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

PH 15-7 Mo STAINLESS STEEL

UNS S15700

AK Steel

AK Steel PH 15-7 Mo® is a semi-austenitic precipitation-hardening stainless steel that provides high strength and hardness, good corrosion resistance and minimum distortion on heat treatment. It is easily formed in the annealed condition and develops an effective balance of properties by simple heat treatments. For applications requiring exceptionally high strength, cold-reduced PH 15-7 Mo Stainless Steel in Condition CH 900 is particularly useful for applications permitting limited ductility and workability. This alloy is particularly beneficial for a wide range of applications that include retaining rings, springs, diaphragms, aircraft bulkheads, welded and brazed honeycomb paneling and other aircraft components requiring high strength at elevated temperatures.

AVAILABLE FORMS

AK Steel produces PH 15-7 Mo Stainless Steel sheet and strip in thicknesses from 0.015" to 0.135" (0.381 to 3.429 mm). 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.

COMPOSITION

	%
Carbon	0.09 max.
Manganese	1.00 max.
Phosphorus	0.040 max.
Sulfur	0.040 max.
Silicon	1.00 max.
Chromium	14.00 - 16.00
Nickel	6.50 - 7.75
Molybdenum	2.00 - 3.00
Aluminum	0.75 - 1.50

STANDARD HEAT TREATMENTS

AK Steel PH 15-7 Mo Stainless Steel requires three essential steps in heat treating: 1) austenite conditioning, 2) cooling to transform the austenite to martensite and 3) precipitation hardening. The material normally is supplied from the mill in Condition A. After fabrication, an austenite conditioning treatment is followed by a transformation treatment to either Condition T or Condition R 100. Then the material is precipitation hardened to either Condition TH 1050 or Condition RH 950 to develop fully useable properties.

To obtain the highest mechanical properties in this alloy, Condition A material is transformed to martensite at the mill by cold reduction to Condition C. After fabrication by the user, 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)	210 (1448)	240 (1655)	220 (1517)	265 (1828)
0.2% YS, ksi (MPa)	55 (372)	200 (1379)	225 (1552)	190 (1310)	260 (1793)
Elongation, % in 2" (50.8 mm)	35	7	6	5	2
Hardness, Rockwell	B88	C44	C48	C45	C50

AK STEEL PH 15-7 Mo STAINLESS STEEL DATA

PHYSICAL PROPERTIES

	Condition A	Condition TH 1050	Condition RH 950
Density, lbs/in^3 (g/cm^3)	0.282 (7.804)	0.277 (7.685)	0.277 (7.680)
Modulus of Elasticity, ksi (MPa)	–	29.0 x 10^3 (200)	29.0 x 10^3 (200)
Thermal Conductivity BTU/hr/ft^2/in/°F (W/m•K)			
70°F (21°C)	–	104 (15.1)	104 (15.1)
200°F (93°C)	–	112 (16.2)	112 (16.2)
600°F (316°C)	–	136 (19.7)	133 (19.2)
900°F (482°C)	–	–	150 (21.7)
Mean Coefficient of Thermal Expansion in/in/°F (µm/m•K)			
70 - 200°F (21 - 93°C)	8.0 x 10^{-6} (14.4)	6.1 x 10^{-6} (11.0)	5.0 x 10^{-6} (9.0)
70 - 600°F (21 - 316°C)	8.5 x 10^{-6} (15.3)	6.1 x 10^{-6} (11.0)	5.6 x 10^{-6} (10.1)
70 - 800°F (21 - 427°C)	8.9 x 10^{-6} (16.0)	6.3 x 10^{-6} (11.3)	5.9 x 10^{-6} (10.6)
70 - 1000°F (21 - 538°C)	9.4 x 10^{-6} (16.9)	6.6 x 10^{-6} (11.9)	6.1 x 10^{-6} (11.0)

CORROSION RESISTANCE

The general level of corrosion resistance in Conditions TH 1050 and RH 950 is superior to standard hardenable types of stainless such as Types 410, 420 and 431, but is not quite as good as Type 304.

FORMABILITY

The material in Condition A can be formed comparably to Type 301 stainless steel. 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, so fabrication techniques for such materials must be used.

SPECIFICATIONS

Specifications are listed without revision indications. Contact ASTM or AMS division of SAE for the latest revisions.

AMS 5520 Sheet, Strip and Plate

ASTM A 693 Plate, Sheet and Strip (Listed as Grade 632-UNS S15700)

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 me chanical 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, either W PH 15-7 Mo or W 17-7 PH is most often specified.

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

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