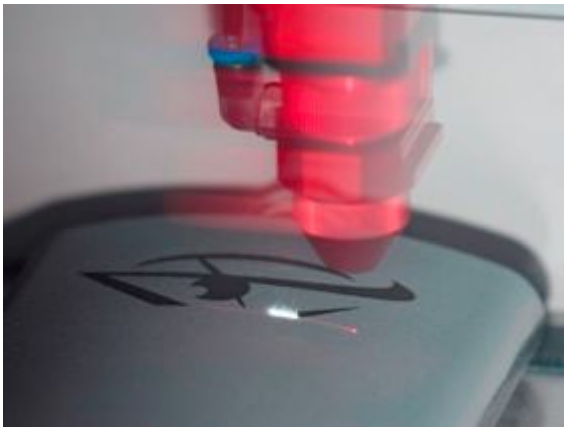
LASER BONDING



After TherMark laser marking material has been applied to your substrate and dried, the next step is laser marking. The laser beam should be focused on the substrate and moves through the mark, fusing the ink to the substrate selectively wherever it passes. For more information on how the TherMark process works, refer to Thermark Principle document.

The laser settings for marking are specific and depend on the substrate material, TherMark product, thickness of the material, and the focusing lens of the laser.

Material Safety

The TherMark process involves laser and chemicals so certain hazards are present during marking. Appropriate care should be taken to prevent injury.

- **Fume extraction:** While TherMark products do note pose any serious chemical safety issues, fumes generated during marking can be potentially hazardous. Proper care should be taken to extract fumes from the laser chamber where marking occurs. If your laser is supplied with a separate fume extraction unit, make sure it is connected and operational.

- **Ventilation while using aerosol cans:** Aerosol cans should be used in a well-ventilated area. Short term exposure does not pose much potential hazard, but extensive exposure or misuse of the products can be harmful. Operators using aerosol cans over a longer period of time should consider using cans in a spray booth with fume extraction and/or wearing a breathing mask. Read the precautions section on the back of a can before using it.

- **Handling:** TherMark materials are generally fairly benign, but it is good practice to wear rubber gloves when handling any of our liquid/paste products or aerosols as skin irritation can result from direct contact.

For Material Safety Data Sheets with more detailed information on the safety of specific TherMark marking materials please contact STAMP ‘IT CNC.

Laser Safety

Laser light poses significant safety hazards not associated with light from conventional sources.

Positioning the Sample

Some laser engraving systems such as flatbed systems are equipped with a visible laser beam/pointer for positioning purposes. This beam is much weaker in intensity than the full strength beam and does not pose significant hazards. However, one should still not look directly into it or its direct reflection from a shiny substrate. The actual strong laser output travels paraxial with this beam, such that the pointer can be used to position the sample inside the engraving system quite accurately. The position of the marker/pointer is also visible on the computer screen in the laser software and can be used to determine the correct position of the mark.

Other types of lasers such as the ones with galvo scanners (e.g. some fiber lasers) are not equipped with a visible pointer/marker beam and are somewhat harder to position. A quick and easy method to align the sample is to tape or glue a flat piece of black paper on the tray and create two perpendicular lines passing through (0,0) point on the plane (x-, y-axes) by marking with very high speed and low intensity. These lines will serve as the center (origin) of the laser beam and the sample can be conveniently positioned relative to those lines.

To produce well positioned and consistent marks on individual or multiple parts, one may need a jig or fixture to position the part accurately in the machine. This is especially important for small parts or parts for which positioning must be very accurate. Jigs can be self-made to match a specific sample or can be purchased from a

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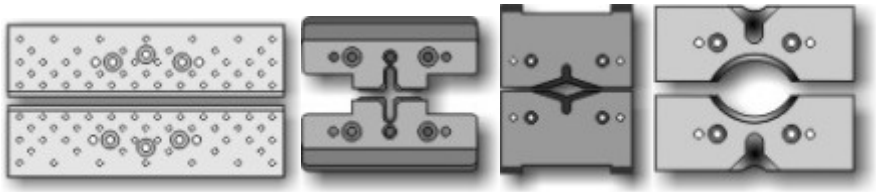
manufacturer. Most laser manufacturers sell their own fixtures and attachments, and/or can refer you to an automation specialist to find a more sophisticated fixture.

Some engraving machines may come with a rotary attachment for marking round shaped objects. Round samples are mounted to such rotary attachments, placed inside the engraving machine, and connected (wired) to activate the rotation axes. As the laser starts marking, the sample rotates slowly to keep the distance between the lens and the substrate even. In XY-flatbed systems one of the dimensions acts as a rotation axis when the rotary attachment is connected.

Fixtures, jigs and holders that fit most engraving machines include Genie, Wizzard, Wizzard II, Wizzard XL, Wizzard XL-Xtra, Vision, New Hermes, Xenetech, Meistegram, HSquare.



(Left to Right) Universal Pin Jig, Jewelry & Plate Holder, Pen & Seal Jig, and Medallion Holder

For information on the Jigs seen here, please contact us.

Software

Laser engraving machines usually come with their own software which allows control of laser settings, positioning of the laser beam, and monitoring of marking time. Examples of such software are GCC LaserPro, Job Control (from Trotec). Some software packages have their own graphical environment to create vector images. Others require external graphical programs (such as CorelDraw) to create these files which can then be imported into the laser software.

Contact your specific laser manufacturer with questions regarding their software.