

TUNGSTEN HIGH DENSITY COMPOSITES

Description of Product:

Tungsten based composite materials are outstanding due to high density and good mechanical properties. They have a good electrical and thermal conductivity. The product can be delivered both as semi finished product for further processing by the customer or in accordance with the drawing as finished machined components. To meet the specific application of our customers we recommend the delivery of the finished machined product. The production of single parts up to large series is possible.

Our HPM 1700 to HPM 1850 materials with small amounts of nickel and iron or nickel and copper provide a solution in a wide range of applications requiring concentrated weight or density in a limited space. These lead-free parts meet legal requirements and recommendations to protect the environment.

Range of application:

Balance weights, radiation protection, vibration absorbers, heat transfer, drilling bars. The mechanical characteristics must guarantee the stability and strength in any application case.

The absorption of x-ray and gamma radiation is in direct proportion to the density of the shielding material. Tungsten high density composites are more than 1,5 times as effective as lead and provide extremely efficient protection, particularly where space is limited.

HPM 1750 (sheet) and HPM 1801 (sheet) are materials specially produced for rolling into sheets. These are rolled to standard thicknesses of 0,5 to 3 mm. Other sheet thicknesses are available on request. The rolled raw sheets can be further processed into a wide variety of shapes by laser or waterjet cutting or wirecut EDM.

Standards:

The denoted tolerances are in accordance with the international aerospace material specification AMS-T-21014 and the standard ASTM B 777.

Typical properties of tungsten composite materials (1)

Characteristic		Material					
Inspection criterion	Dimension	HPM 1700	HPM 1710	HPM 1701	HPM 1705	HPM 1750	HPM 1750 sheet
Tungsten content	%	90,0	90,0	90,0	90,0	92,5	92,5
Balance		Ni, Fe	Ni, Fe Without Cu	Ni, Cu	Ni, Fe; Mo	Ni, Fe	Ni, Fe
Density	g/cm ³	17,0 ± 0,2	17,0 ± 0,2	17,0 ± 0,2	17,3 ± 0,2	17,5 ± 0,2	17,6 ± 0,2
Maximum Hardness	HV 30 HRC	320 32	320 32	320 32	350 35	325 33	460 46
Ultimate tensile strength (typical value)	MPa	760 840	760 860	650 750	800 890	760 880	760 900
Minimal yield strength (Typical value)	MPa	520 560	520 570	520 560	520 570	520 580	520 650
Minimum Elongation (typical value)	%	5 14	5 17	2 10	5 16	5 20	5 10
Young's modulus (average value)	GPa	320	320	300	330	340	340
Median coefficient of linear thermal expansion 20 – 100 °C	10-6/K	6,1	6,3	6,0	4,5	5,5	5,5
20 – 300 °C	10-6/K	6,2	6,5	6,2	5,1	5,7	5,7
20 – 450 °C	10-6/K	6,3	6,6	6,4	5,3	5,8	5,8
Thermal conductivity	W/mK	≥ 70	≥ 70	≥ 90	≥ 70	≥ 75	≥ 75
Electrical conductivity (average value)	%IACS MS/m	11 6,4	11 6,4	14 8,1	13 7,5	12 6,9	12 6,9
Specific electrical resistance (average value)	μΩm	0,16	0,16	0,12	0,13	0,15	0,15
Permeability μ		> 1,05	> 1,05	< 1,05	> 1,05	> 1,05	> 1,05

Typical properties of tungsten composite materials (2)

Characteristic		Material					
Inspection criterion	Dimension	HPM 1760	HPM 1800	HPM 1810	HPM 1801	HPM 1801 sheet	HPM 1850
Tungsten content	%	92,5	95,0	95,0	95,0	95,0	97,0
Balance		Ni, Fe	Ni, Fe	Ni, Fe without Cu	Ni, Cu	Ni, Cu	Ni, Fe
Density	g/cm ³	17,6 ± 0,2	18,0 ± 0,2	18,0 ± 0,2	18,0 ± 0,2	18,0 ± 0,2	18,5 ± 0,2
Maximum Hardness	HV 30	325 33	332 35	332 35	332 35	460 46	340 35
Ultimate Tensile strength (typical value)	MPa	760 930	725 830	725 880	650 730	650 900	690 800
Minimal yield strength (typical value)	MPa	520 590	520 560	520 580	520 570	520 750	520 580
Minimum Elongation (typical value)	%	5 16	3 12	3 16	1 5	1 8	2 7
Young's modulus (average value)	GPa	340	370	370	330	330	380
Median coefficient of linear thermal expansion 20 – 100 °C	10 ⁻⁶ /K	5,5	4,9	5,2	5,4	5,4	5,1
20 – 300 °C	10 ⁻⁶ /K	5,8	5,1	5,3	5,5	5,5	5,1
20 – 450 °C	10 ⁻⁶ /K	5,9	5,2	5,5	5,6	5,6	5,2
Thermal conductivity	W/mK	≥ 75	≥ 80	≥ 80	≥ 85	≥ 85	≥ 75
Electrical conductivity (average value)	%IACS MS/m	12 6,9	13 7,7	13 7,7	15 9,0	15 9,0	16 9,3
Specific electrical resistance (average value)	μΩm	0,15	0,14	0,14	0,11	0,11	0,10
Permeability μ		> 1,05	> 1,05	> 1,05	< 1,05	> 1,05	> 1,05

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Delivery form:

The products may be delivered as well as a semi-finished material for further processing by the customer or according to a drawing as a finished product.

H.C. Starck Hermsdorf GmbH
Robert-Friese-Strasse 4
07629 Hermsdorf
Phone +49 36601 922-101, Fax +49 36601 922-111

