First Article Inspection

Mike Terry
9102 Team member
August 2014
First Article Inspection (FAI) – Topics

- AS9102 Rev B
- FAI Efficiencies
- Common Issues
- FAI Resources
- Questions
AS9102 Rev B
9102 Evolution

- **9102: 2000-08**
  - Standardized aerospace FAI requirements
  - Common form of documentation for supplier FAI

- **9102 A: 2004-01**
  - Define What and When, not How
  - Improved layout and readability of the standard
  - Eliminated points of confusion
  - Provided open fields for company specific non-9102 use

- **9102 B: 2014-xx**
  - Enhanced Scope & Purpose to emphasize value of FAI
  - Separated planning activities from evaluation activity
  - Addressed Digital Product Definitions (DPD)
  - Utilize FAQs and SCMH to clarify intent and provide examples of complex concepts (Help Needed)

*How ➔ What ➔ Value*
This standard was revised to emphasize the value of the First Article Inspection (FAI) process to an organization, separate and enhance the planning and evaluation activities, and define Digital Product Definition (DPD) and its relationship to the FAI process. Additional changes to the standard requirements, definitions, and associated notes were incorporated in response to stakeholder needs.

- IAQG requested feedback (250+ items globally)
  - Breakdown of comments
The organization shall have a process to plan for completion of FAI or shall plan FAI activities prior to the first production run.

FAI planning shall address the activities to be performed throughout the FAI process and identify the responsible organizations for those activities.

“Plan” is used as a Verb
9102 B – *First production delivery parts require an FAI*

- **Part Requirements**
  - The organization shall perform FAI on new product representative of the first production run
  - *The first production delivery parts require an FAI*
9102 B – Digital Product Definition Requirements

- When design requirements are in a DPD format and traditional 2D drawing information is not available for all applicable design requirements, DPD design characteristics required for product realization shall be extracted, verified, and included in the FAIR.

- The organization shall:
  - Establish a process to extract the applicable DPD design characteristics
  - Extract the DPD design characteristics required for product realization
  - Ensure the production, inspection, and operations requiring verification have been completed as planned to achieve DPD design characteristics
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, that are uniquely identified and traceable to their calibration records.

... attribute data (e.g., pass/fail) may be used in lieu of variable data when:

... qualified tooling is consistently used as a check feature and a go/no-go feature has been established for the specific characteristic. When qualified tooling (e.g., radius gauges) are used as a go/no-go gauge, record the gauge value or range (e.g., minimum/maximum value), as applicable.
9102 B – Control of Records

- FAI documentation required by this standard shall be considered a quality record. The organization shall retain the appropriate FAI documentation while the product is being produced and, at a minimum, retain them according to applicable customer or regulatory requirements.

Form instructions:
- For a partial FAI, provide the previous part number, including revision level to which this partial FAI is performed and the reason for the current FAI (e.g., changes in design, process, or manufacturing location). For partial FAIs based on similar parts (reference 9102, 4.6), provide the approved configuration FAI part number, including revision level.

- The organization shall verify every design characteristic, during the FAI, and record the associated results.
When automated inspection tooling produces measurement results, those results may be referenced on 9102 Form 3, identified as pass/fail, and attached only when:

- The characteristic numbers are clearly linked in the attached report
- The results in the attached reports are clearly traceable to the characteristic numbers
- The results are directly comparable to the design characteristic

NOTE: Coordinate Measurement Machine (CMM) data alone would not be acceptable for a positional tolerance; the results shall show the actual positional value.
FAI Efficiencies
FAI and Your QMS (9100 7.5.1.1)

The FAI will:

- Validate the Production System is capable
- Document As Built = As Defined

FAI Documentation + QMS → Enables Production System
FAI Technology Tools

Improving Quality, Reducing Cost and Effort

Existing & Emerging Technology
- Reduce Cost
- Improve Quality
- Automation

Generate FAI from Source
- CAD Tools
- Ballooning Tools
- Specification Management

Automate Measurements
- Eliminate manual entry

Interface to Existing Systems

Reporting and Analytics
- Status
- Process Improvement
- Warnings
Common Issues
Common FAI Issues

- Forms not completed properly
- Engineering requirements not understood
- FAI training & processes not defined or effective
- 9102 Flow-down and oversight inconsistent and ineffective
Common Issues – Forms

- Forms not completed properly
  - Wrong information in fields/forms, signatures missing, typos
  - Inspection results data integrity
  - CMS inspection results not traceable to design characteristics
  - Attribute data recorded when Characteristic is expressed by numerical limits

Form 3: Characteristic Accountability, Verification and Compatibility Evaluation

No, this is not an acceptable 9102 Form 3
Common Issues – Engineering Requirements

- Engineering requirements not understood
  - Engineering authority incomplete
  - Engineering characteristics not accounted for
  - Missing implicit characteristics, missed notes, omitted characteristics
Common Issues – Training & Processes

- FAI training & processes not defined or effective
  - FAI not performed on first production run
  - FAI performed to Manufacturing Planning or Tooling instead of Design
  - Partial FAIs not being performed when required
  - Depth of evaluation
    » 9100 8.2.4 – Monitoring and Measurement of Product
      • Measure characteristics to verify (Specification) requirements have been met
      • Evidence of conformity with the acceptance criteria shall be maintained
    » 9100 7.1.2 – Risk Management
      • Assignment of responsibilities for risk management
      • Identification, assessment and communication of risks throughout product realization

9102 B – First Article Inspection Planning
Common Issues – Flow-down & Oversight

- 9102 Flow down and oversight inconsistent and ineffective
  - Sub-tier FAI review
  - Sub-tier FAI visibility
FAI Resources
FAL Resources – IAQG FAQs

http://www.sae.org/iaqg/publications/faq9102.htm

Table:
A. Forms Usage
B. When to Perform an FAI
C. Standard Catalog Hardware (SCH)
D. Similar Parts
E. Purchase Order Requirements
F. General Questions

9102 Rev A
Aerospace First Article Inspection Requirement (FAI) Frequently Asked Questions (FAQ's)

Introduction to First Article: updated 3/2013

Forward
International Aerospace Group (IAQG) procedure 103 defines the process for providing “clarifications” to published standards. Below are clarification questions and responses received by the Sector Document Representatives (SDR's) over the past three years. It is intended that these FAQ's be updated as new questions are received.

Standards provide requirements but are prohibited from providing methods for meeting those requirements.

The 9102 standard is not intended to be used to assess compliance to any other published standard.
IAQG FAQs – example

A. Forms Usage

A1. Question:
Are requirements defined as "CR" in the forms (1-3) to be filled only when there is a special requirement from the customer or, always filled when applicable?

A1. Response:
"Special requirement from the customer" is only an example of Conditionally Required (CR) items must be filled in when "applicable". For example, not all parts have a serial number but when they do you must fill in that block (form 1 block 3). The same is true for the other "CR" blocks. When not applicable or required by engineering, leave them blank or write N/A.

A2. Question:
What are some examples entries for form 1, field 9 (required field)?

A2. Response:
The intent is to provide linkage to the planning/router that was used during the manufacture of the FAI part/assembly. Some companies track parts with a production control number and a "router issue number". Production control numbers are usually for cost collection and order tracking and router issue can be directly correlated to the router. You may use anything that provides linkage to the exact router/planning used during FAI.

A3. Question:
Form 1 Field #9: Manufacturing Process Reference. Please elaborate on what is required?

A3. Response:
The purpose of field 9 on form 1 is to provide traceability from the FAI part to the router/planning used to manufacture the part. Any number or reference that provides that traceability is acceptable.
Supply Chain Management Handbook (SCMH)

Terms of Use

The SCMH is provided by the IAQG to assist with the advancement of quality practices. The use of the SCMH is entirely voluntary, and its applicability and suitability for any particular use, is the sole responsibility of the user. IAQG maintains intellectual property rights to the SCMH material.

Do you accept these Terms?

Accept Terms and Launch SCMH

The Product and Supply Chain Improvement Strategy Team responsible for the SCMH is holding a day of “FREE” and “Open” meetings on Wednesday April 9th in Brussels.
IAQG Supply Chain Management Handbook

- Registration is free
Chapter 3.2 First Article Inspection (FAI)
Questions??