



AF 9100:2026

Aerospace Quality Management System

PROCEDURE

Special-Process Qualification and Continuing Control

AF-PR-9100-016

FIRST EDITION

30 September 2026 | English master text

Publication identity and application

Control	Publication value
Title	Special-Process Qualification and Continuing Control
Document code	AF-PR-9100-016
Edition / language	FIRST EDITION / English master text
Companion edition identity	30 September 2026
Controlling source	AF 9100:2026 — FIRST EDITION — 29 September 2026
Responsible owner function	Process qualification authority
Primary source anchors	8.5.1.2, 18, 25, L
Delivery status	Prepared implementation companion. Actual approval, adoption, effectivity and operational decisions are recorded separately.

Use and document-control boundary

This companion implements the supplied AF 9100 requirement basis without changing the original standard. Its process allocation, examples, checklists and record design are authored implementation material. Actual mission or product limits, specialist procedures, permissions and genuine observations must be completed before consequential use. Applicable source minima and independent decision conditions cannot be reduced by this companion.

The printed edition date identifies the companion series; it is not evidence that later preparation, review or operational decisions occurred on that date. New support codes in this set are proposed allocations for controlled registration. Established AF-IG-9100-001, AF-FAQ-9100-001 and AF-TR-9100-001 identities are retained; earlier files, the corporate master list and ASTRA codes are not overwritten.

Equivalent combined or digital records are permitted when all required fields, relationships, authority and history remain intact. A completed PDF field or typed name is not evidence of an authenticated approval. Blank records in this delivery contain no invented applicant, signature, event or result.

Contents and reading route

Publication identity and application	2
Contents and reading route	3
1 Scope, responsibility and source priority	4
2 Trigger, inputs and handover	4
3 Operating sequence	4
4 Decision, interruption and escalation	5
5 Required records and receiving checks	5
6 Worked case and adverse challenge	5
Appendix A — Controlling source and evidence	7
Source tables — complete field and decision payloads	11
Appendix B — Local implementation and release	12

Select actual scope → complete application criteria → use the applicable procedure and technical book → capture authentic evidence → evaluate every applicable condition → obtain the required independent decision. Document availability does not establish implementation or conformity.

1 Scope, responsibility and source priority

Applies to the responsible function and exact evaluated object selected from the source. Use only the duties triggered by actual activity and retained responsibility.

Boundary	Required implementation decision
Object and route	Identify ORG, PRD, SVC, PRC, PER, SUB or CAB separately. Combined records do not merge outcomes.
Activity	Apply source technical modules by performed or retained responsibility, including relevant outsourced work.
Authority	Technical release, employer task permission, independent attestation and statutory authorization remain distinct.
Source priority	AF 9100:2026 and all compatible binding obligations control. This companion does not import ASTRA programme rules or external normative schemes.

2 Trigger, inputs and handover

Trigger: Initial process approval, changed essential variable, transfer, excursion or loss of continuing validity.

Accountable process owner: Process qualification authority. Actual named appointments and deputies are maintained locally.

Input to verify	Required output / receiving function
Exact request, object and source profile	Accepted scope and controlled work package, or a reasoned hold/refusal.
Current people, authority, data and equipment	Authorized assignment and evidence-access boundary.
Original execution, adverse evidence and source history	Attributable result, identified limitations and required action.
Relevant source clocks and actual event times	Genuine due/completion history and timely recipient communication.

3 Operating sequence

3.1 Define the entire route

Identify material and geometry ranges, site, equipment, software, preparation, principal processing and downstream treatments that can influence required hidden properties.

3.2 Fix qualification criteria

Record output characteristics, approved variable window, worst or bounding combinations, trials, repetitions, inspection, destructive checks and uncertainty before evaluating qualification.

3.3 Demonstrate actual capability

Use representative inputs, operators, tools, environment and configurations. Preserve every failed or excluded run and explain limits of coupons, samples and family inference.

3.4 Approve bounded use

Issue the exact qualified route, people, equipment, work instructions, monitoring and change triggers. Machine or supplier qualification does not certify every output.

3.5 Monitor each consequential run

Record variables, alarms, witness samples, control checks and genealogy. Evaluate drifting trends and mixtures of variables rather than relying only on an average result.

3.6 Contain and requalify

Trace excursions to affected output and review whether inspection detects the relevant hidden effect. Define full or partial requalification after change and verify actual receiving results before resumption.

4 Decision, interruption and escalation

Unqualified variables or unobservable required properties prevent unrestricted production acceptance.

State or event	Action and limit
Evidence valid and criteria met	Record the bounded result and pass it to the authorized receiving function; do not enlarge scope.
Evidence missing, invalid or inconclusive	Keep the dependent conclusion not yet demonstrated / HOLD, preserve the reason and define competent next work.
Valid evidence demonstrates failure	Record nonconformity and protect the affected population; follow actual technical disposition and source status controls.
Trigger genuinely absent	Record the exclusion and its approved responsibility basis. Resource shortages do not justify N/A.
Interrupted or changed work	Preserve prior state and actual configuration; complete impact and revalidation before claiming completion.

5 Required records and receiving checks

Document	Record purpose
AF-FR-9100-022	Process Qualification, Execution and Requalification
AF-FR-9100-018	Calibration, Method Validity and Uncertainty Budget
AF-FR-9100-023	Sample, Verification Campaign and Technical Report
AF-FR-9100-009	Supplier Flow-Down, Custody and Transfer

At handover the receiver checks object, scope, current version, original evidence, open conditions, true event chronology and the action they may authorize. An email sent, field marked complete or invoice paid is not acceptance of that handover.

6 Worked case and adverse challenge

Synthetic scenario: A bonding run exceeds its approved out-time but the bond looks normal.

Required reasoning: Preserve the excursion and assess its material mechanism through competent technical disposition. Appearance cannot erase a hidden-property uncertainty.

Challenge before local use	Expected behavior
Missing essential input	Dependent conclusion remains held; no favorable default.
Wrong configuration or performer	Detect the mismatch and reassess relevant evidence.
Expired or conflicted authority	Block the prohibited assignment or decision; later renewal cannot validate earlier unauthorized work.

Challenge before local use	Expected behavior
Failed mandatory condition with high total score	No compensation; preserve the failure and required action.
Correction without original history	Reject an apparent closure that erases relevant earlier evidence.

Appendix A — Controlling source and evidence

Source: AF 9100:2026, Aerospace Quality Management System, FIRST EDITION, 29 September 2026; supplied 131-page PDF. Source page references below locate the original publication. These excerpts are read with the complete applicable standard; local implementation sequences do not replace it.

8.5.1.2 Special-process validation and control

SOURCE p. 24 | Normative when applicable

8.5.1.2(a) Special processes shall have approved methods, qualified personnel, suitable equipment, validated parameter windows and defined acceptance and monitoring criteria. Qualification shall demonstrate that relevant output characteristics can be achieved reproducibly under the proposed operating conditions.

8.5.1.2(b) The organization shall define conditions for maintaining approval, monitoring essential variables, retaining records and requalification. Changes to material, geometry, equipment, software, consumables or location shall be evaluated. Final visual inspection alone shall not replace control of hidden or irreversible characteristics.

Required evidence: Special-process qualification dossier; approved parameter ranges; operator qualifications; run records; requalification decisions.

18.1 Material and process specification control

SOURCE p. 36 | Normative when applicable

18.1(a) Materials shall be specified by properties, condition, composition, processing history and acceptance requirements appropriate to intended use. Equivalent material claims shall be reviewed by the design authority and supported by relevant evidence.

18.1(b) The organization shall control batch identity, storage, shelf life, contamination, substitutions and supplier changes. Recycled or reclaimed content shall meet the same applicable performance and traceability obligations; environmental benefit shall not substitute for material qualification.

Required evidence: Material specifications; batch certificates and verification; substitution approvals; storage and life records.

18.2 Metals, castings, forgings and heat treatment

SOURCE p. 36 | Normative when applicable

18.2(a) Processes shall control relevant material state, geometry, essential variables, equipment condition, thermal history and inspection. Defects that may not be visible in final inspection shall be addressed through validated process controls and suitable NDT or destructive verification.

18.2(b) Repair, weld blending, additional heat treatment or other disposition shall be authorized and traceable. Mechanical-property test specimens shall be representative of the relevant material and processing. Certificate values without verified relationship to the supplied batch shall not establish acceptance.

Required evidence: Process qualification; batch and thermal records; representative test evidence; repair approvals.

18.3 Composites, polymers, adhesives and bonded structures

SOURCE p. 36 | Normative when applicable

18.3(a) The organization shall control constituent identity, storage, out-time, mixing, surface preparation, lay-up, cure, environmental conditions and handling as relevant. Bond quality shall not be inferred solely from external appearance.

18.3(b) Qualification shall address relevant geometries, defects, aging, moisture, thermal exposure and inspectability. Essential process changes shall trigger requalification review. Traceability shall connect constituent lots, cure or process history, inspection and the final assembly.

Required evidence: Composite or bond qualification; constituent genealogy; process history; inspection capability; change review.

18.4 Additive and digitally driven manufacturing

SOURCE p. 37 | Normative when applicable

18.4(a) Additive manufacturing shall control feedstock, reuse history, machine state, build orientation, parameters, digital file identity, in-process monitoring and post-processing. Qualification shall address location within the build,

material anisotropy, defects and the intended geometry or qualified family.

18.4(b) A qualified machine or material alone shall not qualify every component. Changes to algorithms, slicing, software, feedstock source or post-processing shall be assessed for effects on the qualified process. In-process sensor data shall supplement rather than automatically replace validated acceptance methods.

Required evidence: Build qualification; feedstock history; signed build package; monitoring validation; post-process and acceptance records.

18.5 Electronics, semiconductors and interconnections

SOURCE p. 37 | Normative when applicable

18.5(a) Electronic-part assurance shall address source authenticity, component suitability, assembly processes, handling, ESD, moisture sensitivity, contamination and relevant environmental stresses. Programmable devices shall have controlled design and loaded configuration.

18.5(b) Assembly and inspection shall control soldering, bonding, coatings, connectors and other critical interconnections. Screening and burn-in, where used, shall have a justified purpose and shall not be represented as removing all latent defects. Obsolete or substituted components shall receive impact review.

Required evidence: Component assurance plan; approved parts list; assembly qualification; configuration and screening evidence.

18.6 NDT, inspection capability and probability of detection

SOURCE p. 37 | Normative when applicable

18.6(a) NDT methods shall be qualified for the relevant material, geometry, defect type, size range and access condition. Personnel, equipment, reference artifacts, procedures and environmental conditions shall be controlled.

18.6(b) Where detection capability is used quantitatively in an integrity argument, the organization shall establish a statistically and physically justified evaluation with uncertainty and representative defects. A nominal detectable flaw size or a single successful demonstration shall not establish a probability-of-detection claim.

Required evidence: NDT procedure qualification; personnel authorization; reference-artifact control; detection capability and limitations.

18.7 Surface engineering, cleanliness and contamination-sensitive products

SOURCE p. 37 | Normative when applicable

18.7(a) Coatings, plating, surface treatments, lubrication and cleaning shall be controlled for material compatibility, essential variables, residue, thickness or other relevant characteristics. The organization shall assess effects on fatigue, corrosion, bonding, electrical contact and contamination.

18.7(b) Changes in chemicals, suppliers, bath condition, preparation or cure shall be reviewed. Cleanliness acceptance shall use a defined method and sampling location. A generic statement that an item is “clean” shall not establish conformity to a contamination-sensitive requirement.

Required evidence: Surface-process qualification; bath or chemical controls; test results; cleanliness criteria and records.

25.1 Process identity, scope and essential variables

SOURCE p. 44 | Normative when applicable

25.1(a) The process owner shall define the purpose, inputs, outputs, sequence, equipment, software, materials, personnel, environment and interfaces. Essential variables that can affect conformity shall be identified with approved limits and monitoring methods. Boundaries shall include preparation and downstream steps where they influence hidden characteristics.

25.1(b) Process families may be grouped only through a justified relationship between operating conditions, failure mechanisms and relevant output properties. A machine, operator or material qualification alone shall not qualify every process or product made using it.

Required evidence: Process definition; essential-variable register; qualified family rationale; interface controls.

25.2 Qualification strategy and demonstration

SOURCE p. 44 | Normative when applicable

25.2(a) Before unrestricted use, qualification shall demonstrate that the actual process can achieve specified output criteria under the proposed operating conditions. The plan shall justify samples, extremes, repetitions,

measurement capability, uncertainty and the treatment of failed or excluded runs.

25.2(b) Special processes shall meet Annex L. Service or digital processes shall use representative end-to-end trials appropriate to their failure modes. Simulation may supplement demonstration where its credibility is established, but convenience alone shall not justify removal of necessary physical or operational evidence.

Required evidence: Qualification plan; representative results; method suitability; failed-run disposition; approved process window.

25.3 Capability, stability and statistical interpretation

SOURCE p. 45 | Normative when applicable

25.3(a) The organization shall distinguish process stability, process capability and conformity of an individual output. A capability index shall be used only with sufficient suitable data, a defined estimator, justified grouping, measurement suitability and a distribution or model appropriate to the interpretation.

25.3(b) Control-chart limits shall describe process behavior and shall not replace product specifications. Unstable or dependent data shall not be treated as independent normal observations merely to obtain a favorable index. Low-volume work shall use suitable engineering and verification evidence where statistical capability cannot be established.

Required evidence: Study design; data and model assumptions; stability review; capability calculation; justified alternative evidence.

25.4 Operating approval and release for use

SOURCE p. 45 | Normative when applicable

25.4(a) Process approval shall identify the qualified scope, equipment and site, authorized personnel, approved instructions, parameter limits, inspection requirements, monitoring and requalification triggers. Qualification conditions shall be available at the point of use.

25.4(b) The authority releasing a process for use shall verify closure of blocking deficiencies and adequacy of continuing controls. A process-qualification attestation does not certify every output; product or service release still requires the corresponding acceptance evidence.

Required evidence: Process approval record; released instructions; authorization and limitations; ongoing acceptance controls.

25.5 Monitoring, drift and excursions

SOURCE p. 45 | Normative when applicable

25.5(a) Monitoring shall detect relevant drift, tool wear, environmental changes, material variability, software changes and loss of operator capability. Response plans shall identify the last demonstrated valid state, potentially affected output and conditions requiring immediate hold.

25.5(b) An excursion shall be evaluated against the relevant failure mechanism. Additional inspection may support disposition only when it can detect the potential effect. Restoring process settings or obtaining one conforming sample shall not retrospectively demonstrate conformity of the affected population.

Required evidence: Monitoring records; reaction plan; affected-population trace; technically justified disposition and restart.

25.6 Changes, transfer and requalification

SOURCE p. 45 | Normative when applicable

25.6(a) Requalification review shall follow changes to essential variables, material source, software, equipment, tooling, location, personnel arrangements or inspection method, and adverse trends or significant interruption. The review shall define whether full or partial demonstration is necessary.

25.6(b) Work transferred to another source or site shall demonstrate receiving capability. Partial requalification shall identify evidence retained as valid and explain why unaffected characteristics remain covered. Commercial urgency shall not substitute for receiving-site evidence.

Required evidence: Requalification trigger review; transfer readiness; retained-evidence rationale; actual receiving-site results.

25.7 Process records, traceability and retirement

SOURCE p. 45 | Normative when applicable

25.7(a) Execution records shall link actual inputs, parameters, personnel, equipment, time and output identity to the qualified configuration. Data used to support a process claim shall preserve unsuccessful runs and any authorized corrections. Automated collection shall be verified for completeness and correct mapping.

25.7(b) Withdrawal of process approval shall identify affected work, prohibit unauthorized reuse and preserve records needed for existing products or services. Obsolete tools, software and instructions shall be controlled so that they cannot silently re-enter production.

Required evidence: Traceable process history; automated-data verification; withdrawn approval controls; preserved lifecycle evidence.

L.1 Qualification strategy

SOURCE p. 72 | Normative when applicable

L.1(a) The organization shall define the qualified process, scope, materials, geometries, equipment, site, personnel, essential variables and intended outputs. Qualification shall establish a technically justified operating window and the evidence needed to demonstrate repeatable performance.

L.1(b) The plan shall identify representative test articles, worst-case or bounding conditions, measurement methods, acceptance criteria, sampling rationale and independent review. A supplier's generic capability statement shall not replace a scope-specific qualification.

L.2 Excursion and production disposition

SOURCE p. 72 | Normative when applicable

L.2(a) An excursion outside the approved process window shall identify the affected population from the last demonstrated valid state. The organization shall hold affected outputs and assess the technical consequences using qualified expertise.

L.2(b) Additional inspection may support disposition only when it can detect the relevant effects. If the characteristic is inherently hidden or the inspection is not capable, a favorable inspection shall not erase the excursion. Repair, concession or scrap shall follow authorized technical decisions.

L.3 Requalification triggers

SOURCE p. 72 | Normative when applicable

L.3(a) Triggers shall include relevant changes in material, source, geometry, equipment, software, location, essential parameters, preparation, consumables or inspection method, as well as adverse trends and significant interruption.

L.3(b) A partial requalification shall identify which prior evidence remains valid and why. The approval shall specify effectivity and any initial-production surveillance. Qualification certificates shall not be used beyond the process scope and conditions they actually establish.

L.4 Worked administrative example

SOURCE p. 72 | Definition, explanation or informative example; no new universal limit

L.4(a) Example: an additive-manufacturing supplier changes powder reuse policy and post-processing source. The change review identifies possible effects on porosity, chemistry and mechanical properties. Production release is held while representative builds, material checks and post-process qualification are evaluated against the approved product requirements.

L.4(b) The record identifies both changes rather than attributing the result to a machine already being "qualified". The example intentionally supplies no process temperature, energy-density or material-strength recipe; those values require a qualified material and product-specific engineering basis.

Source tables — complete field and decision payloads

Table L-1 — Qualification dossier contents

Source p. 72 | Required structure when applicable

Topic	Required technical content	Control after approval
Scope and boundaries	Process family; materials; thickness/geometry ranges; product criticality; intended use.	Prevent application outside the demonstrated scope.
Essential variables	Parameters that can alter relevant properties; interactions; approved ranges; measurement capability.	Monitor and record actual values; define excursion response.
Facilities and equipment	Equipment identity; calibration; uniformity or performance checks; utilities; environment.	Maintain condition and reassess after relocation or major repair.
Personnel	Task competence, qualification method, authorization and supervision.	Reassess after change, inactivity or poor performance.
Consumables and inputs	Source, material condition, shelf/out-time, preparation and contamination controls.	Track lots and prevent unauthorized substitution.
Qualification samples	Representativeness, preparation, locations, destructive/NDT methods and acceptance.	Retain the relationship to the qualified process and production.
Results and uncertainty	Actual results, variability, method limitations, uncertainty and deviations.	Use valid evidence; do not hide failed or excluded trials.
Approved process	Released procedure, parameter window, inspection plan and approval authority.	Control revisions and point-of-use access.
Continuing validation	Monitoring, periodic checks, witness samples or audits as justified.	Detect drift before output escapes.
Requalification	Triggers, impact assessment, full/partial basis and required approval.	No unrestricted production until necessary evidence is restored.

Appendix B — Local implementation and release

Readiness condition	Evidence before consequential use
Authority and responsibility	Actual legal operator, owner, competent technical authority, independent reviewer and permitted result class are recorded.
Scope and criteria	Object, configuration, site, period, trigger, every technical value or observable attribute, units and prospective approval are complete.
Evidence and methods	Original accessible evidence, representative observations, valid methods, uncertainty, adverse cases and limitations support the intended conclusion.
People and independence	Competence is current for each task; genuine conflicts, relevant prior work and needed separation have been checked.
Records and tools	Field meanings, unique IDs, original history, access, retention, recovery and actual deployed workflows have passed local validation.
Decision and public use	All relevant blockers are resolved; required independent decision and written permissions precede the exact public claim.
Continuity and handover	Receiving custody, unresolved duties, corrections and historical decisions survive transfer, retirement or provider closure.

Record the completed local readiness and actual authorization in AF-FR-9100-032 or an equivalent controlled record. Preserve the unchanged source standard and each earlier decision basis. A blocked activity may continue only within a genuinely permitted development boundary, not as a provisional conformity certificate.