NEVER CRACK
UNDER PRESSURE

SANDVIK HIGH-PRESSURE TUBING FOR DEMANDING APPLICATIONS
HIGH-PRESSURE TUBING FOR EXTREME CONDITIONS

When working pressures rise to 60,000 psi (4,134 bar) or more, you need tubing with high tensile strength and an extremely smooth inner surface. Where some manufacturers leave off, we continue the journey on up to 160,000 psi (12,000 bar) – even in corrosive conditions. Our aim is to help you be more competitive.

Our seamless high-pressure tubes are used for a wide range of applications – not only for extremely high pressures, but also in corrosive atmospheres. The main applications are water-jet cutting facilities, chemical production processes, hydraulic installations, test benches in the oil and gas industry as well as in hydrogen fuel stations. The pressure medium can be a suitable liquid or gas.

Based on our close cooperation with demanding customers over many years, we’ve developed special tubes with optimal properties for high-pressure applications. These are characterized by high yield strength and tensile strength in connection with high elongation. The pressure resistance is guaranteed by the very smooth ID surface. Individual advice can be provided as needed.

**MATERIAL GRADES AND MECHANICAL PROPERTIES**

<table>
<thead>
<tr>
<th>SANDVIK EN number</th>
<th>ASTM</th>
<th>Yield strength $R_{p0.2}$ min. MPa</th>
<th>Tensile strength $R_m$ min. MPa</th>
<th>Elongation A min. %</th>
</tr>
</thead>
<tbody>
<tr>
<td>5R60/3R12</td>
<td>TP 304L</td>
<td>680</td>
<td>700</td>
<td>18</td>
</tr>
<tr>
<td>3R65/3R60</td>
<td>TP 316L</td>
<td>600</td>
<td>700</td>
<td>18</td>
</tr>
<tr>
<td>SAF 2507</td>
<td>UNS S32760</td>
<td>1100</td>
<td>1200</td>
<td>12</td>
</tr>
<tr>
<td>Sanicro 60</td>
<td>UNS N06625</td>
<td>350</td>
<td>800</td>
<td>25</td>
</tr>
<tr>
<td>Grade 1</td>
<td></td>
<td>3415</td>
<td>8350</td>
<td>x30</td>
</tr>
<tr>
<td>Grade 2</td>
<td></td>
<td>276</td>
<td>6900</td>
<td>x30</td>
</tr>
</tbody>
</table>

Other grades and mechanical properties are available upon request

**STANDARD DIMENSIONS**

<table>
<thead>
<tr>
<th>OD mm</th>
<th>ID mm</th>
<th>Wall mm</th>
<th>Working pressure (stat.)</th>
<th>Theoretical weight kg/m</th>
</tr>
</thead>
<tbody>
<tr>
<td>6.00</td>
<td>—</td>
<td>1.90</td>
<td>430/144/440 bar</td>
<td>—</td>
</tr>
<tr>
<td>8.35</td>
<td>3/8”</td>
<td>1.25</td>
<td>1/2”</td>
<td>3.85</td>
</tr>
<tr>
<td>11.40</td>
<td>7/16”</td>
<td>1.00</td>
<td>1/4”</td>
<td>11.40</td>
</tr>
<tr>
<td>14.00</td>
<td>1”</td>
<td>0.63</td>
<td>1/2”</td>
<td>14.00</td>
</tr>
<tr>
<td>19.05</td>
<td>3/4”</td>
<td>0.50</td>
<td>3/8”</td>
<td>19.05</td>
</tr>
<tr>
<td>30.00</td>
<td>1”</td>
<td>0.35</td>
<td>1”</td>
<td>30.00</td>
</tr>
</tbody>
</table>

Other dimensions available upon request

Please note: The pressures in the table are only provided as guidance. The design must be approved according to regulations from domestic authorities.

**MECHANICAL PROPERTIES**

**TOLERANCES**
Outside and inside diameters +/- 0.05 or 0.1 mm
Wall thickness +/- 10 %
Tighter tolerances are available upon request.

**SURFACE QUALITY**
Our standard surface quality is free from laps, flaws and fissures deeper than 0.1 mm. Maximum 5 defects > 0.05 mm are allowed per cross section.

On prior consultations, depth of defects max. 0.02 mm according to ISO 8535-1 can be reached.

**CERTIFICATES**
All tests carried out are in accordance with mill test cert. 3.1 acc. to EN 10204. Test certs. 3.2 acc. to EN 10204 carried out by a third party and can be provided upon request.

**SPECIAL TESTS**
The following special tests can be carried out upon request:
- Fatigue strength by ID pressure (up to 4,000 bar)
- Max. pressure up to 15,000 bar
- Bursting pressure trials
- Dynamic load tests with defined working conditions

Individual advice can be provided in close collaboration with customers.

**LENGTHS**
Standard lengths are between 4 and 7 m. Other random lengths up to 16 m (depending on size) can be agreed.

Defined cut lengths can be provided upon request.

**DIMENSION RANGE IN MM**
Sandvik HP 160

Sandvik HP 160 is a high-strength nitrogen-alloyed austenitic stainless steel with high corrosion resistance. This grade offers higher strength compared to 1.4301 (TP 304) or 1.4404 (TP 316 L). Additional advantages compared to the standard grades are the improved corrosion resistance, a higher degree of purity, a very good forming property and the capability to carry out an autofrettage process up to 12,000 bar.

### 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>
<th>Mo</th>
<th>Fe</th>
<th>Nb</th>
</tr>
</thead>
<tbody>
<tr>
<td>max.</td>
<td>0.05</td>
<td>0.3</td>
<td>2</td>
<td>≤0.05</td>
<td>≤0.05</td>
<td>≤0.025</td>
<td>≤0.025</td>
<td>≤0.025</td>
<td>≤0.015</td>
</tr>
</tbody>
</table>

### Mechanical properties

To meet a high static and dynamic requirement, the following mechanical properties can be reached:

- Tensile strength $R_{m}$: min. 1,200 MPa
- Yield strength $R_{p0.2}$: min. 1,100 MPa
- Elongation A: min. 12 %

In annealed condition, the following mechanical properties can be reached:

- Tensile strength $R_{m}$: min. 850 MPa
- Yield strength $R_{p0.2}$: min. 450 MPa
- Elongation A: min. 35 %

### Physical properties (at 20 °C)

- Density: 8 g/cm³
- Modulus of elasticity: 200,000 Mpa
- Specific heat: 485 J/kg °C
- Thermal conductivity: 14 W/(m °C)

Due to its high purity levels, Sandvik HP 160 is highly resistant to corrosion in general as well as intergranular corrosion and hydrogen embrittlement. The high molybdenum content enables strong resistance to pitting crevice corrosion.

Sandvik HP 160 can be supplied as a seamless tube as well as in round bars in rolled or forged condition or as square steel in rolled or forged condition. Hexagon bars can also be supplied. If machining is required, Sandvik Coromant is able to give service and advice.

Sandvik SAF 2507

Sandvik SAF 2507 is a high-alloyed stainless (ferritic/austenitic) duplex steel with high corrosion resistance. This grade is highly resistant to stress corrosion cracking in chlorinated media. In addition, it offers excellent resistance to pitting and crevice corrosion and a high level of resistance to corrosion erosion and corrosion fatigue. This grade also offers a high strength level, but due to the low thermal expansion coefficient enormous construction advantages can be reached compared to austenitic stainless steels.

### 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>
<th>Mo</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>max.</td>
<td>0.03</td>
<td>0.12</td>
<td>0.25</td>
<td>0.035</td>
<td>0.015</td>
<td>0.015</td>
<td>0.04</td>
<td>0.3</td>
</tr>
</tbody>
</table>

### Mechanical properties

To meet a high static and dynamic requirement, the following mechanical properties can be reached:

- Tensile strength $R_{m}$: 800 - 1,000 MPa
- Yield strength $R_{p0.2}$: 550 MPa
- Elongation A: min. 25 %

### Physical properties (at 20 °C)

- Density: 7.8 g/cm³
- Thermal expansion: 13.5 at 30 - 100 °C
- Specific heat: 480 J/kg °C
- Thermal conductivity: 14 W/(m °C)

Sandvik SAF 2507 is a high-strength nitrogen-alloyed austenitic stainless steel with high corrosion resistance. This grade offers higher strength compared to 1.4301/TP 304 or 1.4404/TP 316 L. Additional advantages compared to the standard grades are the improved corrosion resistance, a higher degree of purity, a very good forming property and the capability to carry out an autofrettage process up to 12,000 bar.

### 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>
<th>Mo</th>
<th>Fe</th>
<th>Nb</th>
</tr>
</thead>
<tbody>
<tr>
<td>max.</td>
<td>0.0025</td>
<td>0.2</td>
<td>0.15</td>
<td>≤0.015</td>
<td>≤0.015</td>
<td>≤0.015</td>
<td>≤0.015</td>
<td>≤0.015</td>
<td>≤0.015</td>
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### Mechanical properties

To meet a high static and dynamic requirement, the following mechanical properties can be reached:

- Tensile strength $R_{m}$: min. 1,200 MPa
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- Elongation A: min. 12 %

In annealed condition, the following mechanical properties can be reached:

- Tensile strength $R_{m}$: min. 850 MPa
- Yield strength $R_{p0.2}$: min. 450 MPa
- Elongation A: min. 35 %

### Physical properties (at 20 °C)

- Density: 8 g/cm³
- Modulus of elasticity: 200,000 Mpa
- Specific heat: 485 J/kg °C
- Thermal conductivity: 14 W/(m °C)

Due to its high purity levels, Sandvik HP 160 is highly resistant to corrosion in general as well as intergranular corrosion and hydrogen embrittlement. The high molybdenum content enables strong resistance to pitting crevice corrosion.

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Sandvik high-pressure tubing for demanding applications

Sandvik is accredited by:

- DAKS nach DIN EN ISO/IEC 17025
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Sandvik high pressure is certified according to:

- EN 9100, ISO 9001, ISO 14001, OHSAS 18001, ISO 17025, S0001
- TÜV AD-Merkblatt WO/TRD 100
- Druckgeräterichtlinie 97/23/EG annexe I, 4.3.
- Bureau Veritas
- DNV
- NORSOK M650

Sandvik services:

Our quality inspections include, for instance, examination of dimensions, technological testing, metallographic examinations, intergranular corrosion as well as eddy current testing. Pressure test up to burst pressure level can be carried out. The scope of inspection depends on the customer’s specification.

- Lab tests
- Corrosion tests
- Pressure tests
- Quality Assurance: Sandvik uses only raw material processed under controlled conditions and is approved in accordance with EN ISO 9001. Seamless precision steel tubes are cold-worked in the most advanced production facilities at the highest quality level. In addition to all relevant equipment for material testing, automatic eddy current testing systems with material identification testing and marking of the tubes are also available.

Contact us:

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