

Accellent Nitinol Tube Capabilities

Overview

Accellent offers Nitinol tubing for a variety of medical device and other high technology applications. Through a combination of material chemistry and special processing, Accellent produces two distinct super elastic grades with differing room temperature strength and operating temperatures. The high strength grade offers higher room temperature strength for more demanding applications and effective super elastic operation below room temperature. The standard grade offers moderate strength and operates most effectively at or above room temperature.

Accellent has developed a unique tube drawing process that produces improved wall thickness control. Better wall thickness control results in improved torque transmission for catheters and more uniform radial force for stents. For stent-size tubing, wall thickness can be measured directly and reported statistically. The tube drawing process also allows for the production of tubing with a shaped cross section.

In addition to nitinol tubing, Accellent offers a wide range of nitinol fabrication operations. These include laser machining burr free end cutting, EDM wire machining, straight and step grinding, burr free drilling, expansion, heat setting, electropolishing, and passivation. Our technical team is available to discuss your specific nitinol product needs.

Accellent also assembles sophisticated finished devices, in-house, to the most demanding specifications. Our goal is to provide our customers with one stop shopping for nitinol tubular medical devices.

Fabrication Capabilities

End Cutting – EDM wire cutting for burr-free square cut ends

Grinding – Taper, step, profile, and straight grinding of tubing down to 0.008" (0.2mm) OD

Heat Setting – Heat setting of formed and expanded parts

Electropolishing – Electropolishing of small parts such as stents, connectors, and curved needles.

Forming – Bending, flaring, and forming of round tubes

Micro Machining – Laser cutting, EDM wire and plunge drilling of burr-free features

Sizes and Tolerances*

English

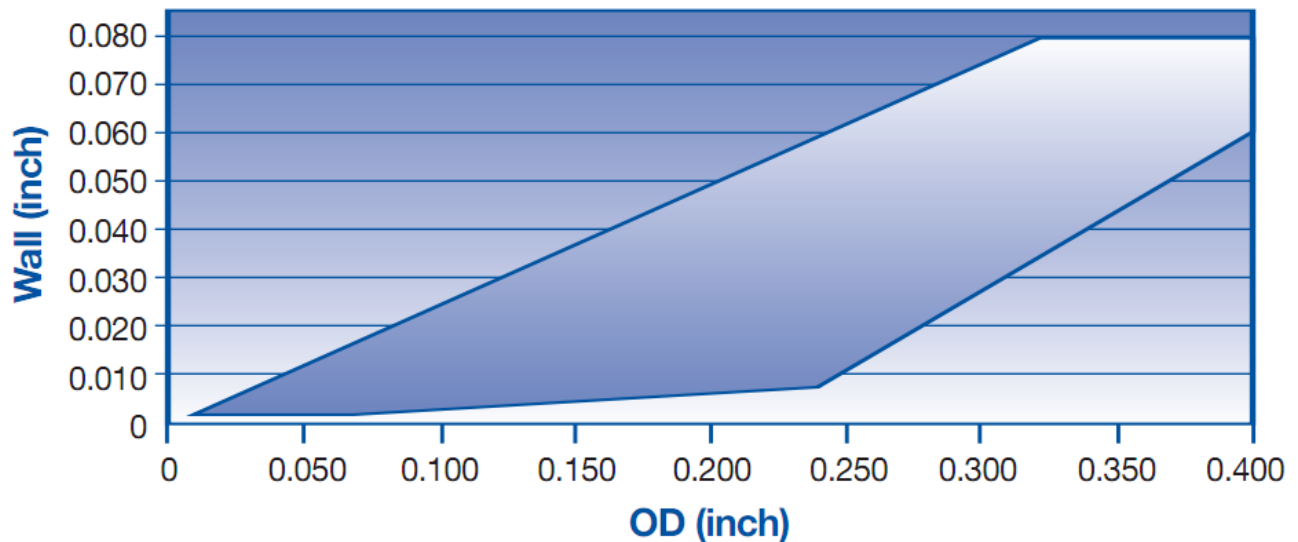
OD	OD Tolerance	Wall	Wall Tolerance
0.010" to 0.025"	+/- 0.0005"	0.001" to 0.005"	+/- 0.0003"
>0.025" to 0.125"	+/- 0.001"	>0.005 to 0.045"	+/- 6% of Wall
>0.125" to 0.400"	+/- 0.002"	>0.045" to 0.080"	+/- 6% of Wall

Metric

OD	OD Tolerance	Wall	Wall Tolerance
0.25 to 0.635mm	+/- 0.013mm	0.025 to 0.125mm	+/- 0.008mm
>0.635 to 3.175mm	+/- 0.025mm	>0.125 to 1.15mm	+/- 6% of Wall
>3.175 to 10.2mm	+/- 0.05mm	>1.15 to 2.04mm	+/- 6% of Wall

*Not all combinations of OD and Wall are available. See size chart for standard combinations – call for other sizes.

Standard Size Range *



***Select sizes are stocked for off-the-shelf delivery. Call for availability.**

Note: Call for availability of sizes outside the standard size range.

Length

Range
0.100" to 240" (2.5 to 6100mm)

Tolerance
+/- 0.003" (0.076mm)

Straightness

Tubing will be straight to 0.012" per foot (1mm per meter)

Shaped Tubing

Shaped cross sections are available. Please call to discuss your specification requirements.

Surface Finish

Tubing can be supplied with blue oxide, straw oxide, or a ground surface finish. Ground tubing has an OD tolerance of +/- .0003" (0.007mm). The ID surface has a bright oxide-free finish.

Cut parts can be supplied with a deoxidized matte finish or electropolished finish in addition to the finishes supplied on tubing.

Chemical Composition and Mechanical Properties

Accellent tubular nitinol products meet the requirements of ASTM F2063 “Wrought Nickel – Titanium Shape Memory Alloys for Medical and Surgical Implants” and ASTM F2633 “Wrought Seamless Nickel-Titanium Shape Memory Alloy Tube for Medical Devices and Surgical Implants”.

Chemistry:

<u>Element</u>	<u>Wt %</u>	<u>Element</u>	<u>Wt %</u>
Nickel	54.5 to 57.0	Hydrogen (max)	0.005
Carbon (max)	0.050	Iron (max)	0.050
Cobalt (max)	0.050	Niobium (max)	0.025
Copper (max)	0.010	Nitrogen & Oxygen (max)	0.050
Chromium (max)	0.010	Titanium	Balance

Upon request, Accellent can provide nitinol with an active austenite finish temperature with a spread <10 Deg C at a variety of active austenite finish temperatures.

Mechanical Properties:

Grade Description ¹	Transformation Temperature ²		Typical Properties – Tested at Room Temperature per ASTM F2516				
	Active Austenite Finish		UTS	Plateau Stress		Elongation	Permanent Set
	Minimum (Deg C)	Maximum (Deg C)	Ksi (MPa)	Loading ksi (MPa)	Unloading ksi (MPa)	Min (% in 4D)	Max (after 6% strain)
Standard Super Elastic	15	30	145 (1000)	50 (345)	20 (138)	10	0.3%
High Strength Super Elastic	0	15	160 (1100)	60 (415)	30 (205)	10	0.3%

Notes: 1) Other alloys and material conditions are available. Call for more details.

2) Measured by bend and free recovery. We will consider customer applications with more restrictive limits. Call for capabilities.