GNB200

Type analysis

Single figures are nominal except where noted.

Iron	Balance	**Nickel**	3.20–3.70 %	**Molybdenum**	1.30–1.80 %
Chromium	1.30–1.70 %	**Vanadium**	0.20–0.40 %	**Carbon**	0.21–0.26 %
Copper	max 0.10 %	**Manganese**	max 0.10 %	**Silicon**	max 0.10 %
Columbium/Niobium	0.005–0.030 %	**Aluminum**	max 0.02 %	**Phosphorus**	max 0.005 %
Sulfur	max 0.002 %				

Forms manufactured

Bar

Description

GNB200 is a premium melted alloy steel specially formulated for applications requiring high mechanical strength combined with very high toughness at -40°F. The clean microstructure produced by ARC/AOD melting followed by Vacuum ARC refining allows for the development of very tough properties. The high tempering temperature makes GNB200 suitable for applications that see temperatures up to 1000°F. The toughness at -40°F makes GNB200 suitable for applications in very cold environments. GNB200 can be supplied in either the annealed condition or full hard condition. The full hard condition is conducive to the cold hammer forging process.

Key Properties:

- High strength
- High toughness
- Magnetic
- High- and low-temperature

Markets:

- Aerospace
- Consumer
- Defense
- Industrial

Applications:

- Thin-walled pressure vessels
- Rifle barrels
- Bolts
- Shafts

> GNB200

Physical properties

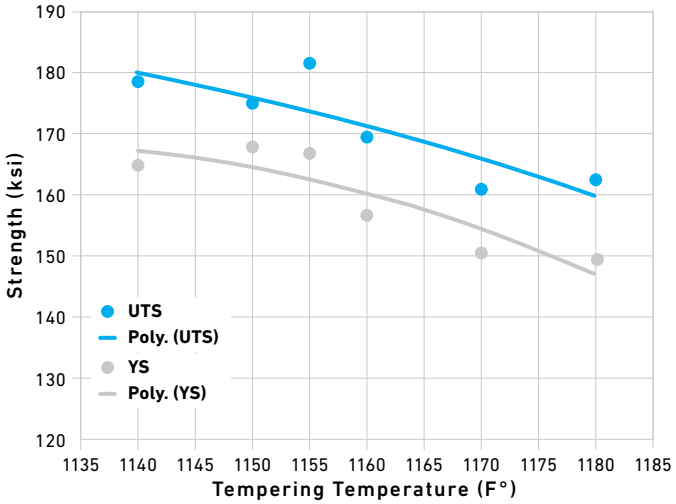
PROPERTY	At or From	English Units	Metric Units
DENSITY	—	0.284 lb/in^3	—

Typical mechanical properties

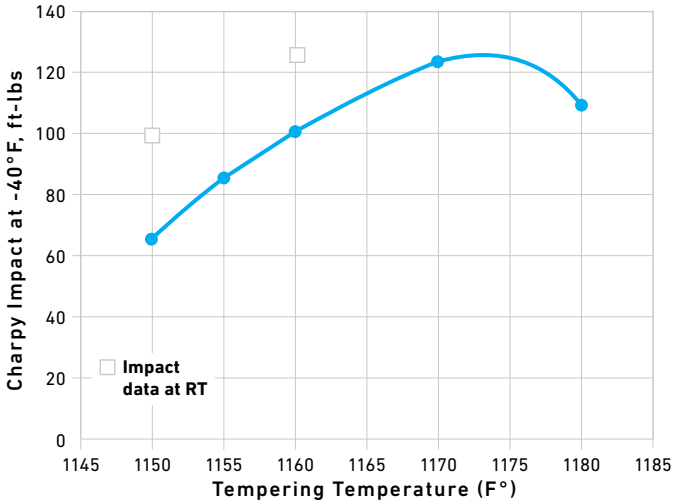
AGING TEMP	ORIENTATION	0.2% YIELD STRENGTH		ULTIMATE TENSILE STRENGTH		ELONGATION	REDUCTION OF AREA
		ksi	MPa	ksi	MPa	%	%
1155°F (624°C) temper	Longitudinal	161	1110	175	1206	21	68

AGING TEMP	CHARPY V-NOTCH (-40°F)		HARDNESS
	FT-LBS	J	HRC
1155°F (624°C) temper	96	130	38

AGING CURVE FOR STRENGTH



AGING CURVE FOR IMPACT STRENGTH



> GNB200

Heat treatment

Annealing	Subcritical anneal 1200–1250°F to soften, as annealed hardness will be ~295 HB.
Hardening	1600–1700°F, 1–4 hours,oil/water quench to room temperature.
Tempering	1150–1160°F, 2–4 hours, air cool to room temperature.
Stress relieving	100°F below tempering temperature.

Corrosion resistance

GNB200 is not a corrosion resistant alloy and will require protection to mitigate corrosion.

IMPORTANT NOTE:
The following 4-level rating scale (Excellent, Good, Moderate, Restricted) is intended for comparative purposes only and is derived from experiences with wrought product. Additive manufactured material may perform differently; corrosion testing is recommended. Factors that affect corrosion resistance include temperature, concentration, pH, impurities, aeration, velocity, crevices, deposits, metallurgical condition, stress, surface finish, and dissimilar metal contact.

Humidity	Restricted

> GNB200

Workability

Forging	GNB200 is readily forged in the temperature range of 1750–2250°F.
Hot working	GNB200 is readily hot worked in the temperature range of 1750–2250°F.
Machinability	GNB200 machines similar to 4340 at similar hardness.

Typical feeds and speeds for quenched and tempered ~38 HRC

The feeds and speeds in the following charts are conservative recommendations for initial setup. Higher feeds and speeds may be attainable depending on machining environment.

TURNING — SINGLE-POINT AND BOX TOOLS

DEPTH OF CUT, IN	HIGH-SPEED TOOLS			CARBIDE TOOLS			
	SPEED, FPM	FEED, IPR	TOOL MATERIAL	SPEED, FPM		FEED, IPR	TOOL MATERIAL
				BRAZED	THROW AWAY		
.040	65	.005	T-15, M-42	240	375	.007	C-7
.150	50	.010	T-15, M-42	190	300	.015	C-6

TURNING — CUT-OFF AND FORM TOOLS

SPEED, FPM	FEED, IPR							TOOL MATERIAL	
	CUT-OFF TOOL WIDTH, IN			FORM TOOL WIDTH, IN				HIGH-SPEED TOOLS	CARBIDE TOOLS
	1/16	*1/8*	*1/4*	*1/2*	*1*	*1-1/2*	*2*		
30	.0011	.0014	.0018	.0014	.0011	.0009	.0007	T-15, M-42	C-6
95	.0011	.0014	.0018	.0014	.0011	.0009	.0007	T-15, M-42	C-6

> GNB200

Typical feeds and speeds for quenched and tempered ~38 HRC (continued)

ROUGH REAMING

HIGH-SPEED TOOLS		CARBIDE TOOLS		FEED, IPR, REAMER DIAMETER, IN					
SPEED, FPM	TOOL MATERIAL	SPEED, FPM	TOOL MATERIAL	1/8	1/4	1/2	1	1-1/2	2
30	T-15, M-42	—	—	.002	.004	.005	.006	.007	.008
—	—	45	C-2	.004	.006	.008	.010	.011	.012

DRILLING — HIGH-SPEED TOOLS

SPEED, FPM	FEED, IPR NOMINAL HOLE DIAMETER, IN								TOOL MATERIAL
	1/16	1/8	1/4	1/2	3/4	1	1-1/2	2	
25	-	.002	.003	.004	.006	.008	.008	.010	T-15, M-42

MILLING — END PERIPHERAL

DEPTH OF CUT, IN	HIGH-SPEED TOOLS						CARBIDE TOOLS					
	SPEED, FPM	FEED, IN PER TOOTH CUTTER DIAMETER, IN				TOOL MATERIAL	SPEED, FPM	FEED, IN PER TOOTH CUTTER DIAMETER, IN				TOOL MATERIAL
		1/4	1/2	3/4	1-2			1/4	1/2	3/4	1-2	
.02	65	.0005	.0015	.003	.004	M-2	260	.001	.0015	.003	.005	C-5
.06	55	.0005	.0015	.004	.005	M-3	200	.0015	.003	.005	.006	C-5

BROACHING — HIGH-SPEED TOOLS

SPEED, FPM	CHIP LOAD, IPT	TOOL MATERIAL
10	.002	T15, M42

For additional information, please contact your nearest sales office:
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