TECHNICAL REPORT

ISO/ASTM TR 52917

First edition
2022-08

Additive manufacturing — Round robin testing — General guidelines

Fabrication additive — Essais interlaboratoires — Lignes directrices générales

Reference number
ISO/ASTM TR 52917:2022(E)

© ISO/ASTM International 2022



COPYRIGHT PROTECTED DOCUMENT

© ISO/ASTM International 2022

All rights reserved. Unless otherwise specified, or required in the context of its implementation, no part of this publication may be reproduced or utilized otherwise in any form or by any means, electronic or mechanical, including photocopying, or posting on the internet or an intranet, without prior written permission. Permission can be requested from either ISO at the address below or ISO's member body in the country of the requester. In the United States, such requests should be sent to ASTM International.

ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11

Email: copyright@iso.org
Website: www.iso.org

ASTM International
100 Barr Harbor Drive, PO Box C700
West Conshohocken, PA 19428-2959, USA
Phone: +610 832 9634
Fax: +610 832 9635
Email: khooper@astm.org
Website: www.astm.org

Published in Switzerland

© ISO/ASTM International 2022 – All rights reserved

Contents

Page

Foreword ..... **iv**
Introduction ..... **v**
1 Scope **1**
2 Normative references **1**
3 Terms and definitions **1**
4 RRS task force and RRS manager **1**
5 Develop a round robin study **2**
5.1 Suggested steps to develop a round robin study 2
5.2 Identify the goal of the study and select the round robin task force 2
5.3 Prepare scope of round robin study 2
5.4 Develop a manufacturing plan 3
5.5 Process control document 5
6 Develop a measurement and testing plan **5**
7 Solicit participants **5**
8 Send the manufacturing plan to participants **5**
9 Execute a pilot run with select participants **6**
10 Execute a full scale production run **6**
11 Data handling **7**
12 Prepare study report **7**
13 Record keeping **7**
Bibliography **8**

© ISO/ASTM International 2022 – All rights reserved

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).

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).

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.

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, 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.

© ISO/ASTM International 2022 – All rights reserved

Introduction

This document outlines the steps with regard to aspects of design to conduct and run a round robin study (RRS) to assess the degree of variability in an additive manufacturing material or process.

The RRS can be used to study variations arising from the AM production process including feedstock, machine operation, process control, and post processing. The RRS plan can identify various aspects of the AM process to be considered to execute the study so that it is possible to maximize the consistency of the results based on the objective of the study.

Additive manufacturing is still a developing technology and round robin studies play an important role to help generate the information needed to populate materials engineering databases, determine design allowables, and improve processing and post-processing consistency in order to drive maturation.

The result of the RRS is a qualitative or quantitative assessment of the material used or the process variability, rather than the assessment of accuracy and precision of a specific test method from an inter-laboratory study. Additionally, RRS can involve other entities besides laboratories.

Round robin studies differ from normal research studies by having different participants, each trying to undertake a nominally identical process. The aim is to determine the effect of the desired variables on the process outcome. The output can be used for different applications such as the demonstration of process robustness or for derivation of material property data. A well-conducted RSS does not guarantee small variability, but ensures that any observed variability is indicative of the material or process, not poor study design.

© ISO/ASTM International 2022 – All rights reserved

Additive manufacturing — Round robin testing — General guidelines

1 Scope

This document is focused on the management of the round robin study (RRS) and can provide guidance for the scope development, planning, and execution of the RRS study. It can provide guidance to identify the feedstock, machine operations, process controls, and post-processing operations prior to running the study. RR organizers can identify controlled and free parameters in the study. This document can also provide guidance on the selection and use of test methods that can be applicable. The RRS investigates the variations found in AM parts. The outcome of the study can be used to improve the maturation of AM technologies.

A RRS, as described in this document, is different from an inter-laboratory comparison because an inter-laboratory study establishes the variability in a measurement method when undertaken by multiple users on a well-controlled artefact.

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*

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

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

3.1
process control document
document recording process variables, procedure followed, and building notes

4 RRS task force and RRS manager

The RR task force is the executive team responsible for establishing the goals and scope of the round robin study. The procedure presented in this guide can consist of sequences to help the RRS task force in preparing the RRS. Once the RRS has been developed, an RRS manager can be assigned to assist participants with operational questions.

The RRS task force can be the sole arbiter of technical issues.

© ISO/ASTM International 2022 – All rights reserved