

# Tungsten Heavy Alloy Grade Sheet



**ATI Firth  
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# Tungsten Heavy Alloy Grade Sheet

Grades	SD170	SD175	SD180	SD185	DENS21	DENS23	DENS25
<b>Material Specifications</b>							
Mil.T-21014 Rev. D	Class 1	Class 2	Class 3	Class 4	Class 1	Class 2	Class 3
SAE-AMS-T-21014	Class 1	Class 2	Class 3	Class 4	Class 1	Class 2	Class 3
AMS 7725 B	7725B	—	—	—	7725B	—	—
ASTM-B-777-87	Class 1	Class 2	Class 3	Class 4	Class 1	Class 2	Class 3
Nominal Density (g/cc)	17.0	17.5	18.0	18.5	17.0	17.5	18.0
Nominal Density (lbs/in <sup>3</sup> )	.614	.632	.651	.665	.614	.632	.651
Nominal W Content (wt.%)	90	92.5	95	97	90	92.5	95
Nominal Nickel Content (wt.%)	7.1	5.4	3.6	2.1	8.8	6.6	4.4
Nominal Iron Content (wt.%)	2.9	2.1	1.4	0.9	1.2	0.9	0.6
Maximum Magnetic Perm	n/a	n/a	n/a	n/a	<1.05	<1.05	<1.05
Typical Hardness (HRC)	28	28	29	30	28	28	29
Modulus of Elasticity (x10 <sup>6</sup> psi)	45	48	50	52	45	48	50
Ultimate Tensile Strength Min. (ksi)	120	120	120	110	110	110	110
0.2% Offset Yield Strength Min. (ksi)	80	80	80	80	75	75	75
Minimum % Elongation (1" Gauge Length)	10	8	6	2	4	3	3

Characteristics		Applications
SD170	Readily machinable using common metalworking tools and techniques. It is the ideal alloy to use in the form of rolled sheet, which is available in thicknesses ranging down to 0.020" and widths to 12".	General purpose tungsten heavy alloy that is widely used for ballast and counterbalance weights, inertial damping, and radiation shielding applications. It offers the highest ductility available within the Densalloy® family of materials.
SD175	Like all Densalloy® W-Ni-Fe heavy alloys, SD175 offers good corrosion resistance. Easily applied organic and metallic finishes provide additional protection in the presence of electrolytes. It is readily machinable into complex geometries.	Offers excellent combination of ductility and stiffness, making it an ideal choice for reduced chatter toolholders, rigid fixtures, high durability radiation instrument casings and radioisotope containers. Representing the best compromise in density, stiffness, and ductility, it is the best general purpose alloy in the Densalloy® family.
SD180	Due to its relatively high tungsten content, SD180 exhibits minimal distortion during sintering, making it an excellent choice for net shape press and sinter parts. By use of this P/M approach, maximum economy can be realized in the production of small parts.	Commonly used for small, high density balance weights. Whether in sheet or monolithic form, SD180 is also widely used for the shielding and/or collimation of gamma rays and high energy x-rays in medical imaging devices.
SD185	The very high elastic (Young's) modulus of SD185 rivals that of pure tungsten but the alloy still retains machinability for fabrication into a variety of medical and industrial components. Strong absorber of high energy x-rays and gamma rays.	Possessing the highest density of any of the standard Densalloy® alloys, SD185 is the preferred material for large radioisotope containers that must provide the greatest radiation attenuation possible in a given size as well as other specialized applications.
DENS21	Provides the greatest ductility of any of the low magnetic permeability Densalloy® materials. It is readily machinable into complex geometries.	Commonly used for large radiation shielding components where the shielding is located in close proximity to magnetic fields that cannot be disturbed (as is common in modern radiotherapy devices). The composition of DENS21 provides superior mechanical properties compared to older W-Ni-Cu non-magnetic alloys.
DENS23	Provides a good balance of ductility versus stiffness in a low magnetic permeability material. It is readily machinable into complex geometries using common shop tools and techniques.	Commonly used for radiation shielding components that are located in close proximity to magnetic fields that relate to device function and/or diagnostics and must not be distorted.
DENS25	Provides maximum attenuation of high energy x-rays and gamma rays available in a standard low magnetic permeability Densalloy®. Its very low value of magnetic permeability ( $\mu$ ) is comparable to that of typical austenitic stainless steels. Despite its high tungsten content, DENS25 is readily machinable into complex geometries.	Commonly used for thick radiation shielding components in modern oncology machines that are located in close proximity to magnetic fields that relate to device function and/or diagnostics and must not be disturbed.