

Stainless Steel 1.4301 - 304

Material Data Sheet

Stainless steel types 1.4301 and 1.4307 are also known as grades 304 and 304L respectively. Type 304 is the most versatile and widely used stainless steel. It is still sometimes referred to by its old name 18/8 which is derived from the nominal composition of type 304 being 18% chromium and 8% nickel. Type 304 stainless steel is an austenitic grade that can be severely deep drawn. This property has resulted in 304 being the dominant grade used in applications like sinks and saucepans. Type 304L is the low carbon version of 304. It is used in heavy gauge components for improved weldability. Some products such as plate and pipe may be available as “dual certified” material that meets the criteria for both 304 and 304L. 304H, a high carbon content variant, is also available for use at high temperatures. Properties given in this data sheet are typical for flat rolled products covered by ASTM A240/A240M. It is reasonable to expect specifications in these standards to be similar but not necessarily identical to those given in this data sheet.

Application

- Saucepans
- Springs, screws, nuts & bolts
- Sinks & splash backs
- Architectural panelling
- Tubing
- Brewery, food, dairy and pharmaceutical production equipment
- Sanitary ware and troughs

Supplied Forms

- Sheet
- Strip
- Plate
- Pipe
- Bar
- Tube
- Fittings & flanges

Alloy Designations

Stainless steel grade 1.4301/304 also corresponds to: S30400, 304S15, 304S16, 304S31 and EN58E.

Corrosion Resistance

304 has excellent corrosion resistance in many environments and when in contact with different corrosive media. Pitting and crevice corrosion can occur in environments containing chlorides. Stress corrosion cracking can occur above 60°C.

Heat Resistance

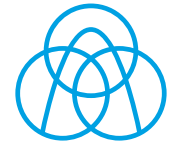
304 has good resistance to oxidation in intermittent service up to 870°C and in continuous service to 925°C. However, continuous use at 425-860°C is not recommended. In this instance 304L is recommended due to its resistance to carbide precipitation. Where high strength is required at temperatures above 500°C and up to 800°C grade 304H is recommended. This material will retain aqueous corrosion resistance.

Fabrication

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

304 stainless steel 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

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

Machinability

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.

Heat Treatment

304 stainless steel cannot be hardened by heat treatment. Solution treatment or annealing can be done by rapid cooling after heating to 1010-1120°C.

Weldability

Fusion welding performance for type 304 stainless steel 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.

Chemical Composition^{a)}

Element	% Present
Carbon (C)	0.07
Chromium (Cr)	17.50 - 19.50
Manganese (Mn)	2.00
Silicon (Si)	1.00
Phosphorous (P)	0.045
Sulphur (S)	0.015 ^{b)}
Nickel (Ni)	8.00 - 10.50
Iron (Fe)	Balance
Nitrogen (N)	0.10

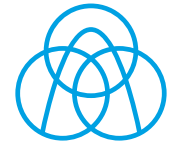
^{a)} Maximum values unless otherwise stated.

^{b)} For machinability a controlled sulphur content of 0.015 - 0.030% is recommended and permitted.

Mechanical Properties

Property	Value
Comprehensive Strength	210 MPa
Proof Stress	210 Min MPa
Tensile Strength	520 to 720 MPa
Elongation	45 Min %

Properties above are for 1.4301



Physical Properties

Property	Value
Density	8,000 Kg/m ³
Melting Point	1450 °C
Thermal Expansion	17.2 x 10 ⁻⁶ /K
Modulus of Elasticity	193 GPa
Thermal Conductivity	16.2 W/m.K
Electrical Resistivity	0.072x 10 ⁻⁶ Ω .m

Editor

thyssenkrupp Materials (UK) Ltd
Cox's Lane
Cradley Heath
West Midlands
B64 5QU

Important Note

Information given in this data sheet about the condition or usability of materials respectively products are no warranty for their properties, but act as a description.

The information, we give on for advice, comply to the experiences of the manufacturer as well as our own. We cannot give warranty for the results of processing and application of the products.