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Alloy Technical Data Sheet
Type 321 Stainless Steel
UNS Designation: S32100

GENERAL PROPERTIES
Type 321 (S32100) is a stabilized stainless steel that offers excellent resistance to intergranular corrosion following exposure to temperatures in the chromium carbide precipitation range from 800 to 1500°F (427 to 816°C). Type 321 is stabilized against chromium carbide formation by the addition of titanium.

While Type 321continues to be employed for prolonged service in the 800 to 1500°F (427 to 816°C) temperature range, Type 304L has supplanted this stabilized grade for applications involving only welding or short time heating.

Type 321stainless steel is also advantageous for high temperature service because of its excellent mechanical properties. Type 321 stainless steel offers higher creep and stress rupture properties than Type 304 and, particularly, Type 304L which might also be considered for exposures where sensitization and intergranular corrosion are concerns. This results in higher elevated temperature allowable stresses for this stabilized alloy for ASME Boiler and Pressure Vessel Code applications. The Type 321 alloy has a maximum use temperature of 1500°F (816°C) for code applications like Type 304, whereas T304L is limited to 800°F (426°C).

CHEMICAL COMPOSITION
Chemistries represented by ASTM A240 and ASME SA-240

Element	Percent by Weight Maximum Unless Range is Specified
Carbon	0.08 maximum
Manganese	2.00 maximum
Phosphorus	0.045 maximum
Sulfur	0.030 maximum
Silicon	0.75 maximum
Chromium	17.00-19.00
Nickel	9.00-12.00
Titanium	5x(C+N) min to 0.70 max
Nitrogen	0.10 maximum
Iron	Balance

RESISTANCE TO CORROSION
Type 321offers similar resistance to general, overall corrosion as the unstabilized chromium nickel Type 304. Heating for long periods of time in the chromium carbide precipitation range may affect the general resistance of Type 321 in severe corrosive media.

PHYSICAL PROPERTIES
The values reported below are representative for average composition in the annealed condition.

Melting Range	2550-2635ºF (1398-1446ºC)
Density	0.286 lb/in^3 (7.92g/cm^3)
Specific Gravity	7.9
Modulus of Elasticity in Tension	28 x 10^6 (193 GPa)*

LINEAR COEFFICIENT OF THERMAL EXPANSION

Temperature Range		Coefficients	
°F	°C	in/in/°F	cm/cm/°C
68-212	20-100	9.2 x 10^{-6}	16.6 x 10^{-6}
68-1112	20-600	10.5 x 10^{-6}	18.9 x 10^{-6}
68-1832	20-1000	11.4 x 10^{-6}	20.5 x 10^{-6}

THERMAL CONDUCTIVITY

Temperature Range		Btu/hr·ft·°F	W/m·K
°F	°C		
68-212	20-100	112.5	16.3
68-932	20-500	147.7	21.4

The overall heat transfer coefficient of metals is determined by factors in addition to the thermal conductivity of the metal. The ability of the 18-8 stainless grades to maintain clean surfaces often allows better heat transfer than other metals having higher thermal conductivity.

SPECIFIC HEAT

°C	°F	J/kg °K	Btu/lb/°F
0-100	32-212	500	0.12

MAGNETIC PERMEABILITY
The stabilized Type 321 is generally non-magnetic in the annealed condition with magnetic permeability values typically **less than 1.02 at 200H**.

ELECTRICAL RESISTIVITY

Temperature		Microhm-in	Microhm-cm
°F	°C		
68	20	28.3	72
212	100	30.7	78
392	200	33.8	86
752	400	39.4	100
1112	600	43.7	111
1472	800	47.6	121
1652	900	49.6	126

Room Temperature Mechanical Properties
Minimum mechanical properties in the annealed condition (2000°F [1093°C], air cooled) are shown in the table below as required by ASTM-A-240 and ASME SA-240.

Condition	Tensile Strength, Min. Ksi	(MPa)	0.2% Yield Strength, Min. Ksi	(MPa)	Elong. In 2" (50mm) %, Min.
Annealed	75	(515)	30	(205)	40

B95 Maximum hardness required for strip and sheet.