Press Release

Release No: Z60
Date: July 2009
Release Date: Immediate

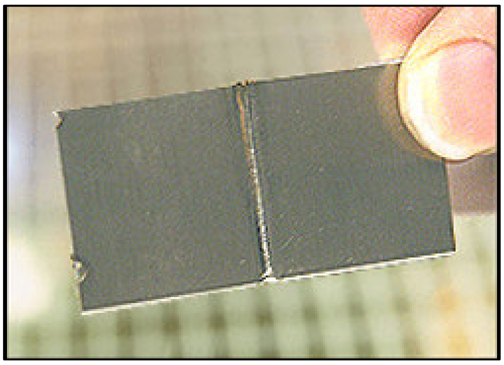
Laser Welding Stainless Steel

Nylon Welding processes are split into two categories: (1) low energy density, and (2) high energy density processes. Low energy density processes are those such as traditional arc and resistance welding technologies that rely on heat conduction through the material from a surface point to provide melting. High energy density processes using lasers create a heating filament, known as the keyhole, which penetrates the depth and offers two-dimensional line heating, causing a highly efficient heat transfer into the weld joint.

The key advantages of laser welding are a small heat affected zone (HAZ), accurate control of heat input, and the ability to direct the beam precisely to the weld point. This means reduced thermal distortion, the ability to weld close to heat sensitive parts, and precision welding capabilities.

Major applications for sub-kilowatt lasers are in precision-welding and heat-sensitive welding processes, such as hermetic sealing, because the typical focused beam diameter of 100 microns localises temperature rises around the weld to fractions of an inch.

These stainless steel coupons were welded using the *Firestar f400* laser. The 0.9 mm (0.036") thick stainless steel was fixtured with the ends tightly aligned to create a butt type weld. Because most laser welding processes do not use filler wire, but instead rely on the molten material to create the weld joint, part fit up for a laser weld must be free of any gaps or voids in order to achieve strong, consistent joints. As with conventional welding processes, creating initial spot-welds at intervals along the joint helps to prevent material separation during the actual weld pass.



Full weld penetration through the stainless steel was achieved using 400W of power at a weld speed of 1.9 meters per minute (75 inches/minute - IPM). Beam delivery for this application was accomplished using a 63.5 mm (2.5") positive meniscus lens, which produced a 100-micron (0.004") spot and 1.8 mm (0.07") depth of focus. During welding, argon shield gas at a flow rate of 1.0 SCFM prevents the molten weld pool from reacting with the surrounding atmosphere. At this material thickness and weld speed, there is no difference between argon and helium assist. When welding thicker stainless material at higher speeds, helium shielding provides deeper weld penetration due to its higher ionisation potential and smaller weld plume.

These 0.036" thick stainless steel coupons were welded together with 400 watts of power at a speed of 75 IPM using argon shield gas at a flow rate of 1.0 SCFM.

For pre-publication queries contact: Jeryl Adcock (jeryla@laserlines.co.uk)
For sales/technical queries contact: Gary Broadhead (garyb@laserlines.co.uk)

Laser Lines Ltd
Beaumont Close | Banbury | Oxon | OX16 1TH | UK

T: +44 (0) 1295 672500 | **E:** +44 (0) 1295 672550
E: info@laserlines.co.uk | **W:** www.laserlines.co.uk