One Metal Supplier, Endless Solutions

Metals for Medical

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.)**
### 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>3.35</td>
<td>80</td>
<td>1.97</td>
<td>50</td>
<td>.63</td>
<td>16</td>
<td>.28</td>
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<tr>
<td>DIN 100</td>
<td>3.94</td>
<td>100</td>
<td>2.48</td>
<td>63</td>
<td>.63</td>
<td>16</td>
<td>.28</td>
<td>7</td>
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<tr>
<td>DIN 125</td>
<td>4.92</td>
<td>125</td>
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<td>80</td>
<td>.63</td>
<td>16</td>
<td>.28</td>
<td>7</td>
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<tr>
<td>DIN 160</td>
<td>6.30</td>
<td>160</td>
<td>3.94</td>
<td>100</td>
<td>.87</td>
<td>22</td>
<td>.51</td>
<td>13</td>
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<tr>
<td>10</td>
<td>5.98</td>
<td>152</td>
<td>3.5</td>
<td>89</td>
<td>.63</td>
<td>15.9</td>
<td>.40</td>
<td>10.2</td>
</tr>
</tbody>
</table>

Meets ICE 264-2-1 (DIN 46 399)  
* Capacity for 304V SS  
** 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>
<th>*Capacity</th>
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</thead>
<tbody>
<tr>
<td>15 MM</td>
<td>1.57</td>
<td>40</td>
<td>59</td>
<td>15</td>
<td>.42</td>
<td>10.6</td>
<td>.14</td>
</tr>
<tr>
<td>26 MM</td>
<td>1.69</td>
<td>43</td>
<td>1.02</td>
<td>26</td>
<td>.42</td>
<td>10.6</td>
<td>.14</td>
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<tr>
<td>30 MM</td>
<td>1.57</td>
<td>40</td>
<td>1.18</td>
<td>30</td>
<td>.42</td>
<td>10.6</td>
<td>.14</td>
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<tr>
<td>NEB</td>
<td>1.32</td>
<td>34</td>
<td>.74</td>
<td>19</td>
<td>.33</td>
<td>8.0</td>
<td>.29</td>
</tr>
<tr>
<td>WARDWELL</td>
<td>2.60</td>
<td>66</td>
<td>1.37</td>
<td>35</td>
<td>.66</td>
<td>17</td>
<td>NA</td>
</tr>
</tbody>
</table>

Multiple colors available  
* Capacity for 304V SS

### Common Wire Sizes

<table>
<thead>
<tr>
<th>FLAT WIRE</th>
<th>ROUND WIRE</th>
</tr>
</thead>
<tbody>
<tr>
<td>.0003” x .0035”</td>
<td>0.0076 mm x 0.0899 mm</td>
</tr>
<tr>
<td>.0005” x .0025”</td>
<td>0.0127 mm x 0.0635 mm</td>
</tr>
<tr>
<td>.0005” x .0030”</td>
<td>0.0127 mm x 0.0762 mm</td>
</tr>
<tr>
<td>.0005” x .0050”</td>
<td>0.0127 mm x 0.1270 mm</td>
</tr>
<tr>
<td>.0007” x .0030”</td>
<td>0.0178 mm x 0.0762 mm</td>
</tr>
<tr>
<td>.0007” x .0050”</td>
<td>0.0078 mm x 0.1270 mm</td>
</tr>
<tr>
<td>.0010” x .0030”</td>
<td>0.0254 mm x 0.0899 mm</td>
</tr>
<tr>
<td>.0010” x .0050”</td>
<td>0.0254 mm x 0.1270 mm</td>
</tr>
<tr>
<td>.0010” x .0070”</td>
<td>0.0254 mm x 0.0762 mm</td>
</tr>
<tr>
<td>.0015” x .0050”</td>
<td>0.0381 mm x 0.1270 mm</td>
</tr>
<tr>
<td>.0015” x .0070”</td>
<td>0.0381 mm x 0.1778 mm</td>
</tr>
<tr>
<td>.0020” x .0100”</td>
<td>0.0508 mm x 0.2540 mm</td>
</tr>
<tr>
<td>.0020” x .0120”</td>
<td>0.0508 mm x 0.3048 mm</td>
</tr>
<tr>
<td>.0030” x .0100”</td>
<td>0.0762 mm x 0.2540 mm</td>
</tr>
<tr>
<td>.0040” x .0100”</td>
<td>0.1016 mm x 0.2540 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.

### SIZES, SHAPES AND EDGES

**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.
New Product Development

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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

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
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

Slitting Capabilities*

Gauges .0004 inch – .125 inch (0.010 – 3.175 mm)
Width .020 – 48 inch (0.508 – 1220 mm, Ribbon Wound)
Width .125 – 1.5 inch (3.175 – 38.1 mm, OSC Wound)
Oscillate Face 12 inch max. (305 mm)

Ribbon ID 2 – 24 inch (50.8 – 609.6 mm)
Oscillate ID 16 inch max. (406.4 mm)
Ribbon OD 48 inch max. (1220 mm)
Oscillate OD 30 inch max. (762 mm)

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

Strip Applications

- Hypodermic Needles and Shields
- Implantable Housings: Pacemakers, Hearing Aids, Defibrillators
- Staple Guns
- Endoscopic Products
- Surgical Instruments

#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)
<table>
<thead>
<tr>
<th>Alloy Name</th>
<th>Product</th>
<th>UNS</th>
<th>C. MAX</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>301</td>
<td>S30100</td>
<td>0.15</td>
<td>6.0–8.0</td>
<td>16.0–18.0</td>
<td>rå</td>
<td>0.29</td>
<td>Chromium nickel steel capable of attaining high tensile strength and ductility by moderate or severe cold working.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>302</td>
<td>S30200</td>
<td>0.15</td>
<td>8.0–10.0</td>
<td>17.0–19.0</td>
<td>rå</td>
<td>0.29</td>
<td>General purpose chromium 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>
<td></td>
<td></td>
</tr>
<tr>
<td>304</td>
<td>S30400</td>
<td>0.08</td>
<td>8.0–10.5</td>
<td>18.0–20.0</td>
<td>rå</td>
<td>0.29</td>
<td>Low carbon chromium nickel stainless and heat resisting steel somewhat superior to Type 302 in corrosion resistance. VAC: (Vacuum Arc Remelted) VAR.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>304L</td>
<td>S30403</td>
<td>0.03</td>
<td>8.0–12.0</td>
<td>18.0–20.0</td>
<td>rå</td>
<td>0.29</td>
<td>Very low carbon chromium nickel 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 which cannot be subsequently annealed. VAC: (Vacuum Arc Remelted) VAR.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>305</td>
<td>S30500</td>
<td>0.12</td>
<td>10.0–13.0</td>
<td>17.0–19.0</td>
<td>rå</td>
<td>0.29</td>
<td>A high corrosion-resistant alloy with low rate of work hardening, designed for extra deep drawing and spinning.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>316</td>
<td>S31600</td>
<td>0.08</td>
<td>10.0–14.0</td>
<td>16.0–18.0</td>
<td>2.0–3.0 MO</td>
<td>5224</td>
<td>A chromium nickel stainless and heat resisting steel with superior corrosion resistance to other chromium nickel steels when exposed to many types of chemical corrosants; superior creep strength at elevated temperatures.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>316L</td>
<td>S31603</td>
<td>0.03</td>
<td>10.0–14.0</td>
<td>16.0–18.0</td>
<td>2.0–3.0 MO</td>
<td>5507</td>
<td>A chromium nickel stainless steel with general corrosion resistance similar to Type 316 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 which cannot be subsequently annealed.</td>
<td></td>
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<tr>
<td>316LVM</td>
<td>S31637</td>
<td>0.03</td>
<td>13.0–15.0</td>
<td>17.0–19.0</td>
<td>0.50 CU</td>
<td>2.0–3.0 MO</td>
<td>5199</td>
<td>A highly refined medical grade of stainless steel designed for implant applications. Vacuum Arc Remelted (VAR).</td>
<td></td>
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<tr>
<td>431</td>
<td>SA1000</td>
<td>0.15</td>
<td>11.5–13.5</td>
<td>5504</td>
<td>A 240</td>
<td>0.28</td>
<td>General purpose corrosion and heat resisting chromium steel. Good corrosion resistance and fair machining properties. Can be treated to RC30/40.</td>
<td></td>
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<tr>
<td>420</td>
<td>SA2000</td>
<td>0.15</td>
<td>12.0–14.0</td>
<td>5506</td>
<td>A 178</td>
<td>0.28</td>
<td>Chromium steel capable of hardening to a maximum of approximately RC35/58.</td>
<td></td>
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<tr>
<td>440A</td>
<td>S44002</td>
<td>0.2–0.75</td>
<td>16.0–18.0</td>
<td>rå</td>
<td>0.28</td>
<td>High carbon grade, high chromium, capable of being heat treated to a hardness range of RC35/58.</td>
<td></td>
<td></td>
<td></td>
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</tbody>
</table>

### Precip Hardening Grades

| 317PH      | S17700  | 0.09| 6.5–7.5| 18.0–18.0 | 0.75–1.5 AL | 5528 | A 693 | 0.28 | A chromium nickel stainless steel with characteristics of good workability, easy hardening, high strength, and excellent mechanical properties at elevated temperature. Can be heat treated at relatively low temperature for high strength properties. |
| 17-4PH     | S17600  | 0.07| 3.0–5.0| 15.0–17.5| 3.0–5.0 CU | 5604 | A 693 (Type 630) | 0.28 | Precipitation hardening stainless steel with high strength and good corrosion resistance to 600°F. Used in aerospace, chemical, petrochemical, paper and metalworking industries. |

### Nickel Alloys

| NICKEL 200 | NO2201  | 0.02| 99.0 min | 5553 | B 162 | 0.32 | Similar to Nickel 200 except with a lower carbon content for better formability. Most applications in chemicals. |
| MONEEL 420 | NO4400  | 0.3 | 63.0 min | 5553 | B 127 | 0.31 | A solid solution alloy with high strength and toughness over wide temperature ranges. Used in electronic components, springs. Corrosion resistant and oxidation resistance to 1000°F. |
| INCONEL 625 | NO6625 | 0.1 | 58.0 min | 5899, 5869, 5879 | B 443 | 0.305 | Outstanding corrosion resistance with excellent fabricability. Good for cryogenic to high temperature applications up to 2000°F. |

### Cobalt Alloys

| HAYNES 230 (2.25-0.25) | RO6065 | 0.05–0.15 | 9.0–11.0| 19.0–21.0 | BAL CO | 0.33 | Jet engine components, combustion chambers, afterburner parts. Oxidation and carburization resistant to 1900°F. Good high temperature strength. |
| MIP5N | RO6035 | 0.02 | 33.0–37.0| 19.0–21.0 | BAL CO | 0.304 | An age hardenable Nickel-Cobalt base alloy that has a unique combination of properties – ultra high strength, toughness, ductility and outstanding corrosion resistance. Used in fasteners, springs, nonmagnetic electrical components medical instruments, medical and dental devices, seawater, oil and gas well, and chemical and food processing environments. |

### Titanium

| Grade 1-4 | R525050, R52400, R52505, R50700 | F 67, B 265 | 0.363 | Alpha phase grades of commercially pure titanium with oxygen equivalents resulting in strength levels from low to high. |
| Grade 9, Ti-3.25 | R6320 | 0.05 | B 265 | 0.363 | Alpha & Beta alloy—considered 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. |
| Grade 5, Ti-6.4 | R58153 | 0.05 | B 265 | 0.372 | A cold formable metastable Beta alloy available in foil and strip which is typically aged to high strengths after fabrication. |

### Other

| NITINOL | R581 | 0.05 | 0.235 | NITINOL (an acronym for Nickel Titanium Naval Ordnance Laboratory) is a family of intermetallic materials, which contain a nearly equal mixture of nickel (55 wt. %) and titanium. Other elements can be added to adjust the material properties. Nitinol exhibits unique behavior such as “Shape Memory” and “Superelasticity.” NITINOL is used for both consumer and medical applications. |
| NIOBIUM TYPE 1 | R393 | 0.31 | Pure niobium, reactor grade, high melting point, corrosion resistant for use in medical and high temperature industrial applications. |