly all standard fieldbus interfaces (Ethernet/IP, EtherCAT, ProfiNet, Profibus, Sercos III, Powerlink and Modbus RTU). A software development kit that contains function modules and programming examples is available for control programmers so that even the most challenging tasks can be performed quickly. The ultrasonic vibrations generated by the generator are converted by the converter's piezo-ceramic components into mechanical oscillations, which are then transmitted to the cutting sonotrode. The sonotrode is moved by resonance oscillations and establishes the connection to the workpiece.

The sonotrode and the blade are also designed as individual modules, so – in contrast to most common ultrasonic cutting systems – they do not form a fixed unit: the ultrasonic sonotrode directs the mechanical oscillations into the screw-mounted ultrasonic blade. The sonotrodes are available in two lengths (approx. 266 mm and 136 mm). The installation conditions on the system determine the length to be used. The stable suspension of the resonance system ensures excellent decoupling of the ultrasonics.

The right blade for every application

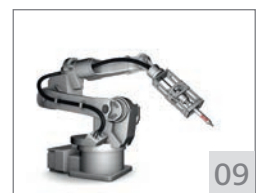
The exchangeable ultrasonic blades – or knife tips – are available in many variants. They are selected specifically for each application and then fastened onto the sonotrode. The criteria for selection include the material and thickness of the product being cut, the required cutting contours and geometries, the desired cutting speed, application area and ambient conditions. There is therefore a suitable blade for any requirement – whether for straight cutting or small radii.

Blade-specific mounting tools are also available to avoid injury when mounting or dismantling the blades. All knife tips are made of hard metal and are therefore extremely durable. Their service life is up to 20 times longer than with conventional tool steel. The tips are offered for cutting depths up to 75 mm as standard; customer-specific designs are also available. Cutting pads to protect the knife tips are available as optional accessories.

Using one ultrasonic system for multiple tasks

The modular sonotrode design enables the same ultrasonic cutting system to be used for different materials or cutting contours, simply by changing to the appropriate blade. The generator automatically "detects" the type of blade via a frequency scan and ensures that it is moved at the appropriate resonance frequency. The modular design of the sonotrode and blade naturally reduces operating and maintenance costs when compared with other cutting solutions. With these advantages, there is no doubt that the versatile and powerful ultrasonic cutting systems from Switzerland will be able to tap into many other application areas, such as cutting carbon-fibre parts and rubber-based materials, as well as trimming off excesses for a wide range of lightweight construction materials.

by Lex Wirz, Product Manager at Telsonic AG, and Ellen-Christine Reiff, M.A., Redaktionsbüro Stutensee



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