

LMM 6000

Liquid/Paste & Aerosol Spray Can

User Manual

Black Marks on Metal

Important to know:

 **LMM 6000 is an all-round laser marking material** and creates a permanent black mark on many metals, preferably on stainless steel.

 **LMM 6000** is available in bottles as a **liquid/paste** product and in **aerosol spray cans** too.

 After applying and the following drying both products create a **dry to touch coat** and therefore allow a careful stacking of e.g. signs, which have been coated to stock for several days.

 **Spraying is the recommended way of application.**
Application with a brush is only recommendable on small areas.



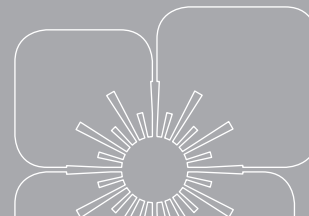
How to proceed:

1. The **surface of the metal** must be *clean, dry and free of oils*.
Clean it with alcohol or acetone if necessary.
2. **Before each use shake the LMM 6000 Aerosol Spray can intensively.**
Shake the can until you hear the agitator ball inside keep shaking for an additional minute or two so that possible clumps of material can be fully dissolved by the agitator ball.

To Spray lead the can in a distance of ca. 20-30 cm and with consistent speed over the surface of the metal. (→ 6).

After use rotate the spray can 180° (spray valve downwards) and spray until only propellant gas escapes. In so doing the valve and spray nozzle are clean again. Clogged spray nozzles can be made functional again by putting them in warm water and blowing them clean for example with compressed air.





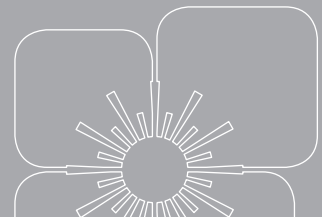
3. **Before use** shortly **stir the liquid/paste products** so that the solid and liquid parts on the surface get mixed up well. Fill the needed amount in another container and dilute it according to your planned method of application (→ 4 or 5). Sometimes, small dried up "crumbs" fall from the inside wall of the container back into the fluid material. Those should be separated with a fine filter before you start applying
4. **Application with an Air Brush:** a dilution exclusively with ethanol (denatured alcohol) ca. 1:1 (depending on the volume) has delivered an optimal performance in practice. Adjust your rate of dilution in a way which allows you to work with your air brush pistol comfortably. The dilution has no influence on the subsequent characteristics of the marking. (→ 6)
5. **Application with a brush:** Preferably use a soft hair brush or a fine pored foam brush. Dilute only with ethanol (denatured alcohol). Adjust the dilution according to your mode of operation with the brush. Normally applying by brushing will be easier with a stronger dilution up to 1:2 (2 volume parts alcohol). We recommend using a brush which covers the complete area to be coated. The coating with the brush should be done in one stroke.
6. **While applying** the product mind a homogenous and thin coating as much as possible. Strive for a coating thickness (dry) of circa 30µm. According to a simple rule of thumb you received the right coating thickness when the coat is very thin and barely covers the surface. Too thick coatings need more laser energy which might negatively influence the result of the marking.
7. **Dry the coating** before starting to mark. If left to air dry one or two minutes should be time enough to dry. If using a (warm) air blower for support the chosen temperature should be low to avoid cracks in the coat due to too fast drying.
8. To **set the laser parameter** we recommend creating a test grid with different combinations of laser parameters from which you can adopt the best parameter **for your device**.
The laser parameters are depending on the surface to be marked and must be individually found for each metal.
9. **After marking** you best remove the excessive LMM with a wet cloth or in a water bath.

Concerning this matter please also refer to our material safety data sheet with advices on handling and disposal.

Storage:

The product must be stored frost proofed, cool and dry at a temperature between 5°C and 35°C. The container should always be closed tightly. A dried up product will turn unusable.

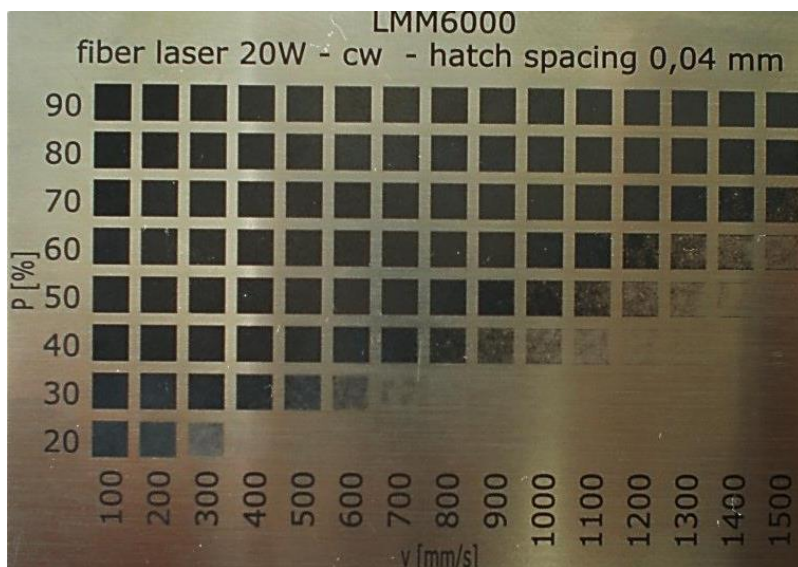
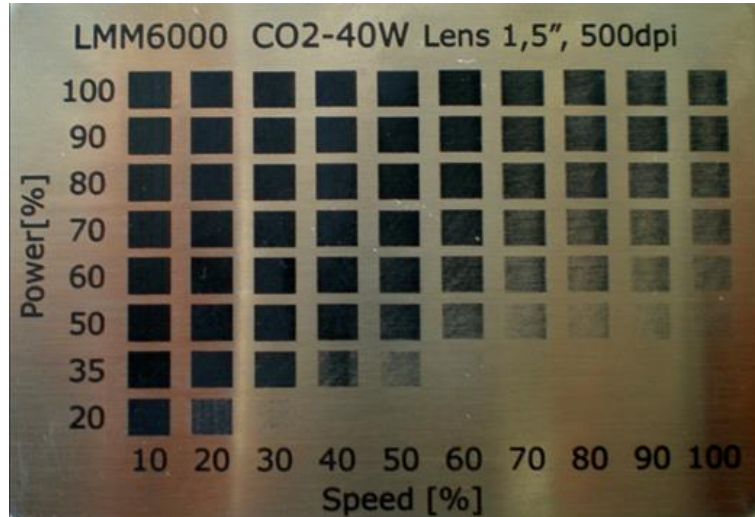




Example: Test grid on Stainless Steel 1.4301

The two pictures show each an example for a test grid for a Nd:YAG, respectively a fibre laser (bottom picture) and a CO₂ Laser (upper picture).

Please pay attention that the results of the parameters of the shown pictures cannot thoroughly be used with other marking laser and a further optimization on your device might be necessary.



IMPORTANT:

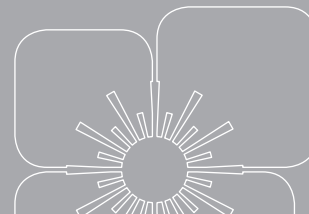
The laser settings depend mainly on the metal to be marked.

Additional factors such as the thickness of the sprayed coat or the thickness of the sprayed metal sign might require an adjustment of the parameters.

Useful information and further documents:

- | | |
|-------------------------|--|
| MSDS_LMM_6000.M9LP.pdf | ... Material Safety data sheet liquid/paste |
| MSDS_LMM_6000.M9AS.pdf | ... Material Safety data sheet aerosol spray can |
| Laseradjustment.pdf | ... Laser adjustment with a test grid |
| QuickStart_Spray.pdf | ... In three steps to a complete marking |
| Metal_marking_notes.pdf | ... What you need to know about marking |





Laser settings:

The following table details laser settings on a range of common substrates. These settings are designed to help guide the user to the optimum parameters as quickly as possible. **Please note that the actual parameters depend on the substrate and on the particular laser used and that they may vary from tabular value.**

Power and Speed are the most important Laser Parameters using Laser Marking Materials. Depending on the used device others e.g. focal distance, lens, definition (DPI, PPI) or hatch spacing might be relevant.

Substrate Material	CO ₂ X-Y Plotter				Nd:YAG Beam Steered f = 160mm			
	Power [Watt]	Speed [mm/s]	Focal distance ["]	DPI/ PPI *	Power [Watt]	Speed [mm/s]	Hatch spacing [µm]	Frequency [kHz] **
LMM 6000 Liquid/Paste & Aerosol								
Stainless Steel 1.4301	30	450	2	500	9	250	40	0 / CW
Stainless Steel Bright Annealed	30	400	2	500	9	250	40	0 / CW
Galvanized Steel	30	400	2	500	7	150	40	0 / CW
Aluminum	30	150	2	1000	15	200	40	0 / CW
Copper	30	150	2	1000	16	50	40	0 / CW
Pewter	30	200	2	1000	10	300	40	0 / CW
Brass	30	150	2	1000	15	150	40	0 / CW
Gold Plating	30	150	2	1000	15	100	40	0 / CW
Silver Plating	30	200	2	1000	15	100	40	0 / CW
Nickel Plating	30	250	2	1000	10	200	40	0 / CW
Chrome Plating	30	250	2	1000	10	100	40	0 / CW

* **CO₂ Laser:** Some laser devices might increase the quality of a mark by selecting a higher DPI/PPI setting in combination with a higher speed setting

** **YAG/Fiber laser – in case your device doesn't support the CW-mode:** some laser devices only support the pulsed mode (QS) and are not able to operate in the Continuous Wave Mode (CW). In case that your device doesn't operate in the CW-Mode or with the frequency = 0, you should try following:

- Choose the highest possible frequency
- Set the pulse duration on the longest possible value.
- Test marking with several, different speed and power settings.
- Should the marking not be successful try to improve your results by minor defocussing

Please note: This instruction switches the properties of your laser spot as similar as possible to a CW laser. In a final step it depends on many details and properties of your laser if such changes can make possible perfect marking results. These steps cannot make sure for all lasers to produce perfect marking results in QS-Mode.

