



AEROSPACE STANDARD

AS9102™**REV. C**Issued 2000-08
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Superseding AS9102B

Technically equivalent writings
published in all IAQG sectors**(R) Aerospace Series - First Article Inspection Requirements**

RATIONALE

This standard was revised to emphasize and enhance the First Article Inspection (FAI) planning, evaluation, and re-accomplishment activities; aligning requirements to the 9100 standard. Additional changes to the standard requirements, definitions, and associated notes were incorporated in response to stakeholder needs.

FOREWORD

To assure customer satisfaction, the aviation, space, and defense industry organizations must produce and continually improve safe, reliable products that meet or exceed customer and regulatory requirements. The globalization of the industry and the resulting diversity of regional/national requirements and expectations have complicated this objective. End-product organizations face the challenge of assuring the quality and integration of products purchased from suppliers throughout the world and at all levels of the supply chain. Industry suppliers face the challenge of delivering products to multiple customers having varying quality requirements and expectations.

The aviation, space, and defense industry established the International Aerospace Quality Group (IAQG) for the purpose of achieving significant improvements in quality, delivery, safety, and reductions in cost throughout the value stream. This organization includes representation from companies in the Americas, Asia/Pacific, and Europe.

This document standardizes FAI process requirements to the greatest extent possible. While primarily developed for the aviation, space, and defense industry, this standard can also be used in other industry sectors where a standardized FAI process is needed.

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1. SCOPE

1.1 General

This standard establishes the requirements for performing and documenting FAI. It is emphasized the requirements specified in this standard are complementary (not alternative) to customer and applicable statutory and regulatory requirements.

1.2 Purpose

The primary purpose of FAI is to verify and validate product realization processes are capable of producing characteristics that meet engineering and design requirements. A well-planned and executed FAI by a multi-disciplinary team (e.g., members from responsible functions) provides objective evidence the manufacturer's processes can produce compliant product; having effectively understood and incorporated the associated requirements.

NOTE: A FAI is not a product acceptance document. While interrelated, FAI and product acceptance are separate activities. The focus of FAI is verification of production processes via assessment of product. FAI and supporting documentation does not provide assurance regarding conformance for product acceptance purposes; neither does the lack of a FAI necessarily imply product is nonconforming to engineering and design requirements.

FAI will:

- Provide confidence, through objective evidence, the product realization processes are capable of producing conforming product.
- Demonstrate the manufacturers and processors of the product have an understanding of the associated requirements.
- Provide assurance of product conformance at the start of production and after changes, as outlined in this standard.

A FAI is intended to:

- Mitigate risks associated with production startup and process changes.
- Reduce future escapes.
- Help ensure product safety.
- Improve quality, delivery, and customer satisfaction.
- Reduce costs and production delays associated with product nonconformances.
- Identify product realization processes not capable of producing conforming characteristics, and initiate and/or validate associated corrective actions.

1.3 Application

This standard applies to organizations and their suppliers responsible for product realization processes that produce the design characteristics of the product. The organization shall flow down the requirements of this standard to suppliers who produce design characteristics.

This standard also applies to suppliers performing special process(es). A Certificate of Conformance (CoC) provided by processors attests to satisfying the requirements. External suppliers providing special process(es) can satisfy this standard's requirements by either:

- Documenting the design characteristics and associated results on a First Article Inspection Report (FAIR).
- Documenting the design characteristics and associated results on a detailed CoC.

This standard applies to assemblies, sub-assemblies, and detail parts including castings, forgings, and modifications to standard catalogue or Commercial-Off-the-Shelf (COTS) items. Each of these items shall have a separate FAI.

Unless contractually required, this standard does not apply to:

- Development and prototype parts that are not considered as part of the first production run.
- Procured standard catalogue item, COTS, or deliverable software. When these items are included in an assembly, they shall be documented in the index of part numbers in an assembly FAIR.

1.4 Informative

If there is a conflict between the requirements of this standard, and customer or applicable statutory/regulatory requirements, the latter shall take precedence.

In this standard, the following verbal forms are used:

- “Shall” indicates a requirement.
- “Should” indicates a recommendation.
- “May” indicates a permission.
- “Can” indicates a possibility or a capability.

Information marked as “NOTE” is for guidance in understanding or clarifying the associated requirement.

2. APPLICABLE DOCUMENTS

The following referenced documents support the application/use of this standard. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies. When a conflict in requirements between this standard and the referenced documents below exist, the requirements of this document shall take precedence.

9100 Quality Management Systems - Requirements for Aviation, Space, and Defense Organizations

9103 Aerospace Series - Quality Management Systems - Variation Management of Key Characteristics

As developed under the auspices of the IAQG and published by various standards bodies [e.g., ASD-STAN, SAE International, European Committee for Standardization (CEN), Japanese Standards Association (JSA)/Society of Japanese Aerospace Companies (SJAC), Brazilian Association for Technical Norms (ABNT)].

ASME Y14.41 Digital Product Definition Data Practices

ISO 9000 Quality management systems - Fundamentals and vocabulary

ISO 16792 Digital Product Definition Data Practices

3. TERMS AND DEFINITIONS

Definitions for general terms can be found in ISO 9000 and the IAQG International Dictionary (located on the IAQG website). An acronym log for this standard is presented in Appendix A. For the purpose of this standard, the following definitions apply.

3.1 ASSEMBLY

A product that is produced by joining two or more detail parts, COTS, standard catalogue item, or sub-assemblies into one item.

3.2 ATTRIBUTE DATA

A result from a characteristic or property that is appraised only as to whether it does or does not conform to a given requirement (e.g., go/no-go, accept/reject, pass/fail).

3.3 BALLOONED DESIGN CHARACTERISTIC

Clear and uniquely identified design characteristic indicated on a ballooned document. The unique identifier may be circled or highlighted for easy visual identification.

3.4 BALLOONED DOCUMENT

An aid used in FAI to identify all the design characteristics, including all documents—e.g., drawings, purchase order, Digital Product Definition (DPD)—typically sequentially numbering the design characteristics and putting a circle around or highlighting the numbered design characteristics.

3.5 BASELINE PART NUMBER

This refers to a part number from the previous FAI or approved configuration, including revision level, to which a partial FAI is performed. An example of an approved configuration is a part produced and verified as conforming product prior to the requirements of this standard.

3.6 COMMERCIAL-OFF-THE-SHELF (COTS) ITEM

Commercially available item intended by design to be procured and utilized without modification (e.g., common electronic components). Any item or assembly meeting all of the following requirements:

- a. Defined by industry, manufacturer, military, or recognized specifications or standards.
- b. Without design modification, specifically for a customer.
- c. Customarily used by the public or industries.
- d. Offered for sale to the public, through catalogues, price list, brochures, stores, or websites.

3.7 DELIVERABLE SOFTWARE

Embedded or loadable airborne, spaceborne, or ground support software or firmware components which are part of an aircraft type design, weapon system, missile, or spacecraft.

3.8 DESIGN CHARACTERISTIC

Dimensional, visual, functional, mechanical, and material features or properties, which describe and constitute the design of the product. These characteristics can be measured, inspected, tested, or verified to determine conformance to the design requirements as specified on the parts list, purchasing document, drawing, or DPD, to which the product is to be produced.

- Dimensional design characteristics include in-process locating features (e.g., additive manufacturing, target-machined or forged/cast dimensions on forgings and castings, weld/braze joint preparation necessary for acceptance of finished joint).
- Material design characteristics include processing output variable (e.g., plating or coating thickness/runout, material hardness/conductivity). These provide assurance of intended characteristics that could not be otherwise defined.

3.9 DESIGNED TOOLING

Product specific tooling [e.g., check fixtures, Coordinate Measurement Machine (CMM) program] specifically made to validate the design characteristics of a product.

3.10 DETAIL PART

Article/part produced to engineering definition that does not include assembly processes (i.e., processes that join two or more parts together). Detail parts may include processing, finishes, and/or special process(es).

3.11 DIGITAL PRODUCT DEFINITION (DPD)

Digital data file(s) that disclose, directly or by reference, the physical or functional requirements, including data files that disclose the design or acceptance criteria of a product. Examples of DPD include the following:

- Digital data file(s) and fully dimensioned two-dimensional (2D) drawing sheets.
- Three-dimensional (3D) data model, and simplified or reduced content 2D drawing sheets.
- 3D data model with design characteristics displayed as text.
- Any other data files containing design characteristics that define a product in its entirety.

3.12 FIRST ARTICLE INSPECTION (FAI)

A planned, complete, independent, and documented inspection and verification process to ensure that prescribed production processes have produced an item conforming to engineering drawings, DPD, planning, purchase order, engineering specifications, and/or other applicable design documents.

NOTE: The intent of independent as referenced above is to mitigate the effect of measurement error. This includes ensuring the person that verifies the characteristic for the first article not be the same person that generated the characteristic. Self-inspection (i.e., operator self-verification) is not considered independent. The equipment used to verify the characteristic should be different from the equipment used to produce the characteristic.

3.13 FIRST ARTICLE INSPECTION REPORT (FAIR)

Comprised of the forms identified in Appendix B, all ballooned design characteristics, and the supporting documentation determined by FAI planning for a part number (e.g., detail part, sub-assembly, or assembly).

3.14 FIRST PRODUCTION RUN

The initial group of one or more parts that are the result of a planned process designed to be used for production of these same parts.

3.15 MODIFIED COMMERCIAL-OFF-THE-SHELF (COTS)/STANDARD CATALOGUE ITEM

A COTS or Standard Catalogue item that has a change made to it from its original designed configuration.

NOTE: Once modified, these items are categorized as detail parts for the purpose of assembly.

3.16 MULTIPLE CHARACTERISTICS

Identical characteristics that occur at more than one location (e.g., four places), but are identified by a single set of drawing or DPD requirements (e.g., rivet hole size, dovetail slots, corner radii, chemical milling pocket thickness).

3.17 PRODUCT

Any intended output resulting from the product realization process, which in the context of this standard includes finished detail parts, sub-assemblies, assemblies, forgings, and castings.

3.18 QUALIFIED TOOLING

Universal (not part specific) calibrated monitoring and measuring equipment (e.g., go/no go gauges, thread gauges, radius gauges) used to validate product design characteristics using attribute data.

3.19 REFERENCE CHARACTERISTIC

Characteristic (including reference and basic dimensions) that are used for “information only” or to show relationship; these are dimensions without tolerances and refer to other dimensions on the drawing or in the DPD.

3.20 SPECIAL PROCESS

Any process for production and service provision where the resulting output cannot be verified by subsequent monitoring or measurement and, as a consequence, deficiencies become apparent only after the product is in use or the service has been delivered.

3.21 STANDARD CATALOGUE ITEM

A part or material that conforms to an established industry or national authority published specification, having all characteristics identified by written description or an industry/national/military standard drawing.

3.22 VARIABLE DATA

Quantitative measurements taken on a continuous scale (e.g., the diameter of a cylinder, the gap between mating parts).