Technical Datasheet

CarTech® 52100 Alloy

Identification

UNS Number

• G52986

AISI Number

• Type E52100

Type Analysis

Single figures are nominal except where noted.

Carbon	1.00 %	**Manganese**	0.30 %
Silicon	0.25 %	**Chromium**	1.40 %
Iron	Balance		

General Information

Description

CarTech 52100 is a high-carbon, chromium-bearing alloy steel possessing deep hardening characteristics as well as high wear resistance.

To meet the exacting requirements of bearing manufacturers for a clean steel with uniform microstructure, it is produced by vacuum induction melting (VIM), followed by vacuum arc remelting (VAR).

Properties

Physical Properties

Density	0.2830	lb/in³
Mean CTE	6.90	x 10 $^{-6}$ in/in/°F
Modulus of Elasticity (E)	29.0	x 10 ^{3} ksi
Modulus of Rigidity (G)	12.0	x 10 ^{3} ksi

Typical Mechanical Properties

Typical Mechanical Properties — Carpenter VIM-VAR 52100
Spheroidized annealed bars

Condition	0.2% Yield Strength		Tensile Strength		% Elongation in 2" (50.8 mm)	% Reduction of Area	Hardness Brinell
	ksi	MPa	ksi	MPa			
1" Rounds							
Turned & Polished	62	427	94.4	651	27	62.5	179
Cold-Drawn	87.5	603	107	738	17	54.9	229
7/16" Rounds							
13% Cold Work	91.2	629	104.8	723	25	57.0	229
26% Cold Work	106	731	124	855	16	50.0	262

Heat Treatment

Normalizing

Heat to 1700°F (927°C), then air cool.

Annealing

Heat uniformly to 1425°F (775°C), then cool slowly in the furnace. Brinell hardness will be 223 maximum with a spheroidized structure.

Hardening

For sections up to 1" (25.4 mm) in diameter or thickness, heat to 1530/1550°F (832/843°C), then oil quench.

For sections over 1" (25.4 mm) in diameter or thickness, heat to 1475/1500°F (802/816°C), then water quench. An interrupted quench from water into oil as soon as the first violent vibration on the tongs is over is suggested.

Tempering

The hyperlink entitled "Tempering" illustrates Rockwell C hardness values which may be expected by tempering VIM-VAR 52100 for 1 hour at various temperatures.

Tempering

The following chart illustrates Rockwell C hardness values which may be expected by tempering VIM-VAR 52100 for 1 hour at various temperatures.

Tempering Temperature		Rockwell C Hardness	
°F	°C	Water Quenched	Oil Quenched
As hardened		66	64
300	149	64	62
400	204	61	60
500	260	60	58
600	316	57	57
700	371	54	54
800	427	—	51
900	482	—	48

Workability

Forging

VIM-VAR 52100 should be forged from a temperature of not over 1950°F (1066°C).

Machinability

For most machining operations a spheroidized structure is preferred.

Cold drawn annealed VIM-VAR 52100 bars possess a machinability rating of 37% of AISI B1112 steel and cut at a speed of 63 sfm. The character of the chips is continuous and stringy.

Hot rolled annealed bars have a machinability rating of 45% of AISI B1112 steel.

Following are typical feeds and speeds for VIM-VAR 52100.

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The following guidelines are suggested for grind single point turning tools:

Operation	High-Speed	Carbide
Side Rake	10/15°	4/7°
Back Rake	5/8°	0/5°
Side Relief	6/8°	6/8°
End Relief	6/8°	6/9°
End Cutting Edge Angle	8/12°	8/12°
Side Cutting Edge Angle	5/15°	10/18°
Nose Radius, depth of cut	10%	1/32"

Other Information

Applicable Specifications

- AMS 6440
- AMS 6444
- ASTM A295

Forms Manufactured

- Bar-Rounds
- Billet
- Wire

Technical Articles

- Blade Alloys 101: What You Need to Know About the Alloys Used for Knife Blades

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