

## Joining Technologies for Medical Devices

### 1. The need for development of joining technology

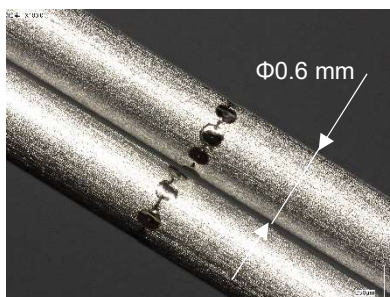
We provide our customers with products assembled from sub-components manufactured using various and multiple processing technologies including cutting, grinding, laser processing, polishing, and surface treatment. Especially for medical devices, the development of specialized joining technologies is essential to meet the frequent requests of combining small components made of high-performance materials.

### 2. Joining technology for fine pipes of shape memory alloy (NiTi)

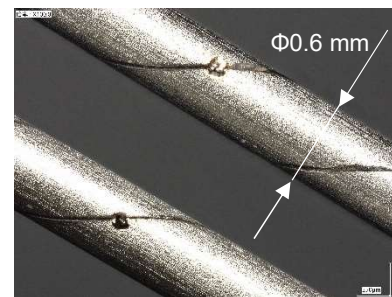
Medical devices such as catheters used in endovascular procedures often require to use processed components made of shape memory alloy (NiTi). The shape memory alloys in this use necessitate specialized joining techniques due to their high susceptibility of the properties to the heat history incurred during the joining process.



Soldering  
(joining NiTi pipes)



Laser spot welding  
(joining NiTi pipes)

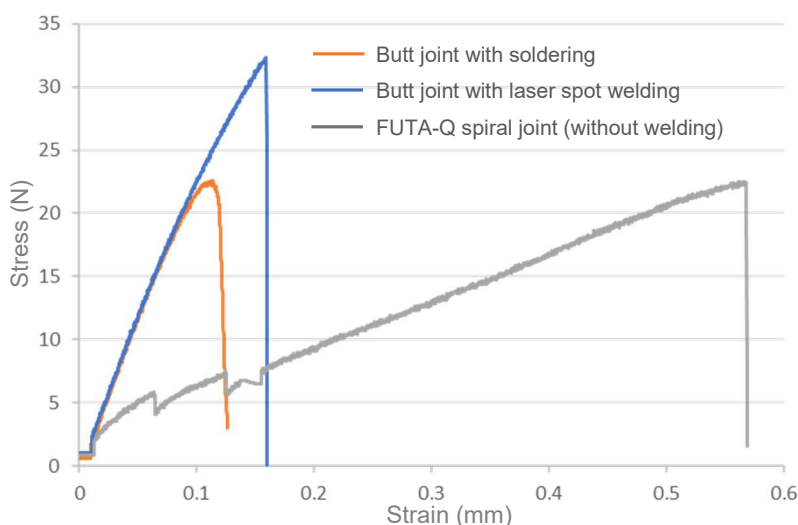


Spiral joining + welding  
(developed by FUTA-Q)

### 3. The analysis on the tensile test results of the test specimens

#### Stress-strain curve of the joined fine pipes

Tensile speed: 1 mm/min NiTi pipe: OD/ID is 0.6/0.4 mm



- In the tensile tests of the evaluated samples, the laser spot welded component demonstrated improved joint strength compared to the soldered one.
- The spiral-jointed sample without welding exhibited equivalent joint strength and approximately five times the maximum strain compared to soldered one.
- We are continuing technological development to achieve a more reliable joining technology to improve the break-resistant.

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