



Overview of Ferrium® M60S Properties

YS (ksi)	UTS (ksi)	Hardness (HRC)
250	350	60

Materials by Design® Objective

Stainless steels for cutlery applications have historically not achieved the strength and hardness of non-stainless steels. QuesTek's ultrahigh-strength stainless steel, *Ferrium*® M60S, was designed with the objectives of achieving strength and hardness levels comparable to non-stainless cutlery steels such as, M2 tool steels.

Description

Ferrium M60S is one of QuesTek's *Ferrium* S-series alloys. *Ferrium* S-series alloys are a family of new corrosion resistant ultrahigh-strength steels. *Ferrium* S-series alloys are tempered martensitic secondary-hardening steels and can be solution heat treated and tempered to hardness levels ranging from 40 Rockwell C (HRC) to more than 62 HRC depending on the chemical composition.

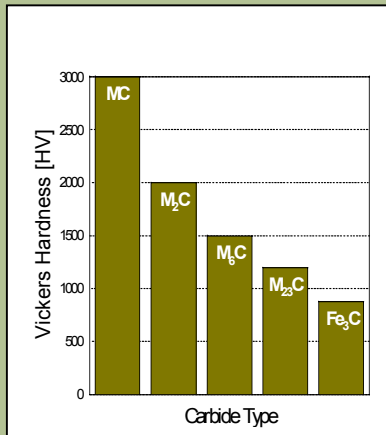
The key structural features of *Ferrium* S-series alloys are:

- A strong and tough fine lath martensite matrix,
- Fine grain refining MC dispersion to improve wear resistance and toughness,
- Nanoscale M₂₃C dispersion strengthening through tempering while avoiding other carbides to maximize strength, wear resistance and toughness, and
- A stable passive oxide film on the material surface for optimum corrosion resistance.

Ferrium S-series alloys contain only MC and M₂₃C carbides. MC and M₂₃C carbides have the highest hardness of all carbides found in steel. This results in an optimum combination of strength, wear resistance, and toughness and gives superb edge retention.

Advantages

Ferrium M60S achieves strength and hardness levels that previously could only be attained in non-stainless steels. *Ferrium* M60S's capability to retain its edge is among the best ever tested by CATRA (Cutlery Allied Trades Research Association).



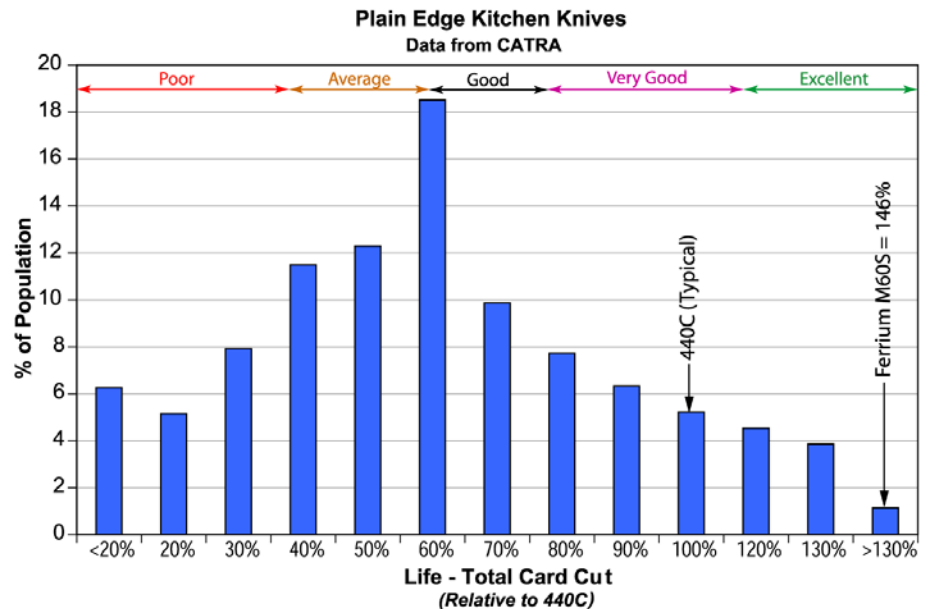


Processing

Processing of *Ferrium M60S* is similar to other quench and tempered martensitic secondary-hardening steels. The hardness of *Ferrium M60S* in the annealed condition is 30-40 HRC. Vacuum heat treatment and vacuum tempering is recommended to avoid surface decarburization. The high hardenability of *Ferrium M60S* reduces the distortion that normally results from quenching. After quenching to room temperature *Ferrium M60S* is subjected to cryogenic treatment to assure a complete martensitic transformation. *Ferrium M60S* is typically tempered at 900°F (482°C) to achieve a hardness of 60 HRC.

Wear

Results from testing against ISO 8442.5 show that *Ferrium M60S* outperforms 440C in blade life (TCC) by nearly 50%.



Temperature Resistance

Ferrium M60S is capable of withstanding temperatures up to nearly 900°F (482°C) without loss of mechanical properties. This means higher grinding speeds without risk for grinding burns.

Surface Treatments

Ferrium M60S can be nitrided to a surface hardness of 1100 HV (70 HRC). Typical nitrided case depth is 0.003 inch to 0.005 inch.

Product Forms

Ferrium M60S can be manufactured in typical ingot, bar, billet and sheet forms.

Other

Patents Pending.