QuesTek® Innovations Ferrium® C61™ Case-hardened Gear Steel with Ultrahigh-strength Core

Category : Metal , Ferrous Metal , Alloy Steel

Material Notes:

Description: Ferrium® C61™ is a member of a new class of martensitic secondary-hardening gear and bearing steels that utilize an efficient M2C precipitate strengthening dispersion. Because of the efficiency of this strengthening dispersion, a superior combination of properties can be attained for a given application. Ferrium® C61™ was designed to provide carburized surface properties similar to conventional gear steels such as AISI 9310 and EN36C with the added benefit of an ultra high-strength core along with excellent fracture toughness. C61™ should be considered for use in applications that require high case hardness, high strength, high toughness, and thermal resistance. C61™ has very high hardenability and only requires mild quenching.Typical Applications: Power transmission shaft, gears and other demanding applications in aerospace, energy, and racing/off-road/mission-critical vehicles and other industries where weight savings, compactness, high temperature resistance and high surface fatigue resistance are valued. The high core strength and high hardenability of Ferrium® C61™ particularly benefits structural components such as shafts with integral gearing.Workability:Fording: Forge at 1800-2100°F (982-1149°C) Heat Treatment:Normalizing: Heat uniformly to 1875°F(1024°C) and air cool..Annealing: Heat uniformly to 1250°F(677°C), hold for 2 to 8 hours and air cool.. Hardness should be less than 327 HBW.Carburizing and Hardening: Vacuum carburize at 1830°F (1000°C), followed by quenching in gas (1.5 Bar Nitrogen or higher) or oil medium.Refrigerate: To obtain optimum case hardness, a refrigeration treatment at -100°F (-73°C) or lower for 1 hour is recommended. This should be performed with minimal delay after completion of the quench.Temper: At 900°F (482°C)Product Forms: Ferrium® C61™ is manufactured in typical ingot, bar and billet forms.Ferrium is designed by Questek Innovations, LLC. and is manufactured by Latrobe Specialty Steel under license.

Order this product through the following link:
http://www.lookpolymers.com/polymer_QuesTek-Innovations-Ferrium-C61-Case-hardened-Gear-Steel-with-Ultrahigh-strength-Core.php

Physical Properties	Metric	English	Comments
Density	7.98 g/cc	0.288 lb/in³	

Mechanical Properties	Metric	English	Comments
Hardness, Rockwell C	44	44	Distance from Quenched End 1 [in]
	44	44	Distance from Quenched End 1 1/4 [in]
	44	44	Distance from Quenched End 1 1/2 [in]
	44	44	Distance from Quenched End 1 3/4 [in]
	44	44	Distance from Quenched End 2 [in]
	44.5	44.5	Distance from Quenched End 3/4 [in]
	45	45	Distance from Quenched End 1/4 [in]
	45	45	Distance from Quenched End 1/2 [in]

Mechanical Properties	Metric	English	Comments
	60 - 62	60 - 62	Typical Case Hardness
Hardness, Vickers	540 @Load 0.500 kg	540 @Load 1.10 lb	Depth from Surface .070 [in]
	550 @Load 0.500 kg	550 @Load 1.10 lb	Depth from Surface .045 [in]
	600 @Load 0.500 kg	600 @Load 1.10 lb	Depth from Surface .029 [in]
	650 @Load 0.500 kg	650 @Load 1.10 lb	Depth from Surface .02 [in]
	700 @Load 0.500 kg	700 @Load 1.10 lb	Depth from Surface .014 [in]
Tensile Strength at Break	>= 1720 MPa	>= 250000 psi	
Tensile Strength, Ultimate	1380 MPa @Temperature 427 °C	200000 psi @Temperature 800 °F	
	1520 MPa @Temperature 204 °C	220000 psi @Temperature 400 °F	
	1520 MPa @Temperature 316 °C	220000 psi @Temperature 600 °F	
	1650 MPa @Temperature 21.1 °C	240000 psi @Temperature 70.0 °F	
Tensile Strength, Yield	1210 MPa @Temperature 427 °C	175000 psi @Temperature 800 °F	
	1340 MPa @Temperature 316 °C	195000 psi @Temperature 600 °F	
	1380 MPa @Temperature 204 °C	200000 psi @Temperature 400 °F	
	1550 MPa @Temperature 21.1 °C	225000 psi @Temperature 70.0 °F	
	>= 1430 MPa	>= 208000 psi	

Mechanical Properties	Metric	English	Comments
	@Strain 0.200 %	@Strain 0.200 %	
Elongation at Break	>= 13 %	>= 13 %	
	15 % @Temperature 21.1 °C	15 % @Temperature 70.0 °F	
	15 % @Temperature 204 °C	15 % @Temperature 400 °F	
	15 % @Temperature 316 °C	15 % @Temperature 600 °F	
	15 % @Temperature 427 °C	15 % @Temperature 800 °F	
Reduction of Area	68 % @Temperature 21.1 °C	68 % @Temperature 70.0 °F	
	68 % @Temperature 204 °C	68 % @Temperature 400 °F	
	68 % @Temperature 316 °C	68 % @Temperature 600 °F	
	68 % @Temperature 427 °C	68 % @Temperature 800 °F	
Fatigue Strength	<= 931 MPa @# of Cycles >=1.00e+7	<= 135000 psi @# of Cycles >=1.00e+7	
	<= 1030 MPa @# of Cycles >=1.00e+7	<= 150000 psi @# of Cycles >=1.00e+7	
	<= 1070 MPa @# of Cycles >=1.00e+7	<= 155000 psi @# of Cycles >=1.00e+7	
	<= 1100 MPa @# of Cycles 6.30e+6	<= 160000 psi @# of Cycles 6.30e+6	
	<= 1120 MPa @# of Cycles 7.30e+6	<= 162000 psi @# of Cycles 7.30e+6	
	<= 1140 MPa @# of Cycles 130000	<= 165000 psi @# of Cycles 130000	

Mechanical Properties	Metric	English	Comments
	<= 1140 MPa @# of Cycles 330000	<= 165000 psi @# of Cycles 330000	
	<= 1140 MPa @# of Cycles 8.00e+6	<= 165000 psi @# of Cycles 8.00e+6	
	<= 1210 MPa @# of Cycles 120000	<= 175000 psi @# of Cycles 120000	
	<= 1280 MPa @# of Cycles 80000	<= 185000 psi @# of Cycles 80000	
	<= 1340 MPa @# of Cycles 43000	<= 195000 psi @# of Cycles 43000	
Fracture Toughness	143 MPa-m½	130 ksi-in½	
Charpy Impact	74.6 J	55.0 ft-lb	V-notch

Thermal Properties	Metric	English	Comments
CTE, linear	9.54 µm/m-°C @Temperature 24.0 - 93.0 °C	5.30 µin/in-°F @Temperature 75.2 - 199 °F	
	9.59 µm/m-°C @Temperature 24.0 - 204 °C	5.33 µin/in-°F @Temperature 75.2 - 399 °F	
	10.76 µm/m-°C @Temperature 24.0 - 316 °C	5.978 µin/in-°F @Temperature 75.2 - 601 °F	
	11.09 µm/m-°C @Temperature 24.0 - 427 °C	6.161 µin/in-°F @Temperature 75.2 - 801 °F	
	11.28 µm/m-°C @Temperature 24.0 - 538 °C	6.267 µin/in-°F @Temperature 75.2 - 1000 °F	

Component Elements Properties	Metric	English	Comments
Carbon, C	0.15 %	0.15 %	
Chromium, Cr	3.5 %	3.5 %	
Cobalt, Co	18 %	18 %	

Component Elements Properties	Metric	English	Comments
Iron, Fe	87.91 %	87.91 %	
Molybdenum, Mo	1.1 %	1.1 %	
Nickel, Ni	9.5 %	9.5 %	
Vanadium, V	0.080 %	0.080 %	

Descriptive Properties	Value	Comments
Cycles of Failure	46100	

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