iSONIC CM
iSONIC FLEX

Special machines for the industrial processing of plastics Automotive

SONOTRONIC
ULTRASONICS TECHNOLOGY

Customized special machines

Development and production from one source

With a high level of expertise and experience, we develop around 150 customized special machines every year. Our special machines based on innovative ultrasonic technology cover a wide range of applications for every industry.

Applications

In the automotive industry the applications range from the ultrasonic welding machine for bonding filter fleece through to robotic systems for the flexible ultrasonic stamping of bumpers. We also solve the problems of cutting, riveting or embossing thermoplastics using ultrasound. If the task demands it, we include additional devices, such as transport or adhesive units, in order to automate processes and combine process jobs.

Project planning

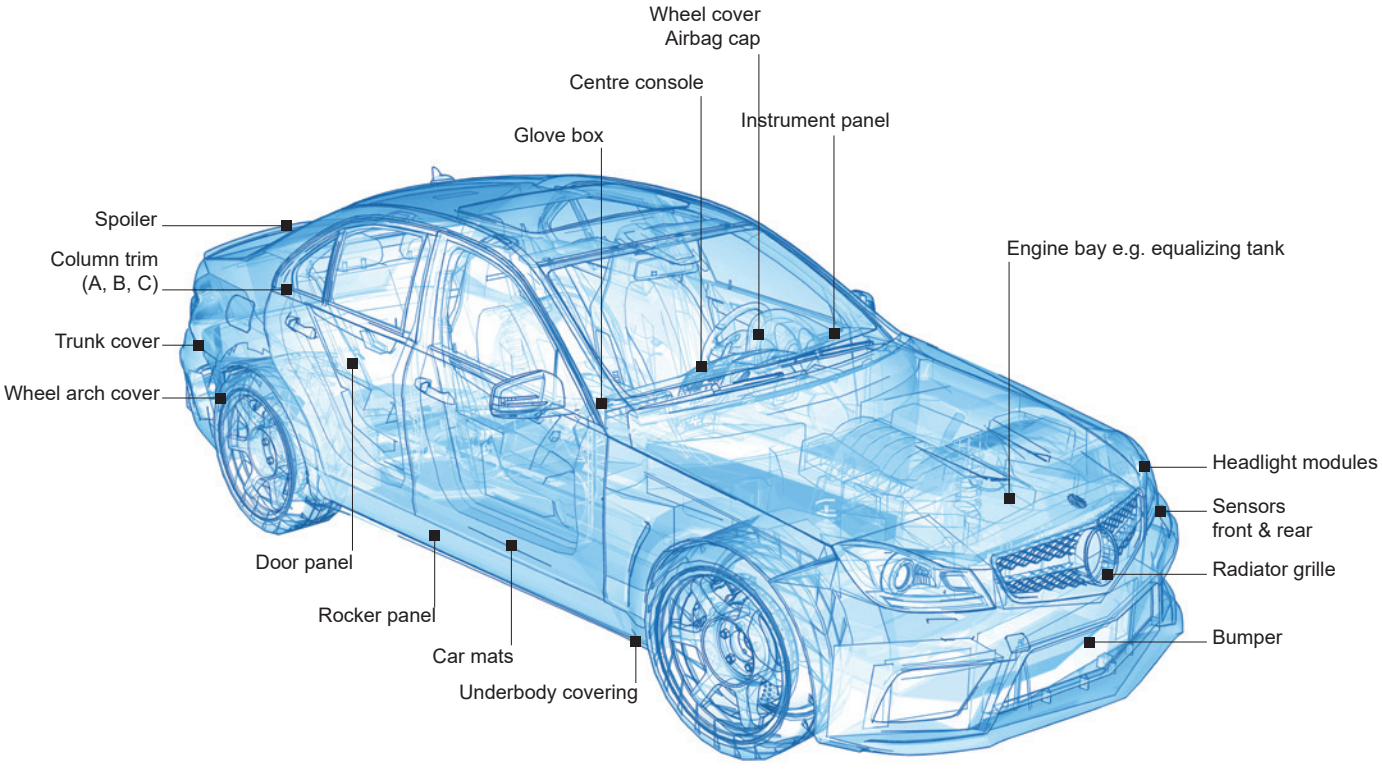
When planning new production lines for series production and when expanding existing production, we will assist you with advice. We will examine, on your behalf, the feasibility of your projects using our technologies and will find perfect solutions.

Simultaneous Engineering

Within product development, we use the tools of “Simultaneous Engineering”. This shortens not only the development and design times but also reduces component and machine construction costs.

From idea to concept

From the idea through the concept and definition of the target, our design teams, in direct co-operation with the customers, analyze the specific application functions of the special machines. Performance calculations and knowledge of the application technology result in initial technical drafts, which mature to become finished machine designs with the help of 3D-CAD and FEM optimiation.



Applications in the automotive and automotive supplier industry

Infos online

From prototypes to production

Following careful production of the technical documentation, work starts on building the prototypes, followed by the test phase. At this stage we communicate more closely with our customers and implement specific technical adjustments until release for production is finally given.

Simultaneous tooling design

As part of component design, we provide parallel support to our customers with CAD tooling design. At the same time as the injection molding is designed, we develop the tools for the special machines by working directly with the customer.

Reliable products

The SONOTRONIC special machines impress by their quality and functionality. Our customers are provided with ready-to-use, reliable, tested products of the latest state of the art. We design and manufacture every special machine with extreme care and precision. This allows our customers to benefit from our many years of experience in building special machines, from our outstanding technical know-how and our feel for the optimum solution.

About us

- More than 50 years experience
- Special machines with ultrasonic, infrared, hot plate and hot air technology
- Standard machines with individual workspace for small and medium format parts
- Components after own development and production in our own manufacturing center
- Application engineering advice and tests
- 24-hour hotline

Specialist in building special machines

Know-how in all sectors

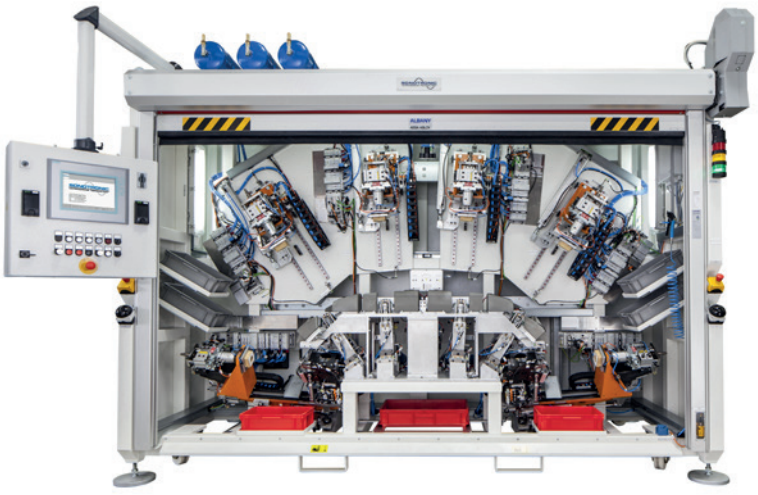
Customer-specific designs

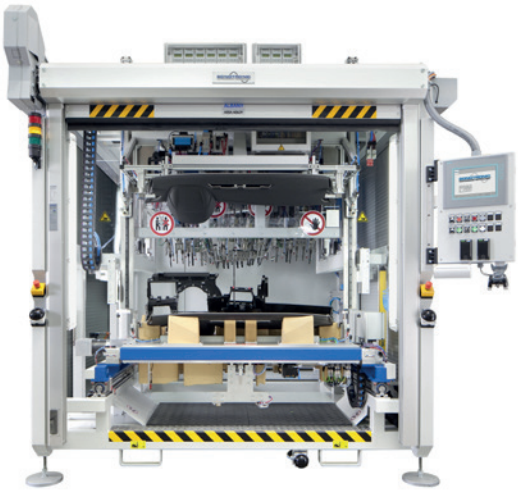
From simple ultrasonic punching machines through to highly complex special designs, we exhaust all possibilities in order to find the optimum machine solution for customer-specific applications. We adjust the special machines to the requirements of the production lines and quality standards of our customers. If the workpieces allow, we combine several working processes, by developing machines with rotary tables, swing frames or sliding tables.

The design of customized machines is governed by the work process, degree of automation and application. On request, we shall design our special machines and sub-assemblies in such a way that they can be incorporated without problem into the existing production lines or machine concepts. We optimize the various parameters of our special machines, as follows: Work processes, process times, safety, flexibility, user-friendliness, quality of applications, useful life of the machines and tools.

Machine concepts

- **Bridge type machines**
  Applications with one working station
- **Sliding table machines**
  For one or more workrooms and one free insertion area
- **Rotary transfer machines**
  Particularly short processing times by implementing several workstations and parallel execution of several process stages
- **Cassette machines**
  Change concept using tool cassettes to produce smaller runs of different designs
- **Robot systems**
  Flexibility in production using the latest robot technology in conjunction with highly developed ultrasonic devices
- **iSONIC FLEX**
  Automated production lines for the integration of upstream and downstream operations such as feeding, screwing, clipping, gluing, etc.





Continuous development

Our special machines incorporate high-quality ultrasonic technology of 20 kHz or 35 kHz. We are continuously developing the technology in order to optimize existing ultrasonic applications and to find new ones. With numerous patents, we are the leaders in the ultrasonic industry.

System advantages with ultrasound

Because of its system advantages compared with other technologies, ultrasound enables our customers to improve the quality, performance and flexibility of their plant and machinery, amongst other things.

Tool design

A deciding factor in the quality of ultrasonic applications is the design of the tools (sonotrodes). We have been developing and producing these key components since the year dot in our own tool production plant. To date, we have produced far in excess of 100,000 application-specific sonotrodes. With our exceptional know-how, we design the sonotrodes so that the ultrasound is transferred in the best possible way to the workpiece.

Workpiece supports

The workpiece supports ensure that the workpiece is perfectly positioned in relation to the ultrasonic devices within a special machine. Like the sonotrodes, we manufacture the supports specifically with the customer and application in mind. In our in-house pattern-making department, experienced skilled workers adjust each support precisely to the respective workpiece. During this time, we are in permanent contact with our customers.

Tools

- Ideal vibration response of the sonotrodes by FEM-assisted development
- Optimizing the arrangement of the weld joints
- Avoiding over or undersizing the weld joint
- Powerful sonotrodes

Flexibility in production

Robot cells combined with ultrasonic technology

Flexibility in production is achieved by state-of–the-art robot technology in conjunction with highly developed ultrasonic equipment. Using its experience from projects already successfully completed, SONOTRONIC has the know-how to develop advanced robot solutions for small series runs as well as flexible production solutions on a large industrial scale. There are different ways efficiently to combine robot technology and ultrasonic processing.

Robots as means of transport

One possibility is to load and discharge the work pieces automatically, using robots. In this particular case the robots transport the work pieces to the processing areas where they are welded or punched by ultrasound. A special coupling system on the robots, rapid tool changing and individual programming therefore make for flexible production: different applications can be executed on different work pieces on one single system.

Robots as tools

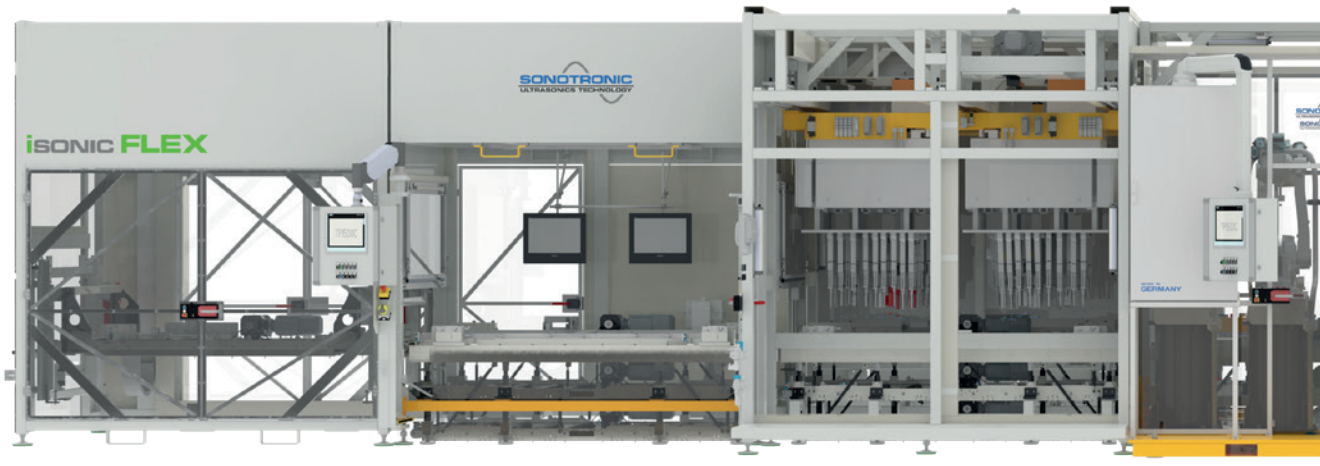
On the other hand, robots can also be used to process work pieces directly using ultrasonic technology. In this case, the ultrasonic welding or punching tools are fixed directly to the robot arms, whilst the work pieces are positioned in the holders provided. A variable holder design coupled with rapid tool change and individual software programming also provide production flexibility.

Ultrasonic applications in robot systems

Almost all fixed ultrasonic applications, such as surface welding, ultrasonic riveting, cutting or punching, can be flexibly reproduced in robot systems. When there is a production change the individual ultrasonic work stations and tools can simply be replaced or adapted. It is also possible to achieve application combinations with identical ultrasonic technology.

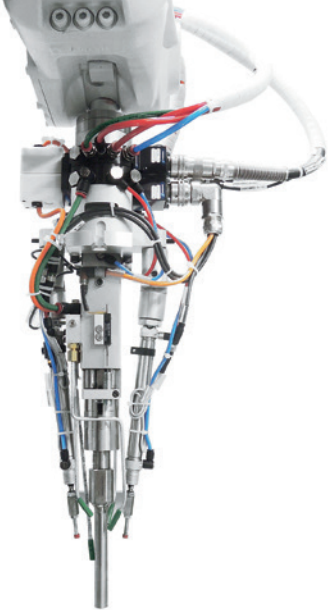
Features and advantages

- Processing flexibility
- Economic, automated production even of small batches (for example, spare part production)
- Different variants of robot installations
- Robots for loading and unloading the work pieces automatically
- Robots equipped with special fast coupling systems for loading and unloading different work pieces automatically
- Robots equipped with ultrasonic tools for processing work pieces, which are already in holders
- Flexible production solutions on a large industrial scale



Convincing machine concepts

Greater economy through greater flexibility



Infos online

Ultrasonic joining technology

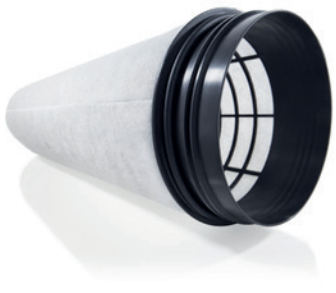
Welding and riveting with ultrasound

Ultrasonic welding can be found everywhere where thermoplastics, polymer-compatible plastics are used and where strict demands are made of the joining system. Depending on their polymer compatibility, thermoplastic materials, such as PP, PVC, PE, PET, ABS, composite materials, fabrics, fleeces or films are suitable for welding with ultrasound.

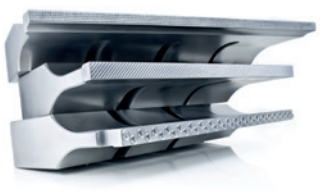
Process characteristics

Compared with other welding processes, ultrasonic welding is ideal if rapid process times and good process reliability are demanded. Moreover, ultrasonic welding is characterized by the quality, strength and precise reproducibility of the welds.

Ultrasonic riveting of aitbag caps



Ultrasonic welding of utility vehicle filters



Welding sonotrodes with different structures

Form-fit joining

Ultrasonic riveting is ideal for producing a form-fit joining between thermoplastics or with non-plastics. Whilst the cycle times of ultrasonic riveting are greater than for flat welding, several rivets can be simultaneously applied with one sonotrode. Just like ultrasonic welding, riveting with ultrasound is also very efficient and at the same time saves energy. The technology is used mainly where fusion joins are not possible, where metal parts are to be inserted in a plastic housing or where the join is subsequently invisible.

Applications

For Automotive Exterior

- Welding of headlamp lenses, wheelhouse or underfloor panelling
- Welding of supports, e.g. for parking sensors, headlamp washing systems, side marker lamps or trailer couplings

For Automotive Interior

- Welding of textile inserts, rear parcel shelves, suspension rails in door panelling
- Welding or riveting of instrument clusters, airbag covers or door panelling

Features and advantages

- Very fast process times
- Excellent process control and reliability by monitoring the welding parameters
- Selective supply of energy through digital control of the welding process
- Consistent welding quality with visually perfect and strong, as well as reproducible welds
- Visually appealing weld design through individual sonotrode structure or anvil impression / embossing
- Environmentally friendly technology
- Cold welding tools
- No machine warm-up times
- No damage to workpieces when the machine stops
- Rapid and simple changing of welding tools

Riveting sonotrode

Ultrasonic punching

Punched openings and radial embossing in premium quality

Infos online

The patented ultrasonic punching from SONOTRONIC makes it possible to introduce precisely defined openings of very high quality in plastic parts or textiles. In the automotive industry, ultrasonic punching is ideal for materials, such as PP, PP-EPDM, PC/ABS, PC/PBT or composite materials, such as textile /PUR, Slush/PUR/ABS.

Areas of use

As the developer of ultrasonic punching and the worldwide market leader in this area, we deploy the technology in special machines for various different applications. The automotive industry, in particular, benefits from this innovation. For example, the apertures for parking sensors or headlamp washing systems when punched with radial embossing, can be introduced directly into the already painted bumpers.

Radial embossing

As a result of a special sonotrode design, the radius can be embossed directly following cutting. The plastic, which is heated by ultrasound, is reformed for the purpose at the separating edge. The result is radial embossing of visually outstanding quality.

Punch quality

The punched edges of the workpieces are already welded or sealed during ultrasonic punching, in a quality that is visually clean and exceptional.

Applications

For Automotive Exterior

- Punching holes, e.g. in bumpers for parking sensors, headlamp washing systems, side marker lamps or trailer couplings

For Automotive Interior

- Punching holes for draught stops, door openers, window winders, entrance lamps and navigation modules

Features and advantages

- Process benefits resemble those of ultrasonic welding
- Reduced punching force as a result of using an ultrasound-assisted punch
- No stress whitening or fluff creation on the punched surface
- Eges welded during punching
- Decoupled, constant radial embossing irrespective of material thickness
- Visually clean punching of painted and unpainted plastics
- No subsequent change in punched openings as a result of punching already painted plastics
- Paint drawn in during radial embossing

Coated punching sonotrode
for punched opening with radius embossing e.g. for parking sensors in the bumper

Technology solutions for every application

Infrared, hot plate and hot air

The aim of every joining technique is to join the material firmly and yet gently. Depending on the material, other methods such as hot plate welding, infrared or hot air riveting can also be used and combined.

Infrared

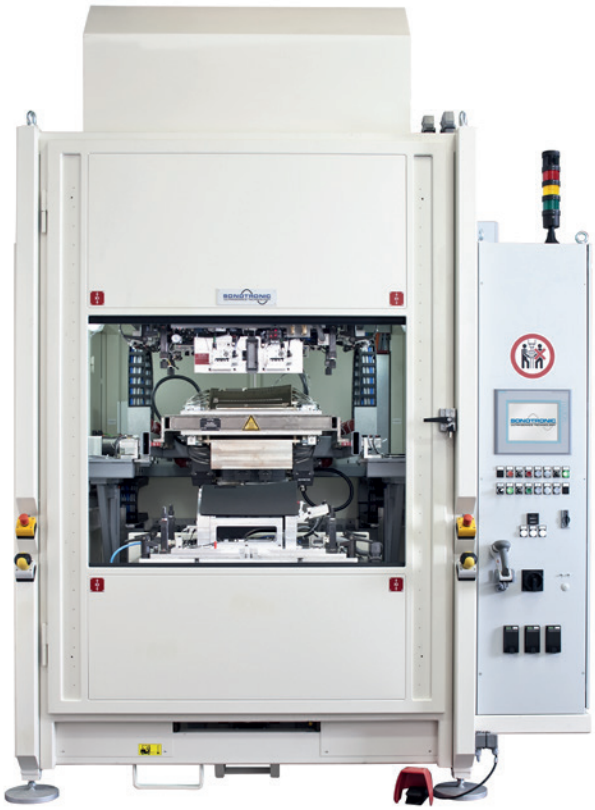
Infrared technology is used when the material properties are not ideal for ultrasonic processing. The compact infrared units from SONOTRONIC work with a focused short-wave infrared radiation. This not only generates the radiation quickly, but also allows it to penetrate deep into the material at a relatively large distance from the component, heating and plasticizing the rivet dome evenly right down to the base. After the rivet dome has been heated, the rivet dome is homogeneously formed via the coining die. The results are riveted joints that do not recede and have a very high strength. The process has also been optimized so that almost no smoke is generated during riveting.

Hot plate

Hot plate technology is a heat and pressure based manufacturing process. The joins are made using electrically heated tools, the so-called heating mirror. The heating mirror first plasticizes the joining surfaces. Then the heating mirror moves out of the joining area. The heated and melted surfaces are pressed together. The welded joints are reproducible and can be concealed. After cooling, the seam strength is very high. Another advantage: workpiece fluctuations can be compensated very well. In comparison, hot plate technologies are more cost-effective, but they consume significantly more energy than ultrasonic technologies, for example.

Hot air

With hot air riveting, the material is not damaged, but is brought into shape gently and without contact. It is particularly suitable for materials that tend to show marks and impressions when processed with other riveting techniques. First, air is heated by a heating cartridge. Then this heated air flows around the thermoplastic rivet dome. After the rivet dome has been evenly heated, it is homogeneously formed with the cold stamping die (rivet dome) and riveted to the material. The result is a riveted joint with high strength that leaves no marks, especially on the visible side or sensitive surfaces of the application. Depending on the material and the rivet dome contour, the output of the heating cartridge and the air volume can vary.



Hot plate machines with horizontal or vertical NC-axis are suitable for welding of large-area joining or double shells for workpieces made of thermoplastic plastics.

Welding methods

Thermal

Hot plate

- Welding
- Riveting
- Hot cutting

Contactless

Infrared / hot air

- Welding
- Riveting

Friction

Ultrasound

- Welding
- Roll seam welding
- Cutting
- Punching
- Embossing
- Riveting
- Treatment of biosolids

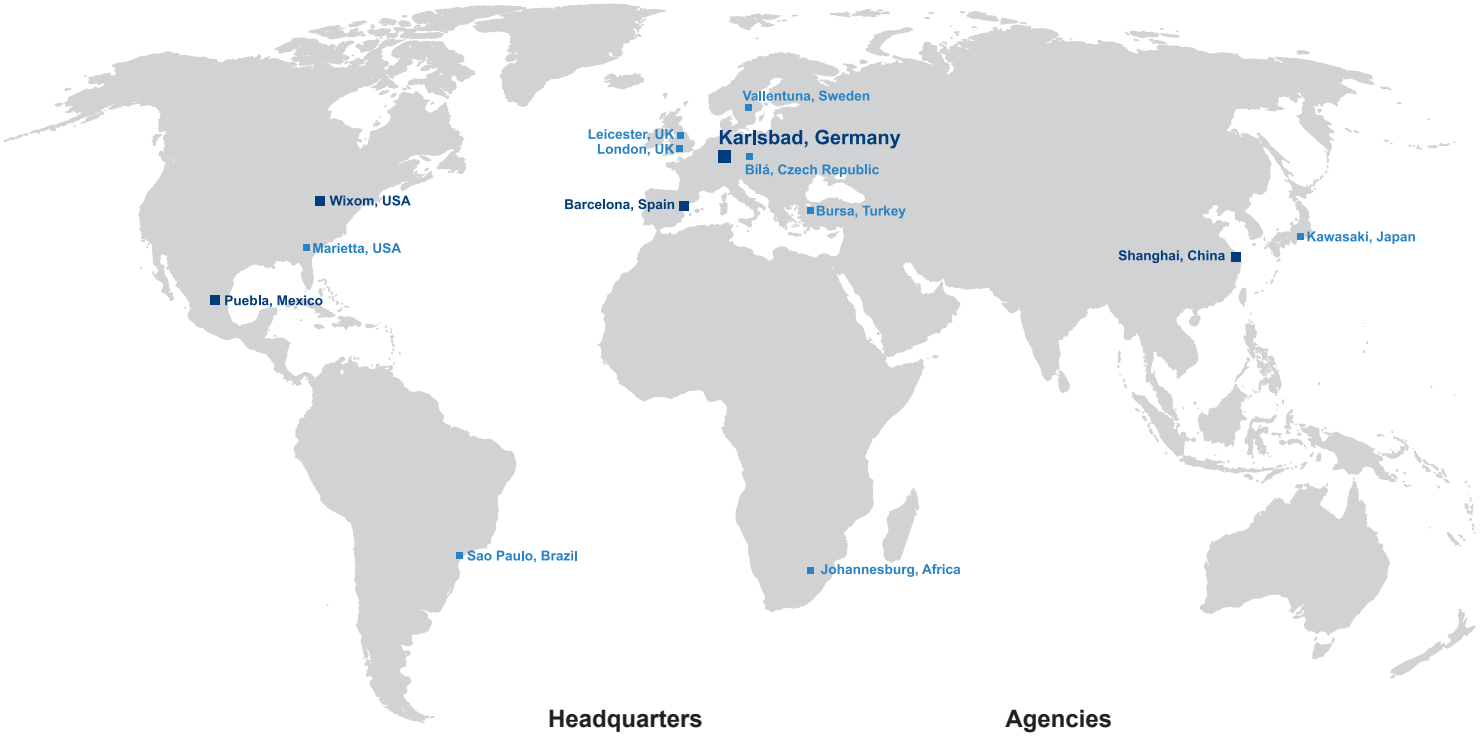
	Property	Ultrasound	Hot plate	Hot air	Infrared
Material	Amorphous Thermoplastics	✓	✓	✓	✓
	Semi-Crystalline Thermoplastics	•	✓	✓	✓
	Olefins	•	✓	✓	✓
	TPRs	×	•	✓	✓
	Composites	•	•	✓	✓
Application	Thin Walls	✓	✓	×	✓
	Complex Geometry	•	✓	✓	•
	Large Parts	✓	✓	✓	•
	Small Parts	✓	✓	✓	✓
	Internal Welds	✓	✓	×	✓
	Long Unsupported Walls	✓	✓	×	✓
	Thermoplastic Fabrics	✓	•	×	×
	Thermoplastic Films	✓	•	•	×

✓ = Recommended
• = Recommended with limitations
× = Not recommended

Locations

Global presence

Infos online



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Branch plants
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- Wixom, MI, USA
- Shanghai, China

Agencies
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- Bílá, Czech Republic
- Johannesburg, South Africa
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- London, UK
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- Marietta, Georgia, USA
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- Sao Paulo, Brazil
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