

# APPLICATION TIPS



Version 1.2

## METAL MARKING WITH LASERS

### Introduction

Marking metals with lasers can be difficult. Some metals work with select laser configurations and others work with all laser configurations. This sheet will outline the difficulties of marking metals with lasers.

There are two wavelengths Universal Laser Systems makes to mark metals. The most common is the  $10.6\mu\text{m}$  CO<sub>2</sub> laser and the  $1.06\mu\text{m}$  Fiber laser. This tip sheet will explore all metal marking options with both laser sources.

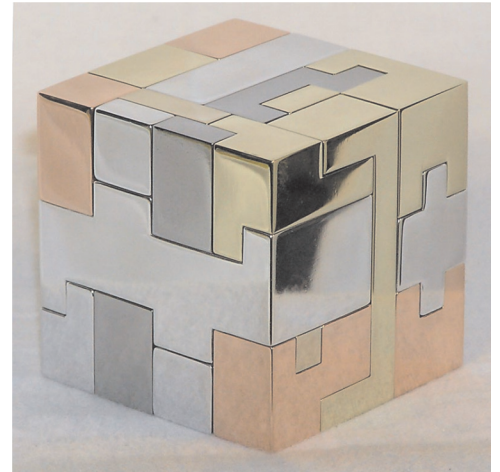
### Overview

This application tip covers three processes for marking metals. To determine the best method for different applications. Each process is described in detail to provide a comprehensive perspective on effectively marking metal.

This document includes a metal marking chart (Page 2) to help identify the optimal laser for metal marking.

### In-depth overview:

- Metal Marking Compound Laser Metal Marking
- (High Power Density Focusing Optics) HPDFO™ Direct Metal Marking
- Fiber Laser Metal Marking



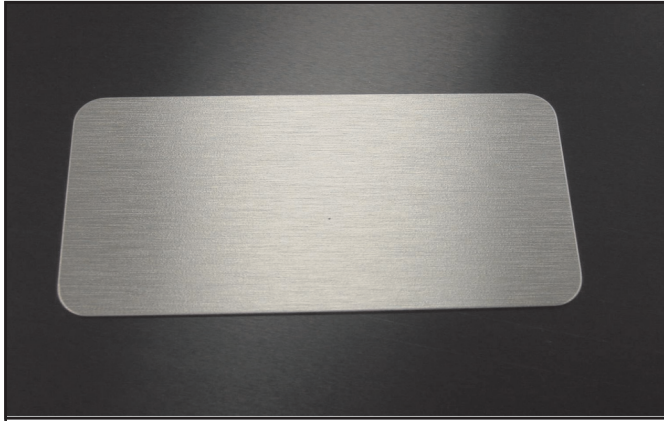
## METAL MARKING WITH LASERS

Based on the type of metal used there are many different options to mark metal. The laser metal marking chart below shows options depending on the type of metal and the laser configuration.

*(This list only includes the most common metals)*

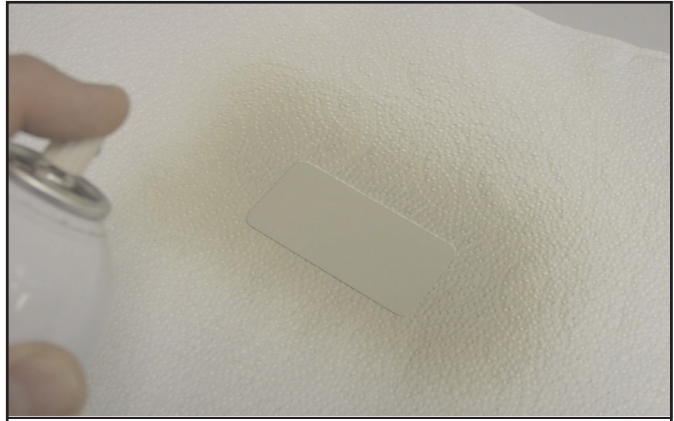
<b>Laser Metal Marking Chart</b>			
<b>Metal</b>	<b>Direct Mark 10.6 Co2</b>	<b>*Metal Marking Compound</b>	<b>Fiber Laser 1.06um Direct Mark</b>
Steel	X <sub>1</sub>	X	X
Stainless Steel	X <sub>1</sub>	X	X
Iron	X <sub>1</sub>	X	X
Brass		X	X
Coated Brass (Painted)	X		X
Aluminum		X	X
Anodized Aluminum	X		X
Copper		X	X
Titanium	X <sub>1</sub>	X	X
Tungsten	In some cases, must be tested	X	X
Carbide	In some cases, must be tested	X	X
Alum A Mark	X		X
Nickel		X	X
Cobalt		X	X
Chrome Plating	In some cases, must be tested	X	X
Pewter	X <sub>1</sub>	X	X
Silver		X	X
Gold		X	X
*Metal marking compound requires a raw metal, no clear coating or polish can be on metal			
<b>1 = Requires the HIGH POWER DENSITY FOCUSING OPTICS (HPDFO) NO DEPTH IS POSSIBLE JUST A DISCOLORATION OF THE METAL AND THE TIME TO PROCESS IS SLOW.</b>			

## Metal Marking with Metal Marking Compound

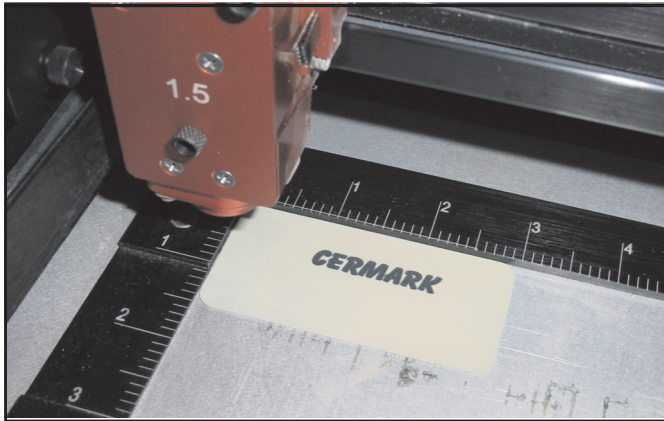


1. Take raw metal of any type.

**Warning!** No clear coating can be on metal such as polyurethane, laquer or varnish otherwise this process will not work.



2. Brush, spray or place metal marking tape onto the surface of the raw metal.



3. Laser mark metal using database metal marking settings.  
Use "Medium" setting for all carbon based metals, for all other metals, use the "dark" setting in the Materials Database.



4. Remove the finished tag from the laser. Wash the remaining metal marking compound off the surface with water.



5. Finished high contrast UV stable metal tag.

### Metal Marking Compound details:

Metal Marking compound is a liquid ceramic-like product, and when applied to raw metal uses the laser to "FIRE" the ceramic in a localized state effectively fusing black glass to the surface of metals. (This is why the metal cannot have a clear coating)

### Things to consider:

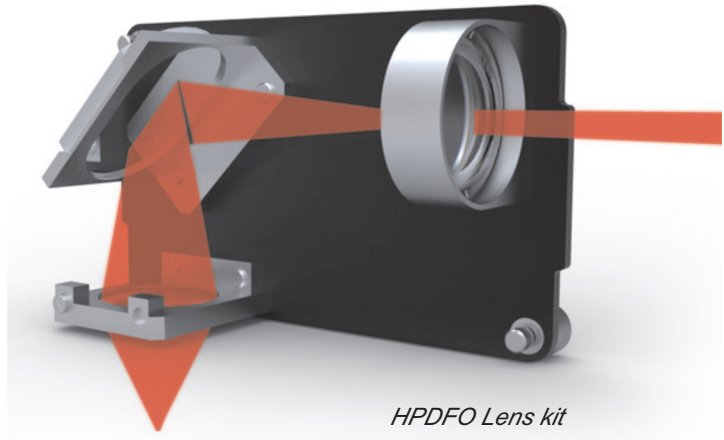
Metal marking compound can be expensive. Using this compound adds additional cost for each marked metal part. This surface mark can be mechanically sheered off.

### Where to get metal marking compound:

[www.thermark.com](http://www.thermark.com)  
[www.cermarksales.com](http://www.cermarksales.com)



## METAL MARKING WITH STANDARD CO<sub>2</sub> LASER AND THE HPDFO LENS



Laser marking with (High Power Density Focusing Optics kit) HPDFO only works on some metals. The metals must be carbon based such as steel products. The laser mark will be a yellowish to dark brown.

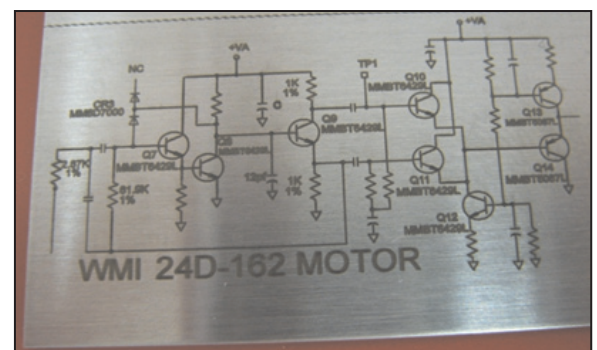
HPDFO uses a patented method to expand the laser beam within the focusing carriage. This expansion allows the beam to be focused into a much smaller focal spot, suitable for intricate, tight-tolerance laser marking. In addition to sharper images and expanded material processing capability, systems using HPDFO benefit from lighter-weight delivery optics and an efficient motion system.

### **To process Metals with HPDFO lens:**

- Place carbon-based metals into laser system
- Select the “Direct Marking” option on the selected metal from the materials database and input the metal thickness
- Process the metal part with your laser system
- Remove part for finished results

### **Marking metals with standard CO<sub>2</sub> Laser and the HPDFO lens details:**

- Requires 50+ watts for some productivity, application can be slow, vector outline is faster
- Only carbon based metals will work with this process
- Produces a UV stable mark
- Sub surface Mark, cannot be sheered off



*Example HPDFO mark on steel*

## METAL MARKING WITH 1.06um FIBER LASER

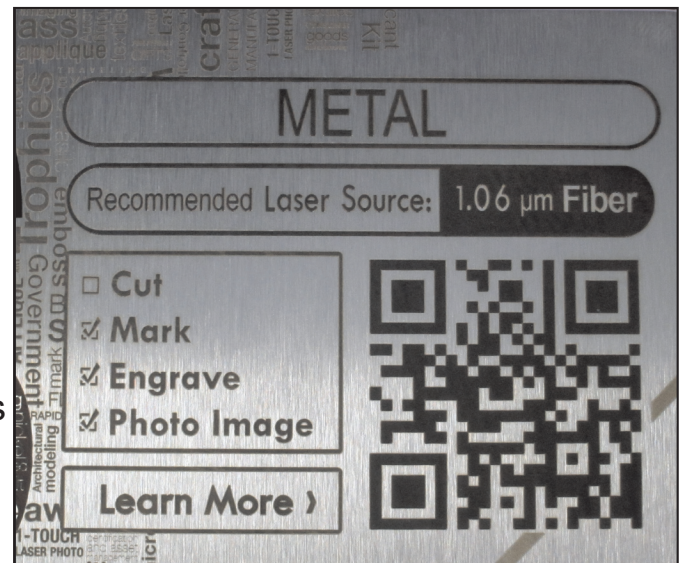
Direct marking with a fiber laser is by far the fastest and best solution to processing all metals. This wavelength will directly mark any metal without the need for a special lens or metal marking compound. The contrast of the mark will depend on the metal processed.

### To process metal with fiber laser:

- Place any type of metal into multi-wave fiber laser system
- Select the metal from the materials database and put in the thickness
- Run the metal part
- Remove part for finished results

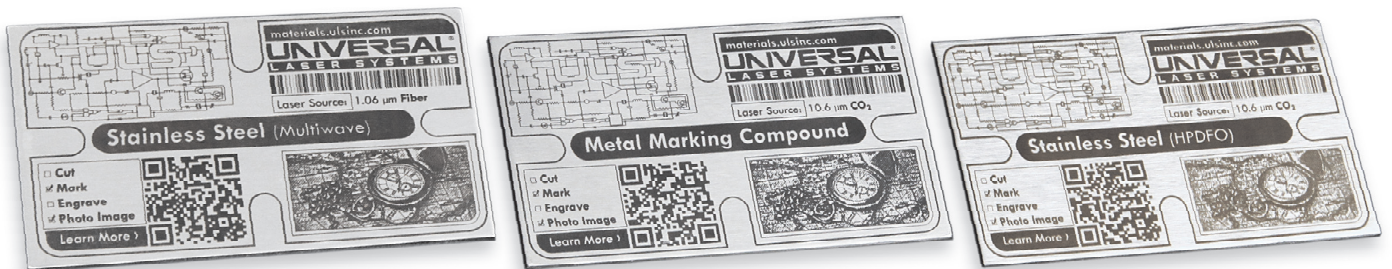
### Marking metals with Fiber Laser details:

- Any lens will mark any metal
- Metal can be clear coated and still mark
- Produces a UV stable mark
- Sub surface Mark, cannot be sheered off
- The easiest and fastest laser mark on metals
- Produces depth into some metals



Example fiber laser mark on stainless steel

### Side by side example



Fiber laser 1.06micron(Multi-wave)

Metal Marking Compound 10.6micron Co<sub>2</sub>

HPDFO Direct Mark10.6micron Co<sub>2</sub>