Metals for Medical

One Metal Supplier, Endless Solutions

Ulbrich Stainless Steels and Special Metals, Inc.
Global Representation with Service and Distribution Centers Worldwide.
Ulbrich is a family owned company in its fourth generation of leadership. Established in 1924, Ulbrich has become a critical supplier of stainless steels and special metals to the Medical Device Industry. During this time, we have participated in the development and manufacturing of hundreds of innovative medical devices. With industry leading Dimensional Control, real time gauging and Statistical Process Control (SPC), a large variety of medical alloys, and the best service available, we strive to produce and distribute the highest quality materials. We are comprised of a series of manufacturing divisions of specialty strip and precision wires, all with local management and all designed to provide custom precision products to satisfy your needs.

Our Products
» Precision Flat and Ultrafine Round Wire
» Shaped Wire
» Precision Strip

Our Service
You can expect nothing but the best when dealing with Ulbrich. All of our capabilities, especially our people, are what separate Ulbrich from your typical metals supplier.
» Extensive technical staff focused on your specific needs
» Inventory management and custom stocking programs: VMI, KANBAN, etc.
» Production of small samples to be delivered quickly
» All facilities are ISO 9001:2008 compliant
Ulbrich Specialty Wire Products, located in Westminster, SC., is capable of producing flat wire as thin as .00025 inch (0.006 mm) and as narrow as .0015 inch (0.038 mm). In addition, this manufacturing facility can draw ultrafine round wire as small as .00075" in diameter.

Our medical wire focus factory can efficiently control dimensional tolerances to ±5% down to .001" round and is staffed with dedicated management and engineers.

Additional Value to your business:
- Our production equipment uses the latest in on-line gauging and data acquisition technology, which generates full statistical summaries of each production run
- Precision spooling of fine wires onto a variety of spools or bobbins using CNC winders
- Lead times that are typically much shorter than the rest of the industry
- Working closely with our customers in order to customize the product for their particular application

MATERIALS
- Stainless Steels
  - 304  |  304V  |  304L  |  304LV  |  316  |  316L  |  316LVM
- Specialty Metals
  - Nitinol  |  MP35N  |  Copper  |  Aluminum  |  Tungsten  |  Beryllium Copper
  - Titanium  |  Molybdenum  |  Phosphor Bronze  |  L605  |  …and other alloys

Width Distribution
- Width (In.)
- Width Distribution
- 3 Sigma Tolerance
### BULK SPOOLS

<table>
<thead>
<tr>
<th>NUMBER</th>
<th>D1 Flange</th>
<th>D2 Barrel</th>
<th>D3 Arbor Hole</th>
<th>D4 Drive Pin</th>
<th>L1 O/A Length</th>
<th>L2 Traverse</th>
<th>L3</th>
<th>*Capacity</th>
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<tbody>
<tr>
<td>DIN 80</td>
<td>3.15</td>
<td>80</td>
<td>.63</td>
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<td>DIN 125</td>
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<td>DIN 160</td>
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<td>160</td>
<td>.87</td>
<td>.51</td>
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<td>10</td>
<td>5.98</td>
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<td>.63</td>
<td>.40</td>
<td>4.29</td>
<td>.75</td>
<td>19</td>
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Meets ICE 264-2-1 (DIN 46 399)  *

** Available with 16 mm bore adapters

### STEEGER, NEB AND WARDWELL BOBBINS

<table>
<thead>
<tr>
<th>NUMBER</th>
<th>D1 Flange</th>
<th>D2 Barrel</th>
<th>D3 Arbor Hole</th>
<th>D4 Flange Width</th>
<th>L1 O/A Length</th>
<th>L2 Traverse</th>
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<th>*Capacity</th>
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<tbody>
<tr>
<td>15 MM</td>
<td>1.57</td>
<td>40</td>
<td>.42</td>
<td>.14</td>
<td>1.40</td>
<td>1.02</td>
<td>26</td>
<td>120</td>
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<tr>
<td>26 MM</td>
<td>1.69</td>
<td>43</td>
<td>.42</td>
<td>.14</td>
<td>1.40</td>
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<td>90</td>
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<tr>
<td>30 MM</td>
<td>1.57</td>
<td>40</td>
<td>.42</td>
<td>.14</td>
<td>1.40</td>
<td>1.02</td>
<td>26</td>
<td>50</td>
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<tr>
<td>NEB</td>
<td>1.32</td>
<td>34</td>
<td>.33</td>
<td>.29</td>
<td>3.95</td>
<td>3.29</td>
<td>84</td>
<td>225</td>
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<tr>
<td>WARDWELL</td>
<td>2.60</td>
<td>66</td>
<td>.66</td>
<td>NA</td>
<td>NA</td>
<td>3.25</td>
<td>83</td>
<td>450</td>
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</tbody>
</table>

Multiple colors available  *

### COMMON WIRE SIZES

<table>
<thead>
<tr>
<th>FLAT WIRE</th>
<th>ROUND WIRE</th>
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<tbody>
<tr>
<td><strong>inch</strong></td>
<td><strong>mm</strong></td>
</tr>
<tr>
<td>.0003” x .0035”</td>
<td>.0076 mm x .0899 mm</td>
</tr>
<tr>
<td>.0005” x .0025”</td>
<td>.0127 mm x .0635 mm</td>
</tr>
<tr>
<td>.0005” x .0030”</td>
<td>.0127 mm x .0762 mm</td>
</tr>
<tr>
<td>.0005” x .0050”</td>
<td>.0127 mm x .1270 mm</td>
</tr>
<tr>
<td>.0007” x .0030”</td>
<td>.0178 mm x .0762 mm</td>
</tr>
<tr>
<td>.0007” x .0050”</td>
<td>.0078 mm x .1270 mm</td>
</tr>
<tr>
<td>.0010” x .0030”</td>
<td>.0254 mm x .0899 mm</td>
</tr>
<tr>
<td>.0010” x .0050”</td>
<td>.0254 mm x .1270 mm</td>
</tr>
<tr>
<td>.0010” x .0070”</td>
<td>.0254 mm x .0762 mm</td>
</tr>
<tr>
<td>.0015” x .0050”</td>
<td>.0381 mm x .1270 mm</td>
</tr>
<tr>
<td>.0015” x .0070”</td>
<td>.0381 mm x .1778 mm</td>
</tr>
<tr>
<td>.0020” x .0100”</td>
<td>.0508 mm x .2540 mm</td>
</tr>
<tr>
<td>.0020” x .0120”</td>
<td>.0508 mm x .3048 mm</td>
</tr>
<tr>
<td>.0030” x .0100”</td>
<td>.0762 mm x .2540 mm</td>
</tr>
<tr>
<td>.0040” x .0100”</td>
<td>.1016 mm x .2540 mm</td>
</tr>
<tr>
<td>.0039”</td>
<td>.0991 mm</td>
</tr>
<tr>
<td>.0036”</td>
<td>.0914 mm</td>
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<tr>
<td>.0030”</td>
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<td>.0025”</td>
<td>.0635 mm</td>
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<tr>
<td>.0020”</td>
<td>.0508 mm</td>
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<tr>
<td>.00165”</td>
<td>.0419 mm</td>
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<tr>
<td>.0015”</td>
<td>.0381 mm</td>
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<td>.0014”</td>
<td>.0356 mm</td>
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<td>.0013”</td>
<td>.0330 mm</td>
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<td>.0012”</td>
<td>.0305 mm</td>
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<tr>
<td>.0011”</td>
<td>.0279 mm</td>
</tr>
<tr>
<td>.0010”</td>
<td>.0254 mm</td>
</tr>
</tbody>
</table>
Ulbrich Shaped Wire supplies both shaped wire products as well as flat wire to a wide variety of medical device and component manufacturers. We work with and stock a wide range of medical quality alloys, including most stainless steel grades, titanium, titanium alloys, nickel alloys, cobalt alloys and nitinol. The versatility of our shaped wire process allows us to produce net or near-net custom cross-sectional shapes with compositions and mechanical properties tailored to meet your specific requirements.

Starting with wire rod, we breakdown to exact starting diameters and remove any variation in the starting stock which allows us to tightly control our final tolerances. Our unique ability to anneal in line allows us to provide our customers with the mechanical properties they require without having to worry about inconsistencies in hardness throughout their spools or cut lengths.

### Round Wire
Soap, Grease and Bright Finish: .040 – .400 inch (1.016 to 10.16 mm)

### Flat Wire
Thickness: .005 – .335 inch (0.127 – 8.509 mm)  
Width: .020 – 1.50 inch (0.508 – 38.1 mm)

### Gauge and Width Tolerances
Your special tolerances, or extra close tolerances, upon request.

### Shapes
A variety of standard and custom shapes are available in widths from .016 to 1.00 inch (0.406 to 25.4 mm).

### Edges
The following are available on flat and rectangular wire:  
Square Edges  
Natural Round  
Custom Profiled Corners and Radius
New Product Development

Our products are engineered products, tailored to meet your specifications. Our New Product Team can help you develop custom specifications and even manage your secondary, finishing and prototype requirements.

In addition to shapes, Ulbrich Shaped Wire produces a range of flat wire products with custom edge geometry, in gauges as light as .005 inch (0.127 mm) and widths as wide as 1.500 inch (38.1 mm).

At Ulbrich Shaped Wire, we have been leading the effort to produce light gauge, nitinol strip in continuous coil length. Filling the void in nitinol product form availability, this flat wire offers a unique solution to current processing limitations.

<table>
<thead>
<tr>
<th>Diameter</th>
<th>Standard Tolerance</th>
</tr>
</thead>
<tbody>
<tr>
<td>.325 – .091 inch (8.255 – 2.311 mm)</td>
<td>+/- .001 (0.025)</td>
</tr>
<tr>
<td>.0909 – .0511 inch (2.309 – 1.298 mm)</td>
<td>+/- .0008 (0.020)</td>
</tr>
<tr>
<td>.051 – .0201 inch (1.295 – 0.511 mm)</td>
<td>+/- .0005 (0.013)</td>
</tr>
<tr>
<td>.020 – .0159 inch (0.508 – 0.404 mm)</td>
<td>+/- .0004 (0.010)</td>
</tr>
<tr>
<td>.0158 – .010 inch (0.401 – 0.254 mm)</td>
<td>+/- .0003 (0.008)</td>
</tr>
</tbody>
</table>
New Product Development

Our products are engineered products, tailored to meet your specifications. Our New Product Team can help you develop custom specifications and even manage your secondary, finishing and prototype requirements.

In addition to shapes, Ulbrich Shaped Wire produces a range of flat wire products with custom edge geometry, in gauges as light as .005” and widths as wide as 1.500”.

At Ulbrich Shaped Wire, we have been leading the effort to produce light gauge, nitinol strip in continuous coil length. Filling the void in nitinol product form availability, this new strip offers a unique solution to current processing limitations. Many new applications are anticipated for this product form in the future.

APPLICATIONS

- Reinforced Catheters
- Guidewires
- Coils
- Electronic Devices
- Leads and Connectors
- Tubing Mandrels
- Braiding
- Embedded Wire
- Orthodontia
- Copper and Silver-Plated Copper Mandrels for Catheter Applications

MATERIALS

- Stainless Steels
  - 304  |  304L  |  304VM  |  316  |  316L  |  316LVM
- Specialty Metals
  - MP35  |  Copper Clad Steel and Aluminum  |  Tungsten  |  Titanium  |  Phos/Bronze

CUSTOM PRECISION PLATING

Specialized in the continuous plating of fine, round and flat wire, we have in-house plating equipment for your custom requirements. We can plate almost any alloy with:

- Gold
- Silver
- Nickel
- Tin
- Tin/Lead Solders
- Tin/Silver

SPECIAL SERVICES AVAILABLE

- Precision Spooling
- Straighten and Cut
- Customized Processes

(Precision size tolerances for all round and flat wire are available per your specific requirements.)
Ulbrich Stainless Steels and Special Metals precision strip products are found in a variety of medical applications ranging from hypodermic needles, surgical instruments and implantable devices such as pacemaker and defibrillators.

### Added Value Capabilities
- Controlled Atmosphere Annealing Lines
- Tension Leveling
- Slitting and Edging
- Oscillate Winding
- In-House Testing Lab
- Special Finishes

### Re-Roll Capabilities
- **Gauges**: .0004 – .125 inch (0.010 – 3.175 mm)
- **Width**: Up to 14 inch (353 mm)
- **Tempers**: Dead Soft – Extra Full Hard
- **Finishes**: Dull – Bright Ra 2-60
- **Special Textures**: Rolled or Mechanically Applied
Service Centers

Our service centers are capable of stocking highly engineered inventory designed for specific medical applications. The material we stock is produced at our own re-rolling facility or from some of the most capable specialty steel producers around the world. We are constantly upgrading our slitting, edging and packaging capabilities to give you the highest quality product available.

Ulbrich is not your basic steel service center; we specialize in supplying stainless steel and special metals to customers that have critical requirements, like those of the medical industry.

### SLITTING AND EDGE CAPABILITIES

<table>
<thead>
<tr>
<th>Slitting Capabilities*</th>
<th>Strip Applications</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Gauges</strong> .0004 inch – .125 inch (0.010 – 3.175 mm)</td>
<td>□ Hypodermic Needles and Shields</td>
</tr>
<tr>
<td><strong>Width</strong> .020 – 48 inch (0.508 – 1220 mm, Ribbon Wound)</td>
<td>□ Implantable Housings:</td>
</tr>
<tr>
<td><strong>Width</strong> .125 – 1.5 inch (3.175 – 38.1 mm, OSC Wound)</td>
<td>- Pacemakers</td>
</tr>
<tr>
<td><strong>Oscillate Face</strong> 12 inch max. (305 mm)</td>
<td>- Hearing Aids</td>
</tr>
<tr>
<td><strong>Ribbon ID</strong> 2 – 24 inch (50.8 – 609.6 mm)</td>
<td>- Defibrillators</td>
</tr>
<tr>
<td><strong>Oscillate ID</strong> 16 inch max. (406.4 mm)</td>
<td>□ Staple Guns</td>
</tr>
<tr>
<td><strong>Ribbon OD</strong> 48 inch max. (1220 mm)</td>
<td>□ Endoscopic Products</td>
</tr>
<tr>
<td><strong>Oscillate OD</strong> 30 inch max. (762 mm)</td>
<td>□ Surgical Instruments</td>
</tr>
</tbody>
</table>

* The full range of widths can not be produced on all thicknesses.

- **#1 Round Edge**
  - **Width Oscillate** .250 – 1.250 inch (6.35 – 31.75 mm)
  - **Width Pancake** .250 – 3.0 inch (6.35 – 76.2 mm)
  - **Thickness** .008 – .140 inch (0.203 – 3.55 mm)

- **#3 Slit Edge**
  - **Width** .020 – 36 inch (0.508 – 914 mm)
  - **Thickness** .0009 – .125 inch (0.02286 – 3.175 mm)

- **#5 Square Edge**
  - **Width** 2.250 inch (57 mm max.)
  - **Thickness** .004 – .062 inch (0.1016 – 3.175 mm)
**THE ULBRICH FAMILY OF ALLOYS: MEETING ALL YOUR STOCK AND CUSTOM NEEDS WITH PRECISION**

### Precip Hardening Grades

<table>
<thead>
<tr>
<th>Alloy Name</th>
<th>Product</th>
<th>UNS</th>
<th>Cmax</th>
<th>Ni</th>
<th>Cr</th>
<th>Other</th>
<th>AMS</th>
<th>ASTM</th>
<th>Density</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>200</td>
<td>R50700</td>
<td>R50700</td>
<td>0.08</td>
<td>13.0–15.0</td>
<td>17.0–19.0</td>
<td>5507</td>
<td>A 260, A 666, A 313, A 276, A 180</td>
<td>0.29</td>
<td>Low carbon chromium nickel stainless steel with general corrosion resistance similar to Type 304 but with superior resistance to intergranular corrosion following welding or stress relieving. It is recommended for use in parts which are fabricated by welding and cannot be subsequently annealed. <strong>Vacuum Arc Remelted (VAR).</strong></td>
<td></td>
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### Nickel Alloys

#### Nickel 200

<table>
<thead>
<tr>
<th>Product</th>
<th>UNS</th>
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<th>Ni</th>
<th>Cr</th>
<th>Other</th>
<th>AMS</th>
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<th>Density</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>S30000</td>
<td>S30000</td>
<td>0.08</td>
<td>8.0–10.0</td>
<td>17.0–19.0</td>
<td>5516</td>
<td>A 260, A 666, A 313, A 276, A 180</td>
<td>0.29</td>
<td>General purpose chromium nickel stainless steel. Its corrosion resistance is superior to that of Type 301. It can be cold worked to high tensile strengths but with slightly lower ductility than Type 301.</td>
<td></td>
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#### Inconel® 718

<table>
<thead>
<tr>
<th>Product</th>
<th>UNS</th>
<th>Cmax</th>
<th>Ni</th>
<th>Cr</th>
<th>Other</th>
<th>AMS</th>
<th>ASTM</th>
<th>Density</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>S71800</td>
<td>S71800</td>
<td>0.08</td>
<td>16.0–18.0</td>
<td>2.0–3.0</td>
<td>Mo</td>
<td>5524</td>
<td>A 260, A 666, A 313, A 276, A 180</td>
<td>0.29</td>
<td>Chromium nickel stainless and heat resisting steel somewhat superior to Type 302 in corrosion resistance. <strong>Vacuum Arc Remelted (VAR).</strong></td>
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### Cobalt Alloys

#### Haynes® 230 (1-203)

<table>
<thead>
<tr>
<th>Product</th>
<th>UNS</th>
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<th>Ni</th>
<th>Cr</th>
<th>Other</th>
<th>AMS</th>
<th>ASTM</th>
<th>Density</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>R30605</td>
<td>R30605</td>
<td>0.05–0.15</td>
<td>9.0–11.0</td>
<td>19.0–21.0</td>
<td>B 265</td>
<td>0.33</td>
<td>Jet engine components, combustion chambers, afterburner parts. Oxidation and carburization resistant to 1000°F. Good high temperature strength.</td>
<td></td>
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</tbody>
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### Titanium

#### Grade 1–4

<table>
<thead>
<tr>
<th>Product</th>
<th>UNS</th>
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<th>Ni</th>
<th>Cr</th>
<th>Other</th>
<th>AMS</th>
<th>ASTM</th>
<th>Density</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>R50505</td>
<td>R50505</td>
<td>0.08</td>
<td>18.0–20.0</td>
<td>19.0–21.0</td>
<td>B 265</td>
<td>0.36</td>
<td>Jet engine components, combustion chambers, afterburner parts. Oxidation and carburization resistant to 1000°F. Good high temperature strength.</td>
<td></td>
<td></td>
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### Grade 9, Ti-3-2.5

<table>
<thead>
<tr>
<th>Product</th>
<th>UNS</th>
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<th>Ni</th>
<th>Cr</th>
<th>Other</th>
<th>AMS</th>
<th>ASTM</th>
<th>Density</th>
<th>Description</th>
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<tbody>
<tr>
<td>R56320</td>
<td>R56320</td>
<td>0.05</td>
<td>58.0–65.0</td>
<td>20.0–23.0</td>
<td>B 265</td>
<td>0.36</td>
<td>Alpha-beta alloy—considered a very weldable. Superior to high strength C.P.Ti of equivalent strength level in weld toughness and useful temperature range. May be strengthened by cold working.</td>
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### Grade 5, Ti-6-4

<table>
<thead>
<tr>
<th>Product</th>
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<th>Cr</th>
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<th>Density</th>
<th>Description</th>
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<tbody>
<tr>
<td>R64400</td>
<td>R64400</td>
<td>0.08</td>
<td>58.0–65.0</td>
<td>20.0–23.0</td>
<td>B 265</td>
<td>0.16</td>
<td>Grade 5 Titanium is the workhorse of all the titanium grades. It is also known as Ti-6AL-4V or simply Ti 6-4. Its high strength, light weight and corrosion resistance enables Ti 6-4 to be used in many applications. The most common application is for aerospace components. The alloy is also “age hardenable” by heat treatment to achieve even higher strengths.</td>
<td></td>
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### Nitinol

#### Nitinol

<table>
<thead>
<tr>
<th>Product</th>
<th>UNS</th>
<th>Cmax</th>
<th>Ni</th>
<th>Cr</th>
<th>Other</th>
<th>AMS</th>
<th>ASTM</th>
<th>Density</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>NITINOL</td>
<td>NITINOL</td>
<td>0.05</td>
<td>16.0–18.0</td>
<td>2.0–3.0</td>
<td>Mo</td>
<td>5524</td>
<td>A 260, A 666, A 313, A 276, A 180</td>
<td>0.29</td>
<td>Nitinol exhibits unique behavior such as “Shape Memory” and “Superelasticity”. NITINOL is used for both consumer and medical applications.</td>
</tr>
</tbody>
</table>

#### Niobium Type 1

<table>
<thead>
<tr>
<th>Product</th>
<th>UNS</th>
<th>Cmax</th>
<th>Ni</th>
<th>Cr</th>
<th>Other</th>
<th>AMS</th>
<th>ASTM</th>
<th>Density</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>NOB1UM</td>
<td>NOB1UM</td>
<td>0.05</td>
<td>58.0–65.0</td>
<td>20.0–23.0</td>
<td>B 265</td>
<td>0.31</td>
<td>Pure niobium, reactor grade, high melting point, corrosion resistant for use in medical and high temperature industrial applications.</td>
<td></td>
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</tbody>
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1. Trademark of Special Metals Corporation group of companies.  
3. Other materials available for medical designers include copper alloys, silver plated copper, tungsten and gold plated tungsten.

In addition to the alloys produced by sources identified herein by trademarks, Ulbrich can, in many cases, offer equivalent or similar alloys produced by alternate sources.
CORPORATE HEADQUARTERS
153 WASHINGTON AVENUE, P.O. BOX 294
NORTH HAVEN, CT 06473
(203) 239-4481
(800) 243-1676
FAX: (203) 239-7479
E-MAIL: INFORMATION@ULBRICH.COM
WWW.ULBRICH.COM
WWW.ULBRICHDIRECT.COM

MANUFACTURING FACILITIES
ULBRICH SPECIALTY STRIP MILL
1 DUDLEY AVENUE, P.O. BOX 610
WALLINGFORD, CT 06492-4453
(203) 239-4481
FAX: (203) 239-7479
WWW.ULBRICH.COM

ULBRICH SHAPED WIRE, INC.
55 DEFCO PARK ROAD
NORTH HAVEN, CT 06473-1191
(203) 239-4481
(800) 243-1676
FAX: (203) 239-6744
WWW.ULBRICHWIRE.COM

ULBRICH SPECIALTY WIRE PRODUCTS
692 PLANT ROAD, P.O. BOX 619
WESTMINSTER, SC 29693
(864) 647-6087
(864) 647-0482
E-MAIL: SOLAR@ULBRICH.COM
WWW.PVRIBBON.COM

SERVICE CENTERS
ULBRICH OF ILLINOIS, INC.
12340 SOUTH LARAMIE AVENUE
ALSIP, IL 60803-3292
(708) 489-9500
(800) 323-7035
FAX: (708) 371-1802
WWW.ULBRICH.COM

ULBRICH OF NEW ENGLAND
153 WASHINGTON AVENUE, P.O. BOX 294
NORTH HAVEN, CT 06473
(203) 239-4481
(800) 243-1676
FAX: (203) 239-7479
WWW.ULBRICH.COM

ULBRINOX, INC.
AV. LA CAÑADA NO. 25
PARQUE INDUSTRIAL BERNARDO QUINTANA
QUERÉTARO, MÉXICO 76246
+52-442-2215500
FAX: +52-442-2215501
WWW.ULBRINOX.COM.MX

DIVERSIFIED ULBRICH OF CANADA
150 NEW HUNTINGTON ROAD, UNIT #1
WOODBRIDGE, ONTARIO, CANADA L4H 4N4
(416) 663-7130
(800) 268-1233 (WITHIN CANADA)
FAX: (416) 663-7792
WWW.DIVERSIFIEDULBRICH.CA

DIVERSIFIED ULBRICH DU CANADA
20 HYMUS BOULEVARD
POINTE CLAIRE, QUEBEC, CANADA H9R1C9
(514) 694-6522
(800) 361-5950 (WITHIN CANADA)
FAX: (514) 694-0266
WWW.DIVERSIFIEDULBRICH.CA

SOLAR TECHNOLOGIES
ULBRICH SOLAR TECHNOLOGIES, INC.
692 PLANT ROAD, P.O. BOX 619 WESTMINSTER, SC 29693
(864) 647-6087
FAX: (864) 647-0482
E-MAIL: SOLAR@ULBRICH.COM
WWW.PVRIBBON.COM

ULBRICH SOLAR TECHNOLOGIES - AT
INDUSTRIESTRAßE 1
7052 MÜLLENDORF, AUSTRIA
+43 2682 61897 0
FAX: +43 2682 61897 40
WWW.PVRIBBON.COM

SALES OFFICES
ULBRICH OF CALIFORNIA, INC.
770 E SHAW AVENUE, SUITE 100
FRESNO, CA 93710
(559) 456-2310
(800) 237-2888
FAX: (559) 456-2321
WWW.ULBRICH.COM

ULBRICH ASIA METALS
ULBRICH SHANGHAI OFFICE
ROOM 1185, CALDERN DREAM PLAZA,
NO. 6088 HUMIN ROAD, SHANGHAI,
201199 CHINA
+86-21-46060850
WWW.ULBRICH.COM