

Physical Testing of LMM-6000 Laser Marks

Laser marks were made on type 304 stainless steel tags using LMM-6000 and a CO2 laser. Marks were made at settings of 100% power, 12% speed, 500 DPI on a 35 watt laser.

Tags were totally immersed in the test solutions.

Exposure Time

Organic Solvents	<u>1 Hour</u>	<u>12 Hours</u>	<u>24 Hours</u>	<u>1 Week</u>
Gasoline	No effect	No effect	No effect	No effect
Limonene	No effect	No effect	No effect	No effect
Methyl Ethyl Ketone	No effect	No effect	No effect	No effect
N-Butanol	No effect	No effect	No effect	No effect
Mineral Spirits	No effect	No effect	No effect	No effect
Xylene	No effect	No effect	No effect	No effect
Acetone	No effect	No effect	No effect	No effect
Propylene Carbonate	No effect	No effect	No effect	No effect
Ethanol	No effect	No effect	No effect	No effect
DMSO	No effect	No effect	No effect	No effect
Motor Oil	No effect	No effect	No effect	No effect
Lime A-Way	No effect	No effect	No effect	No effect
e-z-est coin cleaner	No effect	No effect	No effect	No effect
6877 triple Etch	No effect	No effect	No effect	No effect
TSP all purpose cleaner	No effect	No effect	No effect	No effect
Deionized Water	No effect	No effect	No effect	No effect
409	No effect	No effect	No effect	No effect
Jet Fuel A (Orange Glo)	No effect	No effect	No effect	No effect
Stainless Steel Polish	No effect	No effect	No effect	No effect
 Acid/Bases				
Hydrochloric Acid 35%	No effect	No effect	Test stopped - see notes	
Nitric Acid 68%	No effect	No effect	No effect	No effect
Sulfuric Acid (conc.)	No effect	No effect	No effect	No effect
Acetic Acid 99.5%	No effect	No effect	No effect	No effect
Hydrogen Peroxide 30%	No effect	No effect	No effect	No effect
Sodium Hydroxide 25%	No effect	No effect	No effect	No effect
Ammonium Hydroxide 20%	No effect	No effect	No effect	No effect

Other

Boiling H ₂ O	Marks soaked in boiling water for 1 hr. - no effect
LN ₂ (Cold)	Marks dipped in liquid nitrogen - no effect
Flame (Hot)	Marks heated in a propane flame until cherry red - metal discolours, no effect on mark.
Hot/Cold Cycling	Marks heated red hot and immediately plunged in liquid nitrogen. - metal discolours, no effect on mark

Notes:

Hydrochloric acid testing:

- Acid dissolves the steel tag and was not run over 12 hrs.
- After 1 hr. acid dissolved 0.2767 gms of steel tag (4.7%), laser mark was unaffected.
- 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 discolours at approximately 96 hrs., mark appears slightly discolored.