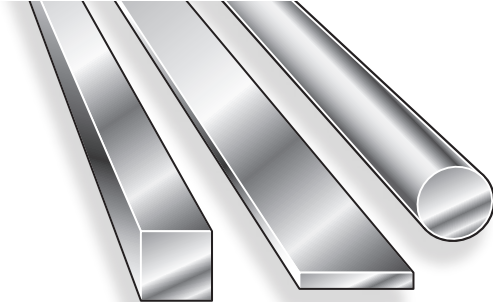


Amera-Graf™

OIL HARDENING STEEL **AISI 0-6**



Color code:
TAN



Amera-Graf is a medium alloy 1.45 carbon oil-hardening tool steel. In its annealed condition, about one-third of the carbon is present as graphitic carbon. The remainder is present as combined carbon in the form of carbides. In this condition, Amera-Graf is the most readily machinable of the oil hardening tool grades.

Typical Analysis

- Carbon 1.45
- Silicon 1.25
- Manganese 1.0
- Molybdenum .25

Features And Advantages

- Excellent machinability
- Good wear resistance

Applications

Forming, shaping, and drawing dies. Suitable for a great variety of cold-work dies calling for physical properties, wear resistance, and edge holding similar to standard oil hardening tool steels like Type 01. Non-galling, self-lubricating characteristics of Amera-Graf make it well suited for dies subject to galling and seizing.

Heat Treatment

- **Forging** 2000°F max., stop at 1700°F, cool slowly
- **Normalizing** Do not normalize
- **Annealing** 1425°–1450°F, furnace-cool to 1000°F, hold 1 hour per inch of greatest cross section. Air cool. Brinell 212 max.
- **Preheating** 1250°F prior to hardening
- **Hardening** 1450°–1500°F, oil-quench to 150°F
- **Tempering** 300°– 400°F, resulting hardness Rockwell C 61–62

Characteristics

- **Machinability** When properly annealed to Brinell 212 max., Amera-Graf has a machinability rating of 125 – as compared with a 1% carbon tool steel rated at 100.
- **Dimensional stability** When oil-quenched from proper hardening temperature, this grade normally expands .0015 in./in. plus.
- **Critical Points** Critical point ranges obtained by dilatometer test when heating and cooling at a rate of 400°F/hour:

Heating – Ac range 1400° to 1420°F

Cooling – Ar range 1340° to 1280°F

- **Decarburization** Decarburizes more rapidly than other tool steels when heated for forging, annealing, or hardening. This is due to the high silicon and molybdenum content. Care should be taken when heating Amera-Graf to protect it from decarburization. Preheating can be very helpful, as it shortens exposure to high temperature. Use controlled-atmosphere annealing furnace if available. If not available, pack-anneal with inert material in a sealed container.

General Instructions

- **Forging** Preheat Amera-Graf at approx. 1300°F before uniformly heating to a forging temperature of 2000°F. Stop forging at 1700°F. Reheat if necessary. Bury in insulating material immediately after forging.

Heat Treatment (continued)

- **Annealing** Heat Amera-Graf uniformly to a temperature range of 1425°–1450°F. Then cool slowly in the furnace to 1000°F and hold at this temperature approximately 1 hour per inch of greatest cross section. Cool in air. The resulting hardness will be Brinell 217 max.

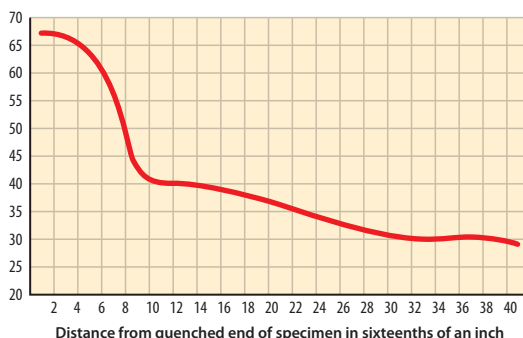
- **Hardening** Preheat Amera-Graf thoroughly at approximately 1250°F, and then heat to the hardening temperature of 1450°–1500°F. For small sections, the lower part of the hardening range should be used; larger sections require higher temperatures. All sections should be equalized at the hardening temperature for 1 hour per inch of greatest cross section before quenching in oil to 150°F. Temper immediately.

- **Tempering** For the majority of tooling work, tempering at 300°–400°F is satisfactory. This will result in a hardness of approximately Rockwell C 61/62. Heat the tools to tempering temperature and hold for approximately 2 hours per inch of greatest cross section.

Resulting Rockwell C hardness obtained from samples oil-quenched from 1475°F and tempered at various temperatures:

Tempering Temperature (°F)	Rockwell C
As Quenched	65
300°	62
400°	61
500°	60
600°	58
700°	54

Jominy Hardenability Curve



Rounds Decarb Free Or Hot Rolled Annealed

1/4	1	2	4	7
3/8	1-1/8	2-1/8	4-1/4	7-1/4
1/2	1-1/4	2-1/4	4-1/2	7-1/2
5/8	1-3/8	2-3/8	4-3/4	8
3/4	1-1/2	2-1/2	5	8-1/2
7/8	1-5/8	2-5/8	5-1/4	9
	1-3/4	2-3/4	5-1/2	9-1/2
	1-13/16	3	5-3/4	10
	1-7/8	3-1/4	6	10-1/2
		3-1/2		11
		3-3/4		12

Flats & Squares Decarb-Free Plus .015/.035

1/2	5/8	3/4	7/8	1
x 1	x 1	x 3/4	x 2-3/4	x 1
x 1-1/2	x 1-1/2	x 1	x 3-1/2	x 1-1/4
x 2	x 2	x 1-1/2		x 1-1/2
x 2-1/2	x 3	x 2		x 2
x 3	x 3-1/2	x 2-1/2		x 2-1/2
x 3-1/2	x 4	x 3		x 3
x 4	x 6	x 3-1/2		x 3-1/2
x 5		x 4		x 4
x 6		x 5		x 4-1/2
		x 6		x 5
		x 8		x 6
				x 8
				x 10

1-1/8	1-1/4	1-3/8	1-1/2	1-3/4
x 1-1/2	x 1-1/4	x 2	x 1-1/2	x 1-3/4
x 2	x 1-1/2	x 2-1/2	x 2	x 2
x 2-1/2	x 1-3/4	x 3	x 2-1/2	x 2-1/2
x 3	x 2	x 4	x 3	x 3
x 3-1/2	x 2-1/4	x 5	x 3-1/2	x 3-1/2
x 5	x 2-1/2		x 4	x 4
x 6	x 3		x 4-1/2	x 5
	x 3-1/2		x 5	x 6
	x 4		x 6	
	x 4-1/2		x 7	
	x 5		x 8	
	x 6			
	x 8			

2	2-1/4	2-1/2	3	3-1/2
x 2	x 2-1/2	x 2-1/2	x 3	x 3-1/2
x 2-1/2	x 3	x 3	x 3-1/2	x 4-1/2
x 3	x 4	x 3-1/2	x 4	
x 3-1/2		x 4	x 4-1/2	
x 4		x 4-1/2	x 5	
x 4-1/2		x 5	x 6	
x 5		x 6	x 8	
x 6		x 7		
x 8				

4	5	6
x 4	x 5	x 6
x 5	x 6	x 8
x 8		x 10

ROUNDS: Lengths precut to any size desired, or 10'–12' R/L lengths. **FLATS & SQUARES:** Standard 8'–10' R/L lengths. Wider widths and non-standards available upon request. Prompt forging service available.