

# Ultradur<sup>®</sup> LUX PBT

## Laser welding technical brief



### What is Ultradur<sup>®</sup> LUX?

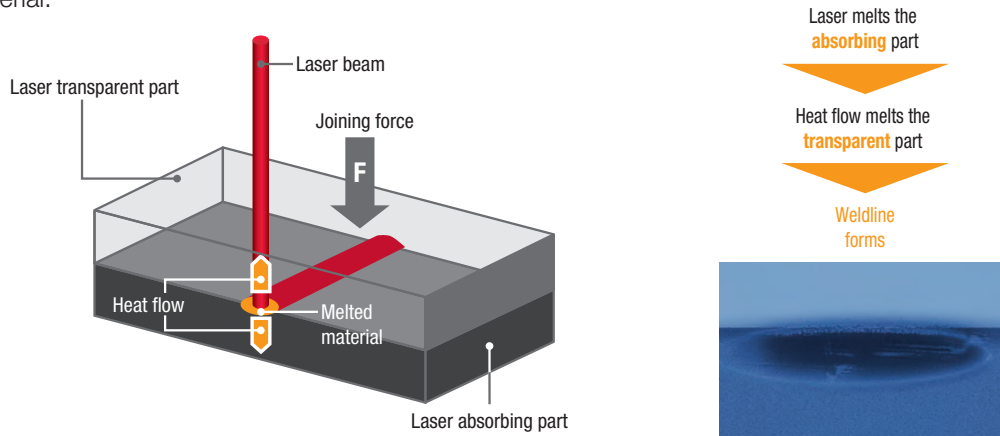
Ultradur LUX is a new family of PBT materials with outstanding optical properties ideal for laser welding (LW).

### Why Ultradur LUX vs. Standard PBT\*?

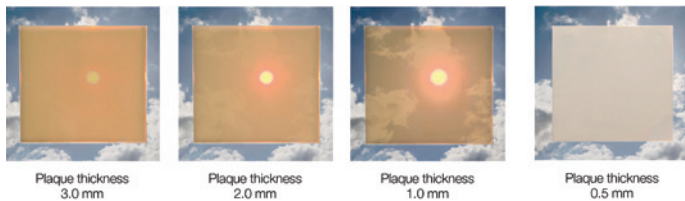
- Shorter cycle times and better throughput from laser welding
- Ability laser weld through thicker sections for more design flexibility and strength

### The Dynamics of Laser Welding

Laser welding, is a joining method with several advantages and offers an economic alternative to conventional connecting methods such as screwing or adhesion. The principle of laser welding: laser beams pass through a laser transparent part to be joined and melt the underlying half of the component that absorbs laser beams. The melted plastic transfers the heat to the laser-transparent material, thus ultimately creating a weldline. Therefore, the basic premise for laser welding is the pairing of a laser-transparent and a laser-absorbing material.



#### Ultradur LUX

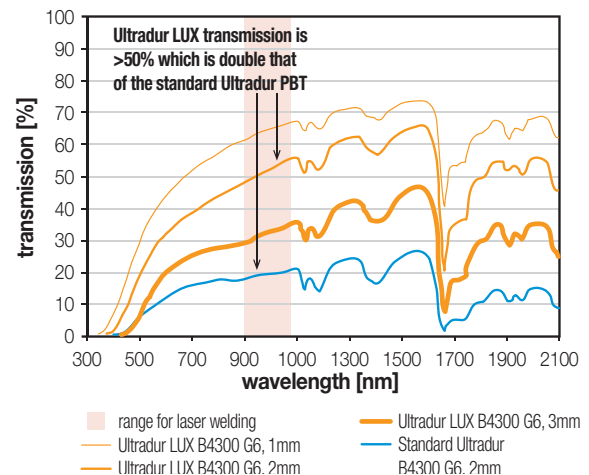


Transmission of sunlight: comparison of sample plaques of varying thickness made of standard PBT\* and Ultradur LUX.

NOTE: Ultradur LUX black PBT (not shown), which has an improved LET, is also available.

#### Standard PBT\*

### Laser Energy Transmission (LET) – Weldability

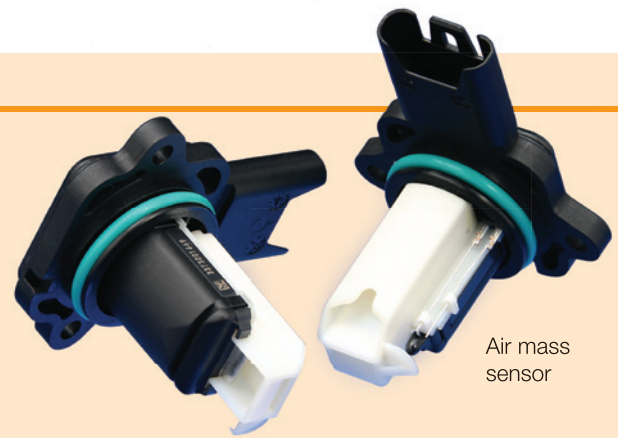


\* References to standard PBT are based on standard Ultradur PBT.

## Laser Welding Case Study

### Set up:

- LW equipment: NdYAG quasi-simultaneous system
- Validation technique for weld quality: Burst Test
- Transmitting layer: 1mm and 2mm thick covers for the enclosure (Ultradur® B4300 G6 LUX uncolored and black)
- Absorbing layer: Bottom housing for enclosure (Ultradur® B4300 G6 LS black)

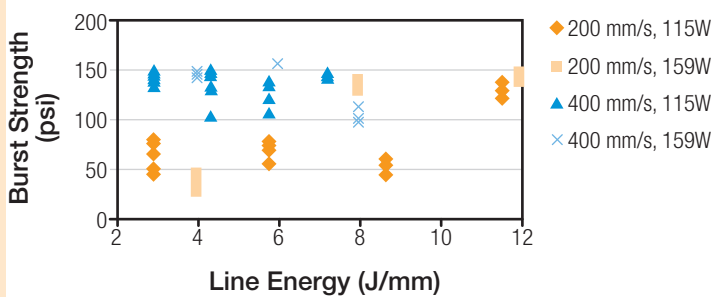


Air mass sensor

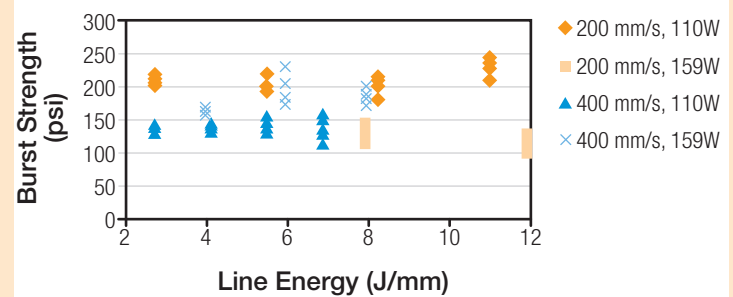
### Data:

Ultradur LUX will weld under many different conditions, allowing flexibility in welding.

#### Ultradur® LUX Natural - 1 mm thick Speed/Power Effect



#### Ultradur® LUX Natural - 2 mm thick cover Speed/Power Effect



Low line energy equates to low number of passes required to achieve meltdown or collapse and welding.

### Learnings:

- A weld bead on the absorber side is suggested for more consistent localized meltdown
- **Thinner covers**
  - Welded most consistently with high laser speed (400mm/s) and with relatively high power
  - Only a few passes were required to achieve a weld
  - Once any degree of collapse is registered, the weld appears to be acceptable
- **Thicker covers**
  - More accepting of a greater variability of laser welding
- Laser welding using black top cover welded with success

#### • Validation

- Standard PBT\* burst results are similar to those achieved with Ultradur LUX PBT (10-15% higher if achieved)
- Ultradur LUX welding appears to be more consistent over a range of process

#### • Color

- Ultradur LUX is normally a light beige color. The color difference from the standard PBT\* does not affect the weld behavior.

**Note:** There are a multitude of laser type/geometry scenarios. This is just one example. Therefore, these guidelines are suggestions to aid in developing the proper welding parameters.

For more information and details on the testing, please contact Inga Balke at [inga.balke@basf.com](mailto:inga.balke@basf.com).

\* References to standard PBT are based on standard Ultradur PBT.

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