



AEROSPACE MATERIAL SPECIFICATION

AMS7031™

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Batch Processing Requirements for the Reuse of
Used Powder in Additive Manufacturing of Aerospace Parts

RATIONALE

Release of a new process specification where none before had been published.

1. SCOPE

1.1 Purpose

This specification prescribes process requirements for batch processing of used, metal powder originating from an existing additive manufacturing process workflow for reuse in subsequent additive manufacturing of aerospace parts in non-closed loop additive manufacturing machines. Such powders may be pre-alloyed or commercially pure. This specification is not limited to a specific additive manufacturing process workflow as the originating source of material to be reused. It is intended to define those procedures and requirements necessary to achieve required cleanliness and performance of metal powder feedstock to be reintroduced into the same additive manufacturing process from which such powder originated. This specification is intended to be used in conjunction with relevant AMS powder specifications and AMS process specifications for additive manufacturing.

Unless otherwise specified, powder prepared for reuse following this specification is intended to be conforming in physical and chemical attributes as defined by the originating virgin powder specification for the purposes of producing aerospace parts, providing equivalent characteristics and properties as specified by the corresponding AMS material specification.

1.2 Application

This specification should be applied to the solid-state processing of used, metal powder for reuse in the additive manufacturing of aerospace parts. Typical applications for used powder include but are not limited to powder bed fusion, directed energy deposition, or binder jetting additive manufacturing processes. Powders processed in accordance with this specification are typically but not limited to Fe, Ni, Co, Al, Cu, or Ti base alloys or commercially pure metal powder.

This document applies to two different use case scenarios. The first is limited to cases where producers of aerospace parts recover, recondition, blend, and desorb used powder from their own additive manufacturing process and return it as labeled and traced feedstock for reuse in subsequent production of aerospace parts. In this scenario the parts producer is also the powder processor preparing used powder for reuse. The second use case scenario is limited to situations where producers of aerospace parts recover powder from their own additive manufacturing process and supply it to a third-party processor who reconditions, blends, desorbs, and labels powder prior to returning it to the originating part producer. In this scenario the parts producer is not the powder processor preparing used powder for reuse but is still performing the initial step of powder recovery.

This document is not intended to be used in the scenario where a third party collects, reconditions, and makes available for sale processed reuse powder feedstock to a customer different than the one initially generating the used powder.

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Documents

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1.3 Safety - Hazardous Materials

While the materials, methods, applications, and processes described or referenced in this specification may involve the use of hazardous materials, this specification does not address the hazards which may be involved in such use. It is the responsibility of the user to ensure familiarity with the safe and proper use of any hazardous materials and to take necessary precautionary measures to ensure the health and safety of all personnel involved.

2. APPLICABLE DOCUMENTS

The issue of the following documents in effect on the date of the purchase order form a part of this specification to the extent specified herein. The supplier may work to a subsequent revision of a document unless a specific document issue is specified. When the referenced document has been cancelled and no superseding document has been specified, the last published issue of that document shall apply.

2.1 SAE Publications

Available from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or +1 724-776-4970 (outside USA), www.sae.org.

AMS7002	Process Requirements for Production of Metal Powder Feedstock for Use in Additive Manufacturing of Aerospace Parts
AMS7025	Metal Powder Feedstock Size Classifications
AS7766	Terms Used in Aerospace Methods Specifications

2.2 ASTM Publications

Available from ASTM International, 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428-2959, Tel: 610-832-9585, www.astm.org.

ASTM B214	Standard Test Method for Sieve Analysis of Metal Powders
ASTM B215	Standard Practices for Sampling Metal Powders
ASTM B243	Standard Terminology of Powder Metallurgy
ASTM E11	Standard Specification for Woven Wire Test Sieve Cloth and Test Sieves

2.3 ISO Publications

Copies of these documents are available online at <https://webstore.ansi.org/>.

ISO 17025	General requirements for the competence of testing and calibration laboratories
ISO/ASTM 52900	Additive manufacturing - General principles - Terminology

3. TECHNICAL REQUIREMENTS

3.1 Process Control Documentation (PCD)

The PCD shall be established by the parts producer when establishing a powder reuse strategy as part of an additive manufacturing process PCD. The PCD describing the preparation of used powder for reuse shall be substantiated with respect to the specified requirements and authorized by the Cognizant Engineering Organization (CEO). Once authorized, all aspects of the PCD are a fixed process and any changes to the PCD shall require substantiation prior to the change being implemented into production. Changes to the PCD that can affect a Key Process Variable (KPV) must be authorized by the CEO. All other changes to the PCD must be acceptable to the CEO. The PCD shall address the following aspects of preparing used powder for reuse:

3.1.1 Key Process Variables

The parts producer shall establish values, tolerances, and measurement frequency for all Key Process Variables of the recovery, reconditioning, blending, and desorption processes, including but not be limited to the variables defined in Appendix A. These values and tolerances shall be substantiated with respect to the specified requirements and be authorized by the CEO. Any change to a Key Process Variable shall be authorized by the CEO. For each reuse powder lot, the processor shall establish parameters for process control factors that will consistently produce powder meeting the requirements of the applicable material specification and this specification. These used materials, controls, processes, and production parameters shall constitute the approved procedure to prepare used powder and shall be used for the recovery, reconditioning, blending, and desorption of subsequent powder and powder samples.

3.1.1.1 Process variables may be omitted from the PCD when substantiated by the parts producer and authorized by the CEO.

3.1.1.2 The values of any Key Process Variables considered proprietary by the parts producer may be assigned a code designation and recorded by the parts producer in an internal document. Each variation in such variable value shall be assigned a modified code designation.

3.1.2 Unplanned Process Delays and Interruptions

To substantiate process delays and interruptions not already described in the PCD, the parts producer shall demonstrate through documented testing or other suitable means that a process delay or interruption does not affect the quality of the reuse powder. This documentation shall be provided to the CEO prior to final acceptance of reuse powder.

3.1.3 Process Setup Verification

Requirements (e.g., checklists, secondary steps, additional personnel oversight) shall be included in the PCD to facilitate operator selection of the correct machine settings and parameters.

3.1.4 Calibration and Verification Plan

Procedures for calibration and verification shall be established and substantiated by the parts producer to measure and adjust, at a minimum, all variables required by the recovery, reconditioning, blending, and desorption machine equipment, as well as those identified as required in Appendix B. The plan shall include procedures, values, tolerances, and frequency of verification of each variable specific to the application.

All calibrations and verifications performed shall be recorded via manual or electronic means and maintained for a period compliant with requirements of the approved PCD.

When authorized by the CEO, Calibration and Verification variables may be omitted when substantiated to have no impact on the ability for the reuse powder to meet the specified requirements.

3.1.5 Maintenance Plan

Procedures for maintenance shall be established and substantiated that include a checklist of activities, instructions to perform each activity, and the frequency by which that activity shall be completed. At a minimum, maintenance plans shall include all activities, instructions, and equipment that are required by the recovery, processing, blending, and desorption machine equipment manufacturer(s). Additional maintenance items unique to the installation, facility, or specific application shall also be documented and included in the maintenance plan. All maintenance performed shall be recorded via physical or digital means and maintained for a period compliant with requirements of the ordering documents. Maintenance plans shall include all wear and life limited items that have been determined critical to consistent and reliable processing.

3.1.6 Moisture and Contamination Control Documents

The parts producer shall have contamination control documents in the form of, but not limited to, procedures, plans, command media, or work instructions, to identify and eliminate sources of powder contamination throughout the reuse process. The parts producer shall also have moisture control documents in similar form and implementation as above to identify and eliminate sources of humidity, condensation, and other moisture to the powder surfaces throughout the reuse process. The moisture and contamination control documents shall address but are not limited to each of the following PCD elements:

- Substantiation methods to demonstrate powder is specification compliant and free of excess contaminants and moisture
- Powder identification during storage and prior to/post recovery
- Powder recovery methods and tools (manual, automatic, or pneumatic)
- Material (or grade) changes
- Powder handling, transport, and conveyance
- Air classification, screening
- Blending
- Packaging (shipment to third party and/or quarantine storage)
- Powder storage conditions
- Ancillary equipment
- Process isolation and equipment location

The contamination and moisture control documents shall be embedded in the PCD. Changes to either the moisture or contamination control plans must be authorized by the CEO prior to implementation.

Moisture and contamination control documents established as part of the AM-specific process control document may encompass and establish procedures used when executing AMS7031.

Additional recommended elements of a powder handling and storage document can be found in Appendix E.

3.1.7 Process Environments

The process environment throughout all steps of preparing used powder for reuse shall be specific to the powder chemistry being handled and established in the PCD. The need for an inerted environment or tolerance to atmospheric exposure during powder recovery shall be determined when establishing process controls to ensure compliance with the associated powder specification.

3.1.8 Input Gas Purity

If gases are specified for use at any step of the process, each of the specified gases utilized shall be a minimum of 99.9% purity and ordered to an industry standard or internal purchasing specification. The dew point of the gas shall be -60 °F (-51 °C) or lower and either dew point temperature or moisture content shall be specified in the gas certificate. The gas delivery auxiliary equipment, including piping transmitting the gas, shall provide for gas delivery without contamination. The composition of the gas supply shall be certified and recorded in internal documentation.

3.2 Powder Recovery Process

Powder recovery from both AM equipment and completed parts requires attention to possible sources of material contamination and when applicable, atmospheric degradation via moisture and oxygen exposure.

3.2.1 Recovery Process Equipment Approval

Used powder sources that originate at the terminus of an existing additive manufacturing process may be recovered by hand with simple tools or aided using automated or mechanized equipment. The parts producer shall demonstrate that powder, when recovered from an additive manufacturing process, conforms to all PCD requirements, including KPVs defined in A.1 and all calibration requirements in B.1. The CEO shall define the requirements and the parts producer shall provide objective evidence to demonstrate those requirements are met. This substantiation shall be authorized by the CEO prior to implementation into operation. For mechanized powder recovery methods, these machines shall meet the following requirements at a minimum:

- Calibration and verification plan is executed and complies with the requirements of 3.1.4.
- Preventive maintenance is performed, documented, and complies with the requirements of 3.1.5.

3.3 Powder Reconditioning Process

Powder to be processed may undergo modifications that do not affect the underlying bulk chemistry before returning as available feedstock for the same additive manufacturing process from which it originated. These modifications may include, but are not limited to, its particle size distribution, surface chemistry, or rheological properties. The processes used to achieve this transformation from a waste stream into a functional feedstock shall be defined in the PCD and acceptable to the CEO.

3.3.1 Reconditioning Process Equipment Approval

The parts producer shall demonstrate that powder, when reconditioned using each piece of equipment, conforms to all PCD requirements, including KPVs defined in A.2 and all calibration requirements in B.2. The CEO shall define the requirements and the processor shall provide objective evidence to demonstrate those requirements are met. This substantiation shall be authorized by the CEO prior to implementation into operation. For mechanized powder reconditioning methods, these machines shall meet the following requirements at a minimum:

- Calibration and verification plan is executed and complies with the requirements of 3.1.4.
- Preventive maintenance is performed, documented, and complies with the requirements of 3.1.5.

3.4 Powder Blending Process

Powder machine batches may be combined to batch process when performing reconditioning operations. Alternatively, fully processed reuse powder may be blended with other fully processed reuse powder or virgin powder when permitted by the additive manufacturing PCD and authorized by the CEO. Characteristics of powder constituents in a blend, as well as the process of blending itself, require strict entrance and exit process criteria.

3.4.1 Powder Blending Process Equipment Approval

- The parts producer shall demonstrate that powder, when blended using equipment for that purpose, conforms to all PCD requirements, including KPVs defined in A.3 and all calibration requirements in B.3. The CEO shall define the requirements and the processor shall provide objective evidence to demonstrate those requirements are met. This substantiation shall be authorized by the CEO prior to implementation into operation. For mechanized powder blending methods, these machines shall meet the following requirements at a minimum:
 - Calibration and verification plan is executed and complies with the requirements of 3.1.4.
 - Preventive maintenance is performed, documented, and complies with the requirements of 3.1.5.

3.4.2 Blending Process Environment

Blending of powder shall be performed in an enclosed vessel.

3.5 Powder Desorption Process

Powder to be prepared for reuse may undergo treatment intended to remove particle surface moisture or volatile organics that have condensed or accumulated as a result of the AM process, storage, handling, or subsequent reuse processes. The removal methods of such compounds may include, but are not limited to, oven drying, vacuum drying, or powder fluidization via forced gas. If required as part of a powder handling and storage plan or reuse process PCD, powder desorption shall be used at the appropriate step to maintain processability of powder throughout the reuse workflow and to show conformance of the processed reuse powder to rheological, chemistry, and or specific moisture content requirements detailed by the applicable powder specification. The necessary steps and order of operations for powder processing to include desorption during the reuse process shall be defined in the PCD and authorized by the CEO.

3.5.1 Powder Desorption Process Equipment Approval

The powder processor shall demonstrate that desorption of powder using each piece of equipment conforms to all PCD requirements, including KPVs defined in A.4 and all calibration requirements in B.4. The CEO shall define the requirements and the processor shall provide objective evidence to demonstrate those requirements are met. This substantiation shall be authorized by the CEO prior to implementation into operation. For mechanized powder desorption methods, these machines shall meet the following requirements at a minimum:

- Calibration and verification plan is executed and complies with the requirements of 3.1.4.
- Preventive maintenance is performed, documented, and complies with the requirements of 3.1.5.

3.6 Powder Chemistry Uniformity, Surface Reactive Elements

All machine batches of material to be blended shall meet the chemistry listed for “surface reactive elements” in the applicable powder specification. The final, processed reuse powder lot chemistry shall not be resultant of blending powder with constituents that exceed limits for any surface reactive elements when specified in the applicable powder specification. Compositional doping by powder mixing is not permitted.

3.7 Powder Chemistry Uniformity, Bulk Non-Reactive

All machine batches of material to be blended shall meet the chemistry listed for “bulk non-reactive” in the applicable powder specification. The final, processed reuse powder lot chemistry shall not be resultant of blending powder with constituents that exceed limits for any bulk non-reactive elements when specified in the applicable powder specification. Compositional doping by powder mixing is not permitted.

3.8 Powder Chemistry Uniformity, Bulk Reactive

All machine batches of material to be blended shall meet the chemistry listed for “bulk reactive elements” in the applicable powder specification. The final, processed reuse powder lot chemistry shall not be resultant of blending powder with constituents that exceed limits for any bulk reactive elements when specified in the applicable powder specification. Compositional doping by powder mixing is not permitted.

3.9 Particle Size Distribution

All used powder to be prepared for reuse shall be identified with an upper and lower size range as it was originally sourced when virgin feedstock. This size range is established when procured by an applicable powder or part specification or when referencing AMS7025 (e.g., 15 to 63 μm). Powder prepared for reuse shall meet all original size limits and tolerances prior to acceptance as reuse powder for an AM process.

Mixing of machine batches or reuse powder lots with different, virgin size ranges shall not be permitted.

Example:

One virgin powder lot procured with a size class of 10 to 45 μm per AMS7025 and another virgin powder lot procured with a size class of 15 to 63 μm per AMS7025 shall not be combinable regardless of use history or current particle size distribution state.

Unless otherwise agreed upon by the CEO and parts producer, powder recovered from one AM process under control of a PCD may not be mixed with powder recovered from another AM process of the same kind, but under control of a different PCD.

3.10 Powder Recovery, Processing, Blending, and Desorption Approval

Process approval moves beyond equipment approval and incorporates all key process variables of the PCD including final environment management, size classification, powder pedigree tracing, and blending procedures and frequencies. The CEO shall approve the requirements (e.g., particle size distribution, surface reactive element limits, number of print cycle exposures, etc.) and the processor shall demonstrate the capability to meet those requirements through each step of the recovery, reconditioning, blending, and desorption process. This substantiation shall be authorized by the CEO prior to implementation of the process for preparing used powder for reuse.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for Inspection

The parts producer recovering used powder and generating processed reuse powder themselves or through a third party shall supply all samples for tests. These samples are to be collected as outlined in the PCD in cases prior to blending. Additionally, samples shall be collected of the final processed reuse powder lot to show conformance to the requirements of the applicable powder specification before acceptance. The parts producer shall be responsible for the performance of all required tests. The CEO reserves the right to sample and to perform any confirmatory testing deemed necessary to ensure the powder conforms to specification requirements.

4.2 Approval

The PCD (3.1) for preparing used powder for reuse shall be established by the parts producer and approved by the CEO before reuse powder is supplied to produce parts. Any changes to the PCD shall be authorized by the CEO prior to implementation.

4.3 Classification of Tests

All technical requirements are acceptance tests and failure to meet in-process or post-process requirements shall be cause for in-process or final lot rejection, respectively. In-process tests shall be performed on used powder batches prior to blending with other used or virgin powder. Prior to process implementation, substantiation of the PCD shall be confirmed by qualification tests performed on the final lot of processed reuse powder and require a requalification when a change in: ingredients, processing, or ingredients and processing requires re-approval as in 4.2. Reuse powder lot acceptance tests shall be performed to show conformance to powder specification requirements after completion of all processing steps and in advance of use by the same, original additive manufacturing process, or when the CEO deems confirmatory testing to be required of the parts producer.

4.4 Sampling and Testing

All in-process requirement verification tests shall be performed on samples, taken in accordance with ASTM B215, from each in-process lot prior to blending. All final lot acceptance tests shall be performed on samples, taken in accordance with ASTM B215, from the blended reuse powder lot at the final particle size distribution, or if included as part of the approved PCD, after powder desorption. Sufficient powder shall be sampled from each batch or lot to perform all required tests in duplicate.

4.4.1 Retained Sample

A sample shall be taken of each reuse powder lot at the completion of preparing used powder for reuse and retained in a sealed container stored in a controlled environment appropriate to the containment vessels used. Sample mass shall be documented as part of the PCD and agreed upon between the parts producer and CEO in advance of implementing the process to prepare used powder for reuse. Samples are to be collected and retained in both cases when testing is required with each implementation of the process and when a reduced testing schedule has been established (see 4.4.2 and 4.4.3). Powder samples are to be retained so long as the reuse powder continues to be in circulation as feedstock for the AM process. Samples retained from each reuse powder lot shall be stored until the sampled powder no longer remains available to the AM process (either consumed through parts production or quarantined and discarded as waste) and acceptance testing of AM processed material is complete, or for a period of time agreed upon between the parts producer and the CEO.

4.4.2 Frequency, In-Process Testing

Sampling and testing shall be performed on all in-process lots prior to blending for confirmation of in-process requirements. This requirement for testing frequency may be waived by the CEO and replaced with a reduced testing frequency after such a schedule is substantiated to show sufficient capability to predict changes in as-measured powder characteristics for the combined fixed AM process and process to prepare used powder for reuse. This reduced testing frequency must be shown to adequately identify when an in-process lot of powder will become non-conforming to specified requirements so as to quarantine material from continued processing or consumption as feedstock by the AM process. The CEO may require confirmatory testing be performed of samples retained from each in-process lot that is not tested as part of this reduced testing schedule.

4.4.3 Frequency, Post-Process Testing

4.4.3.1 Qualification Tests

Qualification tests shall be performed of powder sampled at the final particle size distribution after the first implementation of the fixed PCD of the process to prepare used powder for reuse. Such testing shall substantiate aspects of the process, including but not limited to, effective controls for contamination, monitoring of changes in surface and bulk reactive elements, and effective implementation of as-intended modifications to powder via reconditioning.

4.4.3.2 Acceptance Tests

Acceptance tests of final reuse powder lots shall be performed at the completion of each implementation of the process to prepare used powder for reuse, prior to final lot acceptance as feedstock for use by the AM process. The CEO may waive this requirement and replace it with a reduced frequency of post-process testing after it has been demonstrated that both the AM process and subsequent process to prepare used powder for reuse adequately control for changes in tested powder characteristics (e.g. powder bulk reactive and non-reactive chemistries do not test outside of the original limits specified by the applicable powder specification via sources of in-process contamination). Confirmatory testing of retained samples may be required by the CEO to demonstrate continued conformance to processed powder outside of this reduced testing frequency.

4.4.4 Powder Requirements

The applicable AM process PCD shall include at a minimum:

- a. Composition requirements, including the classification of each specified element as: bulk non-reactive, bulk reactive, or surface reactive for testing purposes (see 3.6, 3.7, and 3.8). These classifications shall be specified in the powder specification and be identified as key process variable of the AM process specification.
- b. Particle size requirements.
- c. Test methods for composition, particle size, and any additional powder attributes, if specified in the associated powder specification.

4.4.4.1 Sampling for Chemical Analysis

Elements shall be tested at the appropriate step of preparing used powder for reuse.

Bulk non-reactive elements, defined in the applicable powder specification, whose measured composition are not dependent on time at temperature or by surface area to volume, shall be measured in loose or consolidated powder form as a qualification activity of the implementation of the PCD. Bulk non-reactive elements are to then be measured at a frequency agreed upon by the CEO and the parts producer.

Bulk reactive elements, when defined in the applicable powder specification, shall be measured of each in-process lot of powder before blending and again at the final, processed reuse powder product form. The testing shall be performed as a qualification activity of the implementation of the PCD and at each interval of the implementation of the process. However, a reduced frequency after initial qualification of the process to prepare used powder for reuse may be implemented as agreed upon by the CEO and the parts producer.

Surface reactive elements, when defined in the applicable powder specification, shall be measured of each in-process lot of powder before blending and again at the final reuse product form. The testing shall be performed as a qualification activity of the implementation of the PCD and at each interval of the implementation of the reuse process. However, a reduced frequency after initial qualification of the process to prepare used powder for reuse may be implemented as agreed upon by the CEO and the parts producer.

“Other elements”, when defined in the applicable powder specification, shall be measured in loose or consolidated powder form as a qualification activity of the process to prepare used powder for reuse. If additional elements not listed in the applicable powder specification are to be measured, that list shall be agreed upon by the parts producer and the CEO in advance of the process implementation and documented as part of the PCD. Subsequent to process qualification, the complete list of specified “other elements” are to then be measured at a frequency agreed upon by the CEO and the parts producer.

4.5 Blending of Multiple Lots of Powder

Powder blending of lots into a new powder feedstock lot is allowed when:

All lots (virgin or used) conform to the same powder requirements defined in the powder or part specifications including chemistry, morphology, PSD, AM process history (including but not limited to the same build file, machine configuration, and number of prior build cycles), and reuse limits (if applicable) as defined in the PCD. Each individual machine batch is tested to prove conformance to all surface reactive and bulk reactive element requirements prior to blending. This individual machine batch testing requirement may be waived by the CEO when a reduced sampling and testing schedule has been established (see 4.4.2).

4.5.1 Blending of Multiple Lots of Powder from Multiple Process PCDs Exception

Used machine batches resulting from fabrication of multiple parts at a single part producer using the same powder requirements defined in powder or part specifications including chemistry, morphology, and PSD but with different AM process histories may be blended if authorized by the CEO. Blending of powder from different AM process histories (i.e., separate part PCDs) and different CEOs is prohibited.

4.6 Resampling and Retesting

If any sample used in the acceptance or conformance tests fails to meet the specified requirements, disposition of the powder may be based on the results of testing three additional samples for each original nonconforming specimen. Failure of any retest sample to meet the specified requirements shall be cause for rejection of the powder represented. In the event of a testing malfunction not conforming to the analysis method, a one-to-one replacement test is allowed.

4.7 Reports

Unless otherwise specified, the processor of powder shall furnish with each completed lot of reuse powder a report showing the results of tests to determine conformance to the acceptance test requirements for final composition, size, and any additional properties specified as acceptance tests in applicable powder material specifications. This report shall include at a minimum:

- The country where the material was originally melted or atomized in accordance with AMS7002.
- Final heat or (if blended) lot identification.
- The title and revision of this specification (AMS7031 Rev. - and AMS Powder Specification Rev. -).
- The supplier's product designation (part number or manufacturing number).
- Quantity.
- Powder was processed in accordance with AMS7031.
- If applicable, powder blend composition and pedigree.
- PSD ranges and tolerances.

Unless otherwise specified, only acceptance tests performed on reuse powder lots are required to be reported and shall be reported as the mean of the determinations. In-process testing for composition (4.4.2) on individual in-process lots shall be documented and available for audit.

Reports generated for powder processed per AMS7031 shall be furnished to the parts producer and retained as part of the process control document of the associated AM process. The powder processor and parts producer may be the same entity and therefore the reports are to be retained by the parts producer at the requirement of the associated PCD for the AM process.

Certificates of conformance to the associated powder specification of final lots of reuse powder when processed by a third party may be requested by the parts producer.

4.8 Additional Quality Requirements for Part Producers

For processors that are ISO 9001 registered, but not registered to AS9100 (see 3.1.1). The additional requirements outlined in 4.8 apply:

4.8.1 Support

4.8.1.1 Resources

4.8.1.1.1 Monitoring and Measuring Resources

4.8.1.1.1.1 Measurement Traceability

The part producer shall establish, implement, and maintain a process for the recall of monitoring and measuring equipment requiring calibration or verification.

The part producer shall maintain a register of the monitoring and measuring equipment. The register shall include the equipment type, unique identification, location, and the calibration or verification method, frequency, and acceptance criteria.

NOTE: Monitoring and measuring equipment can include, but are not limited to: test hardware, test software, automated test equipment (ATE), and plotters used to produce verification data. It also includes personally owned and customer supplied equipment used to provide evidence of product and service conformity.

Calibration or verification of monitoring and measuring equipment shall be carried out under suitable environmental conditions (refer to ISO 9001 or AS9100).

4.8.1.2 Awareness

The part producer shall ensure that persons doing work under the part producer's control are aware of:

- a. Relevant quality management system documented information and changes thereto;
- b. Their contribution to product or service conformity;
- c. Their contribution to product safety;
- d. The importance of ethical behavior.

4.8.1.3 Documented Information

4.8.1.3.1 Control of Documented Information

When documented information is managed electronically, data protection processes shall be defined (e.g., protection from loss, unauthorized changes, unintended alteration, corruption, physical damage).

4.8.1.3.2 For the control of documented information, the part producer shall address the following activity, as applicable:

- Prevention of the unintended use of obsolete documented information by removal or by application of suitable identification or controls if kept for any purpose.

4.8.2 Operation

4.8.2.1 Operational Planning and Control

4.8.2.1.1 Configuration Management

The part producer shall plan, implement, and control a process for configuration management as appropriate to the part producer and its products and services in order to ensure the identification and control of physical and functional attributes throughout the product lifecycle. This process shall:

- Control product identity and traceability to requirements, including the implementation of identified changes;
- Ensure that the documented information (e.g., requirements, design, verification, validation, and acceptance documentation) is consistent with the actual attributes of the products and services.

4.8.2.2 Control of Externally Provided Processes, Products, and Services

4.8.2.2.1 General

- a. The parts producer shall be responsible for the conformity of all externally provided processes, products, and services, including from sources defined by the CEO.
- b. The parts producer shall ensure, when required, that CEO-designated or approved external providers, including process sources (e.g., special processes), are used.
- c. The parts producer shall identify and manage the risks associated with external provision of processes, products and services, as well as the selection and use of external providers.
- d. The parts producer shall require that external providers apply appropriate controls to their direct and sub-tier external providers to ensure that requirements are met.