QuesTek® INNOVATIONS LLC

# FERRIUM® C64™

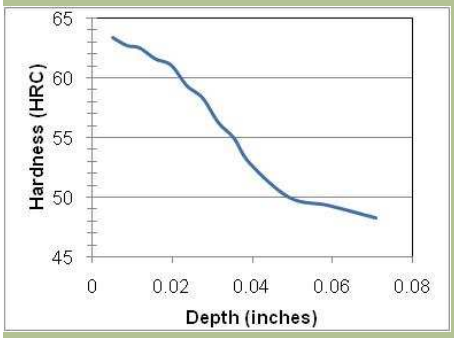
**Case-Hardened Gear Steel with Ultrahigh-Strength Core**

## Ferrium® C64™ Chemical Composition (nominal wt. %)

| Fe | C | Co | Cr | Ni | Mo | W | V |
|---|---|---|---|---|---|---|---|
| Bal. | 0.11 | 16.3 | 3.5 | 7.5 | 1.75 | 0.2 | 0.02 |

## Overview of Ferrium C64 Properties

| YS (ksi) | UTS (ksi) | El (%) | RA (%) | Core Hardness (HRC) | $K_{IC}$ $\left(ksi\sqrt{in}\right)$ |
|---|---|---|---|---|---|
| *199* | *229* | *18* | *75* | *48-50* | *85* |




### Materials By Design® Objective

Increased engine power transmission demands high-performance gears. The design objective for *Ferrium*® C64 was to develop a secondary-hardening gear and bearing steel with superior core and surface properties to current gear steels.

### Description

*Ferrium* C64 is a member of a new class of martensitic secondary-hardening gear and bearing steels that utilize an efficient $M_2C$ precipitate strengthening dispersion. Because of the efficiency of this strengthening dispersion, *Ferrium* C64 achieves carburized surface hardness (62-64 HRC) superior to current gear steels with the added benefit of increased core properties. A typical hardness profile of carburized *Ferrium* C64 is shown to the left.

### Advantages

*Ferrium* C64 has surface-wear properties and fatigue properties superior to those found in current commercial alloys.

*For additional information regarding QuesTek's Ferrium C64 contact info@questek.com or call 847.328.5800.*

*March 2010*

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## Processing

*Ferrium* C64 was designed for high-temperature carburizing. This allows solution heat treatment to be combined with the carburizing treatment and *Ferrium* C64 is therefore quenched directly from the carburizing temperature. After quenching to room temperature, *Ferrium* C64 is subjected to cryogenic treatment to assure a complete martensitic transformation. *Ferrium* C64 is typically tempered at 925℉ (496℃) and has excelle nt thermal resistance approaching this temperature.

Case carburizing produces a gradient in the volume fraction of the $M_2C$ carbides and results in an increase in hardness and surface residual compressive stress. The efficiency of the $M_2C$ strengthening response allows this class of steels to achieve very high surface hardness with very low carbon content. Thus, this class of steels has the ability to achieve very high surface hardness without the formation of detrimental primary carbides. Final shot peening is recommended for superior fatigue performance.

## Fatigue

*Ferrium* C64 has demonstrated increase in rolling sliding fatigue over conventional gear steels. Single tooth bending fatigue data is currently being generated.

## Product Forms

*Ferrium* C64 is manufactured in typical ingot, bar and billet forms.

## Other

US Patent Pending

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