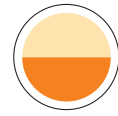
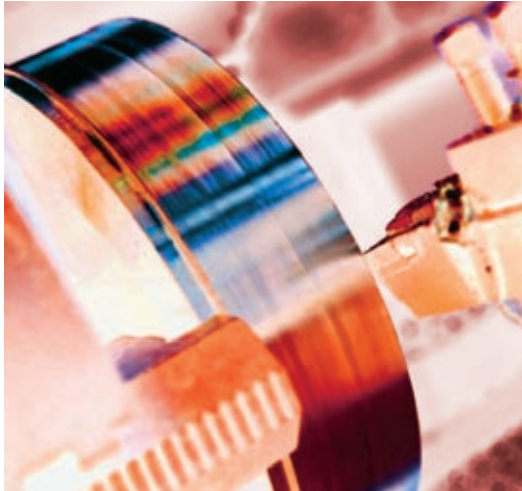


Ameralloy-7[®]

IMPACT RESISTANT STEEL AISI S-7



Color Code:
TAN & ORANGE



Ameralloy-7 is remarkably versatile. It is widely used for medium run cold-work tools and dies, plastic molding dies, shear blades, medium hot-work dies, master hobs, and component parts. Ameralloy-7 is a shock steel with exceptional impact properties, unnotched Charpy over 200 ft-lbs at 400°F temper. Since it hardens in air, Ameralloy-7 is safe and stable in heat treatment.

Ameralloy-7 Modified* is available in mill run quantities.

Typical Analysis

- Carbon .50
- Manganese .70
- Chromium 3.25 (3.75)*
- Silicon .25
- Molybdenum 1.40 (1.50)*

Heat Treatment

- **Forging** Preheat 1200°–1300°F, forge at 2000°–2050°F, stop at 1700°F and cool slowly
- **Normalizing** Do not normalize
- **Annealing** 1500°–1550°F, cool slowly to 1000°F, air cool. Brinell 197 max.
- **Preheating** 1200°–1300°F prior to hardening
- **Hardening** 1725°F, quench in air if cross section is 2½" or smaller. Sections 2½–6" should be oil-quenched to black (1000°F) then air-cooled to 150°F. Larger cross sections should be oil-quenched to 150°F.
- **Tempering** 400°F minimum, double temper oil-quenched masses

Features And Advantages

- Good machinability
- Maximum shock resistance
- Air hardening
- Medium hot-work characteristics

Applications

- Hot and cold shock applications
- Rivet sets
- Chisels
- Punches
- Moil points
- Hot headers
- Gripper dies
- Cold Forming
- Blanking
- Bending
- Engraving dies
- Machined cavities
- Plastic-molding dies
- Die-casting dies
- Shear blades
- Master hobs

Characteristics

- **Machinability** When annealed to Brinell 197 max. Ameralloy-7 is rated at 95, as compared to a rating of 100 for a 1.00% carbon tool steel.
- **Dimensional stability** When quenched in air from the proper hardening temperature, Ameralloy-7 expands no more than 0.001 in./in. of cross section.

General Instructions

- **Maintain surface chemistry** Precautions should be taken to avoid excessive decarburization or carburization when heating Ameralloy-7 for forging, annealing, and hardening.
- **Forging** Preheat Ameralloy-7 at 1200°–1300°F before raising to a forging temperature of 2000°–2050°F. Discontinue forging at 1700°F and reheat rather than forge below this temperature. Ameralloy-7 is subject to decarburization and should not be held at the forging temperature longer than necessary. Following forging, cool slowly by burying in your choice of heat-insulating material to avoid cooling cracks.
- **Annealing** Anneal in a protective atmosphere. Heat rapidly to 1500°–1550°F and hold at temperature for 1½ hours per inch of greatest thickness. To obtain best machining properties, cool slowly to 1000° then air cool. Resulting hardness will be Brinell 197 max.
- **Hardening** To maintain surface chemistry, Ameralloy-7 should be hardened in a controlled neutral environment. Note that packing in cast-iron chips could impart a light carburized case. Unless such a case is considered desirable, make provisions for grinding it after treatment.

Ameralloy-7 should be preheated at 1200°–1300°F and raised to a hardening temperature of 1725°F. Hold at temperature 1 hour per inch of greatest thickness. Thicknesses 2½" or less should be quenched in still air. Upon reaching 150°F, temper without delay.

Thicknesses of 2½"–6" should be oil-quenched until black (1000°F), then cooled in air. For massive sections larger than 6", it is advisable to oil-quench until the piece reaches 150°F then temper immediately. After oil-quenched sections have cooled to room temperature, temper again to insure complete transformation.

Ameralloy-tested Rockwell hardness and fracture grain ratings for specimens 1" round by 3" long, preheated to 1300°F. Various quenching methods and temperatures listed.

STILL AIR

Quenching Temperature (°F)	Fracture Grain Size	Rockwell C
1550°	6½	43.5
1600°	7	48
1650°	8	57
1700°	9	60
1725°	8½	60
1750°	8	60
1800°	7	60
1850°	7	60

AIR-BLAST

Quenching Temperature (°F)	Fracture Grain Size	Rockwell C
1550°	6½	52.5
1600°	7	57
1650°	8½	57.5
1700°	9	58
1725°	8½	60
1750°	8	60
1800°	7½	60
1850°	7	61

OIL-QUENCH

Quenching Temperature (°F)	Fracture Grain Size	Rockwell C
1550°	8	52
1600°	8	54
1650°	9	57.5
1700°	9	61
1725°	8½	61
1750°	8	61.5
1800°	8	62
1850°	7	62

- **Carburizing** During heating for hardening to increase wear resistance, for some types of tools such as master hobs, striking dies, die stamps, and forming dies it is possible to increase wear resistance of Ameralloy-7 while retaining desirable shock resistance.

The best case depth for many applications is 0.010" or less. Hardness will be approximately Rc 60/62. A carburized case can be put on while heating for the hardening operation, by packing the tool in carburizing compound instead of inert material. A low activity carburizer such as wood charcoal is recommended to avoid the possibility of excessively deep or extremely high-carbon cases, which can produce "austenitic soft skin."

Avoid using cyanide cases due to brittleness.

General Instructions (continued)

• **Tempering** Ameralloy-7 is normally tempered 1½ to 2 hours per inch of greatest thickness. Tempering temperature varies according to intended use. For cold-work and similar applications, a temperature of 400°F is recommended. For hot-work applications, temper at 900°–1000°F. Never temper at less than 400°F.

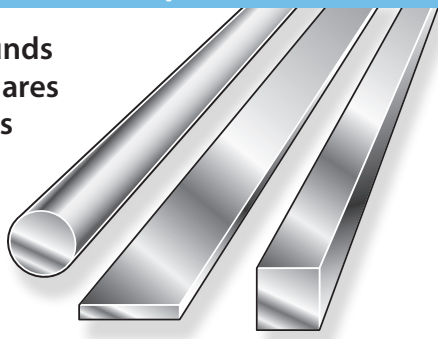
When interrupted oil-quench (to 1000°F) or full oil-quench (150°F) has been utilized in hardening, always temper immediately. After cooling down to room temperature, temper again to insure complete transformation.

Rockwell hardness for specimens 1" round by 3" long, air hardened from 1725°F and tempered at various temperatures for 2 hours.

Tempering Temperature (°F)	Rockwell C
As quenched	60
300°	59
400°	58
500°	56
600°	55
700°	54
800°	53
900°	52
1000°	51
1100°	47
1200°	38
1300°	31

Available Shapes And Sizes

Rounds
Squares
Flats



ROUNDS: Standard lengths 8'–10' R/L. **FLATS & SQUARES:** Standard lengths 8'–12' R/L. Specify O.D. and I.D. Ameralloy-7 Modified and special sizes available upon request. Prompt forging service available.

Rounds Hot Rolled Annealed & Pre-Machined

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

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