

DATA SHEET



LATROBE SPECIALTY
STEEL COMPANY

Latrobe, PA 15650-0031 USA

FERRIUM S53[®]

CORROSION RESISTANT HIGH STRENGTH STEEL

Typical Composition	C	Co	Cr	Ni	Mo	W	V
	0.21	14.0	10.0	5.50	2.00	1.00	0.30

GENERAL CHARACTERISTICS

FERRIUM S53 is an ultra-high strength corrosion resistant steel for structural aerospace and other applications where 300M and 4340 are typically used. Ferrium S53 has mechanical properties on par with these conventional alloys but with the added benefit of atmospheric corrosion resistance. This can eliminate the need for cadmium coating and the subsequent accompanying processing. In addition Ferrium S53 has greatly improved resistance to stress-corrosion cracking (SCC) compared to 300M and 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 to provide corrosion resistance similar to 440C stainless steel. It also has high hardenability, permitting less severe quench conditions for a given section size and resulting in less distortion during heat treatment.

Typical applications include aircraft landing gears, flap tracks, actuators, fasteners and other structural applications.

PHYSICAL PROPERTIES

Density: 0.288 lb/in³ (7.98 g/cm³)

Modulus of Elasticity: 29.6 x 10⁶ psi (204 GPa)

Critical Temperatures: Ac₁ 1364°F (740°C)

Ac₃ 1436°F (780°C)

Ms 212°F (100°C)

Specific Heat

Temperature		Specific Heat Cp	
°F	°C	Btu / lb*°F	J / kg*K
73	23	0.108	451
392	200	0.120	503
752	400	0.134	562
1076	580	0.233	974

Mean Coefficient of Thermal Expansion

Temp Range		in / in / °F	mm / mm / °C
°F	°C	(x 10 ⁻⁶)	(x 10 ⁻⁶)
75 - 220	24 - 104	5.86	10.53
75 - 400	24 - 204	5.89	10.59
75 - 600	24 - 316	6.00	10.79
75 - 800	24 - 427	6.13	11.02
75 - 1000	24 - 538	6.22	11.18
75 - 1100	24 - 593	6.19	11.13

Thermal Conductivity

Temperature		Thermal Conductivity	
°F	°C	Btu / hr*°F	W / cm*K
73	23	10.39	0.180
212	100	11.68	0.202
392	200	13.10	0.227
572	300	14.27	0.247
752	400	15.10	0.261
932	500	16.65	0.288
1099	593	20.32	0.352

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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 solution is 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.

MECHANICAL PROPERTY DATA

Orientation	U.T.S.		0.2% Yield		%El	%RA	Impact energy		Fracture Toughness		HRC
	ksi	MPa	ksi	MPa	in 4D		ft-lbs	J	ksi√in	MPa√M	
Long.	288	1986	225	1551	15	57	18	24	65	71	54
Trans.	288	1986	225	1551	15	55	18	24	65	71	54

CORROSION RESISTANCE

The general corrosion resistance of Ferrium S53 is similar to 440C stainless steel. Linear polarization testing measured an average corrosion rate of 0.40 mils per year versus a saturated Ag/AgCl reference electrode in 3.5% sodium chloride (NaCl) solution at ambient temperature. Ferrium S53 is rust resistant in 3.5% NaCl solution.

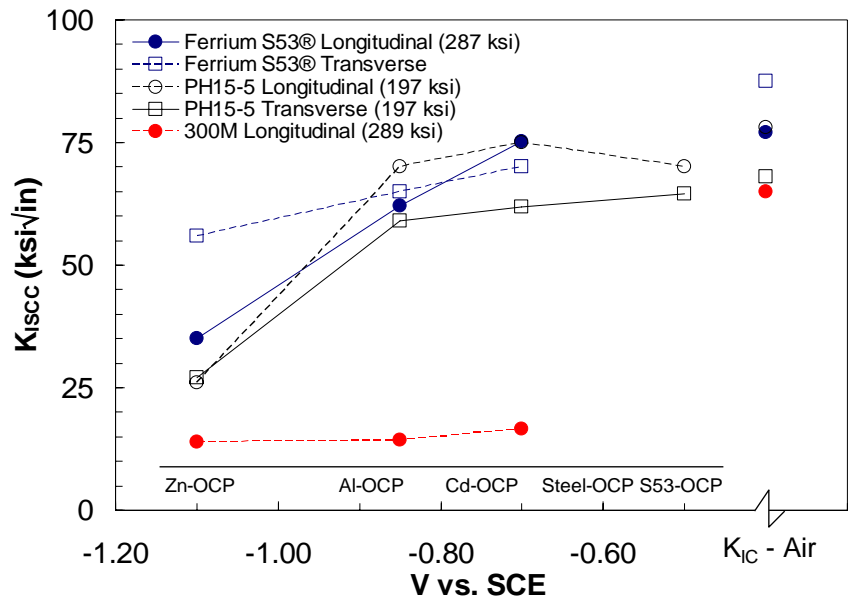
SPECIFICATIONS

The following industry specifications are offered for general familiarization and should not be considered a complete listing.

AMS 5922
MMPDS-05
UNS S10500

Stress Corrosion Cracking

(per ASTM F1624 in 3.5 wt% NaCl Solution)



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