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Additive manufacturing for aerospace — Process characteristics and performance —

Part 2: Directed energy deposition using wire and arc

Fabrication additive pour l'aérospatiale — Caractéristiques et performances du procédé —

Partie 2: Dépôt de matière sous énergie concentrée utilisant du fil et un arc

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Foreword

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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).

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Additive manufacturing for aerospace — Process characteristics and performance —

Part 2: Directed energy deposition using wire and arc

1 Scope

This document specifies requirements for the additive manufacturing of metallic parts with directed energy deposition (DED) in the aerospace industry.

Within the application scope of this document, wire is used as feedstock, and arc processes (gas-shielded metal arc processes (MIG/MAG/GMAW), tungsten inert gas processes (TIG/GTAW), plasma arc processes (PAW)) are used as the main energy source.

This document is to be used in conjunction with the engineering documents, if required by the engineering authority.

This document does not address health and safety issues.

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 14175, *Welding consumables — Gases and gas mixtures for fusion welding and allied processes*

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

ISO/ASTM 52926-5, *Additive manufacturing of metals — Qualification principles — Part 5: Qualification of operators for DED-Arc*

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 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/

3.1
preliminary additive procedure specification
pAPS
document containing the required variables of the additive manufacturing process which has to be qualified

Note 1 to entry: The pAPS contains process specific parameters and will form a section of the manufacturing plan.

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3.2
additive procedure specification
APS
document that has been qualified and provides the required variables of the additive manufacturing process to ensure repeatability during production

Note 1 to entry: The APS contains process specific parameters and will form a section of the manufacturing plan.

Note 2 to entry: Further information on the qualification of processes can be found in the ISO 15614 series.

3.3
key process variable
KPV
aspects of the manufacturing process that may impact the capability to meet the specified requirements that include physical, chemical, metallurgical, mechanical and dimensional properties

[SOURCE: SAE AMS 7005:2019-01-31, 8.2.1]

3.4
engineering authority
organization that has the responsibility for the structural integrity or maintenance of airworthiness of the hardware and compliance with all relevant documents

[SOURCE: ISO 24394:2023, 3.8, modified — "design" was removed from the term and Notes to entry have been deleted.]

3.5
build platform
base which provides a surface upon which the building of the part/s, is started and supported throughout the build process

[SOURCE: ISO/ASTM 52900:2021, 3.3.5]

3.6
substrate
base metal utilized to initiate the deposition of material that can remain a portion of the preform

[SOURCE: SAE AMS 7005:2019-01-31, 8.2.1, modified — “may” has been replaced with “can”. Note 1 to entry added]

Note 1 to entry: A substrate can be integral to the final part whereas a build platform will be removed from the final part.

3.7
point of use
location where the process is performed e.g. gas nozzle or torch, trailing nozzle, gas chamber (if used)

4 Requirements for the feedstock

The properties of the feedstock to be used shall be specified. In order to guarantee a constant delivery quality ISO 544, ISO 15792 (all parts) and ISO 14344 can be used. Typical properties include:

— feedstock diameter;

— chemical composition;

— surface condition;

— storage conditions;

— traceability (e.g. heat lot, batch).

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