

California Metal & Supply Inc.

ISO9001 & AS9100 Certified Company, Founded 1984
Titanium, Inconel, Nickel, Aluminum, A286, Stainless

T) 800-707-6061

sales@CaliforniaMetal.com

DATA SHEET: 17-7 Stainless Steel

17-7 PH stainless steel is a precipitation-hardening stainless steel. SS 17-7 offers good corrosion resistance, good formability, and high strength therefore has been used for aerospace applications.

Applications: Stainless Steel Alloy 17-7 is used for intricate parts due to its low distortion in heat treatment. Stainless steel grade 17-7 PH finds uses in variety of springs and washers, chemical processing equipment, heat exchangers, power boilers, superheater tubes, and components used in high-strength/high-temperature conditions.

17-7 PH Stainless Steel Corrosion Resistance

Corrosion resistance in Condition TH 1050 and RH 950 is generally superior to that of the standard hardenable chromium types of stainless steel such as Types 410, 420 and 431, but is not quite as good as chromium-nickel Type 304. Corrosion resistance in Condition CH 900 approaches that of Type 304 in most environments.

Physical Properties of 17-7 PH Stainless Steel

	Condition A	Condition TH 1050	Condition RH 950
Density, lbs/cu in (g/cu cm)	0.282 (7.81)	0.276 (7.65)	0.276 (7.65)
Modulus of Elasticity, ksi (Gpa)	--	29.0 x 10(3) (200)	29.0 x 10(3) (200)
Electrical Resistivity, microhm-cm	80	82	83
Magnetic Permeability			
@50 oersteds	1.4 - 3.6	120 - 167	113 - 130
@200 oersteds	1.4 - 3.2	46 - 55	44 - 52
Maximum	1.4 - 3.6	134 - 208	119 - 135
Thermal Conductivity			
BTU/hr/ft ² /in/Degrees F (W/m-K)			
300 Degrees F (149 Degrees C)	--	117 (16.87)	117(est) (16.87)
500 Degrees F (260 Degrees C)	--	128 (18.46)	128(est) (18.46)
900 Degrees F (482 Degrees C)	--	146 (21.05)	146(est) (21.05)
Mean Coefficient of Thermal Expansion			
in/in/Degrees F (um/m-K)			
70-200 Degrees F (21-93 Degrees C)	8.5 x 10(-5) (15.3)	5.6 x 10(-5) (10.1)	5.7 x 10(-5) (10.3)
70-400 Degrees F (21-204 Degrees C)	9.0 x 10(-5) (16.2)	6.1 x 10(-5) (11.0)	6.6 x 10(-5) (11.9)
70-800 Degrees F (21-427 Degrees C)	9.6 x 10(-5) (16.0)	6.6 x 10(-5) (11.9)	6.9 x 10(-5) (12.4)

Heat Treatment for 17-7 PH Stainless Steel

This material requires three essential steps in heat treating:

- 1) Austenite conditioning.
- 2) Cooling to transform the austenite to martensite.
- 3) Precipitation hardening to Condition TH 1050 or RH 950.

To obtain the highest mechanical properties from the alloy, Condition A material is transformed to martensite the mill by cold reduction to Condition C. Hardening to Condition CH 900 is accomplished with a single, low-temperature heat treatment.

Mechanical Properties of 17-7PH Stainless Steel

Property	Condition A	Condition TH 1050	Condition RH 950	Condition C	Condition CH 900
UTS, ksi (MPa)	130 (896)	200 (1379)	235 (1620)	220 (1517)	265 (1828)
0.2% YS, ksi (MPa)	40 (276)	185 (1276)	220 (1517)	190 (1310)	260 (1793)
Elongation % in 2"	35	9	6	5	2
Hardness, Rockwell	B85	C43	C48	C43	C49

Workability for 17-7 PH Stainless Steel

Formability

In Condition A, the alloy can be formed comparably to Type 301. It work hardens rapidly and may require intermediate annealing in deep drawing or in forming intricate parts. Springback is similar to that of Type 301. This alloy is extremely hard and strong in Condition C. Therefore, fabrication techniques for such material must be used.

Weldability

The precipitation hardening class of stainless steel is generally considered to be weldable by the common fusion and resistance techniques. Special consideration is required to achieve optimum mechanical properties by considering the best heat-treated conditions in which to weld and which heat treatments should follow welding. This particular alloy is generally considered to have poorer weldability compared to the most common alloy of this stainless class, 17-4 PH stainless steel. A major difference is the high Al content of this alloy, which degrades penetration and enhances weld slag formation during arc welding. Also, the austenite conditioning and precipitation hardening heat treatments are both required after welding to achieve high strength levels. When a weld filler is needed, 17-7 PH is most often specified.