Stainless Steels - Stainless 304 Properties, Fabrication and Applications, Supplier Data by Aalco

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Background

Stainless steel types 1.4301 and 1.4307 are also known as grades 304 and 304L respectively. They are the most versatile and widely used stainless steel. It is still sometimes referred to by 304, which is derived from the nominal composition of type 304 being 18% chromium and 8% nickel.

304 Stainless Steel

Stainless steel 304 is an austenitic grade that can be severely deep drawn. This property makes it the dominant grade used in applications like sinks and saucepans.

304L Stainless Steel

Type 304L is the low carbon version of Stainless steel 304. It is used in heavy gauge applications where improved weldability is required. Some products such as plate and pipe may meet the criteria for both 304 and 304L.

304H Stainless Steel

304H, a high carbon content variant, is also available for use at high temperatures.

Property data given in this document is typical for flat rolled products covered by ASTM, EN or other standards. It is reasonable to expect that these standards to be similar but not necessarily identical to those given in this document.

Chemical Composition of Stainless Steel 304

<table>
<thead>
<tr>
<th>%</th>
<th>304</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>0-0.07</td>
</tr>
<tr>
<td>Mn</td>
<td>0-2.0</td>
</tr>
<tr>
<td>Si</td>
<td>0-1</td>
</tr>
<tr>
<td>P</td>
<td>0-0.05</td>
</tr>
<tr>
<td>S</td>
<td>0-0.02</td>
</tr>
<tr>
<td>Cr</td>
<td>17.5-19.5</td>
</tr>
<tr>
<td>Ni</td>
<td>8-10.5</td>
</tr>
<tr>
<td>Fe</td>
<td>Balance</td>
</tr>
</tbody>
</table>

Properties of Stainless Steel 304

Mechanical Properties of Stainless Steel 304

Table 2. Typical mechanical properties for 304
### Physical Properties of Stainless Steel 304

**Table 3.** Typical physical properties for 304 stainless steel alloys

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Density</td>
<td>8.00 g/cm³</td>
</tr>
<tr>
<td>Melting Point</td>
<td>1450°C</td>
</tr>
<tr>
<td>Modulus of Elasticity</td>
<td>193 GPa</td>
</tr>
<tr>
<td>Electrical Resistivity</td>
<td>0.072x10⁻⁶ Ω.m</td>
</tr>
<tr>
<td>Thermal Conductivity</td>
<td>16.2 W/m.K</td>
</tr>
<tr>
<td>Thermal Expansion</td>
<td>17.2x10⁻⁶ /K</td>
</tr>
</tbody>
</table>

### Alloy Designations

*Stainless steel 304* also corresponds to the following standard designations and specifications:
Corrosion Resistance of Stainless Steel 304

Stainless steel 304 has excellent corrosion resistance in a wide variety of environments and when in contact with different corrosive media. Pitting and crevice corrosion can occur in environments containing chlorides. Stress corrosion cracking can occur at temperatures over 60°C.

Heat Resistance of Stainless Steel 304

Stainless steel 304 has good resistance to oxidation in intermittent service up to 870°C and in continuous service to 925°C. However, continuous use at 425-860°C is not recommended if corrosion resistance in water is required. In this instance 304L is recommended due to its resistance to carbide precipitation.

Fabrication of Stainless Steel 304

Fabrication of all stainless steels should be done only with tools dedicated to stainless steel materials. Tooling and work surfaces must be thoroughly cleaned before use. These precautions are necessary to avoid cross contamination of stainless steel by easily corroded metals that may discolour the surface of the fabricated product.

Cold Working of Stainless Steel 304

Stainless steel 304 readily work hardens. Fabrication methods involving cold working may require an intermediate annealing stage to alleviate work hardening and avoid tearing or cracking. At the completion of fabrication a full annealing operation should be employed to reduce internal stresses and optimise corrosion resistance.

Hot Working of Stainless Steel 304

Fabrication methods, like forging, that involve hot working should occur after uniform heating to 1149-1260°C. The fabricated components should then be rapidly cooled to ensure maximum corrosion resistance.

Heat Treatment of Stainless Steel 304

Stainless steel 304 cannot be hardened by heat treatment.

Solution treatment or annealing can be done by rapid cooling after heating to 1010-1120°C.

Machinability

Stainless steel 304 has good machinability. Machining can be enhanced by using the following rules:

- Cutting edges must be kept sharp. Dull edges cause excess work hardening.
- Cuts should be light but deep enough to prevent work hardening by riding on the surface of the material.
- Chip breakers should be employed to assist in ensuring swarf remains clear of the work
- Low thermal conductivity of austenitic alloys results in heat concentrating at the cutting edges. This means coolants and lubricants are necessary and must be used in large quantities.

Welding of Stainless Steel 304
Fusion welding performance for Stainless steel 304 is excellent both with and without fillers. Recommended filler rods and electrodes for stainless steel 304 is grade 308 stainless steel. For 304L the recommended filler is 308L. Heavy welded sections may require post-weld annealing. This step is not required for 304L. Grade 321 may be used if post-weld heat treatment is not possible.

**Applications of Stainless Steel 304**

**Stainless steel 304** is typically used in:

- Sinks and splashbacks
- Saucepans
- Cutlery and flatware
- Architectural panelling
- Sanitaryware and troughs
- Tubing
- Brewery, dairy, food and pharmaceutical production equipment
- Springs, nuts, bolts and screws

**Supplied Forms**

**Stainless steel 304** is typically supplied by Aalco in a range of finishes in the following forms:

- Sheet
- Strip
- Tube
- Quarto plate
- Bar
- Fittings & Flanges
- Pipe
- Plate

Source: Aalco

For more information on this source please visit Aalco

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