AMADA WELD TECH INC.

Dark Marking with Picosecond Lasers

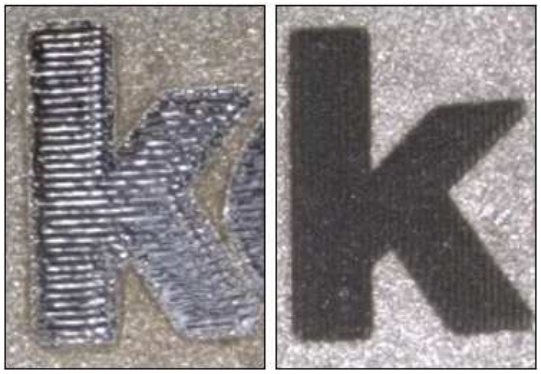
Ultrashort pulse lasers create high contrast marks that are resistant to passivation, corrosion, and autoclaving and that meet federally regulated UDI standards for medical devices.

Unique Device Identification Mandates in the Medical Device Industry

Many medical devices and tools, whether for repeated use in surgery or for single use in implantation, require distinct marks for identification, tracking, and traceability. This FDA-mandated practice of Unique Device Identification, or UDI, places strict requirements on the quality of the marks and, by extension, on the medical device manufacturers who supply the products. Fiber IR lasers have traditionally been the laser of choice for marking, as they create dark, highly visible annealed marks by imparting thermal energy to the material surface to build up a surface oxide layer.

Traditional Laser Marking Not Resistant to Passivation and Corrosion

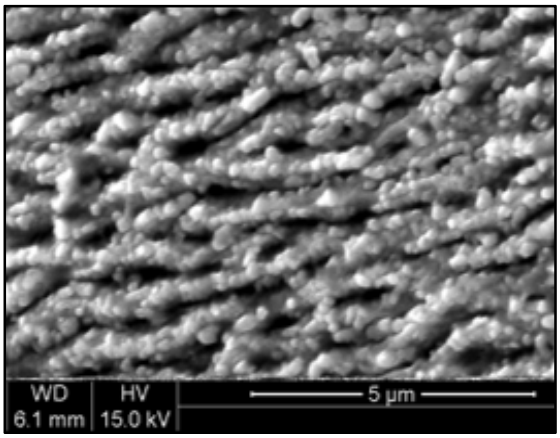
300-series and 17-series stainless steels are commonly used for medical devices due to their mechanical strength, corrosion resistance, and machinability. The naturally-occurring chromium oxide passive layer that forms on the surface resists corrosion during sterilization and is inert to the human body. This layer is damaged during processing, so a post-process passivation step is often included in manufacturing lines to restore the passive layer. However, this passivation step has the unintended consequence of severely degrading the fiber laser annealed marks. Since marking must take place prior to passivation in a production line, a more robust and permanent laser marking method is required.



Dark mark with single mode fiber IR laser (left) and with picosecond IR laser (right)

Fast, Permanent, Reliable Dark Marking with Picosecond IR Lasers

The ultrashort pulse durations of picosecond lasers allow them to impart energy to a material surface with almost no thermal effects. Unlike heat-generated annealed marks of fiber lasers, marks created by picosecond IR lasers are periodic nanostructures – "light traps" – with antireflective properties that make the marks appear deep black against their surroundings. Since the marks are actually the restructured surface material and not an oxide layer, they are highly resistant to passivation, corrosion, and autoclaving. The processing window for developing these marks is much wider than with traditional fiber lasers, not only for stainless steels, but also for other metals, like aluminum and titanium. Picosecond IR lasers also offer excellent marking capabilities on polymers, another important medical device material. Picosecond laser marking is the premier choice for robust, smooth, and permanent UDI-compliant dark marking for medical device manufacturers.



Picosecond IR laser dark mark nanostructures

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