材料详情表

Materialdatenblatt

Material Data Sheet

青铜 CuSn10 / CC480K / DIN EN 1982 [1]

概述

青铜归属于铜锡合金大家族的一员，一直是一种广泛应用的中流砥柱一般的合金材料，有着很高的延伸率以及中等的硬度。CuSn10一直被认为是具有很好的耐磨性以及抗腐蚀性的合金，特别是在抗空气腐蚀方面有很好的性能，原因是在青铜表面会自然形成一层致密紧附的保护层。鉴于青铜良好的耐空蚀和海水腐蚀的能力，它通常被用于海洋方面的应用，比如水阀水泵、泵的导轮和斗轮、水轮机以及通常的工程应用中。

General

Bronze is assigned to the group of copper-tin-alloys and is pronounced as construction material, which has a high elongation at medium hardness. CuSn10 is characterized by good wear resistance and good corrosion resistance, especially against atmospheric influences, since a tightly adhering dense protective layer is formed on the surface. Due to the resistance to cavitation and seawater, the material is primarily used in seawater applications. Possible applications are, for example, valve and pump housings, guide and bucket wheels for pumps and water turbines as well as in general mechanical engineering.

材料结构

经过SLM工艺处理的青铜零件展现出各向同性、近乎无孔的结构，因此其机械特性可以参考概述中对于青铜的性能描述。同时，如有对零件性能的特殊要求，也可以通过硬化、热处理或热等静压（HIP）等后处理来实现。

Material Structure

Following the SLM process, CuSn10 components exhibit a homogeneous, nearly poreless texture, whereby the mechanical characteristic values lie within the range of the material specifications. Through subsequent post treatment, such as hardening, heat treatment or hot isostatic pressing (HIP), the components' properties can be adapted to meet specific requirements. In the SLM process with CuSn10 theoretical build-up rates of 9.1 cm³/h (layer thickness 30 µm) and 17.3 cm³/h (layer thickness 50 µm) are achieved.

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物理/化学 性质
Physical and Chemical Properties

材料密度 *Material Density*	8,74 g/cm³			
20 °C时的导热系数 Thermal Conductivity at 20 °C	59 W/mK			
打印件密度[2] *Build Part Density[2]*	层厚 30 µm[3] *Layer Thickness 30 µm*	> 99,5 %	层厚 50 µm[4] *Layer Thickness 50 µm*	> 99,5 %

化学成分 (wt%)[5] *Chemical Composition (wt%)[5]*	**Element** *Element*	**Min.** *Min.*	**Max.** *Max.*
	Cu	Balance	Balance
	Sn	9,00	10,00

颗粒大小分布（范围）[5] *Particle Size Distribution[5]*	10 – 45 µm *10 – 45 µm*
晶粒形状[6] *Grain Shape[6]*	球形 *Spherical*

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机械特性
Mechanical Data

拉伸试验[7] *Tensile Test[7]*		层厚 30 µm[3] *Layer Thickness 30 µm[3]*	层厚 50 µm[4] *Layer Thickness 50 µm[4]*
拉伸强度 *Tensile Strength*	R_m [MPa]	516 ± 10	495 ± 17
屈服强度 *Yield Strength*	$R_{p0,2}$ [MPa]	385 ± 14	373 ± 7
断裂伸长率 *Elongation Break*	A [%]	22 ± 3	16 ± 4
断面收缩率 *Contraction at Fracture*	Z [%]	21 ± 3	16 ± 3
弹性模量 *Young's modulus*	E [GPa]	109 ± 9	116 ± 16

硬度测试[8] *Hardness Test[8]*		层厚 30 µm[3] *Layer Thickness 30 µm[3]*	层厚 50 µm[4] *Layer Thickness 50 µm[4]*
维氏硬度 *Vickers Hardness*	[HV10]	160 ± 6	159 ± 1

粗糙度测试[9] *Roughness Measurement[9]*		层厚 30 µm[3] *Layer Thickness 30 µm[3]*	层厚 50 µm[4] *Layer Thickness 50 µm[4]*
平均粗糙度 *Mean Roughness Index*	R_a [µm]	9 ± 1	10 ± 2
平均平面粗糙度 *Average Surface Roughness*	R_z [µm]	54 ± 6	71 ± 13

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本表中的测试性能与机械特性的粉末是由SLM Solutions测试及销售的，测试是在使用SLM Solutions提供的参数和机器的情况下，根据适当的操作指令（包括机器状况和维护）进行的。零件的性能是严格实验的结果，如需了解更多细节可以与SLM Solutions沟通询问。
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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 on the basis of 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 themselves form a sufficient basis for component design. 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.

SLM Solutions Group AG
Materialentwicklung / Material Development
Lübeck, den 08.02.2017

[1] Material gemäß DIN EN 1982 / *Material according to DIN EN 1982.*
[2] Optische Dichtebestimmung mittels Lichtmikroskopie. / *Optical density determination by light microscopy.*
[3] Materialdatei / *Material data file:* Bronze_SLM_MBP2.2_30_Stripes_FS_T0_400Watt_V5101
[4] Materialdatei / *Material data file :* Bronze_SLM_MBP2.2_50_Stripes_FS_T0_400Watt_V5101
[5] Bzgl. pulverförmigen Ausgangsmaterial. / *With respect to powder material.*
[6] Gemäß DIN EN ISO 3252. / *According DIN EN ISO 3252.*
[7] Zugprüfung gemäß ISO 6892-1: 2009 B (DIN 50125 – B6x30); Ausrichtung: 0° und 90°; Wärmebehandlung: keine; Prüfmaschine: Zwick 1484; Lastbereich: 200 kN; Prüfgeschwindigkeit 0,008 1/s; Prüftemperatur: Raumtemperatur; Prüflabor: intern. Die Proben sind vor dem Zugversuch abgedreht worden. / *Tensile test according to ISO 6892-1: 2009 B (DIN 50125 – B6x30); Orientation: 0° und 90°; Heat treatment: None; Testing machine: Zwick 1484; Load range: 200 kN; Testing speed: 0,008 1/s; Testing temperature: room temperature; Test laboratory: internal. Test samples were turned before Tensile test.*
[8] Härteprüfung gemäß DIN EN ISO 6507-1. / *Hardness testing according to DIN EN ISO 6507-1.*
[9] Rauheitsmessung gemäß DIN EN ISO 4288: 1998; λc = 0,8 mm. / *Roughness Measurement according to DIN EN ISO 4288: 1998; λc = 0,8 mm.*

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