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Stainless Steel Grade 304 / 1.4301

Stainless steel types1.4301 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.

Property data given in this document is typical for flat rolled products covered by ASTM A240/A240M. ASTM, EN or other standards may cover products sold by Aalco. It is reasonable to expect specifications in these standards to be similar but not necessarily identical to those given in this datasheet.

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

Typical Chemical Composition

%	304	304L	304H
C	0.08 max	0.03 max	0.10 max
Mn	2.0	2.0	2.0
Si	0.75	0.75	0.75
P	0.045	0.045	0.045
S	0.03	0.03	0.03
Cr	18-20	18-20	18-20
Ni	10.5	12	10.5
N	0.1	0.1	-

Typical Mechanical Properties

Grade	304	304L	304H
Tensile Strength (MPa)	520	500	520
Compression Strength (MPa)	210	210	210
Proof Stress 0.2% (MPa)	210	200	210
Elongation A5 (%)	45	45	45
Hardness Rockwell B	92	92	92

Typical Physical Properties

Property	Value
Density	8.00 g/cm^3
Melting Point	1400-1450°C
Modulus of Elasticity	193 GPa
Electrical Resistivity	0.072x10^{-6} Ω.m
Thermal Conductivity	16.2 W/m.K at 100°C
Thermal Expansion	17.2x10^{-6} /K at 100°C

Alloy Designations

Stainless steel 304 also corresponds to the following standard designations and specifications:

Euronorm	UNS	BS	En	Grade
1.4301	S30400	304S15 304S16 304S31	58E	304
1.4306	S30403	304S11	-	304L
1.4307	-	304S11	-	304L
1.4311	-	304S11	-	304L
1.4948	S30409	304S51	-	304H

Corrosion Resistance

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

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.

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 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

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.

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.

Welding

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.

Supplied Forms

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

- Sheet
- Plate
- Welded mesh
- Quarto plate
- Round bar
- Flat bar and rolled edge flat bar
- Equal angle
- Square bar
- Hollow bar
- Seamless pipe
- Welded pipe
- Seamless butt weld fittings
- Welded butt weld fittings
- Flanges
- Seamless tube
- Hygienic fittings
- Round, square and rectangular decorative tube

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