



Ferrium® M54™ Chemical Composition (nominal wt. %)

Fe	C	Co	Cr	Ni	Mo	W	V
Bal.	0.3	7	1	10	2	1.3	0.1

Ferrium M54 Mechanical Properties (typical)

YS (ksi)	UTS (ksi)	EI (%)	Ra (%)	Hardness (HRC)	CVN (ft-lb)	K _{1c} (ksi√in)
251	293	15	64	54	24	118

Materials by Design® Objective

The design objective of Ferrium® M54® was to create a cost effective ultra high-strength, high fracture toughness material with high resistance to stress corrosion cracking material for use in structural applications.

Description

Ferrium® M54® is an ultra high-strength steel for structural applications. Ferrium® M54® was designed to provide mechanical properties equal to, or better than ultrahigh-strength steels such as Aermet® 100. Ferrium® M54® has high resistance to stress-corrosion cracking (SCC) over conventional ultra high-strength steels.

Ferrium® M54® 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.

Ferrium® M54® also has high hardenability, permitting less severe quench conditions for a given section size and resulting in less distortion during heat treatment.



Processing

Processing of Ferrium[®] M54[®] is similar to other quench and tempered martensitic secondary-hardening steels. Vacuum heat treatment and vacuum tempering is recommended to avoid surface decarburization. After quenching to room temperature, Ferrium[®] M54[®] is subjected to cryogenic treatment to assure a complete martensitic transformation. Ferrium[®] M54[®] is typically tempered around 960°F (516°C) and has excellent thermal resistance approaching this temperature. This allows for higher grinding speeds without risk for grinding burns and more reliability in service.

Heat treatment recommendation: Test specimens should be hardened by heating to 1940°F ±27 (1060°C ±15), holding at heat for 60 - 90 minutes, quenching in oil (or equivalent), cooling to -100°F (-73°C) or lower, holding at temperature for 1 hour +2, -0, and warming in air to room temperature; and tempered by heating to 960°F ±12 (516°C ±7), holding at heat for 10 hours +2, -2, and cooling in air (or equivalent).

Application Environment

Ferrium[®] M54[®] is not considered corrosion resistant. Therefore, users should consider the specific environment when determining surface treatment.

Product Forms

Ferrium[®] M54[®] may be manufactured in typical ingot, bar, and billet forms. Sheet and plate also available upon request.

Other

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