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**NATIONAL STANDARD OF THE  
PEOPLE'S REPUBLIC OF CHINA**

**GB/T 42617-2023**

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**Additive manufacturing - Design - Laser-based powder bed  
fusion of metals**

增材制造 设计 金属材料激光粉末床熔融

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## Foreword

This document was issued on 23 May 2023 by the State Administration for Market Regulation; Standardization Administration of the PRC and takes effect on 1 December 2023.

It is a GB/T standard: recommended rather than compulsory, but it is the text a Chinese reviewer applies when assessing a submission.

It is classified under ICS 25.030, Chinese classification J04.

This document is in accordance with the provisions of GB/T 1.1-2020 "Guidelines for Standardization Work Part 1. Structure and Drafting Rules for Standardization Documents" drafting.

This document is modified to adopt ISO /ASTM52911-1.2019 "Design for Additive Manufacturing Part 1. Laser Powder Bed Fusion of Metal Materials melt".

Compared with ISO /ASTM52911-1.2019, this document has more structural adjustments. Structure number changes between two files

See Appendix A for a comparison list.

Compared with ISO /ASTM52911-1.2019, this document has many technical differences.

Settings are marked with a single vertical line (|). See Appendix B for a list of these technical differences and their causes.

The following editorial changes have been made to this document.

--- In order to coordinate with existing standards, change the name of the standard to "Laser powder bed fusion of metal materials for additive manufacturing design";

---Added the abbreviations "3D" and "2.5D", changed the abbreviations "PBF-LB/M" and Another name for "STL" (see 4.2);

--- Merge the content of process advantages in 6.1.1 of ISO /ASTM52911-1.2019 into 5.2, and the content of process limitations into

5.3, at the same time adjust the surface treatment content of 6.7.5 in ISO /ASTM52911-1.2019 to 6.6.2;

--- Replaced ISO /ASTM52915 with the informative referenced GB/T 35352;

--- Deleted the commercial introduction of 3MF in 5.8 of ISO /ASTM52911-1.2019;

--- Added Appendix A (informative) and the comparison between this document and ISO /ASTM52911-1.2019 structure number;

--- Added Appendix B (informative) and the technical differences between this document and ISO /ASTM52911-1.2019 and their reasons;

---Changed the raw material designation of ISO /ASTM52911-1.2019 Table A.1 (see Table C.1);

--- Deleted the application case of 6.9 in ISO /ASTM52911-1.2019, and added the application case of my country (see Appendix D).

Please note that some contents of this document may refer to patents. The issuing agency of this document assumes no responsibility for identifying patents.

This document is proposed by China Machinery Industry Federation.

This document is under the jurisdiction of the National Additive Manufacturing Standardization Technical Committee (SAC/TC562).

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## Introduction

Metal material laser powder bed fusion process (LB-PBF/M) is a kind of metal additive manufacturing process, which has been widely used in aerospace,

Medical, mold, energy, automobile and other fields. LB-PBF/M has excellent product performance and high material utilization rate, which can shorten the product development cycle

period, reduce production costs, and realize integrated forming of complex parts. Due to the diversity of forming materials, it is determined that the LB-PBF/M process can meet

Forming requirements for multiple types of parts with different characteristics and uses.

LB-PBF/M utilizes the thermal effect of the high-energy laser beam to rapidly melt the metal powder material and accumulate it layer by layer to obtain three-dimensional solid parts.

Some unmelted powders are recovered by sieving and mixed with the original powders, which can be recycled in the subsequent forming process. Commonly used metal powders

Final materials include titanium alloy, aluminum alloy, superalloy, stainless steel, etc.

Compared with the traditional manufacturing process (such as subtractive material and equal material manufacturing), the LB-PBF/M process has different concerns in the design stage. LB-

PBF/M has no restrictions similar to traditional processes, which provides designers and manufacturers with a high degree of freedom, but it is also necessary to understand the manufacturability of the process.

creativity and limitations.

This document describes the process characteristics and design criteria for laser powder bed fusion of metallic materials

Design provides guidance and methods, guides users in the process of transforming design ideas into physical parts, and helps designers determine design elements and make full use of them.

Take advantage of craftsmanship. This document can effectively promote product designers to master the technical characteristics of laser powder bed fusion of metal materials, and to grasp the advantages of additive materials.

The key to manufacturing product design, improving the quality and performance of additive manufacturing products, and promoting the additive manufacturing industry to a more orderly, reasonable and economical direction

It has good economic and social benefits.

Additive Manufacturing Design Metal Materials Laser Powder Bed Fusion

## 1 Scope

GB/T 42617-2023 covers how a metal part is designed when it is going to be built by laser powder bed fusion, and it addresses the designer rather than the machine operator. Clause 5 describes the characteristics of the process: the part size it can hold, the advantages of the process and the limits it runs into, its economy and efficiency, the functional constraints, the accuracy achievable in size, shape and position, and the data quality, resolution and representation in which the geometry has to arrive. Clause 6 then sets out the design guidelines - material and structural properties, support structures, forming direction, position and placement in the build volume, the anisotropy of the material, surface