

12 SR STAINLESS STEEL



AK Steel 12 SR™ is a 12% chromium ferritic stainless steel that provides a more oxidation-resistant alternative to Type 409 stainless steel. In addition, it provides formability and weldability comparable to other more highly alloyed ferritic stainless steels. AK Steel 12 SR Stainless Steel was developed specifically for automotive exhaust gas applications. Typical uses include passenger car and truck catalytic converters, stamped and tubular manifolds, flanging and tubing associated with exhaust system components. Non-automotive applications include heat exchangers, flue liners and commercial furnaces.

TYPICAL COMPOSITION

	%
Carbon	0.02
Silicon	0.50
Chromium	12.0
Aluminum	1.20
Titanium	0.30
Columbium	0.60

AVAILABLE FORMS

AK Steel 12 SR Stainless Steel is available as sheet and strip. Data presented in this product data sheet were generated by testing material annealed at 1950°F (1066°C) unless otherwise stated.

MECHANICAL PROPERTIES

Typical Mechanical Properties*

Alloy	Test Direction	UTS ksi (MPa)	0.2% YS ksi (MPa)	Elongation % in 2" (50.8 mm)	Hardness Rockwell B
12 SR	Longitudinal	73 (503)	50 (345)	31.5	80.5
Type 409	Longitudinal	64 (441)	36 (248)	35.0	70.0

*1950°F (1066°C) Anneal.

Properties Acceptable for Material Specification*

Alloy	UTS ksi (MPa)	0.2% YS ksi (MPa)	Elongation % in 2" (50.8 mm)	Hardness Rockwell B
12 SR	60 (448) min.	35 (276) min.	20 min.	92 max.
Type 409	55 (379)	30 (207)	22 min.	80 max.

*1950°F (1066°C) annealed sheet and strip.

ELEVATED TEMPERATURE STRENGTH

Laboratory tests show that AK Steel 12 SR Stainless Steel is stronger at elevated temperatures than Type 409. This strength advantage holds at high strain rates such as with short-time elevated temperature tensiles and with low strain rates such as with sag testing.

Short-Time Elevated Temperature Tensile Properties*

Temperature °F (°C)	UTS ksi (MPa)	0.2% YS ksi (MPa)
Room	73.0 (504)	50.0 (329)
1000 (538)	53.4 (368)	28.4 (196)
1200 (649)	43.7 (301)	23.9 (164)
1300 (704)	21.6 (149)	16.2 (111)
1400 (760)	10.1 (70)	8.1 (56)
1500 (816)	7.5 (52)	6.1 (42)
1600 (871)	5.2 (35)	4.2 (29)

*Average of duplicate tests.

PHYSICAL PROPERTIES

Density,

7.63 g/cm³.276 lbs/in³ (.278 lbs/in³ for Type 409)

Modulus of Elasticity in Tension,

27.5 x 10⁶ psi (189 GPA)**OXIDATION RESISTANCE**

AK Steel 12 SR Stainless Steel resists oxidation comparably to Type 409 at 1400°F (760°C), is superior to Types 409 and 430 at 1600°F (871°C) and approaches the 18% Cr ferritic stainless steels up through 1700°F (927°C) in resisting weight gain through oxidation.

CORROSION RESISTANCE

AK Steel 12 SR Stainless Steel exhibits superior resistance to Type 409 in muffler condensate tests and compares quite favorably with Type 409 in 5% salt fog exposure tests.

FORMABILITY

Use the same techniques employed with Type 409 to fabricate AK Steel 12 SR Stainless Steel. In the annealed condition, the alloy exhibits good bend ductility. Similar to other ferritic stainless steels, formability decreases with increases in thicknesses, particularly above 0.125" (3.2 mm) thick. In tubular form, the material does not fabricate as easily as Type

409 unless an annealing cycle is included after welding. For maximum elevated temperature creep strength, a 1950°F (1066°C) anneal at temperature for several minutes is suggested. Following the anneal, air cooling is usually sufficient. To minimize grain size, a lower temperature anneal cycle is beneficial. Contact AK Steel for guidance in selecting the optimum cycle for applications other than creep resistance.

WELDABILITY

AK Steel 12 SR Stainless Steel is weldable by Gas Metal Arc (GMAW), Gas Tungsten Arc (GTAW) and resistance welding techniques. Weld formability approaches that of Type 409, but because of the higher alloy content, may not be equal to Type 409. Qualification trials should precede any commercial production requiring high-frequency weld fabrication. Filler metal can be used, but the specific alloy selection depends on the application. Contact AK Steel sales for assistance in selecting a suitable weld filler metal.

METRIC CONVERSION

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

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 27,760

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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