

## Black Marking of Stainless Steel Medical Devices

### Challenge

There is a growing requirement to permanently mark reusable tools and implants with a unique device identifier (UDI). In the U.S., FDA regulations governing this are already partially active and the EU MDR will be implemented by 2025. There is thus a need for a labeling method that creates marks that are robust and able to withstand repeated sterilization (autoclaving) cycles without fading. Plus, these marks should not degrade the natural passivation of the stainless steel surface, i.e., the natural corrosion resistance.

### Solution

A method based on ultrashort pulse (USP) lasers, called “black marking”, meets all these goals. The Coherent PowerLine Rapid NX is an integrated sub-system that enables simple implementation of black marking. In this method, the combination of high peak power and short pulse duration causes a permanent nanoscale change in the surface and sub-surface structure of stainless steel products. This has a strong light-trapping effect that makes the marks appear black with very high contrast. Because this is a nanostructural change in the steel, it does not corrode or fade during repeated autoclaving. The same sub-system, using the same optical configuration, can be used to mark other materials as well, e.g. titanium, anodized aluminum, and even plastic material like PEEK/PPSU.

### Benefit

With black marking using PowerLine Rapid NX, medical devices and implants made of stainless steel can be permanently and economically marked with high contrast. The process works with all commonly used stainless types such as 1.4301. Moreover, the marked surface does not require any post-processing such as re-passivation.

### Application Field

Permanent, corrosion-resistant marking of re-usable stainless steel medical devices and tools in a single step process.

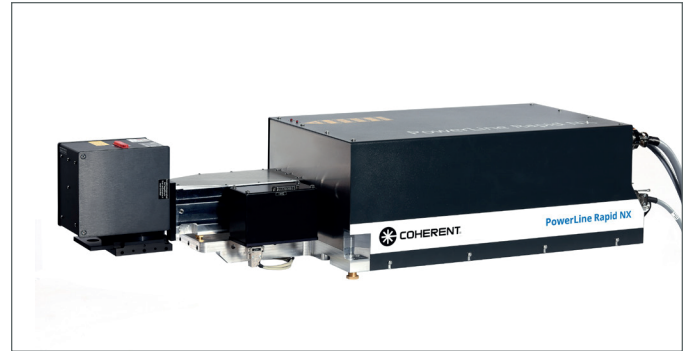
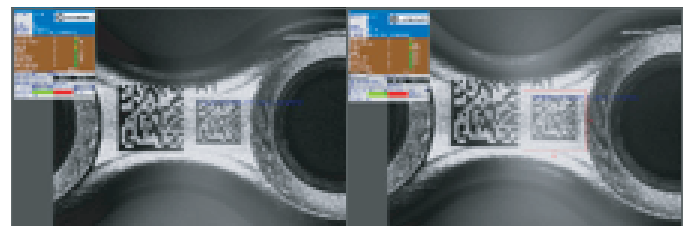


Figure 1. The PowerLine Rapid NX is a complete sub-system that simplifies black marking of medical devices and other stainless surfaces.



Figure 2. Black marking creates high contrast permanent marks in stainless steels such as this 1.4301 example.



Before Passivation

After Passivation

### Contact

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