Product Range
Seamless Stainless Steel & Nickel-Based Alloy Tubing and Piping
Seamless stainless steel and nickel-based alloy tubes and pipes are our everyday passion and our history at Salzgitter Mannesmann Stainless Tubes.

Our group integrates the tradition of three seamless stainless steel worlds (Mannesmann, Dalmine and Vallourec). Resulting in “DMV Stainless” from this international merger in 1994, DMV became a part of Salzgitter group in 2003 and adjusted its name to Salzgitter Mannesmann Stainless Tubes in 2008.

With an international network of plants and offices, we are a global top player in our markets and a consistently reliable business partner, ensuring quick and customer focused answers to changing market requirements.

Our customers profit from one of the most comprehensive product ranges in our business:

- from small instrumentation tubing to large pipe sizes with outside diameters from 6 to 250 mm (from 0.24 up to 9.84 inches) and with wall thicknesses from 0.5 up to 50 mm (from 0.02 up to 1.97 inches)
- in materials from standard austenitic stainless, duplex and super-duplex steels to highly sophisticated nickel-based alloys – this variety offers highest corrosion resistance, heat resistance and/or high-temperature, high-strength materials.

We combine high quality products for critical environments with efficient and reliable services: our customers thus enjoy a supportive personal account management.

Ongoing cycles of investment ensure that we work according to the latest technical standards. This gives us the trustworthiness to equip the so called “critical spots” of customers’ products and processes with the special qualities of our tubes and pipes.

Typically, these “critical” service conditions are defined e.g. by:
- high temperatures
- high pressure
- aggressive media (acids or basic)

Our tubes and pipes come into operation mainly in the following sectors:

**Instrumentation Tubes**
Used in several market segments (e.g. chemical, Oil & Gas, ...) for analyser systems, measurement instruments and hydraulic circuits

**Boiler Tubes**
In power generation plants in applications such as reheaters and superheaters

**Furnace Tubes**
Industrial furnaces and similar applications demand our heat-, high temperature- and corrosion resistant austenitic stainless steel (usually with high carbon contents) and nickel-based alloys

**Oil and Gas Tubes**
- OCTG (Oil Country Tubular Goods) Onshore and offshore oil and gas exploration and production need special tubular products to cope with high pressure and/or high temperature conditions as well as with highly aggressive substances
- **Umbilical Tubes** Subsea applications have to withstand aggressive sea water and must be essentially inert to the commonly used fluids transmitted through the tubes
- **Other Upstream and Downstream Applications**
  These comprise e.g. Risers, Flowlines and Linepipes

**Hollow Bar and Mechanical Tubes and Pipes**
Our tubes as highly efficient quality raw material for radially machined components and a favorable alternative to use of solid bars

**Heat Exchanger Tubes**
Serving e.g. refineries, (petro-)chemical and pharmaceutical industries as well as fertilizer production and food industries

**General Tubes and Pipes**
Apart from the above mentioned special applications, we also offer tubes for general use and different corrosion and heat resistant applications

Salzgitter Mannesmann Stainless Tubes products are exported to over 100 different countries for use within plants, products and processes, e.g. in:

- Onshore and offshore oil and gas industry
- Chemical and Petrochemical industry
- Energy and power generation
- Mechanical- and plant engineering
- Machine tool manufacturing
- Automotive industry
- Environmental engineering (water treatment and waste incineration)
- Nuclear industry
- Shipping industry
- Food processing industry
- Coal gasification
- Fertilizer production
- Biotechnology
- Analytical and medical technology

Typical Application Areas
You can find the following materials within the framework of our manufacturing programme:

**Stainless Steels**

**Corrosion resistant stainless steels**

Our product range offers our customers two classes of stainless steels that have an excellent resistance to corrosion.

**Austenitic-ferritic** stainless steels (duplex and super duplex steels) are characterised by their excellent mechanical properties, particularly their high stress corrosion cracking resistance. They are especially well-suited for maritime applications and in the chemical industry. Their excellent resistance to corrosion enables them to withstand concentrated chloride medium, particularly under mechanical stress. This makes them superior to austenitic steels in many cases.

**Austenitic** corrosion resistant stainless steels primarily include materials with higher alloys (e.g. nickel, chrome and molybdenum). They are resistant to different types of corrosion caused by wet chemical influences, and are still able to maintain an austenitic face centred cubic matrix. This creates a range of highly versatile stainless steels.

**High temperature stainless steels**

These steels maintain their mechanical properties when exposed to elevated temperatures on either a short- or long-term basis. Depending on the area of application these temperatures can rise e.g. to:

- 500°C (932°F) in chemical processes
- 700°C (1,292°F) in power plant applications
- 1,000°C (1,832°F) for furnace engineering

With their increased concentration of chrome, silicon and aluminium they are especially resistant under the influence of hot gases as well as in salt and metal melting. However, the individual corrosion resistance is always dependent on the surrounding conditions, and can therefore not be precisely determined in a single testing.

**Nickel-Based Alloys**

**Corrosion resistant nickel-based alloys**

Nickel's high degree of corrosion resistance is due to the fact that it is a relatively noble metal within the galvanic electrochemical series of metals. Adding chrome, molybdenum, copper and other elements forms alloys with even higher resistance to oxidation and corrosion which makes it possible to use them in a wider range of applications. Seamless tubes and pipes made of corrosion resistant nickel-based alloys are the first choice for basic industry manufacturers due to their excellent resistance to various acids (sulphuric acid, hydrochloric acid, phosphoric acid) and alkaline solutions.

**High temperature nickel-based alloys**

Based on an austenitic structure, high temperature, high strength nickel-based alloys allow further increasing of specific alloying elements, such as chrome, molybdenum, tungsten, titanium, aluminium, niobium, etc. This leads to a very low iron concentration enabling the material to be employed within applications up to 1,100°C (2,012°F) in aggressive atmospheres.

Available upon special request are titanium tubes for heat exchangers and bimetallic tubes for strippers in urea application.

Our production techniques are adapted to the high quality level required by our customers.

**Production Techniques**

**Hot Extrusion**

...is a production process for manufacturing hot finished tubes, pipes, re-draw hollows and hollow bars in stainless steels and nickel-based alloys. Our range of dimensions includes:

- outside diameters from 32 up to 250 mm (1.26 up to 9.84 inches) and
- wall thicknesses from 2.7 up to 50 mm (0.11 up to 1.97 inches)

**Cold Pilgering**

...is the preferred production process for seamless, cold-finished, high alloyed stainless steel and nickel-based alloy tubes and pipes. This technique provides a high forming rate, close tolerances and good productivity yields. Our production range covers:

- outside diameters from 6 up to 219.1 mm (0.24 up to 8.63 inches) and
- wall thicknesses from 0.5 up to 30 mm (0.02 up to 1.18 inches)

**Cold Drawing**

...is the ideal process for achieving very close tolerance ranges, especially for outside diameters. Additionally, the cold drawing process is the perfect choice when a low forming ratio is required.
## ISO-Dimensions and Tolerances for Seamless Tubes and Pipes

### Outside Diameter Wall Thickness (hot extruded)

<table>
<thead>
<tr>
<th>Outside Diameter</th>
<th>Hot Extruded</th>
<th>Cold Finished</th>
</tr>
</thead>
<tbody>
<tr>
<td>EN ISO 1127 tolerance class</td>
<td>D2</td>
<td>D2</td>
</tr>
<tr>
<td>Permissible deviation</td>
<td>≥ 5.0% (min. ≥ 0.5 mm (± 0.0197”))</td>
<td>≥ 0.7% (min. ≥ 0.5 mm (± 0.0012”))</td>
</tr>
</tbody>
</table>

### Outside Diameter Wall Thickness (cold finished)

<table>
<thead>
<tr>
<th>Outside Diameter</th>
<th>Wall Thickness (cold finished)</th>
</tr>
</thead>
<tbody>
<tr>
<td>EN ISO 1127 tolerance class</td>
<td>T1</td>
</tr>
<tr>
<td>Permissible deviation</td>
<td>≥ 15.0% (min. ≥ 0.4 mm (± 0.0074”))</td>
</tr>
</tbody>
</table>

### Wall Thickness

<table>
<thead>
<tr>
<th>Outside Diameter</th>
<th>Wall Thickness (hot extruded)</th>
</tr>
</thead>
<tbody>
<tr>
<td>En mm</td>
<td>0.039</td>
</tr>
<tr>
<td>0.126</td>
<td>3.2</td>
</tr>
<tr>
<td>0.134</td>
<td>3.4</td>
</tr>
<tr>
<td>0.142</td>
<td>3.6</td>
</tr>
<tr>
<td>0.157</td>
<td>4.0</td>
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<tr>
<td>0.197</td>
<td>5.0</td>
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<tr>
<td>0.213</td>
<td>5.4</td>
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<tr>
<td>0.220</td>
<td>5.6</td>
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<tr>
<td>0.232</td>
<td>6.3</td>
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<tr>
<td>0.248</td>
<td>7.1</td>
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<tr>
<td>0.280</td>
<td>8.0</td>
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<tr>
<td>0.315</td>
<td>8.8</td>
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<tr>
<td>0.346</td>
<td>10.0</td>
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<tr>
<td>0.394</td>
<td>12.5</td>
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<tr>
<td>0.433</td>
<td>14.2</td>
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<tr>
<td>0.492</td>
<td>17.5</td>
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<tr>
<td>0.559</td>
<td>20.0</td>
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<tr>
<td>0.630</td>
<td>22.5</td>
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<tr>
<td>0.689</td>
<td>26.0</td>
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<td>0.787</td>
<td>30.0</td>
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<tr>
<td>0.874</td>
<td>35.0</td>
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<tr>
<td>0.984</td>
<td>40.0</td>
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<tr>
<td>1.102</td>
<td>45.0</td>
</tr>
<tr>
<td>1.181</td>
<td>50.0</td>
</tr>
<tr>
<td>1.260</td>
<td>55.0</td>
</tr>
</tbody>
</table>

### Permissible Deviation

- **Hot Extruded**
  - ≤ 5 mm (0.1969”)
  - > 5 mm (0.1969”)
- **Cold Finished**
  - T1
  - T2

### ISO-Dimensions and Tolerances for seamless Tubes and Pipes
### “American Standard” Series

#### Dimensions for Heat Exchangers

- **ASTM A 213 and A 209**

<table>
<thead>
<tr>
<th>Outside Diameter</th>
<th>Wall Thickness (cold finished)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>inch</td>
</tr>
<tr>
<td></td>
<td>0.005</td>
</tr>
<tr>
<td>3/4</td>
<td>1.771</td>
</tr>
<tr>
<td>1</td>
<td>2.375</td>
</tr>
<tr>
<td>11/4</td>
<td>2.875</td>
</tr>
<tr>
<td>2</td>
<td>4.500</td>
</tr>
<tr>
<td>21/2</td>
<td>5.000</td>
</tr>
</tbody>
</table>

Tolerances according to ASTM A 1016.

Tube deliveries according to EN-DIN-AFNOR-UNI requirements as well as intermediate dimensions (diameters, wall thicknesses) on request.

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Stainless steel pipe ANSI B 36-19 M up to and including Schedule 80 S. Above, ANSI B 36-10 M dimensions.

The conventional linear mass are those of austenitic stainless steel calculated from the formula:

\[
M = \frac{D \cdot T}{(D-T)T} K
\]

(assuming a density of 7.97 with \( K = 40 \))

The above values (weight / meter and feet) are those applicable to austenitic stainless steel.

\[M = \text{mass (weight per length unit)} \]
\[D = \text{outside diameter} \]
\[T = \text{wall thickness} \]
At Salzgitter Mannesmann Stainless Tubes, quality management begins way ahead of any production step. From the selection of raw material suppliers up to the final quality tests in our own laboratories we thoroughly evaluate, test and control our products and processes, aiming at continuous improvements. For in-process and acceptance inspection, the quality departments at the individual manufacturing centers have state-of-the-art equipment at their disposal including mechanical workshops, tensile and impact testing machines, chemical laboratories for corrosion tests, equipment for hardness testing and metallographic inspection. We also have extensive facilities for non-destructive testing, like ultrasonic, eddy current, hydrostatic, positive material identification and dye penetrant testing.

This list gives some examples of approvals & accreditations that Salzgitter Mannesmann Stainless Tubes has received:

- EN ISO 9001: 2000
- EN ISO 14001:2004
- AD 2000 - W0 / TRD 100
- PED no. 97/23/EC (Material manufacturer Annex 1, Paragraph 4.3)
- API SLC
- API SRT
- ASME Section III NCA 3800
- NORSOK STANDARD M-650
- STOOMWEZEN M303
- Framatome KTA 1401
- Germanischer Lloyd W 1201 HH 1

(For construction of ships or installations)
### Stainless Steel Grades

#### Austenitic Ferritic

<table>
<thead>
<tr>
<th>Designation</th>
<th>Nearest equivalent standard</th>
<th>Typical chemical composition</th>
<th>Density</th>
<th>Min. mechanical prop. at RT</th>
</tr>
</thead>
<tbody>
<tr>
<td>UNS 201</td>
<td>SS1002</td>
<td>0.08 Cr, 0.8 Ni, 0.5 Mo, 0.45 Cu</td>
<td>8.1 g/cm³</td>
<td>210 31 500 73</td>
</tr>
<tr>
<td>UNS 304</td>
<td>SS1301</td>
<td>0.08 Cr, 10.0 Ni, 0.5 Mo, 0.45 Cu</td>
<td>8.1 g/cm³</td>
<td>210 31 500 73</td>
</tr>
<tr>
<td>UNS 304L</td>
<td>SS1307</td>
<td>0.08 Cr, 10.0 Ni, 0.5 Mo, 0.45 Cu</td>
<td>8.1 g/cm³</td>
<td>210 31 500 73</td>
</tr>
<tr>
<td>UNS 316L</td>
<td>SS1371</td>
<td>0.08 Cr, 16.0 Ni, 0.5 Mo, 0.45 Cu</td>
<td>8.1 g/cm³</td>
<td>210 31 500 73</td>
</tr>
<tr>
<td>UNS 317L</td>
<td>SS1372</td>
<td>0.08 Cr, 16.0 Ni, 0.5 Mo, 0.45 Cu</td>
<td>8.1 g/cm³</td>
<td>210 31 500 73</td>
</tr>
<tr>
<td>UNS 316</td>
<td>SS1380</td>
<td>0.08 Cr, 16.0 Ni, 0.5 Mo, 0.45 Cu</td>
<td>8.1 g/cm³</td>
<td>210 31 500 73</td>
</tr>
<tr>
<td>UNS 317</td>
<td>SS1381</td>
<td>0.08 Cr, 16.0 Ni, 0.5 Mo, 0.45 Cu</td>
<td>8.1 g/cm³</td>
<td>210 31 500 73</td>
</tr>
<tr>
<td>UNS 310</td>
<td>SS1384</td>
<td>0.08 Cr, 16.0 Ni, 0.5 Mo, 0.45 Cu</td>
<td>8.1 g/cm³</td>
<td>210 31 500 73</td>
</tr>
<tr>
<td>UNS 304 LN</td>
<td>SS1475</td>
<td>0.08 Cr, 16.0 Ni, 0.5 Mo, 0.45 Cu</td>
<td>8.1 g/cm³</td>
<td>210 31 500 73</td>
</tr>
<tr>
<td>UNS 321</td>
<td>SS1661</td>
<td>0.08 Cr, 18.5 Ni, 0.5 Mo, 0.45 Cu</td>
<td>8.1 g/cm³</td>
<td>210 31 500 73</td>
</tr>
<tr>
<td>UNS 321 H</td>
<td>SS1662</td>
<td>0.08 Cr, 18.5 Ni, 0.5 Mo, 0.45 Cu</td>
<td>8.1 g/cm³</td>
<td>210 31 500 73</td>
</tr>
<tr>
<td>UNS 347 HFG</td>
<td>SS1761</td>
<td>0.08 Cr, 18.5 Ni, 0.5 Mo, 0.45 Cu</td>
<td>8.1 g/cm³</td>
<td>210 31 500 73</td>
</tr>
<tr>
<td>UNS 309</td>
<td>SS1775</td>
<td>0.08 Cr, 18.5 Ni, 0.5 Mo, 0.45 Cu</td>
<td>8.1 g/cm³</td>
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<tr>
<td>UNS 310 H</td>
<td>SS1948</td>
<td>0.08 Cr, 21.0 Ni, 0.5 Mo, 0.45 Cu</td>
<td>8.1 g/cm³</td>
<td>210 31 500 73</td>
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### Nickel and Nickel-based alloys

<table>
<thead>
<tr>
<th>Designation</th>
<th>Nearest equivalent standard</th>
<th>Typical chemical composition</th>
<th>Density</th>
<th>Min. mechanical prop. at RT</th>
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<tbody>
<tr>
<td>UNS 600</td>
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<td>UNS 601</td>
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<tr>
<td>UNS 602</td>
<td>SS1663</td>
<td>0.08 Cr, 16.0 Ni, 0.5 Mo, 0.45 Cu</td>
<td>8.1 g/cm³</td>
<td>210 31 500 73</td>
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<tr>
<td>UNS 603</td>
<td>SS1664</td>
<td>0.08 Cr, 16.0 Ni, 0.5 Mo, 0.45 Cu</td>
<td>8.1 g/cm³</td>
<td>210 31 500 73</td>
</tr>
<tr>
<td>UNS 604</td>
<td>SS1665</td>
<td>0.08 Cr, 16.0 Ni, 0.5 Mo, 0.45 Cu</td>
<td>8.1 g/cm³</td>
<td>210 31 500 73</td>
</tr>
<tr>
<td>UNS 605</td>
<td>SS1666</td>
<td>0.08 Cr, 16.0 Ni, 0.5 Mo, 0.45 Cu</td>
<td>8.1 g/cm³</td>
<td>210 31 500 73</td>
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</tbody>
</table>

### Pure Nickel

<table>
<thead>
<tr>
<th>Designation</th>
<th>Nearest equivalent standard</th>
<th>Typical chemical composition</th>
<th>Density</th>
<th>Min. mechanical prop. at RT</th>
</tr>
</thead>
<tbody>
<tr>
<td>UNS 400</td>
<td>SS1667</td>
<td>0.08 Cr, 16.0 Ni, 0.5 Mo, 0.45 Cu</td>
<td>8.1 g/cm³</td>
<td>210 31 500 73</td>
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</tbody>
</table>

### Non-ferrous Grades

#### Titanium

<table>
<thead>
<tr>
<th>Designation</th>
<th>Nearest equivalent standard</th>
<th>Typical chemical composition</th>
<th>Density</th>
<th>Min. mechanical prop. at RT</th>
</tr>
</thead>
<tbody>
<tr>
<td>UNS 11</td>
<td>Grade 1</td>
<td>3.76 ± 0.25, 0.15 ± 0.05</td>
<td>4.5 g/cm³</td>
<td>130 20 260 35</td>
</tr>
<tr>
<td>UNS 12</td>
<td>Grade 2</td>
<td>3.76 ± 0.25, 0.15 ± 0.05</td>
<td>4.5 g/cm³</td>
<td>130 20 260 35</td>
</tr>
</tbody>
</table>
### Standards and delivery specifications

### ASTMD-Standards

#### Iron and Steel Products - Steel Piping, Tubing, Fittings

- **A 213 / A 213M** Seamless ferritic and austenitic alloy steel boiler, superheater and heat exchanger tubes
- **A 269 / A 269M** Seamless and welded austenitic stainless steel tubing for general service
- **A 312 / A 312M** Seamless and welded austenitic stainless steel pipes
- **A 376 / A 376M** Seamless austenitic steel pipe for high-temperature central-station service
- **A 511** Stainless steel seamless mechanical tubing
- **A 789 / A 790M** Seamless and welded ferritic-austenitic stainless steel tubing for general service
- **A 790 / A 790M** Seamless and welded ferritic-austenitic stainless steel pipe

#### Nonferrous Metal Products - Nickel...

- **B 161** Nickel seamless pipe and tube (UNS N02200; N02201)
- **B 163** Seamless nickel and nickel alloy condenser and heat exchanger tubes (e.g. UNS N02200; N04400; N06600; N08800)
- **B 165** Nickel-copper alloy (UNS N04400), seamless nickel pipe and tube
- **B 167** Nickel-chromium-iron alloys (UNS N06600; N06601; N06602), seamless pipe and tube
- **B 407** Nickel-chromium-iron alloys (UNS N06600; N06610; N08811), seamless pipe and tube
- **B 423** Nickel-iron-chromium-molybdenum-copper alloys (UNS N06825), pipe and tube
- **B 444** Nickel-iron-chromium-molybdenum-nickel-iron alloys (UNS N08800), pipe and tube
- **B 622** Seamless nickel and nickel-cobalt alloy pipe and tube (e.g. UNS N06450; N06459; N1; N0276; N06002)
- **B 668** Seamless tubes (UNS N06028)
- **B 677** Seamless pipe and tube (UNS N06934; N06925; N06926)
- **B 729** Seamless pipe and tube (UNS N06020; N06026; N06024)

#### Nonferrous Metal Products - Titanium....

- **ASTM Volume 02.04**
  - **B 338** Seamless and welded Titanium and titanium alloy tubes for condensers and heat exchangers

### ASME-Standards

#### ASME Boiler Pressure Code Section II Part A - Ferrous Material Specification

- **SA 213 / SA 213M** Seamless ferritic and austenitic alloy steel boiler, superheater and heat exchanger tubes
- **SA 312 / SA 312M** Seamless and welded austenitic stainless steel pipes
- **SA 376 / SA 376M** Seamless austenitic steel pipe for high-temperature central-station service
- **SA 511** Stainless steel seamless mechanical tubing
- **SA 789 / SA 790M** Seamless and welded ferritic-austenitic stainless steel tubing for general service
- **SA 790 / SA 790M** Seamless and welded ferritic-austenitic stainless steel pipe

#### ASME Boiler Pressure Code Section II Part B - Non-Ferrous Material Specification

- **SB 161** Nickel seamless pipe and tube (UNS N02200; N02201)
- **SB 163** Seamless nickel and nickel-based alloy condenser and heat exchanger tubes (e.g. UNS N02200; N04400; N06600; N08800)
- **SB 165** Nickel-copper alloy (UNS N04400), seamless nickel pipe and tube
- **SB 167** Nickel-chromium-iron alloys (UNS N06600; N06601; N06602), seamless pipe and tube
- **SB 407** Nickel-iron-chromium alloys (UNS N06600; N06610; N08811), seamless pipe and tube
- **SB 423** Nickel-iron-chromium-molybdenum-copper alloys (UNS N06825), pipe and tube
- **SB 444** Nickel-iron-chromium-molybdenum-nickel-iron alloys (UNS N08800), pipe and tube
- **SB 622** Seamless nickel and nickel-cobalt alloy pipe and tube (e.g. UNS N06450; N06459; N1; N0276; N06002)
- **SB 668** Seamless tubes (UNS N06028)
- **SB 677** Seamless pipe and tube (UNS N06934; N06925; N06926)
- **SB 729** Seamless pipe and tube (UNS N06020; N06026; N06024)

### API-Standards

#### API 5CT Specification for Casing and Tubing

#### API 5L Specification for Line Pipe

### EN-Standards

#### EN 10216-5 Seamless steel tubes for pressure purposes

#### EN 10297-2 Seamless steel tubes for mechanical and general engineering purposes

### ISO-Standards

#### ISO 13680 Petroleum and natural gas industries – Corrosion-Resistant alloy Seamless tubulars for use as casing, tubing and coupling stock – Technical delivery condition

### GOST Standards

#### Stainless Steels

- **GOST 9940 Seamless stainless steel tubes, hot finished**
- **GOST 9941 Semless stainless steel tubes, cold and hot finished**

### BS-Standards

#### Stainless and high-strength high-temperature steels

- **BS 3059 Steel boiler and superheater tubes.**

### JIS-Standards

#### JIS G 3446 Stainless steel pipes

#### JIS G 3459 Stainless steel boiler and heat exchanger tubes

#### JIS G 3463 Stainless steel boiler and heat exchanger tubes

#### JIS G 3467 Steel tubes for fire heater

### DNV-Standards

#### OS F101 Submarine Pipeline Systems