ELMET
TECHNOLOGIES

# TUNGSTEN HEAVY ALLOY PRODUCTS

Elmet Technologies presses and sinters high quality tungsten heavy alloy (WHA) blocks, rods, and shaped parts. All material is made in the USA at Elmet's fully integrated facilities in Lewiston, Maine and Euclid, Ohio. Elmet has a large and growing inventory of standard molds and sizes that can be sold "rough as sintered" or machined to provide tighter tolerances. Sintered WHA blanks can be further rolled or swaged by Elmet to produce plates, sheets, and rods. Elmet also precision machines WHA parts for use as ballast weights, radiation shields, boring bars, ordnance components, and other components that require high density and good ductility.



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## ELMET TECHNOLOGIES TYPICAL PROPERTIES OF TUNGSTEN HEAVY ALLOYS:

| PROPERTY | UNITS | K1700 \| ET90 | | K1701 \| ET90NM | | K1750 \| ET92.5 | | ET92.5NM | ET93 | K1800 \| ET95 | | K1801 \| ET95NM | | K1850 \| ET97 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Tungsten content | (%) | 90 | | 90 | | 92.5 | | 92.5 | 93 | 95 | | 95 | | 97 | |
| Density | ($g/cm^3$) | 17.0 | | 17.0 | | 17.5 | | 17.5 | 17.7 | 18.0 | | 18.0 | | 18.5 | |
| | ($lb/in^3$) | 0.61 | | 0.61 | | 0.63 | | 0.63 | 0.64 | 0.65 | | 0.65 | | 0.67 | |
| Hardness | (HRc) | ≤ 32 | | ≤ 32 | | ≤ 33 | | ≤ 33 | ≤ 33 | ≤ 34 | | ≤ 34 | | ≤ 35 | |
| Ultimate Tensile Strength | (ksi) | ≥ 110 | | ≥ 94 | | ≥ 110 | | ≥ 94 | ≥ 110 | ≥ 105 | | ≥ 94 | | ≥ 100 | |
| | ($N/mm^2$)= Mpa | ≥ 758 | | ≥ 648 | | ≥ 758 | | ≥ 648 | ≥ 758 | ≥ 724 | | ≥ 648 | | ≥ 689 | |
| Yield Strength | (ksi) | ≥ 75 | | ≥ 75 | | ≥ 75 | | ≥ 75 | ≥ 75 | ≥ 75 | | ≥ 75 | | ≥ 75 | |
| | ($N/mm^2$)= Mpa | ≥ 517 | | ≥ 517 | | ≥ 517 | | ≥ 517 | ≥ 517 | ≥ 517 | | ≥ 517 | | ≥ 517 | |
| Elongation | (%) | ≥ 5 | | ≥ 2 | | ≥ 5 | | ≥ 2 | ≥ 5 | ≥ 3 | | ≥ 1 | | Other | |
| Modulus of Elasticity | (psi × $10^6$) | 45 | | 40 | | 46 | | 47 | 47 | 48 | | 45 | | 50 | |
| | ($kN/mm^2$) | 310 | | 280 | | 320 | | 327 | 327 | 330 | | 310 | | 345 | |
| Magnetic Properties | | slight | | none | | slight | | none | slight | slight | | none | | slight | |
| Magnetic Permeability | (μ) | >1.05 | | ≤ 1.05 | | >1.05 | | ≤ 1.05 | > 1.05 | >1.05 | | ≤ 1.05 | | >1.05 | |
| Thermal Expansion Coefficient | (×$10^{-6}$/K) (20 °C–500 °C) | 5.1 | | 5.4 | | 4.9 | | 4.9 | 4.9 | 4.8 | | 5 | | 4.8 | |
| Thermal Conductivity | (cgs) | 0.2 | | 0.23 | | 0.24 | | 0.24 | 0.24 | 0.27 | | 0.32 | | 0.26 | |
| Electrical Conductivity | (% IACS) | 11 | | 14 | | 12 | | 12 | 12 | 15 | | 16 | | 16 | |
| ASTM-T-21014, MIL-T-21014, AMS-T-21014 | class | 1 | | 1 | | 2 | | 2 | - | 3 | | 3 | | 4 | |
| ASTM B777 | class | 1 | | 1 | | 2 | | 2 | - | 3 | | 3 | | 4 | |
| AMS 7725 | class | Class 1 Type 2 | | Class 1 Type 1 | | Class 2 Type 2 | | Class 2 Type 1 | - | Class 3 Type 2 | | Class 3 Type 1 | | Class 4 Type 2 | |
| Nominal Chemical Composition | Ni content, wt.% | 5.1 | 7.0 | 6.7 | 8.9 | 3.89 | 5.3 | 6.7 | 5.6 | 2.6 | 3.5 | 3.4 | 4.4 | 1.25 | 2.1 |
| | Fe content, wt.% | 2.59 | 3.0 | 0.2 | 1.1 | 1.98 | 2.2 | 0.8 | 1.4 | 1.2 | 1.5 | 0.1 | 0.6 | 1.25 | 0.9 |
| | Cu content, wt.% | 1.95 | - | 2.6 | - | 1.48 | - | - | - | 0.95 | - | 1.37 | - | - | - |
| | Co content, wt.% | 0.1 | - | 0.2 | - | 0.1 | - | - | - | 0.21 | - | 0.01 | - | - | - |
| | W content, wt.% | 90.2 | 90.0 | 90.2 | 90.0 | 92.5 | 92.5 | 92.5 | 93.0 | 95.0 | 95.0 | 95.0 | 95.0 | 97.5 | 97.0 |

*Other chemical compositions available on request.*

*All products comply with: DFARS 252.225-7001 Buy American Act; DFARS 252.225-7009 Specialty Metals; DFARS 252.225-7052 Magnet and Tungsten. All products are compliant with EU RoHS Directive 2015/863 and with Regulation (EC) No. 1907/2006 of The European Parliament and of the Council concerning the Registration, Evaluation, Authorization and Restriction of Chemicals (REACH). Mercury or mercury-containing compounds were not intentionally added or came in direct contact with hardware or supplies furnished under this purchase order. Pursuant to Section 1502 ("the Provision") of the Dodd-Frank Wall Street Reform and Consumer Protection Act ("Act") (Pub. L. 111-203, 124 Stat. 1376, July 21, 2010), also referred to as the "Conflict Minerals Act", Elmet Technologies only purchases "DRC conflict-free" minerals from smelters on the Conflict-Free Smelter Program (CFSP) Compliant Smelter list. Material free from radiation contamination.*

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