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

ACSYS at a glance

As managers and owners of this successful company, we are proud to be able to work with a team of highly motivated, ambitious employees.

We consider ourselves team players and coaches, and we are committed to the continuing healthy development of the company. We have responsibilities towards our employees and their families, as well as to our customers and business partners.

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

Gerhard Kimmel Mirko Jedynak
Laser cutting with ACSYS
Always make the "cut"!

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1. Laser fusion cutting of 5 mm acrylic glass.
2. Laser remote cutting of aluminium foil.

Laser fine-cutting of jewelry using gold rings as an example.
Laser cutting systems from ACSYS
Precision, the latest level.

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. 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!

ACSYS Laser cutting centers

Laser cutting
Max. workpiece weight
20 kg
Materials
Metal, plastic, composites, organic materials
Max. motion range x/y/z (mm)
400 x 400 x 120
PIRANHA® cut

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

High-precision laser cutting 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.

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.
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.

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<td>Plastics, organic materials</td>
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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 12

**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 14

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 16

1. Laser oxygen cutting of 4 mm thick steel, quickly and productively.
2. Laser fusion cutting of stainless steel. Precision anchor for wrist watches.
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 oxygen 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.
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.

**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 reshaping 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.

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.
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.

**Coated metals**

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Due to their specific wavelength, plastics and organic materials are normally cut with carbon dioxide lasers (CO₂ lasers). This includes, for example, wood, paper, and PMMA (acrylic glass). However, CO₂ 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).

**Plastics, organic materials & other materials**

ACSYS offers special automatic solutions with database integration for this area.

![Laser-cut PU foam mat. Material thickness in the example: 15 mm.](image1)

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.
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.

**Plastics, organic materials & other materials**

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.

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.
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.

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.

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.
Technical Specifications Machine

<table>
<thead>
<tr>
<th>PIRANHA® cut</th>
<th>SHARK® cut</th>
<th>SHARK® cut μ</th>
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<tbody>
<tr>
<td><strong>Housing</strong></td>
<td>Laser class 1</td>
<td>Laser class 1</td>
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<tr>
<td>Dimensions: W/H/D (mm)</td>
<td>970 x 1150 x 1800</td>
<td>1600 x 2000 x 1800</td>
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<tr>
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<td>1000 kg</td>
<td>2000 kg</td>
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<tr>
<td><strong>Max. workpiece weight</strong></td>
<td>20 kg</td>
<td>20 kg</td>
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<tr>
<td><strong>Working range</strong></td>
<td>Max. motion range x/y/z (mm)</td>
<td>400 x 400 x 120</td>
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Technical Specifications Software

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<td><strong>Intuitive user interface</strong></td>
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<td><strong>Dual-laser control</strong></td>
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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.

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