

# LASER ETCHING VS LASER ENGRAVING: WHICH SHOULD YOU CHOOSE?

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If you are relatively new to laser technology, you may be wondering what the difference is between [laser engraving](#) and laser etching. More importantly, which one is right for you.

The main difference between laser etching and laser engraving is that etching melts the microsurface to create raised marks, while engraving removes material to produce darker marks. Both processes use high temperatures to create permanent marks on metal surfaces.

Both processes are heavily used for parts traceability. Let's take a deep dive into each process to see which is best for which application.

### Laser Etching Process

When etching, the laser heats and distorts the microscopic surface of the material. By doing this, the laser-etched surface expands and creates texture.

Laser etching produces black and white marks and is the most effective process for permanently marking most types of materials. Etching is faster than engraving because it requires less energy from the laser beam.

You may need laser etching if:

Parts made of any metal, except stainless steel

fastest laser processing

A cost-effective laser that requires less laser power

Integrated laser marking prior to non-abrasive processing, including powder coating, e-coating and heat treatment

laser engraving process

With the engraving method, a laser evaporates a thin layer of material to create a tracking code. This

is done by sending highly localized laser pulses to your part.

Instead of creating a microsurface above the material, laser engraving penetrates deep into the material. Engraving depths up to 500 microns.

You may need laser engraving if:

Parts are made of steel or aluminum;

Marking with maximum durability;

Integrated laser marking prior to abrasive treatments, including sandblasting and grit blasting.

In the video below, the black marks are created by deep laser engraving and the white background is created by etching.

Why do you need laser etching and laser engraving?

If you've used dot peening, inkjet printing, or printed labels to track parts in the past, you know that these marking techniques come with significant maintenance and consumable costs. Also, you may have to deal with inconsistent results due to an unreliable tagging system.

How Etching and Engraving Can Solve These Problems

Laser direct part marking encodes information that cannot be separated from the product throughout its lifetime.

Laser marking has high resolution; a lot of information can be packed into a small area (especially if you are using Data Matrix codes).

Laser etching and laser engraving machines require very low maintenance.

Fiber and CO2 laser systems require no consumables.

Pulsed fiber lasers have very low power consumption.

laser etching

Which industries use laser etching and engraving?

Many of our customers use laser etching and engraving to collect large amounts of information for their traceability programs. Some of them also use this information to optimize their manufacturing processes.

They use these laser processes to mark all types of barcodes, including QR codes and Data Matrix codes, as well as serial numbers and alphanumeric characters. Others also choose to brand their products with their company logo on the part.

The following are the most common industrial applications

Automobile industry

Automakers have long required traceability from their suppliers. They were early adopters of Data Matrix codes as a way to uniquely identify parts going into final assembly. Parts are scanned at critical steps throughout the value chain to ensure compliance and enforce accountability. Today, they require early part identification.

primary metal industry

Smelters, die casting machines, hot and cold rolling mills, and extrusion machines came later in the game, mainly because of the demands placed on them by customers in the automotive industry.

They found that the data they collected from their internal traceability program helped them optimize their processes. Others use laser marking to differentiate themselves from competitors by manufacturing products that meet stringent environmental standards.

medical device manufacturer

The FDA has strict regulations requiring identification of medical devices. It requires most medical

devices to be identified using a unique identifier.

### Other industrial laser marking processes

Laser etching and laser engraving are not the only processes used in industrial applications. Laser annealing, although less common, is the only solution for marking stainless steel and chrome-plated workpieces.

The reason is simple: it is the only process that produces a permanent mark while maintaining the natural corrosion resistance of the part.

Laser annealing heats the metal rather than engraving it. This process creates black marks beneath the surface through a reaction called oxidation.

The difference between annealing and etching is that annealing is a chemical reaction that does not melt the surface of the material. The difference is subtle.