

QuesTek® Innovations Ferrium® S53® Corrosion Resistant High Strength Steel for Aerospace Structural Applications

Category : Metal , Ferrous Metal , Alloy Steel

Material Notes:

Description: Ferrium® S53® is a corrosion resistant ultra high-strength steel for structural aerospace applications. Ferrium® S53® was designed to provide mechanical properties equal to, or better than, conventional ultrahigh-strength steels such as 300M and SAE 4340 with the added benefit of general corrosion resistance. This eliminates the need for cadmium coating processes, which are environmentally unfriendly and require subsequent hydrogen bake-out operations in order to avoid hydrogen embrittlement. Ferrium® S53® has a greatly improved resistance to stress-corrosion cracking (SCC) over 300M and SAE 4340. Ferrium® S53® utilizes an efficient M2C strengthening dispersion precipitated through tempering while avoiding other carbides. This maximizes strength, wear resistance, and toughness; resulting in a unique combination of mechanical properties for a corrosion resistant steel. Ferrium® S53® uses a stable passive oxide film for optimum corrosion resistance. It also has high hardenability, permitting less severe quench conditions for a given section size and resulting in less distortion during heat treatment. S53® should be considered for use in applications requiring high strength with good fracture toughness, corrosion resistance and high resistance to stress-corrosion cracking (per ASTM F1624). S53® is supplied in a normalized and annealed condition. The dimensional change upon hardening from the annealed condition is approximately 0.003 in./in.

Typical Applications: Aircraft landing gears, flap tracks, actuators, fasteners and other structural applications.

Workability: Forging: Forge at 2050°F (1121°C) followed by an air cool, normalize, subzero treatment and anneal.

Machinability: Annealed Ferrium® S53® has machinability similar to 300M at 35 HRC.

Passivation: Passivation in a 50% nitric acid solutions recommended for maximum corrosion resistance per AMS 2700B, Method 1

Heat Treatment: Solution Treatment: 1985°F(1085°C) 1 hour and oil quench or equivalent, water quenching is not recommended. Soak time must be closely monitored, load couples are recommended.

Sub Zero Treatment: Following the solution treatment, -100°F(-73°C), 1 hour and air warm.

Tempering: 934°F (501°C), 3 hours and oil quench or equivalent followed by -100°F(-73°C), 1 hour and air warm then a second temper at 900°F(482°C) 12 hours and air cool.

Other Key Properties Corrosion resistance has been measured using a variety of test methods. General corrosion resistance of S53® is similar to 440C. Fatigue testing at a number of R values and stress levels has shown equivalent performance to typical 300M values. S53® yields a Class A Weld. Welding studies have shown minimal impact on mechanical properties.

Product Forms: Ferrium® S53® may be manufactured in typical ingot, bar, and billet forms. Sheet and plate also available upon request.

Ferrium is designed by Questek Innovations, LLC. and is manufactured by Latrobe Specialty Steel under license.

Order this product through the following link:

http://www.lookpolymers.com/polymer_QuesTek-Innovations-Ferrium-S53-Corrosion-Resistant-High-Strength-Steel-for-Aerospace-Structural-Applications.php

Physical Properties	Metric	English	Comments
Density	7.98 g/cc	0.288 lb/in ³	

Mechanical Properties	Metric	English	Comments
Hardness, Rockwell C	54	54	typical
Tensile Strength at Break	>= 1930 MPa	>= 280000 psi	
Tensile Strength, Ultimate	1990 MPa	288000 psi	Typical

Mechanical Properties	Metric	English	Comments
Tensile Strength, Yield	@Strain 0.200 %	@Strain 0.200 %	
	1550 MPa	225000 psi	
	@Strain 0.200 %	@Strain 0.200 %	
Elongation at Break	>= 11 %	>= 11 %	
	15 %	15 %	
Reduction of Area	55 %	55 %	Transverse
	57 %	57 %	Flow
Modulus of Elasticity	204 GPa	29600 ksi	Tension
Compressive Yield Strength	1790 MPa	260000 psi	
Ultimate Bearing Strength	3110 MPa	451000 psi	e/D = 1.5
	4060 MPa	589000 psi	e/D = 2.0
Bearing Yield Strength	2550 MPa	370000 psi	e/D = 1.5
	3120 MPa	452000 psi	e/D = 2.0
Fracture Toughness	71.4 MPa-m ^{1/2}	65.0 ksi-in ^{1/2}	
Shear Strength	1250 MPa	181000 psi	
Charpy Impact	24.4 J	18.0 ft-lb	V-notch

Thermal Properties	Metric	English	Comments
CTE, linear	10.53 µm/m-°C	5.850 µin/in-°F	
	@Temperature 24.0 - 104 °C	@Temperature 75.2 - 219 °F	
	10.59 µm/m-°C	5.883 µin/in-°F	
	@Temperature 24.0 - 204 °C	@Temperature 75.2 - 399 °F	
	10.79 µm/m-°C	5.994 µin/in-°F	
	@Temperature 24.0 - 316 °C	@Temperature 75.2 - 601 °F	
	11.02 µm/m-°C	6.122 µin/in-°F	
	@Temperature 24.0 - 427 °C	@Temperature 75.2 - 801 °F	
	11.13 µm/m-°C	6.183 µin/in-°F	

Thermal Properties	Metric	English	Comments
	@ Temperature 24.0 - 593 °C	@ Temperature 75.2 - 1100 °F	
	11.18 µm/m-°C	6.211 µin/in-°F	
	@ Temperature 24.0 - 538 °C	@ Temperature 75.2 - 1000 °F	
Specific Heat Capacity	0.452 J/g-°C	0.108 BTU/lb-°F	
	@ Temperature 22.8 °C	@ Temperature 73.0 °F	
	0.502 J/g-°C	0.120 BTU/lb-°F	
	@ Temperature 200 °C	@ Temperature 392 °F	
	0.561 J/g-°C	0.134 BTU/lb-°F	
	@ Temperature 400 °C	@ Temperature 752 °F	
	0.975 J/g-°C	0.233 BTU/lb-°F	
	@ Temperature 580.0 °C	@ Temperature 1076 °F	
Thermal Conductivity	18.0 W/m-K	125 BTU-in/hr-ft ² -°F	
	@ Temperature 23.0 °C	@ Temperature 73.4 °F	
	20.2 W/m-K	140 BTU-in/hr-ft ² -°F	
	@ Temperature 100 °C	@ Temperature 212 °F	
	22.7 W/m-K	158 BTU-in/hr-ft ² -°F	
	@ Temperature 200 °C	@ Temperature 392 °F	
	24.7 W/m-K	171 BTU-in/hr-ft ² -°F	
	@ Temperature 300 °C	@ Temperature 572 °F	
	26.1 W/m-K	181 BTU-in/hr-ft ² -°F	
	@ Temperature 400 °C	@ Temperature 752 °F	
	28.8 W/m-K	200 BTU-in/hr-ft ² -°F	
	@ Temperature 500 °C	@ Temperature 932 °F	
	35.2 W/m-K	244 BTU-in/hr-ft ² -°F	
	@ Temperature 593 °C	@ Temperature 1100 °F	

Component Elements Properties	Metric	English	Comments
Carbon, C	0.21 %	0.21 %	
Chromium, Cr	10 %	10 %	
Cobalt, Co	14 %	14 %	

Component Elements Properties	Metric	English	Comments
Molybdenum, Mo	2.0 %	2.0 %	
Nickel, Ni	5.5 %	5.5 %	
Tungsten, W	1.0 %	1.0 %	
Vanadium, V	0.30 %	0.30 %	

Chemical Properties	Metric	English	Comments
Critical Temperature	100 °C	212 °F	Ms
	740 °C	1360 °F	Ac1
	780 °C	1440 °F	Ac2

Contact Songhan Plastic Technology Co.,Ltd.

Website : www.lookpolymers.com

Email : sales@lookpolymers.com

Tel : +86 021-51131842

Mobile : +86 13061808058

Skype : lookpolymers

Address : United North Road 215,Fengxian District, Shanghai City,China