

Ameralloy-T[®]

TUNGSTEN BASE STEEL AISI T-1



Ameralloy-T is the best known tungsten base type of high speed steel. Ameralloy-T is used for general purpose cutting operations.

Typical Analysis

- Carbon .75
- Chromium 4.00
- Tungsten 18.00
- Vanadium 1.10

Features And Advantages

- Balanced combination of abrasion and shock resistance for cutting tools
- High red-hardness
- Least decarburization of the standard high speed steels.

Heat Treatment

- **Forging** 2050°–2150°F, stop at 1800°F
- **Annealing** 1650°F, furnace-cool, Brinell 241 max.
- **Preheating** 1600°F, prior to hardening
- **Hardening** 2350° oil-quench
- **Tempering** 1000°–1050°F, Rockwell C 65

Applications

- Lathe tools
- Planer tools
- Boring mill tools
- Slotter tools
- Shaper tools
- Tool bits
- Flat and twist drills
- Hobs
- Milling cutters
- Chasers
- Taps
- Reamers
- File-cutting chisels
- Gear cutters
- Form cutters
- End mills
- Broaches
- Threaders
- Punches
- Piercers
- Crowning tools

Characteristics

- **Machinability** Like all highly alloyed steels, Ameralloy-T machines with somewhat more difficulty than steels containing lower alloy content. Ameralloy-T has a machinability of 60, as compared with a 1% carbon tool steel rated at 100.
- **Critical points** Critical point ranges obtained by dilatometer test when heating and cooling at a rate of 400°F/hour:

Heating – Ac range 1540° to 1630°F
Cooling – Ar range 1550° to 735°F

- **Decarburization** Ameralloy-T is not as highly susceptible to decarburization as the molybdenum base high speed steels. However, reasonably good heat treating equipment is required, otherwise the tools must be ground to remove decarburization after hardening.

General Instructions

- **Forging** Preheat Ameralloy-T and soak at approximately 1300°F before transferring to the high temperature furnace. Heat slowly to the forging range of 2050°–2150°F. Discontinue forging as soon as the piece has cooled to about 1800°F, and reheat before resuming forging. Pieces should be cooled slowly after the forging operation is completed.
- **Annealing** Ameralloy-T should always be annealed after forging. To prevent decarburization, use a controlled atmosphere furnace or pack in a sealed container using inert material. Heat slowly to 1650°F and hold at this temperature for approximately 1 hour per inch of greatest thickness. Cool at a rate of 25°F per hour to 900°F. Resulting hardness after proper annealing is Brinell 241 max.
- **Hardening** Preheat Ameralloy-T slowly to 1600°F and hold at this temperature until thoroughly soaked. Then heat to the quenching temperature of 2350°F. Tools should be heated to the quenching temperature rapidly and not held

at this temperature any longer than necessary for proper solution of carbides. If held too long, grain growth with accompanying brittleness may result. Total heating time in the furnace or bath varies from a few minutes to 10–15 minutes, depending on the size of the tool. Temper as soon as the tool has reached a quenching temperature of 150° to 200°F.

Ameralloy-tested fracture grain size & Rockwell C hardness of Ameralloy-T specimens 1" round x 5" long, quenched in oil and quenched in still air:

Quenching Temperature (°F)	OIL-QUENCHED		AIR-QUENCHED	
	Fracture Rating	Rockwell C	Fracture Rating	Rockwell C
1900°	8½	59	8½	56
2000°	8¾	61	9	61
2100°	9	63	9¼	63
2200°	9¼	65	9¼	64
2300°	9¼	65	9¼	64
2350°	9½	66	9¼	64
2400°	8¾	66	8¾	64

- **Tempering** The best combination of cutting ability, strength, hardness, shock resistance, and toughness for all types of tools is developed by tempering in the secondary hardness range. For Ameralloy-T that range is approximately 1000°–1050°F. Tools are tempered by heating to 1025°–1050°F, at a minimum holding time of 2 hours per inch of greatest cross section. Then cool to room temperature. It is customary to use a double-tempering operation carried out with a secondary heating at 25°–50°F below the primary tempering temperature. Shock resisting and hot work parts are usually tempered within a range of 1100°–1200°F.

Rockwell C hardness of specimens 1" round x 2-1/2" long, hardened in oil vs. still air at temperatures ranging from 2100°–2400°F. The specimens were then tempered for 2 hours at temperatures ranging from 300°–1400°F:

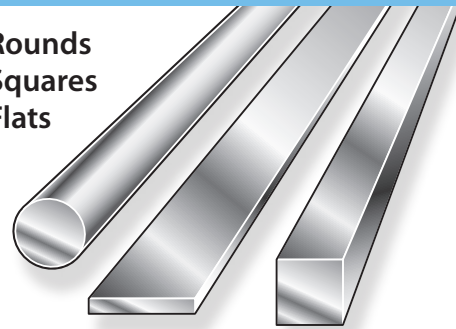
OIL-QUENCH	Quenching Temperature (°F)				
	2100°	2200°	2300°	2350°	2400°
Tempering Temperature (°F)	Rockwell C				
As quenched	63	65	65	66	66
300°	63	65	65	65	65
400°	62	63	64	64	64
500°	60	61	62	62	63
600°	60	61	61	61	62
700°	59	60	61	61	61
800°	59	60	61	61	61
900°	60	61	62	63	63
1000°	61	62	64	65	65
1050°	61	62	64	65	65
1100°	61	62	64	64	64
1200°	53	55	57	57	58
1300°	44	45	47	47	47
1400°	33	36	36	37	37

AIR-QUENCH	Quenching Temperature (°F)				
	2100°	2200°	2300°	2350°	2400°
Tempering Temperature (°F)	Rockwell C				
As quenched	63	64	64	64	64
300°	63	64	64	64	64
400°	62	63	64	64	64
500°	59	60	61	63	63
600°	59	61	61	62	62
700°	59	61	62	62	62
800°	59	61	61	62	62
900°	59	61	62	62	62
1000°	59	62	63	63	63
1050°	59	60	62	63	63
1100°	57	60	61	62	62
1200°	52	55	55	55	56
1300°	43	45	43	43	43
1400°	26	28	31	31	31

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.

Available Shapes And Sizes

Rounds
Squares
Flats



Standard lengths 10'–12' or cut to specified length.
Modified and special sizes available upon request.
Prompt forging service available.

Rounds Decarb-Free

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

Squares Hot Rolled Finish–Tolerance Standard

1-1/4	1-1/2	2
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Flats Hot Rolled Finish–Tolerance Standard

3/8 x 1-1/4	3/4	1-1/2
1/2 x 2-1/2	x 1-1/4	x 2
5/8 x 1-1/4	x 1-1/2	x 2-1/2
11/16 x 1-5/16	1	
	x 1-1/4	
	x 1-1/2	
	x 1-3/4	
	x 2	
	x 3	