

Additive manufacturing - Test artifacts - Geometric capability assessment of additive manufacturing systems (ISO/ASTM 52902:2019)

## EESTI STANDARDI EESSÕNA

## NATIONAL FOREWORD

See Eesti standard EVS-EN ISO/ASTM 52902:2019 sisaldab Euroopa standardi EN ISO/ASTM 52902:2019 ingliskeelset teksti.	This Estonian standard EVS-EN ISO/ASTM 52902:2019 consists of the English text of the European standard EN ISO/ASTM 52902:2019.
Standard on jõustunud sellekohase teate avaldamisega EVS Teatajas	This standard has been endorsed with a notification published in the official bulletin of the Estonian Centre for Standardisation.
Euroopa standardimisorganisatsioonid on teinud Euroopa standardi rahvuslikele liikmetele kättesaadavaks 25.09.2019.	Date of Availability of the European standard is 25.09.2019.
Standard on kättesaadav Eesti Standardikeskusest.	The standard is available from the Estonian Centre for Standardisation.

Tagasisidet standardi sisu kohta on võimalik edastada, kasutades EVS-i veebilehel asuvat tagasiside vormi või saates e-kirja meiliaadressile [standardiosakond@evs.ee](mailto:standardiosakond@evs.ee).

ICS 25.030

Standardite reprodutseerimise ja levitamise õigus kuulub Eesti Standardikeskusele

Andmete paljundamine, taastekitamine, kopeerimine, salvestamine elektroonsesse süsteemi või edastamine ükskõik millises vormis või millisel teel ilma Eesti Standardikeskuse kirjaliku loata on keelatud.

Kui Teil on küsimusi standardite autorikaitse kohta, võtke palun ühendust Eesti Standardikeskusega:  
Koduleht [www.evs.ee](http://www.evs.ee); telefon 605 5050; e-post [info@evs.ee](mailto:info@evs.ee)

The right to reproduce and distribute standards belongs to the Estonian Centre for Standardisation

No part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying, without a written permission from the Estonian Centre for Standardisation.

If you have any questions about copyright, please contact Estonian Centre for Standardisation:

Homepage [www.evs.ee](http://www.evs.ee); phone +372 605 5050; e-mail [info@evs.ee](mailto:info@evs.ee)

Additive manufacturing - Test artifacts - Geometric  
capability assessment of additive manufacturing systems  
(ISO/ASTM 52902:2019)

Fabrication additive - Pièces types d'essai - Évaluation  
de la capacité géométrique des systèmes de fabrication  
additive (ISO/ASTM 52902:2019)

Additive Fertigung - Testkörper - Allgemeine Leitlinie  
für die Bewertung der geometrischen Leistung  
additiver Fertigungssysteme (AM-Systeme)  
(ISO/ASTM 52902:2019)

This European Standard was approved by CEN on 7 July 2019.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN-CENELEC Management Centre or to any CEN member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the CEN-CENELEC Management Centre has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Republic of North Macedonia, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and United Kingdom.



EUROPEAN COMMITTEE FOR STANDARDIZATION  
COMITÉ EUROPÉEN DE NORMALISATION  
EUROPÄISCHES KOMITEE FÜR NORMUNG

CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels

## European foreword

This document (EN ISO/ASTM 52902:2019) has been prepared by Technical Committee ISO/TC 261 "Additive manufacturing" in collaboration with Technical Committee CEN/TC 438 "Additive Manufacturing" the secretariat of which is held by AFNOR.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by March 2020, and conflicting national standards shall be withdrawn at the latest by March 2020.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN shall not be held responsible for identifying any or all such patent rights.

According to the CEN-CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Republic of North Macedonia, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

## Endorsement notice

The text of ISO/ASTM 52902:2019 has been approved by CEN as EN ISO/ASTM 52902:2019 without any modification.

# Contents

Page

<b>Foreword</b>	<b>v</b>
<b>1 Scope</b>	<b>1</b>
<b>2 Normative references</b>	<b>1</b>
<b>3 Terms and definitions</b>	<b>1</b>
<b>4 Significance and use</b>	<b>2</b>
4.1 General	2
4.2 Comparing results from one machine	2
<b>5 General principles for producing artifacts</b>	<b>2</b>
5.1 General	2
5.2 Need to use feedstock conforming to a material specification	2
5.3 Need to undertake artifact building according to a documented process specification	2
5.4 File formats and preparation	3
5.5 Download files	3
5.6 Discussion of file conversion	3
5.7 AMF preferred (with conversion instructions/ resolutions)	3
5.8 Need for test specification and test process	3
5.9 Quantity of test artifacts	3
5.10 Position and orientation of test artifacts	4
5.11 Considerations for orientation	4
5.12 Labelling	4
5.13 Coverage	4
5.14 Arrays	4
5.15 Part consolidation	4
5.16 Supports and post processing	5
<b>6 General principles for measuring artifacts</b>	<b>5</b>
6.1 General	5
6.2 Measure parts as built	5
6.3 Measurement strategy	5
6.4 Measurement uncertainty	6
<b>7 Artifact geometries</b>	<b>6</b>
7.1 General	6
7.2 Accuracy	6
7.2.1 Linear artifact	6
7.2.2 Circular artifact	8
7.3 Resolution	10
7.3.1 Resolution pins	10
7.3.2 Resolution holes	11
7.3.3 Resolution rib	13
7.3.4 Resolution slot	15
7.4 Surface texture	17
7.4.1 Purpose	17
7.4.2 Geometry	17
7.4.3 Measurement	18
7.4.4 Reporting	19
7.4.5 Considerations	19
7.5 Labelling	20
7.5.1 Purpose	20
7.5.2 Geometry	20
7.5.3 Considerations	21
<b>Annex A (informative) Example artifact configurations</b>	<b>22</b>
<b>Annex B (informative) Measurement techniques</b>	<b>25</b>

**Annex C (informative) Measurement procedures.....28**

**Annex D (informative) List of specimen names and sizes.....34**

**Bibliography.....36**

This document is a preview generated by EVS

## 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 be the subject of patent rights. 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 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.

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).

# Additive manufacturing — Test artifacts — Geometric capability assessment of additive manufacturing systems

## 1 Scope

This document covers the general description of benchmarking test piece geometries along with quantitative and qualitative measurements to be taken on the benchmarking test piece(s) to assess the performance of additive manufacturing (AM) systems.

This performance assessment can serve the following two purposes:

- AM system capability evaluation;
- AM system calibration.

The benchmarking test piece(s) is (are) primarily used to quantitatively assess the geometric performance of an AM system. This document describes a suite of test geometries, each designed to investigate one or more specific performance metrics and several example configurations of these geometries into test piece(s). It prescribes quantities and qualities of the test geometries to be measured but does not dictate specific measurement methods. Various user applications can require various grades of performance. This document discusses examples of feature configurations, as well as measurement uncertainty requirements, to demonstrate low and high grade examination and performance. This document does not discuss a specific procedure or machine settings for manufacturing a test piece, which are covered by ASTM F 2971 and other relevant process specific specifications.

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

ISO/ASTM 52921, *Standard terminology for additive manufacturing — Coordinate systems and test methodologies*

ASME B46.1, *Surface Texture (Surface Roughness, Waviness and Lay)*

## 3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO/ASTM 52900 and ISO/ASTM 52921 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>
- IEC Electropedia: available at <http://www.electropedia.org/>