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Additive manufacturing of metals — Process characteristics and performance — Metal powder bed fusion process to meet critical applications



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Preface

This Standard was prepared by the Standards Australia Committee MB-028, Additive Manufacturing to supersede AS ISO/ASTM 52904:2021, *Additive manufacturing — Process characteristics and performance — Practice for metal powder bed fusion process to meet critical applications.*

The objective of this document is to cover the operation and production control of metal powder bed fusion (PBF) machines and processes for areas of critical applications. A critical application is assumed once failing parts-functionality leads to immediate threats.

This document is applicable for production of parts and mechanical test specimens using powder bed fusion (PBF) with both laser and electron beams.

Specifications related to specific fields of application are provided in respective standards.

WARNING This document does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this document to establish appropriate safety, health, and environmental practices and determine the applicability of regulatory limitations prior to use.

This document is identical with, and has been reproduced from ISO/ASTM 52904:2024, *Additive manufacturing of metals — Process characteristics and performance — Metal powder bed fusion process to meet critical applications*.

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Australian or Australian/New Zealand Standards that are identical adoptions of international normative references may be used interchangeably. Refer to the online catalogue for information on specific Standards.

The terms “normative” and “informative” are used in Standards to define the application of the appendices or annexes to which they apply. A “normative” appendix or annex is an integral part of a Standard, whereas an “informative” appendix or annex is only for information and guidance.

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO document should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 261, *Additive manufacturing technologies*, based on a partnership agreement between ISO and ASTM International with the aim to create a common set of ISO/ASTM standards on additive manufacturing, in collaboration with the European Committee for Standardization (CEN) Technical Committee CEN/TC 438, *Additive manufacturing*, in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

This second edition cancels and replaces the first edition (ISO/ASTM 52904:2019), which has been technically revised.

The main changes are as follows:

— The structure of the document is modified to reflect the following workflow: Personnel – Digital data – PBF equipment – Feedstock – Qualification – Manufacturing plan;

— Original Clauses 8 "Control of machine operating system software", Clauses 9 "Auxiliary tools and contamination" and Clauses 11 "External environmental controls" have been merged to a new Clause 6 "PBF equipment requirements";

— New structure and examples for the manufacturing plan, consistent with the new workflow;

— 9.2 "Documentation" is added to the manufacturing plan;

— Figure 1 was updated.

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Introduction

Operation and production control of machines and processes for powder bed fusion (PBF) in critical applications are described in this document. Critical applications can be subject to regulation. This is one way of meeting quality requirements. The supplier/manufacturer can also ensure quality of components through validation and verification of the AM process, as per internal procedures and requirements, and inspection of the CTQs (critical to quality) of the AM components, as per customer agreement.

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Australian Standard®

Additive manufacturing of metals — Process characteristics and performance — Metal powder bed fusion process to meet critical applications

Section 1 Scope

WARNING — This document does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this document to establish appropriate safety, health, and environmental practices and determine the applicability of regulatory limitations prior to use.

This document covers the operation and production control of metal powder bed fusion (PBF) machines and processes for areas of critical applications. A critical application is assumed once failing parts-functionality leads to immediate threats.

This document is applicable for production of parts and mechanical test specimens using powder bed fusion (PBF) with both laser and electron beams.

Specifications related to specific fields of application are provided in respective standards.

Section 2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 8573-1, *Compressed air — Part 1: Contaminants and purity classes*

ISO/ASTM 52900, *Additive manufacturing — General principles — Fundamentals and vocabulary*

ISO/ASTM 52907, *Additive manufacturing — Feedstock materials — Methods to characterize metal powders*

ISO 17295, *Additive manufacturing — General principles — Part positioning, coordinates and orientation*

ISO/ASTM 52926-1, *Additive manufacturing of metals — Qualification principles — Part 1: General qualification of operators*

ISO/ASTM/TS 52930:2021, *Additive manufacturing — Qualification principles — Installation, operation and performance (IQ/OQ/PQ) of PBF-LB equipment*

Section 3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO/ASTM 52900 and ISO/ASTM 52926-1 and the following apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at https://www.electropedia.org/

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