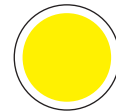


# Ameralloy<sup>®</sup> Oil

**OIL HARDENING STEEL**      **AISI 0-1**



Color Code:  
YELLOW



Ameralloy Oil is an electric furnace, fully deoxidized tool steel and is produced under conditions of strictest tool steel practice. Ameralloy Oil is one of the best general purpose oil hardening tool and die steels. It machines with relative ease to a high finish. With reasonable care, Ameralloy Oil can be hardened safely with very little dimensional change. It has a good combination of abrasion resistance and toughness for a wide variety of tool and die applications.

## Typical Analysis

- Carbon .90
- Manganese 1.20
- Chromium .65
- Vanadium .30
- Tungsten .55
- Silicon .30
- Molybdenum .15

## Heat Treatment

- **Forging** 1850°–1950°F, stop at 1500°F, cool slowly
- **Normalizing** Do not normalize
- **Annealing** 1450°F, furnace-cool. Brinell 202 max.
- **Hardening** 1475°F, oil-quench to 150°F
- **Tempering** 300°– 450°F, average hardness after heat treatment Rockwell C 61–63

## Features And Advantages

- Good machinability
- Spheroidize annealed prior to shipment
- Safe hardening
- Maximum surface hardness
- Keen cutting edges
- Low distortion in heat treatment
- High core strength
- Controlled analysis
- Good toughness and wear resistance

## Applications

- Cold forming
- Blanking
- Bending dies
- Broaches
- Knurling tools
- Gages

# Ameralloy<sup>®</sup> Oil

OIL HARDENING STEEL

AISI 0-1

## Characteristics

- **Machinability** Annealed to Brinell 202 max., Ameralloy Oil machines easily and approaches the machinability of straight-carbon water hardening tool steel. Where a 1% carbon steel is rated at 100, Ameralloy Oil has a rating of 90.
- **Dimensional stability** When quenched from proper hardening temperature, this grade normally expands .0015 in./in. plus. In many instances, slight scaling occurs during heat treatment which tends to counteract the expansion. Like all tool steels, hardening of Ameralloy Oil to insure minimum size change necessitates careful study of the die or tool and the furnace used for heat treatment.
- **Critical points** Critical point ranges obtained by dilatometer test when heating and cooling at a rate of 400°F/hour:

**Heating – Ac range 1390° to 1450°F**

**Cooling – Ar range 1280° to 1260°F**

- **Decarburization** Ameralloy Oil is not inherently subject to excessive decarburization or to a soft skin on the surface. Good furnace practice as to atmosphere, time, and temperature will result in excellent properties.

## General Instructions

- **Forging** Heat slowly to 1850°–1950°F and do not forge below 1500°F. If a preheater is available, hold at 1200°F until uniformly heated before heating to the forging temperature. After forging, bury in an insulation medium for slow cooling.
- **Annealing** The recommended practice is to use controlled-atmosphere furnaces. When not available, pack-anneal in an inert material. For a quick annealing cycle to develop fair machining properties, heat slowly to 1375°–1425°F, and cool slowly in the furnace. To develop the lowest hardness and best spheroidization for optimum machinability, heat slowly to 1400°F and furnace cool at 20°F per hour to 900°F. The piece may then be removed from the furnace and cooled in air. Hardness after this cycle will be Brinell 202 max.
- **Hardening** If pack-hardening cannot be used or is not essential, a slight oxidizing atmosphere should be used in heating to the hardening temperature of 1450°–1475°F for minimum decarburization and distortion. On large parts, pack-harden and preheat at approximately 1200°F with a thorough soaking before raising to the quenching temperature of 1475°–1500°F. Hold at

the quenching temperature for 1/2 hour per inch of greatest cross section. Follow by quenching in oil to 150°F and temper immediately.

### Ameralloy-tested hardness and fracture grain ratings for various oil-quenching temperatures:

Quenching Temperature (°F)	Fracture Grain Size	Rockwell C
1400°	9	60
1425°	9	62
1450°	9½	63
1475°	9½	65
1500°	9½	65
1525°	9¼	65
1550°	9¼	65

- **Tempering** Employ varying temperatures from 300°–450°F depending on size and properties required. Tempering at 350°F is satisfactory for general purpose use. Temperatures above 450°F are rarely used on Ameralloy Oil. The hardness levels produced by tempering above 450°F can also be produced in shock-resisting grades. Where greater toughness is required, Ameralloy recommends using a shock-resisting steel.

Small tools should be held at the tempering temperature for at least 1 hour, and larger tools for 2 hours per inch of greatest thickness. If a second temper is used, it should be 25° lower than the first.

### Resulting Rockwell hardness for various tempering temperatures. Obtained from 1" round samples oil-quenched from 1475°F and tempered for 2 hours.

Tempering Temperature (°F)	Rockwell C
None	65
300°	63
350°	62.5
400°	62
450°	61
500°	60
600°	57
700°	53
800°	50
900°	47
1000°	44
1100°	39
1200°	31
1300°	22

*Above results on 1" diameter specimens may be used as a guide in tempering tools to desired hardness. Tools of heavy section or mass may be several points lower in Rockwell hardness for a given treatment.*

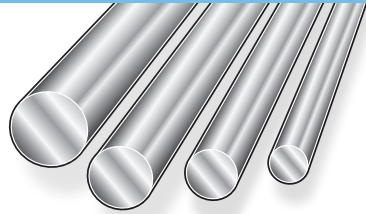
# Ameralloy<sup>®</sup> Oil

OIL HARDENING STEEL

SAE 5160  
AISI 0-1

## Available Shapes And Sizes

### Rounds



### Flats



### Squares



**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.

## Rounds Decarb Free Or Hot Rolled Annealed

1/4	1	2	4	8
9/32	1-1/16	2-1/8	4-1/4	8-1/4
5/16	1-1/8	2-1/4	4-1/2	8-1/2
3/8	1-3/16	2-3/8	4-3/4	8-3/4
7/16	1-1/4	2-1/2	5-1/4	9
1/2	1-5/16	2-9/16	5-1/2	9-1/2
9/16	1-3/8	2-5/8	5-3/4	10
5/8	1-1/2	2-3/4	6	10-1/2
11/16	1-5/8	2-7/8	6-1/4	11
3/4	1-3/4	3	6-1/2	12
13/16	1-7/8	3-1/8	6-3/4	
7/8		3-1/4	7	
15/16		3-1/2	7-1/4	
		3-5/8	7-1/2	
		3-3/4		

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

1/2	5/8	3/4	7/8	1
x 1/2	x 5/8	x 3/4	x 7/8	x 1
x 3/4	x 3/4	x 7/8	x 1	x 1-1/4
x 7/8	x 7/8	x 1	x 1-1/8	x 1-1/2
x 1	x 1	x 1-1/8	x 1-1/4	x 1-3/4
x 1-1/8	x 1-1/8	x 1-1/4	x 1-1/2	x 2
x 1-1/4	x 1-1/4	x 1-3/8	x 1-3/4	x 2-1/4
x 1-3/8	x 1-1/2	x 1-1/2	x 2	x 2-1/2
x 1-1/2	x 1-3/4	x 1-3/4	x 2-1/4	x 2-3/4
x 1-3/4	x 1-7/8	x 2	x 2-1/2	x 3
x 1-7/8	x 2	x 2-1/4	x 2-3/4	x 3-1/2
x 2	x 2-1/4	x 2-1/2	x 3	x 4
x 2-1/4	x 2-1/2	x 2-3/4	x 3-1/2	x 4-1/2
x 2-1/2	x 2-3/4	x 3	x 4	x 5
x 2-3/4	x 3	x 3-1/2	x 4-1/2	x 5-1/2
x 3	x 3-1/4	x 4	x 5	x 6
x 3-1/4	x 3-1/2	x 4-1/2	x 6	x 7
x 3-1/2	x 4	x 5	x 7	x 8
x 3-3/4	x 4-1/2	x 6	x 8	x 10
x 4	x 5	x 8	x 10	x 12
x 4-1/2	x 6	x 10	x 12	
x 5	x 8	x 12		
x 6	x 10			
x 8	x 12			
x 10				
x 12				

1-1/8	1-1/4	1-3/8	1-1/2	1-3/4
x 1-1/8	x 1-1/4	x 1-3/8	x 1-1/2	x 1-3/4
x 1-1/4	x 1-1/2	x 1-1/2	x 1-3/4	x 2
x 1-1/2	x 1-3/4	x 1-3/4	x 2	x 2-1/4
x 1-3/4	x 2	x 2	x 2-1/4	x 2-1/2
x 2	x 2-1/4	x 2-1/4	x 2-1/2	x 2-3/4
x 2-1/4	x 2-1/2	x 2-1/2	x 2-3/4	x 3
x 2-1/2	x 2-3/4	x 2-3/4	x 3	x 3-1/2
x 2-3/4	x 3	x 3	x 3-1/2	x 4
x 3	x 3-1/2	x 3-1/2	x 4	x 4-1/2
x 3-1/2	x 4	x 4	x 4-1/2	x 5
x 4	x 4-1/2	x 4-1/2	x 5	x 6
x 4-1/2	x 5	x 5	x 6	x 7
x 5	x 5-1/2	x 6	x 7	x 8
x 6	x 6	x 8	x 8	x 10
x 8	x 7	x 10	x 9	x 12
x 10	x 8	x 12	x 10	
x 12	x 10		x 12	
	x 12			

2	2-1/4	2-1/2	3	3-1/2
x 2	x 2-1/4	x 2-1/2	x 3	x 3-1/2
x 2-1/4	x 2-1/2	x 2-3/4	x 3-1/2	x 4
x 2-1/2	x 3	x 3	x 4	x 4-1/2
x 2-3/4	x 3-1/2	x 3-1/2	x 4-1/2	x 5
x 3	x 4	x 4	x 5	x 6
x 3-1/2	x 4-1/2	x 4-1/2	x 6	x 8
x 4	x 5	x 5	x 8	x 10
x 4-1/2	x 6	x 6	x 10	x 12
x 5		x 7	x 12	
x 5-1/2		x 8		
x 6		x 10		
x 7		x 12		
x 8				
x 10				
x 12				

4	4-1/2	5	6
x 4	x 4-1/2	x 5	x 6
x 4-1/2	x 5	x 6	x 8
x 5	x 6	x 8	x 10
x 6	x 8	x 10	x 12
x 8	x 10	x 12	
x 10	x 12		
x 12			