

15-5 PH STAINLESS STEEL

UNS S15500



AK Steel 15-5 PH® is a martensitic precipitation-hardening stainless steel that provides high strength, good corrosion resistance, good mechanical properties at temperatures up to 600°F (316°C) and good toughness in both the longitudinal and transverse directions in both base metal and welds. Short-time, low-temperature heat treatments minimize distortion and scaling.

AK Steel 15-5 PH is the ferrite-free version of AK Steel 17-4 PH Stainless Steel. Both alloys are widely used in the aerospace, chemical, petrochemical, food processing, paper and general metalworking industries.

COMPOSITION

	%
Carbon	0.07 max.
Manganese	1.00 max.
Phosphorus	0.040 max.
Sulfur	0.030 max.
Silicon	1.00 max.
Chromium	14.00 - 15.50
Nickel	3.50 - 5.50
Copper	2.50 - 4.50
Columbium plus Tantalum	0.15 - 0.45

AVAILABLE FORMS

AK Steel produces 15-5 PH Stainless Steel sheet and strip in thicknesses from 0.015" to 0.125" (0.38 to 3.18 mm). Material is supplied in Condition A, ready for fabrication and subsequent hardening by the user. For sizes and conditions other than these, inquire.

STANDARD HEAT TREATMENTS

AK Steel 15-5 PH Stainless Steel is supplied from the mill in Condition A, ready for fabrication and subsequent heat treatment by the user. Eight standard heat treatments have been developed to provide a wide range of properties to meet specific applications:

H 900	H 1075	H 1150 + 1150
H 925	H 1100	H 1150-M
H 1025	H 1150	

PHYSICAL PROPERTIES

	Condition A	Condition H 900	Condition H 1075	Condition H 1150
Density, lbs/in ³ (g/cm ³)	0.28 (7.78)	0.282 (7.80)	0.283 (7.81)	0.284 (7.82)
Thermal Conductivity BTU/hr/ft ² /in/°F (W/m•K)				
300°F (149°C)		124 (17.9)		
500°F (260°C)		135 (19.5)		
900°F (482°C)		157 (22.6)		
Mean Coefficient of Thermal Expansion in/in/°F (µm/m•K)				
-100 - 70°F (-73 - 21°C)	—	5.8 x 10 ⁻⁶ (10.4)	—	6.1 x 10 ⁻⁶ (11.0)
70 - 200°F (21 - 93°C)	6.0 x 10 ⁻⁶ (10.8)	6.0 x 10 ⁻⁶ (10.8)	6.3 x 10 ⁻⁶ (11.3)	6.6 x 10 ⁻⁶ (11.9)
70 - 600°F (21 - 316°C)	6.2 x 10 ⁻⁶ (11.2)	6.3 x 10 ⁻⁶ (11.3)	6.6 x 10 ⁻⁶ (11.9)	7.1 x 10 ⁻⁶ (12.8)
70 - 800°F (21 - 427°C)	6.3 x 10 ⁻⁶ (11.3)	6.5 x 10 ⁻⁶ (11.7)	6.8 x 10 ⁻⁶ (12.2)	7.2 x 10 ⁻⁶ (13.0)

MECHANICAL PROPERTIES

Typical Mechanical Properties*

Property	A	H 900	Condition H 925	H 1025	H 1075	H 1150	H 1150-M
UTS, ksi (MPa)							
Longitudinal	161 (1110)	209 (1438)	181 (1249)	174 (1200)	162 (1114)	150 (1035)	136 (938)
Transverse	162 (1116)	213 (1466)	184 (1272)	175 (1204)	162 (1114)	152 (1050)	137 (944)
0.2% YS, ksi (MPa)							
Longitudinal	140 (963)	201 (1385)	175 (1208)	171 (1176)	160 (1102)	140 (967)	111 (765)
Transverse	143 (988)	202 (1393)	177 (1222)	171 (1176)	161 (1112)	146 (1009)	111 (765)
Elongation, % in 2" (50.8 mm)							
Longitudinal	8.4	10.1	12.2	12.2	12.8	14.6	18.8
Transverse	7.6	9.4	9.8	9.3	11.4	13.1	17.8
Hardness, Rockwell C							
Longitudinal	35	46	41	40	38	36	31
Transverse	35	46	42	39	38	36	31

*Average of two heats, 0.090" (2.3 mm) gauge.

CORROSION RESISTANCE

The general level of corrosion resistance exceeds that of Types 410 and 431, and is approximately equal to that of AK Steel 17-4 PH Stainless Steel as indicated by laboratory tests in both strongly oxidizing and reducing media, as well as by atmospheric exposures. The general level of corrosion resistance is best in the fully hardened condition, and decreases slightly as the aging temperature is increased.

FABRICATION

Because the alloy in Condition A is strong, forming normally should be limited to mild operations. However, fabri-

cation can be improved greatly by heat treating before cold working or by using hot forming methods.

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 equivalent weldability to the most common alloy of this stainless class, 17-4 PH Stainless

Steel. When a weld filler is needed, AWS E/ER 630 is most often specified. AK Steel 15-5 PH Stainless Steel is well known in reference literature and more information can be obtained in this way.

SPECIFICATIONS

The following specifications are listed without revision indications. Contact ASTM Headquarters or AMS Division of SAE for latest revisions.

AMS 5862

ASTM A 693 Plate, Sheet and Strip
(Listed as Grade XM-12 UNS S15500)

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

The information and data in this product data sheet are accurate to the best of our knowledge and belief, but are intended for general information only. Applications suggested for the materials are described only to help readers make their own evaluations and decisions, and are neither guarantees nor to be construed as express or implied warranties of suitability for these or other applications.

Data referring to mechanical properties and chemical analyses are the result of tests performed on specimens obtained from specific locations with prescribed sampling procedures; any warranty thereof is limited to the values obtained at such locations and by such procedures. There is no warranty with respect to values of the materials at other locations.

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