Laser cutting with ACSYS

ACSYS LASERTECHNIK

Laser cutting with ACSYS – Always make the “cut”!

Laser cutting of paper.
In-house production at ACSYS with a PIRANHA II Multi and a CO_2 Laser source.

Precision laser cutting.
The picture shows the moment of puncture.

Gerhard Kimmel
Managing Director, Sales & Finance

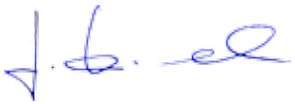
ACSYS – Your Partner for perfect system solutions in laser material processing.

ACSYS at a glance

As Managing Director and owner of this successful company, i am proud to be able to work with a team of highly motivated and ambitious employees.

I consider myself team player and coach and i am committed to the continuous sound development of the company. I have responsibilities towards my employees and their families as well as our customers and business partners.

Our day-to-day activities are shaped by the use of the resources and options that are available to us. We
define our goals and strategies in terms of a sustainable company development.



Gerhard Kimmel

More efficiency in production and service – we‘re pacemakers for your laser processing.

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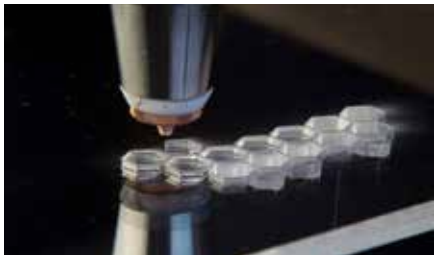

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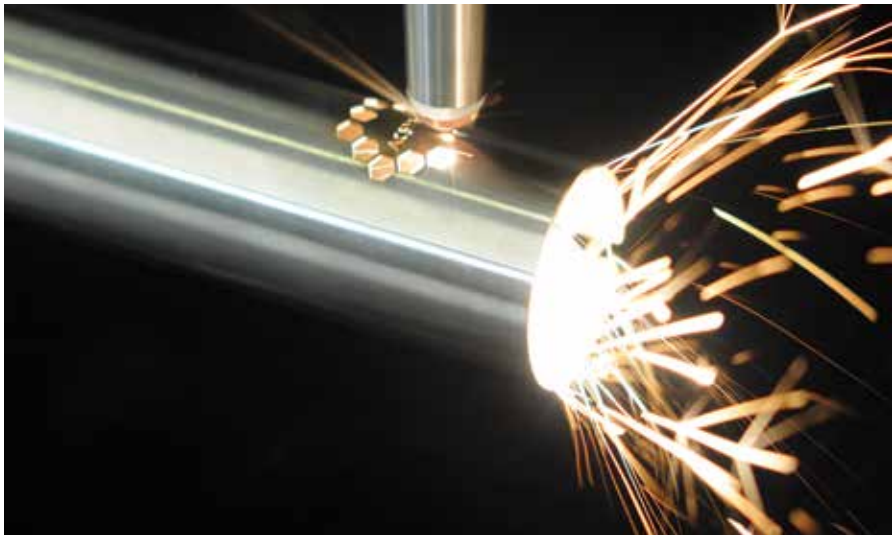


3.

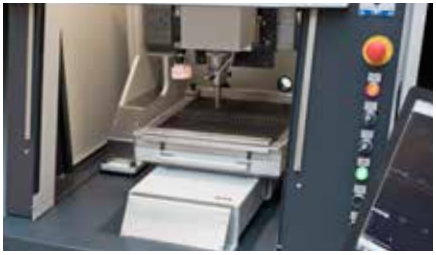
Laser fine-cutting of jewelry using gold rings as an example.

1. Laser fusion cutting of 5 mm acrylic glass.

2. Laser remote cutting of aluminum foil.

3. High-precision laser cutting of pipes.

PIRANHA®
Icon of precision.



Technical data

Laser cutting

Max. workpiece weight
20 kg

Max. motion range x/y/z (mm)
400 x 400 x 120

Materials
Metal, plastic, composites, organic materials

PIRANHA®cut

PIRANHA®cut – Laser cutting system

The compact design of the PIRANHA cut is designed for sheet sizes up to 400 x 400 mm², high contour accuracy (at± 20µm) and for sheet thicknesses up to 3mm. Depending on the requirements, the systems are equipped with air-cooled fiber lasers of different power classes and are suitable for laser oxygen cutting and laser fusion cutting.

Optional: The LAS cut (Live Adjust System cut - pat. pend.) from ACSYS shows the interior of the laser cutting system on the screen. So cutting layouts can be placed exactly. In addition, NC or manually controlled rotary and tilting axes for accurate machining of cylindrical or conical workpieces are available.

High-precision laser cutting of stainless steel.

SHARK®cut
Sovereign class.

Technical data

Laser cutting

Max. workpiece weight
20 kg

Max. motion range x/y/z (mm)
700 x 1000 x 120

Materials
Metal, plastic, composites, organic materials

SHARK®cut

Vibration-free granite base for the SHARK cut of ACSYS.

QR-Code for Film

SHARK®cut – Laser cutting center

Laser cutting today is more effective and simpler than ever before. Due to their compact design and great flexibility, laser cutting centers from ACSYS are unique and setting new standards. A machine bed made of granite, an automatic distance control and highly dynamic linear motors guarantee highly precise results in the shortest of times with sheet sizes of up to 700 x 1000 m². In addition, a program-controlled dividing head and manually adjustable fifth axis can be used for interpolated laser cutting. This enables round components to be machined.

Whether we are dealing with inlays, templates, or high-precision cut-to-size components in the most varied of industries, with the laser cutting systems and the AC-LASER software suite, our customers always make the cut!

High-precision laser cutting of fine miniature gears made of stainless steel.

Options
For every need.

LAS – Live Adjust System® cut

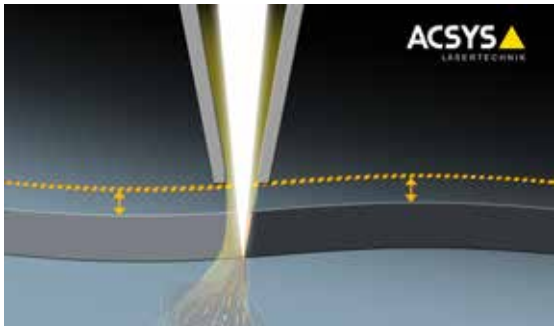
The laser cutting systems from ACSYS offer an extraordinary innovation in the laser cutting sector: the camera system for laser cutting applications. The LAS cut (Live Adjust System) from ACSYS shows the usable machining surface on the screen; in this manner, cutting layouts can be precisely placed. This enables the optimum placement of new layouts. This will allow you to reduce waste and scrap and keep setup times to a minimum.

LAS – Live Adjust System® cut

Efficiency with ACSYS:
The camera adjustment module LAS - Live Adjust System at a glance.
1. Phase: Insert part to be machined.
2. Phase: The working area of the cutting laser will appear on the monitor. Position the cutting layout.
3. Phase: Start laser processing
4. Phase: Just pick up a perfect result and proceed to the next project.

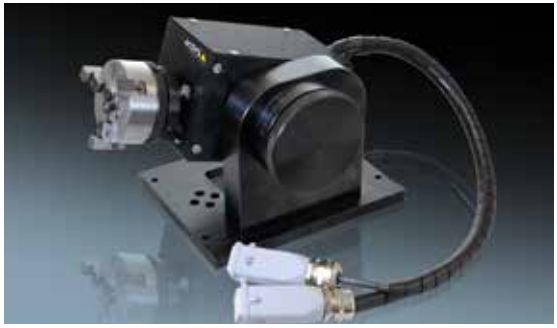
ADC – Automatic Distance Control

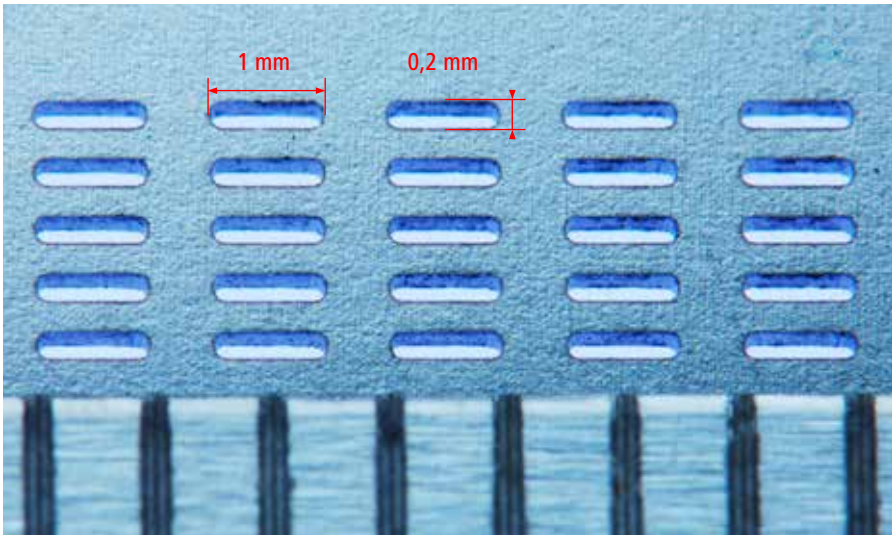
The automatic distance control function enables the laser cutting of rounded sheets. The focus of the laser is controlled and kept at the ideal distance through the automatic distance control over the entire working surface and thus automatically glides even over uneven areas in the material.



Manual and powered dividing heads

NC or manually controllable rotating and swiveling axes for precise machining of cylindrical or conical workpieces.





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Introduction of materials

Laser cutting is a thermal separating method in which complex geometries are generated with the help of a focused laser beam. Various metals, plastics, organic materials, and other materials can be processed.

1. & 2. High-precision laser fine-cutting of metal. 0.9 x 0.2 mm breakthrough size with 0.3 mm material thickness as compared to a working standard according to DIN 866. (See enlarged view to the left.)

3. Laser cutting of Kapton film (polyimide) in the electronics and medical industries.

Method introduction

There are three basic laser cutting methods; they are differentiated by the gas added for cutting, which is placed into the separating joint, axially with respect to the focused laser beam.

With **laser oxygen cutting**, oxygen is used as the cutting gas. The oxygen provides additional thermal energy during separation due to local oxidation of the base material in the kerf and thus accelerates the cutting process. It is suitable for quickly and productively finishing parts whose visual appearance will be further modified by additional surface finishing. **Page 16**

Laser fusion cutting has the advantage of a practically oxide-free cutting edge. An inert gas is used as the cutting gas. This gas blows the melt out of the kerf and cools down the cutting edge. When workpieces need to have a good visual appearance without further processing, this method is used. Furthermore, hygienic and laboratory aspects must be noted when a subsequent material change is undesirable. **Page 18**

The laser cutting of very thin, sensitive materials, which are cut without a cutting gas, is called **laser remote cutting** (sublimation cutting). The laser alone in this case vaporizes the material thus creating the very fine cutting gap through layer-wise erosion. This method offers unique solutions for machining the most varied of composites. **Page 20**

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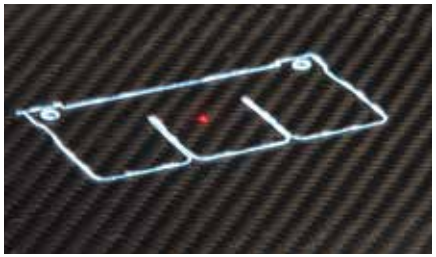
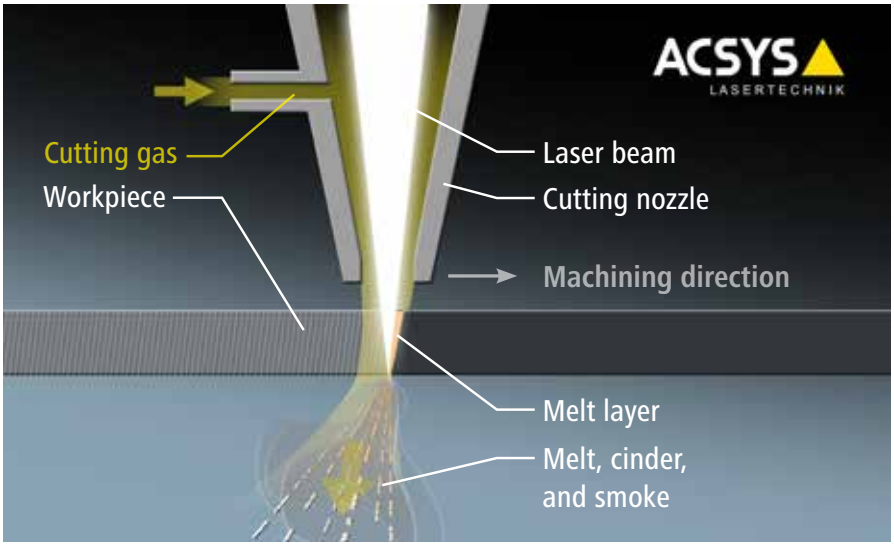


3.

1. Laser oxygen cutting of 4 mm thick steel, quickly and productively.

2. Laser fusion cutting of stainless steel. Precision anchor for wristwatches.

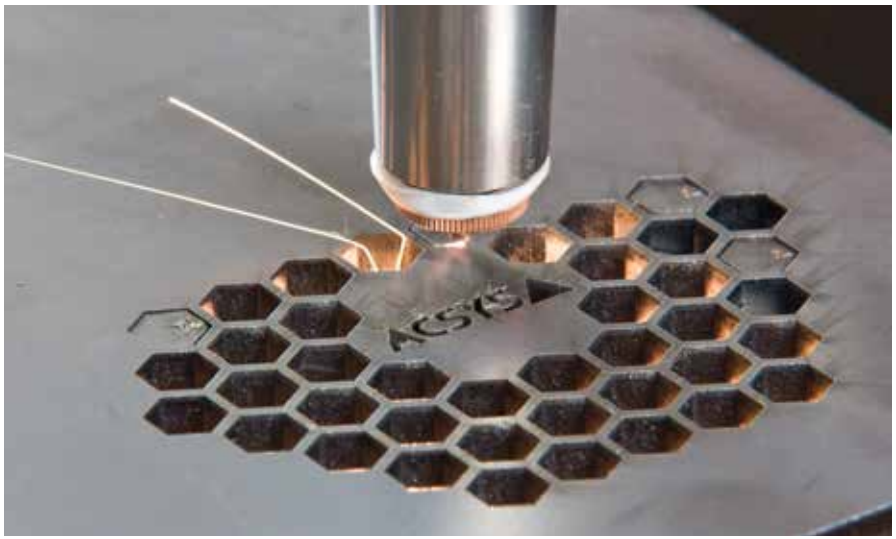
3. Laser remote cutting of carbon mats. (Long-term illumination: Laser plasma during a cut is shown here.)



Heavy metals – Laser oxygen cutting

Oxygen is used as the cutting gas for laser oyxgene cutting. The laser penetrates into the metal and heats up the material. The oxygen is blown into the kerf at pressures of up to 6 bar. The heated metal then reacts with the oxygen and releases additional energy. The energy input is increased significantly due to the exothermic reaction. Thus, laser flame cutting enables high cutting speeds and the machining of thicker sheets.

Laser oxygen cutting is recommended for processing heavy metals and for applications where the appearance will be further modified by paint or other processes.



1.

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3.

5 mm structural steel. Quickly and productively.

1. & 2. SHARK cut with the integrated LAS cut module four machining 4 mm thick structural steel. (detailed image, 1.)

3. Precise laser oxygen cutting of 3 mm aluminum.

1.

2.

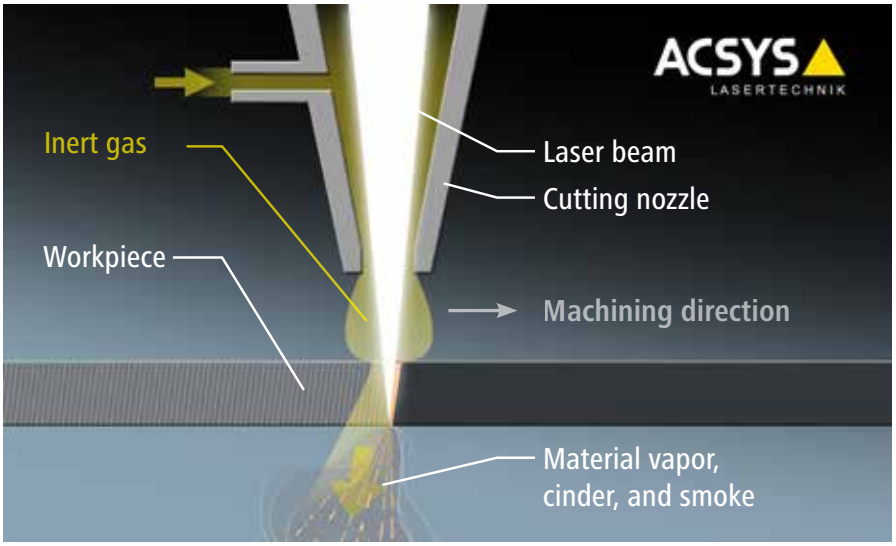
3.

Laser fusion cutting of 0.5 mm stainless steel.
Pencil point as a direct comparison

1. Laser fusion cutting of 1 mm stainless steel.

2. High-precision laser fusion cutting of 1 mm brass sheet for the watch/clock and jewelry industries.

3. Microscopic image, cutting edge of 2 mm steel



Precious metals – Laser fusion cutting

Laser fusion cutting uses the reaction-suppressing cutting gas nitrogen or argon. The gas is driven through the kerf at pressures of up to 20 bar. The specific properties of the gas cool down the material and prevent oxidation at the cutting edge.

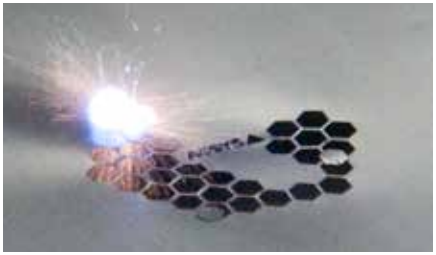
This method is suitable for thin sheets and applications in which the workpiece must be visually appealing without further processing.

Remote cutting

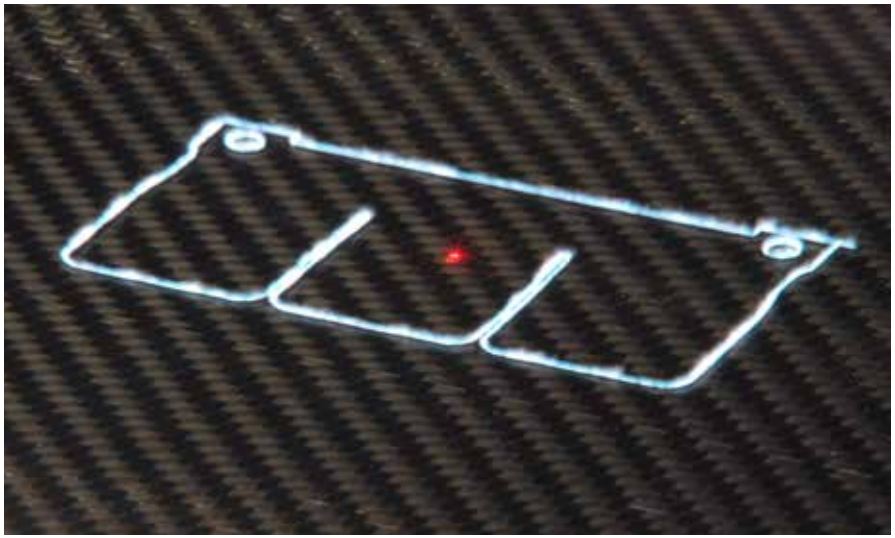
With remote laser cutting, the laser beam is moved using a highly dynamic galvo scanner. When combined with a fiber laser, contour speeds of more than 100 m/min can be achieved. Remote laser beam cutting can handle complicated contours easily with great precision.

The laser-cut edges are characterized by minimal burring and a minimal amount of surface roughness. The range of material that can be machined is quite extensive. Due to the higher cutting speed, the zone that is influenced by heat with remote laser beam cutting is less than that with classic laser cutting.
Compared to punching, the advantages of laser cutting can be seen in the cost savings for tool construction and the resharpening of the punching tools as well as the lower noise level in the production area.

Due to the greater distance between the scanner and the workpiece, the small deflections in the beam deflection system create large distances on the workpiece. Because of this translated ratio and the relatively small masses moved, high contour speeds can be achieved on the workpiece.



Process:
Laser remote cutting of aluminum foil.
Size of the hexagon: 1 mm. Machining time in the example: 0.7 s.



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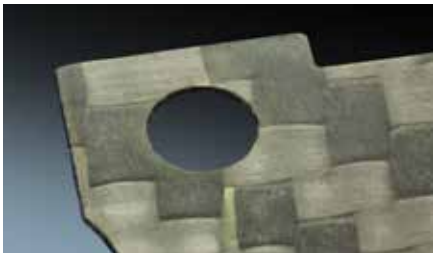


2.

3.

1. Laser remote cutting of carbon mats. (Long-term illumination: Laser plasma during a cut is shown here.)

2. Cut carbon. (For the cutting process, see 1.)

3. Cut aluminum foil as compared to a pencil tip.

1.

2.

3.

Laser cutting of coated materials. For advantages of the LAS cut camera setup system, see page 12.

1. & 2. Laser cut of a component already coated with powder.

3. Close-up of the results.

The working surface of the laser cutting system on the screen.
The LAS cut enables simple placement of cutting layouts in advance directly on the workpiece.

Coated metals

The cutting of coated metals is mainly of interest for companies that frequently produce customized work. The ability to place precise drill holes and cuts on already painted components is the advantage of this process. However, the ability to laser cut already coated materials is not what differentiates this system from the process of laser flame, laser fusion, and remote laser cutting.
The laser cutting systems from ACSYS offer an extraordinary innovation in the laser cutting sector:
the camera system for laser cutting applications. The LAS cut (Live Adjust System) from ACSYS shows you the machining surface of the laser cutting system on the screen and you can then precisely place your cutting layouts as desired. This enables the optimum placement of new layouts.

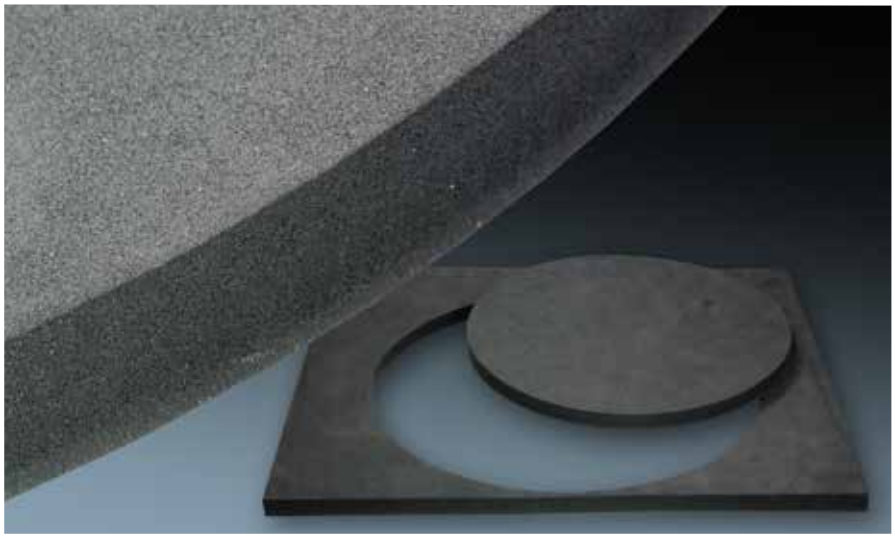
Foil marking and cut.
ACSYS offers special automatic solutions with database integration for this area.

Plastics, organic materials & other materials

Due to their specific wavelength, plastics and organic materials are normally cut with carbon dioxide lasers (CO_2 lasers). This includes, for example, wood, paper, and PMMA (acrylic glass). However, CO_2 lasers can also cut steel sheets using the laser flame cutting method.

Remote cutting also shows its advantages in the area of plastic cutting. Without mechanical tracking of the axes, the laser beam is directed onto the material to be separated only by means of a deflection mirror.

This is possible with thin materials such as film or thin plastic mats. No gas is required. The laser melts the plastic in a fraction of a second and separates it reliably. An additional advantage is that the foil can be marked in the same work cycle (see left).



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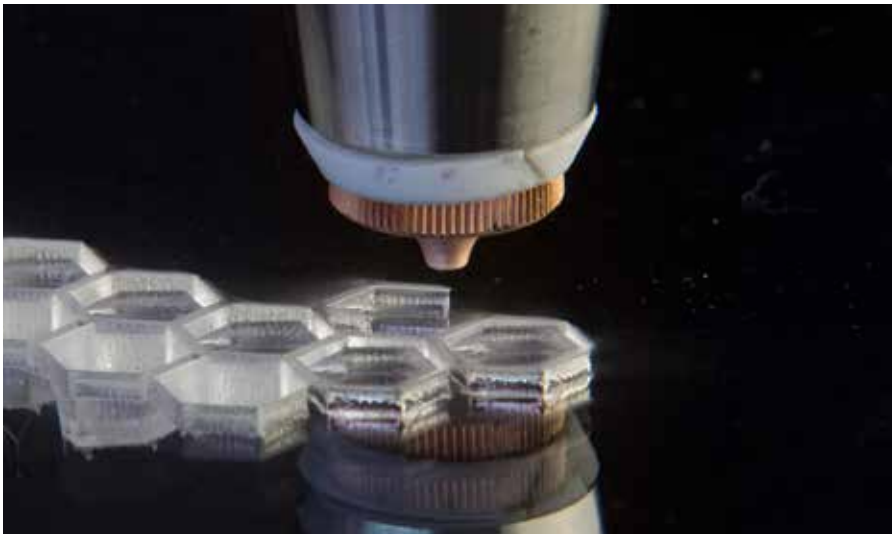
1. Laser-cut PU foam mat. Material thickness in the example: 15 mm.

2. Laser cutting of finished plastic injection-molded parts.

3. Laser cutting of PE material, material thickness 3 mm in example.

Laser cutting of PU foam mats,
Ø 15 mm.



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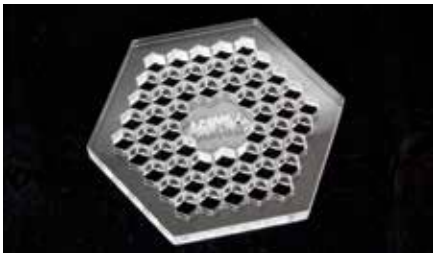

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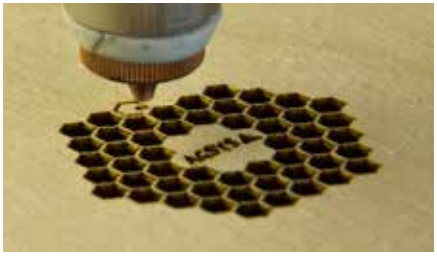

3.

1. & 2. Laser fusion cutting of 5 mm acrylic glass. The land width of the hexagons is only 0.8 mm.

3. Laser cutting process: Wood, thickness 5 mm.

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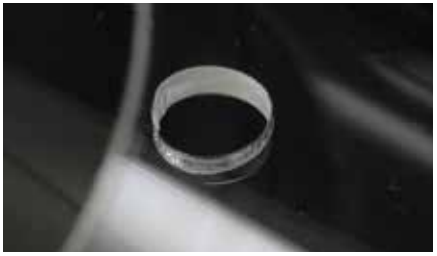


4.

1. Wood, 5 mm. The flexibility of laser cutting, together with the great precision and quality of the flat joint, makes the use very beneficial for this application

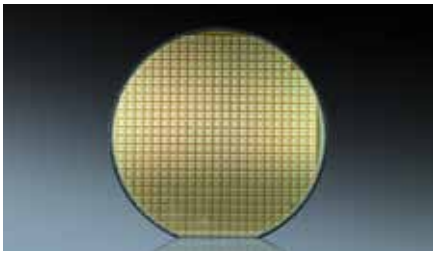
2. Laser cutting process:
Quartz glass tube, wall thickness 4 mm.

3. Acrylic glass, 5 mm. Depending on the parameter settings, separating cuts or polishing cuts (visually clear cutting edges) can be achieved.

4. Quartz glass tube, wall thickness 4 mm.

Plastics, organic materials & other materials

Compared to conventional cutting methods, the laser cutting of plastics and organic materials primarily provides advantages for applications needing flexibility and maximum quality. The same as when cutting metals, the cutting of plastics, organic materials, and other similar materials is carried out with the laser by local heating of the material above the vaporization point. The vapor created in the combustion point of the focused laser beam is carried off by a gas routed coaxially with respect to the laser beam thus resulting in the flat joint. The separating edge is high-value, because there is no formation of microscopic cracks as there is with conventional methods.



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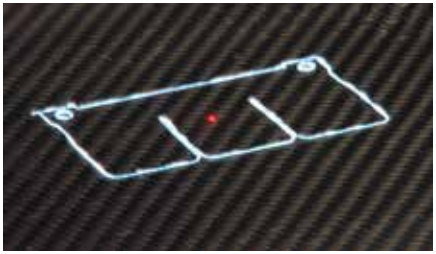

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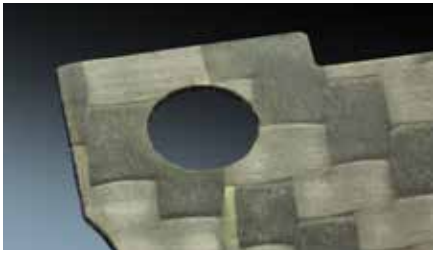


3.

1. Laser cutting of silicon wafers.

2. Laser cutting process:
Carbon (CRP).

3. Close-up: Cut CRP.

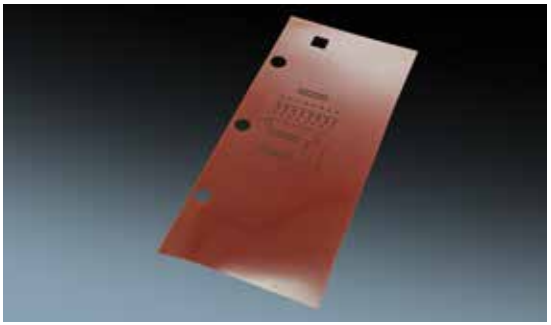
Other materials

The laser enables a very broad machining spectrum of the most varied of materials. In addition to metals, plastics, and organic materials, a whole host of other materials such as semiconductors, ceramics, graphite, diamonds, and even composites can be cut with the laser.

Ceramics:
The excellent high-temperature resistance of ceramic materials in conjunction, for example, with the customized electrical, magnetic, thermal, or visual properties has led to the spread of ceramic components in the most varied of sectors of modern technology in the last decade. The machining of brittle ceramic components, however, is problematic and tedious. The laser though is predestined to cut ceramics.

Tungsten:
Tungsten is an extremely hard metal with high tensile strength and an extremely high melting point. Using argon as a cutting gas, very good results can be achieved at high speeds.

Silicon:
Silicon is used in various industries, but mainly in the semiconductor industry and in solar technology. In both cases, a clean edge without microscopic cracks or fragments is an absolute must. Silicon is usually cut with diamond saws, which is expensive. The problem also in this case is that only straight lines can be cut. In addition, this results in chips and dust, which are then also expensive to remove. Fiber lasers open up a whole new realm of possibilities here. They result in burr-free edges without traces of chips or dust.



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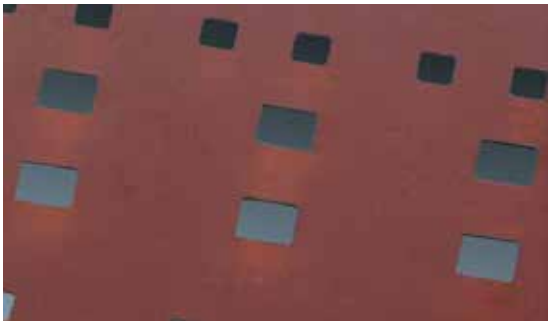

5.

PCD (Polycrystalline diamond):

Polycrystalline diamond represents a product that has been on the market since the 70s and is a composite of randomly oriented diamond particles, which have been permanently pressed onto a hard metal bottom layer under high pressure and high temperature.

In this case, the laser offers the best cut and machining quality due to its excellent beam quality with short pulses and great pulse performance.

4. Laser fusion cutting of of polyimide (Kapton film).

5. Close-up of cut Kapton film. In the medical field, polyimide film is used for dialysis.

Carbon-fiber-reinforced plastic (Carbon-fiber-reinforced plastic – CRP):

CRP is used when high weight-specific strength and stiffness are required, e.g. in aeronautics and space, in vehicle construction, or for sport devices such as bicycle frames, speed skates, tennis rackets, arrows (for bows), football shoes, and fishing rods.

In the building industry, CRP is used in the form of slits or slots bonded on the component surface to reinforce the structures.

Laser-cut CRP component.

Technical Specifications Machine

	PIRANHA® cut	SHARK® cut	SHARK® cut$_\mu$
Housing	Laser class 1	Laser class 1	Laser class 1
Dimensions: W/H/D (mm)	970 x 1800 x 1150	1600 x 1800 x 2000	1600 x 1800 x 2000
Weight approx.	1000 kg	2000 kg	2500 kg
Max. workpiece weight	20 kg	20 kg	20 kg
Working range			
Max. motion range x/y/z (mm)	400 x 400 x 120	700 x 1000 x 120	500 x 500 x 120

▲ The values indicated are maximum values and may deviate according to the configuration or variation!

LASER	
ACSYS offers various laser sources for a wide range of materials. With a power range of 0.5 to 1000 Watts available, we can find the ideal configuration for every conceivable application.	

Technical Specifications Software

	AC-LASER
System requirements	Microsoft® Windows® 7 Processor with at least 1.8 GHz 2 GB RAM 1 GB available hard disk memory USB 2.0 1 serial interface 1680 x 1050 pixel screen resolution
Language versions available	German, English, French, Spanish, Italian, Swedish, Polish, Czech
Security	The software is protected by a product-specific dongle.
Interfaces	CANOpen, Profibus, DeviceNET, RS232, LAN, Digital Signal SPS, SAP...
File import	STL, STEP, DXF, PLT, JPEG, BMP…
Database integration	For automation purposes, AC-LASER offers data interface options for databases and ERP systems, as well as to other data sources like Excel or text files.
Multiple execution	The laser machine can fully automatically control certain tasks and automatically process multiple blank parts overnight or over the weekend.
LAS – Live Adjust System® cut	Camera-based processing of layouts and text directly on the workpiece.
OPR – Optical Parts Recognition	Fully automatic recognition and processing of non-paletted, loose parts.
ADC – Automatic Distance Control	The automatic distance control function enables the laser cutting of rounded sheets. The focus of the laser is controlled and kept at the ideal distance through the automatic distance control over the entire working surface and thus automatically glides even over deformations in the material.
Remote control	With the online integration of the "ACSYS – Direct Access Line" for service, support, or training, we are able to help you with complex task settings directly on your system, provide customer support with training for software innovations, or offer you the fastest possible remote maintenance service in the event of a malfunction.
Custom programming	Customer-specific layout and sequence programming and database integration.
Intuitive user interface	Various user interface standards are available. With everything from "Easy Mode" to customer-programmable user interfaces – the intuitive layout of the AC-LASER facilitates quick and creative workflows.
Dual-laser control	The software is capable of managing and controlling two laser sources simultaneously.

▲ All statements current as of the print date of this publication.
Binding information available upon request!

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