TECHNICAL DATA SHEET

Stainless Steel: 1.4301 (304) and Sheet Plate (Quarto Plate & CPP)

ORION ALLOYS

Description

Quarto Plate refers to hot-rolled plates over 12mm thick that have not been coiled during production.

CPP, or Continuously Produced Plate, is up to 12mm thick and has been coiled during the rolling process.

Sheet refers to cold-rolled material.

Stainless steel types 1.4301 and 1.4307 are also known as grades 304 and 304L, respectively. Type 304 is highly versatile and widely used in stainless steel. It is sometimes referred to by its old name “18/8,” derived from its nominal composition of 18% chromium and 8% nickel.

Type 304 stainless steel is an austenitic grade known for its capability for severe deep drawing, making it a dominant choice in applications like sinks and saucepans.

Type 304L is the low carbon version of 304, used in heavy gauge components to improve weldability. Some products, such as plate and pipe, may be available as “dual certified,” meeting the criteria for both 304 and 304L.

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

The property data provided in this document is typical for flat-rolled products covered by EN 10088-2:2005. While ASTM, EN, or other standards may cover sold products, specifications in these standards are expected to be similar but not necessarily identical to those in this datasheet.

Designations

Stainless Steel Grade 1.4301/304 corresponds to the following designations, but it may not be a direct equivalent:

- S30400
- 304S15
- 304S16
- 304S31
- EN58E

Machinability

Stainless Steel Grade 304 (1.4301) exhibits good machinability. To enhance machining performance, the following rules are recommended:

- Sharp Cutting Edges: Keep cutting edges sharp to avoid excess work hardening. Dull edges can lead to increased work hardening.
- Light but Deep Cuts: Make cuts light but deep enough to prevent work hardening by avoiding surface riding.
- Chip Breakers: Utilize chip breakers to help ensure that swarf remains clear of the work.
- Coolants and Lubricants: Due to the low thermal conductivity of austenitic alloys like 304, heat tends to concentrate at the cutting edges. Therefore, it is crucial to use coolants and lubricants in substantial quantities during machining processes.

Supplied Forms

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

Corrosion Resistance

Stainless Steel Grade 304 (1.4301) demonstrates excellent corrosion resistance in numerous environments and when exposed to various corrosive media. However, it’s important to note specific considerations:

- Pitting and Crevice Corrosion: In environments containing chlorides, there is a risk of pitting and crevice corrosion.
- Stress Corrosion Cracking: Above 60°C, stress corrosion cracking can occur in certain conditions.
- It’s crucial to be mindful of these potential corrosion issues in specific environments to ensure the optimal performance of Stainless Steel Grade 304.

Cold Working

Stainless Steel Grade 304 exhibits a tendency to readily work harden during fabrication. When employing fabrication methods involving cold working, an intermediate annealing stage may be necessary to alleviate work hardening and prevent tearing or cracking. Upon completion of the fabrication process, a full annealing operation should be carried out to reduce internal stresses and optimize corrosion resistance. This approach helps ensure the desired mechanical properties and overall performance of the material.

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Hot Working

Fabrication methods such as forging, which involve hot working of Stainless Steel Grade 304, should be carried out after uniform heating to a temperature range of 1149-1260°C. Subsequently, the fabricated components should undergo rapid cooling to ensure maximum corrosion resistance. This heat treatment process is crucial for achieving the desired material properties and corrosion performance in hot-worked components.

Applications

- 304 stainless steel 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

Heat Resistance

Stainless Steel Grade 304 demonstrates good resistance to oxidation in intermittent service conditions, withstanding temperatures up to 870°C. In continuous service, it maintains its resistance up to 925°C. However, continuous use within the range of 425-860°C is not recommended if corrosion resistance in water is essential. In such cases, Stainless Steel Grade 304L is recommended due to its resistance to carbide precipitation.

For applications requiring high strength at temperatures above 500°C and up to 800°C, Stainless Steel Grade 304H is recommended. Importantly, this material retains its aqueous corrosion resistance in these elevated temperature ranges.

Heat Treatment

Stainless Steel Grade 304 cannot be hardened by heat treatment. Solution treatment or annealing can be performed by rapidly cooling the material after heating it to a temperature within the range of 1010-1120°C. This process is utilized to achieve specific material properties and to enhance the overall performance of the stainless steel.

Fabrication

Fabrication of all stainless steels, including Grade 304, should be carried out using tools that are dedicated exclusively to stainless steel materials. It is crucial to ensure that tooling and work surfaces are thoroughly cleaned before use. These precautions are necessary to prevent cross-contamination of stainless steel by metals that are easily corroded, as such contamination can lead to discoloration of the surface of the fabricated product. Adhering to these practices helps maintain the integrity and appearance of the stainless steel during the fabrication process.

Weldability

The fusion welding performance of type 304 stainless steel is excellent, both with and without fillers. Recommended filler rods and electrodes for stainless steel 304 are of grade 308 stainless steel. For 304L, the recommended filler is 308L. In the case of heavy welded sections, post-weld annealing may be necessary, although this step is not required for 304L. If post-weld heat treatment is not possible, Grade 321 may be used as an alternative. It's important to choose the appropriate filler materials and consider post-weld treatments based on the specific requirements and conditions of the welding application.

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Chemical Composition

EN 10088-2:2005. 1.4301 Steel

Element	% Present
Chromium (Cr)	17.50 - 19.50
Nickel (Ni)	8.00 - 10.50
Manganese (Mn)	0.0 - 2.00
Silicon (Si)	0.0 - 1.00
Nitrogen (N)	0.0 - 0.11
Carbon (C)	0.0 - 0.07
Phosphorous (P)	0.0 - 0.05
Sulphur (S)	0.0 - 0.02
Iron (Fe)	Balance

Physical Properties

Property	Value
Density	8.00 g/cm^3
Melting Point	1450 °C
Thermal Expansion	17.2 x10-6 /K
Modulus of Elasticity	193 GPa
Thermal Conductivity	16.2 W/m.K
Electrical Resistivity	0.72 x10^{-6} Ω .m

Mechanical Properties

EN 10088-2:2005. Plate. From 8mm to 75mm thick

Property	Value
Proof Stress	210 Min MPa
Tensile Strength	520 to 720 MPa
Elongation A50 mm	45 Min %

EN 10088-2:2005. Sheet. Up to 8mm thick

Property	Value
Proof Stress	230 Min MPa
Tensile Strength	540 to 750 MPa
Elongation A50 mm	45 Min %

Above properties are for 1.4301 sheet / plate

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Disclaimer

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