The Advantages of Laser Marking

- Excellent durability
- Low cost
- High velocity manufacturing
- Greatly reduced tooling and setup
- Total flexibility -- rapid, easy modification of graphics or tooling
- Non-contact process
- Easier marking of complex geometries
- More accurate than sublimation technology
- Perfectly suited for high mix, low volume manufacturing and prototyping

As it is crucial to the appearance of your input device, let Esterline Interface Technologies determine the ultimate marking technology for your specific application.
Laser Marking Technology

**Speed, performance and versatility give you the competitive edge**

Laser marking is state-of-the-art technology that applies computer generated text, graphics and machine readable code to many materials - most notably metal, plastic and painted elastomeric materials. Laser decoration gives your input device a sharp and progressive look in today's competitive marketplace.

**Primary Advantages of Laser Marking:**

1. **SPEED:** fast set-up and cycle times
2. **ACCURACY:** registration tolerances as low as 0.005 inches
3. **DURABILITY:** wear test data indicates 20X better than pad and up to 2X better than sublimation printing
4. **COST:** minimal tooling needed due to non-contact process
5. **FLEXIBILITY:** software driven, colors and materials can usually be changed without retooling.

These attributes differentiate laser marking from all other current technologies in most applications.

**Laser Marking Technology Summary**

The laser can create many different effects on various materials. Achieving the optimal solution for your specific application and environment are crucial elements to the look, touch, and protection of your input device. Let Esterline Interface Technologies guide your material selection and marking technology to create the ultimate look and durability for your product.

**Mark Types and Applications:**

- **Annealing (Tempering):** Surface heading below melting point yields dark permanent marks with no surface disruption on high carbon steels and titanium. Other metals can be marked using this process with varying degrees of success.

- **Color Change, surface Melting or Foaming:** Normally used on plastics to create very durable contrasting marks. Usually disrupts the surface, but some materials can be marked with no surface impact. Material choice is critical to achieve desired color or contrast.

- **Ablation or Removal:** Almost any material coating can be selectively removed to create contrast and/or allow backlighting in certain designs. Painting allows for broad color variation and lighting options. Durability is good to excellent depending on the particular design and post-laser treatment. Clinches can be created for pad printing operations.

**Marking speed**

- **Laser power**
- **Pulse frequency**

Different combinations of these parameters yield different effects on any given material.

**LASER Fundamentals**

Laser (L.A.S.E.R.) is an acronym for Light Amplification by Stimulated Emission of Radiation. Esterline Interface Technologies uses two different type of lasers for decoration, a Krypton arch lamp-pumped Nd:YAG (Neodymium Yttrium Aluminum Garnet crystal) and a diode-pumped Nd:YVO4 (Neodymium Yttrium Ortho-Vanadate crystal). Both lasers absorb energy from their respective pump sources and emit a high intensity beam of coherent photons. The energy projected by the beam is what creates contrastive images on different substrates in a non-contact thermal process.

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**Summary**

The wavelength of both lasers is fixed at 1064 nanometers. The ability of the laser beam to make a mark or impact is dependent upon the target material properties, predominantly the reflectivity and thermal conductivity. There are three primary laser parameters that govern the mark type and appearance on a given substrate:

- **Marking speed**
- **Laser power**
- **Pulse frequency**

These attributes differentiate laser marking from all other current technologies in most applications.