

# DuPont Engineering Polymers

## Helping You Get the Most from Laser Welding

DuPont engineering plastics and know-how can help you gain the benefits of laser welding in cost-effective assembly solutions.

### Key capabilities and benefits of laser welding include:

- Assembly of sensitive parts
  - No relative motion of parts being welded.
  - Little or no heating beyond the weld area
- Excellent aesthetics: no visible scars or flash on exposed surfaces.
- High precision: tight control of relative part location.
- Wide latitude in molding related materials, e.g. PA66 to high-performance polyamide (HTN).
- Versatility: suitable for a wide range of part designs and sizes.
- Low cost: usually competitive with alternative welding methods, and sometimes less expensive.

### Application Ideas

**Automotive:** Sensors, door lock and gearshift housings, headlights, taillights, fuel and air filters, fuel injectors, actuators, reservoirs for clutch and brake fluids.

**Electronics:** Instruments, keyless entry devices, connectors, housings, keyboards, mobile phones, watches.

**Microtechnology:** Biochips, pumps, motors, valves, manifolds, containers, test plates.

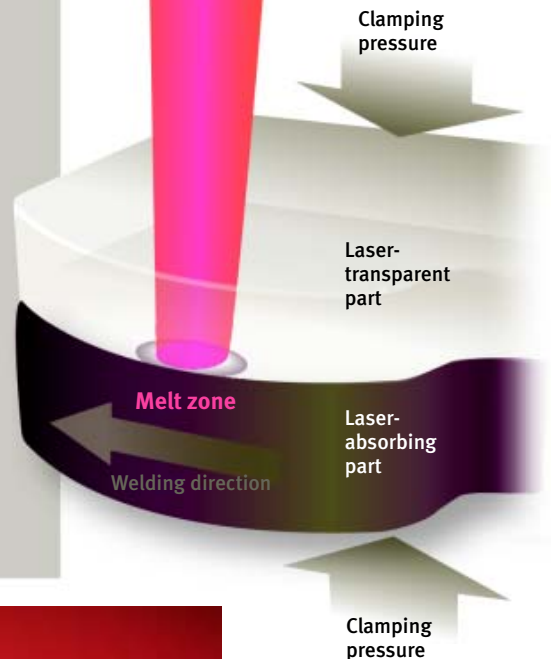
**Office equipment:** containers, cartridges for toner, ink, etc.

**Packaging:** sterile containers for pharmaceuticals or medical products, food packages.

### How laser welding works...

Laser welding can join parts made from the same or very similar polymers. One part must absorb laser light, and the other part must be at least partially laser-transparent.

In making a weld, the laser beam passes through the laser-transparent part to reach the laser-absorbing part. Absorption of the laser's energy produces heat, melting the material in the localized absorption area. The adjacent surface of the laser-transparent part is melted by the conduction of heat from the laser-absorbing part. When the laser beam is removed or relocated, the molten surfaces cool and bond together.



In automotive door lock (left) and fuel vapor canister (below), covers made of natural, laser-transparent PA66 are welded to black, laser-absorbing PA66 housings. Both materials are DuPont™ Zytel® nylon resins.

**Medical products:** containers, syringes, connectors

**Design idea:** rigid structural parts with flexible seals. Do it by welding Hytrel® thermoplastic polyester elastomer to Crastin® PBT thermoplastic polyester resin. Think how other hard-soft structures can be used in your products.



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## Do it with DuPont

DuPont Engineering Polymers offers a wide range of suitable materials for laser welding and a wealth of expertise in the technology.

It's quite easy to produce strong welds with Delrin® acetal, Zytel® nylon (including PA66, PA6 and PA612 types) and Zytel® HTN high performance polyamide. With somewhat tighter limitations on wall thickness and part design, strong welds are also feasible with Vespel® TP parts, Crastin® PBT and Rynite®

PET thermoplastic polyesters and Hytrel® thermoplastic polyester elastomers. Special grades of Crastin® PBT and Rynite® PET with enhanced laser transparency provide greater latitude in part thickness and welding process conditions.

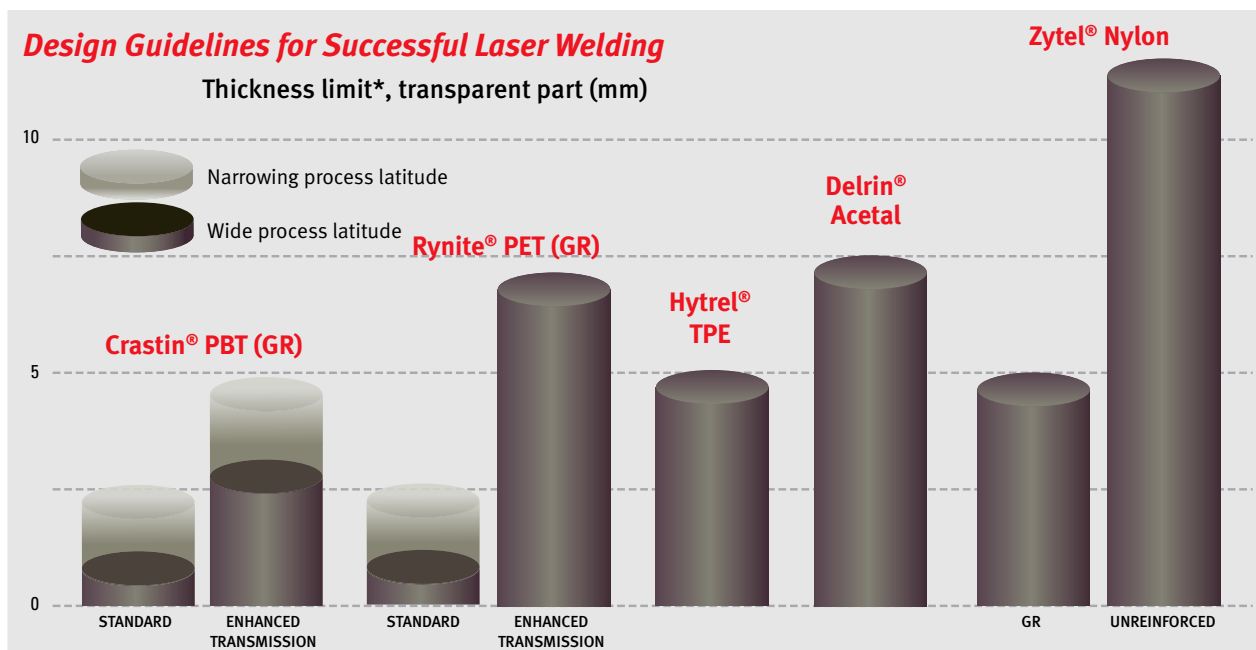
### Laser transparent components.

Most natural (uncolored) grades are sufficiently transparent to laser light to permit strong welds. Colored laser-transparent components can be made from materials that are opaque to visible light - i.e., to the naked eye -

but have sufficient laser transparency for successful welding. Laser-transparent colors permit strong welds to laser-absorbing colors.

For evaluation purposes, we can supply laser-transparent colors of Delrin®, Zytel®, Crastin® PBT, Rynite® PET or Hytrel®.

**Laser-absorbing parts.** Standard black and some standard colored grades of the resins cited above are suitable for laser-absorbent components of welded assemblies.



\*The thickness of injection molded parts does not typically exceed 4 mm.

## Let's go forward together

We're geared up to support customers like you in developing laser welding applications with good business potential. Contact your local DuPont representative or the nearest contact point listed below:

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**CAUTION:** Do not use in medical applications involving permanent implantation in the human body. For other medical applications, see "DuPont Medical Caution Statement," H-50102.

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