

## TUNGSTEN ALLOYS

Eagle Alloys Corporation can offer a wide variety of High Density Machinable Tungsten Alloy sizes and compositions for immediate shipping or we can supply custom grades, shapes and finished parts with a short lead time. Eagle Alloys can supply alloys ranging from 90% to 97% Tungsten and contain nickel, copper and or iron binders for applications where high density and machinability are required. We can supply magnetic as well as non-magnetic Tungsten Alloys. Eagle Alloys Corporation is capable of supplying raw material or finished parts as well as custom grades to our customer's specifications.

Eagle Alloys supplies DRC Conflict Free material only.

Please see our chart of standard grades of Tungsten Alloys and minimum physical properties

EA Tungsten Alloy Grades	EA17	EA17M	EA17.5	EA17.5M	EA17.7	EA18	EA18M	EA18.5M
W Content, nom. (Wt%)	90	90	92.5	92.5	93	95	95	97
Binder Elements	6%Ni + 4%Cu	7%Ni + 3% Fe	5.25%Ni + 2.25%Cu	5.25%Ni + 2.25%Fe	Ni + Fe + Mo	3.5%Ni + 1.5%Cu	3.5%Ni + 1.5%Fe	2.1%Ni + 0.9%Fe
Density Gms/cc	17 nom. (16.85-17.30)	17 nom. (16.85-17.30)	17.5 nom. (17.15- 17.85)	17.5 nom. (17.15-17.85)	17.7 nom.	18 nom. (17.75- 18.35)	18 nom. (17.75-18.35)	18.5 nom. (18.25- 18.85)
Density Lbs./cu in.	0.61	0.61	0.63	0.63	0.64	0.65	0.65	0.67
Ultimate Tensile Strength	94ksi/ 648Mpa min.	110ksi/ 758Mpa min.	94ksi/ 648Mpa min.	110ksi/ 758Mpa min	Produced to Customer's Specifications	94ksi/ 648Mpa min.	105ksi/ 724Mpa min.	100ksi/ 689Mpa min.
Yield Strength at 0.2% Offset	75ksi/ 517Mpa min.	75ksi/ 517Mpa min.	75ksi/ 517Mpa min.	75ksi/ 517Mpa min		75ksi/ 517Mpa min.	75ksi/ 517Mpa min.	75ksi/ 517Mpa min.
Elongation % min.	2% min.	5%min.	2% min.	5%min.		1% min.	3%	2%
Hardness (HRC) max. Unworked (As Sintered or Annealed)	32 max	32 max	33 max	33max		34 max	34 max	35 max
Coefficient of Thermal Expansion x 10 <sup>-6</sup> /°C	4~6	4~6	4~6	4~6		4~6	4~6	4~6
Magnetic Properties	None	Slight	None	Slight	Slight	None	Slight	Slight
ASTM-B-777-15	Class 1	Class 1	Class 2	Class 2	N/A	Class 3	Class 3	Class 4
AMS-T-21014	Class 1	Class 1	Class 2	Class 2	N/A	Class 3	Class 3	Class 4
MIL-T-21014D	Class 1	Class 1	Class 2	Class 2	N/A	Class 3	Class 3	Class 4
AMS 7725E	Class 1 Type 1	Class 1 Type 2	Class 2 Type 1	Class 2 Type 2	N/A	Class 3 Type 1	Class 3 Type 2	Class 4 Type 2

\*Note: Tungsten Alloy materials can be fabricated and custom produced to customer's specifications. For mechanically worked material, the hardness can be as high as HRC49. Above data is for informational purposes only. Eagle Alloys is not liable for accuracy of these contents or applications. Finished part drawings may be forwarded to a third party of outsourcing.

# EAGLE ALLOYS

GLOBAL MATERIALS SUPPLIER

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## Forms Available

Wire, rod, bar, strip, foil, sheet, plate, tubing, blanks, semi-finished and custom finished parts.

## Tungsten Alloys Typical applications

Weights, ballast, balancing rotating systems for aerospace and race cars, boring bars, sinker bars, crank shafts, radiation shielding, medical imaging, high precision tools, darts, lead replacement, collimator, and oil & gas drilling applications.

## Machining Tungsten Alloys

Tungsten Alloy materials are relatively easy to machine and have similar engineering properties to steel. These alloys can be bored, cut, drilled, ground, joined, milled, plated, sawed, tapped, turned, waterjet cut, both wire and sinker EDM can also be performed. Tungsten Alloys use speeds and feeds similar to Gray Cast Iron. Tungsten Alloy materials becomes easier to machine as the copper content increases. The more tungsten content present the more care must be taken when machining. Carbide tools are suggested for drilling, milling, and turning Tungsten Alloys.

## Cutting and Sawing

High-speed abrasive cutoff wheels can be used for cutting. Use a bi-metal blade when sawing, blade pitch to be relative to the thickness of material. Fine blades can be run at high speeds, and coarser blades can be run at lower speeds. Coolant is not required, but can be used.

## Drilling

Carbide tipped or solid carbide drills are suggested. Increased clearance angles and automatic feeds will help to avoid binding and seizing. Carbide drills will give a better tool life. Use of coolant or lubricant is highly recommended, chlorinated oil can be used as a coolant. For small holes, pay particular attention to clearance and chip removal to avoid seizing or bit breakage. Drill tap holes to 50-55% of thread hole requirement.

## EDM

Both wire and sinker EDM can be used on Tungsten Alloy materials. EDM surfaces can experience hydrogen embrittlement and grain removal.

## Grinding

Use aluminum oxide or silicon carbide type wheels with a coolant.

## Milling

Carbide cutters are suggested. Feed and speeds should follow recommendations for Gray Cast Iron. Finishing-feeds of 0.003 inch to 0.010 inch per tooth at speeds of 300 to 700 SFM  
Roughing-feeds of 0.007 inch to 0.015 inch per tooth at speeds of 200 to 400 SFM

## Tapping

Use high alloy, straight flute or two flute plug spiral point taps. Thread forming taps can be used for small threaded holes. A chlorinated oil coolant may be used.

## Turning and Boring

Carbide inserted cutters are suggested. No rake to positive rake for boring, positive rake for turning.

Finishing-0.010 inch to 0.015 inch cutting depth and 0.004 inch to 0.010 inch feed at 250 to 400 SFM

Roughing-Cutting depth of 0.030 inch to 0.125 inch and 0.008 inch to 0.015 inch feed at 200 to 300 SFM

## Joining

Brazing is a good method of joining Tungsten Alloy material to itself and to other materials. To prevent oxidation, this should be done in a controlled atmosphere. Joint strength is close to that of the parent material. Brazing can alter the chemistry of the material surrounding the joint.

Mechanical Joining by using bolts, pins or standard fasteners is the best option for joining Tungsten Alloy material. Tungsten Alloy can also be threaded to mate to itself.

Shrink Fitting is another good method of joining Tungsten Alloy material to steel.

Silver Soldering is an efficient and practical method of joining Tungsten Alloys to itself or steel.



Please feel free to contact us for alloys and sizes available for same or next day shipping as well as your custom needs.