Material Data Sheet

Tool Steel 1.2344 / A681 H13 / H13[1]

General

Components made of tool steel such as 1.2344 (H13) are known for great hardness combined with high ductility. Through selective application of alloying components, the material properties can be precisely adjusted. Applications for corrosion resistant alloys are found in medical technologies, the automotive industry as well as in aerospace engineering. Tool steel is mainly used for producing tools and molds. Its layered structure enables components to be equipped with integrated cooling channels. The good mechanical characteristic values of tool and stainless steel make it suitable for use in places that are exposed to heavy strain, because its high wear to resistance keeps abrasion to a minimum.

Material Structure

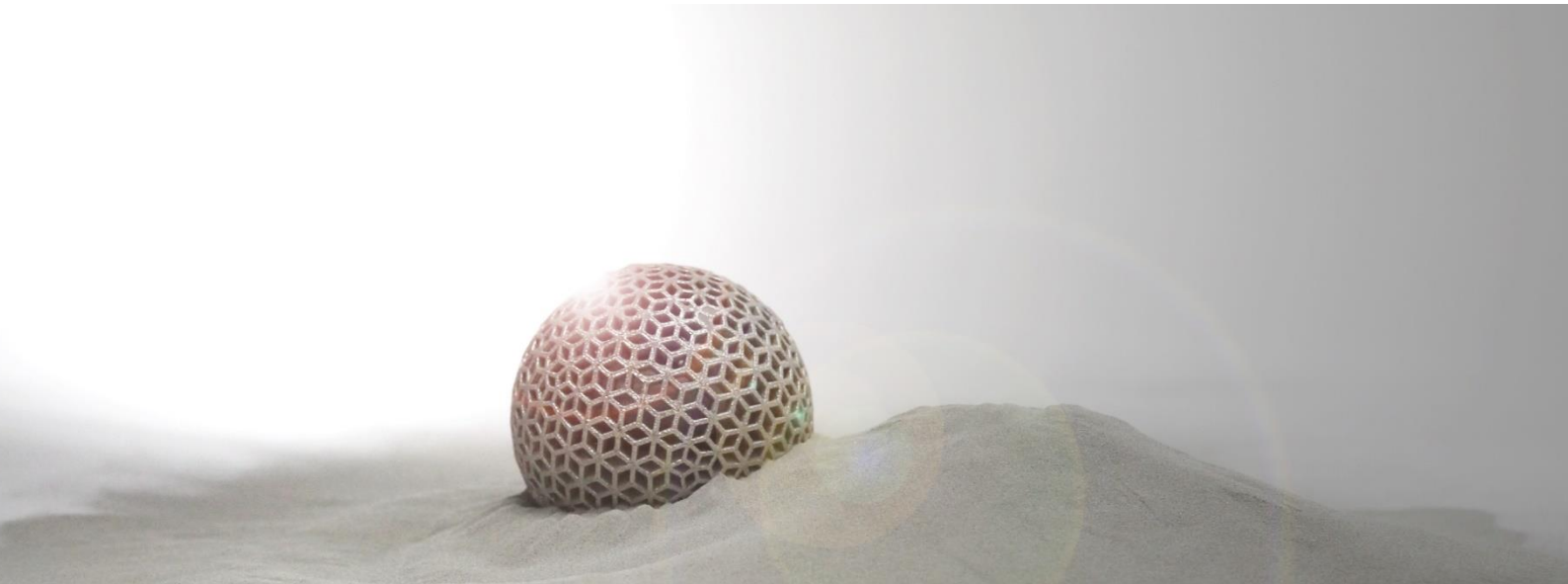
SLM®-processed tool steel components exhibit a homogeneous, nearly non-porous texture, with mechanical characteristic values in the range of material specifications. Through subsequent processing such as heat treatment (e.g. precipitation hardening, soft annealing), the components' properties can be adapted to meet specific requirements.

Chemical composition [Mass fraction in %][7]

Fe	C	Cr	Mn	Mo	Ni + Cu	P	S	Si	V	N	O
Balance	0.32 – 0.45	4.75 – 5.50	0.20 – 0.60	1.10 – 1.75	0.75	0.03	0.03	0.80 – 1.25	0.80 – 1.20	/	/

Powder properties

Particle size[7]	10 – 45 µm	Particle shape[8]	Spherical
Mass density[2]	≈ 8.0 g/cm³	Thermal conductivity	/



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Layer thickness 30 µm[3]	As-built	Heat-treated [12]

Build-up rate [10]	[cm³/h]	10.4 cm³/h
Component density[11]	[%]	≈ 99.5 %

Tensile test[9]				M	SD	M	SD
Tensile strength	R_m	[MPa]	H	1244	106	1719	239
			V	1360	86	1720	99
Offset yield strength	$R_{p0,2}$	[MPa]	H	987	39	1528	32
			V	-	-	-	-
Elongation at break	A	[%]	H	2	2	4	2
			V	1	2	9	2
Reduction of area	Z	[%]	H	-	-	14	5
			V	-	-	16	5
Young's modulus	E	[GPa]	H	203	23	-	-
			V	-	-	-	-

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The properties and mechanical characteristics apply to powder that is tested and sold by SLM Solutions, and that has been processed on SLM Solutions machines using the original SLM Solutions parameters in compliance with the applicable operating instructions (including installation conditions and maintenance). The part properties are determined based on specified procedures. More details about the procedures used by SLM Solutions are available upon request.

The specifications correspond to the most recent knowledge and experience available to us at the time of publication and do not form a sufficient basis for component design on their own. Certain properties of products or parts or the suitability of products or parts for specific applications are not guaranteed. The manufacturer of the products or parts is responsible for the qualified verification of the properties and their suitability for specific applications. The manufacturer of the products or parts is responsible for protecting any third-party proprietary rights as well as existing laws and regulations.

[1] Material according to ASTM A681 H13.

[2] Material density varies within the range of possible chemical composition variations.

[3] Material data file: H13_SLM_MBP2.2_30_FS_Stripes_T200_400W_V5103

[4] Material data file: H13_SLM_MBP2.2_50_Stripes_T200_400W_V5103

[5] Optical density determination by light microscopy.

[6] Theoretical build-up rate for each laser = layer thickness x scan speed x track distance.

[7] With respect to powder material.

[8] According to DIN EN ISO 3252:2001

[9] Tensile test according to DIN EN ISO 6892-1:2017 B (DIN 50125:2016 – B6x30); orientation: 0°, 90°; testing machine: Zwick 1484; load range: 200 kN; testing speed: 0,008 1/s; testing temperature: room temperature; test laboratory: EWIS GmbH. Test samples were turned before tensile test.

[10] Hardness testing according to DIN EN ISO 6507-1:2018.

[11] Roughness measurement according to DIN EN ISO 4288:1998; λc = 0,8 mm.

[12] Heat treatment: preheating to 750 °C for 2 h, followed by austenitizing at 1050 °C for 15 min. and quenching in warm oil (about 60 °C). Immediate double tempering at 300 °C for 2.5 h with interstage cooling down to room temperature.

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