Cutting Transcatheter Aortic Valve Replacement (TAVR) scaffolds

Challenge

Transcatheter aortic valve replacement is a minimally invasive procedure that enables heart valve replacement without open heart surgery. The valve is a metal (e.g. nitinol) scaffold to which leaflets made from denatured mammalian material are then attached. It can be folded for transcatheter insertion. The challenge in cutting is to guide and cut the comparatively large (outside diameter 10-30 mm) rigid tubes with wall thicknesses of 500-700 µm to an accuracy of a few µm. In addition, the heat-sensitive material Nitinol is widely used, the art of which is to generate as little heat-affected zone (HAZ) as possible by correctly selecting the laser parameters. The StarFiber is the ideal laser source for this purpose.

Solution

Coherent provides a complete high-precision laser system - StarCut Tube SL- that is ideal for valve scaffold cutting. This fully automated laser CNC machine is equipped with 3 cutting axes – x, z and rotary. The enclosed fiber laser (Coherent StarFiber FC) combines superior reliability with high performance. The combination of an all-granite cutting platform, a fixed laser beam, and tube motion delivers what this application requires: high accuracy cutting, superior repeatability, high surface quality and minimized process time. Despite the complexity of the finished result, the machine operation is straightforward, thanks to a user-friendly interface. Multiple security access levels, integrated diagnostics, and comprehensive data logging for process validation and documentation, ensures that StarCut Tube SL will easily integrate into an ISO 13485 compliant environment.

Benefit

StarCut Tube SL enables automated creation of valve scaffolds from nitinol and other metals with the requisite cut quality and accuracy that this application requires, and at a market-enabling cost point.

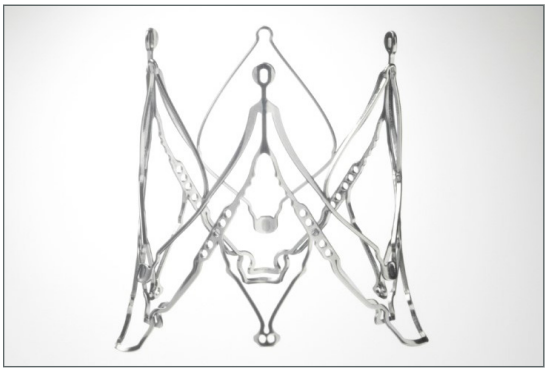

Figure 1. Laser cut TAVR aortic valve where leaflets made from denatured mammalian material will be attached.

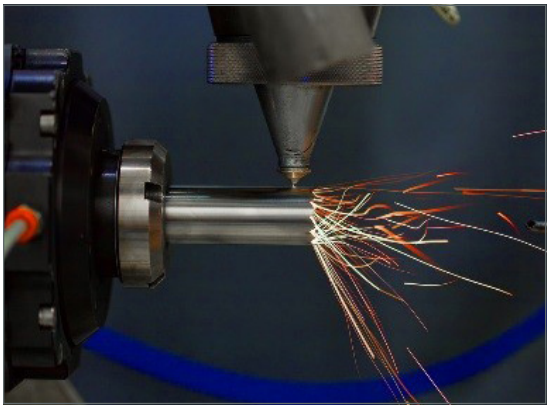

Figure 2. Laser cutting of a TAVR aortic valve out of a metal tube (e.g. nitinol).

Figure 3. The StarCut Tube SL is a complete system that simplifies cutting valve scaffolds and other complex

Application Field

Cutting of prosthetic heart valve scaffolds and other minimally-invasive medical devices, e.g. stents and guidewires.

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