

Laser-marking materials meet the need for durable, high-contrast direct marking.

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The idea of marking or decorating products is not new. There are several methods to decorate or apply functional markings on a substrate, some of which make more permanent marks than others. Over the years, companies have used these methods to mark products, and there are many different kinds of marks to be placed on a product. The types of markings on a given product can range anywhere from decorative designs to bar codes and serial numbers. Today, a new technique for producing durable, high-contrast markings on a variety of substrates is beginning to emerge as a preferred method for marking appliance products. This marking technique is known as laser bonding.

The methods available in the marking industry employ a wide range of techniques. Each of these techniques has certain strengths and weaknesses. Taken as a group, some benefits these marking techniques offer include speed, low cost, and, in some cases, an attractive mark. There are also several disadvantages associated with this group, including indirect markings, damage to the surface, and many non-permanent marks. The marking method employed in any given situation will usually be dictated by either the requirements of the marking application and/or the cost of the marking. In many cases, a permanent marking may not be needed, and there are several inexpensive methods that can be used to provide such markings, like using a paper label.

If the application requires a permanent marking, the choice of technique is more limited. Sandblasting, acid etching, metal

stamping, laser etching and laser bonding are the common permanent marking techniques. Sandblasting will produce a durable mark,



The liquid metal marking material can be applied using conventional spray equipment.



The laser-bonded mark is as durable as the metal it is bonded to.



When spray-type marking material is used, the excess can be simply washed away with plain water.

but it is low contrast and messy. Acid etching is also messy and time consuming. Metal stamping may cause significant substrate damage, as well as having very little aesthetic appeal. Laser etching is very fast and permanent, but it also damages the substrate, causes debris, and can often be low contrast. Laser bonding addresses a primary need to apply a marking directly on appliance surfaces that is permanent, high contrast, and doesn't damage the substrate. The process requires no messy chemicals, produces a marking that withstands the everyday rigors of the appliance usage, and provides an aesthetically appealing decoration that also has the permanence of the other marking techniques.

The laser bonding technique is a simple process comprised of three steps:

1. Applying the marking material.
2. Bonding the marking material to the substrate with a laser.
3. Removing the excess marking material.

The first step needed to create a laser-bonded decoration or marking is to apply the marking material to the metal substrate. CerMark laser marking materials, manufactured by Ferro Corp., are formulated specifically for this process. The laser-bonding materials can be applied to the marking surface by either spraying or via a dry transfer tape. The liquid product, LMM-6000 metal-marking material, can be used on a wide range of metals. The LMM-6000 is applied using conventional spray equipment such as gravity-fed HVLP guns, siphon-feed spray guns, or airbrushes. After applying a smooth, even coating of the proper film weight, the material is dried before laser marking. The product dries quickly, and drying can be accelerated by blowing air or heat across the surface.

The dry transfer tape, LMM-6018 metal marking tape, is formulated for use on stainless steel. The LMM-6018 is applied just like a label or masking tape. It is supplied in rolls similar in size to a roll of

masking tape. The tape is removed from the roll and then is positioned on the substrate to be marked. After applying to the metal, the tape is smoothed out to ensure good contact with the substrate and to remove any air bubbles from beneath the tape.

After the marking material is applied, the next step is to bond it to the metal substrate with a laser. The marking materials can be laser bonded with CO₂, YAG and fiber laser systems. The laser needed to create a laser-bonded decoration or marking may vary depending on the substrate to be marked. Some metals will require more power to mark on than others, depending on their heat conductivity and their mass. The power settings used to perform the laser bonding may be different for each application, and they are normally optimized by marking test pieces of substrate. The power settings used for the LMM-6000 spray product will also be different than those used for the LMM-6018 tape. The LMM-6018



Dials for cooking appliances are a natural fit for laser-bonded marks.

tape will require more power than the LMM-6000. This is because the paper, binders and adhesive used in the manufacture of the tape must also be incinerated during the bonding process.

After laser marking the substrate, any excess unbonded marking material will have to be removed. If the spray type marking material has been used, the excess can be simply washed away with plain water. If the dry transfer tape has been used, the excess is peeled off of the substrate, and any char or remaining debris can be wiped away with alcohol and a wet cloth.

The resulting mark will be extremely durable and resistant to chemicals, cleaners, hot and cold cycling, and abrasion. The marking will be as durable as the metal it is bonded to, and will provide a high contrast, black marking that is functional as well as decorative. Marks made using CerMark materials have actually survived outside the International Space Station for four years, seeing exposure to solar radiation, atomic oxygen and micrometeorite impact.

Laser bonding is already in use around the globe in a great variety of applications. The technique is used in parts marking and identification, the manufacture of nametags and switch plates, the personalization of items, and in the awards and engraving industry. The technique is also accepted as a standard military spec method (MIL-STD-130L), in the Automotive Marking Standard (AIAG B-4) and in the NASA Marking Standard (NASA STD 6002).

An appliance is a natural application for the laser bonding technique. Appliances of many types have markings on them to designate on/off controls, power settings, and cycles. These markings need to have aesthetic appeal along with the durability to withstand the normal wear and tear of usage. They also need to have chemical resistance to many standard household cleaners. A laser-bonded mark is an excellent solution for such a marking wherever the designer wishes to have a direct marking on a metal part that can withstand these durability requirements. Laser-bonding can replace such marking

techniques as screen printing or labeling, offering an aesthetic look as well as exceptional durability. A typical application where appliance manufacturers have adopted this technique can be found in the marking of dials for cooking appliances.

The need to mark or decorate products is something every manufacturer, designer and engineer faces. There are many methods to decorate or put functional markings on a substrate. The choice of technique tends to be dependent on the application and functionality of the product. In applications requiring extremely durable markings, the choice of marking technique can be narrowed to a select few. For applications requiring a direct marking that is permanent, high contrast, and doesn't damage the substrate, laser bonding is a good choice, providing an image that will withstand the everyday rigors of appliance usage, provide an aesthetically appealing decoration, and deliver quality expected from a premium appliance. **IAM**