

# Tungsten

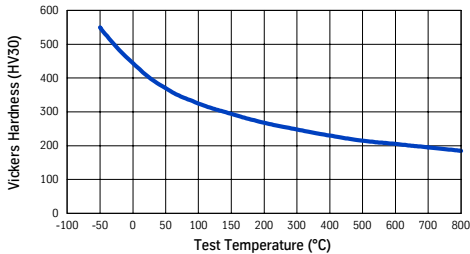
## Technical Datasheet

<b>Short Name</b>	Tungsten		<b>Chemical Composition</b>		W
<b>Code</b>	Tungsten		<b>Composition</b>		min. 99,95 %
<b>Material-No.(alt)</b>	-		(Reference values in %)		
<b>Material-Properties</b>	Tungsten is hard and brittle, his corrosion resistance to many acids is excellent, the machinability is difficult. High hardness under elevated temperatures, highest melting point of all metals, high effect against radiation.				
<b>Applications</b>	<ul style="list-style-type: none"> <li>• Heating elements, heat shields and parts in vacuum- and protective gas furnaces</li> <li>• Filaments and boats for the evaporation technique</li> <li>• Tungsten electrodes for TIG-welding</li> <li>• Radiation shields for x-ray technique</li> <li>• Stationary and rotating cathodes and anodes of x-ray valves</li> </ul>				
<b>Mechanical Properties</b> (Reference values)			Sheet-thicknesses		
			0,5 – 1,0 mm	> 1 – 5,0 mm	
Hardness 293 K (20 °C)	HV 30		> 500	> 460	
Tensile strength 293 K (20 °C) ca. 85 % reduction	N/mm <sup>2</sup>		>1300	> 800	
Modulus of elasticity 293 K (20 °C)	kN/mm <sup>2</sup>			410	
Modulus of rigidity 293 K (20 °C)	kN/mm <sup>2</sup>			177	
<b>Physical Properties</b>					
Electrical conductivity 293 K (20 °C)	MS/m			18	
Electrical resistance 293 K (20 °C)	$\frac{\Omega \cdot \text{mm}^2}{\text{m}}$			0,055	
Specific heat	$\frac{\text{J}}{\text{g} \cdot \text{K}}$			0,14	
Thermal conductivity 293 K ( 20 °C)	$\frac{\text{W}}{\text{m} \cdot \text{K}}$			125	
Density	$\frac{\text{g}}{\text{cm}^3}$			19,3	
<b>Available sizes</b>	Sheets, wire, bars, machined parts				
	Tensile strength properties depend on cross-section and design.				

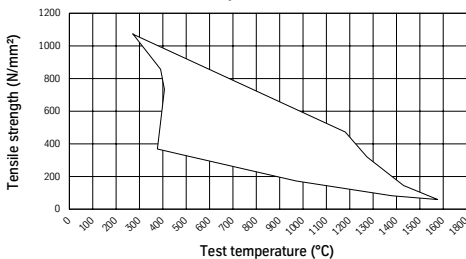
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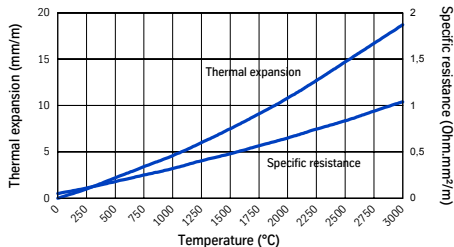
Vickers Hardness of 3 mm tungsten sheet versus temperature



Tensile strength of 1 mm tungsten sheet at higher temperature. The upper limit corresponds to stress relieved and the lower to recrystallized condition.



Thermal expansion and specific resistance versus temperature



### Machining Instructions

In connection with machining preheating to about 473 K (200 °C) is recommended, especially at thick-walled pieces. EDM-machining (wire cutting) is possible.

#### Drilling

Cutting speed m/min.

Lip angle  
Machining

Tungsten Carbide  
ISO K 05

20 – 25

as with steel  
dry

High speed Steel  
THYRAPID 3202

5 – 7

as with steel  
dry

#### Turning

Cutting speed m/min.

Rake angle  
Clearance angle  
Lip angle  
Machining

Tungsten Carbide  
ISO K 05

30 – 50

c. 25°  
8 – 10°  
90°  
dry

#### Milling

Cutting speed m/min.

Rake angle  
Clearance angle  
Lip angle  
Radius  
Feed  
Depth of cut  
Machining

Tungsten Carbide  
ISO K 10 or ISO K 05

20 – 25

10°  
8°  
90°  
3 mm  
0,3 mm  
2 mm  
dry

#### Grinding

Hardness  
Grain size  
Structure  
Binder

Cutting speed m/sec.

Machining

Silicon Carbide wheels  
alt. diamond wheels

H, J, K  
60 – 120  
medium  
ceramic

30

intensive cooling

All statements as to the properties or utilization of the materials and products mentioned in this datasheet are only for the purpose of description. Guarantees in respect of the existence of certain properties or utilization at the material mentioned are only valid if agreed upon in writing.

THYSSEN DURO METALL GMBH

Albert-Einstein-Str. 1  
70806 Kornwestheim

Tel.: \*\*49 7154/8255-0, Telefax: \*\*49 7154/8255-49

E-mail: ELMEDUR@t-online.de

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