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304 & 304L Stainless Steel

DESCRIPTION

Type 304 Stainless Steel is the most widely used of the austenitic (chromium/nickel) stainless steels. In the annealed condition it is essentially non-magnetic and becomes slightly magnetic with the application of cold work. Type 304L Stainless Steel is preferred in welding applications to exclude the formation of chromium carbides during cooling in the heat affected region of the weld. These alloys represent an excellent combination of corrosion resistance and fabricability.

PRODUCT FORMS

Sheet, Strip

SPECIFICATIONS

Type 304 – ASTM A240, ASTM A666, AMS 5513 Type 304L – ASTM A240, ASTM A666, AMS 5511

APPLICATIONS

Chemical equipment and piping, heat exchanger components, dairy and food handling equipment and utensils, cryogenic vessels and components, architectural and structural applications exposed to non-marine atmospheres

PROCESSING

Types 304 and 304L cannot be hardened by thermal treatment. Annealing: Heat to 1850o F to 2050 o F and cool at sufficiently high rates through 1500oF to 800oF to avoid precipitation of chromium carbides. Stress Relief Annealing: Cold worked parts should be stress relieved at 750oF for ½ to 2 hours.

FORMING

Annealed Types 304 and 304L can be fabricated by roll forming, deep drawing, bending and most other fabrication techniques. Due to the high work hardening rate of these materials, intermediate anneals maybe required to successfully fabricate the part.

WELDING

Types 304 and 304L are weldable by most fusion or resistance welding techniques. If filler metal is required, Type 308 is normally used. Type 304L should be used in heavier sections to reduce the occurrence of carbide precipitation in the heat affected region adjacent to the weld pool

CORROSION

Types 304 and 304L provides corrosion resistance in a wide range of moderately oxidizing and reducing conditions, fresh water and non-marine applications.



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CHEMICAL COMPOSITION: (PER ASTM A240)

Element	Type 304	Type 304L
Carbon	0.07 max.	0.030 max.
Manganese	2.00 max.	2.00 max.
Sulfur	0.030 max.	0.030 max.
Phosphorus	0.045 max.	0.045 max.
Silicon	0.75 max.	0.75 max
Chromium	17.5 to 19.5	18.0 to 20.0
Nickel	8.0 to 10.5	8.0 to 12.0
Nitrogen	0.10 max.	0.10 max.

MECHANICAL PROPERTIES: (PER ASTM A240, A666)

Type	Yield Strength 0.2% offset (KSI)	Tensile Strength (KSI)	% Elongation (2" Gauge Length)
304 Ann	30 min.	75 min.	40 min.
304 1/4 Hard	75 min.	125 min.	12 min.
304 1/2 Hard	110 min.	150 min.	7 min.
304L Ann	25 min.	70 min.	40 min
304L 1/4 Hard	75 min.	125 min.	12 min
304L 1/3 Hard	110 min.	150 min.	6 min.



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PHYSICAL PROPERTIES: (ANNEALED)

Density (lb./in ³) @ RT		0.29
Modulus of Elasticity in Tension (psi x 10 ⁶)		28.0
Specific Heat (BTU/o F/lb.)	32 to 212 oF	0.12
Thermal Conductivity (BTU/hr/ft ² /ft)	212oF	9.4
	932oF	12.4
Mean Coefficient of Thermal Expansion (in. x 10 ⁻⁶ per o F)	32 to 212 oF	9.2
	32 to 600oF	9.9
	32 to 1,000oF	10.2
	32 to 1,200oF	10.4
Electrical Resistivity (micro ohms - cm)	at 70oF	72
Melting Point Range (oF)		2500 to 2650
Oxidation Resistance - Continuous Service (oF)		1,650
Oxidation Resistance - Intermittent Service (oF)		1,500