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.
The various alloys we process are known for their superior performance and excellent reliability. These products are the result of years of metallurgical development, offering properties well beyond those of ordinary metals. Ulbrich serves in markets as diverse as aerospace, aircraft and automotive, nuclear and solar energy, medical and surgical equipment, chemical processing, electronics and many others. We are an international company that strives to deliver high quality products to various industries. At Ulbrich, all employees focus their talents and energies in a common direction — total customer responsiveness, total company involvement, total quality commitment and continuous professional development.

Chris Ulbrich
CHIEF EXECUTIVE OFFICER
At the Ulbrich Specialty Strip Mill

»We use fully integrated quality sources to supply us with excellent raw material.

»We follow rigid incoming and in-process inspection procedures.

»We have over 165 alloy grades to select from: common stainless steels; nickel and nickel alloys, titanium and titanium alloys plus many other special metal alloys.

»We use historical knowledge from a library of critical processing information and specialized equipment to process all orders.

»All orders are processed efficiently and quickly.

»Our automated mill controls continually monitor the product to make certain all dimensions are within tolerances.

»This is what you should expect from an ISO 9001:2008 certified producer like Ulbrich.

WHEN YOUR SPECIFICATION DEMANDS SOMETHING EXTRA, ULBRICH HAS THE CAPABILITIES AND EXPERTISE TO MAKE THE PROPER ADJUSTMENTS.

We have:

»6 Sendzimir Z-mills

»8 Controlled atmosphere bright annealing lines

»3 4-high rolling mills

»State-of-the-art finishing equipment

»Coil cleaning, tension leveling, slitting, edging and oscillate winding

Temperature and dew point of our annealing furnaces can be precisely regulated to meet user specifications.

This high speed Z-mill is equipped with automatic gauge control to instantly adjust the roll bite and maintain the desired gauge and close tolerances.

Internal view of a Z-mill.
UltraLite Foil®

Ulbrich has dedicated itself to being one of the premier producers of stainless steel, special metals and titanium foils. We define UltraLite Foil® as .0015" (0.0381 mm) and lighter.

Ulbrich has dedicated a new building with UltraLite Foil® rolling, annealing, slitting and washing capabilities.

Small Orders

We pride ourselves in being able to ship small quantities of any strip product we make or stock.

We use excess material to help our customers develop new applications requiring small quantities for prototypes.

Whether in production or development, we strive to meet or exceed your expectations in as many ways as we can.

Significant inventory available in numerous size coils for small orders.

ALLOYS AND SIZES

<table>
<thead>
<tr>
<th>Strip Alloys</th>
<th>Gauge Range</th>
<th>Tempers</th>
<th>Width</th>
<th>Surface Finishes</th>
</tr>
</thead>
<tbody>
<tr>
<td>300 &amp; 400 Series Stainless Steels</td>
<td>.0004 to .125 inch (0.01 to 3.175 mm)</td>
<td>Fully Annealed Through Extra Full Hard</td>
<td>14.00 inch max. (356 mm max.)</td>
<td>Dull</td>
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<td>Precipitation Hardening Stainless Steels</td>
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<td></td>
<td></td>
<td>Bright</td>
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<tr>
<td>Nickel &amp; Nickel Alloys</td>
<td></td>
<td></td>
<td></td>
<td>Special Textures</td>
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<tr>
<td>Cobalt Alloys</td>
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<td></td>
<td></td>
<td></td>
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<tr>
<td>Titanium &amp; Titanium Alloys</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Others on Request</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The micrometer reads .0004 inches (0.010mm).

This high pressure hot water jet cleaning system is used for applications requiring ultra clean surfaces.

We meet requirements for strip that must be truly flat (.005 piw) with the latest in stretch bend leveling technology, with rugged tension bridles and a nest of small diameter bending rolls.
United States of America

LOCATIONS » Connecticut » Illinois

Oscillate (or traverse) wound strip is available on either open coils or spools. Special edges, from deburred to square to full round, are within our capabilities. Orders for production or prototype quantities are processed quickly and efficiently and usually delivered within one week or less.

Strip and Coil Stainless Steel: 300 Series, 400 Series, PH Grades / Nickel Alloys / Titanium and Titanium Alloys / Cobalt Alloys

Gauge Range .002 to .135 inch (0.0508 to 3.429 mm)

Width Range .020 to 54 inches (0.5 to 1368 mm)

Edges Rounded / Square / Deburred

Packaging Ribbon Wound Coils / Oscillate Wound Coils & Spools / Cut-To-Length

Canada and Mexico

Diversified Ulbrich of Canada

LOCATIONS » Toronto » Montreal

Diversified Ulbrich of Canada is a stainless steel and aluminum service center providing sheet, plate, bar, strip, tubing and structural angle to the Canadian Market. In addition to standard stock sizes, we can shear, level, plasma roll, slit or cut to length our products to your exact specifications. Our stainless alloys include the following: 200 Series, 300 Series, 400 Series, Duplex Grades, Invar, as well as 3003 H14 and 5052 H32 aluminum. See Technical Detail page 12 for size ranges.

Ulbrinox

LOCATIONS » Queretaro

Ulbrinox is a versatile service center that offers a wide range of metals including stainless steel, red metals, silicon steel, and aluminum. Ulbrinox provides different inventory management solutions such as JIT, Kanban and Consignment programs in order to help you control stocks and reduce costs.
Ulbrich Shaped Wire specializes in the manufacture of custom-made shapes and flats for a wide variety of industries. Depending on the complexity of the profile, shapes may be either net- or near net-suitable for stamping, coining, forming, or machining. All tooling is custom manufactured in-house by our state-of-the-art tooling center. We also offer metallurgical and engineering support for all customers. Ulbrich Shaped Wire supplies a wide range of alloys, including nitinol, which can be provided as a flat, coiled wire product that is not readily available in the marketplace.

<table>
<thead>
<tr>
<th>Alloys</th>
<th>Shaped Wire</th>
<th>Gauge Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stainless Steels</td>
<td>Rectangle</td>
<td>.005 to .335 inch (0.127 mm to 8.509 mm)</td>
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<tr>
<td>Titanium Alloys</td>
<td>Hexagonal</td>
<td></td>
</tr>
<tr>
<td>Nickel Alloys</td>
<td>Octagonal</td>
<td></td>
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<tr>
<td>Cobalt Alloys</td>
<td>Triangle</td>
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</tr>
<tr>
<td>Nitinol Alloys</td>
<td>Half-Round</td>
<td>.020 to 1.50 inches (0.508 mm to 38.1 mm)</td>
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<tr>
<td>Aluminum Shape</td>
<td>Many Custom Profiles on Request</td>
<td></td>
</tr>
<tr>
<td>Copper Steel</td>
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</tr>
<tr>
<td>Copper Alloy</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other Resistance Alloys</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Filling a void in nitinol product form availability, this “strip” produced in continuous coil length in our wire mill offers your engineers a unique solution to current processing limitations.

Our controlled atmosphere strand annealing capabilities ensure consistent mechanical properties and a quality surface finish.

Custom wire shapes offer an all-around reduction in cost and process steps by bringing customers closer to a finished part.

Our shaping mills are equipped with highly engineered tooling designed and manufactured in-house at our state-of-the-art tooling center.
# Precision Flat & Fine Wire

Our Precision Flat Wire facilities are capable of producing gauges for many demanding applications serving a variety of industries. Our state-of-the-art “Focus Factory” approach dedicates managers and engineers along with state-of-the-art equipment to produce and manage industry specific requirements.

Our production equipment uses the latest in “on-the-line” gauging and data acquisition technology that generates full statistical summaries with each production run, enabling us to control our process and offer tolerances as tight as +/- .0001 inch (0.0025 mm) on our lightest gauges. Precision spooling of fine wires onto a variety of spools or bobbins using CNC winders enables trouble-free performance in the most demanding applications. We offer a wide range of finishes for photovoltaic applications, saw blades, as well as for certain medical applications.

## Alloys
- Stainless Steels
- Aluminum Alloys
- Copper & Brass Alloys
- Nickel Alloys
- Carbon Steel
- Nitinol

## Gauge Range

<table>
<thead>
<tr>
<th>Rounds</th>
<th>Width Range</th>
<th>Applications</th>
</tr>
</thead>
<tbody>
<tr>
<td>.00075 to .400 inch (0.019 mm to 10.16 mm)</td>
<td>.002 to 1.50 inches (0.0508 mm to 38.1 mm)</td>
<td>Tinned copper and aluminum tabs for capacitors</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Aluminum and nickel tabs for batteries</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Gold plated products for a variety of applications in the electronics, medical, and aerospace markets</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Silver-plated copper flat shielded wires for telecom cables</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Silver-plated copper wires for applications in music strings and medical devices</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Medical braidwire and mandrel applications</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Specialty music string and wire products</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Silver-plated and solder-coated copper PV Ribbon for solar cell tabbing and string interconnect</td>
</tr>
</tbody>
</table>

## Surface Finishes
- Tin and Lead Coated
- Heat Treated and Tempered
- Bright Polish

## Applications
- Tinned copper and aluminum tabs for capacitors
- Aluminum and nickel tabs for batteries
- Gold plated products for a variety of applications in the electronics, medical, and aerospace markets
- Silver-plated copper flat shielded wires for telecom cables
- Silver-plated copper wires for applications in music strings and medical devices
- Medical braidwire and mandrel applications
- Specialty music string and wire products
- Silver-plated and solder-coated copper PV Ribbon for solar cell tabbing and string interconnect

Telecommunications products.

Engineered music wire products.
Precision Flat & Fine Wire

Ulbrich is the perfect source for your ultra-fine wire requirements. We process precision plated and bare wire in various geometries, including rounds, squares, and flats, all to extremely close tolerances.

We process a vast amount of materials for various markets that include: medical, electronics, telecommunications, and energy materials.

Ulbrich supplies materials in spools, cut to length, pancake coils, precision layer wound, and other custom packages. Traverse spools, flanges, various barrels, and bore sizes available to satisfy all your requirements.

Alloys
- Copper
- Phosphorus Bronze
- Beryllium Copper
- Brass
- Monel400
- Copper Nickel Alloys
- Kovar
- Dumet
- Pure Nickel 200/205
- Invar
- Alloy 52
- Other Resistant Alloys

Specialty Alloys
- Copper Clad
- Copper Aluminum Clad
- Titanium Alloys
- Aluminum Clad
- Aluminum
- 300 Series VM
- Nickel Plated Steel
- Molybdenum
- FeChrome
- Nickel Alloys

Plating
- Gold type I, II, III per MIL-G-45204
- Solder per MIL-P-81728*
- Silver per QQ-S-365 and ASTM B-298
- Military Standard -1276*
- Nickel per QQ-N-290*
- Tin per MIL-T-10727 Type 2 Solder-ability per MIL-STD-202

*ASTM Specifications
Strip and wire products from Ulbrich Stainless Steels are used in many of the world's leading edge applications, including aircraft engines, automotive components; surgical, diagnostic and other medical instruments; consumer and industrial electronics, chemical processing equipment; solar, nuclear and conventional power generation equipment, and many more.

**END-USE APPLICATIONS MADE FROM ULBRICH PRODUCTS**

- Carrier strip for electronic connectors
- Photo-etched parts
- Stainless steel springs
- Fixed stator vanes for aircraft and land-based turbines
- Electronic components
- Automotive components
- Surgical tools
- Random and structured tower packing for chemical processing facilities
- Titanium honeycomb sections
- Recuperator sections and high pressure seal rings
- Nuclear energy components
- Solar energy components
- Aerospace components
# TECHNICAL INFORMATION

## Strip Rolling Mill Capabilities
- **Gauge**: .0004 – .125 inch (0.010 – 3.175 mm)
- **Width**: up to 14 inches (up to 356 mm)
- **Special Textures**: Rolled or Mechanically Applied
- **Tempers**: Dead Soft – Extra Full Hard

## Sheet Inventory*
- **Thickness**: 28 – 7 gauge
- **Width**: up to 72 inches (up to 1828 mm)
- **Finishes**: 2B, #4 Polish, BA XLBUFF

* Diversified Ulbrich of Canada only

## Plate Inventory*
- **Thickness**: .1875 – 2 inches (4.76 – 50.8 mm)
- **Width**: up to 96” x 288” (up to 2438 x 7315 mm)
- **Finishes**: HRAP, #4 Polish, Smooth and Diamond Pattern

* Diversified Ulbrich of Canada only

## Slitting Capabilities*
- **Gauge**: .0004 – .165 inch
  (Ribbon wound) 0.010 – 3.429 mm
- **Gauge**: .0025 – .060 inch
  (Oscillate wound) 0.063 – 1.52 mm
- **Width**: .032 – 54 inches
  (Ribbon wound) 0.508 – 1368 mm
- **Width**: .062 – 1.00 inches
  (Oscillate wound) 1.57 – 25.4 mm
- **Oscillate Face**: 3.5 – 12 inch max.
  (88 – 304 mm)
- **Ribbon ID**: 2 – 24 inches
  (50.8 – 609.6 mm)
- **Oscillate ID**: 5 – 16 inch max.
  (127 – 406 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.

## Flat Wire Products
- **Flat Wire Gauge**: .0002 – .210 inch
  (0.0058 – 5.33 mm)
- **Flat Wire Width**: .002 – 1.5 inch
  (0.005 – 38.1 mm)
- **Round Wire Dia.**: .00075 – .400 inch
  (0.019 – 10.16 mm)
- **Shaped Wire**: rectangular, hexagonal, octagonal, triangular, half-round, many custom profiles on request.

---

## EDGES

### A.I.S.I. No. 1 — Round edge
- **Width**: 1.500 inches (38 mm) max.
- **Thickness**: .007 – .062 inch (0.1778 – 1.575 mm)

### Broken Corner
- **Width**: 3.500 inches (89 mm) max.
- **Thickness**: .062 – .125 inch (1.575 – 3.175 mm)

### A.I.S.I. No. 3 — Slit edge
- **Width**: .020 inch (0.5 mm) min.
- **Thickness**: .0009 – .125 inch (0.02286 – 3.175 mm)

### A.I.S.I. No. 5 — Square edge
- **Width**: 2.250 inches (57.15 mm) max.
- **Thickness**: .004 – .062 inch (0.1016 – 1.575 mm)

### Broken corner
- **Width**: 3.500 inches (89 mm) max.
- **Thickness**: .062 – .125 inch (1.575 – 3.175 mm)

---

**IMPORTANT NOTICE**

The information contained in this document is believed to be accurate and complete as of its printing; however, no warranty is made, in regard to that information, as to its accuracy, completeness or otherwise. Specifically, no warranty is made by this document in regard to any of the products or their suitability for any application or use, and no recommendations are made, or opinions offered, by this document, regarding the application or use of those products. All information and statements contained herein are subject to change without notice.
<table>
<thead>
<tr>
<th>Alloy Name</th>
<th>Trademark</th>
<th>UNS</th>
<th>C MAX</th>
<th>Ni</th>
<th>Cr</th>
<th>Mo</th>
<th>AMS</th>
<th>ASTM</th>
<th>Density</th>
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<td>201</td>
<td>S20100</td>
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<td>3.5–5.5</td>
<td>16.0–18.0</td>
<td>A240, A666</td>
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<tr>
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<td>S30100</td>
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<td>16.0–8.0</td>
<td>A240, S5519, S558</td>
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<td>303 (wire only)</td>
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<td>420</td>
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<td>12.0–14.0</td>
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<td>17-4PH</td>
<td>S17400</td>
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<td>3.0–5.0</td>
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<td>S17400</td>
<td>0.07</td>
<td>3.0–5.0</td>
<td>15.0–17.5</td>
<td>A686</td>
<td>0.28</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AM 350</td>
<td>S15000</td>
<td>0.07–0.1</td>
<td>4.0–5.0</td>
<td>16.0–17.0</td>
<td>2.5–3.2</td>
<td>A584</td>
<td>0.28</td>
<td></td>
<td></td>
</tr>
<tr>
<td>NICKEL 200</td>
<td>N02200</td>
<td>0.15</td>
<td>19.0–21.0</td>
<td>2.0–3.0</td>
<td>A240, A666</td>
<td>0.29</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NICKEL 201</td>
<td>N02200</td>
<td>0.02</td>
<td>99.0 min</td>
<td>B162</td>
<td>0.32</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PERMANICKEL 300</td>
<td>N00300</td>
<td>0.4</td>
<td>199.0 min</td>
<td>B162</td>
<td>0.32</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1 Trademark of Special Metals Corporation group of companies
2 Trademark of Haynes International, Inc.
3 Trademark of Carpenter Technology Corporation
4 Trademark of Armco, Inc.
5 Trademark of United Technologies Corporation
6 Trademark of Ulbrich Stainless Steels & Special Metals, Inc.
7 Trademark of Allegheny Ludlum Corporation
8 CARPENTER 20CB-3LR® is a trademark of Hoechst Celanese Corporation

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.
<table>
<thead>
<tr>
<th>Alloy Name</th>
<th>Trademark</th>
<th>UNS</th>
<th>Cr</th>
<th>Mo</th>
<th>AMS</th>
<th>ASTM</th>
<th>Density</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nickel Alloys</td>
<td>MONEL® 400</td>
<td>N04400</td>
<td>0.3</td>
<td>63.0 min</td>
<td></td>
<td>B 127</td>
<td>0.318</td>
<td>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.</td>
</tr>
<tr>
<td>MOGON®-601</td>
<td>N06601</td>
<td>0.5</td>
<td>60.0 min</td>
<td></td>
<td></td>
<td></td>
<td>0.321</td>
<td>An alloy used for thermal and electronic applications. This alloy is sometimes called Constantan and is 64% Nickel and 26% Copper.</td>
</tr>
<tr>
<td>MOGON®-K 500</td>
<td>N05500</td>
<td>0.5</td>
<td>63.0 min</td>
<td></td>
<td></td>
<td></td>
<td>0.304</td>
<td>Similar to Monel® 400 and B42; but with higher tensile strength. A precipitation hardening alloy. Used in oil well drilling columns, doctor blades. Good strength and ductility-230°F to 1200°F.</td>
</tr>
<tr>
<td>INCONEL® 600</td>
<td>N06600</td>
<td>0.75</td>
<td>20.0-25.0</td>
<td>B 168</td>
<td></td>
<td></td>
<td>0.304</td>
<td>Has high corrosion and heat resistance combined with excellent strength and workability. Used in gas turbine engines. Oxidation resistance up to 1200°F.</td>
</tr>
<tr>
<td>Nimonic 75</td>
<td>N06755</td>
<td>0.08-0.15</td>
<td>Bal</td>
<td>18.0-20.0</td>
<td></td>
<td></td>
<td>0.302</td>
<td>A nickel chromium alloy with good mechanical properties and oxidation resistance at high temperatures. Used for sheet-metal fabrications in gas-turbine engines, for components of industrial furnaces, for heat-treating equipment and fixtures, and in nuclear engineering.</td>
</tr>
<tr>
<td>INCONEL® 625</td>
<td>N06625</td>
<td>0.1</td>
<td>58.0 min</td>
<td></td>
<td></td>
<td></td>
<td>0.305</td>
<td>Outstanding corrosion resistance with excellent fabricability. Good for cryogenic to high-temperature applications up to 2200°F.</td>
</tr>
<tr>
<td>INCONEL® X-750</td>
<td>N07750</td>
<td>0.08</td>
<td>70.0 min</td>
<td></td>
<td></td>
<td></td>
<td>0.3</td>
<td>A precipitation-hardening nickel chromium alloy with useful strength to 1500°F. Good corrosion and oxidation resistance.</td>
</tr>
<tr>
<td>INCOLOY® 800</td>
<td>N08800</td>
<td>0.1</td>
<td>30.0-35.0</td>
<td>Bal</td>
<td>B 439</td>
<td></td>
<td>0.3</td>
<td>Nickel iron chromium alloy that is carburization resistant at elevated temperatures.</td>
</tr>
<tr>
<td>Ni-SpanC® 902</td>
<td>N09902</td>
<td>0.16</td>
<td>4.5-5.7</td>
<td></td>
<td></td>
<td></td>
<td>0.3</td>
<td>A nickel iron chromium alloy used in precision spring applications.</td>
</tr>
<tr>
<td>HASTELLOY® C-276</td>
<td>N10276</td>
<td>0.01</td>
<td>Bal</td>
<td>15.0-17.0</td>
<td>B 575</td>
<td></td>
<td>0.321</td>
<td>Used in chemical industry for resisting to oxidizing agents. Replaces Hastelloy® C and B42, with better fabricability.</td>
</tr>
<tr>
<td>HASTELLOY® C-4</td>
<td>N06455</td>
<td>0.01</td>
<td>60.0</td>
<td>16.0-18.0</td>
<td></td>
<td></td>
<td>0.332</td>
<td>Ni-Cr alloy has excellent high-temperature stability with good ductility and corrosion resistance. Alloy resists grain boundary precipitations in weld zone making it suitable for chemical processing applications in the automotive industry. Has excellent resistance to carburizing and oxidation atmospheres up to 1000°F.</td>
</tr>
<tr>
<td>HASTELLOY® C-22</td>
<td>N06222</td>
<td>0.015</td>
<td>Bal</td>
<td>20.0-25.0</td>
<td></td>
<td></td>
<td>0.314</td>
<td>A versatile nickel chromium molybdenum tungsten alloy with resistance to a variety of industrial chemicals. Superb workability.</td>
</tr>
<tr>
<td>HASTELLOY® C-30</td>
<td>N06302</td>
<td>0.03</td>
<td>Bal</td>
<td>16.0-21.0</td>
<td></td>
<td></td>
<td>0.327</td>
<td>High chromium nickel base alloy with superior corrosion resistance to phosphoric acids and environments with highly oxidizing acids.</td>
</tr>
<tr>
<td>HASTELLOY® B-3</td>
<td>N06175</td>
<td>0.01</td>
<td>65.0 min</td>
<td>1.0-3.0</td>
<td>27.0-32.0</td>
<td></td>
<td>0.333</td>
<td>Used in chemical industry for resisting to hydrochloric acid. Sulfuric acid, phosphoric acid. Oxidation resistant up to 1200°F.</td>
</tr>
<tr>
<td>HASTELLOY® X</td>
<td>N06202</td>
<td>0.015-0.03</td>
<td>Bal</td>
<td>15.0-20.0</td>
<td></td>
<td></td>
<td>0.327</td>
<td>Jet engine components for afterburner sections, blades, tailpipes, furnace applications, fluecomb, bellows, ducting. Good strength and oxidation resistance to 2000°F.</td>
</tr>
<tr>
<td>HAYNES® 231</td>
<td>N07121</td>
<td>0.015</td>
<td>Bal</td>
<td>15.0-17.0</td>
<td></td>
<td></td>
<td>0.29</td>
<td>Nickel-based precipitation strengthened alloy with oxidation resistance to 2200°F. For furnace parts exposed to carburizing, chlorine-contaminated and oxidizing atmospheres, gas turbine parts.</td>
</tr>
<tr>
<td>HAYNES® 230</td>
<td>N06120</td>
<td>0.05-0.15</td>
<td>Bal</td>
<td>20.0-24.0</td>
<td></td>
<td></td>
<td>0.319</td>
<td>Nickel-chromium molybdenum alloy with outstanding resistance to oxidizing environments up to 2200°F for prolonged periods.</td>
</tr>
<tr>
<td>HAYNES® 242</td>
<td>N07126</td>
<td>0.03</td>
<td>Bal</td>
<td>7.0-9.0</td>
<td></td>
<td></td>
<td>0.327</td>
<td>Age hardenable, nickel-based alloy for use up to 1500°F. Low thermal expansion, good oxidation resistance and excellent elevated-temperature ductility. Suited for gas turbine engines and chemical process plants.</td>
</tr>
<tr>
<td>Cobalt Alloys</td>
<td>HAYNES® 188</td>
<td>N01888</td>
<td>0.05-0.15</td>
<td>20.0-24.0</td>
<td></td>
<td></td>
<td>0.326</td>
<td>A cobalt-based alloy with excellent high-temperature strength and oxidation resistance to 2000°F combined with outstanding post-standing ductility.</td>
</tr>
<tr>
<td>HAYNES® 25 L-605</td>
<td>N06505</td>
<td>0.05-0.15</td>
<td>9.0-11.0</td>
<td>19.0-23.0</td>
<td></td>
<td></td>
<td>0.33</td>
<td>Hot working. ASTM B265 G9. UNS R56320</td>
</tr>
<tr>
<td>Ubasraloy 29-17</td>
<td>K9160</td>
<td>0.20 max</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.502</td>
<td>Nickel-based precipitation strengthened alloy with oxidation resistance to 2200°F. For furnace parts exposed to carburizing, chlorine-contaminated and oxidizing atmospheres, gas turbine parts.</td>
</tr>
<tr>
<td>Ubasraloy 36</td>
<td>K9630</td>
<td>0.25 max</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.502</td>
<td>Nickel-based precipitation strengthened alloy with oxidation resistance to 2200°F. For furnace parts exposed to carburizing, chlorine-contaminated and oxidizing atmospheres, gas turbine parts.</td>
</tr>
<tr>
<td>Ubasraloy 42</td>
<td>K9410</td>
<td>0.41</td>
<td>2.1-2.5</td>
<td></td>
<td></td>
<td></td>
<td>0.502</td>
<td>Nickel-based precipitation strengthened alloy with oxidation resistance to 2200°F. For furnace parts exposed to carburizing, chlorine-contaminated and oxidizing atmospheres, gas turbine parts.</td>
</tr>
<tr>
<td>Waspaloy</td>
<td>N07001</td>
<td>0.03-0.10</td>
<td>Bal</td>
<td>18.0-21.0</td>
<td></td>
<td></td>
<td>0.294</td>
<td>For high-temperature applications. Jet engine turbine wheels, buckets, spacers, shafts.</td>
</tr>
<tr>
<td>Titanium Alloys</td>
<td>Ti-6A-2B-1</td>
<td>0.03 max</td>
<td>0.08 max</td>
<td>0.01 max</td>
<td>0.20 max</td>
<td></td>
<td></td>
<td>0.163</td>
</tr>
<tr>
<td>Ti-6Al-4V</td>
<td>0.03 max</td>
<td>0.08 max</td>
<td>0.01 max</td>
<td>0.20 max</td>
<td></td>
<td></td>
<td>0.163</td>
<td>Alpha phase. This alloy is age hardenable, nickel-based alloy with high strength, light weight, and excellent fatigue properties up to 700°F. Used in high-temperature titanium alloys in jet engine compressors and airframe structures. ASTM B265/G11. UNS R56400.</td>
</tr>
<tr>
<td>Ti-6Al-2Sn-4Zr-2Mo</td>
<td>0.03 max</td>
<td>0.08 max</td>
<td>0.01 max</td>
<td>0.20 max</td>
<td></td>
<td></td>
<td>0.163</td>
<td>Alpha phase. This alloy is age hardenable, nickel-based alloy with high strength, light weight, and excellent fatigue properties up to 700°F. Used in high-temperature titanium alloys in jet engine compressors and airframe structures. ASTM B265/G11. UNS R56400.</td>
</tr>
<tr>
<td>Ti-6Al-4V ELI</td>
<td>0.03 max</td>
<td>0.08 max</td>
<td>0.01 max</td>
<td>0.20 max</td>
<td></td>
<td></td>
<td>0.163</td>
<td>Alpha phase. This alloy is age hardenable, nickel-based alloy with high strength, light weight, and excellent fatigue properties up to 700°F. Used in high-temperature titanium alloys in jet engine compressors and airframe structures. ASTM B265/G11. UNS R56400.</td>
</tr>
<tr>
<td>Other</td>
<td>Ti-6Al-4V</td>
<td>0.03 max</td>
<td>0.08 max</td>
<td>0.01 max</td>
<td>0.20 max</td>
<td></td>
<td></td>
<td>0.163</td>
</tr>
<tr>
<td>Zirconium 702</td>
<td>N07702</td>
<td>0.03</td>
<td>Bal</td>
<td>7.5-2.5</td>
<td></td>
<td></td>
<td>0.235</td>
<td>Exhibits a superior corrosion resistance and high heat transfer efficiency. Zirconium has good ductility, formability and strength comparable with 17 common engineering alloys.</td>
</tr>
</tbody>
</table>
**Base Metal Options**

<table>
<thead>
<tr>
<th>UNS Designation</th>
<th>C1000</th>
<th>C10200</th>
</tr>
</thead>
<tbody>
<tr>
<td>Common Name</td>
<td>CDA110 Cu-ETP1</td>
<td>CDA102 Cu-OF1</td>
</tr>
<tr>
<td>Copper Content</td>
<td>99.90%</td>
<td>99.95%</td>
</tr>
<tr>
<td>Resistivity (ohm gram/m²) (Annealed) @ 20°C</td>
<td>.15328 max.</td>
<td>.15176 max.</td>
</tr>
</tbody>
</table>

Contact Ulbrich Representatives for temper designation.

**Solder Coating Options**

A) Solder Alloys 96.5Sn / 3.5Ag | 62Sn / 36Pb / 2Ag | 60Sn / 40Pb | 100Sn

(Other solder alloys available on request.)

B) Coating Thickness .5 to 50 microns

**Base Material**

A) Base Metal Thickness 0.15 to 0.5 mm (+/- 0.08 mm)
B) Base Metal Width 1.3 to 6.5 mm (+/- 0.008 mm)
C) Camber 8 mm max. in 1m
D) Yield max. 70N/mm²

**Ulbrich Optimum LCR-XP Series**

»Premium high-performance line of Light Capturing Ribbon
»Electro-plated silver over a copper base ribbon with light-capturing profile geometry

**Silver Coating**

»99.99% purity
»Electro-plated from round wire to ensure consistent plating on all sides

**Sizes Available**

»Thickness Range: 0.12 mm to 0.35 mm (+/- 0.008 mm)
»Width Range: 1.00 mm to 6.00 mm (+/- 0.08 mm)

**Physical Properties**

»Yield Strength: 65 N/mm² max
»Reduced silver percentage
»Elongation > 25%

**Copper Base Material**

»ASTM standard copper: CDA110 and CDA102

**Reflectivity**

»65% minimum and up to 85% potential
»Measured using Ulbrich Reflectivity Gauge
»Measurements taken from the total ribbon grooved surface
»Up to 3% power gain through reflectivity and ribbon cross section optimization
The quality policy of Ulbrich Stainless Steels & Special Metals, Inc. encompasses one critical core value:

Enhancing and achieving customer satisfaction through:

» Continuous improvement
» Providing quality products, services, and solutions
» Promoting operational excellence

To support this Quality Policy, Ulbrich will ensure that:

» All Ulbrich employees are given ownership for the quality of product or service that they provide
» Ulbrich will work in partnership with customers, employees, and suppliers to provide excellence in performance and customer satisfaction in a competitive marketplace
» Ulbrich will work to provide solutions to complex problems for its customers
» Ulbrich will work to provide total cost alternatives for its customers
» Ulbrich will work to continuously train their employees and, if needed and desired, train its customers
» Ulbrich will provide a safe work environment for all their employees and its customers
» Ulbrich will use objective measurements to drive continuous improvement in how Ulbrich does its business

The Ulbrich family fully supports this policy. We thank our employees, our customers, and our suppliers for all of their past and current loyalty to Ulbrich.

Sincerely,

Chris Ulbrich
Chief Executive Officer