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Additive manufacturing — General principles — Main characteristics and corresponding test methods

Fabrication additive — Principes généraux — Principales caractéristiques et méthodes d'essai correspondantes

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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*, in cooperation with ASTM Committee F42, *Additive Manufacturing Technologies*, on the basis of a partnership agreement between ISO and ASTM International with the aim 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).

The first edition of this document cancels and replaces the first edition of ISO 17296-3:2014, which has been technically revised and merged with document ASTM F3122-14 and therefore re-designated and renamed to ISO/ASTM 52927.

The main changes are as follows:

— the main types of materials (metallic, polymers and ceramics) are separated in specific annexes following the main part containing general requirements;

— This document includes the contents of ASTM F3122-14 and merges them with (formerly) ISO 17296-3.

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.

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Introduction

Additive manufacturing is a process of joining materials to make parts from 3D model data, usually layer upon layer, as opposed to subtractive manufacturing and formative methodologies. It is used to manufacture prototypes and production parts.

This document aims to offer recommendations and advice to machine manufacturers, feedstock suppliers, AM system users, part providers, and customers, to improve communication between these stakeholders concerning test methods.

This document has been developed within a set of consistent documents from terminology to test methods and data exchange.

Additive manufacturing processes require the selective application of thermo-physical and/or chemical mechanisms to generate the part. Thus, it is possible to produce parts with different characteristics, depending on the method and the process parameters used. However, complete testing of all characteristics for every part is neither cost-effective nor technologically feasible. Therefore, when formulating parts specifications, the nature and scope of testing is an important issue.

This document provides an overview of test methods for the characterization of the mechanical properties of metals, ceramics and polymers. It lists all the applicable standards based on specimens manufactured in a traditional process and gives the complement applicable when these specimens are manufactured by additive manufacturing.

At the time of publication of this document, the state of the art does not allow to describe all these specificities related to additive manufacturing. This document will therefore be regularly revised in order to incorporate the knowledge acquired in the field of additive manufacturing.

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Additive manufacturing — General principles — Main characteristics and corresponding test methods

1 Scope

This document specifies the principal requirements applied to the testing of parts produced by additive manufacturing processes.

This document

— identifies quality characteristics for feedstock and parts and the corresponding test procedures,

— provides the specific procedures to build specimens using additive manufacturing process, and

— recommends the scope and content of test and supply agreements.

This document is aimed at machine manufacturers, feedstock suppliers, AM system users, part providers, and customers to facilitate the communication on main quality characteristics. It applies wherever additive manufacturing processes are used.

NOTE It is the intent to include, in future versions of this document, other characteristics such as thermal properties, electrical requirements and physical and physico-chemical properties based upon material types.

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 17295[1)], *Additive manufacturing — General principles — Part positioning, coordinates and orientation*

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

ISO/ASTM 52909, *Additive manufacturing — Finished part properties — Orientation and location dependence of mechanical properties for metal powder bed fusion*

ISO/ASTM 52915, *Specification for additive manufacturing file format (AMF) Version 1.2*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO/ASTM 52900 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/

1) ISO 17295 cancels and replaces ISO/ASTM 52921-13 which is still available at: https://www.astm.org/f2921-13r19.html.

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