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Additive manufacturing of metals — Qualification principles — Installation, operation and performance (IQ/OQ/PQ) of PBF-EB equipment

Fabrication additive de métaux — Principes de qualification — Installation, fonctionnement et performances (IQ/OQ/PQ) des équipements PBF-EB

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Contents

Page

Foreword ..... **iv**
Introduction ..... **v**
1 Scope **1**
2 Normative references **1**
3 Terms and definitions **1**
4 Abbreviated terms **1**
5 General concepts **1**
6 Elements of process validation **2**
6.1 General 2
6.2 Installation qualification (IQ) 2
6.2.1 General 2
6.2.2 Specific considerations for installation qualification 2
6.3 Operational qualification (OQ) 3
6.3.1 General 3
6.3.2 Specific considerations for operational qualification 3
6.4 Performance qualification (PQ) 4
6.4.1 General 4
6.4.2 Specific considerations for performance qualification 4
7 Revalidation **5**

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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).

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 machine-centric process. This document provides recommended practices for machine-related process qualification for serial production of metal parts produced with the powder bed fusion, by electron beam process (PBF-EB/M). Since this process is very similar to the PBF-LB/M this document references ISO/ASTM TS 52930 pointing only the differences on the validation processes. This document is addressed to organizations that already have a comprehensive quality system in place.

While this document is process specific, it is intended to apply to any industry with strict quality requirements. In such industries, it is not possible to complete machine qualification without ensuring repeatable production of the desired process result, given the current state of AM process knowledge. Operational quality and part performance quality sections are included for this reason.

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Additive manufacturing of metals — Qualification principles — Installation, operation and performance (IQ/OQ/PQ) of PBF-EB equipment

1 Scope

This document addresses installation qualification (IQ), operational qualification (OQ), and performance qualification (PQ) issues directly related to the additive manufacturing system that has a direct influence on the consolidation of material. The first three elements of process validation, process mapping, risk assessment, and validation planning, are necessary pre-conditions to machine qualification, however, they are outside the scope of this document.

This document covers issues directly related to the AM equipment and does not cover feedstock qualification or post processing beyond powder removal.

Physical facility, personnel, process and material issues are only included to the extent necessary to support machine qualification.

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/TS 52930, *Additive manufacturing — Qualification principles — Installation, operation and performance (IQ/OQ/PQ) of PBF-LB equipment*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO/ASTM 52900, ISO/ASTM TS 52930 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 http://www.electropedia.org/

4 Abbreviated terms

For the purpose of this document the abbreviated terms in ISO/ASTM TS 52930 apply.

5 General concepts

In accordance with ISO/ASTM TS 52930, assurance of product quality is derived from careful attention to many factors including selection of parts and materials, product and process design, control of the process, equipment installation and maintenance, and in-process and end-product testing. By managing these factors, a machine user can establish confidence that all manufactured units from successive manufacturing lots will be acceptable.

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