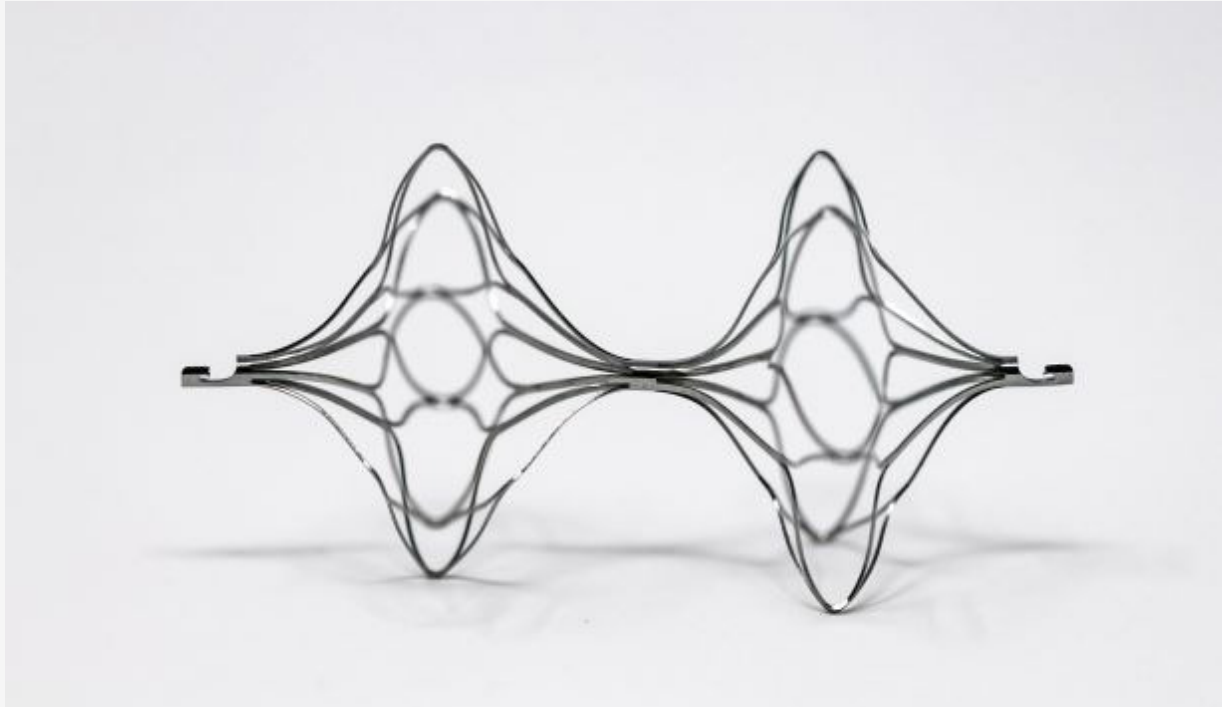

JUNE 2019

RESONETICS OFFERS FRESH PERSPECTIVE TO NITINOL MANUFACTURING



NITINOL



NITINOL HISTORY

William J. Buehler is credited with naming nitinol, an acronym for Nickel Titanium Naval Ordinance Laboratories. Nickel-titanium alloys were first developed in the late 1950's by the Naval Ordinance Laboratory and Buehler's team. One of the most useful properties was discovered by accident in a laboratory management meeting in 1961. A sample was bent out of shape many times and was then heated with a pipe lighter, and then resumed its original shape.



WHY YOU NEED NITINOL FOR YOUR NEXT PROJECT

AND HOW RESONETICS CAN HELP

Shape memory and super elastic alloys, such as nitinol, can help elevate your next medical device. The unique properties of nitinol enable the material to restore its original shape when deployed and traverse difficult anatomies without mechanical deformation (super elasticity). These attributes make nitinol a good choice for minimally invasive medical device components including stents, catheters, and guidewires. As our customers are designing new devices, they are often challenged with navigating into a difficult location in the body. Nitinol has the capability to endure high strain while maintaining flexibility, which makes it a good material for catheter components.

In the past, design engineers failed to create products that employed the versatility and flexibility of nitinol. Through our nitinol center of excellence, located in San Diego, we are able to help design engineers push the envelope on the fabrication of nitinol products. Through our ultrafast laser cutting, shape setting, and electropolishing services, we are providing dedicated tools to push products from prototype to production faster.

MARKETS THAT BENEFIT FROM NITINOL

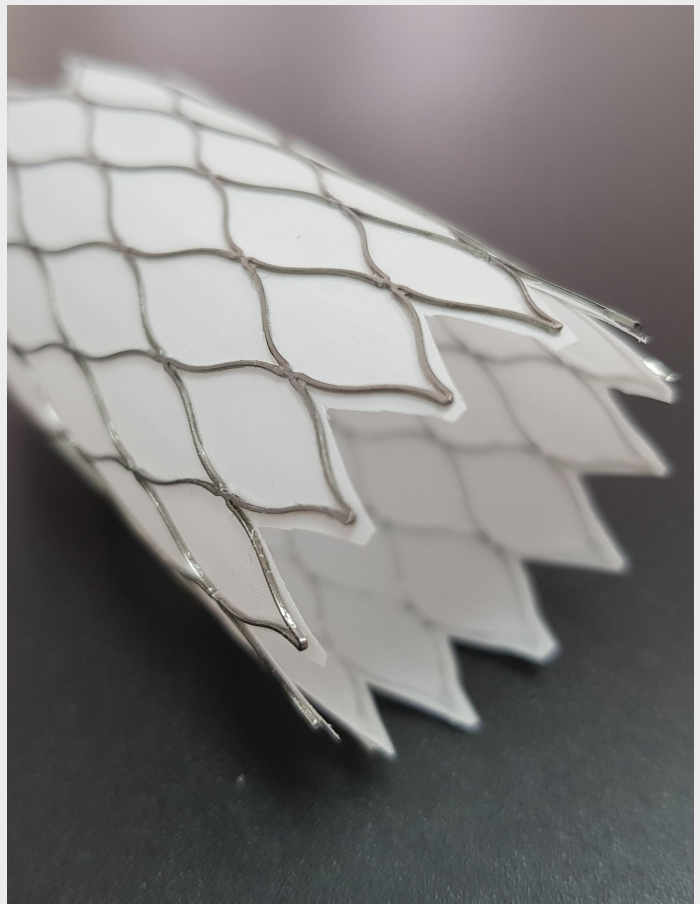
The unique combination of shape memory and super elasticity properties, coupled with its biocompatibility, has made nitinol an excellent material for medical devices specifically in the neurovascular, structural heart, electrophysiology and ophthalmic markets. Products such as orthodontic arch wires, filters, stents and bone anchors are all prime nitinol applications.



HEATING NITINOL

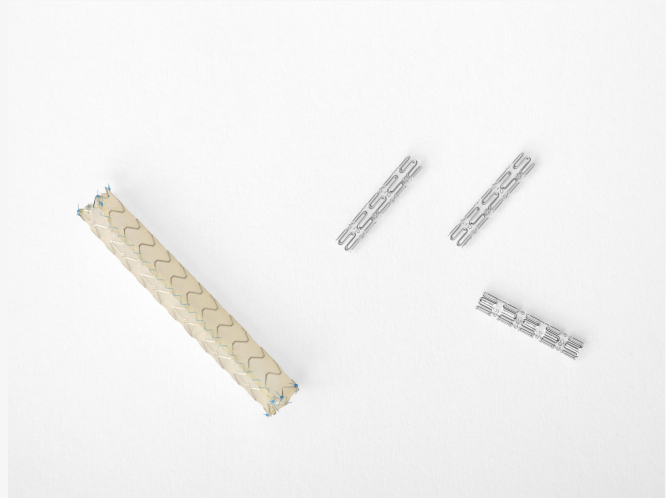
Af is the temperature where nitinol has finished transforming to austenite upon heating, or the temperature at which your part is fully expanded.

Transition Temperature - Hysteresis is the temperature difference between a material's phase transformation upon heating and cooling. This spread is typically around 68-86° F (20 - 30°C) for nitinol super-elastic alloys used in medical device applications. Various heat treatments can shift the range higher, lower, or widen it.



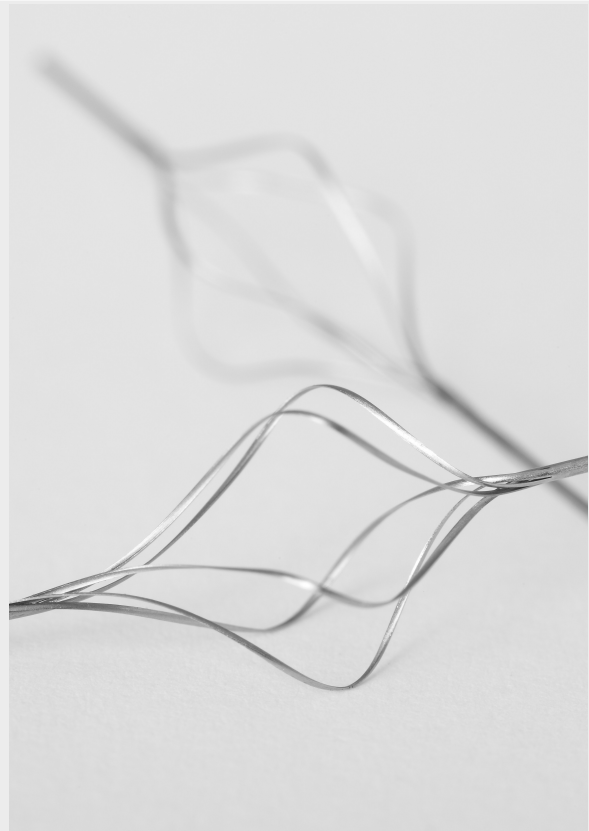
ULTRAFAST CUTTING

Resonetics is innovating nitinol manufacturing by applying our ultrafast laser cutting knowledge to improve nitinol components. Traditionally, nitinol stents and valve frames have been cut using older laser technology. By applying state-of-the-art, ultrafast laser technology, we are able to produce nitinol devices faster that require less post processing.



NITINOL SHAPE SETTING

Shape setting configures the transformational and mechanical properties of nitinol. A laser-cut nitinol component is mounted on a custom fixture or mandrel and then heat treated to set the shape. Resonetics designs and manufactures these mandrels and custom fixtures according to the exact specifications of the product.



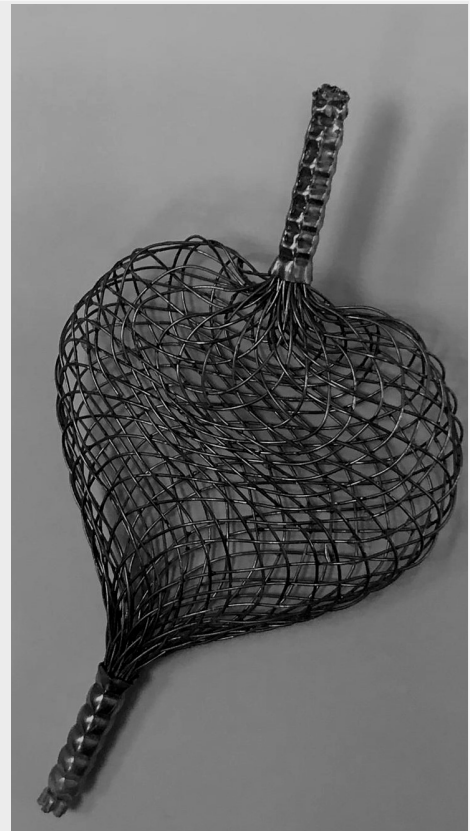
ELECTROPOLISHING

Resonetics is applying innovation and technical know-how to improve the consistency of the electropolishing process. Our team have taken a scientific approach to the "art" of electropolishing nitinol. We are taking the guess work out to make the process more robust for manufacturing.



HAVING FUN WITH NITINOL

This braided heart was developed and produced by our nitinol experts in Israel. This novel idea was created using 48 nitinol wires that were braided into a straight cylindrical shape. The ends were then clamped and the heart shape was set in an oven and was featured on social media celebrating National Heart Month.



LOCATIONS AND RESOURCES

BEHIND YOUR NEXT NITINOL PROJECT



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NITINOL CENTER OF
EXCELLENCE



ISRAEL
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