

WHA PRODUCTS MATERIAL DATA SHEET

Elmet Technologies presses and sinters high quality tungsten heavy alloy (WHA) blocks, rods, and shaped parts. Sintered WHA blanks can be further rolled or swaged by Elmet to produce plates, sheets, and rods with ultimate tensile strengths exceeding 180 ksi (1240 MPa) and elongations exceeding 5%. 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.

CHEMICAL COMPOSITION AND AS-SINTERED MECHANICAL PROPERTIES

STANDARD GRADES

Grade	ET90	ET90NM	ET92.5	ET92.5NM	ET93	ET95	ET95NM	ET97
ASTM B-777	Class 1	Class 1	Class 2	Class 2	-	Class 3	Class 3	Class 4
AMS 7725E	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
MIL-T-21014D	Class 1	Class 1	Class 2	Class 2	-	Class 3	Class 3	Class 4
W content, wt.%	90	90	92.5	92.5	93	95	95	97
Ni content, wt.%	7.0	8.9	5.3	6.7	5.6	3.5	4.4	2.1
Fe content, wt.%	3.0	1.1	2.2	0.8	1.4	1.5	0.6	0.9
Density, g/cm ³	17.0	17.0	17.5	17.5	17.7	18.0	18.0	18.5
UTS, ksi	≥ 110	≥ 110	≥ 110	≥ 110	≥ 110	≥ 105	≥ 105	≥ 100
UTS, MPa	≥ 758	≥ 758	≥ 758	≥ 758	≥ 758	≥ 724	≥ 724	≥ 689
YS, ksi	≥ 75	≥ 75	≥ 75	≥ 75	≥ 75	≥ 75	≥ 75	≥ 75
YS, MPa	≥ 648	≥ 648	≥ 648	≥ 648	≥ 648	≥ 648	≥ 648	≥ 648
Elongation, %	≥ 5	≥ 5	≥ 5	≥ 5	≥ 5	≥ 3	≥ 3	≥ 2
Hardness, HRC	≤ 32	≤ 32	≤ 33	≤ 33	≤ 33	≤ 34	≤ 34	≤ 35
Mag. perm.	> 1.05	≤ 1.05	> 1.05	≤ 1.05	> 1.05	> 1.05	≤ 1.05	> 1.05

Other alloy compositions and properties may be available as special order

All WHA products are compliant with EU RoHS Directive 2002/95/EC, 2011/65/EU and
with REACH Regulation (EC) No. 1907/2006

All WHA defense products are compliant with section 871 of the FY2019 National Defense
Authorization Act, codified at 10 U.S.C. 2533c, and the January 28, 2019 acquisition directive
from the Office of the Under Secretary of Defense

All raw materials for Elmet's WHA rod products are obtained from certified conflict-free sources

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DIMENSIONAL PROPERTIES

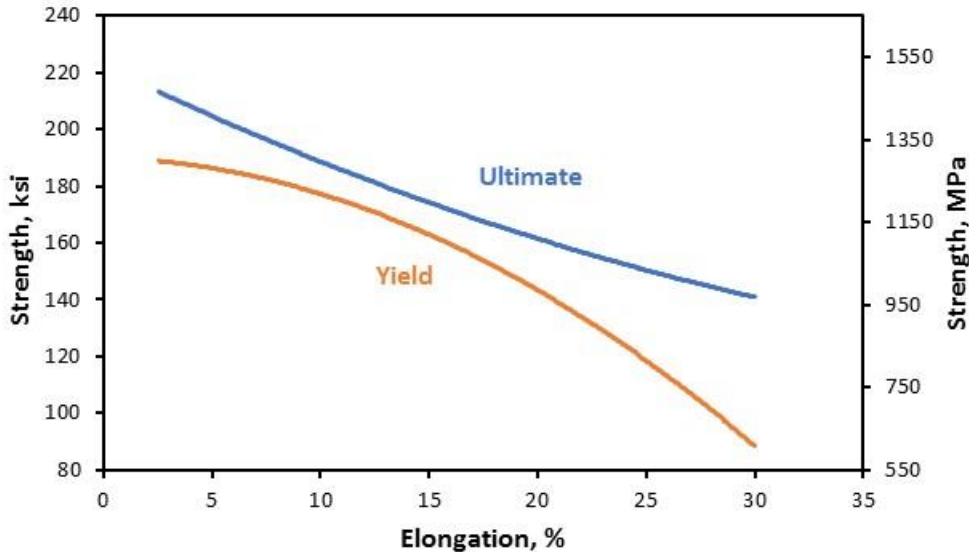
STANDARD PRODUCT SIZES

Blocks, sintered	6.0" x 4.8" x 2.3" 4.6" x 3.4" x 2.1" 7.0" x 2.3" x 2.0" 6.0" x 1.5" x 1.5"	150 mm x 120 mm x 57 mm 120 mm x 86 mm x 54 mm 180 mm x 58 mm x 51 mm 150 mm x 39 mm x 38 mm
Rods, sintered	0.5 to 1.0" in diameter Lengths up to 24"	6.35 to 25.4 mm in diameter Lengths up to 610 mm
Rods, swaged	0.25 to 1.0" in diameter Lengths up to 48"	6.35 to 25.4 mm in diameter Lengths up to 610 mm
Plate, hot rolled	0.25 to 1.0" in thickness Widths and lengths up to 24"	6.35 to 25.4 mm in thickness Widths and lengths up to 305 mm

Other sizes and properties available as special order

AS-SWAGED MECHANICAL PROPERTIES

Elmet Technologies can adjust swaging and heat-treating conditions to produce WHA rods with specific combinations of strength and ductility.



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