Laser Marking
Fiber, Nd:YVO₄, Green, UV and CO₂ Laser Markers

TYPICAL APPLICATIONS

[Images of different laser markings]
**HOW A LASER MARKER WORKS**

*How it works:* The laser is steered by mirrors mounted onto galvo motors to produce the mark. Each mirror moves along a single axis. These galvos move extremely quickly with very little inertia, and, therefore, can write marks at high speeds. The beam is focused using an f-theta lens.

**FEATURES**
- Marks text, barcodes and datamatrix codes, logos and graphics
- Imports .jpg, .bmp, .dxf and other formats
- Variable text, data and batch codes can be linked to external database
- Windows® based control software
- Marking fields up to 12 in x 12 in
- Character size down to 0.004 in
- RS232 and external I/O for ease of integration
- Rotary motion for circumferential welding

**HOW A LASER MARKS**

The laser marks (ablates, melts, vaporizes, or removes) materials using a fine spot diameter which ranges from 0.002 in–0.01 in. It marks with short pulses (30 nano-seconds), providing precise mark control and negligible heat input. Subsequently, mark penetration into the material of less than 0.001 in unless otherwise required.

**BENEFITS**
- Non-contact, direct mark process
- No post processing
- High speed
- High quality
- Permanent marks
- Dynamic mark sizing
- Datamatrix code friendly
- Wide range of markable materials

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LASER MARKING EXAMPLES

Steel component
Anodized aluminum
Day / night switches
Plastic molded part
Medical implantable device
Fine mark next to penny

MARKING PLASTICS
Lasers are the best solution for marking plastics, as many inks either have difficulty adhering to them or quickly wear away, and many labels simply will not stick. Other processes produce unclear marks or require post-process operations. Laser marks generally require no post-process finishing operations and so can be shipped immediately.

Lasers produce contrasting, high quality marks on a wide range of plastics. With the development of additive pigments and resins that enhance contrast, virtually any plastic can now be laser marked.

MARKING METALS
By using fine spot sizes to increase power density, many metals can be marked extremely well. High contrast marks can be produced on stainless steels and titanium. These highly permanent marks, which have no crevices or features to attract debris, care ideal for medical, food and pharmaceutical applications.

Other key metals such as aluminum are engraved to minimal depths such that the mark has good permanency but does not affect the material's bulk properties.

However, an engraved mark that penetrates into the material can also be produced in applications that require an increased level of wear resistance.

PART TRACKING AND TRACEABILITY
With the flexibility of marking characters, barcodes or datamatrix codes on plastics and metals, laser marking is well geared to direct part marking for identification purposes. Laser marking systems linked to part information databases are able to automatically increment serial numbers or data codes that can be verified by in-system readers.

FREE EVALUATION SERVICE
Amada Miyachi America offers a free service to evaluate your application. Simply send a few samples to our laser applications lab in Monrovia, along with a brief mark description, and we’ll mark and return them to you with a written evaluation and product recommendation.

Alternatively, contact our staff directly to discuss your application.

Tel. (626) 303-5676
Email: info@amadamiyachi.com
## MARKING SUITABILITY OF MATERIALS

<table>
<thead>
<tr>
<th>Material</th>
<th>Contrast</th>
<th>Material</th>
<th>Contrast</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ceramic</td>
<td>Good</td>
<td>Titanium</td>
<td>Excellent</td>
</tr>
<tr>
<td>Glass</td>
<td>Good</td>
<td>PC Board</td>
<td></td>
</tr>
<tr>
<td>Metals</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aluminum</td>
<td></td>
<td>Bare</td>
<td>Good</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Coated fiber</td>
<td>Good</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Fiber substrate (FR4)</td>
<td>Good</td>
</tr>
<tr>
<td>Copper</td>
<td></td>
<td>ABS</td>
<td>Excellent</td>
</tr>
<tr>
<td>Brass (bare)</td>
<td>Good</td>
<td>Acrylic</td>
<td>Good</td>
</tr>
<tr>
<td>Copper (bare)</td>
<td>Good</td>
<td>Epoxy</td>
<td>Good</td>
</tr>
<tr>
<td>Copper (nickel coated)</td>
<td>Good</td>
<td>Mylar (silver nickel coating)</td>
<td>Good</td>
</tr>
<tr>
<td>Cobalt</td>
<td>Good</td>
<td>Nylon (natural)</td>
<td>Good</td>
</tr>
<tr>
<td>Germanium</td>
<td>Good</td>
<td>Nylon (pigment, glass filled)</td>
<td>Good</td>
</tr>
<tr>
<td>Gold</td>
<td>Good</td>
<td>PES/PET/PBT</td>
<td>Good</td>
</tr>
<tr>
<td>Invar</td>
<td>Excellent</td>
<td>Phenolic</td>
<td>Good</td>
</tr>
<tr>
<td>Inconel</td>
<td>Excellent</td>
<td>Polyacetal (POM)</td>
<td>Good</td>
</tr>
<tr>
<td>Kovar (gold plated)</td>
<td>Good</td>
<td>Polycarbonate (Lexan®)</td>
<td>Excellent</td>
</tr>
<tr>
<td>Silver</td>
<td>Good</td>
<td>Polyethylene</td>
<td>Good</td>
</tr>
<tr>
<td>Steel</td>
<td></td>
<td>PVC</td>
<td>Excellent</td>
</tr>
<tr>
<td>Carbon steel</td>
<td>Excellent</td>
<td>Styrene</td>
<td>Excellent</td>
</tr>
<tr>
<td>Chrome plated</td>
<td>Good</td>
<td>Rubber</td>
<td>Poor</td>
</tr>
<tr>
<td>Hardened</td>
<td>Good</td>
<td>Silicon</td>
<td>Good</td>
</tr>
<tr>
<td>Nickel plated</td>
<td>Excellent</td>
<td></td>
<td></td>
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<tr>
<td>MIM Parts</td>
<td>Excellent</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stainless (300 &amp; 400)</td>
<td>Excellent</td>
<td>Surgical steel</td>
<td>Excellent</td>
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