SLOVENSKI STANDARD
oSIST prEN ISO/ASTM 52921:2019

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Aditivna proizvodnja - Splošna načela - Standardna praksa za pozicioniranje, koordinate in orientacijo delov (ISO/ASTM DIS 52921:2019)

Additive manufacturing - General principles - Standard practice for part positioning, coordinates and orientation (ISO/ASTM DIS 52921:2019)

Additive Fertigung - Grundlagen - Standardpraxis der Positionierung, Koordinaten und Ausrichtung des Bauteils (ISO/ASTM DIS 52921:2019)

Fabrication additive - Principes généraux - Pratique normalisée pour le positionnement, les coordonnées et l'orientation de la pièce (ISO/ASTM DIS 52921:2019)

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Additive manufacturing — General principles — Standard practice for part positioning, coordinates and orientation

Terminologie normalisée pour la fabrication additive — Systèmes de coordonnées et méthodes d'essai

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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).

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.

The committee responsible for this document is 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.

This second edition of ISO/ASTM 52921 replaces first edition (ISO/ASTM 52921:2013), which has been technically revised.

The main changes compared to the previous edition are as follows:

— Terms and definitions that are included in ISO/ASTM 52900:2019 "Additive manufacturing — General principles — Fundamentals and vocabulary" have been removed from this document and instead referred to ISO/ASTM 52900;

— Since the list of terms and definitions have been removed from this edition, it is therefore not a standard terminology anymore, and therefore it has been renamed so that the title describes the actual content of the standard;

— The remaining normative content of the document including the annex have been consolidated into one single normative document;

— Specifications of some aspects of initial build orientation and orthogonal orientation notation have been integrated in the text body of the document;

— The coordinate system for additive manufacturing with horizontal z-positive build direction is described and illustrated.

Introduction

Although many additive manufacturing systems are based heavily upon the principles of Computer Numerical Control (CNC), the coordinate systems and nomenclature specific to CNC are not sufficient to be applicable across the full spectrum of additive manufacturing equipment. This International Standard expands upon the principles of ISO 841 and applies them specifically to additive manufacturing. Although this International Standard is intended to complement ISO 841, if there should arise any conflict, it is this International Standard shall have priority for additive manufacturing applications. For any issues not covered in this International Standard, the principles in ISO 841 may be applied.

Additive manufacturing — General principles — Standard practice for part positioning, coordinates and orientation

1 Scope

This document provides specifications and illustrations for the positioning and orientation of parts with regards with coordinate systems and testing methodologies for additive manufacturing (AM) technologies in an effort to standardize the method of representation used by AM users, producers, researchers, educators, press/media, and others, particularly when reporting results from testing of parts made on AM systems. Specifications included cover coordinate systems and the location and orientation of parts. It is intended, where possible, to be compliant with the principles of ISO 841 and to clarify the specific adaptation of those principles for additive manufacturing.

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 52900:2019, *Additive manufacturing — General principles — Fundamentals and vocabulary*

ISO 841:2001, *Industrial automation systems and integration — Numerical control of machines — Coordinate system and motion nomenclature*

3 Terms and definitions

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

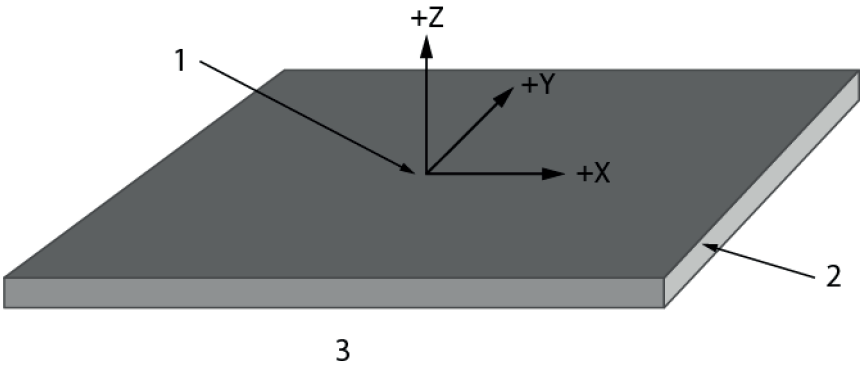
— IEC Electropedia: available at http://www.electropedia.org/

4 Coordinate systems for additive manufacturing machines with different build directions

The location and orientation of a part within the build volume shall be specified using coordinates in a three-dimensional coordinate system. The coordinate system can be Cartisian or otherwise defined by the machine manufacturer. Examples of different types of coordinate systems are illustrated in Figures 1, 2 and 3.

4.1 Coordinate system for additive manufacturing with upwards z-positive build direction

A three-dimesnional Cartesian coordinate system located at the build origin for a generic additive manufacturing process using upwards z-positive building direction, is illustrated as seen from the front of the machine in Figure 1. This is the most common type of coordinate system and is used for processes within all defined additive manufacturing process categories, though other types of coordinate systems can be used for specific process solutions within some process categories.



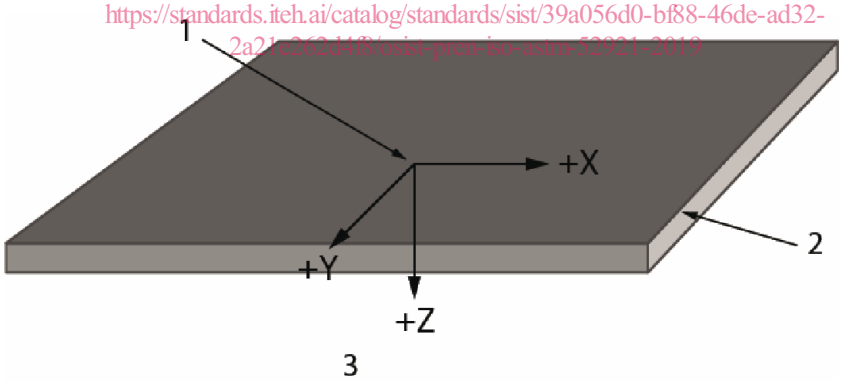
Key

1 Build origin (0,0,0)
2 Build platform
3 Fron of machine

Figure 1 — Cartesian coordinate system for additive manufacturing with upward z-positive building direction

4.2 Coordinate system for additive manufacturing with downwards z-positive build direction

A three-dimensional Cartesian coordinate system located at the build origin for a generic additive manufacturing process using downwards z-positive building direction, is illustrated as seen from the front of the machine in Figure 2. This type of coordinate system is mostly used for certain vat photopolymerization process solutions.



Key

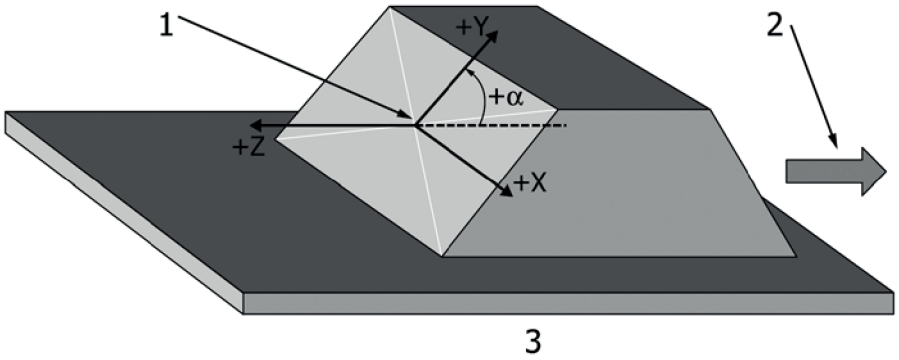
1 Build origin (0,0,0)
2 Build platform
3 Fron of machine

Figure 2 — Cartesian coordinate system for additive manufacturing with downward z-positive building direction

4.3 Coordinate system for additive manufacturing with horizontal z-positive build direction

A three-dimensional Cartesian coordinate system located at the machine origin for a generic additive manufacturing process using horozontal z-positive building direction, is illustrated as seen from the

front of the machine in Figure 3. This type of coordinate system is mostly used for certain binder jetting process solutions.



Key

1 Build origin (0,0,0)
2 Direction of movement
3 Fron of machine

Figure 3 — Cartesian coordinate system for additive manufacturing with horizontal z-positive building direction

5 Rule for positive rotation

Positive rotation directions around the *x-*, *y-*, or *z*-axis shall be as specified in ISO 841. In practice this means that the positive direction will be the same as the direction of the fingers of the right hand if gripping around the axis when the thumb points in the positive direction of the axis. Positive rotation directions around the axis in a coordinate system is illustrated in Figure 4.

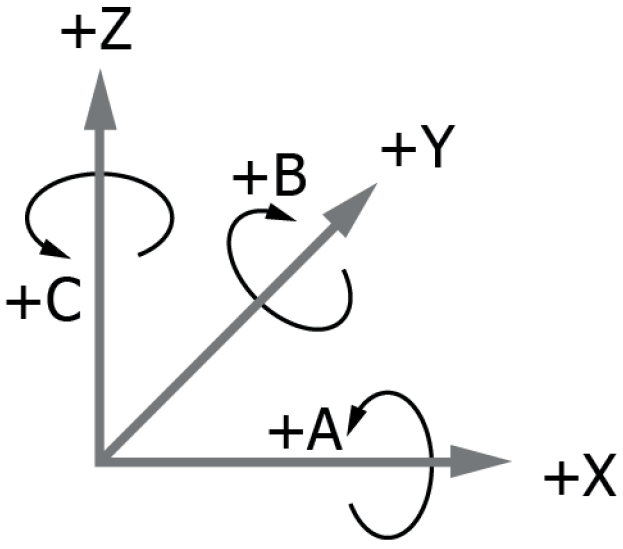


Figure 4 — Right hand rule for positive rotations with reference to the direction from the origin

6 Bounding box

An example part geometry, in this case a pressure plate, enclosed by its bounding box is illustrated in Figure 5.