



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 _{IC} (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 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

Patent pending