12R10/12R10HV (vacuum remelted) are austenitic stainless steels characterized by moderate tensile strength, good corrosion resistance and moderate fatigue and relaxation resistance.

Vacuum-remelted 12R10HV offers higher cleanliness compared to 12R10, which is usually required for medical applications.

Service temperature: -200 to 250 °C (-330 to 480 °F).

12R10 and 12R10 HV are characterized by:
- High tensile strength and tempering effect
- Good relaxation resistance, especially at elevated temperatures
- High fatigue strength

Applications
12R10/12R10HV can be used for blood lancets, stylets, acupuncture needles and dental files and reamers.

Chemical Composition (nominal) %

<table>
<thead>
<tr>
<th>C</th>
<th>Si</th>
<th>Mn</th>
<th>P</th>
<th>S</th>
<th>Cr</th>
<th>Ni</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.08</td>
<td>0.5</td>
<td>1.2</td>
<td>≤ 0.040</td>
<td>≤ 0.010</td>
<td>18.0</td>
<td>8.3</td>
</tr>
</tbody>
</table>

Forms of Supply

<table>
<thead>
<tr>
<th>Surface finish</th>
<th>Size range, mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coated</td>
<td>0.20 - 10.00</td>
</tr>
<tr>
<td>Nicoat A (nickel coating)</td>
<td>0.22 - 2.50</td>
</tr>
<tr>
<td>Bright</td>
<td>0.11 - 0.80</td>
</tr>
<tr>
<td>Nicoat P (nickel coating + bright)</td>
<td>0.11 - 0.80</td>
</tr>
<tr>
<td>Mechanically polished</td>
<td>0.40 - 6.00</td>
</tr>
<tr>
<td>Degreased</td>
<td>0.50 - 5.00</td>
</tr>
</tbody>
</table>

Wire is delivered in a number of different forms to meet customers’ requirements:
- In coils with weights up to 150 kg
- On spools with wire weights up to 500 kg
- In straightened lengths up to 4 m, diameters between 0.6 to 10 mm

Standards
- ASTM: 302/302VM, '304V'
- ISO: X9CrNi18-8 Grade 1 NS
- EN Number: 1.4310NS
- EN Name: X10CrNi18-8NS
- W.Nr.: 1.4310
- JIS: SUS 302/304-WPB

Product Standards

<table>
<thead>
<tr>
<th>EN</th>
<th>10270-3</th>
</tr>
</thead>
<tbody>
<tr>
<td>ISO</td>
<td>6931-1</td>
</tr>
<tr>
<td>ASTM</td>
<td>A 313/A 313 M, F899</td>
</tr>
<tr>
<td>JIS</td>
<td>G 4314</td>
</tr>
</tbody>
</table>
### Forms of Supply
Mechanical properties in the 'as delivered' condition

#### Wire diameter
Nominal, $R_{0.2}$

<table>
<thead>
<tr>
<th>Wire diameter</th>
<th>Nominal, $R_{0.2}$</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.15 – 0.20</td>
<td>0.0059 – 0.0079</td>
</tr>
<tr>
<td>&gt; 0.20 – 0.30</td>
<td>&gt; 0.0079 – 0.012</td>
</tr>
<tr>
<td>&gt; 0.30 – 0.40</td>
<td>&gt; 0.012 – 0.016</td>
</tr>
<tr>
<td>&gt; 0.40 – 0.50</td>
<td>&gt; 0.016 – 0.020</td>
</tr>
<tr>
<td>&gt; 0.50 – 0.65</td>
<td>&gt; 0.020 – 0.026</td>
</tr>
<tr>
<td>&gt; 0.65 – 0.80</td>
<td>&gt; 0.026 – 0.031</td>
</tr>
<tr>
<td>&gt; 0.80 – 1.00</td>
<td>&gt; 0.031 – 0.039</td>
</tr>
<tr>
<td>&gt; 1.00 – 1.25</td>
<td>&gt; 0.039 – 0.049</td>
</tr>
<tr>
<td>&gt; 1.25 – 1.50</td>
<td>&gt; 0.049 – 0.059</td>
</tr>
<tr>
<td>&gt; 1.50 – 1.75</td>
<td>&gt; 0.059 – 0.069</td>
</tr>
<tr>
<td>&gt; 1.75 – 2.00</td>
<td>&gt; 0.069 – 0.079</td>
</tr>
<tr>
<td>&gt; 2.00 – 2.50</td>
<td>&gt; 0.079 – 0.098</td>
</tr>
<tr>
<td>&gt; 2.50 – 3.00</td>
<td>&gt; 0.098 – 0.118</td>
</tr>
<tr>
<td>&gt; 3.00 – 3.50</td>
<td>&gt; 0.118 – 0.138</td>
</tr>
<tr>
<td>&gt; 3.50 – 4.25</td>
<td>&gt; 0.138 – 0.167</td>
</tr>
<tr>
<td>&gt; 4.25 – 5.00</td>
<td>&gt; 0.167 – 0.197</td>
</tr>
<tr>
<td>&gt; 5.00 – 6.00</td>
<td>&gt; 0.197 – 0.236</td>
</tr>
<tr>
<td>&gt; 6.00 – 7.00</td>
<td>&gt; 0.236 – 0.276</td>
</tr>
<tr>
<td>&gt; 7.00 – 8.50</td>
<td>&gt; 0.276 – 0.335</td>
</tr>
<tr>
<td>&gt; 8.50 – 10.00</td>
<td>&gt; 0.335 – 0.394</td>
</tr>
</tbody>
</table>

1 Tolerance on tensile strength ± 7.0 % in accordance with EN 10 270-3 (ISO 6931-1).

12R10 can be supplied in the annealed condition.

#### Tensile Strength

can be increased by 150 - 250 MPa (22 - 36 ksi) by tempering. Click on heat treatment for further information. The tensile strength variation between spools/coils within the same production lot is ± 50 MPa (7 ksi) maximum.

#### Proof Strength

in the tempered condition is approx. 85 % of the tempered tensile strength. Tensile strength values are guaranteed and are measured directly after production. During storage, the strength will increase slightly due to ageing. Depending on storage conditions, ageing can increase the strength by 0 - 50 MPa (0 - 7 ksi)

The strength will decrease by 3 - 4 % per 100 °C (184 °F) increase in service temperature.

#### Straightened Lengths

After straightening, the strength is approx. 7 % lower.
Physical Properties

Density: 7.9 g/cm, 0.29 lb/in

Specific heat capacity

<table>
<thead>
<tr>
<th>Temperature °C</th>
<th>W/m °C</th>
<th>Temperature °F</th>
<th>Btu/ft h °F</th>
</tr>
</thead>
<tbody>
<tr>
<td>50</td>
<td>500 J/kg °C</td>
<td>50 - 100°C</td>
<td>0.12 Btu/lb °F</td>
</tr>
</tbody>
</table>

Thermal conductivity

<table>
<thead>
<tr>
<th>Temperature °C</th>
<th>Per °C</th>
<th>Temperature °F</th>
<th>Per °F</th>
</tr>
</thead>
<tbody>
<tr>
<td>20 – 100</td>
<td>17.0</td>
<td>68 – 210</td>
<td>9.5</td>
</tr>
<tr>
<td>20 – 200</td>
<td>17.5</td>
<td>68 – 390</td>
<td>9.5</td>
</tr>
<tr>
<td>20 - 300</td>
<td>18.5</td>
<td>68 – 570</td>
<td>10.0</td>
</tr>
</tbody>
</table>

Resistivity

<table>
<thead>
<tr>
<th>Temperature °C</th>
<th>μΩm</th>
<th>Temperature °F</th>
<th>μΩin.</th>
</tr>
</thead>
<tbody>
<tr>
<td>20</td>
<td>0.80</td>
<td>68</td>
<td>31</td>
</tr>
<tr>
<td>100</td>
<td>0.85</td>
<td>200</td>
<td>33</td>
</tr>
<tr>
<td>200</td>
<td>0.90</td>
<td>400</td>
<td>36</td>
</tr>
<tr>
<td>300</td>
<td>0.95</td>
<td>600</td>
<td>38</td>
</tr>
</tbody>
</table>

Thermal expansion1

<table>
<thead>
<tr>
<th>Temperature °C</th>
<th>Per °C</th>
<th>Temperature °F</th>
<th>Per °F</th>
</tr>
</thead>
<tbody>
<tr>
<td>20</td>
<td>17.0</td>
<td>68</td>
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</tr>
<tr>
<td>20 - 300</td>
<td>18.5</td>
<td>68 – 570</td>
<td>10.0</td>
</tr>
</tbody>
</table>

1) Mean values in temperature ranges (x10^6)

Magnetic Permeability

\[ \mu_{\text{max}} : \text{about 10} \]

Shear Modulus, MPa (ksi)

As delivered: approx. 71 000 (10 295)  
Tempered: approx. 73 000 (10 585)

Modulus of Elasticity, MPa (ksi)

As delivered: approx. 185 000 (26 825)  
Tempered: approx. 190 000 (27 550)

Bending

The minimum bending radius should not be less than half the wire diameter. Wire surfaces should be free from any damage caused by tooling, since slight imperfections in the surface can lead to fracture even at large bending radii.

Heat Treatment

By tempering at 350 °C (660 °F)/0.5 - 3 h, the tensile strength will increase by about 100 - 250 MPa (15 - 35 ksi). If a shorter tempering time is used the tempering effect will be lower.

\[ \begin{align*}
\text{In continuous conveyor furnaces, where the holding time at temperature is very short (min. 3 minutes), the temperature can be increased to about 425 °C (780 °F),} \\
\text{In the ‘as delivered’ condition, the ratio proof strength/tensile strength is about 0.80. After tempering the ratio will be about 0.85.}
\end{align*} \]

Please note that tension springs coiled with initial tension must not be tempered at the same high temperature as other types of spring. We recommend batch annealing at 200 °C (390 °F)/0.5 - 3 h, or continuous tempering in a conveyor furnace with a holding time of 3 - 20 minutes at about 250 °C (480 °F).
The illustrations, drawings, dimensional and weight data and other information included in this data sheet are intended only for the purposes of describing our products and represent non-binding average values. They do not constitute quality data, nor can they be used as the basis for any guarantee of quality or durability. The applications presented serve only as illustrations and can be construed neither as quality data nor as a guarantee in relation to the suitability of the material. This cannot substitute for comprehensive consultation on the selection of our products and on their use in a specific application. The brochure is not subject to change control.

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