Precision Laser Welding of Clear Thermoplastics Without Additives

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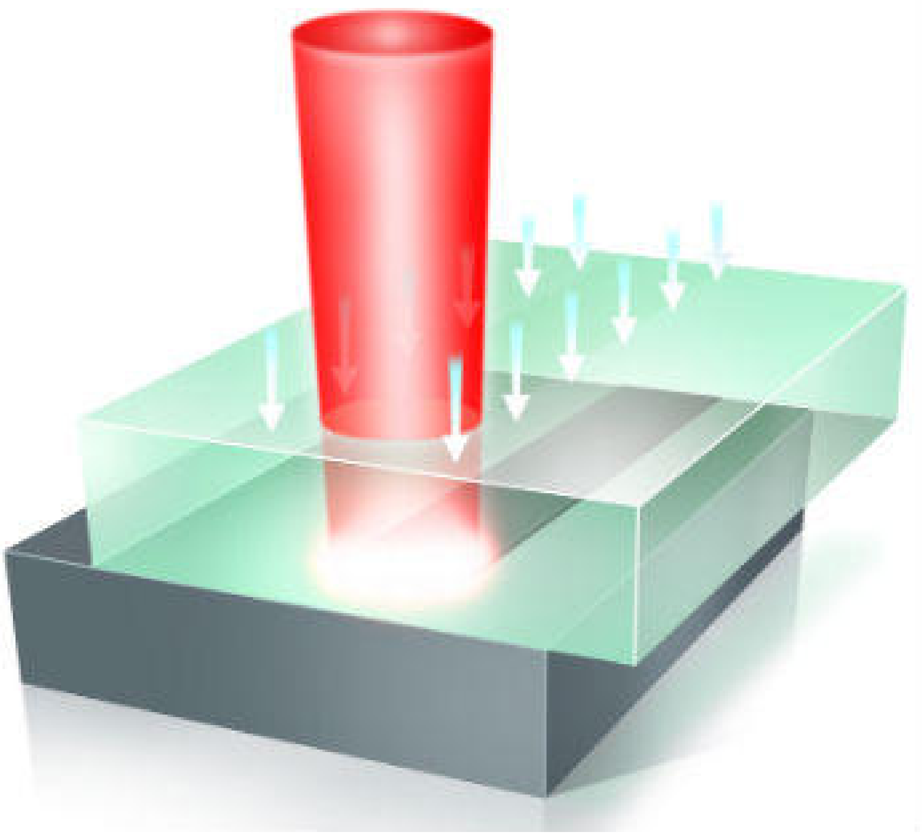
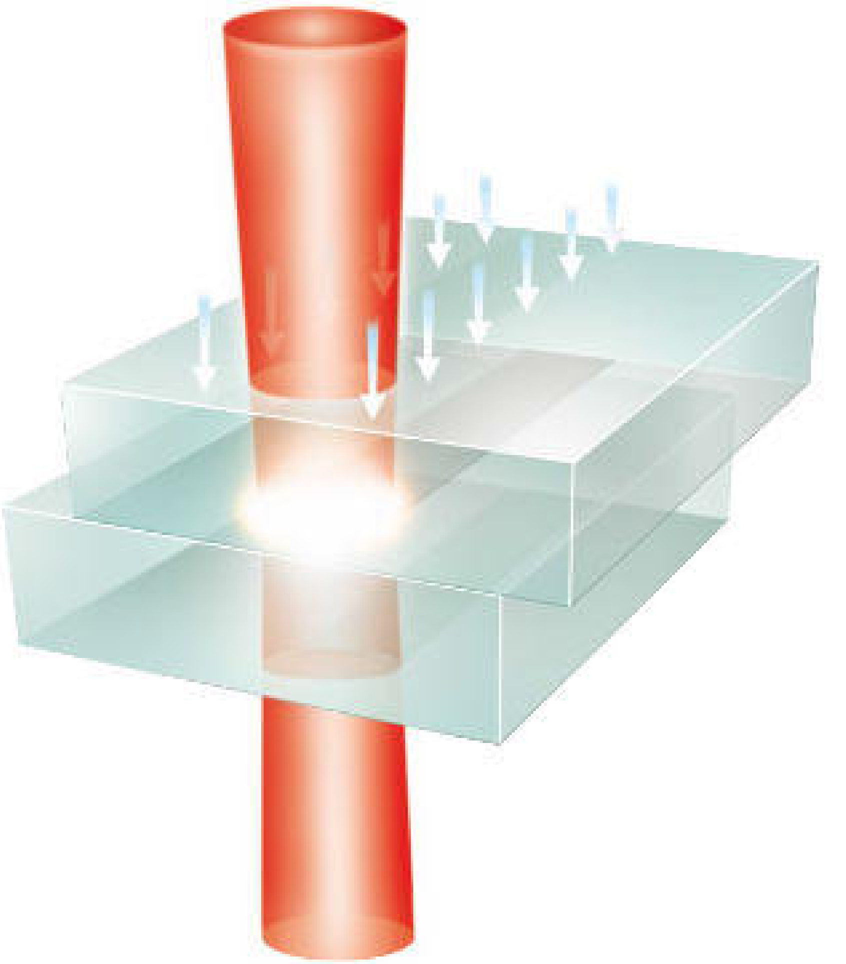
The welding of plastics using laser technology enables the rapid, clean result medical device manufacturers want. However, when welding clear or translucent plastics, additives must be used in order for the bond to occur. That is, until now. New laser technology enables these types of plastics to be welded without any additives being used.



Laser plastic welding has gained a strong foothold in the medical device industry as a suitable alternative to other types of plastic welding or bonding. With advantages such as precision, cleanliness, and repeatability, laser welding is able to take on assembly tasks that were previously impossible. Until now, welding clear or translucent plastics has been difficult or costly, requiring undesirable color combinations or costly special absorbing additives. But that is all changing with the advent of higher-wavelength lasers.

Previously, diode lasers in the 1.0-micron wavelength range were used for bonding thermoplastics. The laser energy at this wavelength will pass through any clear or translucent thermoplastic. In order to achieve a weld, a lower layer colored or doped with an absorbing additive had to be used to absorb the laser light and convert it into heat energy at the weld interface.

Higher wavelength fiber lasers have opened the doors to new possibilities in laser welding, namely bonding of clear thermoplastics. These lasers interact with thermoplastics differently. At wavelengths above 1.5 microns (1,500 nanometers), the laser begins to show inherent absorption in the clear plastic. Not all of the light transmits;



some absorbs into the plastic. This allows for the creation of heat energy in virgin thermoplastics with no colorants or additives required.

The goal is to then get some of the energy to transmit while some of the energy absorbs. Using this method, all layers, whether it is just two layers or many more, are volumetrically heated by the laser energy.

The 1940 nanometer fiber laser is a preferred choice for many applications as it falls into the Goldilocks zone with an absorption/transmission ratio of about 30% absorption to 70% transmission, and also works well with most any thermoplastic.

Conclusion

Clear and translucent plastic are highly desired by medical device designers for their clean look, but also often used out of necessity when visibility through the device is required. Higher wavelength lasers provide an elegant, robust solution for joining clear plastics, a very important step for laser plastic welding as it pertains to the medical industry.

For more information, visit www.lpkfusa.com [1].

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