

Data sheet

Tungsten High Density Alloy (WSM)



Tungsten High Density Alloy (WSM) is a composite material with a very high percentage of Tungsten. Nickel-Iron is used as a composite metal, respectively for paramagnetic applications Nickel-Copper is used instead. WSM is produced by mixing, pressing and sintering of the corresponding metal powder portions. Tungsten High Density Alloy and pure Tungsten have a lot of characteristics in common as for example the very high density or the very good shielding against X-ray radiation, however the machinability of WSM is much easier. WSM is both at processing and application, neither polluting nor harmful.

Significant Characteristics and Applications

- | Good machinability
- | Very high density
- | Very good dimensional stability
- | Very good mechanical properties
- | High surface quality
- | High shielding against X-ray and Gamma radiation

Typical Applications of Tungsten High Density Alloy (WSM)

Shielding against X-ray and Gamma radiation, collimators, balance and counterbalance weights (replacement of Lead), ballistic projectiles, mould inserts and ejectors for Aluminum and Magnesium pressure die-casting moulds, electrical contacts, electric resistance electrodes, tool holder, vibration-reducing drilling rods and others.

ASTM Standard Specifications

ASTM B777 (Tungsten Base, High-Density Metal)
AMS 7725E (AMS T-21014A)
MIL-T-21014D

Properties of the most important Material Types

	WSM W90NiFe/W90NiCu Class 1	WSM W92.5NiFe/W92.5NiCu Class 2	WSM W95NiFe/W95NiCu Class 3	WSM W97NiFe Class 4	WSM W90NiFeMo (no standard)
Chemical Composition					
Tungsten (W) [%]	90	92.5	95	97	90
Nickel (Ni) [%]	6	5.25	3.5	2.1	4
Iron (Fe)/Copper (Cu) [%]	4	2.25	1.5	0.9	2
Molybdenum (Mo) [%]	—	—	—	—	4
Physical Properties					
Density [g/cm ³]	16.85-17.25	17.15-17.85	17.75-18.35	18.25-18.85	17.10-17.30
Thermal Conductivity [W/m · K ⁻¹]	70/95	75/100	85/105	90/115	80
Coefficient of Thermal Expansion [10 ⁻⁶ K ⁻¹]	5.8	5.5	5.2	5.0	5.3
Specific Electrical Resistivity [10 ⁻⁶ Ω · m]	0.17/0.13	0.15/0.12	0.13/0.11	0.10/0.09	—
Mechanical Properties					
E-Modulus [GPa]	320-340	340-360	350-380	360-380	350
Tensile Strength R _m [MPa]	750-1200	750-1400	720-1200	680-1000	700-1000
Yield Strength R _{p0,2} [MPa]**	517	517	517	517	650
Elongation A [%]	5-30	5-25	3-15	2-10	2-15
Hardness [HRC]*	24-32	25-33	25-34	30-35	24-32

Typical values, partly standardized according to ASTM B777

* Higher values allowed for deformed or aged material

** Minimum value according standard (Class 1-4), deviations allowed for paramagnetic type WNiCu

Range of Products

Rods, squares, plates, counterbalance weights, shielding and finished parts according to drawings