Ultrasonic cutting with carbide blades

Aside from cut&seal welding in the textile industry and ultrasonic cutting in the food industry, the cutting of high-strength, sticky and viscous materials using ultrasonically excited blades is a growing field of application.

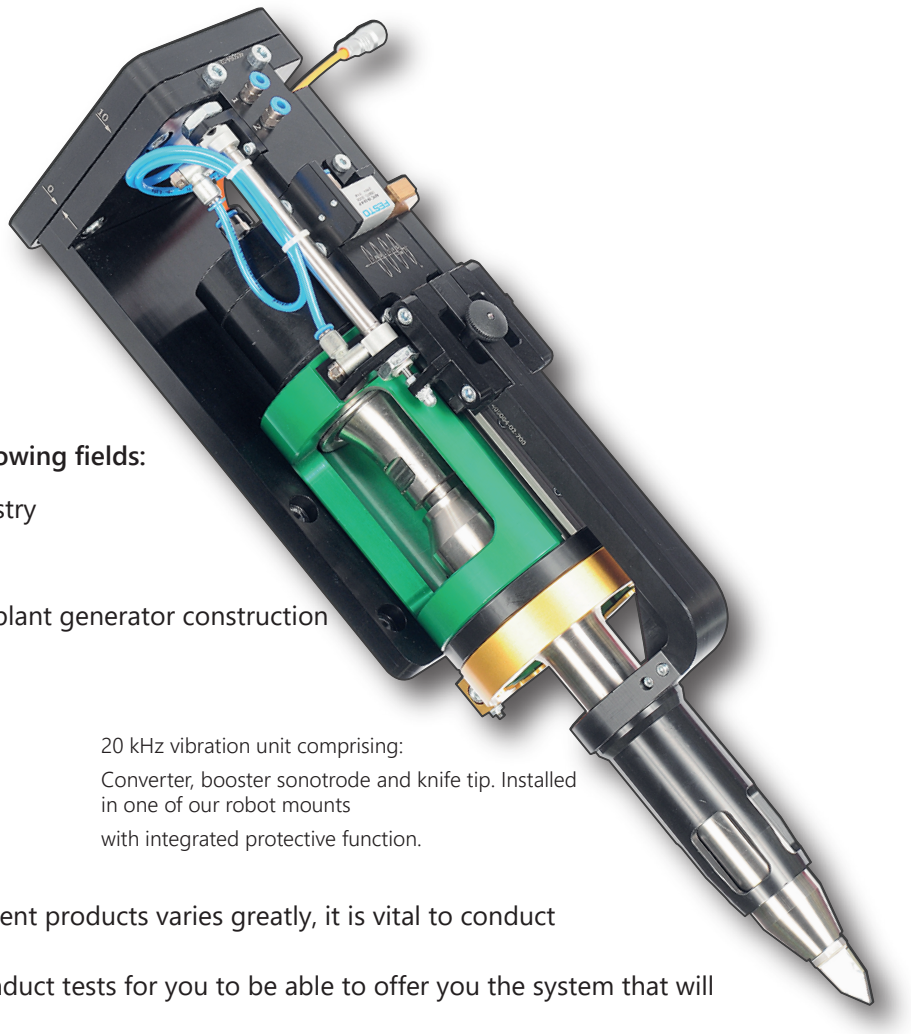
The cutting effect of the blade is assisted by the ultrasound excitation ensuring that the blade will slice through the product at a significantly reduced cutting force. The amount of the cutting force reduction depends on various factors and may be more than 90%.

By selecting the optimal material, almost exclusively carbide, and a high-precision bevel, we can significantly increase the tool life compared to conventional blades.

The work frequency of normally 20 or 30 kHz is generated in a generator in the form of electrical voltage and is converted by piezoceramics into mechanical oscillations. The oscillation excitation is generated in resonance, ensuring that the system works very efficiently.

At present, our systems are being used for reliable cutting of the following materials:

- Glass or carbon fibre, as nonwoven, woven, non-crimp fabric or prepreg
- Aramid
- Leather / cork / rubber
- Bitumen glass fibre mesh
- Paper / cardboard
- foamed materials
- Foils
- Carpets / floor covering



20 kHz vibration unit comprising:
Converter, booster sonotrode and knife tip. Installed in one of our robot mounts
with integrated protective function.

Our customers come from the following fields:

- Aviation and Automotive industry
- Bodywork construction
- Wind power plant and power plant generator construction
- Machine construction
- Textile processing
- Packaging industry
- Consumer goods industry

As the behaviour exhibited by different products varies greatly, it is vital to conduct preliminary tests.

In our technical department, we conduct tests for you to be able to offer you the system that will optimally fit your needs.

Alternatively, you can rent the systems for your own extensive tests. The duration of the renting period will only depend on how thoroughly you wish to test this technology.

The components

Generator

The generator generates an ultrasonic oscillation in the form of an alternating electric voltage, using different frequencies and powers. The generator and the oscillation unit (converter, booster sonotrode and knife) have been adjusted to the respective frequency.

We offer generators in all power categories and frequencies for different areas of use:

- DEG sries -For installation in control cabinets.
- E-GUS series -In a stand-alone enclosure with carrier handle.
- ProteUS series -Particularly rugged, sealed enclosure (IP65) for harsh environments.
- XS series -For low power, simple, yet state-of-the-art digital generators with 30 kHz.

New variants of the E-GUS and ProteUS series:

E-GUS **Twice** and ProteUS **Twice** each with integrated HF toggle switch for simultaneous connection of two oscillating units in externally controllable alternating operation.

ProteUS series

A solid sealed metal enclosure reliably protects the unit from carbon dust and humidity.

Converter

The converter uses piezo elements to convert electrical into mechanical vibration. This progresses in sinus shape in longitudinal direction and amounts to only a few thousandths of a millimetre. The specific structure ensures that no vibration is transmitted via the enclosure so that mounting is possible.

Converters in different designs.

We offer the following converter variants:

- Standard converter:
  With BNC or Lemo connector and the option of compressed air cooling.
- Protected design for food or carbon applications.
- Rotary converter:
  A 360° rotatable HF feed with air purge system connection permits endless rotations around the longitudinal axis.
- Special-purpose converter:
  Customized OEM designs.

Sonotrode and booster sonotrode

The booster sonotrode combines the functions of booster (transformation piece) and sonotrode in one workpiece. On the one hand, it holds the knife and, on the other hand, serves as attachment of the entire oscillating unit. It holds the tension ring, which is vibration-free by design.

The geometry has a vital influence on the amplitude and thus on the cutting performance.

Naturally, we also manufacture sonotrodes in the conventional design.

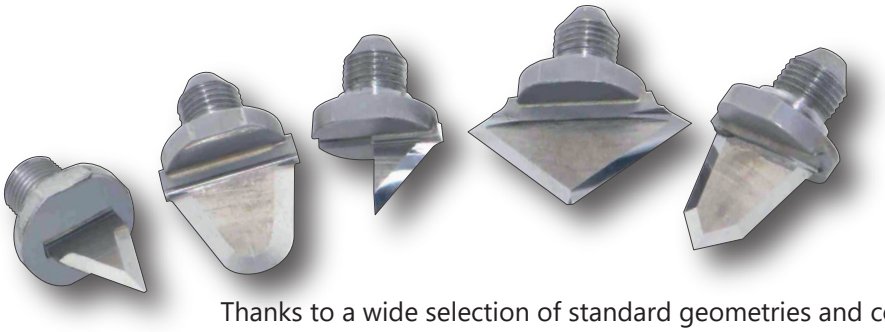
Sonotrode with tension ring and coated knife tip.

Normally, these systems are used:

- in cutting plotters;
- in articulated robots, end effectors, e.g. with extendible knife guard;
- in cross cutters;
- as permanently installed units for sheet products;
- as hand-held devices.

Knives

The knife, also referred to as knife tip, is the actual tool. It consists of a carbide blade soldered on a steel structure. It is bevelled on CNC grinding machines to guarantee precise and sharp blades.
A screw connection ensures easy replacement of the blade tips



Thanks to a wide selection of standard geometries and convenient replacement, the system can be used in a wide variety of applications.
The product range is continuously expanded as we develop customized knives for special cases and new tasks in house.
In addition, we also offer blades for competitor systems.

Hand-held devices

In many cases, it makes sense to produce cuts easily and without much preparation using a hand-held device. Changing or irregularly shaped contours can thus be cut out manually.

The use of a handle with a matching sonotrode permits manual execution of some applications.
By replacing the sonotrode, the hand-held ultrasonic cutting devices can be converted into a hand-held ultrasonic welding apparatus. It is thus possible to weld thermoplastic materials. Ideal for spot welding or for bonding multiple-layer tapes or stacks. We offer hand-held devices in various designs.

Here is an overview of our offer:

▶ Ultrasonic welding:	Welding equipment for plastics, sonotrodes, supports and devices.
▶ Ultrasonic cutting:	Cutting and sealing of thermoplastic fabric.
	Low-pressure cutting of food, such as cheese, pastry, candy bars, dough or pies without sticking or deformation.
	For low-pressure cutting of plastics and natural materials see page 1.
▶ Vibration cutting:	Pneumatic cutting technology with 150 Hz at an amplitude of approx. 3.5 mm, e.g. for foams, foils, felt, cork, rubber, cardboard.
▶ Knives:	Carbide and ceramic knives and blades for a variety of uses. Special blades for ultrasonic applications.

We develop and design small special machines and devices:
Applications technology, design, manufacture, control system engineering, programming and installation – everything from one supplier.
Should you be interested in large systems, we will be happy to refer you to machine constructors from our customer base and will gladly offer advice and support.

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