



# Brown Metals Company

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# Alloy Technical Data Sheet

## Type 301 Stainless Steel

(UNS Designation: S30100)

### GENERAL PROPERTIES

Type 301 is an austenitic stainless steel with a nominal composition of 17 percent chromium and 7 percent nickel. The high strengths of this grade of steel in the six available conditions or tempers, its resistance to atmosphere corrosion and its bright, attractive surface make it an excellent choice for decorative structural applications. Automobile molding and trim, wheel covers, conveyor belts, kitchen equipment, roof drainage systems, hose clamps, springs, truck and trailer bodies, railway and subway cars are some of the major applications for this versatile grade. By varying the chemical composition within the limits set by the ASTM specifications and by temper rolling, a broad range of magnetic and mechanical properties can be obtained for a variety of applications.

### PHYSICAL PROPERTIES

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

Melting Range	2550-2590°F (1399-1421°C)
Density	0.29 lb/in <sup>3</sup> (8.03g/cm <sup>3</sup> )
Specific Gravity	8.03
Modulus of Elasticity in Tension	28 x 10 <sup>6</sup> (193 GPa)*

\* In the cold worked condition, the modulus is lowered.

### LINEAR COEFFICIENT OF THERMAL EXPANSION

Temperature Range		Coefficients	
°F	°C	in/in/°F	cm/cm/°C
62-212	20-100	9.2 x 10 <sup>-6</sup>	16.6 x 10 <sup>-6</sup>
68-572	20-300	9.8 x 10 <sup>-6</sup>	17.6 x 10 <sup>-6</sup>
68-932	20-500	10.3 x 10 <sup>-6</sup>	18.6 x 10 <sup>-6</sup>
68-1292	20-700	10.8 x 10 <sup>-6</sup>	19.5 x 10 <sup>-6</sup>
68-1600	20-871	11.0 x 10 <sup>-6</sup>	19.8 x 10 <sup>-6</sup>

Since the expansion coefficient is higher than that of many other metals and alloys, this characteristic should be considered in the design of equipment involving Type 301 and other materials of construction.

### ELECTRICAL RESISTIVITY

°F	°C	Microhm-in.	Microhm-cm.
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

### MAGNETIC PERMEABILITY

Properly annealed Type 301 is completely austenitic and magnetic permeability is **1.02 maximum at 200H**. Cold working promotes the formation of martensite and the magnetic permeability is increased.

### RESISTANCE TO CORROSION

Type 301 is resistant to a variety of corrosive media. However, the corrosion properties are not as good as the 18-8 chromium-nickel steels. Its susceptibility to carbide precipitation during welding restricts its use in many applications in favor of Types 304 or 304L.

### RESISTANCE TO OXIDATION

Type 301 possesses good resistance to oxidation at temperatures up to 1550F (840C). At 1600F(871C), Type 301 exhibits an oxidation weight gain of 10mg/cm<sup>2</sup> in 1,000 hours. Therefore, this stainless steel is not suggested for use at 1600F or above. As the rate of oxidation is greatly affected by the atmosphere to which the metal is exposed by the heating and cooling cycle, and by the structural design, no data can be presented which will apply to all service conditions.

### CHEMICAL COMPOSITION

Represented by ASTM A240 and A666

Element	Percent by Weight
Carbon (C)	0.15 maximum
Manganese (Mn)	2.00 maximum
Phosphorus (P)	0.045 maximum
Sulfur (S)	0.030 maximum
Silicon (Si)	1.00 maximum
Chromium (Cr)	16.00-18.00
Nickel (Ni)	6.00-8.00
Nitrogen (N)	0.10 maximum

### THERMAL CONDUCTIVITY

Temperature Range		Btu/ft <sup>2</sup> /hr/°F/ft	W/m-K
°F	°C		
68-212	20-100	9.4	16.3
68-932	20-500	12.4	21.4

### SPECIFIC HEAT

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

### MECHANICAL PROPERTIES

Type 301 is used in the annealed and cold-rolled conditions. In the work-hardened condition, Type 301 develops higher tensile strength than the other stable austenitic grades. Minimum properties for plate, sheet and strip per ASTM A240 and A666 follow.

#### Minimum Room Temperature Mechanical Properties, ASTM A240 and A666 Specifications

Condition	Tensile Strength, Min.		0.2% Yield Strength, Min.		Elong. In 2" (50mm) %, Min.
	Ksi	(MPa)	Ksi	(MPa)	
Annealed	75	( 515)	30	(205)	40
1/4 Hard	125	( 862)	75	(517)	25
1/2 Hard	150	(1,034)	110	(758)	18*
3/4 Hard	175	(1,207)	125	(931)	12*
Full Hard	185	(1,276)	140	(965)	9*

\*Value shown for thickness greater than 0.015 in. (.038mm).