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Green laser welder solves gold and copper joining challenges

Key Facts:

- **Gold and copper are difficult to laser-weld due to high reflectivity**
- **Green laser light enables more energy to penetrate the metals for consistent melting at the weld line**
- **Delivers precision joining of wires and sheets for semiconductor, electronics, and medical applications**
- **Compact unit with remote-interface facilities integrates into any manufacturing environment**

Miyachi Europe, the leading supplier of laser and resistance welding systems, and laser marking products, has introduced the ML-8150A SHG Green Laser Welder, specifically designed to produce consistent and reliable welds in gold and copper. The ML-8150A is ideally suited to many applications in, for example, the semiconductor and electronics manufacturing sector, including welding gold and copper wires to substrates.

Gold and copper are known to be difficult metals to laser weld. They have high surface reflectance – exactly the same property that gives gold its lustrous appearance and makes it attractive as a jewellery metal – making it difficult for laser energy to penetrate below the surface. However, both gold and copper absorb more strongly in some parts of the light spectrum than in others (indicated by the fact that both are coloured metals) and, in particular exhibit increased absorbance of green light. (A gold foil beaten so thin that it becomes transparent appears green when held to the light.)

Miyachi's ML-8150A exploits this property by delivering laser energy with a wavelength of 532 nm, which is green light. The unit employs a SHG – second-harmonic generation – architecture, in which laser light is first produced at 1064 nm. Although this is in the infrared it is not well-absorbed by gold and copper. Miyachi's SHG design doubles the frequency of the light, halving the wavelength to 532 nm, and increasing by a factor of between 4.5 and 20 the energy absorbed by the metals to be joined. Improved beam definition, coupled with higher power, raises the energy density of the laser by some nine times compared to Miyachi's earlier product in the sector.

In practice, the ML-8150A has produced high-quality and repeatable weld properties when joining multiple different metal forms and materials. These include welding gold wires to integrated-circuit lead frames and copper wires to PCB substrates. Equally good results are obtained with spot-welding of copper sheet, joining of bus bars for low joint resistance and in "solder-less" assembly of surface-

mount components on to PCB. In trials, laser penetration into three thicknesses of 0.5-mm, non-coated CuSn6 (copper alloyed with 6% tin) was measured at 1.26 mm, effectively welding together all three sheets.

The Miyachi ML-8150A has a maximum rated output of 5W, with energy of 4 J/pulse in pulses 0.2 to 5 msec wide, a repetition rate of one to 30 pulses/sec. Peak power output is 1.5 kW. It is easily integrated into a manufacturing environment, occupying an outline that measures just 822 (H) x 430 (W) x 869 (D) mm; it operates from a single-phase, standard 200 – 240 Vac supply. The technical data sheet for the ML-8150C can be downloaded directly from Miyachi's website at <http://www.miyachieurope.com/cmdata/documents/ML-8150A-TDS-01-10.pdf>

Miyachi Europe develops, builds and supports – in addition to laser welding systems – products for resistance welding, laser welding, laser marking and heat-seal-bonding. Miyachi has also advanced the capabilities of its resistance welding product line with the recent introduction of the MFP-60 Weld Head, for the Active Welding System 3, from its Peco brand. The MFP-60, the latest addition to a product range that has a history of over 100 years, is a servo-driven motorised weld head with a force range of 20 to 60N, and is in use in the fabrication of lighting and tooling products, as well as automotive and electronic components.

About Miyachi Europe

Miyachi is the market leader in developing, building and servicing machines and components for laser welding, laser marking, resistance welding, hot bar and systems. Miyachi solutions are an integral part of the production process to connect, to join, to automate, to identify or to customise components in a very reliable and very sustainable fashion. Miyachi products are in use in a variety of modern high-tech application fields. These application fields are our areas of expertise to the benefit of our customers' and our vendors' future growth in Automotive, IT & Multimedia, Electronics/Solar Cells/Batteries, Medical, Aerospace, and Defence. www.miyachieurope.com

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