World leader in the manufacture of precision cold drawn round wire, cold rolled flat wire and shaped wire in Exotic Alloys.
Alloy Wire International – an employee owned company taking pride in customer satisfaction.
<table>
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Round wire & bars

Alloy Wire International (AWI) manufacture round wire and bars to your specification with very short lead times and, today, is one of the world’s premier suppliers of ‘High Performance’ alloys.

We frequently discuss customers’ individual requirements and, through a combination of new or existing material selection, manufacturing flexibility and our technical knowledge, we can offer a bespoke solution.

Available in:
- all alloys shown in this brochure
- 0.025 mm (.001") to 21 mm (.827")
- quantities from 3 metres to 3 tonnes
- spring temper, bright annealed, No. 1 temper, or your special temper condition
- coils, spools and bulk reels
- cut lengths of 3 mm to 3 metres

“Our lead times are short because we stock in excess of 85 tonnes of more than 50 alloys”

Shaped profile wire

Available in:
- all alloys shown in this brochure, plus other ferrous and non-ferrous materials
- 0.4 mm (.0157") to 16 mm (.630")
- quantities from 3 metres to 3 tonnes
- hard, bright annealed or your special temper condition
- coils, spools and bulk reels
- cut lengths of 50 mm to 3 metres

If you have a special material requirement or you have a specific shape, contact us for your quote
Flat wire – Ribbon / Foil / Tape

Order quantities from 3 metres to 3 tonnes

Available in:
- all alloys shown in this brochure, plus other ferrous and non-ferrous materials not listed
- max. width 20 mm (.787")
- min. thickness 0.025 mm (.001")
- max. ratio width: thickness = 50:1
- order quantities from 3 metres to 3 tonnes
- hard, bright annealed or special temper condition

Wire rope & strand

Another product that AWI specialise in is wire rope and strand in High Performance alloys, for use in highly corrosive or high temperature environments.

Market sectors include oil & gas technology, metering devices, chemical plants, robotics and many more. Stranded wire provides strength, but also flexibility to the overall wire.

Available in:
- all alloys shown in this brochure
- diameters of 0.4 mm (.0157") to 20 mm (.787")
- order quantities from 3 metres to 3000 metres

Available in all alloys
Monel, Hastelloy, MP35N, Inconel, Phynox etc.

Manufacturing sizes from 0.4 mm to 20 mm diameter
Supporting the spring manufacturer

At AWI we manufacture wire for spring makers worldwide, providing unrivalled technical support in the design of a successful end product.

Our knowledge and experience within this industry enables us to produce wire with the perfect properties required for precision coiling and – when you combine this with our 98% on time delivery performance – ensures our customers are able to deliver springs to schedule with minimal waste. This allows them to save money and grow business through their own client satisfaction.

We regularly supply just enough wire to make 2 or 3 springs for critical repairs or for testing new products.

Wire made to your spring design requirements

Manufacturing spring wire with:

- Soap Coating
- Dead Cast
- Consistent Temper

Flat wire for spring energiser seals

Precision rolled flat wire to exacting dimensional tolerances and specific hardnesses

AWI manufactures precision rolled flat wire to exacting mechanical and dimensional tolerances for a multitude of industries.

Manufacturers of spring energisers around the world call on us to supply their flat wire to achieve all the strict design requirements of their customer – we don’t just process wire, we make it to order!

- Phynox (UNS R30003)
- Alloy MP35N
- Hastelloy
- Inconel
- Stainless Steel
Wire for precision electronics

Alloy Wire International manufacture wire for precision electronics, where dimensional tolerances and surface finish are critical. The wire can also be made to differing levels of hardness and can be supplied as the finished straight pin.

Customers using our electrical resistance wire for precision wire wound resistors can specify their round or flat wire to linear resistance. It is available with a bright or oxidised surface finish.

Controlled Expansion Alloys
- NILO® 36 (Invar®)
- NILO® 42
- NILO® 48
- NILO® 52
- NILO® K (Kovar)

Nickel Wire
- NICKEL® 200
- NICKEL® 201
- NICKEL® 205
- NICKEL® 212
- NICKEL® 270

Beryllium-Copper CB101

Glass to metal seals

Wire wound resistors
- 80/20 Nickel-Chrome (Nichrome)
- 45/55 Nickel-Copper (Constantan)
- RW 135 Iron-Chrome-Aluminium

Bright annealed wire and oxidised wire available.
Hot & cold cutting wire

Alloy Wire manufacture wire for both hot and cold cutting applications. Wire choice is made depending upon the strength, ductility and corrosion resistance required of the wire.

Our ‘high strength’ hot cutting wire range is used for the cutting of polystyrene (EPS)/Foam and boasts an excellent track record for working continuously on oscillating cutting frames. To achieve the best cut, adjust the temperature and cutting speed.

Our cold cutting wire, with its superior corrosion resistance and ductility, is used within the food industry for the cutting of numerous foods, including cheese.

Wire assemblies

We can supply the complete ‘hot cutting’ wire assembly for Industrial Foam/EPS cutting machines as an alternative to the customer buying direct from the Original Equipment Manufacturer (OEM).

Our pre-assembled ‘wire assemblies’ are used for speed, convenience and reducing production downtime.
## Electrical resistance wire

Electrical resistance wire for heating elements, resistors and packaging machines. Hot cutting wire for foam cutting.

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<td>Band Heaters</td>
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![Image of wire roll and equipment]

We manufacture and stock electrical resistance wire and flat wire for heating elements, resistors, hot wire cutting and bag sealing.

**Not sure what wire to use?**
**Then buy an AWI ‘TESTER PACK’**

If you are unsure of the wire or ribbon size, or electrical resistance (Ohms/m) you require, you can buy a ‘Tester Pack’. This provides you with a selection of different wire or ribbon stock sizes for you to try in your application.

Our resources have allowed us to develop wires for specific applications that perform even better than the standard product. Please ask us about alternatives that may be more cost effective or durable in your application.

- Element wires for heat sealers & impulse sealers
- Vacuum sealing
- ‘T’-profile heat sealing & impulse sealing
- Plastic bag welding
- Wire for ‘L’ sealers
- Hot cutting wires for foam (EPS)
- Electric heating elements
- Electrical resistors

**Order quantities from 3 metres to 3 tonnes**

sales@alloywire.com  www.alloywire.com
## Resistance & Length – 80/20 Ni Cr Round Wire

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## Resistance & length – 80/20 Ni Cr Round Wire

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These values are for bright annealed wire measured at room temperature. You can also order to a specific size or electrical resistance. For 45/55 NiCu convert using the above Ohms/m or Ohms/ft x 0.454
### Resistance & length – 80/20 Ni Cr Flat Wire / Ribbon / Foil / Tape (mm)

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These values are for bright annealed wire measured at room temperature.
You can also order to a specific size or electrical resistance.
For 45/55 NiCu convert using the above Ohms/m or Ohms/ft x 0.454.
### Resistance & length – 80/20 Ni Cr Flat Wire / Ribbon / Foil / Tape (inches)

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<td>5.557</td>
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<td>3023</td>
<td>2031</td>
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<tr>
<td>.025</td>
<td>.002</td>
<td>10.38</td>
<td>34.06</td>
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<td>2.739</td>
<td>8.985</td>
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<td>17.33</td>
<td>2874</td>
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<td>9.800</td>
<td>32.15</td>
<td>5331</td>
<td>3582</td>
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</tbody>
</table>

These values are for bright annealed wire measured at room temperature.
You can also order to a specific size or electrical resistance.
For 45/55 NiCu convert using the above Ohms/m or Ohms/ft x 0.454
6 key advantages to you, our customer

**Range**
Size: 0.025 mm (.001”) to 21 mm (.827”)

**Order quantity**
Order quantity: 3 metres to 3 tonnes

**Delivery**
Delivery: within 3 weeks

**50**
Wire, bars & rope in over 50 alloys

**Manufactured to your specification**

**Emergency Manufacturing Service**

---

**Industries we serve**
- Aerospace
- Oil & Gas
- Nuclear
- Power generation
- Chemical industries
- Marine engineering
- Automotive
- Pharmaceuticals
- Ceramics
It’s more than just wire manufacturing

Founded in 1946, Alloy Wire is the world’s preferred manufacturer of nickel alloy wire, providing customers with the assurance of quality, delivery and accuracy... the fundamental reasons behind our strapline...

“We can manufacture quality, delivering reliability”

We are a 100% employee owned company, an environment that creates interest, loyalty and commitment from every member of our staff.

To remain a top supplier of nickel alloy wire, AWI’s main priorities are in ongoing investment in new technology, equipment and training.

Our R&D facilities enable us to constantly explore new materials and processes, in order to expand our range of products and services. Customers regularly compliment us on the technical expertise and support we provide.

Aerospace, nuclear, oil & gas – three industries that use Alloy Wire for their safety critical components to withstand high temperatures and corrosive environments
Alloy Wire International is a specialist manufacturer of precision cold drawn round wire, flat wire, shaped wire and wire rope in over 50 different High Performance 'Exotic' nickel alloys.

Why work with us?

Why is AWI such a successful nickel alloy wire specialist?

Firstly, we are completely owned by everyone that works here. This can be seen throughout the organisation when you walk around our factories, or you speak with any of our forty offices in four different continents. Smiles and knowledge are in abundance and each member of staff shares a desire to ensure their individual roles contribute to the positive experience of the customer.

The offer

We offer wire from 0.025 mm (.001”) to 21.0 mm (.827”) and currently work with 4000 customers in more than 15 sectors.

Our extensive stockholding of materials (EU/DFARS), ability to provide small batch quantities and 3 week lead times has seen us become a global leader, delivering our wire to more than 45 countries across the world.

“You need a certain culture to achieve employee ownership, one of transparency, trust and togetherness... almost like a family.”

Mark Venables, Managing Director
A truly global presence

Representatives in over 40 countries

See our website for full details of your local office
100% employee owned

Alloy Wire International is 100% owned by all its employees

This means they have an invested interest in the success of the business and, therefore, are committed to giving our customers ‘First Class’ service. From the Annealing Technicians to the Maintenance Engineers and right through to the Shipping team, all staff are focused on completing your order on time and to specification.

An on-time quality product – with great service – helps our customers receive repeat business and creates another client loyal to Alloy Wire.

“...an on-time quality product – with great service – helps our customers receive repeat business and creates another client loyal to Alloy Wire”
Emergency Manufacturing Service - E.M.S

Wire required urgently?

If you have an emergency situation and require your wire even faster, ask for our Emergency Manufacturing Service (E.M.S). This truly special service ensures your wire is manufactured within days and shipped to your door by the fastest route possible.

When you need your wire manufactured fast!

Processing your free issue material

If you have a special grade of material that you require processing to a smaller size and to a precise specification, we can help.

We will convert your free issue wire or bars to your exact requirements. Our expertise in manufacturing small order quantities means very little material is lost in the setting up process and that’s why we are entrusted to process customers high value materials, such as Silver-Palladium.

“...skill in manufacturing small order quantities means very little material is lost in the setting up process”
A full comprehensive service

Hands-on manufacturing

- Over 85 tonnes of stock
- A manufacturing lead time of 3 weeks
- Accepting orders from 3 metres to 3 tonnes

On-site maintenance

- Self-sufficient maintenance
- Bespoke machinery made on site
- Round and shaped wire, produced on machinery specifically designed for Alloy Wire International

Listening to our customers and manufacturing to their needs

Bespoke manufacturing

- Emergency Manufacturing Service available (E.M.S)
- Manufacturing in coils, on spools or straight bars
- Wire produced to your specification
Multiple size ranges

- **Wire diameters:**
  0.025 mm (.001") to 21.0 mm (.827")

- **Shaped profile wire:**
  widths from 0.4 mm (.0157") to 16.0 mm (.630")
  thickness from 0.025 mm (.001") to 6.0 mm (.236")

- **Bars and ground lengths:**
  3 mm (.118") to 3 m (10 ft)

Technical support

- Providing you with technical support before and after your order, giving you confidence in your purchase and product design

The complete service

- We can re-process your free issue material
- Regular customer visits to understand your needs
- Exhibiting internationally to promote new materials and processes

Shipping

- Positive Material Identification (XRF) done before shipping as part of our 100% final inspection
- High quality bespoke packaging for secure delivery worldwide
Technical support & service

As approved suppliers of nickel alloys into numerous high technology products, we have a wealth of knowledge and experience in the application of the wire and its specific processing to achieve the customer’s design. AWI’s proficiency of the craft and science behind wire manufacturing is of the very highest level.

We offer you technical support from inception to completion and can answer common questions, such as:

- How do I heat treat?
- What is my maximum operating temperature?
- What tensile strength do I need?
- What is the specification AMS 5699?
- Which alloy for my application?

Answering your technical questions gives you confidence in your product’s success

Sales team

Alloy Wire recognise that good business is all about people and service, and it is this mind-set that has made us the preferred choice for nickel alloys.

A first-class and consistent service is key to repeat business as well as the growth of new business.

Meet our global sales team: www.alloywire.com/international
Be confident doing business with us

Quality
Alloy Wire International has maintained quality approval ISO 9001 since 1991 and also achieved accreditation to the aerospace quality standard AS 9100 in April 2013. Both of these approvals are in recognition that our manufacturing and processing techniques are defined to the highest industry standards achievable.

Environmental
We are fully committed to the promotion and preservation of our environment and achieved approval to ISO 14001 in 2015. This demonstrates our commitment to exceed our moral environmental responsibility.

Health and Safety
In 2015, we were awarded the health & safety approval BS OHSAS 18001, which demonstrates the importance we place on exceeding our legal & moral obligations for the well-being and safety of all employees and visitors.

Inspection and Testing
All incoming materials are visually inspected and P.M.I (Positive Material Identification) tested before processing begins. In-process inspection is carried out at every stage of production and full traceability maintained throughout.

Final Inspection on all finished material may include:
- Dimensional Checks
- Surface Finish
- Tensile Strength
- Proof Stress
- Elongation
- Breaking Loads
- Hardness*

* All hardness tests are measured in Vickers and converted using conversion tables in ASTM E140.

Kevin Guest - Quality Executive

Our wire is used for various component parts in aero engines – where quality and dependability is essential.
Here are our standard tolerances. If you require tighter tolerances, please ask.

### Wire Diameter Tolerances

<table>
<thead>
<tr>
<th>Wire Diameter Tolerance</th>
<th>mm</th>
<th>inch</th>
<th>Tolerance</th>
<th>mm</th>
<th>inch</th>
<th>Tolerance</th>
</tr>
</thead>
<tbody>
<tr>
<td>.0254</td>
<td>.203</td>
<td>± .0051</td>
<td>.001</td>
<td>.008</td>
<td>± .002</td>
<td></td>
</tr>
<tr>
<td>.203</td>
<td>.376</td>
<td>± .0076</td>
<td>.008</td>
<td>.015</td>
<td>± .003</td>
<td></td>
</tr>
<tr>
<td>.376</td>
<td>.813</td>
<td>± .0100</td>
<td>.015</td>
<td>.032</td>
<td>± .004</td>
<td></td>
</tr>
<tr>
<td>.813</td>
<td>1.22</td>
<td>± .0127</td>
<td>.032</td>
<td>.048</td>
<td>± .005</td>
<td></td>
</tr>
<tr>
<td>1.220</td>
<td>2.03</td>
<td>± .0152</td>
<td>.048</td>
<td>.080</td>
<td>± .006</td>
<td></td>
</tr>
<tr>
<td>2.030</td>
<td>3.25</td>
<td>± .0203</td>
<td>.080</td>
<td>.128</td>
<td>± .008</td>
<td></td>
</tr>
<tr>
<td>3.250</td>
<td>4.47</td>
<td>± .0254</td>
<td>.128</td>
<td>.176</td>
<td>± .010</td>
<td></td>
</tr>
<tr>
<td>4.470</td>
<td>5.89</td>
<td>± .0381</td>
<td>.176</td>
<td>.232</td>
<td>± .015</td>
<td></td>
</tr>
<tr>
<td>5.890</td>
<td>8.00</td>
<td>± .0510</td>
<td>.232</td>
<td>.315</td>
<td>± .020</td>
<td></td>
</tr>
<tr>
<td>8.000</td>
<td>10.0</td>
<td>± .0635</td>
<td>.315</td>
<td>.395</td>
<td>± .025</td>
<td></td>
</tr>
<tr>
<td>10.00</td>
<td>21.0</td>
<td>± .0762</td>
<td>.395</td>
<td>.827</td>
<td>± .030</td>
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### Wire Ovality Tolerances

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<th>Wire Ovality Tolerance</th>
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<th>inch</th>
<th>Tolerance</th>
<th>mm</th>
<th>inch</th>
<th>Tolerance</th>
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<td>.0254</td>
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<td>.001</td>
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<td>± .002</td>
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<tr>
<td>.0508</td>
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<td>.0076</td>
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<td>1.02</td>
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<td>.0100</td>
<td>.040</td>
<td>.080</td>
<td>± .004</td>
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<td>2.03</td>
<td>4.47</td>
<td>.0127</td>
<td>.080</td>
<td>.176</td>
<td>± .005</td>
<td></td>
</tr>
<tr>
<td>4.47</td>
<td>8.00</td>
<td>.0152</td>
<td>.176</td>
<td>.315</td>
<td>± .006</td>
<td></td>
</tr>
<tr>
<td>8.00</td>
<td>21.0</td>
<td>.0203</td>
<td>.315</td>
<td>.827</td>
<td>± .008</td>
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### Flat Wire Tolerances

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<tr>
<td>Width ± 5%</td>
<td>Width ± 5%</td>
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</tr>
<tr>
<td>Thickness ≤0.20</td>
<td>± .0100</td>
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</tr>
<tr>
<td>Thickness &gt;0.20</td>
<td>± 5%</td>
<td>± .008</td>
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### Section Tolerances

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<thead>
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<td>± 0.04</td>
<td>-</td>
<td>0.0787</td>
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<tr>
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<td>± 0.07</td>
<td>.0787</td>
<td>.157</td>
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<tr>
<td>4.0</td>
<td>-</td>
<td>± 0.15</td>
<td>.157</td>
<td>-</td>
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</table>

sales@alloywire.com | www.alloywire.com
### Straight Length Tolerances

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<td>length</td>
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<tr>
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<td>up to 1000</td>
</tr>
<tr>
<td>up to 2.5</td>
<td>1000 – 2000</td>
</tr>
<tr>
<td>up to 2.5</td>
<td>2000 – 3000</td>
</tr>
<tr>
<td>2.5 – 5.0</td>
<td>up to 1000</td>
</tr>
<tr>
<td>2.5 – 5.0</td>
<td>1000 – 2000</td>
</tr>
<tr>
<td>2.5 – 5.0</td>
<td>2000 – 3000</td>
</tr>
<tr>
<td>5.0 – 12.0</td>
<td>up to 1000</td>
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<tr>
<td>5.0 – 12.0</td>
<td>1000 – 2000</td>
</tr>
<tr>
<td>5.0 – 12.0</td>
<td>2000 – 3000</td>
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### Electrical Resistance Tolerances

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<td>up to but excluding</td>
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<tr>
<td>0.0254</td>
<td>0.0508</td>
</tr>
<tr>
<td>0.0508</td>
<td>0.076</td>
</tr>
<tr>
<td>0.076</td>
<td>0.15</td>
</tr>
<tr>
<td>0.15</td>
<td></td>
</tr>
<tr>
<td>Flat wire</td>
<td></td>
</tr>
</tbody>
</table>

Mechanical results are achieved utilising the latest in-house computer aided testing equipment, giving high levels of accuracy and increased efficiency in our testing.
### Packaging

To ensure your order arrives in perfect condition, we use specifically designed high quality packaging and proven reliable international couriers.

### Coils

<table>
<thead>
<tr>
<th>mm</th>
<th>inch</th>
<th>mm</th>
<th>inch</th>
<th>kg</th>
<th>lb</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.25 – 0.70</td>
<td>.010 – .0275</td>
<td>200</td>
<td>8</td>
<td>20</td>
<td>44</td>
</tr>
<tr>
<td>0.7 – 1.6</td>
<td>.0275 – .063</td>
<td>300</td>
<td>12</td>
<td>50</td>
<td>110</td>
</tr>
<tr>
<td>1.6 – 6.0</td>
<td>.063 – .236</td>
<td>600</td>
<td>24</td>
<td>100</td>
<td>220</td>
</tr>
<tr>
<td>6.0 – 10.0</td>
<td>.236 – .394</td>
<td>800</td>
<td>30</td>
<td>200</td>
<td>440</td>
</tr>
<tr>
<td>10.0 – 21.0</td>
<td>.394 – .827</td>
<td>1000</td>
<td>40</td>
<td>400</td>
<td>880</td>
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### Spools

<table>
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<th>Spool Type</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>Wire Diameter Range</th>
<th>Max. Weight</th>
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</thead>
<tbody>
<tr>
<td>DIN 80</td>
<td>16 mm</td>
<td>50 mm</td>
<td>80 mm</td>
<td>64 mm</td>
<td>80 mm</td>
<td>Up to 0.25 mm</td>
<td>0.800 kg</td>
</tr>
<tr>
<td></td>
<td>.630”</td>
<td>2.00”</td>
<td>3.15”</td>
<td>2.50”</td>
<td>3.15”</td>
<td>Up to .010”</td>
<td>1.7 lb</td>
</tr>
<tr>
<td>DIN 100</td>
<td>16 mm</td>
<td>64 mm</td>
<td>100 mm</td>
<td>80 mm</td>
<td>100 mm</td>
<td>0.19 – 0.4 mm</td>
<td>1.500 kg</td>
</tr>
<tr>
<td></td>
<td>.630”</td>
<td>2.50”</td>
<td>3.90”</td>
<td>3.15”</td>
<td>3.90”</td>
<td>.0076” – .016”</td>
<td>3.3 lb</td>
</tr>
<tr>
<td>DIN 125</td>
<td>16 mm</td>
<td>80 mm</td>
<td>125 mm</td>
<td>100 mm</td>
<td>125 mm</td>
<td>0.19 – 0.55 mm</td>
<td>3 kg</td>
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<tr>
<td></td>
<td>.630”</td>
<td>3.15”</td>
<td>4.90”</td>
<td>3.90”</td>
<td>4.90”</td>
<td>.0076” – .022”</td>
<td>6.5 lb</td>
</tr>
<tr>
<td>DIN 160</td>
<td>22 mm</td>
<td>100 mm</td>
<td>160 mm</td>
<td>128 mm</td>
<td>160 mm</td>
<td>0.25 – 0.71 mm</td>
<td>5 kg</td>
</tr>
<tr>
<td></td>
<td>.865”</td>
<td>3.90”</td>
<td>6.300”</td>
<td>5.040”</td>
<td>6.300”</td>
<td>.010” – .028”</td>
<td>11 lb</td>
</tr>
<tr>
<td>DIN 200</td>
<td>36 mm</td>
<td>125 mm</td>
<td>200 mm</td>
<td>160 mm</td>
<td>200 mm</td>
<td>0.4 – 0.81 mm</td>
<td>10 kg</td>
</tr>
<tr>
<td></td>
<td>1.400”</td>
<td>4.920”</td>
<td>7.875”</td>
<td>6.300”</td>
<td>7.875”</td>
<td>.016” – .032”</td>
<td>22 lb</td>
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<tr>
<td>DIN 250</td>
<td>36 mm</td>
<td>160 mm</td>
<td>250 mm</td>
<td>200 mm</td>
<td>200 mm</td>
<td>0.4 – 1.5 mm</td>
<td>20 kg</td>
</tr>
<tr>
<td></td>
<td>1.400”</td>
<td>6.300”</td>
<td>10.000”</td>
<td>6.300”</td>
<td>7.875”</td>
<td>.016” – .060”</td>
<td>44 lb</td>
</tr>
<tr>
<td>DIN 355</td>
<td>36 mm</td>
<td>225 mm</td>
<td>355 mm</td>
<td>200 mm</td>
<td>200 mm</td>
<td>1.0 – 3.0 mm</td>
<td>40 kg</td>
</tr>
<tr>
<td></td>
<td>1.400”</td>
<td>8.75”</td>
<td>14.000”</td>
<td>6.25”</td>
<td>8”</td>
<td>.040” – .118”</td>
<td>88 lb</td>
</tr>
<tr>
<td>DIN 500</td>
<td>36 mm</td>
<td>316 mm</td>
<td>500 mm</td>
<td>180 mm</td>
<td>250 mm</td>
<td>1.2 – 3.0 mm</td>
<td>75 kg</td>
</tr>
<tr>
<td></td>
<td>1.400”</td>
<td>12.440”</td>
<td>19.690”</td>
<td>7.090”</td>
<td>9.840”</td>
<td>.047” – .118”</td>
<td>165 lb</td>
</tr>
<tr>
<td>SK 460</td>
<td>305 mm</td>
<td>318 mm</td>
<td>460 mm</td>
<td>91 mm</td>
<td>105 mm</td>
<td>0.25 – 1.8 mm</td>
<td>45 kg</td>
</tr>
<tr>
<td></td>
<td>12.000”</td>
<td>12.520”</td>
<td>18.110”</td>
<td>3.580”</td>
<td>4.134”</td>
<td>.010” – .072”</td>
<td>95 lb</td>
</tr>
<tr>
<td>SK 255</td>
<td>216 mm</td>
<td>222 mm</td>
<td>253 mm</td>
<td>30 mm</td>
<td>36 mm</td>
<td>0.25 – 1.0 mm</td>
<td>1 kg</td>
</tr>
<tr>
<td></td>
<td>8.500”</td>
<td>8.740”</td>
<td>10.000”</td>
<td>1.200”</td>
<td>1.420”</td>
<td>.010” – .040”</td>
<td>2.2 lb</td>
</tr>
<tr>
<td>Locking Reel</td>
<td>16 mm</td>
<td>70 mm</td>
<td>102 mm</td>
<td>38 mm</td>
<td>45 mm</td>
<td>0.25 – 1.0 mm</td>
<td>0.500 kg</td>
</tr>
<tr>
<td></td>
<td>.630”</td>
<td>2.750”</td>
<td>4.000”</td>
<td>1.500”</td>
<td>1.770”</td>
<td>.010” – .040”</td>
<td>1.00 lb</td>
</tr>
<tr>
<td>¼ Cat</td>
<td>16 mm</td>
<td>43 mm</td>
<td>63 mm</td>
<td>51 mm</td>
<td>60 mm</td>
<td>Up to 0.25 mm</td>
<td>0.300 kg</td>
</tr>
<tr>
<td></td>
<td>.630”</td>
<td>1.700”</td>
<td>2.500”</td>
<td>2.000”</td>
<td>2.360”</td>
<td>Up to .010”</td>
<td>0.60 lb</td>
</tr>
<tr>
<td>½ Cat</td>
<td>16 mm</td>
<td>43 mm</td>
<td>63 mm</td>
<td>76 mm</td>
<td>86 mm</td>
<td>Up to 0.25 mm</td>
<td>0.500 kg</td>
</tr>
<tr>
<td></td>
<td>.630”</td>
<td>1.700”</td>
<td>2.500”</td>
<td>3.000”</td>
<td>3.390”</td>
<td>Up to .010”</td>
<td>1.00 lb</td>
</tr>
<tr>
<td>Argon / Mig</td>
<td>52 mm</td>
<td>208 mm</td>
<td>300 mm</td>
<td>90 mm</td>
<td>102 mm</td>
<td>0.5 – 1.64 mm</td>
<td>12 kg</td>
</tr>
<tr>
<td></td>
<td>2.050”</td>
<td>8.190”</td>
<td>11.810”</td>
<td>3.540”</td>
<td>4.020”</td>
<td>.020” – .064”</td>
<td>25 lb</td>
</tr>
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</table>

### Straight Lengths, Bars, or Pins

<table>
<thead>
<tr>
<th>Dia mm</th>
<th>Dia inch</th>
<th>Length mm</th>
<th>Length inch</th>
<th>Surface finishes</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.3 – 12.0</td>
<td>.0118 – .472</td>
<td>3.0 – 4500</td>
<td>.118 – 177</td>
<td>Bright or ground or oxidised</td>
</tr>
</tbody>
</table>

If you require neutral labels or labels with your branding, let us know.
Our Alloys
### Chemical Composition

<table>
<thead>
<tr>
<th>Element</th>
<th>Min %</th>
<th>Max %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ni</td>
<td>72.00</td>
<td>-</td>
</tr>
<tr>
<td>Cr</td>
<td>14.00</td>
<td>17.00</td>
</tr>
<tr>
<td>Fe</td>
<td>6.00</td>
<td>10.00</td>
</tr>
<tr>
<td>Mn</td>
<td>-</td>
<td>1.00</td>
</tr>
<tr>
<td>C</td>
<td>-</td>
<td>0.10</td>
</tr>
<tr>
<td>Cu</td>
<td>-</td>
<td>0.50</td>
</tr>
<tr>
<td>Si</td>
<td>-</td>
<td>0.50</td>
</tr>
<tr>
<td>S</td>
<td>-</td>
<td>0.015</td>
</tr>
<tr>
<td>P</td>
<td>-</td>
<td>0.04</td>
</tr>
<tr>
<td>Co</td>
<td>-</td>
<td>1.00</td>
</tr>
<tr>
<td>Nb/Cb</td>
<td>-</td>
<td>1.00</td>
</tr>
<tr>
<td>Ti</td>
<td>-</td>
<td>0.50</td>
</tr>
<tr>
<td>Ta</td>
<td>-</td>
<td>0.05</td>
</tr>
<tr>
<td>Al</td>
<td>-</td>
<td>0.35</td>
</tr>
</tbody>
</table>

### Specifications

- AMS 5665
- AMS 5687
- ASTM B166
- BS 3075 NA 14
- BS 3076 NA 14
- DTD 328A
- QQ-W-390

### Key Features

- Good Oxidation Resistance
- Good Corrosion Resistance at high temperatures
- High temperature static applications

### Typical Applications

- Furnace Components
- Chemical Processing
- Food Processing
- Nuclear Engineering

### Designations

- W.Nr. 2.4816
- UNS N06600
- AWS 010

### Density

<table>
<thead>
<tr>
<th>Density</th>
<th>8.47 g/cm³</th>
<th>0.306 lb/in³</th>
</tr>
</thead>
</table>

### Melting Point

| Coefficient of Expansion | 13.3 μm/m °C (20 – 100 °C) | 7.4 x 10⁻⁶ in/in °F (70 – 212 °F) |

### Modulus of Rigidity

| Modulus of Elasticity | 75.6 kN/mm² | 10965 ksi |

### Modulus of Elasticity

| Modulus of Elasticity | 206 kN/mm² | 29878 ksi |

### Heat Treatment of Finished Parts

<table>
<thead>
<tr>
<th>Condition as supplied by Alloy Wire</th>
<th>Type</th>
<th>Temperature</th>
<th>Time (Hr)</th>
<th>Cooling</th>
</tr>
</thead>
<tbody>
<tr>
<td>Annealed or Spring Temper</td>
<td>Stress Relieve</td>
<td>460 °C</td>
<td>860 °F</td>
<td>1 Air</td>
</tr>
</tbody>
</table>

### Properties

<table>
<thead>
<tr>
<th>Condition</th>
<th>Approx. tensile strength N/mm²</th>
<th>Approx. operating temperature °C</th>
<th>°F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Annealed</td>
<td>600 – 850</td>
<td>-200 to +1000</td>
<td>-330 to +1830</td>
</tr>
<tr>
<td>Spring Temper</td>
<td>900 – 1450</td>
<td>-200 to +1000</td>
<td>-330 to +1830</td>
</tr>
</tbody>
</table>

Slight magnetism may occur below 120 °C (184 °F)

The above tensile strength ranges are typical. If you require different please ask.

**Static application** = still/fixed/motionless/rigid
## Chemical Composition Specifications

<table>
<thead>
<tr>
<th>Element</th>
<th>Min %</th>
<th>Max %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ni</td>
<td>58.00</td>
<td>63.00</td>
</tr>
<tr>
<td>Cr</td>
<td>21.00</td>
<td>25.00</td>
</tr>
<tr>
<td>S</td>
<td>-</td>
<td>0.015</td>
</tr>
<tr>
<td>Mn</td>
<td>-</td>
<td>1.00</td>
</tr>
<tr>
<td>Al</td>
<td>1.00</td>
<td>1.70</td>
</tr>
<tr>
<td>C</td>
<td>-</td>
<td>0.10</td>
</tr>
<tr>
<td>Cu</td>
<td>-</td>
<td>1.00</td>
</tr>
<tr>
<td>Si</td>
<td>-</td>
<td>0.50</td>
</tr>
<tr>
<td>Fe</td>
<td>BAL</td>
<td></td>
</tr>
</tbody>
</table>

### Designations
- W.Nr. 2.4851
- UNS N06601
- AWS 011

### Key Features
- Outstanding resistance to oxidation & other forms of high temperature corrosion
- Higher mechanical properties at elevated temperatures than Inconel 600
- High temperature static applications

### Typical Applications
- Petrochemical - Processing
- Industrial Furnaces
- Gas Turbine - Components
- Heat Treating - Equipment

<table>
<thead>
<tr>
<th>Dense</th>
<th>8.11 g/cm³</th>
<th>0.293 lb/in³</th>
</tr>
</thead>
<tbody>
<tr>
<td>Melting Point</td>
<td>1411 °C</td>
<td>2571 °F</td>
</tr>
<tr>
<td>Coefficient of Expansion</td>
<td>13.75 μm/m °C (20 – 100 °C)</td>
<td>7.6 x 10⁻⁶ in/in °F (70 – 212 °F)</td>
</tr>
<tr>
<td>Modulus of Rigidity</td>
<td>81.2 kN/mm²</td>
<td>11777 ksi</td>
</tr>
<tr>
<td>Modulus of Elasticity</td>
<td>206.5 kN/mm²</td>
<td>29951 ksi</td>
</tr>
</tbody>
</table>

### Heat Treatment of Finished Parts

<table>
<thead>
<tr>
<th>Condition as supplied by Alloy Wire</th>
<th>Type</th>
<th>Temperature</th>
<th>Time (Hr)</th>
<th>Cooling</th>
</tr>
</thead>
<tbody>
<tr>
<td>Annealed or Spring Temper</td>
<td>Stress Relieve</td>
<td>480 – 870 °C</td>
<td>900 – 1600 °F</td>
<td>1 Air</td>
</tr>
</tbody>
</table>

Temperature depends on composition and amount of cold work

### Properties

<table>
<thead>
<tr>
<th>Condition</th>
<th>Approx. tensile strength</th>
<th>Approx. operating temperature</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N/mm²</td>
<td>ksi</td>
</tr>
<tr>
<td>Annealed</td>
<td>700 – 900</td>
<td>102 – 131</td>
</tr>
<tr>
<td>Spring Temper</td>
<td>1200 – 1450</td>
<td>174 – 210</td>
</tr>
</tbody>
</table>

The above tensile strength ranges are typical. If you require different please ask.

*Static application* = still/fixed/motionless/rigid
### Chemical Composition Specifications Key Features Typical Applications

<table>
<thead>
<tr>
<th>Element</th>
<th>Min %</th>
<th>Max %</th>
<th>Specifications</th>
<th>Key Features</th>
<th>Typical Applications</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>-</td>
<td>0.10</td>
<td>AMS 5666</td>
<td>Excellent corrosion resistance in a wide range of corrosive media</td>
<td>Marine Industries</td>
</tr>
<tr>
<td>Mn</td>
<td>-</td>
<td>0.50</td>
<td>ASTM B446</td>
<td>Especially resistant to pitting and crevice corrosion</td>
<td>Aerospace Industries</td>
</tr>
<tr>
<td>Si</td>
<td>-</td>
<td>0.50</td>
<td>BS 3076 NA 21</td>
<td>Good for sea water applications</td>
<td>Chemical Processing</td>
</tr>
<tr>
<td>P</td>
<td>-</td>
<td>0.015</td>
<td>ISO 15156-3</td>
<td></td>
<td>Nuclear Reactors</td>
</tr>
<tr>
<td>S</td>
<td>-</td>
<td>0.015</td>
<td>(NACE MR 0175)</td>
<td></td>
<td>Pollution Control</td>
</tr>
<tr>
<td>Cr</td>
<td>20.00</td>
<td>23.00</td>
<td>W.Nr. 2.4856</td>
<td></td>
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</tr>
<tr>
<td>Co</td>
<td>-</td>
<td>1.00</td>
<td>UNS N06625</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mo</td>
<td>8.00</td>
<td>10.00</td>
<td>AWS 012</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fe</td>
<td>-</td>
<td>5.00</td>
<td>Designations</td>
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<td></td>
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<tr>
<td>Al</td>
<td>-</td>
<td>0.40</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ti</td>
<td>-</td>
<td>0.40</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ni</td>
<td>58.00</td>
<td>-</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nb/Cb</td>
<td>3.15</td>
<td>4.15</td>
<td></td>
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</tr>
<tr>
<td>Ta</td>
<td>-</td>
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### Designations

- W.Nr. 2.4856
- UNS N06625
- AWS 012

### Properties

#### Condition as supplied by Alloy Wire

<table>
<thead>
<tr>
<th>Condition as supplied by Alloy Wire</th>
<th>Type</th>
<th>Temperature</th>
<th>Time (Hr)</th>
<th>Cooling</th>
</tr>
</thead>
<tbody>
<tr>
<td>Annealed or Spring Temper</td>
<td>Stress Relieve</td>
<td>260 – 370</td>
<td>0.5 – 1</td>
<td>Air</td>
</tr>
<tr>
<td></td>
<td></td>
<td>500 – 700</td>
<td></td>
<td></td>
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</tbody>
</table>

#### Approx. tensile strength

<table>
<thead>
<tr>
<th>Condition</th>
<th>Approx. tensile strength</th>
<th>Approx. operating temperature</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N/mm² (ksi) °C °F</td>
<td></td>
</tr>
<tr>
<td>Annealed</td>
<td>800 – 1000 (116 – 145)</td>
<td>-200 to + 340 (−330 to + 645)</td>
</tr>
<tr>
<td>Spring Temper</td>
<td>1300 – 1600 (189 – 232)</td>
<td>up to + 200 (up to + 395)</td>
</tr>
</tbody>
</table>

The above tensile strength ranges are typical. If you require different please ask.
## Chemical Composition

<table>
<thead>
<tr>
<th>Element</th>
<th>Min %</th>
<th>Max %</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
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<td>0.08</td>
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<tr>
<td>Mn</td>
<td></td>
<td>0.35</td>
</tr>
<tr>
<td>Si</td>
<td></td>
<td>0.35</td>
</tr>
<tr>
<td>P</td>
<td></td>
<td>0.015</td>
</tr>
<tr>
<td>S</td>
<td></td>
<td>0.015</td>
</tr>
<tr>
<td>Cr</td>
<td>17.00</td>
<td>21.00</td>
</tr>
<tr>
<td>Ni</td>
<td>50.00</td>
<td>55.00</td>
</tr>
<tr>
<td>Mo</td>
<td>2.80</td>
<td>3.30</td>
</tr>
<tr>
<td>Nb/Cb</td>
<td>4.75</td>
<td>5.50</td>
</tr>
<tr>
<td>Ti</td>
<td>0.65</td>
<td>1.15</td>
</tr>
<tr>
<td>Al</td>
<td>0.20</td>
<td>0.80</td>
</tr>
<tr>
<td>Co</td>
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<td>1.00</td>
</tr>
<tr>
<td>Ta</td>
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<td>0.05</td>
</tr>
<tr>
<td>B</td>
<td></td>
<td>0.006</td>
</tr>
<tr>
<td>Cu</td>
<td></td>
<td>0.30</td>
</tr>
<tr>
<td>Pb</td>
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<td>0.0005</td>
</tr>
<tr>
<td>Bi</td>
<td></td>
<td>0.0003</td>
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<td>Se</td>
<td></td>
<td>0.0003</td>
</tr>
<tr>
<td>Fe</td>
<td></td>
<td>BAL</td>
</tr>
</tbody>
</table>

## Specifications

| AMS 5662 | AMS 5663 | AMS 5832 | AMS 5962 | ASTM B667 | GE B5OTF14/15 | GE B14H89 | ISO 15156-3 | (NACE MR 0175) |

## Key Features

- Good creep rupture strength at high temperatures
- Higher strength than Inconel X-750
- Better mechanical properties at lower temperatures than Nimonic 90 and Inconel X-750
- Age hardenable
- Dynamic applications

## Typical Applications

- Gas Turbines
- Rocket Motors
- Space Craft
- Nuclear Reactors
- Pumps

## Designations

- W:Nr. 2.4668
- UNS N07718
- AWS 013

## Density

8.19 g/cm³ 0.296 lb/in³

## Melting Point

1336 °C 2437 °F

## Coefficient of Expansion

13.0 μm/m °C (20 – 100°C) 7.2 x 10⁻⁶ in/in °F (70 – 212 °F)

## Modulus of Rigidity

77.2 kN/mm² 11197 ksi

## Modulus of Elasticity

204.9 kN/mm² 29719 ksi

## Heat Treatment of Finished Parts

<table>
<thead>
<tr>
<th>Condition as supplied by Alloy Wire</th>
<th>Type</th>
<th>Temperature °C °F</th>
<th>Time (Hr)</th>
<th>Cooling</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. 1 Temper or Spring Temper</td>
<td>Anneal</td>
<td>980 1800</td>
<td>1</td>
<td>Air</td>
</tr>
<tr>
<td></td>
<td>Age Harden</td>
<td>720 1330</td>
<td>8</td>
<td>Furnace</td>
</tr>
<tr>
<td></td>
<td>Total Age</td>
<td>620 1150</td>
<td>18</td>
<td>Air</td>
</tr>
<tr>
<td>No. 1 Temper or Spring Temper</td>
<td>Anneal</td>
<td>1010 1850</td>
<td>2</td>
<td>Air</td>
</tr>
<tr>
<td>(for ISO 15156-3 / NACE MR 0175)</td>
<td>Age Harden</td>
<td>720 1455</td>
<td>6</td>
<td>Air</td>
</tr>
<tr>
<td></td>
<td>Total Age</td>
<td>620 1130</td>
<td>8</td>
<td>Furnace</td>
</tr>
<tr>
<td></td>
<td></td>
<td>620 1330</td>
<td>18</td>
<td>Air</td>
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## Properties

<table>
<thead>
<tr>
<th>Condition</th>
<th>Approx. tensile strength N/mm² ksi</th>
<th>Approx. operating temperature °C °F</th>
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<tbody>
<tr>
<td>Annealed</td>
<td>800 – 1000 116 – 145</td>
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</tr>
<tr>
<td>No. 1 Temper</td>
<td>1000 – 1200 145 – 175</td>
<td>- -</td>
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<tr>
<td>Spring Temper</td>
<td>1300 – 1500 189 – 218</td>
<td>- -</td>
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<tr>
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<td>1250 – 1450 181 – 210</td>
<td>-200 to +550 -330 to +1020</td>
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<tr>
<td>No. 1 Temper + Aged</td>
<td>1520 – 1720 220 – 250</td>
<td>Contact Alloy Wire Technical Dept.</td>
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*The above tensile strength ranges are typical. If you require different please ask.*

*Dynamic applications = active/lively/changing*
### Chemical Composition

<table>
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<tr>
<th>Element</th>
<th>Min %</th>
<th>Max %</th>
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</tr>
<tr>
<td>Mn</td>
<td>1.00</td>
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</tr>
<tr>
<td>Si</td>
<td>0.50</td>
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</tr>
<tr>
<td>S</td>
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<tr>
<td>Cr</td>
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<td>17.00</td>
</tr>
<tr>
<td>Ni</td>
<td></td>
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<td>Nb/Cb</td>
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<td>1.20</td>
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<tr>
<td>Ti</td>
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<td>2.75</td>
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<tr>
<td>Al</td>
<td>0.40</td>
<td>1.00</td>
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<tr>
<td>Fe</td>
<td>5.00</td>
<td>9.00</td>
</tr>
<tr>
<td>Co</td>
<td>1.00</td>
<td></td>
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<tr>
<td>Ta</td>
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<td></td>
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<tr>
<td>Cu</td>
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### Specifications

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<thead>
<tr>
<th>AMS 5667</th>
<th>AMS 5671</th>
<th>AMS 5698</th>
<th>AMS 5699</th>
<th>ASTM B637</th>
<th>BS HR 505</th>
<th>GE B14H41</th>
<th>ISO 15156-3</th>
<th>(NACE MR 0175)</th>
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</thead>
</table>

### Key Features

- Good creep rupture strength at high temperatures
- Not as strong as Nimonic 90
- Very good at cryogenic temperatures
- Age hardenable

#### Designations

- W.Nr. 2.4669
- UNS N07750
- AWS 014

### Typical Applications

- Nuclear reactors
- Gas turbines
- Rocket engines
- Pressure vessels
- Aircraft structures

### Heat Treatment of Finished Parts

<table>
<thead>
<tr>
<th>Condition as supplied by Alloy Wire</th>
<th>Type</th>
<th>Temperature</th>
<th>Time (Hr)</th>
<th>Cooling</th>
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<tr>
<td></td>
<td>Temperature</td>
<td>°C</td>
<td>°F</td>
<td></td>
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<td>Spring Temper Age Harden</td>
<td>650</td>
<td>1200</td>
<td>4</td>
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<td>Spring Temper (3 Part)</td>
<td>1150</td>
<td>2100</td>
<td>2 **</td>
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<tr>
<td>Spring Temper Age Harden</td>
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<td>24</td>
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<tr>
<td>Spring Temper Age Harden Age Harden</td>
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<tr>
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### Properties

<table>
<thead>
<tr>
<th>Condition</th>
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<th>Approx. operating temperature</th>
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<tbody>
<tr>
<td></td>
<td>N/mm²</td>
<td>ksi</td>
</tr>
<tr>
<td>Annealed</td>
<td>800 – 1000</td>
<td>116 – 145</td>
</tr>
<tr>
<td>No. 1 Temper</td>
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<td>130 – 167</td>
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<tr>
<td>Spring Temper</td>
<td>1100 – 1500</td>
<td>159 – 217</td>
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<tr>
<td>No. 1 Temper + Aged</td>
<td>1300 – 1450</td>
<td>188 – 210</td>
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<tr>
<td>Spring Temper + Aged</td>
<td>1350 – 1750</td>
<td>196 – 254</td>
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<tr>
<td>Spring Temper + 3 part heat treated</td>
<td>1100 – 1250</td>
<td>159 – 181</td>
</tr>
</tbody>
</table>

The above tensile strength ranges are typical. If you require different please ask.

** Dynamic applications = active/lively/changing

** for diameters below 1.00mm contact AWI Technical department

sales@alloywire.com  www.alloywire.com
### Chemical Composition

<table>
<thead>
<tr>
<th>Element</th>
<th>Min %</th>
<th>Max %</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
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<tr>
<td>Si</td>
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<tr>
<td>Mn</td>
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<td>1.00</td>
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<td>S</td>
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<td>5.00</td>
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<tr>
<td>Cr</td>
<td>18.00</td>
<td>21.00</td>
</tr>
<tr>
<td>Cu</td>
<td>-</td>
<td>0.50</td>
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<tr>
<td>Fe</td>
<td>-</td>
<td>5.00</td>
</tr>
<tr>
<td>Pb</td>
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<td>0.005</td>
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<tr>
<td>Ni</td>
<td>BAL</td>
<td>BAL</td>
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</table>

### Specifications

| BS HR 5 | BS HR 504 |

### Key Features
- Good corrosion resistance
- Good heat resistance
- High temperature static applications

### Typical Applications
- Aerospace fasteners

---

### Designations

- W.Nr. 2.4951
- W.Nr. 2.4630
- UNS N06075
- AWS 032

---

### Properties

#### Condition

<table>
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<tr>
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<td>ksi</td>
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<tr>
<td>Annealed</td>
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<td>102 – 116</td>
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<tr>
<td>Spring Temper</td>
<td>1200 – 1500</td>
<td>174 – 218</td>
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</tbody>
</table>

The above tensile strength ranges are typical. If you require different please ask.

---

### Static applications = still/fixed/motionless/rigid
### Chemical Composition Specifications

<table>
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<th>Element</th>
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<tr>
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### Designations

- W.Nr. 2.4952
- W.Nr. 2.4631
- UNS N07080
- AWS 031

<table>
<thead>
<tr>
<th>Specifications</th>
<th>Key Features</th>
<th>Typical Applications</th>
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<tbody>
<tr>
<td>ASTM B637</td>
<td>Largely superseded by Nimonic 90 &amp; Inconel X-750</td>
<td>Gas turbine components</td>
</tr>
<tr>
<td>BS 3076 NA 20</td>
<td>Still specified for nuclear applications due to low cobalt content</td>
<td>Nuclear industry</td>
</tr>
<tr>
<td>BS HR 1</td>
<td>Age hardenable</td>
<td>Fasteners</td>
</tr>
<tr>
<td>BS HR 601</td>
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### Properties

<table>
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<th>Approx. operating temperature</th>
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<tbody>
<tr>
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<td>N/mm²</td>
<td>ksi</td>
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<tr>
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<td>116</td>
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<tr>
<td>Annealed + Aged</td>
<td>1200</td>
<td>174</td>
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<tr>
<td>Spring Temper</td>
<td>1300</td>
<td>189</td>
</tr>
<tr>
<td>Spring Temper + Aged</td>
<td>1500</td>
<td>218</td>
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</table>

The above tensile strength ranges are typical. If you require different please ask.

Dynamic applications = active/lively/changing
### Chemical Composition

<table>
<thead>
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<th>Element</th>
<th>Min %</th>
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<td>Ni</td>
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<td>21.00</td>
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<tr>
<td>Fe</td>
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<tr>
<td>Ti</td>
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<td>Mn</td>
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</tr>
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<td>Si</td>
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<td>C</td>
<td>-</td>
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<tr>
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<tr>
<td>Co</td>
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<td>21.00</td>
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<tr>
<td>S</td>
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<td>0.015</td>
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<tr>
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### Specifications

<table>
<thead>
<tr>
<th>Specifications</th>
<th>Key Features</th>
<th>Typical Applications</th>
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<tbody>
<tr>
<td>AMS 5829</td>
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<td>High stress rupture strength and high creep resistance at high temperatures</td>
</tr>
<tr>
<td>BS HR 501</td>
<td></td>
<td>Good resistance to high-temperature corrosion and oxidation</td>
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<tr>
<td>BS HR 502</td>
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<tr>
<td>BS HR 503</td>
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<tr>
<td>BS 3075 NA 19</td>
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<tr>
<td>ISO 15156-3</td>
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<tr>
<td>(NACE MR 0175)</td>
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### Designations

- W.Nr. 2.4632
- W.Nr. 2.4969
- UNS N07090
- AWS 030

### Key Features

- High stress rupture strength and high creep resistance at high temperatures
- Good resistance to high-temperature corrosion and oxidation
- Age hardenable
- High temperature dynamic applications

### Typical Applications

- Aerospace fasteners

---

**Density**

- 8.18 g/cm³
- 0.296 lb/in³

**Melting Point**

- 1370 °C
- 2500 °F

**Coefficient of Expansion**

- 12.7 μm/m °C (20 – 100 °C)
- 7.1 x 10⁻⁶ in/in °F (70 – 212 °F)

**Modulus of Rigidity**

- 82.5 kN/mm²
- 11966 ksi

**Modulus of Elasticity**

- 213 kN/mm²
- 227 / 240 kN/mm²
- 30894 ksi
- 32924 / 34810 ksi

---

### Heat Treatment of Finished Parts

<table>
<thead>
<tr>
<th>Condition as supplied by Alloy Wire</th>
<th>Temperature</th>
<th>Time (Hr)</th>
<th>Cooling</th>
</tr>
</thead>
<tbody>
<tr>
<td>Annealed</td>
<td>Age Harden</td>
<td>750 / 1380</td>
<td>4</td>
</tr>
<tr>
<td>Spring Temper</td>
<td>Age Harden</td>
<td>650 / 1200</td>
<td>4</td>
</tr>
<tr>
<td>Spring Temper</td>
<td>Age Harden</td>
<td>600 / 1100</td>
<td>16</td>
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### Properties

<table>
<thead>
<tr>
<th>Condition</th>
<th>Approx. tensile strength</th>
<th>Approx. operating temperature</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N/mm²</td>
<td>ksi</td>
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<tr>
<td>Annealed</td>
<td>800 – 1000</td>
<td>116 – 145</td>
</tr>
<tr>
<td>Annealed + Aged</td>
<td>1200 – 1400</td>
<td>174 – 203</td>
</tr>
<tr>
<td>Spring Temper</td>
<td>1300 – 1500</td>
<td>189 – 218</td>
</tr>
<tr>
<td>Spring Temper + Aged</td>
<td>1500 – 1800</td>
<td>218 – 261</td>
</tr>
</tbody>
</table>

The above tensile strength ranges are typical. If you require different please ask.

**Dynamic applications** = active/lively/changing

---

sales@alloywire.com | 35 | www.alloywire.com
## INCOLOY® 800

### Chemical Composition

<table>
<thead>
<tr>
<th>Element</th>
<th>Min %</th>
<th>Max %</th>
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<tbody>
<tr>
<td>Ni</td>
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<td>35.00</td>
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<td>Co</td>
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</tr>
<tr>
<td>Cu</td>
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<tr>
<td>Cr</td>
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<td>23.00</td>
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<td>Al</td>
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<td>0.60</td>
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<tr>
<td>C</td>
<td>-</td>
<td>0.10</td>
</tr>
<tr>
<td>Si</td>
<td>-</td>
<td>1.00</td>
</tr>
<tr>
<td>Mn</td>
<td>-</td>
<td>1.50</td>
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<tr>
<td>Ti</td>
<td>0.15</td>
<td>0.60</td>
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<tr>
<td>Fe</td>
<td>BAL</td>
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<tr>
<td>S</td>
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<td>0.015</td>
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### Specifications

<table>
<thead>
<tr>
<th>Designations</th>
<th>BS 3075 NA15</th>
<th>BS 3076 NA15</th>
</tr>
</thead>
</table>

### Key Features

- Excellent resistance to oxidation and carburisation at high temperatures
- Corrosion resistant in many aqueous environments
- High temperature static applications

### Typical Applications

- Process Piping
- Heat Exchangers
- Carburising Equipment
- Heating Element Sheathing

### Designations

- W.Nr. 1.4876
- UNS N08800
- AWS 020

### Physical Properties

<table>
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<tr>
<th>Property</th>
<th>Value</th>
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<td>7.94 g/cm³</td>
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<td>0.287 lb/in³</td>
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<td>Melting Point</td>
<td>1385 °C</td>
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<tr>
<td></td>
<td>2525 °F</td>
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<tr>
<td>Coefficient of Expansion</td>
<td>14.4 μm/m °C (20 – 100 °C)</td>
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<tr>
<td></td>
<td>7.9 x 10⁻⁶ in/in °F (70 – 212 °F)</td>
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<tr>
<td>Modulus of Rigidity</td>
<td>78.9 kN/mm²</td>
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<td>11444 ksi</td>
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<td>28500 ksi</td>
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### Heat Treatment of Finished Parts

<table>
<thead>
<tr>
<th>Condition as supplied by Alloy Wire</th>
<th>Type</th>
<th>Temperature °C</th>
<th>°F</th>
<th>Time (Hr)</th>
<th>Cooling</th>
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<tbody>
<tr>
<td>Annealed or Spring Temper</td>
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### Properties

<table>
<thead>
<tr>
<th>Condition</th>
<th>Approx. tensile strength N/mm²</th>
<th>ksi</th>
<th>Approx. operating temperature °C</th>
<th>°F</th>
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<tbody>
<tr>
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<td>-330 to +1500</td>
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<tr>
<td>Spring Temper</td>
<td>800 – 1100</td>
<td>116 – 159</td>
<td>-200 to +815</td>
<td>-330 to +1500</td>
</tr>
</tbody>
</table>

The above tensile strength ranges are typical. If you require different please ask.

---

### Static Application = still/fixed/motionless/rigid

sales@alloywire.com | www.alloywire.com
## INCOLOY® 800 HT

### Chemical Composition

<table>
<thead>
<tr>
<th>Element</th>
<th>Min %</th>
<th>Max %</th>
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</thead>
<tbody>
<tr>
<td>Ni</td>
<td>30.00</td>
<td>35.00</td>
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<td>Co</td>
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<td>2.00</td>
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<td>Cu</td>
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<td>0.75</td>
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<td>Cr</td>
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<td>0.60</td>
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<td>Ti</td>
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<td>0.60</td>
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<tr>
<td>Fe</td>
<td>BAL</td>
<td></td>
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<tr>
<td>S</td>
<td>-</td>
<td>0.015</td>
</tr>
</tbody>
</table>

### Specifications

- BS 3076 NA 15H

### Key Features

- Higher creep rupture strength than Incoloy 800 due to close control of C, Al, Ti
- Excellent resistance to oxidation and carburisation at high temperatures
- Corrosion resistant in many aqueous environments
- High temperature static applications

### Typical Applications

- Chemical Processing
- Petrochemical Processing
- Industrial Furnaces
- Heat Treating Equipment

### Designations

- W.Nr. 1.4958
- W.Nr. 1.4959
- UNS N08811
- AWS 021

### Properties

<table>
<thead>
<tr>
<th>Condition</th>
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<tbody>
<tr>
<td></td>
<td>N/mm²</td>
<td>ksi</td>
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<tr>
<td>Annealed</td>
<td>600 – 800</td>
<td>87 – 116</td>
</tr>
<tr>
<td>Spring Temper</td>
<td>800 – 1100</td>
<td>116 – 159</td>
</tr>
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</table>

The above tensile strength ranges are typical. If you require different please ask.

### Heat Treatment of Finished Parts

<table>
<thead>
<tr>
<th>Condition as supplied by Alloy Wire</th>
<th>Type</th>
<th>Temperature °C</th>
<th>°F</th>
<th>Time (Hr)</th>
<th>Cooling</th>
</tr>
</thead>
<tbody>
<tr>
<td>Annealed or Spring Temper</td>
<td>Stress Relieve</td>
<td>450 – 470</td>
<td>840 – 880</td>
<td>0.5 - 1</td>
<td>Air</td>
</tr>
</tbody>
</table>

### Chemical Processing

- Petrochemical Processing
- Industrial Furnaces
- Heat Treating Equipment

### Static applications

Static applications = still/fixed/motionless/rigid

---

sales@alloywire.com  | 37  | www.alloywire.com
### Chemical Composition

<table>
<thead>
<tr>
<th>Element</th>
<th>Min %</th>
<th>Max %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ni</td>
<td>38.00</td>
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<td>Co</td>
<td>-</td>
<td>2.00</td>
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<tr>
<td>Cu</td>
<td>1.50</td>
<td>3.00</td>
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<tr>
<td>Cr</td>
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<tr>
<td>Mo</td>
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<td>3.50</td>
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<td>Al</td>
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<tr>
<td>C</td>
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<td>Si</td>
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<td>S</td>
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<tr>
<td>Ti</td>
<td>0.60</td>
<td>1.20</td>
</tr>
<tr>
<td>Fe</td>
<td>BAL</td>
<td>BAL</td>
</tr>
</tbody>
</table>

### Specifications

- ASTM B425
- BS 3075 NA 16
- BS 3076 NA 16
- ISO 15156-3
- (NACE MR 0175)

### Key Features

- Resistant to reducing environments such as those containing sulphuric and phosphoric acids
- Resistant to a variety of oxidising substances such as nitric acid and nitrates
- Resistant to chloride-ion stress corrosion cracking and, pitting & crevice corrosion
- Good for chemical processing

### Typical Applications

- Chemical Processing
- Nuclear Fuel
- Reprocessing
- Acid Production
- Pickling Equipment

### Designations

- W.Nr. 2.4858
- UNS N08825
- AWS 022

### Density

- 8.14 g/cm³
- 0.294 lb/in³

### Melting Point

- 1400 °C
- 2550 °F

### Coefficient of Expansion

- 14.0 μm/m °C (20 – 100 °C)
- 7.8 x 10⁻⁶ in/in °F (70 – 212 °F)

### Modulus of Rigidity

- 75.9 kN/mm²
- 11009 ksi

### Modulus of Elasticity

- 196 kN/mm²
- 28428 ksi

### Heat Treatment of Finished Parts

<table>
<thead>
<tr>
<th>Condition as supplied by Alloy Wire</th>
<th>Type</th>
<th>Temperature</th>
<th>Time (Hr)</th>
<th>Cooling</th>
</tr>
</thead>
<tbody>
<tr>
<td>Annealed or Spring Temper</td>
<td>Stress Relieve</td>
<td>450 – 470 °C</td>
<td>840 – 880 °F</td>
<td>0.5 – 1</td>
</tr>
</tbody>
</table>

### Properties

<table>
<thead>
<tr>
<th>Condition</th>
<th>Approx. tensile strength</th>
<th>Approx. operating temperature</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N/mm²</td>
<td>ksi</td>
</tr>
<tr>
<td>Annealed</td>
<td>600 – 800</td>
<td>87 – 116</td>
</tr>
<tr>
<td>Spring Temer</td>
<td>800 – 1100</td>
<td>116 – 159</td>
</tr>
</tbody>
</table>

The above tensile strength ranges are typical. If you require different please ask.
### Chemical Composition

<table>
<thead>
<tr>
<th>Element</th>
<th>Min %</th>
<th>Max %</th>
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<td>Mn</td>
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<tr>
<td>Cu</td>
<td>-</td>
<td>0.50</td>
</tr>
</tbody>
</table>

### Key Features

- High strength and good corrosion resistance at high temperatures
- Age hardenable
- Good for high temperature fasteners
- High temperature static applications

### Typical Applications

- Jet Engines
- Super Chargers
- After Burner Parts
- Fasteners

### Designations

- W.Nr. 1.4944
- W.Nr. 1.4980
- UNS S66286
- AWS 023

### Density

|          | 7.94 g/cm³ | 0.287 lb/in³ |

### Melting Point

|          | 1430 °C | 2600 °F |

### Coefficient of Expansion

|          | 16.4 μm/m °C (20 – 100 °C) | 9.1 x 10⁻⁶ in/in °F (70 – 212 °F) |

### Modulus of Rigidity

|          | 71.5 kN/mm² | 10370 ksi |

### Modulus of Elasticity

|          | 205 kN/mm² | 29733 ksi |

### Heat Treatment of Finished Parts

<table>
<thead>
<tr>
<th>Condition as supplied by Alloy Wire</th>
<th>Type</th>
<th>Temperature °C</th>
<th>Temperature °F</th>
<th>Time (Hr)</th>
<th>Cooling</th>
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<tr>
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<td>Age Harden</td>
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### Properties

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<th>Approx. tensile strength N/mm²</th>
<th>ksi</th>
<th>Approx. operating temperature °C</th>
<th>°F</th>
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<tbody>
<tr>
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<td>-200 to +400</td>
<td>-330 to +750</td>
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<td>Spring Temper + Aged</td>
<td>1300 – 1500</td>
<td>188 – 218</td>
<td>-200 to +400</td>
<td>-330 to +750</td>
</tr>
</tbody>
</table>

The above tensile strength ranges are typical. If you require different please ask.

*Static applications = still/fixed/motionless/rigid*
### Chemical Composition

<table>
<thead>
<tr>
<th>Element</th>
<th>Min %</th>
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<tr>
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<td>3.00</td>
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<tr>
<td>Cu</td>
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### Specifications

<table>
<thead>
<tr>
<th>ASTM B335</th>
<th>ASTM B619</th>
</tr>
</thead>
</table>

### Key Features

- Excellent corrosion resistance to hydrochloric acid at all concentrations and temperatures
- Withstands sulphuric, acetic, formic & phosphoric acids & other non-oxidising media
- Excellent resistance to pitting corrosion & stress corrosion cracking

### Designations

- W.Nr. 2.4600
- UNS N10675
- AWS 051

### Typical Applications

- Chemical processing

### Density

- 9.22 g/cm³
- 0.333 lb/in³

### Melting Point

- 1418 °C
- 2585 °F

### Coefficient of Expansion

- 10.6 μm/m °C (20 – 100 °C)
- 5.7 x 10^-6 in/in °F (70 – 212 °F)

### Modulus of Rigidity

- 83 kN/mm²
- 12038 ksi

### Modulus of Elasticity

- 216 kN/mm²
- 31329 ksi

### Heat Treatment of Finished Parts

<table>
<thead>
<tr>
<th>Condition as supplied by Alloy Wire</th>
<th>Type</th>
<th>Temperature</th>
<th>Time (Hr)</th>
<th>Cooling</th>
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</thead>
<tbody>
<tr>
<td>Annealed or Spring Temper</td>
<td>Stress Relieve</td>
<td>400 – 450</td>
<td>750 – 840</td>
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### Properties

<table>
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<tr>
<th>Condition</th>
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<th>Approx. operating temperature</th>
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</thead>
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<tr>
<td></td>
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<td>1600 – 2000</td>
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The above tensile strength ranges are typical. If you require different please ask.
### Chemical Composition Specifications

<table>
<thead>
<tr>
<th>Element</th>
<th>Min %</th>
<th>Max %</th>
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</thead>
<tbody>
<tr>
<td>Cr</td>
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<td>18.00</td>
</tr>
<tr>
<td>Mo</td>
<td>14.00</td>
<td>17.00</td>
</tr>
<tr>
<td>Fe</td>
<td>-</td>
<td>3.00</td>
</tr>
<tr>
<td>C</td>
<td>-</td>
<td>0.015</td>
</tr>
<tr>
<td>Si</td>
<td>-</td>
<td>0.08</td>
</tr>
<tr>
<td>Co</td>
<td>-</td>
<td>2.00</td>
</tr>
<tr>
<td>Mn</td>
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<td>1.00</td>
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<tr>
<td>Ni</td>
<td>BAL</td>
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</tbody>
</table>

#### Specifications

- ASTM B574
- ASTM B575
- ASTM B619

#### Key Features

- Excellent resistance to stress-corrosion cracking and to oxidizing atmospheres at high temperature
- Exceptional resistance to a wide variety of chemical process environments including, hot contaminated mineral acids, solvents, chlorine, formic and acetic acids, and salt waters

#### Typical Applications

- Chemical processing

### Designations

- W.Nr. 2.4610
- UNS N06455
- AWS 052

### Properties

<table>
<thead>
<tr>
<th>Condition</th>
<th>Approx. tensile strength</th>
<th>Approx. operating temperature</th>
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<tbody>
<tr>
<td></td>
<td>N/mm²</td>
<td>ksi</td>
</tr>
<tr>
<td>Annealed</td>
<td>800 – 1100</td>
<td>116 – 159</td>
</tr>
<tr>
<td>Spring Temper</td>
<td>1300 – 1500</td>
<td>189 – 218</td>
</tr>
</tbody>
</table>

The above tensile strength ranges are typical. If you require different please ask.
HASTELLOY C-22

Chemical Composition Specifications

<table>
<thead>
<tr>
<th>Element</th>
<th>ASTM B574</th>
<th>ASTM B575</th>
<th>ASTM B619</th>
<th>ISO 15156-3 (NACE MR 0175)</th>
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<tbody>
<tr>
<td>Cr</td>
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<td>Max %</td>
<td>Min %</td>
<td>Max %</td>
</tr>
<tr>
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<td>Min %</td>
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<td>Max %</td>
</tr>
<tr>
<td>Fe</td>
<td>Min %</td>
<td>Max %</td>
<td>Min %</td>
<td>Max %</td>
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<tr>
<td>W</td>
<td>Min %</td>
<td>Max %</td>
<td>Min %</td>
<td>Max %</td>
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<tr>
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<td>Max %</td>
<td>Min %</td>
<td>Max %</td>
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<tr>
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<td>Max %</td>
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</tr>
<tr>
<td>Ni</td>
<td>Min %</td>
<td>Max %</td>
<td>Min %</td>
<td>Max %</td>
</tr>
</tbody>
</table>

Key Features

Better overall corrosion resistance than Hastelloy C-4 & C-276 and Inconel 625
Outstanding resistance to pitting, crevice corrosion and stress corrosion cracking

Typical Applications

Chlorination systems
Nuclear fuel reprocessing
Pickling systems

Designations

W.Nr. 2.4602
UNS N06022
AWS 053

Element Min % Max %
Cr 20.00 22.50
Mo 12.50 14.50
Fe 2.00 6.00
W 2.50 3.50
C - 0.015
Si - 0.08
Co - 2.50
Mn - 0.50
V - 0.35
P - 0.02
S - 0.02
Ni BAL

Density

8.69 g/cm³ 0.314 lb/in³

Melting Point

1399 °C 2550 °F

Coefficient of Expansion

12.4 μm/m °C (20 – 100 °C) 6.9 x 10⁻⁶ in/in °F (70 – 212 °F)

Modulus of Rigidity

78.6 kN/mm² 11400 ksi

Modulus of Elasticity

205.5 kN/mm² 29806 ksi

Heat Treatment of Finished Parts

<table>
<thead>
<tr>
<th>Condition as supplied by Alloy Wire</th>
<th>Type</th>
<th>Temperature °C °F</th>
<th>Time (Hr)</th>
<th>Cooling</th>
</tr>
</thead>
<tbody>
<tr>
<td>Annealed or Spring Temper</td>
<td>Stress Relieve</td>
<td>400 – 450</td>
<td>750 – 840</td>
<td>2</td>
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</tbody>
</table>

Properties

<table>
<thead>
<tr>
<th>Condition</th>
<th>Approx. tensile strength N/mm² ksi</th>
<th>Approx. operating temperature °C °F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Annealed</td>
<td>800 – 1100 116 – 159</td>
<td>-200 to +400 -330 to +750</td>
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<tr>
<td>Spring Tem</td>
<td>1400 – 1700 203 – 247</td>
<td>-200 to +400 -330 to +750</td>
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The above tensile strength ranges are typical. If you require different please ask.
### Specifications

<table>
<thead>
<tr>
<th>Designations</th>
<th>Explanations</th>
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<tbody>
<tr>
<td>ASTM B574</td>
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<tr>
<td>ASTM B575</td>
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<tr>
<td>ASTM B619</td>
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<tr>
<td>ISO 15156-3</td>
<td></td>
</tr>
<tr>
<td>(NACE MR 0175)</td>
<td></td>
</tr>
</tbody>
</table>

- **Key Features**
  - Excellent corrosion resistance in a wide range of corrosive media including, sulphur compounds and chloride ions
  - Excellent resistance to pitting, crevice corrosion and stress corrosion cracking
  - Withstands the corrosive effects of wet chlorine gas, hypochlorite and chlorine dioxide
  - Good for sea water applications

- **Typical Applications**
  - Chlorination systems
  - Nuclear fuel reprocessing
  - Pickling systems
  - Chemical processing
  - Marine industries

### Chemical Composition

<table>
<thead>
<tr>
<th>Element</th>
<th>Min %</th>
<th>Max %</th>
</tr>
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<tbody>
<tr>
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<td>Co</td>
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<td>0.04</td>
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<tr>
<td>S</td>
<td>-</td>
<td>0.03</td>
</tr>
<tr>
<td>Ni</td>
<td>BAL</td>
<td>BAL</td>
</tr>
</tbody>
</table>

### Designations

- W.Nr. 2.4819
- UNS N10276
- AWS 054

### Density

- **8.89 g/cm³**
- **0.321 lb/in³**

### Melting Point

- **1370 °C**
- **2500 °F**

### Coefficient of Expansion

- **11.2 μm/m °C (20 – 100°C)**
- **6.2 x 10⁻⁶ in/in °F (70 – 212 °F)**

### Modulus of Rigidity

- **78.6 kN/mm²**
- **11400 ksi**

### Modulus of Elasticity

- **205.5 kN/mm²**
- **29806 ksi**

### Heat Treatment of Finished Parts

<table>
<thead>
<tr>
<th>Condition as supplied by Alloy Wire</th>
<th>Type</th>
<th>Temperature</th>
<th>Time (Hr)</th>
<th>Cooling</th>
</tr>
</thead>
<tbody>
<tr>
<td>Annealed or Spring Temper Stress Relieve</td>
<td>400 – 450</td>
<td>750 – 840</td>
<td>2</td>
<td>Air</td>
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### Properties

<table>
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<tr>
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<th>Approx. operating temperature</th>
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<tbody>
<tr>
<td></td>
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<td>ksi</td>
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<td>123 – 152</td>
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<td>Spring Temper</td>
<td>1300 – 1600</td>
<td>189 – 232</td>
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</table>

The above tensile strength ranges are typical. If you require different please ask.
### Chemical Composition

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<thead>
<tr>
<th>Element</th>
<th>Min %</th>
<th>Max %</th>
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<tbody>
<tr>
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<td>24.00</td>
</tr>
<tr>
<td>Mo</td>
<td>15.00</td>
<td>17.00</td>
</tr>
<tr>
<td>Fe</td>
<td>-</td>
<td>3.00</td>
</tr>
<tr>
<td>C</td>
<td>-</td>
<td>0.010</td>
</tr>
<tr>
<td>Si</td>
<td>-</td>
<td>0.080</td>
</tr>
<tr>
<td>Co</td>
<td>-</td>
<td>2.00</td>
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<tr>
<td>Mn</td>
<td>-</td>
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<tr>
<td>P</td>
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<td>S</td>
<td>-</td>
<td>0.010</td>
</tr>
<tr>
<td>Cu</td>
<td>1.30</td>
<td>1.90</td>
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<td>Ni</td>
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### Specifications

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<tr>
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<td>W.Nr. 2.4675</td>
<td>UNS N06200</td>
<td>AWS 055</td>
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</tbody>
</table>

### Key Features

- Developed to resist corrosion in a wider range of media
- Resistant to an extensive range of corrosive chemicals including sulphuric, hydrochloric & hydrofluoric acids
- Superior pitting resistance and crevice corrosion resistance to Hastelloy C-276
- Excellent corrosion resistance to reducing media
- Good oxidising resistance

### Typical Applications

- Chemical processing

---

### Chemical Composition

<table>
<thead>
<tr>
<th>Element</th>
<th>Min %</th>
<th>Max %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cr</td>
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### Designations

- W.Nr. 2.4675
- UNS N06200
- AWS 055

### Density

- 8.5 g/cm³
- 0.307 lb/in³

### Melting Point

- 1399 °C
- 2550 °F

### Coefficient of Expansion

- 12.4 μm/m °C (20 – 100 °C)
- 6.9 x 10⁻⁶ in/in °F (70 – 212 °F)

### Modulus of Rigidity

- 79 kN/mm²
- 11458 ksi

### Modulus of Elasticity

- 206 kN/mm²
- 29878 ksi

### Heat Treatment of Finished Parts

<table>
<thead>
<tr>
<th>Condition as supplied by Alloy Wire</th>
<th>Type</th>
<th>Temperature</th>
<th>Time (Hr)</th>
<th>Cooling</th>
</tr>
</thead>
<tbody>
<tr>
<td>Annealed or Spring Temper</td>
<td>Stress Relieve</td>
<td>400 – 450</td>
<td>750 – 840</td>
<td>2</td>
</tr>
</tbody>
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### Properties

<table>
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<th>Condition</th>
<th>Approx. tensile strength</th>
<th>Approx. operating temperature</th>
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<tr>
<td>Spring Temer</td>
<td>1300 – 1600</td>
<td>189 – 232</td>
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The above tensile strength ranges are typical. If you require different please ask.
### Specifications

<table>
<thead>
<tr>
<th>Chemical Composition</th>
<th>Specifications</th>
<th>Key Features</th>
<th>Typical Applications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Element</td>
<td>ASTM B619</td>
<td>Superior corrosion resistance in phosphoric acids and highly oxidising acids such as nitric, hydrofluoric and sulphuric Oxidation Resistant</td>
<td>Nuclear fuel reprocessing Nuclear waste processing Pickling operations Petrochemical processing</td>
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<tr>
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### Chemical Composition

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### Density

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
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</thead>
<tbody>
<tr>
<td>Density</td>
<td>8.22 g/cm³</td>
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### Melting Point

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
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</thead>
<tbody>
<tr>
<td>Melting Point</td>
<td>1399 °C</td>
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### Coefficient of Expansion

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
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</thead>
<tbody>
<tr>
<td>Coefficient of Expansion</td>
<td>12.8 μm/m °C (20 – 100 °C)</td>
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### Modulus of Rigidity

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
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</thead>
<tbody>
<tr>
<td>Modulus of Rigidity</td>
<td>77.6 kN/mm²</td>
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### Modulus of Elasticity

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
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</thead>
<tbody>
<tr>
<td>Modulus of Elasticity</td>
<td>202 kN/mm²</td>
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</table>

### Heat Treatment of Finished Parts

<table>
<thead>
<tr>
<th>Condition as supplied by Alloy Wire</th>
<th>Type</th>
<th>Temperature °C</th>
<th>°F</th>
<th>Time (Hr)</th>
<th>Cooling</th>
</tr>
</thead>
<tbody>
<tr>
<td>Annealed or Spring Temper</td>
<td>Stress Relieve</td>
<td>400 – 450</td>
<td>750 – 840</td>
<td>2</td>
<td>Air</td>
</tr>
</tbody>
</table>

### Properties

<table>
<thead>
<tr>
<th>Condition</th>
<th>Approx. tensile strength N/mm²</th>
<th>Approx. operating temperature °C</th>
<th>°F</th>
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</thead>
<tbody>
<tr>
<td>Annealed</td>
<td>650 – 900</td>
<td>94 – 131</td>
<td>-200 to +400</td>
</tr>
<tr>
<td>Spring Temper</td>
<td>1000 – 1500</td>
<td>145 – 218</td>
<td>-200 to +400</td>
</tr>
</tbody>
</table>

The above tensile strength ranges are typical. If you require different please ask.
### Chemical Composition

<table>
<thead>
<tr>
<th>Element</th>
<th>Min %</th>
<th>Max %</th>
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</thead>
<tbody>
<tr>
<td>Cr</td>
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</tr>
<tr>
<td>Mo</td>
<td>8.00</td>
<td>10.00</td>
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<tr>
<td>Fe</td>
<td>17.00</td>
<td>20.00</td>
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<tr>
<td>W</td>
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<td>1.00</td>
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<tr>
<td>C</td>
<td>0.05</td>
<td>0.15</td>
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<tr>
<td>Si</td>
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<tr>
<td>Co</td>
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<tr>
<td>Mn</td>
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<td>S</td>
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</tr>
<tr>
<td>Ni</td>
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<td>BAL</td>
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</table>

### Specifications

- AMS 5754
- AMS 5798
- ASTM B619
- GE B50A463
- GE B50A655
- ISO 15156-3 (NACE MR 0175)

### Key Features

- Exceptional oxidation resistance
- Highly resistant to stress corrosion cracking in petrochemical applications

### Typical Applications

- Gas turbine engines
- Industrial furnaces
- Chemical processing
- Petrochemical processing

### Designations

- W.Nr. 2.4665
- UNS N06002
- AWS 057

### Properties

#### Approx. tensile strength

- **Annealed**: 850 – 1050 N/mm² (123 – 152 ksi)
- **Spring Temper**: 1350 – 1550 N/mm² (196 – 225 ksi)

#### Approx. operating temperature

- **Annealed**: -200 to +400 °C (-330 to +750 °F)
- **Spring Temper**: -200 to +400 °C (-330 to +750 °F)
### Specifications

<table>
<thead>
<tr>
<th>Element</th>
<th>Min %</th>
<th>Max %</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>0.05</td>
<td>0.15</td>
</tr>
<tr>
<td>Mn</td>
<td>1.00</td>
<td>2.00</td>
</tr>
<tr>
<td>Si</td>
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<td>1.00</td>
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<tr>
<td>P</td>
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<td>3.00</td>
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<tr>
<td>Co</td>
<td>BAL</td>
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</tbody>
</table>

### Key Features

- Good resistance to oxidising environments at high temperatures for long exposures
- Excellent resistance to sulphidation
- High temperature static applications

### Typical Applications

Parts for gas turbine engines and bearings

### Designations

- W.Nr. 2.4964
- UNS R30605
- AWS 060

### Chemical Composition

<table>
<thead>
<tr>
<th>Element</th>
<th>Min %</th>
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<tr>
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<td>3.00</td>
</tr>
<tr>
<td>Co</td>
<td>BAL</td>
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</tr>
</tbody>
</table>

### Density

9.13 g/cm³  
0.330 lb/in³

### Melting Point

1410°C  
2570 °F

### Coefficient of Expansion

12.3 μm/m °C (20 – 100°C)  
6.8 x 10⁻⁶ in/in °F (70 – 212°F)

### Modulus of Rigidity

98 kN/mm²  
14214 ksi

### Modulus of Elasticity

225 kN/mm²  
32634 ksi

### Heat Treatment of Finished Parts

<table>
<thead>
<tr>
<th>Condition as supplied by Alloy Wire</th>
<th>Type</th>
<th>Temperature</th>
<th>Time (Hr)</th>
<th>Cooling</th>
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</thead>
<tbody>
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### Properties

<table>
<thead>
<tr>
<th>Condition</th>
<th>Approx. tensile strength</th>
<th>Approx. operating temperature</th>
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<tbody>
<tr>
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<td>Annealed</td>
<td>900 – 1500 131 – 218</td>
<td>-200 to +900 -330 to +1650</td>
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The above tensile strength ranges are typical. If you require different please ask.
Specifications

<table>
<thead>
<tr>
<th>Key Features</th>
<th>Typical Applications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resistance to oxidation that far exceeds most heat resistant alloys at temperatures of 955 °C (1750 °F) and above</td>
<td>Mesh belts</td>
</tr>
<tr>
<td>High temperature static applications</td>
<td>Trays and fixtures for the firing of pottery and china, and the heat treatment of electronic devices and technical grade ceramics</td>
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Designations

<table>
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Chemical Composition

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<td>P</td>
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<tr>
<td>S</td>
<td>-</td>
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<tr>
<td>Si</td>
<td>-</td>
<td>0.20</td>
</tr>
<tr>
<td>Ti</td>
<td>-</td>
<td>0.50</td>
</tr>
<tr>
<td>W</td>
<td>-</td>
<td>0.50</td>
</tr>
<tr>
<td>Y</td>
<td>0.003</td>
<td>0.04</td>
</tr>
<tr>
<td>Zr</td>
<td>-</td>
<td>0.02</td>
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</tbody>
</table>

Density

| Density | 8.05 g/cm³ | 0.291 lb/in³ |

Melting Point

| Melting Point | 1400 °C | 2550 °F |

Coefficient of Expansion

| Coefficient of Expansion | 13.3 μm/m °C (20 – 100 °C) | 7.4 x 10⁻⁶ in/in °F (70 – 212 °F) |

Modulus of Rigidity

| Modulus of Rigidity | 84 kN/mm² | 12183 ksi |

Modulus of Elasticity

| Modulus of Elasticity | 217 kN/mm² | 31474 ksi |

Heat Treatment of Finished Parts

<table>
<thead>
<tr>
<th>Condition as supplied by Alloy Wire</th>
<th>Type</th>
<th>Temperature</th>
<th>Time (Hr)</th>
<th>Cooling</th>
</tr>
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<tbody>
<tr>
<td>Annealed or Spring Temper</td>
<td>Stress Relieve</td>
<td>400 – 450</td>
<td>750 – 840</td>
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Properties

<table>
<thead>
<tr>
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<th>Approx. operating temperature</th>
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<tbody>
<tr>
<td></td>
<td>N/mm²</td>
<td>ksi</td>
</tr>
<tr>
<td>Annealed</td>
<td>900 – 1200</td>
<td>131 – 174</td>
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<tr>
<td>Spring Temper</td>
<td>1300 – 1700</td>
<td>189 – 247</td>
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</tbody>
</table>

The above tensile strength ranges are typical. If you require different please ask.

Static applications = still/fixed/motionless/rigid
New alloy developed for high temperature structural applications which has excellent creep strength in the temperature range of 650 – 930 °C (1200 – 1700 °F), supposedly surpassing that of Waspaloy, and approaching that of Rene 41

Excellent creep strength

High temperature static applications

Exhaust nozzle components in augmented aircraft gas turbines, hot gas paths in land based gas turbines

A potential choice for high temperature development parts

<table>
<thead>
<tr>
<th>Chemical Composition</th>
<th>Specifications</th>
<th>Key Features</th>
<th>Typical Applications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Element</td>
<td>Min %</td>
<td>Max %</td>
<td>(\text{Specifications})</td>
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<td>1.38</td>
<td>1.65</td>
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<tr>
<td>B</td>
<td>0.003</td>
<td>0.010</td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>0.04</td>
<td>0.08</td>
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<td>Nb/Cb</td>
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<tr>
<td>Co</td>
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<td>11.00</td>
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<tr>
<td>Cr</td>
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<td>20.50</td>
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<tr>
<td>Cu</td>
<td>-</td>
<td>0.10</td>
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<tr>
<td>Fe</td>
<td>-</td>
<td>1.50</td>
<td></td>
</tr>
<tr>
<td>Mn</td>
<td>-</td>
<td>0.30</td>
<td></td>
</tr>
<tr>
<td>Mo</td>
<td>8.00</td>
<td>9.00</td>
<td></td>
</tr>
<tr>
<td>Ni</td>
<td>BAL</td>
<td></td>
<td></td>
</tr>
<tr>
<td>P</td>
<td>-</td>
<td>0.015</td>
<td></td>
</tr>
<tr>
<td>S</td>
<td>-</td>
<td>0.015</td>
<td></td>
</tr>
<tr>
<td>Si</td>
<td>-</td>
<td>0.15</td>
<td></td>
</tr>
<tr>
<td>Ta</td>
<td>-</td>
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<td></td>
</tr>
<tr>
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<td>2.30</td>
<td></td>
</tr>
<tr>
<td>W</td>
<td>-</td>
<td>0.50</td>
<td></td>
</tr>
<tr>
<td>Density</td>
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<td>0.300 lb/in³</td>
<td></td>
</tr>
<tr>
<td>Melting Point</td>
<td>1300 – 1375 °C</td>
<td>2370 – 2510 °F</td>
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<tr>
<td>Coefficient of Expansion</td>
<td>12.1 μm/m °C (20 – 100 °C)</td>
<td>6.7 x 10⁻⁶ in/in °F (70 – 212 °F)</td>
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</table>

<table>
<thead>
<tr>
<th>Heat Treatment of Finished Parts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Condition as supplied by Alloy Wire</td>
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<tr>
<td>Annealed or Spring Temper</td>
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<tr>
<td></td>
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<table>
<thead>
<tr>
<th>Properties</th>
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<tbody>
<tr>
<td>Condition</td>
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<td>Annealed</td>
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<tr>
<td>Spring Temper</td>
</tr>
<tr>
<td>Spring Temper + Stabilised and Aged</td>
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The above tensile strength ranges are typical. If you require different please ask.

Static applications = still/fixed/motionless/rigid
<table>
<thead>
<tr>
<th>Specifications</th>
<th>Key Features</th>
<th>Typical Applications</th>
</tr>
</thead>
<tbody>
<tr>
<td>AMS 5833</td>
<td>Combination of high strength, ductility and good mechanical properties at ambient temperatures</td>
<td>Springs</td>
</tr>
<tr>
<td>AMS 5834</td>
<td>Excellent fatigue life</td>
<td></td>
</tr>
<tr>
<td>AMS 5876</td>
<td>Excellent corrosion resistance in numerous environments</td>
<td></td>
</tr>
<tr>
<td>ASTM F1058</td>
<td>Non magnetic</td>
<td></td>
</tr>
<tr>
<td>ISO 5832-7</td>
<td>Age hardenable (Spring Temper only)</td>
<td></td>
</tr>
<tr>
<td>ISO 15156-3</td>
<td>Good for sea water applications</td>
<td></td>
</tr>
<tr>
<td>(NACE MR 0175)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Typical Applications**
- Springs
- Seal components
- Medical devices
- Components for watches
- Aerospace applications
- Petro-chemical applications
- Marine engineering

<table>
<thead>
<tr>
<th>Designations</th>
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<tbody>
<tr>
<td>W.Nr. 2.4711</td>
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<tr>
<td>UNS R30003</td>
</tr>
<tr>
<td>UNS R30008</td>
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<td>AWS 100</td>
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### Chemical Composition

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<th>Max %</th>
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<td>0.15</td>
</tr>
<tr>
<td>Mn</td>
<td>1.50</td>
<td>2.50</td>
</tr>
<tr>
<td>Si</td>
<td>-</td>
<td>1.20</td>
</tr>
<tr>
<td>P</td>
<td>-</td>
<td>0.015</td>
</tr>
<tr>
<td>S</td>
<td>-</td>
<td>0.015</td>
</tr>
<tr>
<td>Cr</td>
<td>19.00</td>
<td>21.00</td>
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<tr>
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<td>16.00</td>
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<tr>
<td>Co</td>
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<td>41.00</td>
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<tr>
<td>Mo</td>
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<td>8.00</td>
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<tr>
<td>Be</td>
<td>-</td>
<td>0.10</td>
</tr>
<tr>
<td>Fe</td>
<td>BAL</td>
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### Typical Properties

<table>
<thead>
<tr>
<th>Condition</th>
<th>Approx. tensile strength</th>
<th>Approx. operating temperature</th>
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<tbody>
<tr>
<td></td>
<td>N/mm²</td>
<td>ksi</td>
</tr>
<tr>
<td>Annealed</td>
<td>800 – 1000</td>
<td>116 – 145</td>
</tr>
<tr>
<td>Spring Temper</td>
<td>1400 – 1900</td>
<td>203 – 276</td>
</tr>
<tr>
<td>Spring Temper + Aged</td>
<td>1900 – 2200</td>
<td>276 – 319</td>
</tr>
</tbody>
</table>

The above tensile strength ranges are typical. If you require different please ask.
<table>
<thead>
<tr>
<th>Specifications</th>
<th>Key Features</th>
<th>Typical Applications</th>
</tr>
</thead>
<tbody>
<tr>
<td>AMS 5844</td>
<td>Combination of high strength, ductility and good mechanical properties at ambient temperatures</td>
<td>Medical Devices, Marine Engineering</td>
</tr>
<tr>
<td>AMS 5845</td>
<td>Excellent corrosion resistance in hydrogen sulphide</td>
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</tr>
<tr>
<td>ASTM F562</td>
<td>Excellent resistance to crevice and stress corrosion cracking in sea water</td>
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<tr>
<td>ISO 15156-3</td>
<td>Age hardenable (Spring Temper only)</td>
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</tr>
<tr>
<td>(NACE MR 0175)</td>
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<td>ISO 5832-6</td>
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| Designations   | W.Nr. 2.4999 | UNS R30035 | AWS 110 |

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<td>Max %</td>
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<td>P</td>
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<td>0.015</td>
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<tr>
<td>Si</td>
<td>-</td>
<td>0.15</td>
<td></td>
</tr>
<tr>
<td>Ni</td>
<td>33.00</td>
<td>37.00</td>
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</tr>
<tr>
<td>Co</td>
<td>BAL</td>
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<tr>
<td>Mn</td>
<td>-</td>
<td>0.15</td>
<td></td>
</tr>
<tr>
<td>S</td>
<td>-</td>
<td>0.01</td>
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<tr>
<td>Cr</td>
<td>19.00</td>
<td>21.00</td>
<td></td>
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<tr>
<td>Mo</td>
<td>9.00</td>
<td>10.50</td>
<td></td>
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<tr>
<td>Ti</td>
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<td></td>
</tr>
<tr>
<td>Fe</td>
<td>-</td>
<td>1.00</td>
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<table>
<thead>
<tr>
<th>Specifications</th>
<th>Key Features</th>
<th>Typical Applications</th>
</tr>
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<tbody>
<tr>
<td>Density</td>
<td>8.43 g/cm³</td>
<td>0.304 lb/in³</td>
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<tr>
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<td>1440 °C</td>
<td>2625 °F</td>
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<tr>
<td>Coefficient of Expansion</td>
<td>12.8 μm/m °C (20 – 100°C)</td>
<td>7.1 x 10⁻⁶ in/in °F (70 – 212 °F)</td>
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<tr>
<td>Modulus of Rigidity</td>
<td>80.7 kN/mm²</td>
<td>11705 ksi</td>
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<tr>
<td>Modulus of Elasticity</td>
<td>234 kN/mm²</td>
<td>33939 ksi</td>
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<table>
<thead>
<tr>
<th>Heat Treatment of Finished Parts</th>
<th>Type</th>
<th>Temperature</th>
<th>Time (Hr)</th>
<th>Cooling</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>°C</td>
<td>°F</td>
<td></td>
</tr>
<tr>
<td>Annealed</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Spring Temper</td>
<td>Age Harden</td>
<td>650</td>
<td>1200</td>
<td>4</td>
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</table>

<table>
<thead>
<tr>
<th>Properties</th>
<th>Approx. tensile strength</th>
<th>Approx. operating temperature</th>
</tr>
</thead>
<tbody>
<tr>
<td>Condition</td>
<td>N/mm²</td>
<td>ksi</td>
</tr>
<tr>
<td>Annealed</td>
<td>800 – 1000</td>
<td>116 – 145</td>
</tr>
<tr>
<td>Spring Temper</td>
<td>1400 – 1900</td>
<td>203 – 276</td>
</tr>
<tr>
<td>Spring Temper + Aged</td>
<td>1900 – 2200</td>
<td>276 – 319</td>
</tr>
</tbody>
</table>

The above tensile strength ranges are typical. If you require different please ask.
## Specifications

<table>
<thead>
<tr>
<th>Key Features</th>
<th>Typical Applications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very high strength at elevated temperatures</td>
<td>After burner parts</td>
</tr>
<tr>
<td>Good oxidation resistance</td>
<td>Turbine castings</td>
</tr>
<tr>
<td>Age hardenable</td>
<td>Bolts</td>
</tr>
<tr>
<td>High temperature dynamic applications</td>
<td>Other fasteners</td>
</tr>
</tbody>
</table>

## Designations

- W.Nr. 2.4973
- UNS N07041
- AWS 120

## Chemical Composition

<table>
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<td>0.50</td>
</tr>
<tr>
<td>S</td>
<td>-</td>
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<tr>
<td>Cr</td>
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<td>20.00</td>
</tr>
<tr>
<td>Co</td>
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<td>12.00</td>
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<td>0.01</td>
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<td>5.00</td>
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<tr>
<td>Ni</td>
<td></td>
<td>BAL</td>
</tr>
</tbody>
</table>

## Density

- 8.25 g/cm³  
- 0.298 lb/in³

## Melting Point

- 1345 °C  
- 2450 °F

## Coefficient of Expansion

- 13.6 μm/m °C (20 – 100 °C)  
- 7.41 x 10⁻⁶ in/in °F (70 – 212 °F)

## Modulus of Rigidity

- 83.2 kN/mm²  
- 12067 ksi

## Modulus of Elasticity

- 218.0 kN/mm²  
- 31619 ksi

## Heat Treatment of Finished Parts

<table>
<thead>
<tr>
<th>Condition as supplied by Alloy Wire</th>
<th>Type</th>
<th>Temperature</th>
<th>Time (Hr)</th>
<th>Cooling</th>
</tr>
</thead>
<tbody>
<tr>
<td>Annealed</td>
<td>Age Harden</td>
<td>760 °C 1400 °F</td>
<td>16</td>
<td>Air</td>
</tr>
<tr>
<td>Spring Temper</td>
<td>Solution Anneal</td>
<td>1065 °C 1950 °F</td>
<td>4</td>
<td>Air</td>
</tr>
<tr>
<td>Spring Temper</td>
<td>Age Harden</td>
<td>760 °C 1400 °F</td>
<td>16</td>
<td>Air</td>
</tr>
</tbody>
</table>

## Properties

<table>
<thead>
<tr>
<th>Condition</th>
<th>Approx. tensile strength</th>
<th>Approx. operating temperature</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N/mm²</td>
<td>ksi</td>
</tr>
<tr>
<td>Annealed</td>
<td>800 – 1100</td>
<td>116 – 159</td>
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<tr>
<td>Annealed + Aged</td>
<td>1350 – 1550</td>
<td>196 – 225</td>
</tr>
<tr>
<td>Spring Temper</td>
<td>1400 – 1800</td>
<td>203 – 261</td>
</tr>
<tr>
<td>Spring Temper + Annealed + Aged</td>
<td>1350 – 1550</td>
<td>196 – 225</td>
</tr>
<tr>
<td>Spring Temper + Aged</td>
<td>1600 – 2000</td>
<td>232 – 290</td>
</tr>
</tbody>
</table>

The above tensile strength ranges are typical. If you require different please ask.

*Dynamic applications = active/lively/changing*
## Specifications

<table>
<thead>
<tr>
<th>Key Features</th>
<th>Typical Applications</th>
</tr>
</thead>
<tbody>
<tr>
<td>AMS 5544</td>
<td>Very high strength at elevated temperatures</td>
</tr>
<tr>
<td>AMS 5706</td>
<td>Strength is generally comparable to that of Rene 41 and generally superior to Inconel 718</td>
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<tr>
<td>AMS 5708</td>
<td>Age hardenable</td>
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<tr>
<td>AMS 5828</td>
<td>High temperature dynamic applications</td>
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<tr>
<td>ASTM B637</td>
<td>Gas turbine engine parts</td>
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<tr>
<td></td>
<td>Aerospace components</td>
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<tr>
<td></td>
<td>Springs and fasteners</td>
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</table>

### Chemical Composition

<table>
<thead>
<tr>
<th>Element</th>
<th>Min %</th>
<th>Max %</th>
</tr>
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<tbody>
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<tr>
<td>Si</td>
<td>-</td>
<td>0.10</td>
</tr>
<tr>
<td>P</td>
<td>-</td>
<td>0.010</td>
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<tr>
<td>S</td>
<td>-</td>
<td>0.010</td>
</tr>
<tr>
<td>Cr</td>
<td>18.00</td>
<td>21.00</td>
</tr>
<tr>
<td>Co</td>
<td>12.00</td>
<td>15.00</td>
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<tr>
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<td>0.010</td>
</tr>
<tr>
<td>Zr</td>
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<tr>
<td>Fe</td>
<td>-</td>
<td>2.00</td>
</tr>
<tr>
<td>Cu</td>
<td>-</td>
<td>0.10</td>
</tr>
<tr>
<td>Ni</td>
<td>BAL</td>
<td>BAL</td>
</tr>
</tbody>
</table>

### Density

| Density | 8.16 g/cm³ | 0.295 lb/in³ |

### Melting Point

| Melting Point | 1330 °C | 2425 °F |

### Coefficient of Expansion

| Coefficient of Expansion | 12.2 μm/m °C (20 – 100 °C) | 6.8 x 10⁻⁶ in/in °F (70 – 212 °F) |

### Modulus of Rigidity

| Modulus of Rigidity | 81 kN/mm² | 11750 ksi |

### Modulus of Elasticity

| Modulus of Elasticity | 211.0 kN/mm² | 30600 ksi |

### Heat Treatment of Finished Parts

<table>
<thead>
<tr>
<th>Condition as supplied by Alloy Wire</th>
<th>Type</th>
<th>Temperature</th>
<th>Time (Hr)</th>
<th>Cooling</th>
</tr>
</thead>
<tbody>
<tr>
<td>Annealed</td>
<td>Stabilize</td>
<td>843 °C</td>
<td>1550 °F</td>
<td>4</td>
</tr>
<tr>
<td>Annealed</td>
<td>Age Harden</td>
<td>760 °C</td>
<td>1400 °F</td>
<td>16</td>
</tr>
<tr>
<td>Spring Temper</td>
<td>Anneal</td>
<td>1050 °C</td>
<td>1920 °F</td>
<td>4</td>
</tr>
<tr>
<td>Spring Temper</td>
<td>Stabilize</td>
<td>843 °C</td>
<td>1550 °F</td>
<td>4</td>
</tr>
<tr>
<td>Spring Temper</td>
<td>Age Harden</td>
<td>760 °C</td>
<td>1400 °F</td>
<td>16</td>
</tr>
</tbody>
</table>

### Properties

<table>
<thead>
<tr>
<th>Condition</th>
<th>Approx. tensile strength</th>
<th>Approx. operating temperature</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N/mm²</td>
<td>ksi</td>
</tr>
<tr>
<td>Solution Annealed</td>
<td>800 – 1100</td>
<td>116 – 159</td>
</tr>
<tr>
<td>Solution Annealed + Aged</td>
<td>1300 – 1500</td>
<td>189 – 218</td>
</tr>
<tr>
<td>Spring Temper</td>
<td>1300 – 1600</td>
<td>189 – 232</td>
</tr>
<tr>
<td>Spring Temper + Annealed + Aged</td>
<td>1300 – 1500</td>
<td>189 – 218</td>
</tr>
</tbody>
</table>

The above tensile strength ranges are typical. If you require different please ask.

*Dynamic applications = active/lively/Changing*
## Specifications

### Key Features

<table>
<thead>
<tr>
<th>AMS 5225</th>
<th>Outstanding controllable thermoelastic coefficient characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>AMS 5221</td>
<td>Can be processed to have constant modulus of elasticity from -45 to +65 °C (-50 to +150 °F)</td>
</tr>
<tr>
<td>HS 261</td>
<td>Good for springs in watches and weighing equipment</td>
</tr>
<tr>
<td></td>
<td>Age hardenable</td>
</tr>
</tbody>
</table>

### Typical Applications

- Springs in precise applications, such as watches and weighing machines
- Measuring instruments

## Designations

- W.Nr. N09902
- AWS 080

## Chemical Composition

<table>
<thead>
<tr>
<th>Element</th>
<th>Min %</th>
<th>Max %</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>-</td>
<td>0.06</td>
</tr>
<tr>
<td>Mn</td>
<td>-</td>
<td>0.80</td>
</tr>
<tr>
<td>Si</td>
<td>-</td>
<td>1.00</td>
</tr>
<tr>
<td>P</td>
<td>-</td>
<td>0.04</td>
</tr>
<tr>
<td>S</td>
<td>-</td>
<td>0.04</td>
</tr>
<tr>
<td>Cr</td>
<td>4.91</td>
<td>5.75</td>
</tr>
<tr>
<td>Ni+Co</td>
<td>41.00</td>
<td>43.50</td>
</tr>
<tr>
<td>Ti</td>
<td>2.20</td>
<td>2.75</td>
</tr>
<tr>
<td>Al</td>
<td>0.30</td>
<td>0.80</td>
</tr>
<tr>
<td>Cr+ (Ti-4xC)</td>
<td>7.10</td>
<td>8.10</td>
</tr>
<tr>
<td>Co</td>
<td>-</td>
<td>1.00</td>
</tr>
<tr>
<td>Fe</td>
<td>BAL</td>
<td>BAL</td>
</tr>
</tbody>
</table>

## Density

- 8.05 g/cm³
- 0.291 lb/in³

## Melting Point

- 1480 °C
- 2700 °F

## Coefficient of Expansion

- 7.6 μm/m °C (20 – 100 °C)
- 4.2 x 10⁻⁶ in/in °F (70 – 212 °F)

## Modulus of Rigidity

- 62 – 69 kN/mm²
- 8993 – 10008 ksi

## Modulus of Elasticity

- 165 – 200 kN/mm²
- 23932 – 29008 ksi

## Heat Treatment of Finished Parts

### Condition as supplied by Alloy Wire

<table>
<thead>
<tr>
<th>Type</th>
<th>Temperature</th>
<th>Time (Hr)</th>
<th>Cooling</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age Harden</td>
<td>650 °C</td>
<td>2</td>
<td>Air</td>
</tr>
<tr>
<td>Stress equalise</td>
<td>400 °C</td>
<td>2</td>
<td>Air</td>
</tr>
<tr>
<td>Stress equalise</td>
<td>650 °C</td>
<td>2</td>
<td>Air</td>
</tr>
</tbody>
</table>

## Properties

### Condition

<table>
<thead>
<tr>
<th>Approx. tensile strength</th>
<th>Approx. operating temperature</th>
</tr>
</thead>
<tbody>
<tr>
<td>N/mm²</td>
<td>ksi</td>
</tr>
<tr>
<td>Annealed</td>
<td>600 – 800</td>
</tr>
<tr>
<td>Spring Temper</td>
<td>900 – 1100</td>
</tr>
<tr>
<td>Spring Temper + Aged</td>
<td>1300 – 1500</td>
</tr>
</tbody>
</table>

The above tensile strength ranges are typical. If you require different please ask.
## Specifications

<table>
<thead>
<tr>
<th>Key Features</th>
<th>Typical Applications</th>
</tr>
</thead>
<tbody>
<tr>
<td>AMS 4928 Good tensile properties at ambient temperatures compared with other</td>
<td>Aerospace</td>
</tr>
<tr>
<td>titaniums</td>
<td>Jewellery</td>
</tr>
<tr>
<td>Good creep resistance up to approx 300 °C (570 °F)</td>
<td>Chemical</td>
</tr>
<tr>
<td>Outstanding resistance to corrosion in most natural and many industrial</td>
<td>Springs</td>
</tr>
<tr>
<td>process environments</td>
<td>Bolts and various fasteners</td>
</tr>
<tr>
<td>Approx half the density of nickel alloys</td>
<td></td>
</tr>
</tbody>
</table>

### Designations

- W.Nr. 3.7165
- W.Nr. 3.7164
- UNS R56400
- AWS 151

## Chemical Composition

<table>
<thead>
<tr>
<th>Element</th>
<th>Min %</th>
<th>Max %</th>
</tr>
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<td>N</td>
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<td>0.05</td>
</tr>
<tr>
<td>C</td>
<td>-</td>
<td>0.10</td>
</tr>
<tr>
<td>H</td>
<td>-</td>
<td>0.01</td>
</tr>
<tr>
<td>Fe</td>
<td>-</td>
<td>0.40</td>
</tr>
<tr>
<td>O</td>
<td>-</td>
<td>0.20</td>
</tr>
<tr>
<td>Al</td>
<td>5.50</td>
<td>6.75</td>
</tr>
<tr>
<td>V</td>
<td>3.50</td>
<td>4.50</td>
</tr>
<tr>
<td>Ti</td>
<td>BAL</td>
<td></td>
</tr>
</tbody>
</table>

## Density

- 4.42 g/cm³
- 0.16 lb/in³

## Melting Point

- 1650 °C
- 3000 °F

## Coefficient of Expansion

- 9.0 μm/m °C (20 – 100 °C)
- 5.0 x 10⁻⁶ in/in °F (70 – 212 °F)

## Modulus of Rigidity

- 40 – 44 kN/mm²
- 5800 – 6380 ksi

## Modulus of Elasticity

- 105 – 120 kN/mm²
- 15230 – 17405 ksi

## Heat Treatment of Finished Parts

<table>
<thead>
<tr>
<th>Condition as supplied by Alloy Wire</th>
<th>Type</th>
<th>Temperature</th>
<th>Time (Hr)</th>
<th>Cooling</th>
</tr>
</thead>
<tbody>
<tr>
<td>Annealed</td>
<td>Stress Relieve</td>
<td>480 °C 900 °F</td>
<td>2</td>
<td>Air</td>
</tr>
<tr>
<td>Spring Temper</td>
<td>Stress Relieve</td>
<td>250 °C 480 °F</td>
<td>0.5</td>
<td>Air</td>
</tr>
</tbody>
</table>

## Properties

<table>
<thead>
<tr>
<th>Condition</th>
<th>Approx. tensile strength N/mm²</th>
<th>Approx. operating temperature °C</th>
<th>Approx. operating temperature °F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Annealed</td>
<td>950 – 1100</td>
<td>-200 to +400</td>
<td>-330 to +750</td>
</tr>
<tr>
<td>Spring Temper</td>
<td>1100 – 1400</td>
<td>-200 to +400</td>
<td>-330 to +750</td>
</tr>
</tbody>
</table>

The above tensile strength ranges are typical. If you require different please ask.
# Beryllium Copper CB 101

<table>
<thead>
<tr>
<th>Chemical Composition</th>
<th>Specifications</th>
<th>Key Features</th>
<th>Typical Applications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Be</td>
<td>ASTM B196</td>
<td>Good conductor of electricity</td>
<td>Springs</td>
</tr>
<tr>
<td>Fe</td>
<td>ASTM B197</td>
<td>Age hardenable</td>
<td>Electrical connectors &amp; switches</td>
</tr>
<tr>
<td>Ni</td>
<td>BS 2873</td>
<td>Good mechanical properties</td>
<td>&amp; switches</td>
</tr>
<tr>
<td>Co</td>
<td>BS EN 12166</td>
<td></td>
<td>Electronic components</td>
</tr>
<tr>
<td>Cu</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

## Designations
- W.Nr. 2.1247
- UNS C17200
- AWS 140

## Chemcial Composition

<table>
<thead>
<tr>
<th>Element</th>
<th>Min %</th>
<th>Max %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Be</td>
<td>1.70</td>
<td>2.10</td>
</tr>
<tr>
<td>Fe</td>
<td>-</td>
<td>0.20</td>
</tr>
<tr>
<td>Ni</td>
<td>-</td>
<td>0.30</td>
</tr>
<tr>
<td>Co</td>
<td>-</td>
<td>0.30</td>
</tr>
<tr>
<td>Cu</td>
<td>BAL</td>
<td></td>
</tr>
</tbody>
</table>

## Density
- 8.25 g/cm³
- 0.298 lb/in³

## Melting Point
- 980 °C
- 1800 °F

## Coefficient of Expansion
- 17.8 μm/m °C (20 – 100 °C)
- 9.9 x 10⁻⁶ in/in °F (70 – 212 °F)

## Modulus of Rigidity
- 47 kN/mm²
- 6817 ksi

## Modulus of Elasticity
- 123 kN/mm²
- 17840 ksi

## Heat Treatment of Finished Parts

<table>
<thead>
<tr>
<th>Condition as supplied by Alloy Wire</th>
<th>Type</th>
<th>Temperature</th>
<th>Time (Hr)</th>
<th>Cooling</th>
</tr>
</thead>
<tbody>
<tr>
<td>Annealed</td>
<td>Age Harden</td>
<td>315 – 320</td>
<td>600 – 610</td>
<td>3</td>
</tr>
<tr>
<td>Spring Temper</td>
<td>Age Harden</td>
<td>315 – 320</td>
<td>600 – 610</td>
<td>2</td>
</tr>
</tbody>
</table>

## Properties

<table>
<thead>
<tr>
<th>Condition</th>
<th>Approx. tensile strength</th>
<th>Approx. operating temperature</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N/mm²</td>
<td>ksi</td>
</tr>
<tr>
<td>Annealed</td>
<td>400 – 600</td>
<td>58 – 87</td>
</tr>
<tr>
<td>Annealed + Aged</td>
<td>800 – 1200</td>
<td>116 – 174</td>
</tr>
<tr>
<td>Spring Temper</td>
<td>800 – 1200</td>
<td>116 – 174</td>
</tr>
<tr>
<td>Spring Temper + Aged</td>
<td>1200 – 1600</td>
<td>174 – 232</td>
</tr>
</tbody>
</table>

The above tensile strength ranges are typical. If you require different please ask.
### Chemical Composition

<table>
<thead>
<tr>
<th>Element</th>
<th>Min %</th>
<th>Max %</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>-</td>
<td>0.30</td>
</tr>
<tr>
<td>Si</td>
<td>-</td>
<td>0.50</td>
</tr>
<tr>
<td>Mn</td>
<td>-</td>
<td>2.00</td>
</tr>
<tr>
<td>S</td>
<td>-</td>
<td>0.024</td>
</tr>
<tr>
<td>Cu</td>
<td>28.00</td>
<td>34.00</td>
</tr>
<tr>
<td>Fe</td>
<td>2.50</td>
<td>-</td>
</tr>
<tr>
<td>Co</td>
<td>-</td>
<td>2.00</td>
</tr>
<tr>
<td>Ni+Co</td>
<td>63.00</td>
<td>-</td>
</tr>
</tbody>
</table>

### Specifications

| AMS 4730 | ASTM B164 | BS 3075 NA 13 | BS 3076 NA 13 | DTD 204B | ISO 15156-3 (NACE MR 0175) | QQ-N-281 |

### Key Features

- Excellent corrosion resistance in a wide range of acidic & alkaline environments
- Especially suitable for reducing conditions
- Good ductility & thermal conductivity
- Good for sea water applications

### Typical Applications

- Marine Engineering
- Chemical Processing
- Hydro-carbon Processing
- Heat Exchangers
- Valves
- Pumps

### Designations

- W.Nr. 2.4361
- W.Nr. 2.4360
- UNS N04400
- AWS 040

### Density

- 8.8 g/cm³
- 0.318 lb/in³

### Melting Point

- 1350 °C
- 2460 °F

### Coefficient of Expansion

- 13.9 μm/m °C (20 – 100 °C)
- 7.7 x 10⁻⁶ in/in °F (70 – 212 °F)

### Modulus of Rigidity

- 65.3 kN/mm²
- 9471 ksi

### Modulus of Elasticity

- 173 kN/mm²
- 25092 ksi

### Heat Treatment of Finished Parts

<table>
<thead>
<tr>
<th>Condition as supplied by Alloy Wire</th>
<th>Type</th>
<th>Temperature °C</th>
<th>°F</th>
<th>Time (Hr)</th>
<th>Cooling</th>
</tr>
</thead>
<tbody>
<tr>
<td>Annealed or Spring Temper</td>
<td>Stress Relieve</td>
<td>300 – 320</td>
<td>570 – 610</td>
<td>0.5 – 1</td>
<td>Air</td>
</tr>
</tbody>
</table>

### Properties

<table>
<thead>
<tr>
<th>Condition</th>
<th>Approx. tensile strength N/mm²</th>
<th>Approx. operating temperature °C</th>
<th>°F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Annealed</td>
<td>400 – 600</td>
<td>-200 to +230</td>
<td>-330 to +445</td>
</tr>
<tr>
<td>Spring Temper</td>
<td>850 – 1050</td>
<td>-200 to +230</td>
<td>-330 to +445</td>
</tr>
</tbody>
</table>

The above tensile strength ranges are typical. If you require different please ask.
## MONEL® K-500

### Chemical Composition

<table>
<thead>
<tr>
<th>Element</th>
<th>Min %</th>
<th>Max %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ni</td>
<td>63.00</td>
<td>-</td>
</tr>
<tr>
<td>Co</td>
<td>-</td>
<td>2.00</td>
</tr>
<tr>
<td>Cu</td>
<td>27.00</td>
<td>33.00</td>
</tr>
<tr>
<td>Fe</td>
<td>-</td>
<td>2.00</td>
</tr>
<tr>
<td>Al</td>
<td>2.30</td>
<td>3.20</td>
</tr>
<tr>
<td>C</td>
<td>-</td>
<td>0.25</td>
</tr>
<tr>
<td>Si</td>
<td>-</td>
<td>1.00</td>
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<tr>
<td>Mn</td>
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<tr>
<td>Ti</td>
<td>0.35</td>
<td>0.85</td>
</tr>
<tr>
<td>S</td>
<td>-</td>
<td>0.010</td>
</tr>
</tbody>
</table>

### Specifications

- ASTM B865
- BS 3075 NA 18
- BS 3076 NA 18
- ISO 15156-3 (NACE MR 0175)
- QQ-N-286

### Key Features

- Corrosion resistance similar to Monel 400 but with higher strength and hardness
- Low permeability and is non-magnetic to temperatures as low as -101 °C (-150 °F)
- Age hardenable
- Good for sea water applications

### Typical Applications

- Pump Shafts
- Fasteners
- Marine Propeller Shafts
- Oil Well Tools
- Instruments
- Springs

### Designations

- W.Nr. 2.4375
- UNS N05500
- AWS 041

### Density

8.44 g/cm³ 0.305 lb/in³

### Melting Point

1350 °C 2460 °F

### Coefficient of Expansion

13.7 μm/m °C (20 – 100 °C) 7.6 x 10⁻⁶ in/in °F (70 – 212 °F)

### Modulus of Rigidity

66 kN/mm² 9573 ksi

### Modulus of Elasticity

179 kN/mm² 25962 ksi

### Heat Treatment of Finished Parts

<table>
<thead>
<tr>
<th>Condition as supplied by Alloy Wire</th>
<th>Type</th>
<th>Temperature</th>
<th>Time (Hr)</th>
<th>Cooling</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>°C</td>
<td>°F</td>
<td></td>
</tr>
<tr>
<td>Annealed</td>
<td>Age Harden</td>
<td>580 – 590</td>
<td>1075 – 1095</td>
<td>8 – 10</td>
</tr>
<tr>
<td>Spring Temper</td>
<td>Age Harden</td>
<td>530 – 540</td>
<td>985 – 1005</td>
<td>4 – 6</td>
</tr>
</tbody>
</table>

^ Heat treating Monel K-500 in free air can have a detrimental effect on its corrosion resistant properties.

### Properties

<table>
<thead>
<tr>
<th>Condition</th>
<th>Approx. tensile strength</th>
<th>Approx. operating temperature</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N/mm²</td>
<td>ksi</td>
</tr>
<tr>
<td>Annealed</td>
<td>650 – 850</td>
<td>94 – 123</td>
</tr>
<tr>
<td>Annealed + Aged</td>
<td>950 – 1050</td>
<td>138 – 167</td>
</tr>
<tr>
<td>Spring Temper</td>
<td>1000 – 1300</td>
<td>145 – 189</td>
</tr>
<tr>
<td>Spring Temper + Aged</td>
<td>1200 – 1500</td>
<td>174 – 218</td>
</tr>
</tbody>
</table>

The above tensile strength ranges are typical. If you require different please ask.
## Chemical Composition

<table>
<thead>
<tr>
<th>Element</th>
<th>Min %</th>
<th>Max %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ni</td>
<td>35.00</td>
<td>38.00</td>
</tr>
<tr>
<td>Fe</td>
<td>BAL</td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>-</td>
<td>0.10</td>
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<tr>
<td>Mn</td>
<td>-</td>
<td>0.60</td>
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<tr>
<td>P</td>
<td>-</td>
<td>0.025</td>
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<tr>
<td>S</td>
<td>-</td>
<td>0.03</td>
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<tr>
<td>Si</td>
<td>-</td>
<td>0.35</td>
</tr>
<tr>
<td>Cr</td>
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<td>0.50</td>
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<tr>
<td>Mo</td>
<td>-</td>
<td>0.50</td>
</tr>
<tr>
<td>Co</td>
<td>-</td>
<td>1.00</td>
</tr>
</tbody>
</table>

## Specifications

<table>
<thead>
<tr>
<th>W.Nr.</th>
<th>UNS</th>
<th>UNS</th>
<th>AWS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.3912</td>
<td>K93600</td>
<td>K93601</td>
<td>090</td>
</tr>
</tbody>
</table>

## Key Features

- Low expansion alloy. Maintains near constant dimensions over the range of normal atmospheric temperatures.
- Low coefficient of expansion from cryogenic temperatures to about +500 °C (+930 °F).
- Retains strength and toughness at cryogenic temperatures.

## Typical Applications

- Standards of length (measurement reference)
- Thermostat rods
- Laser components
- Tanks and piping for the storage and transportation of liquefied gases

## Specifications

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Density</td>
<td>8.11 g/cm³</td>
</tr>
<tr>
<td>Melting Point</td>
<td>1430 °C</td>
</tr>
<tr>
<td>Inflexion Point</td>
<td>220 °C</td>
</tr>
<tr>
<td>Thermal conductivity</td>
<td>10.0 W/m•°C</td>
</tr>
<tr>
<td>Coefficient of Expansion</td>
<td>1.5 µm/m °C (20 – 100 °C)</td>
</tr>
<tr>
<td></td>
<td>2.6 µm/m °C (20 – 200 °C)</td>
</tr>
<tr>
<td></td>
<td>0.83 x 10⁻⁶ in/in °F (70 – 212 °F)</td>
</tr>
<tr>
<td></td>
<td>1.4 x 10⁻⁶ in/in °F (70 – 392 °F)</td>
</tr>
</tbody>
</table>

## Heat Treatment of Finished Parts

The Nilo alloys are usually supplied and used in the annealed condition (residual cold work distorts the coefficients of thermal expansion). Annealing times may vary due to section thickness.

<table>
<thead>
<tr>
<th>Type</th>
<th>Temperature</th>
<th>Time (Hr)</th>
<th>Cooling</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anale</td>
<td>850 – 1000</td>
<td>1560 – 1830</td>
<td>0.5</td>
</tr>
<tr>
<td></td>
<td>830</td>
<td>1525</td>
<td>0.5</td>
</tr>
<tr>
<td></td>
<td>300</td>
<td>570</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>100</td>
<td>212</td>
<td>48</td>
</tr>
</tbody>
</table>

## Properties

<table>
<thead>
<tr>
<th>Condition</th>
<th>Approx. Tensile Strength</th>
<th>Approx. Operating Temperature</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N/mm²</td>
<td>ksi</td>
</tr>
<tr>
<td>Annealed</td>
<td>450 – 550</td>
<td>65 – 80</td>
</tr>
<tr>
<td>Hard Drawn</td>
<td>700 – 900</td>
<td>102 – 131</td>
</tr>
</tbody>
</table>

The above tensile strength ranges are typical. If you require different please ask.
## Chemical Composition

<table>
<thead>
<tr>
<th>Element</th>
<th>Min %</th>
<th>Max %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ni</td>
<td>41.00 nominal</td>
<td></td>
</tr>
<tr>
<td>Fe</td>
<td>BAL</td>
<td></td>
</tr>
<tr>
<td>Mn</td>
<td>-</td>
<td>0.80</td>
</tr>
<tr>
<td>Si</td>
<td>-</td>
<td>0.30</td>
</tr>
<tr>
<td>C</td>
<td>-</td>
<td>0.05</td>
</tr>
<tr>
<td>Cr</td>
<td>-</td>
<td>0.25</td>
</tr>
<tr>
<td>P</td>
<td>-</td>
<td>0.03</td>
</tr>
<tr>
<td>S</td>
<td>-</td>
<td>0.03</td>
</tr>
<tr>
<td>Al</td>
<td>-</td>
<td>0.10</td>
</tr>
</tbody>
</table>

### Specifications

- **ASTM F30**

### Key Features

- Low and nominally constant coefficient of thermal expansion from room temperature to about 300 °C (570 °F)

### Typical Applications

- Semiconductor lead frames
- Thermostat rods
- Various glass to metal seals

## Designations

- W.Nr. 1.3917
- UNS K94100
- AWS 091

## Density

<table>
<thead>
<tr>
<th></th>
<th>g/cm³</th>
<th>lb/in³</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>8.11</td>
<td>0.293</td>
</tr>
</tbody>
</table>

## Melting Point

<table>
<thead>
<tr>
<th></th>
<th>°C</th>
<th>°F</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1435</td>
<td>2610</td>
</tr>
</tbody>
</table>

## Inflection Point

<table>
<thead>
<tr>
<th></th>
<th>°C</th>
<th>°F</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>370</td>
<td>700</td>
</tr>
</tbody>
</table>

## Thermal Conductivity

<table>
<thead>
<tr>
<th></th>
<th>W/m• °C</th>
<th>btu•in/ft²•h °F</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>10.5</td>
<td>72.8</td>
</tr>
</tbody>
</table>

## Coefficient of Expansion

<table>
<thead>
<tr>
<th></th>
<th>μm/m °C</th>
<th>in/in °F</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(20 – 100 °C)</td>
<td>(70 – 212 °F)</td>
</tr>
<tr>
<td></td>
<td>(20 – 300 °C)</td>
<td>(70 – 572 °F)</td>
</tr>
</tbody>
</table>

## Heat Treatment of Finished Parts

*The Nilo alloys are usually supplied and used in the annealed condition (residual cold work distorts the coefficients of thermal expansion). Annealing times may vary due to section thickness.*

<table>
<thead>
<tr>
<th>Type</th>
<th>Temperature</th>
<th>Time (Hr)</th>
<th>Cooling</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anneal</td>
<td>850 – 1000</td>
<td>1560 – 1830</td>
<td>0.5</td>
</tr>
</tbody>
</table>

## Properties

<table>
<thead>
<tr>
<th>Condition</th>
<th>Approx. tensile strength</th>
<th>Approx. operating temperature</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N/mm²</td>
<td>ksi</td>
</tr>
<tr>
<td>Annealed</td>
<td>450 – 550</td>
<td>65 – 80</td>
</tr>
<tr>
<td>Hard Drawn</td>
<td>700 – 900</td>
<td>102 – 131</td>
</tr>
</tbody>
</table>

The above tensile strength ranges are typical. If you require different please ask.
Chemical Composition

<table>
<thead>
<tr>
<th>Element</th>
<th>Min %</th>
<th>Max %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ni</td>
<td>48.00</td>
<td>nominal</td>
</tr>
<tr>
<td>Fe</td>
<td>BAL</td>
<td></td>
</tr>
<tr>
<td>Mn</td>
<td>-</td>
<td>0.80</td>
</tr>
<tr>
<td>Si</td>
<td>-</td>
<td>0.30</td>
</tr>
<tr>
<td>C</td>
<td>-</td>
<td>0.05</td>
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</tr>
<tr>
<td>P</td>
<td>-</td>
<td>0.025</td>
</tr>
<tr>
<td>S</td>
<td>-</td>
<td>0.03</td>
</tr>
<tr>
<td>Al</td>
<td>-</td>
<td>0.10</td>
</tr>
</tbody>
</table>

Specifications

- ASTM F30

Key Features

- Coefficient of thermal expansion designed to match that of soft lead and soda-lime glasses
- High inflection point

Typical Applications

- Industrial thermostats that operate at temperatures up to 450 °C (840 °F)
- Glass to metal seals

Specifications

- **Density**: 8.2 g/cm³, 0.296 lb/in³
- **Melting Point**: 1450 °C, 2640 °F
- **Inflection Point**: 460 °C, 860 °F
- **Thermal Conductivity**: 16.7 W/m·°C, 116 btu·in/ft²·h·°F
- **Coefficient of Expansion**: 8.5 µm/m °C (20 – 100 °C)
  8.3 – 9.3 µm/m °C (20 – 300 °C)
  4.7 x 10⁻⁶ in/in °F (70 – 212 °F)
  4.6 – 5.2 x 10⁻⁶ in/in °F (70 – 572 °F)

Heat Treatment of Finished Parts

*The Nilo alloys are usually supplied and used in the annealed condition (residual cold work distorts the coefficients of thermal expansion). Annealing times may vary due to section thickness.*

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<thead>
<tr>
<th>Type</th>
<th>Temperature</th>
<th>Time (Hr)</th>
<th>Cooling</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anneal</td>
<td>850 – 1000</td>
<td>1560 – 1830</td>
<td>0.5</td>
</tr>
</tbody>
</table>

Properties

<table>
<thead>
<tr>
<th>Condition</th>
<th>Approx. tensile strength</th>
<th>Approx. operating temperature</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N/mm²</td>
<td>ksi</td>
</tr>
<tr>
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<td>65 – 80</td>
</tr>
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<td>Hard Drawn</td>
<td>700 – 900</td>
<td>102 – 131</td>
</tr>
</tbody>
</table>

The above tensile strength ranges are typical. If you require different please ask.
## Chemical Composition

<table>
<thead>
<tr>
<th>Element</th>
<th>Min %</th>
<th>Max %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ni</td>
<td>50.50 nominal</td>
<td></td>
</tr>
<tr>
<td>Fe</td>
<td>BAL</td>
<td></td>
</tr>
<tr>
<td>Mn</td>
<td>-</td>
<td>0.60</td>
</tr>
<tr>
<td>Si</td>
<td>-</td>
<td>0.30</td>
</tr>
<tr>
<td>C</td>
<td>-</td>
<td>0.05</td>
</tr>
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<td>-</td>
<td>0.25</td>
</tr>
<tr>
<td>P</td>
<td>-</td>
<td>0.025</td>
</tr>
<tr>
<td>S</td>
<td>-</td>
<td>0.03</td>
</tr>
<tr>
<td>Al</td>
<td>-</td>
<td>0.10</td>
</tr>
</tbody>
</table>

### Key Features
- Designed for use with a variety of soft glasses
- Almost constant coefficient of thermal expansion up to approx. 565 °C (1050 °F)

### Typical Applications
- Various glass to metal sealing applications with soft glass and ceramics

### Designations
- W.Nr. 2.4478
- UNS N14052
- AWS 093

### Specifications

<table>
<thead>
<tr>
<th>Density</th>
<th>8.3 g/cm³</th>
<th>0.300 lb/in³</th>
</tr>
</thead>
<tbody>
<tr>
<td>Melting Point</td>
<td>1450 °C</td>
<td>2640 °F</td>
</tr>
<tr>
<td>Inflexion Point</td>
<td>500 °C</td>
<td>930 °F</td>
</tr>
<tr>
<td>Thermal Conductivity</td>
<td>17 W/m°C</td>
<td>118 btu•in/ft²•h°F</td>
</tr>
<tr>
<td>Coefficient of Expansion</td>
<td>10.3 µm/m °C (20 – 100 °C)</td>
<td>5.7 x 10⁻⁶ in/in °F (70 – 212 °F)</td>
</tr>
</tbody>
</table>

### Heat Treatment of Finished Parts

*The Nilo alloys are usually supplied and used in the annealed condition (residual cold work distorts the coefficients of thermal expansion). Annealing times may vary due to section thickness.*

<table>
<thead>
<tr>
<th>Type</th>
<th>Temperature</th>
<th>Time (Hr)</th>
<th>Cooling</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anneal</td>
<td>850 – 1000</td>
<td>1560 – 1830</td>
<td>0.5</td>
</tr>
</tbody>
</table>

### Properties

<table>
<thead>
<tr>
<th>Condition</th>
<th>Approx. tensile strength</th>
<th>Approx. operating temperature</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N/mm²</td>
<td>ksi</td>
</tr>
<tr>
<td>Annealed</td>
<td>450 – 550</td>
<td>65 – 80</td>
</tr>
<tr>
<td>Hard Drawn</td>
<td>700 – 900</td>
<td>102 – 131</td>
</tr>
</tbody>
</table>

*The above tensile strength ranges are typical. If you require different please ask.*
### Chemical Composition

<table>
<thead>
<tr>
<th>Element</th>
<th>Min %</th>
<th>Max %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fe</td>
<td>53.00</td>
<td>nominal</td>
</tr>
<tr>
<td>Ni</td>
<td>29.00</td>
<td>nominal</td>
</tr>
<tr>
<td>Co</td>
<td>17.0</td>
<td>nominal</td>
</tr>
<tr>
<td>Mn</td>
<td>-</td>
<td>0.50</td>
</tr>
<tr>
<td>Si</td>
<td>-</td>
<td>0.20</td>
</tr>
<tr>
<td>C</td>
<td>-</td>
<td>0.04</td>
</tr>
<tr>
<td>Al</td>
<td>-</td>
<td>0.10</td>
</tr>
<tr>
<td>Mg</td>
<td>-</td>
<td>0.10</td>
</tr>
<tr>
<td>Zr</td>
<td>-</td>
<td>0.10</td>
</tr>
<tr>
<td>Ti</td>
<td>-</td>
<td>0.10</td>
</tr>
<tr>
<td>Cu</td>
<td>-</td>
<td>0.20</td>
</tr>
<tr>
<td>Mo</td>
<td>-</td>
<td>0.20</td>
</tr>
</tbody>
</table>

### Specifications

<table>
<thead>
<tr>
<th>Element</th>
<th>Min %</th>
<th>Max %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fe</td>
<td>53.00</td>
<td>nominal</td>
</tr>
<tr>
<td>Ni</td>
<td>29.00</td>
<td>nominal</td>
</tr>
<tr>
<td>Co</td>
<td>17.0</td>
<td>nominal</td>
</tr>
<tr>
<td>Mn</td>
<td>-</td>
<td>0.50</td>
</tr>
<tr>
<td>Si</td>
<td>-</td>
<td>0.20</td>
</tr>
<tr>
<td>C</td>
<td>-</td>
<td>0.04</td>
</tr>
<tr>
<td>Al</td>
<td>-</td>
<td>0.10</td>
</tr>
<tr>
<td>Mg</td>
<td>-</td>
<td>0.10</td>
</tr>
<tr>
<td>Zr</td>
<td>-</td>
<td>0.10</td>
</tr>
<tr>
<td>Ti</td>
<td>-</td>
<td>0.10</td>
</tr>
<tr>
<td>Cu</td>
<td>-</td>
<td>0.20</td>
</tr>
<tr>
<td>Mo</td>
<td>-</td>
<td>0.20</td>
</tr>
</tbody>
</table>

### Designations

- W.Nr. 1.3981
- UNS K94610
- AWS 094

### Key Features

- Controlled coefficient of expansion (which decreases with rising temperature to the inflection point)
- Matches the expansion rate of borosilicate glasses and alumina ceramics

### Typical Applications

- Glass to metal seals in applications requiring high reliability or resistance to thermal shock, i.e., high power transmitting valves

### Density

8.16 g/cm³ | 0.295 lb/in³

### Melting Point

1450 °C | 2640 °F

### Inflection Point

450 °C | 840 °F

### Thermal Conductivity

16.7 W/m•°C | 116 btu•in/ft²•h•°F

### Coefficient of Expansion

- 6.0 µm/m °C (20 – 100 °C)
- 4.6 – 5.2 µm/m °C (20 – 400 °C)
- 3.3 x 10⁻⁶ in/in °F (70 – 212 °F)
- 2.6 – 2.9 x 10⁻⁶ in/in °F (70 – 752 °F)

### Heat Treatment of Finished Parts

The Nilo alloys are usually supplied and used in the annealed condition (residual cold work distorts the coefficients of thermal expansion). Annealing times may vary due to section thickness. Oxidizing time and temperature to be selected depending on required oxide thickness.

<table>
<thead>
<tr>
<th>Type</th>
<th>Temperature °C</th>
<th>Time (Hr)</th>
<th>Cooling</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anneal</td>
<td>850 – 1000</td>
<td>1560 – 1830</td>
<td>0.5</td>
</tr>
<tr>
<td>Decarburization</td>
<td>900 – 1050</td>
<td>1650 – 1920</td>
<td>1</td>
</tr>
<tr>
<td>Oxidize</td>
<td>600 – 1000</td>
<td>1110 – 1830</td>
<td>1</td>
</tr>
</tbody>
</table>

### Properties

<table>
<thead>
<tr>
<th>Condition</th>
<th>Approx. tensile strength N/mm²</th>
<th>Approx. operating temperature °C</th>
<th>°F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Annealed</td>
<td>450 – 550</td>
<td>up to +400</td>
<td>up to +750</td>
</tr>
<tr>
<td>Hard Drawn</td>
<td>700 – 900</td>
<td>up to +400</td>
<td>up to +750</td>
</tr>
</tbody>
</table>

The above tensile strength ranges are typical. If you require different please ask.
### Chemical Composition

<table>
<thead>
<tr>
<th>Element</th>
<th>Min %</th>
<th>Max %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ni</td>
<td>99.0</td>
<td>-</td>
</tr>
<tr>
<td>Cu</td>
<td>-</td>
<td>0.25</td>
</tr>
<tr>
<td>Fe</td>
<td>-</td>
<td>0.40</td>
</tr>
<tr>
<td>C</td>
<td>-</td>
<td>0.15</td>
</tr>
<tr>
<td>Si</td>
<td>-</td>
<td>0.35</td>
</tr>
<tr>
<td>Mn</td>
<td>-</td>
<td>0.35</td>
</tr>
<tr>
<td>Mg</td>
<td>-</td>
<td>0.20</td>
</tr>
<tr>
<td>Ti</td>
<td>-</td>
<td>0.10</td>
</tr>
<tr>
<td>S</td>
<td>-</td>
<td>0.01</td>
</tr>
<tr>
<td>Co</td>
<td>-</td>
<td>2.00</td>
</tr>
</tbody>
</table>

### Specifications

<table>
<thead>
<tr>
<th></th>
<th>ASTM B160</th>
<th>ASTM B162</th>
<th>BS 3075 NA11</th>
<th>BS 3076 NA11</th>
</tr>
</thead>
<tbody>
<tr>
<td>Designations</td>
<td>W.Nr. 2.4060</td>
<td>W.Nr. 2.4066</td>
<td>UNS N02200</td>
<td>AWS 070</td>
</tr>
</tbody>
</table>

### Key Features

- Commercially pure nickel
- Resistant to various reducing chemicals & caustic alkalies
- Good magnetostrictive properties
- High electrical and thermal conductivity
- Good ductility and low work hardening rate
- Good weldability and solderability

### Typical Applications

- Electronic components
- Electrical components
- Lead in wires for heating elements
- Battery connections/terminals
- Chemical processing
- Aerospace components
- Food processing
- Synthetic fibre processing

### Density

| Density | 8.89 g/cm³ | 0.321 lb/in³ |

### Melting Point

| Melting Point | 1446 °C | 2635 °F |

### Coefficient of Expansion

| Coefficient of Expansion | 13.3 μm/m °C (20 – 100 °C) | 7.4 x 10⁻⁶ in/in °F (70 – 212 °F) |

### Modulus of Rigidity

| Modulus of Rigidity | 81 kN/mm² | 11748 ksi |

### Modulus of Elasticity

| Modulus of Elasticity | 204 kN/mm² | 29588 ksi |

### Electrical Resistivity

| Electrical Resistivity | 9.6 μΩ • cm | 58 ohm • circ mil/ft |

### Thermal Conductivity

| Thermal Conductivity | 70.2 W/m • °C | 487 btu • in/ft² • h • °F |

### Properties

<table>
<thead>
<tr>
<th>Condition</th>
<th>Approx. tensile strength N/mm²</th>
<th>Approx. operating temperature</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>ksi</td>
<td>Tensile strength and elongation drop significantly at temperatures above 315 °C (600 °F). Service temperature is dependent on environment, load and size range.</td>
</tr>
<tr>
<td>Annealed</td>
<td>400 – 500</td>
<td>58 – 73</td>
</tr>
<tr>
<td>Hard Drawn</td>
<td>700 – 900</td>
<td>102 – 131</td>
</tr>
</tbody>
</table>

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<td>-</td>
</tr>
<tr>
<td>Cu</td>
<td>-</td>
<td>0.25</td>
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<tr>
<td>Fe</td>
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<td>0.40</td>
</tr>
<tr>
<td>C</td>
<td>-</td>
<td>0.02</td>
</tr>
<tr>
<td>Si</td>
<td>-</td>
<td>0.35</td>
</tr>
<tr>
<td>Mn</td>
<td>-</td>
<td>0.35</td>
</tr>
<tr>
<td>Mg</td>
<td>-</td>
<td>0.20</td>
</tr>
<tr>
<td>Ti</td>
<td>-</td>
<td>0.10</td>
</tr>
<tr>
<td>S</td>
<td>-</td>
<td>0.01</td>
</tr>
<tr>
<td>Co</td>
<td>-</td>
<td>2.00</td>
</tr>
</tbody>
</table>

## Specifications

### Designations
- ASTM B160
- ASTM B162
- BS 3076 NA12
- W.Nr. 2.4061
- W.Nr. 2.4068
- UNS N02201
- AWS 071

## Key Features
- Low-carbon version of Nickel 200
- Preferred to Nickel 200 for applications involving exposure to temperatures above 315 °C (600 °F)
- Resistant to various reducing chemicals & caustic alkalies
- Good magnetostrictive properties
- High electrical and thermal conductivity
- Good ductility and low work hardening rate
- Good weldability and solderability

## Typical Applications
- Electronic components
- Electrical components
- Lead in wires for heating elements
- Battery connections/terminals
- Chemical processing
- Aerospace components
- Food processing
- Synthetic fibre processing

## Properties

<table>
<thead>
<tr>
<th>Condition</th>
<th>Approx. tensile strength N/mm²</th>
<th>Approx. operating temperature</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>ksi</td>
<td>Tensile strength and elongation drop significantly at temperatures above 315 °C (600 °F). Service temperature is dependent on environment, load and size range.</td>
</tr>
<tr>
<td>Annealed</td>
<td>400 – 500</td>
<td>58 – 73</td>
</tr>
<tr>
<td>Hard Drawn</td>
<td>700 – 900</td>
<td>102 – 131</td>
</tr>
</tbody>
</table>

## Density
- 8.89 g/cm³
- 0.321 lb/in³

## Melting Point
- 1446 °C
- 2635 °F

## Coefficient of Expansion
- 13.1 μm/m °C (20 – 100 °C)
- 7.3 x 10⁻⁶ in/in °F (70 – 212 °F)

## Modulus of Rigidity
- 82 kN/mm²
- 11893 ksi

## Modulus of Elasticity
- 207 kN/mm²
- 30000 ksi

## Electrical Resistivity
- 8.5 μΩ • cm
- 51 ohm • circ mil/ft

## Thermal Conductivity
- 79.3 W/m • °C
- 550 btu • in/ft² • h • °F

The above tensile strength ranges are typical. If you require different please ask.
### Chemical Composition

<table>
<thead>
<tr>
<th>Element</th>
<th>Min %</th>
<th>Max %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ni</td>
<td>99.0</td>
<td>-</td>
</tr>
<tr>
<td>Mg</td>
<td>0.01</td>
<td>0.08</td>
</tr>
<tr>
<td>Ti</td>
<td>0.01</td>
<td>0.05</td>
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<tr>
<td>Cu</td>
<td>-</td>
<td>0.15</td>
</tr>
<tr>
<td>Fe</td>
<td>-</td>
<td>0.20</td>
</tr>
<tr>
<td>C</td>
<td>-</td>
<td>0.15</td>
</tr>
<tr>
<td>Si</td>
<td>-</td>
<td>0.15</td>
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<tr>
<td>S</td>
<td>-</td>
<td>0.008</td>
</tr>
<tr>
<td>Mn</td>
<td>-</td>
<td>0.35</td>
</tr>
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</table>

### Specifications

<table>
<thead>
<tr>
<th>Density</th>
<th>8.89 g/cm³</th>
<th>0.321 lb/in³</th>
</tr>
</thead>
<tbody>
<tr>
<td>Melting Point</td>
<td>1446 °C</td>
<td>2635 °F</td>
</tr>
<tr>
<td>Coefficient of Expansion</td>
<td>13.3 μm/m °C (20 – 100 °C)</td>
<td>7.4 x 10⁻⁶ in/in °F (70 – 212 °F)</td>
</tr>
<tr>
<td>Modulus of Rigidity</td>
<td>82 kN/mm²</td>
<td>11893 ksi</td>
</tr>
<tr>
<td>Modulus of Elasticity</td>
<td>207 kN/mm²</td>
<td>30000 ksi</td>
</tr>
</tbody>
</table>

### Key Features

- Similar to Nickel 200 but has compositional adjustments to enhance its performance in electrical and electronic applications

### Typical Applications

- Anodes and grids of electronic valves
- Lead wires
- Transistor Housings
- Magneto-strictive Transducers

### Properties

<table>
<thead>
<tr>
<th>Condition</th>
<th>Approx. tensile strength</th>
<th>Approx. operating temperature</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N/mm²</td>
<td>ksi</td>
</tr>
<tr>
<td>Annealed</td>
<td>400 – 500</td>
<td>58 – 73</td>
</tr>
<tr>
<td>Hard Drawn</td>
<td>700 – 900</td>
<td>102 – 131</td>
</tr>
</tbody>
</table>

Tensile strength and elongation drop significantly at temperatures above 315 °C (600 °F). Service temperature is dependent on environment, load and size range.

---

The above tensile strength ranges are typical. If you require different please ask.
### Chemical Composition

<table>
<thead>
<tr>
<th>Element</th>
<th>Min %</th>
<th>Max %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ni + Co</td>
<td>97.0</td>
<td>-</td>
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<tr>
<td>Mn</td>
<td>1.50</td>
<td>2.50</td>
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<tr>
<td>Fe</td>
<td>-</td>
<td>0.25</td>
</tr>
<tr>
<td>C</td>
<td>-</td>
<td>0.10</td>
</tr>
<tr>
<td>Cu</td>
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<td>0.20</td>
</tr>
<tr>
<td>Si</td>
<td>-</td>
<td>0.20</td>
</tr>
<tr>
<td>Mg</td>
<td>-</td>
<td>0.20</td>
</tr>
<tr>
<td>S</td>
<td>-</td>
<td>0.006</td>
</tr>
</tbody>
</table>

### Specifications

**Designations**
- W.Nr. 2.4110
- AWS 073

### Key Features
Stronger than Nickel 200 due to the addition of manganese

### Typical Applications
- Electrical Lead Wires
- Supporting Components in Lamps and electronic valves
- Electrodes in Glow-discharge Lamps
- Sparking Contacts

### Density
- 8.86 g/cm³
- 0.320 lb/in³

### Melting Point
- 1446 °C
- 2635 °F

### Coefficient of Expansion
- 12.9 μm/m °C (20 – 100 °C)
- 7.2 x 10⁻⁶ in/in °F (70 – 212 °F)

### Modulus of Rigidity
- 78 kN/mm²
- 11313 ksi

### Modulus of Elasticity
- 196 kN/mm²
- 28400 ksi

### Electrical Resistivity
- 10.9 μΩ • cm
- 66 ohm • circ mil/ft

### Thermal Conductivity
- 44 W/m • °C
- 305 btu • in/ft² • h • °F

### Properties

<table>
<thead>
<tr>
<th>Condition</th>
<th>Approx. tensile strength N/mm²</th>
<th>Approx. operating temperature ksi</th>
</tr>
</thead>
<tbody>
<tr>
<td>Annealed</td>
<td>450 – 550</td>
<td>65 – 80</td>
</tr>
<tr>
<td>Hard Drawn</td>
<td>750 – 950</td>
<td>109 – 138</td>
</tr>
</tbody>
</table>

Tensile strength and elongation drop significantly at temperatures above 315 °C (600 °F). Service temperature is dependent on environment, load and size range.

The above tensile strength ranges are typical. If you require different please ask.
### Chemical Composition

<table>
<thead>
<tr>
<th>Element</th>
<th>Min %</th>
<th>Max %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ni + Co</td>
<td>99.9</td>
<td>-</td>
</tr>
<tr>
<td>Cu</td>
<td>-</td>
<td>0.01</td>
</tr>
<tr>
<td>Fe</td>
<td>-</td>
<td>0.05</td>
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<tr>
<td>Mn</td>
<td>-</td>
<td>0.003</td>
</tr>
<tr>
<td>C</td>
<td>-</td>
<td>0.05</td>
</tr>
<tr>
<td>S</td>
<td>-</td>
<td>0.003</td>
</tr>
<tr>
<td>Mg</td>
<td>-</td>
<td>0.005</td>
</tr>
<tr>
<td>Si</td>
<td>-</td>
<td>0.005</td>
</tr>
<tr>
<td>Ti</td>
<td>-</td>
<td>0.005</td>
</tr>
</tbody>
</table>

### Specifications

- High purity grade of nickel that is made by powder metallurgy

### Key Features

- **Typical Applications**
  - Electrical Resistance Thermometers
  - Components for hydrogen thyatrons
  - Electrical and electronic components

### Designations

- W.Nr. 2.4050
- UNS N02270
- AWS 074

### Density

- 8.89 g/cm³
- 0.321 lb/in³

### Melting Point

- 1454 °C
- 2650 °F

### Coefficient of Expansion

- 13.3 μm/m °C (20 – 100 °C)
- 7.4 x 10⁻⁶ in/in °F (70 – 212 °F)

### Modulus of Rigidity

- 82 kN/mm²
- 11893 ksi

### Modulus of Elasticity

- 207 kN/mm²
- 30000 ksi

### Electrical Resistivity

- 7.5 μΩ • cm
- 45 ohm • circ mil/ft

### Thermal Conductivity

- 86 W/m • °C
- 595 btu • in/ft² • h • °F

### Properties

<table>
<thead>
<tr>
<th>Condition</th>
<th>Approx. tensile strength</th>
<th>Approx. operating temperature</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N/mm²</td>
<td>ksi</td>
</tr>
<tr>
<td>Annealed</td>
<td>300 – 450</td>
<td>44 – 65</td>
</tr>
<tr>
<td>Hard Drawn</td>
<td>600 – 800</td>
<td>87 – 116</td>
</tr>
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</table>

The above tensile strength ranges are typical. If you require different please ask.
### Chemical Composition

<table>
<thead>
<tr>
<th>Element</th>
<th>Min %</th>
<th>Max %</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>0.03</td>
<td></td>
</tr>
<tr>
<td>Si</td>
<td>1.00</td>
<td></td>
</tr>
<tr>
<td>Mn</td>
<td>2.00</td>
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<tr>
<td>P</td>
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<tr>
<td>S</td>
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<tr>
<td>Cr</td>
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<td>23.00</td>
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<tr>
<td>Ni</td>
<td>4.50</td>
<td>6.50</td>
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<tr>
<td>Mo</td>
<td>2.50</td>
<td>3.50</td>
</tr>
<tr>
<td>N</td>
<td>0.10</td>
<td>0.22</td>
</tr>
<tr>
<td>Fe</td>
<td>BAL</td>
<td></td>
</tr>
</tbody>
</table>

### Specifications

- ASTM A479
- ISO 15156-3 (NACE MR 0175)

### Key Features

- Greater corrosion resistance than stainless steel 300 series
- Greater pitting resistance and uniform corrosion resistance to stress corrosion cracking than stainless steel 300 series
- Good weldability

### Typical Applications

- Chemical processing
- Oil and gas refining
- Marine environments
- Pollution control equipment

### Designations

- W.Nr. 1.4462
- UNS S31803
- 2205
- AWS 167

### Density

- 7.8 g/cm³
- 0.282 lb/in³

### Melting Point

- 1470 °C
- 2680 °F

### Coefficient of Expansion

- 13.7 μm/m °C (21 – 100 °C)
- 7.61 x 10^-6 in/in °F (70 – 212 °F)

### Modulus of Rigidity

- 76.9 kN/mm²
- 11154 ksi

### Modulus of Elasticity

- 200 kN/mm²
- 29008 ksi

### Heat Treatment of Finished Parts

<table>
<thead>
<tr>
<th>Condition as supplied by Alloy Wire</th>
<th>Type</th>
<th>Temperature</th>
<th>Time (Hr)</th>
<th>Cooling</th>
</tr>
</thead>
<tbody>
<tr>
<td>Annealed or Spring Temper</td>
<td>Stress Relieve</td>
<td>250 °C</td>
<td>480 °F</td>
<td>1</td>
</tr>
</tbody>
</table>

### Properties

<table>
<thead>
<tr>
<th>Condition</th>
<th>Approx. tensile strength</th>
<th>Approx. operating temperature</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N/mm²</td>
<td>ksi</td>
</tr>
<tr>
<td>Solution Annealed</td>
<td>700 – 900</td>
<td>102 – 131</td>
</tr>
<tr>
<td>Spring Temper</td>
<td>1300 – 1900</td>
<td>189 – 276</td>
</tr>
</tbody>
</table>

The above tensile strength ranges are typical. If you require different please ask.
### Chemical Composition

<table>
<thead>
<tr>
<th>Element</th>
<th>Min %</th>
<th>Max %</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
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<td>0.03</td>
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<tr>
<td>Mn</td>
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<tr>
<td>Si</td>
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<td>0.80</td>
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<td>-0.015</td>
<td>0.015</td>
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<tr>
<td>P</td>
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<td>0.035</td>
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<tr>
<td>Cr</td>
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<td>26.0</td>
</tr>
<tr>
<td>Ni</td>
<td>6.0</td>
<td>8.0</td>
</tr>
<tr>
<td>Mo</td>
<td>3.0</td>
<td>4.5</td>
</tr>
<tr>
<td>N</td>
<td>0.24</td>
<td>0.35</td>
</tr>
<tr>
<td>Cu</td>
<td>-</td>
<td>0.5</td>
</tr>
<tr>
<td>Fe</td>
<td>BAL</td>
<td></td>
</tr>
</tbody>
</table>

### Specifications

<table>
<thead>
<tr>
<th>ISO 15156-3 (NACE MR 0175)</th>
<th>W.Nr. 1.4410</th>
<th>UNS S32750 2507</th>
<th>AWS 169</th>
</tr>
</thead>
</table>

### Key Features

- Excellent resistance to stress corrosion cracking in chloride-bearing environments
- Excellent resistance to pitting and crevice corrosion
- High resistance to general corrosion

### Typical Applications

- Oil and gas exploration
- Marine application

### Designations

- W.Nr. 1.4410
- UNS S32750 2507
- AWS 169

### Density

- 7.8 g/cm³
- 0.28 lb/in³

### Melting Point

- 1350 °C
- 2460 °F

### Coefficient of Expansion

- 13.5 μm/m °C (25 – 100 °C)
- 7.5 x 10⁻⁶ in/in °F (70 – 200 °F)

### Modulus of Rigidity

- 77 kN/mm²
- 11000 ksi

### Modulus of Elasticity

- 200 kN/mm²
- 29000 ksi

### Heat Treatment of Finished Parts

<table>
<thead>
<tr>
<th>Condition as supplied by Alloy Wire</th>
<th>Type</th>
<th>Temperature °C</th>
<th>Temperature °F</th>
<th>Time (Hr)</th>
<th>Cooling</th>
</tr>
</thead>
<tbody>
<tr>
<td>Annealed or Spring Temper</td>
<td>Stress Relieve</td>
<td>250</td>
<td>480</td>
<td>1</td>
<td>Air</td>
</tr>
</tbody>
</table>

### Properties

<table>
<thead>
<tr>
<th>Condition</th>
<th>Approx. tensile strength N/mm²</th>
<th>Approx. operating temperature °C</th>
<th>Approx. operating temperature °F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Solution Annealed</td>
<td>700 – 900</td>
<td>-200 to +300</td>
<td>-330 to +570</td>
</tr>
<tr>
<td>Spring Temper</td>
<td>1300 – 1900</td>
<td>-200 to +300</td>
<td>-330 to +570</td>
</tr>
</tbody>
</table>

The above tensile strength ranges are typical. If you require different please ask.
## Chemical Composition

<table>
<thead>
<tr>
<th>Element</th>
<th>Min %</th>
<th>Max %</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>-</td>
<td>0.06</td>
</tr>
<tr>
<td>Si</td>
<td>-</td>
<td>1.00</td>
</tr>
<tr>
<td>Mn</td>
<td>4.0</td>
<td>6.0</td>
</tr>
<tr>
<td>Ni</td>
<td>11.5</td>
<td>13.5</td>
</tr>
<tr>
<td>Cr</td>
<td>20.5</td>
<td>23.5</td>
</tr>
<tr>
<td>S</td>
<td>-</td>
<td>0.03</td>
</tr>
<tr>
<td>P</td>
<td>-</td>
<td>0.04</td>
</tr>
<tr>
<td>Mo</td>
<td>1.5</td>
<td>3.0</td>
</tr>
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<td>0.40</td>
</tr>
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<td>V</td>
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<td>0.30</td>
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<tr>
<td>Nb/Cb</td>
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<td>0.30</td>
</tr>
<tr>
<td>Fe</td>
<td></td>
<td>BAL</td>
</tr>
</tbody>
</table>

## Specifications

- **ISO 15156-3 (NACE MR0175)**
- **W.Nr. 1.3964**
- **UNS S20910**
- **AWS 165**

## Key Features

- Superior corrosion resistance to type 316 stainless steel
- Good mechanical properties at ambient and sub-zero temperatures
- Does not become magnetic when cold worked or cooled to sub-zero temperatures

## Typical Applications

Components in processing environments like:
- Marine
- Petroleum
- Petrochemical
- Fertilizer
- Pulp & Paper

---

### Specifications

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Density</td>
<td>7.88 g/cm³ (0.285 lb/in³)</td>
</tr>
<tr>
<td>Melting Point</td>
<td>1415 – 1450 °C (2579 – 2642 °F)</td>
</tr>
<tr>
<td>Coefficient of Expansion</td>
<td>16.2 μm/m °C (20 – 100 °C) 9.0 x 10⁻⁴ in/in °F (70 – 200 °F)</td>
</tr>
<tr>
<td>Modulus of Rigidity</td>
<td>78.9 kN/mm² (11444 ksi)</td>
</tr>
<tr>
<td>Modulus of Elasticity</td>
<td>196.5 kN/mm² (28500 ksi)</td>
</tr>
</tbody>
</table>

### Heat Treatment of Finished Parts

<table>
<thead>
<tr>
<th>Condition as supplied by Alloy Wire</th>
<th>Type</th>
<th>Temperature °C</th>
<th>Temperature °F</th>
<th>Time (Hr)</th>
<th>Cooling</th>
</tr>
</thead>
<tbody>
<tr>
<td>Annealed or Spring Temper</td>
<td>Stress Relieve</td>
<td>250</td>
<td>480</td>
<td>1</td>
<td>Air</td>
</tr>
</tbody>
</table>

### Properties

<table>
<thead>
<tr>
<th>Condition</th>
<th>Approx. tensile strength N/mm²</th>
<th>Approx. operating temperature °C</th>
<th>°F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Solution Annealed</td>
<td>700 – 1000</td>
<td>-200 to +300</td>
<td>-330 to +570</td>
</tr>
<tr>
<td>Spring Tempered</td>
<td>1300 – 2200</td>
<td>-200 to +300</td>
<td>-330 to +570</td>
</tr>
</tbody>
</table>

The above tensile strength ranges are typical. If you require different please ask.
# Chemical Composition

<table>
<thead>
<tr>
<th>Element</th>
<th>Min %</th>
<th>Max %</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
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<td></td>
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<tr>
<td>Si</td>
<td>3.50</td>
<td>4.50</td>
</tr>
<tr>
<td>Mn</td>
<td>7.00</td>
<td>9.0</td>
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<tr>
<td>Ni</td>
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<td>9.0</td>
</tr>
<tr>
<td>Cr</td>
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<td>18.00</td>
</tr>
<tr>
<td>S</td>
<td>-</td>
<td>0.03</td>
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<tr>
<td>Cu</td>
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<td>0.75</td>
</tr>
<tr>
<td>Fe</td>
<td>BAL</td>
<td></td>
</tr>
</tbody>
</table>

**Specifications**
AMS 5848  
ASTM A580

**Key Features**
- Anti galling  
- Wear resistant

**Typical Applications**  
- Valve Stems  
- Pins  
- Brushes  
- Roller bearings  
- Pump shafts and rings  
- Thread inserts  
- Fasteners

---

**Designations**
- UNS S21800  
- AWS 166

---

**Density**
- 7.6 g/cm³  
- 0.28 lb/in³

**Melting Point**
- 1375 °C  
- 2500 °F

**Coefficient of Expansion**
- 15.8 μm/m °C (21 – 100 °C)  
- 8.81 x 10^-6 in/in °F (70 – 212 °F)

**Modulus of Rigidity**
- 69 kN/mm²  
- 10008 ksi

**Modulus of Elasticity**
- 181 kN/mm²  
- 26200 ksi

---

**Heat Treatment of Finished Parts**

<table>
<thead>
<tr>
<th>Condition as supplied by Alloy Wire</th>
<th>Type</th>
<th>Temperature</th>
<th>Time (Hr)</th>
<th>Cooling</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Stress Relieve</td>
<td>250 °C</td>
<td>480 °F</td>
<td>1</td>
</tr>
</tbody>
</table>

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**Properties**

<table>
<thead>
<tr>
<th>Condition</th>
<th>Approx. tensile strength</th>
<th>Approx. operating temperature</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>N/mm²</td>
<td>ksi</td>
</tr>
<tr>
<td>Solution Annealed</td>
<td>700 – 1000</td>
<td>102 – 145</td>
</tr>
<tr>
<td>Spring Temper</td>
<td>1300 – 1900</td>
<td>189 – 276</td>
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</tbody>
</table>

The above tensile strength ranges are typical. If you require different please ask.
# ALLOY 20 CB 3

<table>
<thead>
<tr>
<th>Chemical Composition</th>
<th>Specifications</th>
<th>Key Features</th>
<th>Typical Applications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Element</td>
<td>Min %</td>
<td>Max %</td>
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</tr>
<tr>
<td>Mn</td>
<td>2.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>P</td>
<td>0.045</td>
<td></td>
<td></td>
</tr>
<tr>
<td>S</td>
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</tr>
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<td>Cu</td>
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<td>Nb/Cb</td>
<td>8xC</td>
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<tr>
<td>Fe</td>
<td>BAL</td>
<td></td>
<td></td>
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**Designations**
- W.Nr. 2.4660
- UNS N08020
- AWS 130

### Specifications
- Density: 8.08 g/cm³ / 0.292 lb/in³
- Melting Point: 1425 °C / 2600 °F
- Coefficient of Expansion: 14.69 μm/m °C (20 – 100 °C) / 8.16 x 10⁻⁶ in/in °F (70 – 212 °F)
- Modulus of Rigidity: 73.6 kN/mm² / 10675 ksi
- Modulus of Elasticity: 193 kN/mm² / 27993 ksi

### Heat Treatment of Finished Parts

<table>
<thead>
<tr>
<th>Condition as supplied by Alloy Wire</th>
<th>Type</th>
<th>Temperature</th>
<th>Time (Hr)</th>
<th>Cooling</th>
</tr>
</thead>
<tbody>
<tr>
<td>Annealed or Spring Temper</td>
<td>Stress Relieve</td>
<td>250 – 530</td>
<td>480 – 990</td>
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### Properties

<table>
<thead>
<tr>
<th>Condition</th>
<th>Approx. tensile strength</th>
<th>Approx. operating temperature</th>
</tr>
</thead>
<tbody>
<tr>
<td>Solution Annealed</td>
<td>600 – 900 N/mm², 87 – 131 ksi</td>
<td>-200 to +300 °C, -330 to +570 °F</td>
</tr>
<tr>
<td>Spring Tempr</td>
<td>1200 – 1800 N/mm², 174 – 261 ksi</td>
<td>-200 to +300 °C, -330 to +570 °F</td>
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</table>

The above tensile strength ranges are typical. If you require different please ask.
### Chemical Composition

<table>
<thead>
<tr>
<th>Element</th>
<th>Min %</th>
<th>Max %</th>
<th>AMS 5688</th>
<th>ASTM A313</th>
<th>ASTM A580</th>
<th>BS 970</th>
<th>BS 2056</th>
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<td>Cr</td>
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<td>19.00</td>
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<tr>
<td>Ni</td>
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<td>10.00</td>
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<td></td>
<td></td>
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<tr>
<td>Fe</td>
<td>BAL</td>
<td></td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

### Key Features

- Good mechanical properties and corrosion resistance

### Typical Applications

- Springs
- Engineered components
- Wire mesh
- Wire cloth
- Hose braiding

### Designations

- W.Nr. 1.4310
- UNS 30200
- AWS 160

### Density

- 8.0 g/cm³
- 0.289 lb/in³

### Melting Point

- 1420 °C
- 2590 °F

### Coefficient of Expansion

- 17.6 μm/m °C (20 – 100°C)
- 9.8 x 10⁻⁶ in/in °F (70 – 212 °F)

### Modulus of Rigidity

- 70.3 kN/mm²
- 10196 ksi

### Modulus of Elasticity

- 187.5 kN/mm²
- 27195 ksi

### Heat Treatment of Finished Parts

<table>
<thead>
<tr>
<th>Condition as supplied by Alloy Wire</th>
<th>Type</th>
<th>Temperature</th>
<th>Time (Hr)</th>
<th>Cooling</th>
</tr>
</thead>
<tbody>
<tr>
<td>Annealed or Spring Temper</td>
<td>Stress Relieve</td>
<td>250 °C</td>
<td>480 °F</td>
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</tr>
</tbody>
</table>

### Properties

<table>
<thead>
<tr>
<th>Condition</th>
<th>Approx. tensile strength</th>
<th>Approx. operating temperature</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N/mm²</td>
<td>ksi</td>
</tr>
<tr>
<td>Annealed</td>
<td>600 – 800</td>
<td>87 – 116</td>
</tr>
<tr>
<td>Spring Temper</td>
<td>1300 – 2200</td>
<td>189 – 319</td>
</tr>
</tbody>
</table>

The above tensile strength ranges are typical. If you require different please ask.
### Chemical Composition

<table>
<thead>
<tr>
<th>Element</th>
<th>Min %</th>
<th>Max %</th>
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<tbody>
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<td>Si</td>
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<td>Cr</td>
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<td>10.50</td>
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<tr>
<td>Fe</td>
<td>BAL</td>
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</tbody>
</table>

### Specifications

- ASTM A313
- ASTM A580
- BS 970
- BS 2056

### Key Features

Good mechanical properties and corrosion resistance

### Typical Applications

- Springs
- Engineered components
- Wire mesh
- Wire cloth
- Hose braiding

### Designations

- W.Nr. 1.4301
- W.Nr. 1.4307
- UNS S30400
- AWS 161

### Density

8.0 g/cm³ 0.289 lb/in³

### Melting Point

1454 °C 2650 °F

### Coefficient of Expansion

18.2 μm/m °C (20 – 100 °C) 10.1 x 10⁻⁶ in/in °F (70 – 212 °F)

### Modulus of Rigidity

70.3 kN/mm² 10196 ksi

### Modulus of Elasticity

187.5 kN/mm² 27195 ksi

### Heat Treatment of Finished Parts

<table>
<thead>
<tr>
<th>Condition as supplied by Alloy Wire</th>
<th>Temperature</th>
<th>Time (Hr)</th>
<th>Cooling</th>
</tr>
</thead>
<tbody>
<tr>
<td>Annealed or Spring Temper</td>
<td>Stress Relieve</td>
<td>250 480</td>
<td>1 Air</td>
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</tbody>
</table>

### Properties

<table>
<thead>
<tr>
<th>Condition</th>
<th>Approx. tensile strength</th>
<th>Approx. operating temperature</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N/mm²</td>
<td>ksi</td>
</tr>
<tr>
<td>Solution Annealed</td>
<td>600 – 800</td>
<td>87 – 116</td>
</tr>
<tr>
<td>Spring Temper</td>
<td>1300 – 2200</td>
<td>189 – 319</td>
</tr>
</tbody>
</table>

The above tensile strength ranges are typical. If you require different please ask.
## STAINLESS STEEL 316

### Chemical Composition

<table>
<thead>
<tr>
<th>Element</th>
<th>Min %</th>
<th>Max %</th>
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<tr>
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<tr>
<td>Mn</td>
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<tr>
<td>Cr</td>
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<td>2.50</td>
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<tr>
<td>Fe</td>
<td>BAL</td>
<td></td>
</tr>
</tbody>
</table>

### Designations

- W.Nr. 1.4401
- W.Nr. 1.4404
- UNS S31600
- AWS 162

### Specifications

- ASTM A313
- ASTM A580
- BS 970
- BS 2056

### Key Features

- Better corrosion resistance and non-magnetic properties than 302 & 304 stainless
- Better pitting and crevice corrosion resistance than 302 & 304 stainless

### Typical Applications

- More suited to Marine, Food and Medical applications than 302 and 304 stainless
- Food processing
- Springs
- Engineered components
- Wire mesh
- Wire cloth
- Hose braiding

### Density

- 8.0 g/cm³
- 0.289 lb/in³

### Melting Point

- 1398 °C
- 2555 °F

### Coefficient of Expansion

- 17.5 μm/m °C (20 – 100 °C)
- 9.7 x 10⁻⁶ in/in °F (70 – 212 °F)

### Modulus of Rigidity

- 70.3 kN/mm²
- 10196 ksi

### Modulus of Elasticity

- 187.5 kN/mm²
- 27195 ksi

### Heat Treatment of Finished Parts

<table>
<thead>
<tr>
<th>Condition as supplied by Alloy Wire</th>
<th>Type</th>
<th>Temperature</th>
<th>Time (Hr)</th>
<th>Cooling</th>
</tr>
</thead>
<tbody>
<tr>
<td>Annealed or Spring Temper</td>
<td>Stress Relieve</td>
<td>250 °C</td>
<td>480 °F</td>
<td>1</td>
</tr>
</tbody>
</table>

### Properties

<table>
<thead>
<tr>
<th>Condition</th>
<th>Approx. tensile strength</th>
<th>Approx. operating temperature</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N/mm²</td>
<td>ksi</td>
</tr>
<tr>
<td>Annealed</td>
<td>600 – 800</td>
<td>87 – 116</td>
</tr>
<tr>
<td>Spring Tempe</td>
<td>1300 – 2200</td>
<td>189 – 319</td>
</tr>
</tbody>
</table>

The above tensile strength ranges are typical. If you require different please ask.
## Chemical Composition

<table>
<thead>
<tr>
<th>Element</th>
<th>Min %</th>
<th>Max %</th>
</tr>
</thead>
<tbody>
<tr>
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<td>Si</td>
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</tr>
<tr>
<td>Fe</td>
<td>BAL</td>
<td></td>
</tr>
</tbody>
</table>

## Specifications

- ASTM F138
- BS 7252 Pt1
- COMPOSITION D
- ISO 5832 - 1

## Key Features

- Regarded as 'Medical Grade' stainless steel vacuum melted to achieve the extremely high levels of purity and 'cleanliness' required for surgical implants
- Good mechanical properties and corrosion resistance
- Better pitting and crevice corrosion resistance than 302 & 304 stainless

## Typical Applications

- Medical implants
- Machined parts

## Designations

- W.Nr. 1.4441
- UNS S31673
- AWS 163

## Density

- 8.0 g/cm³
- 0.289 lb/in³

## Melting Point

- 1500 °C
- 2730 °F

## Coefficient of Expansion

- 16.5 μm/m °C (20 – 100 °C)
- 9.2 x 10⁻⁶ in/in °F (70 – 212 °F)

## Modulus of Rigidity

- 70.3 kN/mm²
- 10196 ksi

## Modulus of Elasticity

- 187.5 kN/mm²
- 27195 ksi

### Heat Treatment of Finished Parts

<table>
<thead>
<tr>
<th>Condition as supplied by Alloy Wire</th>
<th>Type</th>
<th>Temperature</th>
<th>Time (Hr)</th>
<th>Cooling</th>
</tr>
</thead>
<tbody>
<tr>
<td>Annealed or Spring Temper</td>
<td>Stress Relieve</td>
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### Properties

<table>
<thead>
<tr>
<th>Condition</th>
<th>Approx. tensile strength</th>
<th>Approx. operating temperature</th>
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<tbody>
<tr>
<td></td>
<td>N/mm²</td>
<td>ksi</td>
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<tr>
<td>Annealed</td>
<td>600 – 800</td>
<td>87 – 116</td>
</tr>
<tr>
<td>Spring Temper</td>
<td>1300 – 2200</td>
<td>189 – 319</td>
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The above tensile strength ranges are typical. If you require different please ask.
### STAINLESS STEEL 316 Ti

<table>
<thead>
<tr>
<th>Chemical Composition</th>
<th>Specifications</th>
<th>Key Features</th>
<th>Typical Applications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Element</td>
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<td>Better corrosion resistance at higher</td>
<td>Chemical processing</td>
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<tr>
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<td>ISO 15156-3</td>
<td>temperatures than 316 stainless</td>
<td>Springs</td>
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<td>(NACE MR0175)</td>
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<td>Fasteners</td>
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<td>BS EN 10088-3</td>
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<tr>
<td>Fe</td>
<td>BAL</td>
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<td></td>
</tr>
</tbody>
</table>

**Density**

7.9 g/cm³ 0.285 lb/in³

**Melting Point**

1375 °C 2500°F

**Coefficient of Expansion**

16.5 μm/m °C (21 – 100 °C) 9.11 x 10⁻⁶ in/in °F (70 – 212 °F)

**Modulus of Rigidity**

74 kN/mm² 10730 ksi

**Modulus of Elasticity**

193 kN/mm² 27990 ksi

### Heat Treatment of Finished Parts

<table>
<thead>
<tr>
<th>Condition as supplied by Alloy Wire</th>
<th>Type</th>
<th>Temperature °C</th>
<th>Temperature °F</th>
<th>Time (Hr)</th>
<th>Cooling</th>
</tr>
</thead>
<tbody>
<tr>
<td>Annealed or Spring Temper</td>
<td>Stress Relieve</td>
<td>250</td>
<td>480</td>
<td>1</td>
<td>Air</td>
</tr>
</tbody>
</table>

### Properties

<table>
<thead>
<tr>
<th>Condition</th>
<th>Approx. tensile strength N/mm²</th>
<th>Approx. tensile strength ksi</th>
<th>Approx. operating temperature °C</th>
<th>Approx. operating temperature °F</th>
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</thead>
<tbody>
<tr>
<td>Annealed</td>
<td>600 – 750</td>
<td>87 – 109</td>
<td>-200 to +300</td>
<td>-330 to +570</td>
</tr>
<tr>
<td>Spring Temper</td>
<td>1300 – 1600</td>
<td>189 – 232</td>
<td>-200 to +300</td>
<td>-330 to +570</td>
</tr>
</tbody>
</table>

The above tensile strength ranges are typical. If you require different please ask.
### Chemical Composition

<table>
<thead>
<tr>
<th>Element</th>
<th>Min %</th>
<th>Max %</th>
</tr>
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<tbody>
<tr>
<td>C</td>
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<td>Ni</td>
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<tr>
<td>Cr</td>
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<td>Ni + Cr</td>
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</tr>
<tr>
<td>Ti</td>
<td>4 x C</td>
<td></td>
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<td>Nb/Cb</td>
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<tr>
<td>S</td>
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<tr>
<td>P</td>
<td></td>
<td>0.045</td>
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<tr>
<td>Fe</td>
<td>BAL</td>
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### Specifications

| DTD 189A | Corrosion resistant |

### Key Features

- Aircraft Locking wire
- General Locking wire

### Typical Applications

- DTD 189A

### Designations

- AWS 164

### Properties

<table>
<thead>
<tr>
<th>Condition</th>
<th>Approx. tensile strength</th>
<th>Approx. operating temperature</th>
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<tr>
<td></td>
<td>N/mm²</td>
<td>ksi</td>
</tr>
<tr>
<td>Annealed</td>
<td>600 – 800</td>
<td>87 – 116</td>
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The above tensile strength ranges are typical. If you require different please ask.
### Chemical Composition

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<th>Element</th>
<th>Min %</th>
<th>Max %</th>
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<tr>
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<td>Al</td>
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<tr>
<td>Cu</td>
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<td>0.50</td>
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<tr>
<td>Fe</td>
<td>-</td>
<td>1.00</td>
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### Designations

- W.Nr. 2.4869
- UNS N06003
- AWS 180

### Typical Applications

- Heating elements in both domestic and industrial appliances and in control resistors

### Density

- 8.31 g/cm³
- 0.300 lb/in³

### Electrical Resistivity at 20 °C

- 108 microhm • cm
- 650 ohm • Circ • mil/ft

### Maximum Operating Temperature

- For use as a Heating Element
- For use in Hot Cutting, Fabrication – Line Bending

<table>
<thead>
<tr>
<th>Temperature</th>
<th>°C</th>
<th>°F</th>
</tr>
</thead>
<tbody>
<tr>
<td>1200</td>
<td>2192</td>
<td></td>
</tr>
<tr>
<td>300</td>
<td>572</td>
<td></td>
</tr>
</tbody>
</table>

### Melting Point

- 1400 °C
- 2550 °F

### Coefficient of Expansion

- 12.5 µm/m °C (20 – 100 °C)
- 7.0 x 10⁻⁶ in/in °F (70 – 212 °F)

### Temperature-Resistance Factor (F) At:

<table>
<thead>
<tr>
<th>Temperature</th>
<th>20 °C</th>
<th>100 °C</th>
<th>200 °C</th>
<th>300 °C</th>
<th>400 °C</th>
<th>500 °C</th>
<th>600 °C</th>
<th>700 °C</th>
<th>800 °C</th>
<th>900 °C</th>
<th>1000 °C</th>
<th>1100 °C</th>
<th>1200 °C</th>
</tr>
</thead>
<tbody>
<tr>
<td>°C</td>
<td>68 °F</td>
<td>212 °F</td>
<td>392 °F</td>
<td>572 °F</td>
<td>752 °F</td>
<td>932 °F</td>
<td>1112 °F</td>
<td>1292 °F</td>
<td>1472 °F</td>
<td>1652 °F</td>
<td>1832 °F</td>
<td>2012 °F</td>
<td>2192 °F</td>
</tr>
<tr>
<td>F</td>
<td>1.00</td>
<td>1.006</td>
<td>1.015</td>
<td>1.028</td>
<td>1.045</td>
<td>1.065</td>
<td>1.068</td>
<td>1.057</td>
<td>1.051</td>
<td>1.052</td>
<td>1.062</td>
<td>1.071</td>
<td>1.080</td>
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### Chemical Composition

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<td>0.10</td>
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<td>0.50</td>
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<tr>
<td>Mn</td>
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<td>1.00</td>
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<tr>
<td>Fe</td>
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<td>1.00</td>
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<tr>
<td>Cu</td>
<td>55.00 nominal</td>
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<tr>
<td>Ni</td>
<td>BAL</td>
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### Designations

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</thead>
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<td>2.0842</td>
<td>181</td>
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### Typical Applications

Power resistors, shunts, thermocouples and wire-wound precision resistors having operating temperatures up to 400 °C (750 °F)

### Density

<table>
<thead>
<tr>
<th></th>
<th>g/cm³</th>
<th>lb/in³</th>
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<tbody>
<tr>
<td></td>
<td>8.89</td>
<td>0.321</td>
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### Electrical Resistivity at 20 °C

<table>
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<th>microhm • cm</th>
<th>ohm • Circ • mil/ft</th>
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</thead>
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<tr>
<td></td>
<td>49</td>
<td>295</td>
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### Maximum Operating Temperature

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<th>°C</th>
<th>°F</th>
</tr>
</thead>
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<tr>
<td></td>
<td>400</td>
<td>750</td>
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### Melting Point

<table>
<thead>
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<th></th>
<th>°C</th>
<th>°F</th>
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</thead>
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<tr>
<td></td>
<td>1270</td>
<td>2320</td>
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</table>

### Coefficient of Expansion

<table>
<thead>
<tr>
<th></th>
<th>°C (20 – 100)</th>
<th>°F (70 – 212)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>14.7 µm/m</td>
<td>8.17 x 10⁻⁶ in/in</td>
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</table>

45/55 NiCu changes little in electrical resistance as temperature increases. It has a temperature-resistance factor of +0.00003/°C in the 20 – 100 °C range.
# RW 41 Ultra High Strength Hot Cutting Wire

<table>
<thead>
<tr>
<th>Key Features</th>
<th>Typical Applications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exceptional strength at elevated temperatures and is the highest performing hot cutting wire we offer.</td>
<td>Production lines cutting foam polystyrene (EPS), thermal laminate materials etc. Excellent track record for working continuously and on oscillating cutting frames.</td>
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</table>

<table>
<thead>
<tr>
<th>Property</th>
<th>Value 1</th>
<th>Value 2</th>
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</thead>
<tbody>
<tr>
<td>Density</td>
<td>8.25 g/cm³</td>
<td>0.298 lb/in³</td>
</tr>
<tr>
<td>Electrical Resistivity at 20 °C</td>
<td>131 microhm • cm</td>
<td>788 ohm • Circ • mil/ft</td>
</tr>
<tr>
<td>Maximum Operating Temperature</td>
<td>300 °C</td>
<td>572 °F</td>
</tr>
<tr>
<td>Melting Point</td>
<td>1345 °C</td>
<td>2450 °F</td>
</tr>
<tr>
<td>Coefficient of Expansion</td>
<td>13.6 µm/m °C (20 – 100 °C)</td>
<td>7.41 x 10⁻⁶ in/in °F (70 – 212 °F)</td>
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</table>
### RW 118 Properties

<table>
<thead>
<tr>
<th>Property</th>
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</thead>
<tbody>
<tr>
<td>Density</td>
<td>8.18 g/cm³ (0.296 lb/in³)</td>
</tr>
<tr>
<td>Electrical Resistivity at 20 °C</td>
<td>118 microhm • cm (710 ohm • Circ • mil/ft)</td>
</tr>
<tr>
<td>Maximum Operating Temperature</td>
<td>300 °C (572 °F)</td>
</tr>
<tr>
<td>Melting Point</td>
<td>1370 °C (2500 °F)</td>
</tr>
<tr>
<td>Coefficient of Expansion</td>
<td>12.7 μm/m °C (20 – 100 °C) (7.1 x 10⁻⁶ in/in °F (70 – 212 °F))</td>
</tr>
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</table>

### RW 122 Properties

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>Density</td>
<td>8.28 g/cm³ (0.299 lb/in³)</td>
</tr>
<tr>
<td>Electrical Resistivity at 20 °C</td>
<td>122 microhm • cm (734 ohm • Circ • mil/ft)</td>
</tr>
<tr>
<td>Maximum Operating Temperature</td>
<td>300 °C (572 °F)</td>
</tr>
<tr>
<td>Melting Point</td>
<td>1430 °C (2600 °F)</td>
</tr>
<tr>
<td>Coefficient of Expansion</td>
<td>12.6 μm/m °C (20 – 100 °C) (7.0 x 10⁻⁶ in/in °F (70 – 212 °F))</td>
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</tbody>
</table>

### RW 70 Properties

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<td>Density</td>
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</tr>
<tr>
<td>Electrical Resistivity at 20 °C</td>
<td>70 microhm • cm (421 ohm • Circ • mil/ft)</td>
</tr>
<tr>
<td>Maximum Operating Temperature</td>
<td>300 °C (572 °F)</td>
</tr>
<tr>
<td>Melting Point</td>
<td>1375 °C (2500 °F)</td>
</tr>
<tr>
<td>Coefficient of Expansion</td>
<td>17.6 μm/m °C (20 – 100 °C) (9.8 x 10⁻⁶ in/in °F (70 – 212 °F))</td>
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# Alloy designation/specification summary

It may not be possible to fully release wire to some of the below specifications. Please contact us for further information.

<table>
<thead>
<tr>
<th>W.Nr</th>
<th>UNS No.</th>
<th>Material</th>
<th>AWS</th>
<th>AMS</th>
<th>ASTM</th>
<th>BS</th>
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Glossary of terms

**Cold drawn**
Reducing the cross sectional area of a round wire diameter at ambient temperature.

**Cold drawn - spring temper**
A specific amount of reduction in cross sectional area to achieve standard spring temper condition. Not a standard condition for all alloys.

**Cold drawn - No. 1 temper**
A specific amount of reduction in cross sectional area to achieve standard No. 1 temper condition. Less than that of spring temper and not a standard condition for all alloys.

**Cold drawn - special temper**
A specific amount of reduction in cross sectional area to achieve customer required mechanical properties different to spring temper or No.1 temper.

**Hard drawn**
An amount of reduction in cross sectional area to increase mechanical properties to no defined standard.

**Cold rolled flat wire**
Round wire passed through top & bottom rollers at ambient temperature, resulting in naturally radiused edges.

**Cold rolled section**
Round wire rolled on four or more surfaces at ambient temperature, to control width and thickness.

**Coated**
Surface coated with a dry lubricant (soap), generally applied to aid customers during auto coiling.

**Clean**
No surface coating applied onto the wire.

**Annealed**
Softened by heat treatment.

**Age hardening**
Increasing mechanical properties with heat treatment, usually on finished components.

**Stress relieve**
Heat treatment process carried out on finished components to remove internal stresses induced by forming. Not intended to effect mechanical properties.

**Heat treatment - after forming**
Standard heat treatments for finished components are stated in our tables as a guide only and resulting mechanical properties are typical values. Various mechanical properties are achievable through a combination of cold working and heat treatment, please contact us to discuss your specific requirements. We can carry out capability tests on samples to demonstrate our products ability to meet your specification after final heat treatment.

**Tensile strength**
The tensile strength ranges given are typical for each alloy for the specified standard condition of supply. Please be aware that as we manufacture these materials, tensile strength can be altered to suit customer requirements. Please contact us to discuss if different mechanical properties are required.

To the best of our knowledge, the information included in this literature is correct at the time of going to print. Due to continuous development, AWI reserve the right to change specifications without prior notice.
## Alloys quick search

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