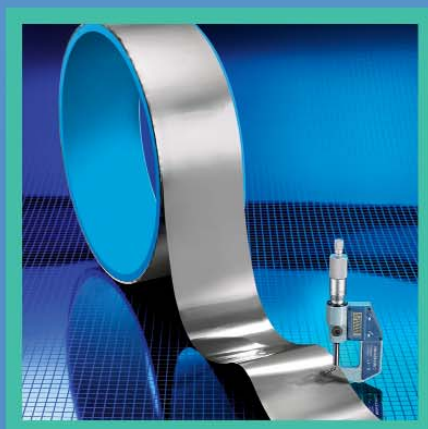


**Ulbrich**  **MEDICAL-METALS**

**One Metal Supplier, Endless Solutions**



*We Deliver Precision<sup>®</sup>*



Global Representation with Service and Distribution Centers Worldwide.



*We Deliver Precision®*

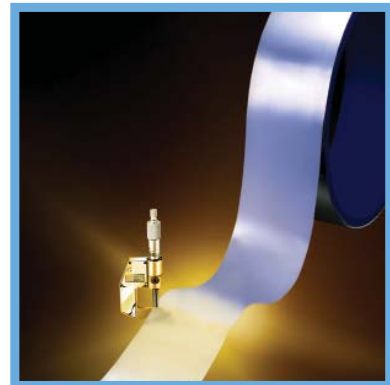
A family owned company in its third generation of leadership, Ulbrich has been supplying stainless steel and specialty metals to the medical device industry for over 50 years. In that time we have participated in the development and manufacturing of dozens of innovative devices. With Industry Leading Dimensional Control, real time gauging and SPC, a large variety of alloys, and simply the best service available, we plan to stay in this business a long time! We are comprised of a series of manufacturing divisions and service centers, all with local management and all designed to provide custom products with top notch service.

## Our Products

To some customers, we are a precision re-roller, processing coils of specialty steel to exacting specifications for a hypodermic needle application. To others, we start with fine wire and roll it into precision flat wire with extremely close tolerances to dimensions a fraction the size of a human hair to be used for braided stainless steel reinforced tubing. We may also start with wire and roll it into a net cross sectional shape to be used as orthodontic brace wire. These and many other capabilities are within reach at one of the Ulbrich companies.

## Our Service

You can expect nothing but the best when dealing with Ulbrich. We can design custom stocking, VMI and KANBAN programs to ensure material availability and minimize inventory. We have an extensive technical staff at your service and we can produce small samples to be delivered quickly. All of our capabilities, especially our people are what separate Ulbrich from your typical metals supplier.





## Precision Flat and Fine Wire



*Material is wound on specialized Steeger machine.*



*Braided stainless steel reinforced tubing (shown magnified) for catheters and related diagnostic systems.*

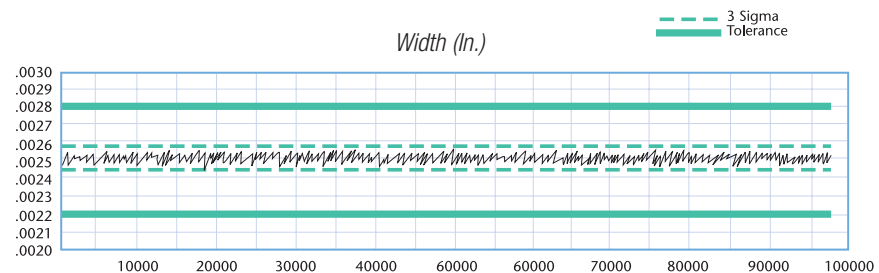
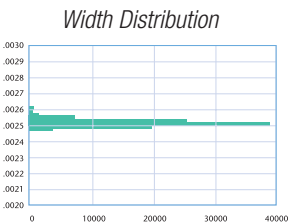
Ulbrich...The new name in ultra fine wires for demanding medical device applications. Our manufacturing facilities in Westminster, South Carolina and Oranmore, County Galway, Republic of Ireland are capable of producing gauges from .0076mm (.0003 inches), widths from .05mm (.001 inches) and rounds to .0075". Both facilities can provide 304V in a variety of tensile ranges for the most common braid wire sizes from stock or with extremely short lead-times. We can also produce fine wire in other special metals including Nitinol.

Our new "Medical Wire Focus Factory" is staffed with dedicated management and engineers, using state of the art equipment to produce the industry's top quality wires. 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 enables trouble-free performance in the most demanding applications.

Ulbrich works closely with our customers to develop custom inventory management programs (KANBAN, VMI, etc.) Maintaining lead times that are typically much shorter than the rest of the industry, turning around sample requests quickly, and working closely with our customers in order to customize the product for their particular application are just a few examples that make our service second to none. All facilities are ISO 9001:2008 compliant.

### Medical Mill - Width • SPC Chart - Continuous Data Collection

Width profile of Coil #: 33343-30B Length: 97163ft.  
 Target 0.002500 in.  $\pm 0.0003$   
 Average: 0.002517 in. Average-Target: 0.000017 in. (0.70%)  
 Std Dev. 0.000023 in.  
 Cp: 4.4416 • Cpk:4.18 • Cr: 22.5%  
 Off Spec. Above 0.002800 in.: 0 ft. (0.00%) • In Tolerance: 97163 ft. (100.00%)  
 Off Spec. Below 0.002200 in.: 0 ft. (0.00%)  
 Max Width: 0.002650 in. at 4100 ft. • Min Width: 0.002450 in. at 1 ft.  
 X and R control limits based on groups of 10 readings every 50 feet  
 Upper Control Limit: 0.002519 in. • X double bar: 0.002517 in.  
 Lower Control Limit: 0.002516 in.  
 Max Width: 0.002650 in. at 4100 ft. • Width: 0.002450 in. at 1 ft.

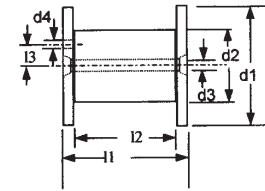




## One Metal Supplier, Endless Solutions

### DIN and Braided Bobbins Spools

Number	d1		d2		d3		d4		I1		I2		I3		*Capacity lbs
	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	
DIN 80	3.15	80	1.97	50	0.63	16	0.28	7	2.52	64	2.52	64	0.79	20	1.9
DIN 100	3.94	100	2.48	63	0.63	16	0.28	7	3.94	100	3.15	80	0.79	20	1.9
DIN 125	4.92	125	3.15	80	0.63	16	0.28	7	4.92	125	3.94	100	0.79	20	1.9
DIN 160	6.30	160	3.94	100	0.87	22	0.51	13	6.30	160	5.04	128	1.26	32	**14.0
10	5.98	152	3.5	89	0.63	15.9	0.40	10.2	4.29	109	3.50	89	0.75	19	9.0
Braided Bobbins	2.60	66	1.37	35	0.66	17	NA	NA	3.25	83	2.84	72	NA	NA	1.0

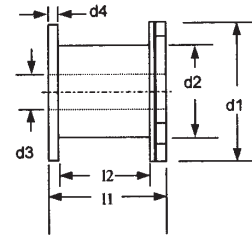


Meets ICE 264-2-1 (DIN 46 399).  
No deposit required.

\*\* Available with 16mm bore adapters.  
\* Capacity for 304V SS

### Steeper and NEB Bobbins

Number	d1		d2		d3		d4		I1		I2		*Capacity	
	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	gms	lbs
15mm	1.57	40	0.59	15	0.42	10.6	0.14	3.6	1.40	35.5	1.02	26	120	0.26
26mm	1.69	43	1.02	26	0.42	10.6	0.14	3.6	1.40	35.5	1.02	26	90	0.20
30mm	1.57	40	1.18	30	0.42	10.6	0.14	3.6	1.40	35.5	1.02	26	50	0.11
NEB	1.32	34	0.74	19	0.33	8.0	0.29	7.0	3.95	100	3.29	84	240	0.5



Multiple colors available.  
No deposit required.

\* Capacity for 304V SS

### Common Wire Sizes

#### Flat Wire

inch	mm
.0003" x .0035"	.0076mm x .0899mm
.0005" x .0025"	.0127mm x .0635mm
.0005" x .0030"	.0127mm x .0762mm
.0005" x .0050"	.0127mm x .1270mm
.0007" x .0030"	.0178mm x .0762mm
.0007" x .0050"	.0078mm x .1270mm
.0010" x .0030"	.0254mm x .0899mm
.0010" x .0050"	.0254mm x .1270mm
.0010" x .0070"	.0254mm x .1778mm
.0015" x .0050"	.0381mm x .1270mm
.0015" x .0070"	.0381mm x .1778mm
.0020" x .0100"	.0508mm x .2540mm
.0020" x .0120"	.0508mm x .3048mm

#### Flat Wire

inch	mm
.0030" x .0100"	.0762mm x .2540mm
.0040" x .0100"	.1016mm x .2540mm
.0040" x .0120"	.1016mm x .3048mm

#### Round Wire

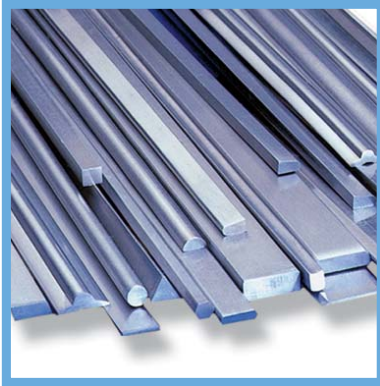
inch	mm	inch	mm
.0010"	.0254mm	.00165"	.0419mm
.0011"	.0279mm	.0020"	.0508mm
.0012"	.0305mm	.0025"	.0635mm
.0013"	.0330mm	.0030"	.0762mm
.0014"	.0356mm	.0036"	.0914mm
.0015"	.0381mm	.0039"	.0991mm



Close up of multiple bobbins wound on Steeger machine.



## Shaped Wire



### 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, wide nitinol strip in continuous coil length. Filling the void in nitinol product form availability, this new wide strip offers a unique solution to current processing limitations. Many new applications are anticipated for this product form in the future.

### Sizes, Shapes & Edges

#### Round Wire

**Soap Finish**, annealed to spring tempers, in diameters from 0.028 - 0.400 inch. (.711 - 10mm)

**Grease Finish**, annealed to spring tempers, in diameters from 0.016 - 0.312 inch. (.406 - 7.92mm)

**Bright Finish**, extra-clean, annealed to spring tempers, in diameters from 0.010" to 0.400" (.254 - 10mm)

#### Flat Wire

Minimum Thickness, 0.005 inch (.127mm) in widths from .050 to .210 inch (1.27 - 5.08mm)

Maximum Thickness, 0.250 inch (6.35mm) in widths from .250 to .875 inch (6.35 - 122.23mm)

Maximum Width, .022 to 1.50 inch (.558 - 38.10mm) in thickness up to 0.025 (.625mm)

#### Gauge and Width Tolerances

Your special tolerances, or extra close tolerances, upon request.

#### Shapes

A wide variety of standard and custom shapes are available from .016" square to .500" half round.

#### Edges

The following are available on flat and rectangular wire.

**Square Edges**, Flat side with very minimum radius at the corners.

**Rounded Corners**, Flat side with a large radius on the corners.

**Natural Rolled or Round Edges**, No flat side, slightly sharp corner where arc meets flat.

**Full Rounded or Blended Edges**, No flat on side. Arc blends into flats,

eliminating sharp corners. Note: This edge available at

slightly higher cost .



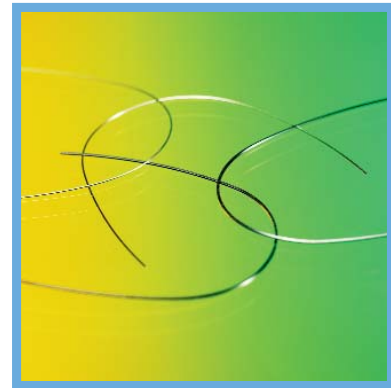
*Nitinol Strip in  
Continuous Coil Length.*



## One Metal Supplier, Endless Solutions

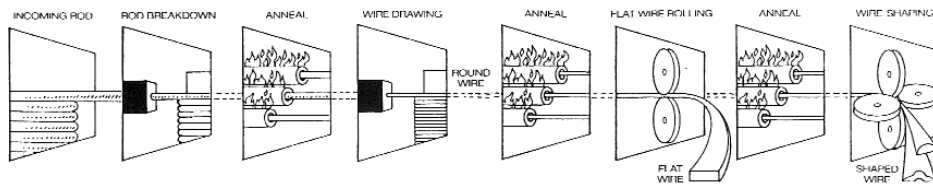
Ulbrich Shaped Wire products are found in a variety of medical applications, ranging from spacers for surgical devices to archwire for braces in the orthodontic industry. We supply to a wide range of medical device and component manufacturers. In addition to all of the stainless steel grades, we work with and stock a wide range of medical quality alloys, including 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 specification requirements. Starting primarily with rod or wire, we breakdown to exact starting diameters to remove any variation in the raw material, allowing us to tightly control finished tolerances. Subsequent flat rolling and shape rolling or drawing with intermediate anneals to restore properties and control finished properties allow us to achieve your custom shape.



*Archwires for Braces.*

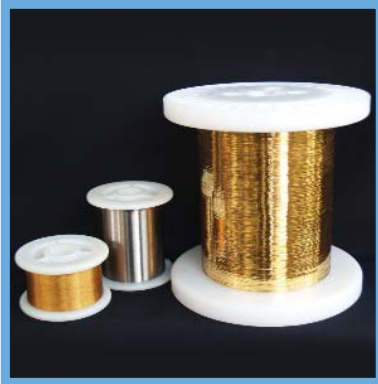
### Shaped Wire Process



*Shaped Profiles*



## Plated Products



### Applications

- Guidewires, Catheters
- Electronic Devices
- Coils
- Leads & Connectors
- Tubing Mandrels
- Braiding & Stranding
- Embedded Wire
- Orthodontia
- Copper and silver-plated copper mandrels for catheter applications
- In-house plating equipment for your custom requirements

### Materials

- Stainless Steels  
304 - 304L - 304VM - 316 - 316L - 316LVM
- Specialty Metals
  - MP35
  - Copper Clad Steel & Aluminum
  - Tungsten
  - Titanium
  - Molybdenum
  - Phos/bronze

### Custom Precision Plating

Delta Ulbrich Precision Alloys specializes in the continuous plating of round and flat wire. We can custom plate almost any alloy with the following:

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

### Special Services Available

- Extra Straight
- Precision Spooling
- Straighten & Cut
- Customized Processes



## One Metal Supplier, Endless Solutions

### Specialty Strip Mill



Ulbrich Stainless Steels and Special Metals precision strip products are found in a variety of medical applications ranging from Hypodermic Needles to implantable Pacemaker Cans. We re-roll coils of steel to meet highly engineered specifications on one of our eight precision rolling mills. Our controlled atmosphere annealing lines work in tandem with the rolling process to produce exacting mechanical properties as well as maintain the required finishes. In addition to rolling and annealing we have capabilities to aggressively clean the metal surface, tension level, slit, edge and oscillate wind the coils.

Our Metallurgical staff can assist in selecting alloys and formulating a specification. We can custom produce small coils (45kg, 100lb) for your R&D work or we can produce full production quantities. Ulbrich re-rolling capabilities are wide reaching and our excellent staff of people will be with you every step.

#### Re-Roll Capabilities

- Gauges: .0005 - .125 inch (.0127 - 3.175mm)
- Width: Up to 14 inches (353mm)
- Tempers: Dead Soft - Extra Full Hard
- Finishes: Dull - Bright Ra 2-60

#### *Special Textures - Rolled or Mechanically Applied*

#### Quality System

- ISO 9001 : 2000 Certified Producer





## Service Centers

At our six North American service centers, Ulbrich offers a large selection of stainless steel and special metals. The coils in our inventory covers a wide range of gauges, widths, tempers and finishes suitable for the medical industry. Our service centers are capable of stocking highly engineered inventory, custom made, and 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 & Edge Capabilities

### Slitting Capabilities\*

Gauges:	.0005 - .135 inch	.0127 - 3.429mm	Ribbon ID:	2 - 24 inches	50.8 - 609.6mm
Width:	.020 - 48 inches	.508 - 1220mm (Ribbon wound)	Oscillate ID:	16 inch max.	406.4mm
Width:	.125 - 1.5 inches	3.175 - 38mm (OSC wound)	Ribbon OD:	48 inch max.	1220mm
Oscillate Face:	12 inch max.	305mm	Oscillate OD:	30 inch max.	762mm

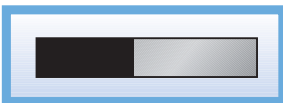
\* The full range of widths can not be produced on all thicknesses.



**#1 Round Edge**  
 Width: 38mm (1.5 inch) Max.  
 Thickness: .1778 - 1.575mm (.007 - .062 inch)



**#3 Slit Edge**  
 Width: .5 - 914mm (.020 - 36 inch)  
 Thickness: .02286 - 3.175mm (.0009 - .125 inch)



**#5 Square Edge**  
 Width: 57mm (2.250 inch) Max.  
 Thickness: .1016 - 3.175mm (.004 - .062 inch)

### Strip Applications

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





## One Metal Supplier, Endless Solutions

### Alloys

Materials	Strip	Foil	Flat Wire	Fine Wire	Shaped Wire
200 Series	•	•	•	•	•
300 Series	•	•	•	•	•
400 Series	•	•	•	•	•
Precipitation Hardening	•	•	•	•	•
Nickel Alloys	•	•	•	•	•
Pure Nickel 200/205	•	•	•	•	•
Titanium/Titanium Alloys	•	•	•	•	•
MO 4000	•	•	•	•	•
Niobium	•	•			
Zirconium	•	•			
Tungsten				•	
OHFC 101-102				•	
ETP110			•	•	
C507 Phos Bronze				•	
BeCu 172/174/175				•	
Phos Bronze A/C/D				•	
P-Bronze				•	
Brass 80/20 70/30			•	•	
CuNi Alloys				•	
F-15 Kovar				•	•
F-29 Dumet				•	
F036 Invar	•			•	•
52 Alloy				•	
Copper Clad Steel				•	
Copper Clad Aluminum				•	
Al Clad				•	
Aluminum			•	•	
Nickel Plated Steel				•	
Molybdenum				•	
Tantalum				•	
MP 35			•	•	•
300 Series SS VM			•	•	•
Fe Chrome Al Alloys				•	
Nickel Chrome Alloys				•	
Nitinol				•	•

\* Ulbrich is authorized to process many alloys that are registered or trade marked by other melting mills. Inquire for details.

### Round Wire

Diameter	Standard Tolerance
.091 and up	+/- .001
.0511-.0909	+/- .0008
.051-.0201	+/- .0005
.020-.0159	+/- .0004
.0158-.0089	+/- .0003

Diameter	Standard Tolerance
.0088-.005	+/- .00025
.0049-.0031	+/- .0002
.003-.00275	+/- .00015
.00274-Finer	+/- .0001

#### Resistance

- Finer than .0019 +/-10%
- .002-.005 +/-8%
- .005 and up +/-5%

\*Tighter tolerances available on request.

### Ribbon

#### Width

- .063 and up +/- .003
- .0625 and below +/- .002

#### Thickness

- .010-.005 +/- .0005
- .0049-Finer +/- .0002

\*Tighter tolerances available on request.

#### Resistance

- All ribbon +/-5%
- All ribbon is manufactured to resistance by holding width and varying the thickness



***We Deliver Precision®***

**Ulbrich Stainless Steels & Special Metals, Inc.**

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Westminster, SC 29693  
(864) 647-6087 • Fax: (864) 647-0482  
e-mail: [flat\\_wire@ulbrich.com](mailto:flat_wire@ulbrich.com)

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