

# LMM14 Black for Metal (General Purpose)

## Recommended use

LMM14 is one of TherMark's two general purpose laser marking inks and is recommended for creating a black mark on most metals. The combination of its flexible process window and wide range of applicable substrates makes LMM14 an extremely easy product to use. In general, if you are looking for one laser marking product to keep on your shelf, we recommend LMM14.

LMM14 dries quickly as a light-gray powder coat and is extremely easy to wash after laser marking. This coat should not be extensively handled prior to laser marking, however, so LMM14 should be marked shortly after application.



## Recommended substrates:

LMM14 is an extremely flexible product which is recommended for almost any metal. The following list is made up of substrates on which LMM14 works well. This list is not exhaustive, however, so if your substrate does not appear on the list, this does not mean LMM14 will not mark it.

Stainless Steel	Chrome Plating
Stainless Steel - Bright Annealed	Nickel Plating
Galvanized Steel	Gold Plating
Brass	Silver Plating
Aluminum	Titanium
Copper	Pewter

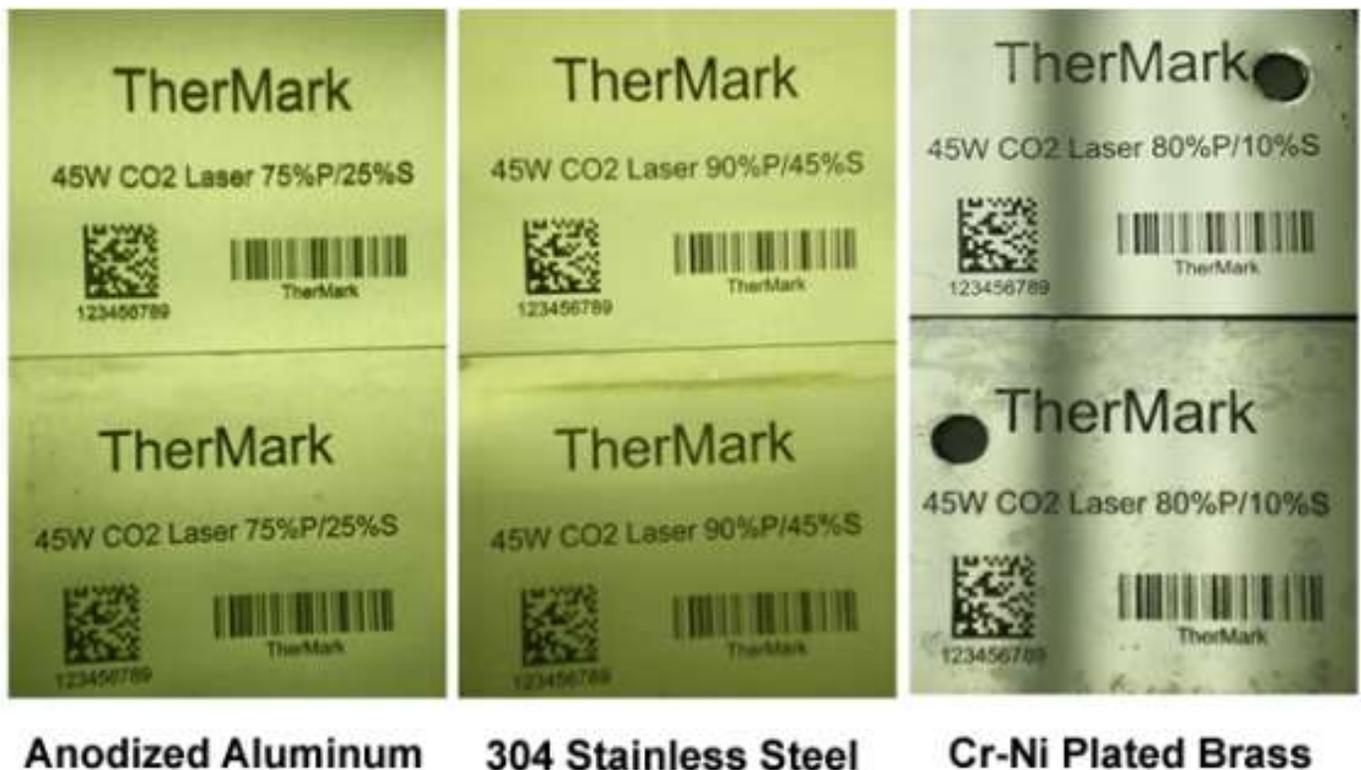
## Permanence

Whether your mark needs to stand up to direct sunlight, abrasive chemicals, high temperatures, physical abrasion, or salt spray, TherMark offers the most permanent, high contrast, high resolution marks possible which do not damage your substrate. The sections below detail the results of our studies on the permanency of our marks in a variety of extreme environments.

### UV Exposure & Weathering

- **ASTM D4329** Procedure / Weather Cycle B
- 8 hrs exposure to UV at 70 °C, followed by 4 hrs exposure to condensation at 50 °C  
1000 hrs (42 days) correlates to 1 yr of Florida exposure

TherMark material was tested on various substrates for 2000 hours. There was no noticeable degradation of the marks (fresh marks on top, UV exposed marks on bottom):



Marks were also tested for extreme UV & Temperature exposure in space. Please [click here](#) to read NASA's test report.

### Chemical Resistance



- After 12 hrs. dissolved 1.8057 gms of steel tag (30.6%), laser mark unaffected, now having a distinctly raised feel.

\*\* Sulfuric acid testing:

- Acid discolors at approximately 96 hrs., mark appears slightly discolored.

<b>Common Aerospace Chemicals</b>		24 Hours	1 Week	1 Month
Skydrol 500 B-4 hydraulic fluid		No effect	No effect	No effect
Royco 756 PAO		No effect	No effect	No effect
Royco 782 PAO		No effect	No effect	No effect
Aeroshell 500 turbine oil		No effect	No effect	No effect
Royco 560 turbine oil		No effect	No effect	No effect
Jet A jet fuel		No effect	No effect	No effect
Aircraft De-icing fluid		No effect	No effect	No effect

<b>Other Tests</b>		
Boiling H <sub>2</sub> O		Marks soaked in boiling water for 1 hr. - no effect
LN <sub>2</sub> (Cold)		Marks dipped in liquid nitrogen - no effect
Flame (Hot)		Marks heated in a propane flame until cherry red - metal discolors, no effect on mark.
Hot/Cold Cycling		Marks heated red hot and immediately plunged in liquid nitrogen - metal discolors, no effect on mark.
ASTM A380		Marks on stainless steel pass corrosion test
ASTM A967		Marks pass citric acid passivation

### Temperature Resistance

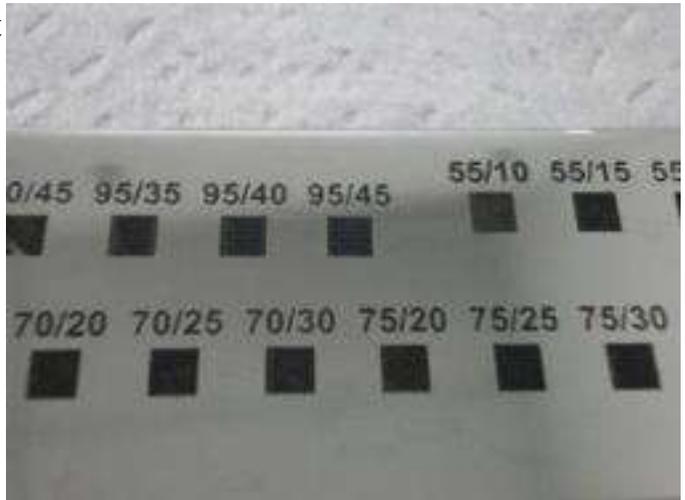
- The glass frit in TherMark materials melts at approximately 1800°F, providing extreme temperature resistance without discoloration.

### Abrasion Resistance

- The glass component of the material ensures the marks are extremely hard and therefore resistant to abrasion assuming they have been correctly bonded. It is generally not possible to remove marks unless the abrasive is also removing the base material.

### Salt Spray Tests

- In applications which require salt spray testing, TherMark materials, when bonded with a CO<sub>2</sub> laser, are able to produce black marks without the substrate annealing typical with a direct mark from a solid state laser.
- The picture shows a 420 stainless steel part that has been marked then tested for corrosion. The salt dip test specification called for the part to be dipped for 20 seconds in a 1% salt solution at a temperature of between 140 & 160°F. The part is then removed for 10 seconds. This cycle is repeated 720 times for total test duration of approximately 6 hours.



### Customer Testing Disclaimer

The word permanence can mean many different things to customers depending on your perspective. The tests described and the results achieved represent limited validation from internal tests conducted by TherMark and its licensees of certain laser bonding materials on a range of common substrates.

Because of the wide range of material substrates and variability of process settings and equipment, we strongly recommend that customers conduct their own testing to determine that the laser bonding process meets their unique requirements for permanence in a given environment.

It is ultimately the responsibility of our customers to validate the suitability of the marking process for their needs.

The above information is supplied from TherMark

By:


**CREATIVE  
TROPHIES & GIFTS**  
 105 - 1960 Springfield Road.  
 Kelowna, BC V1Y 5V7  
 250-860-1153 / 855-860-1153  
[www.creativetrophies.ca](http://www.creativetrophies.ca)  
[sales@creativetrophies.ca](mailto:sales@creativetrophies.ca)