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Alloy Technical Data Sheet
Types 302 (S30200), 304 (S30400), 304L (S30403), 305 (S30500) Stainless Steels

GENERAL PROPERTIES
Types 302, 304, 304L, and 305 stainless steels are variations of the 18 percent chromium – 8 percent nickel austenitic alloy, the most familiar and most frequently used alloy in the stainless steel family. These alloys may be considered for a wide variety of applications where one or more of the following properties are important: resistance to corrosion, prevention of product contamination, resistance to oxidation, east of fabrication, excellent formability, beauty of appearance, ease of cleaning, high strength with low weight, good strength and toughness at cryogenic temperatures, ready availability of a wide range of product forms.

Each alloy represents an excellent combination of corrosion resistance and fabricability. This combination of properties is the reason for the extensive use of these alloys which represent nearly one half of the total U.S. stainless steel production. Type 304 represents the largest volume followed by Type 304L. Types 302 and 305 are used in smaller quantities. These alloys are covered by a variety of construction or use of equipment manufactured from these alloys for specific conditions. Food and beverage, sanitary, cryogenic, and pressure-containing applications are examples.

CHEMICAL COMPOSITION
Chemistries represented by ASTM A240 and A666

Element	Percentage by Weight Maximum Unless Range is Specified			
	302	304	304L	305
Carbon	0.15	0.08	0.030	0.12
Manganese	2.00	2.00	2.00	2.00
Phosphorus	0.045	0.045	0.045	0.045
Sulfur	0.030	0.030	0.030	0.030
Silicon	0.75	0.75	0.75	0.75
Chromium	17.00-19.00	18.00-20.00	18.00-20.00	17.00-19.00
Nickel	8.00-10.00	8.00-10.50	8.00-12.00	10.50-13.00
Nitrogen	0.10	0.10	0.10	--

RESISTANCE TO CORROSION
The Types 302, 304, 304L and 305 austenitic stainless steels provide useful resistance to corrosion on a wide range of moderately oxidizing to moderately reducing environments. The alloys are used widely in equipment and utensils for processing and handling of food, beverages and dairy products. Heat exchangers, piping, tanks and other process equipment in contact with fresh water also utilize these alloys. Building facades and other architectural and structural applications exposed to non-marine atmospheres also heavily utilize the 18-8 alloys. In addition, a large variety of applications involve household and industrial chemicals.

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

Melting Range	2550-2590ºF (1399-1421ºC)
Density	0.285 lb/in^3 (7.90g/cm^3)
Specific Gravity	7.90
Modulus of Elasticity in Tension	29 x 10^6 (200 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
68-212	20-100	9.2 x 10^{-6}	16.6 x 10^{-6}
68-1600	20-870	11.0 x 10^{-6}	19.8 x 10^{-6}

THERMAL CONDUCTIVITY

Temperature Range		Btu/hr·ft·°F	W/m·K
°F	°C		
212	100	9.4	16.3
932	500	12.4	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

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

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 for annealed Types 302, 304, 304L and 305 austenitic stainless steel plate, sheet and strip as required by ASTM specifications A 240 and ASME specification SA-240 are shown below.

Property	Minimum Mechanical Properties Required by ASTM A 240, and ASME SA-240		
	302, 304	304L	305
0.2% Offset Yield Strength PSI MPa	30,000 205	25,000 170	30,000 205
Ultimate Tensile Strength PSI MPa	75,000 515	70,000 485	75,000 515
Percent Elongation in 2 in. or 51 mm	40.0	40.0	40.0
Hardness, Max., Brinell RB	201 92	201 92	183 88

INTERGRANULAR CORROSION
Exposure of the 18-8 austenitic stainless steels to temperatures in the 800°F to 1500°F (427°C to 816°C) range may cause precipitation of chromium carbides in grain boundaries. Such steels are “sensitized” and subject to intergranular corrosion when exposed to aggressive environments. For this reason, the low carbon Type 304L alloy is preferred for applications in which the material is put into service in the as-welded condition. Low carbon content extends the time necessary to precipitate a harmful level of chromium carbides, but does not eliminate the precipitation reaction for material held for long times in the precipitation temperature range.