3D-Micromac AG is the industry leader in laser micromachining. We develop processes, machines and turnkey solutions at the highest technical and technological level. Our aim is to provide superb customer satisfaction even for the most complex projects.

3D-Micromac delivers powerful, user-friendly and leading-edge processes with superior production efficiency. These proprietary technology innovations are now readily available on a worldwide scale.

3D-Micromac’s highly versatile microFLEX™ product family is the all-in-one solution for manufacturing flexible thin films in photovoltaics, electronics, medical devices, displays, and semiconductors.

The production systems can handle various substrates, material thicknesses, and types such as polymer films, stainless steel, and thin glass.

The microFLEX™ systems combine high-precision laser processing with cleaning and packaging technologies as well as inline quality control. Due to its modular concept, various customized solutions are available, reaching from industrial mass production to pilot lines as well as applied research.

**HIGHLIGHTS**

- Highly versatile micromachining system
- High-precision laser processing
- High throughput and efficiency
- In-situ quality control
- Use of different micro-environments
microFLEX™ System Configuration - Examples

<table>
<thead>
<tr>
<th>Application Example</th>
<th>Ablation of Thin-Film Layers for Medical Sensors</th>
<th>Laser-Annealing of Flexible Thin-Film Devices</th>
<th>P1, P2, P3, PT Structuring of Flexible Solar Cells</th>
<th>Customized Configuration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Web Width (ww)</td>
<td>&lt; 50 mm</td>
<td>&lt; 350 mm</td>
<td>400 mm &lt; ww &lt; 1,300 mm</td>
<td>&lt; 1,500 mm</td>
</tr>
<tr>
<td>Material</td>
<td>PET</td>
<td>Stainless Steel</td>
<td>P1</td>
<td>Thin and rollable</td>
</tr>
<tr>
<td>Material Thickness</td>
<td>200 µm</td>
<td>100 µm</td>
<td>&lt; 50 µm</td>
<td>&lt; 500 µm</td>
</tr>
<tr>
<td>Web Speed</td>
<td>50 m/min</td>
<td>0.5 m/min</td>
<td>1 m/min</td>
<td>&lt; 80 m/s</td>
</tr>
<tr>
<td>Throughput Equivalent</td>
<td>600,000 m²/a</td>
<td>85,000 m²/a</td>
<td>100,000 m²/a</td>
<td>Customized configuration</td>
</tr>
<tr>
<td>Positioning Accuracy</td>
<td>± 0.025 mm</td>
<td>± 0.01 mm</td>
<td>± 0.025 mm</td>
<td>&lt; 5 µm</td>
</tr>
<tr>
<td>Laser Source</td>
<td>Excimer</td>
<td>ns laser</td>
<td>ps laser</td>
<td>Excimer, cw, ns, ps, fs</td>
</tr>
<tr>
<td>Beam Delivery</td>
<td>Mask projection</td>
<td>Moving line-beam optics</td>
<td>Galvo scanner</td>
<td>Customized configuration</td>
</tr>
<tr>
<td>Integrated Processes</td>
<td>Quality control</td>
<td>Recycling of ablated material</td>
<td>Quality control</td>
<td>Quality control</td>
</tr>
</tbody>
</table>

microFLEX™ BENEFITS

High versatile micromachining system for:
- Laser structuring
- Laser patterning
- Laser cutting
- Laser annealing
- Laser lift-off

Top-quality products
- High-precision laser processing (continuous/discontinuous)
- Gentle handling of all flexible polymer or metal substrates, thin glass and paper

High throughput and efficiency
- On-the-fly processing
- High machine uptime
- Multiple tension controllers
- Contactless substrate guiding

Quality control
- In-situ optical inspection
- Automated process adjustment

Cost advantages
- Long-term security of investment
- Reasonable cost of ownership
- Easy to upgrade and modify
- Use of different microenvironments (e.g., cleanroom classes)

Optimal usability
- Hardware components and machining parameters to be software controlled
- Intuitive user interface
- Interface to manufacturing execution systems (MES)
- Decentralized control by ethernet ports on each module
- High accessibility
- Easy serviceability

microFLEX™ 500
Laser writing of organic photovoltaic cells

microFLEX™ 300
Laser cutting of medical polymer

microFLEX™ 600
Production of electronic devices