P R O D U C T D A T A S H E E T

17-7 PH STAINLESS STEEL

UNS S17700

AK Steel

AK Steel 17-7 PH® is a precipitation-hardening stainless steel that provides high strength and hardness, excellent fatigue properties, good corrosion resistance, good formability, and minimum distortion upon heat treatment.

The alloy provides valuable property combinations particularly well suited for aerospace applications. This special alloy also provides benefits for other applications requiring high strength and good corrosion resistance, as well as excellent properties for flat springs at temperatures up to 600°F (316°C).

COMPOSITION

	%
Carbon	0.09 max.
Manganese	1.00 max.
Phosphorus	0.040 max.
Sulfur	0.030 max.
Silicon	1.00 max.
Chromium	16.00 - 18.00
Nickel	6.50 - 7.75
Aluminum	0.75 - 1.50

AVAILABLE FORMS

AK Steel produces 17-7 PH Stainless Steel sheet and strip in thicknesses from 0.015" to 0.135" (0.381 to 3.429 mm). For material requirements heavier than 0.135" (3.429 mm), inquire. Material is supplied in Condition A, ready for fabrication by the user. Sheet and strip material 0.050" (1.27 mm) and thinner are also produced in the hard-rolled Condition C for applications requiring maximum strength.

STANDARD HEAT TREATMENTS

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 at the mill by cold reduction to Condition C. Hardening to Condition CH 900 is accomplished with a single, low-temperature heat treatment.

MECHANICAL PROPERTIES

Typical Room Temperature Mechanical Properties

Property	Condition A	TH 1050	RH 950	C	CH 900
UTS, ksi (MPa)	130 (896)	200 (1379)	235 (1620)	220 (1517)	265 (1827)
0.2% YS, ksi (MPa)	40 (276)	185 (1276)	220 (1517)	190 (1310)	260 (1793)
Elongation, % in 2" (50.8 mm)	35	9	6	5	2
Hardness, Rockwell	B85	C43	C48	C43	C49

AK STEEL 17-7 PH STAINLESS STEEL DATA SHEET

PHYSICAL PROPERTIES

	Condition A	Condition TH 1050	Condition RH 950
Density, lbs/in^3 (g/cm^3)	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/°F (W/m•K)			
300°F (149°C)	–	117 (16.87)	117 (est) (16.87)
500°F (260°C)	–	128 (18.46)	128 (est) (18.46)
900°F (482°C)	–	146 (21.05)	146 (est) (21.05)
Mean Coefficient of Thermal Expansion in/in/°F (μm/m•K)			
70 - 200°F (21 - 93°C)	8.5 x 10^{-6} (15.3)	5.6 x 10^{-6} (10.1)	5.7 x 10^{-6} (10.3)
70 - 400°F (21 - 204°C)	9.0 x 10^{-6} (16.2)	6.1 x 10^{-6} (11.0)	6.6 x 10^{-6} (11.9)
70 - 800°F (21 - 427°C)	9.6 x 10^{-6} (16.0)	6.6 x 10^{-6} (11.9)	6.9 x 10^{-6} (12.4)

CORROSION RESISTANCE

Corrosion resistance in Conditions TH 1050 and RH 950 is generally superior to that of the standard hardenable chromium types of stainless steels 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.

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 materials must be used.

WELDABILITY

The precipitation hardening class of stainless steels 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, AK Steel 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, W 17-7 PH is most often specified.

SPECIFICATIONS

Specifications are listed without revision indications. Contact ASTM Headquarters, AMS Division of SAE or Department of Defense Index for latest revisions.

AMS 5528 Sheet, Strip and Plate

AMS 5529 Sheet and Strip–Cold Rolled

MIL-S-25043 Plate, Sheet and Strip

ASTM A 693 Plate, Sheet and Strip (Listed as Grade 631-UNS S17700)

METRIC CONVERSION

Data in this publication are presented in U.S. customary units. Approximate metric equivalents may be obtained by performing the following calculations:

Length (inches to millimeters) – Multiply by 25.4

Strength (ksi to megapascals or meganewtons per square meter) – Multiply by 6.8948

Temperature (Fahrenheit to Celsius) – (°Fahrenheit - 32) – Multiply by 0.5556

Density (pounds per cubic inch to kilograms per cubic meter) – Multiply by 27,670

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Stainless Steel The Value Option

7100-0096 7/07