



AEROSPACE MATERIAL SPECIFICATION

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Machine Qualification for Fusion-Based Metal Additive Manufacturing

RATIONALE

Metal additive manufacturing (AM) machine qualification requirements are process intensive. This document is intended to provide technical information on the requirements for qualifying a metal AM machine that is suitable for producing aerospace-grade material. Thus, the intended users of this document are organizations that will directly produce these aerospace-grade parts, or by those responsible for overseeing their production and therefore have a vested interest in verifying the performance of additive manufacturing machines.

1. SCOPE

This standard has notes/guidance narratives interspersed throughout. These notes/guidance narratives are identified by a header and by text in *italics*.

This standard defines a series of requirements that results in a specific AM machine qualified to produce material (see *GN1*) in compliance to an aerospace materials specification. The machine control and/or configuration types are discussed in the next sections. The industry (including AIA and ASTM) generally acknowledges that there are three qualification milestones for AM machines; nevertheless, this document will focus only on the initial two stages, namely:

- Installation Qualification (IQ): Producing objective evidence to show that all key aspects of the process equipment and ancillary system installation adhere to the AM Part Producer specification and that the recommendations of the supplier of the equipment are suitably considered; this is tied to a specific machine serial number.
- Operational Qualification (OQ): Establishing sufficient process control to maintain stable material performance and demonstrating that the material specification requirements can be met; this is also tied to a specific machine serial number (see *GN2*).

[GN1] Guidance Notes:

For the purposes of this document, "material" refers to consolidated material produced during the AM process, not to be confused with the raw feedstock.

[GN2] Guidance Notes:

Qualification does not end with OQ. Discussion on the final qualification milestone, Performance Qualification (PQ) is outside the scope of this document, although an overview is provided in 9.1. Similarly, Material Qualification (MQ) is summarized in brief as part of the PQ process. It is important to note that each of these qualification milestones may have slightly different considerations based on the machine control and/or configuration types.

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