

ISO/ASTM FDIS 52908:2023(E)

ISO/TC 261 & ASTM F 42

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**Additive manufacturing of metals — Finished part properties — Post processing, inspection and testing of parts produced by powder bed fusion**

*Fabrication additive de métaux — Propriétés des pièces finies — Post-traitement, inspection et essais des pièces produites par fusion sur lit de poudre*

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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 documents 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](http://www.iso.org/directives)).

Attention is drawn to the possibility that some of the elements of this document may involve the use of a patent(s). ISO takes no position concerning the evidence, validity or applicability of any claimed patent rights in respect thereof. As of the date of publication of this document, ISO had not received notice of (a) patent(s) which may be required to implement this document. However, implementers are cautioned that this may not represent the latest information, which may be obtained from the patent database available at [www.iso.org/patents](http://www.iso.org/patents). ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see [www.iso.org/patents](http://www.iso.org/patents)).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

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](http://www.iso.org/iso/foreword.html).

This document was prepared by Technical Committee ISO/TC 261, *Additive manufacturing*, in cooperation with ASTM Committee F42, *Additive Manufacturing Technologies*, on the basis of a partnership agreement between ISO and ASTM International with the Objective to create a common set of ISO/ASTM standards on Additive Manufacturing, and 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](http://www.iso.org/members.html).

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## Introduction

~~This document specifies methods for testing and evaluation of metallic parts made by additive manufacturing powder bed fusion processes.~~ As with conventional manufacturing processes (e.g., casting and milling), metallic parts produced by additive manufacturing technologies have critical-to-quality characteristics. These characteristics include density, strength, hardness, surface quality, dimensional accuracy, residual stresses, absence of cracks, voids, and structural homogeneity, which are typically tested in additively manufactured components. The quality of additively manufactured components is essential for functional components produced on an industrial scale. Thus, it is necessary to qualify additive manufacturing processes according to uniform criteria and to apply standardised in-process and post-process testing.

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# Additive manufacturing of metals — Finished part properties — Post processing, inspection and testing of parts produced by powder bed fusion

## 1 Scope

This document specifies requirements for the qualification, quality assurance and post processing for metal parts made by powder bed fusion.

This document specifies methods and procedures for testing and qualification of various characteristics of ~~additively manufactured metal~~metallic parts made by additive manufacturing powder bed fusion processes, in accordance with ISO/ASTM 52927, Classes H and M.

This document is intended to be used by part providers and/or customers of parts.

This document specifies qualification procedures where appropriate to meet defined quality levels.

## 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.

~~<std>ISO 3369:2006, Impermeable sintered metal materials and hardmetals — Determination of density</std>~~

~~<std>ISO 6892-1, Metallic materials — Tensile testing — Part 1: Method of test at room temperature</std>~~

~~<std>ISO 18265, Metallic materials — Conversion of hardness values</std>~~

~~<std>ISO 21920-1:2021, Geometrical product specifications (GPS) — Surface texture: Profile — Part 1: Indication of surface texture</std>~~

~~<std>ISO/ASTM 52900, Additive manufacturing — General principles — Fundamentals and vocabulary</std>~~

~~<std>ISO/ASTM 52907, Additive manufacturing — Feedstock materials — Methods to characterize metal powders</std>~~

~~<std>ISO 3369:2006, Impermeable sintered metal materials and hardmetals — Determination of density~~

~~ISO 6892-1, Metallic materials — Tensile testing — Part 1: Method of test at room temperature~~

~~ISO 18265, Metallic materials — Conversion of hardness values~~

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[ISO/ASTM 52900, Additive manufacturing — General principles — Fundamentals and vocabulary](#)

[ISO/ASTM 52907, Additive manufacturing — Feedstock materials — Methods to characterize metal powders](#)

[ISO/ASTM 52920, Additive manufacturing — Qualification principles— Requirements for industrial additive manufacturing sites](#)

~~[ISO/ASTM 52927:2022, Additive manufacturing — General principles — Main characteristics and corresponding test methods](#)~~

~~[ISO/ASTM 52928, Additive manufacturing — Feedstock materials — Powder life cycle management](#)~~

~~[ISO/ASTM 52927, Additive manufacturing — General principles — Main characteristics and corresponding test methods](#)~~

[ISO/ASTM 52928, Additive manufacturing — Feedstock materials — Powder life cycle management](#)

[ISO/ASTM/TS 52930, Additive manufacturing — Qualification principles — Installation, operation and performance \(IQ/OQ/PQ\) of PBF-LB equipment](#)

~~[ANSI/ASME Y14.5, Dimensioning and Tolerancing](#)~~

~~[ASTM B311, Standard Test Method for Density of Powder Metallurgy \(PM\) Materials Containing Less Than Two Percent Porosity](#)~~

~~[ANSI/ASME Y14.5, Dimensioning and Tolerancing](#)~~

[ASTM B311, Standard Test Method for Density of Powder Metallurgy \(PM\) Materials Containing Less Than Two Percent Porosity](#)

[ASTM B962, Standard Test Methods for Density of Compacted or Sintered Powder Metallurgy \(PM\) Products Using Archimedes' Principle](#)

~~[ASTM E8/E8M, Standard Test Methods for Tension Testing of Metallic Materials](#)~~

~~[DIN 50125, Testing of metallic materials — Tensile test pieces](#)~~

[ASTM E8/E8M, Standard Test Methods for Tension Testing of Metallic Materials](#)

[DIN 50125, Testing of metallic materials — Tensile test pieces](#)

### 3 Terms and definitions

For the purposes of this document, the terms and definitions given in [ISO/ASTM 52900](#) and the following apply.

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

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

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

**3.1**  
~~powder particle size~~  
~~particle size~~  
 average diameter of powder particles under consideration

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**3.2**  
 grain size  
~~metallurgical grain size~~  
 average grain size in the metallurgical structure when viewed in cross-section

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## 4 Abbreviations

The abbreviations listed in Table 2 are used throughout this document.

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**Table 2 — Abbreviations**

AM	additive manufacturing
EDX	energy-dispersive X-ray spectroscopy
SEM	scanning electron microscope
CAD	computer aided design
NDT	non-destructive testing
QA	quality assurance
COC	certificate of conformance
ASL	approved supplier list
HIP	hot isostatic pressing
EDM	electrical discharge machining
PBF	powder bed fusion

## 5 Qualification

### 5.1 General

The manufacturer shall demonstrate the capability to produce AM parts to the requirements given in the purchase specification. The inspection and testing described in the following clauses is performed and assessed using the methods and acceptance criteria stated in the purchase specification.

NOTE Inspection and testing methods are specified at the design stage, as described in ISO/ASTM 52927, and are in accordance with the relevant standards and regulations that are required for the conformity of that part.

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### 5.2 Part validation

Validation that the part produced complies with the requirements of the purchase specification shall be captured in a qualification record. A typical 'qualification record', shall consist of:

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- technical documentation relating to part(s) produced;

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- facility documentation;
- quality assurance (QA) documentation.

### 5.3 Technical documentation relating to part(s) produced

The technical documentation relating to part(s) produced shall contain:

- part specification in accordance with [ISO/ASTM 52927](#), which includes inspection methods, associated plans, acceptance criteria, and representative quality indicators where applicable;
- feedstock specification, test results and declaration of conformity in accordance with [ISO/ASTM 52907](#);
- material specification (consolidated product material properties specification);
- manufacturing plan (e.g., see [ISO/ASTM 52904](#));
- records of destructive and non-destructive testing;
- inspection record for the part (in accordance with the purchase specification);
- other documentation required by the purchaser, regulation or product standard (e.g. material identification, labelling, product instructions).

NOTE 1 For some materials, there is a singular specification that controls both feedstock and material properties, such as metallurgical and mechanical properties.

NOTE 2 Technical specifications for metal powders are addressed in [ISO /ASTM 52907](#).

### 5.4 Facility documentation

#### 5.4.1 Additive manufacturer documentation requirements

Facility documentation requirements for industrial manufacturing sites are addressed in [ISO/ASTM 52920](#).

For the purpose of this document, an outline of the relevant manufacturing plant and equipment shall be provided at the request of the buyer. The outline shall include the major items of equipment used for post processing, inspection, and testing (including details of geographical location).

The following facility documentation shall be provided:

- records of equipment qualification in accordance with [ISO/ASTM TS 52930](#);
- records of powder lifecycle management in accordance with [ISO/ASTM 52928](#).

The requirements in this subclause are met where a quality management system is in place (see [5.5](#)).

#### 5.4.2 Subcontractor documentation requirements

Where the manufacturer subcontracts post-processing and/or testing activities, the manufacturer shall be able to indicate the conditions under which these activities are subcontracted and shall provide a purchase specification for the operations involved.

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