



International Aerospace Quality Group

First Article Inspection

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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

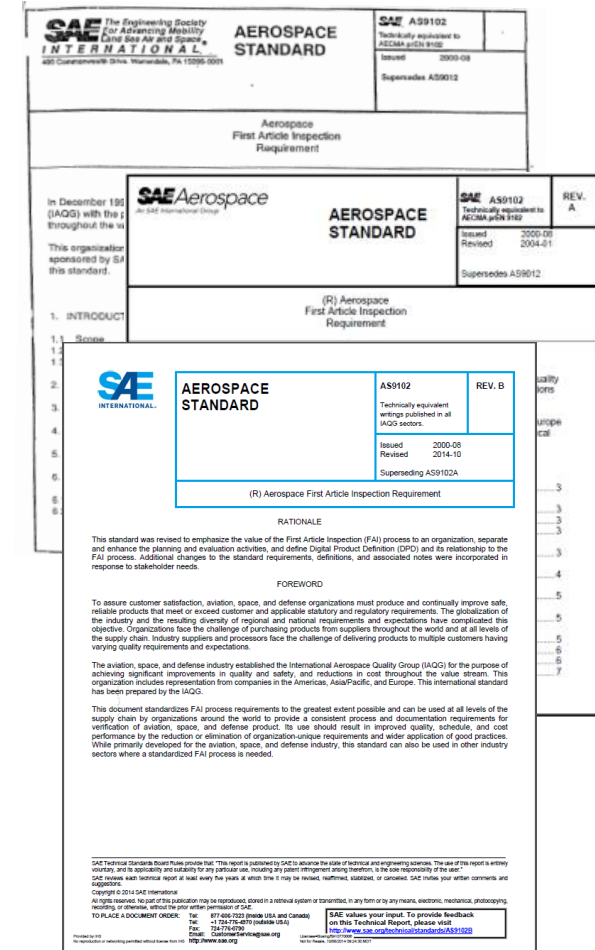
- Standardized aerospace FAI requirements
- Common form of documentation for supplier FAI

■ 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)

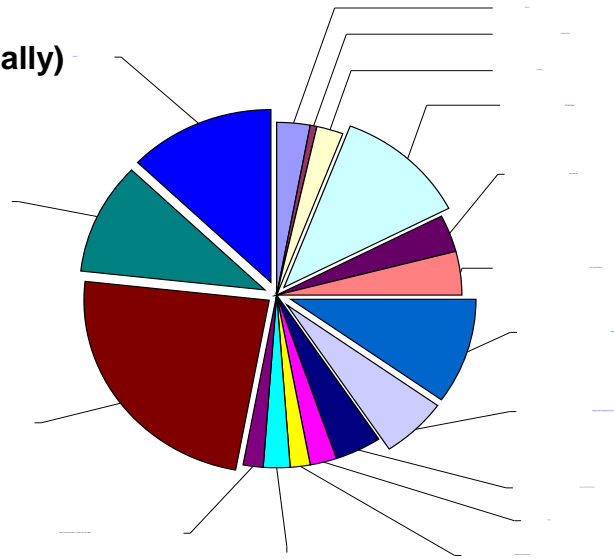


How → What → Value

9102 B – Rationale

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



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***

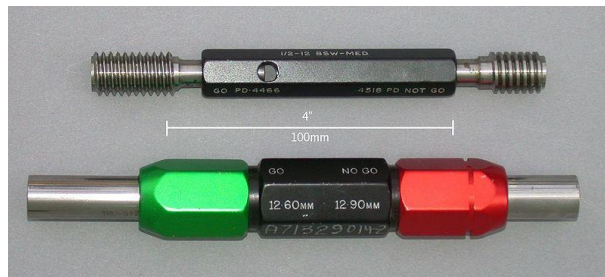
 - ***Extract the DPD design characteristics required for product realization***

 - ***Ensure the production, inspection, and operations requiring verification have been completed as planned to achieve DPD design characteristics***

9102 B – Qualified Tooling

- 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.***

14.	Full FAI	<input type="checkbox"/>	Baseline Part Number including revision level
	Partial FAI	<input type="checkbox"/>	
Reason for Partial FAI:			

Form instructions:

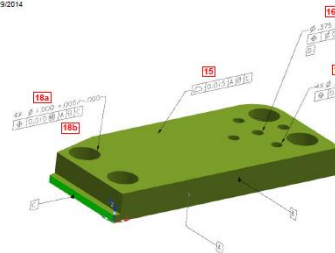
- For a partial FAI, provide the previous part number, including revision level to which this partial FAI is performed and the reason for the current FAI (e.g., changes in design, process, or manufacturing location). For partial FAIs based on similar parts (reference 9102, 4.6), provide the approved configuration FAI part number, including revision level.*
- The organization shall verify every design characteristic, during the FAI, and record the associated results.*

9102 B – Form 3, 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.

Part Number: 9ABD432-1 Rev A
 Model Number: 9ABD432-1_A_group.stp
 Part Name: Bracket
 Sheet 1 of 2
 Date: 4/29/2014



 AX .375 +/- .005/- .000 DIAMETER
 TRUE POSITION WITHIN 0.005M A D B
 ITEM 17A, 17B

5. Char No.	6. Reference Location	7. Characteristic Designator	8. Requirement	9. Results	10. Designed Tooling
16a	Sketch Sht 1		DIA .375 +.005 / -.000	Acceptable	
16b	Sketch Sht 1		$\text{M} \text{ } \text{A} \text{ } \text{B} \text{ } \text{C}$	Acceptable	
17a	Sketch Sht 1		4x DIA .375 +.005 / -.000	Acceptable	
17b	Sketch Sht 1		$\text{M} \text{ } \text{A} \text{ } \text{D} \text{ } \text{B}$	Acceptable	CMM Report- CIR17ab
18a	Sketch Sht 1		4x DIA 1.000 +.005 / -.000	Acceptable	CMM Report- CIR18ab
18b	Sketch Sht 1		$\text{M} \text{ } \text{A} \text{ } \text{B} \text{ } \text{C}$	Acceptable	CMM Report- CIR18ab
19	Sketch Sht 2		2X .250 +/- .010	Min .2502 Max .2506	Gage
20	Sketch Sht 2		.950 +/- .010	.952-.959	Gage

		LOC9 - CIR17-1						
	IN	NOMINAL	MEAS	+TOL	-TOL	DEV	OUTTOL	BONUS
AX		0.0000	0.0002	0	0	0.0002	0	0
X		1.0000	1.0004	0	0	0.0004	0	0
Y		0.3750	0.3758	0.0050	0.0000	0.0008	0.0000	0.0008
DF		MMC	0	0.0050	0	0.0009	0.0000	0.0008
TP								

		LOC8 - CIR17-2						
	IN	NOMINAL	MEAS	+TOL	-TOL	DEV	OUTTOL	BONUS
AX		0.0000	0.0000	0	0	0.0001	0	0
X		1.0000	1.0001	0	0	0.0001	0	0
Y		0.0000	0.0000	0	0	0.0000	0	0
DF		0.3750	0.3758	0.0050	0.0000	0.0008	0.0000	0.0008
TP		MMC	0	0.0050	0	0.0001	0.0000	0.0008

		LOC7 - CIR17-3						
	IN	NOMINAL	MEAS	+TOL	-TOL	DEV	OUTTOL	BONUS
AX		0.0000	-0.0002	0	0	-0.0002	0	0
X		-1.0000	-1.0006	0	0	-0.0006	0	0
Y		0.3750	0.3757	0.0050	0.0000	0.0007	0.0000	0.0007
DF		MMC	0	0.0050	0	0.0013	0.0000	0.0007

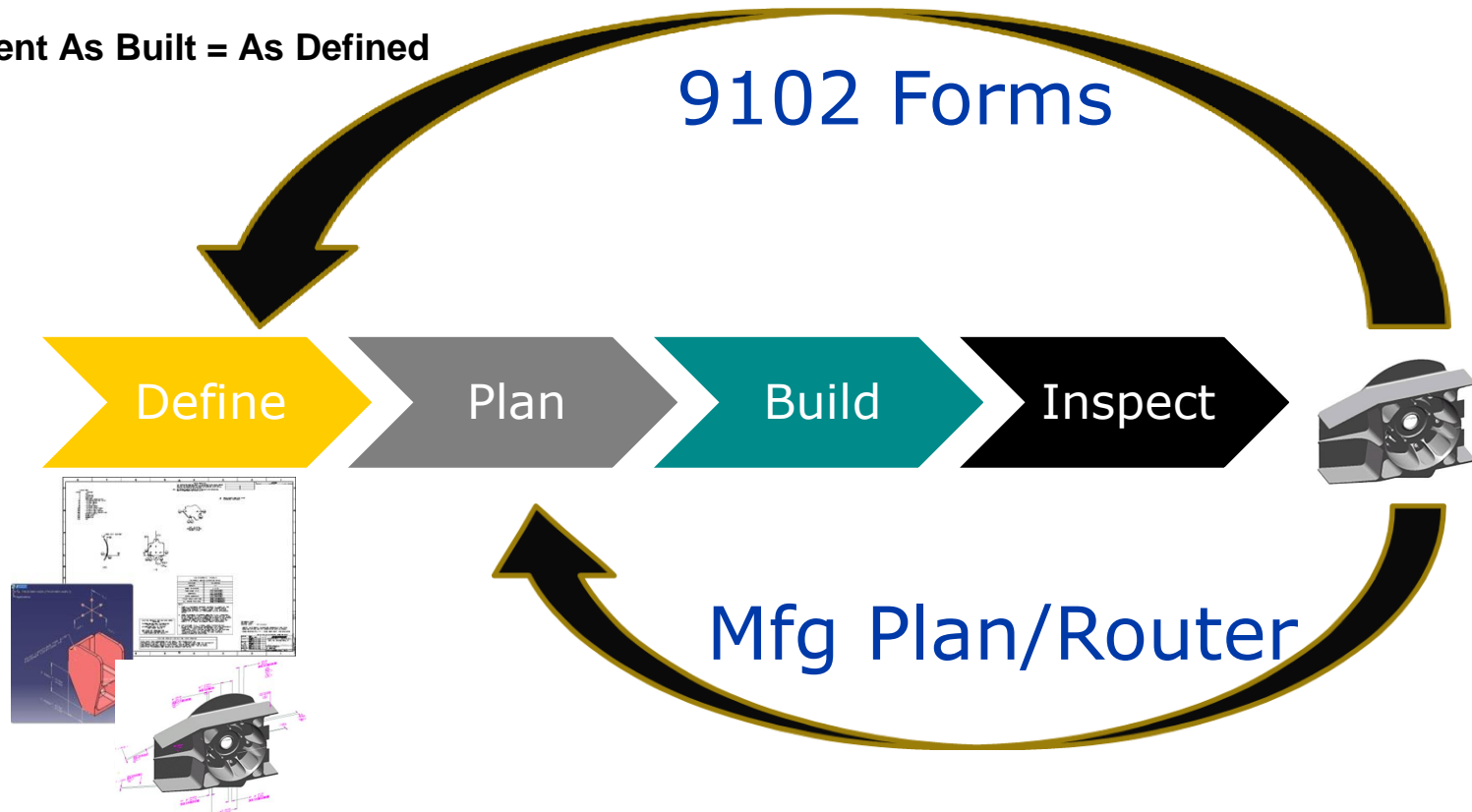
		LOC6 - CIR17-4						
	IN	NOMINAL	MEAS	+TOL	-TOL	DEV	OUTTOL	BONUS
AX		-0.9380	-0.9382	0	0	-0.0002	0	0
X		0.0000	0.0005	0	0	0.0005	0	0
Y		0.3750	0.3758	0.0050	0.0000	0.0008	0.0000	0.0008
DF		MMC	0	0.0050	0	0.0011	0.0000	0.0008

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

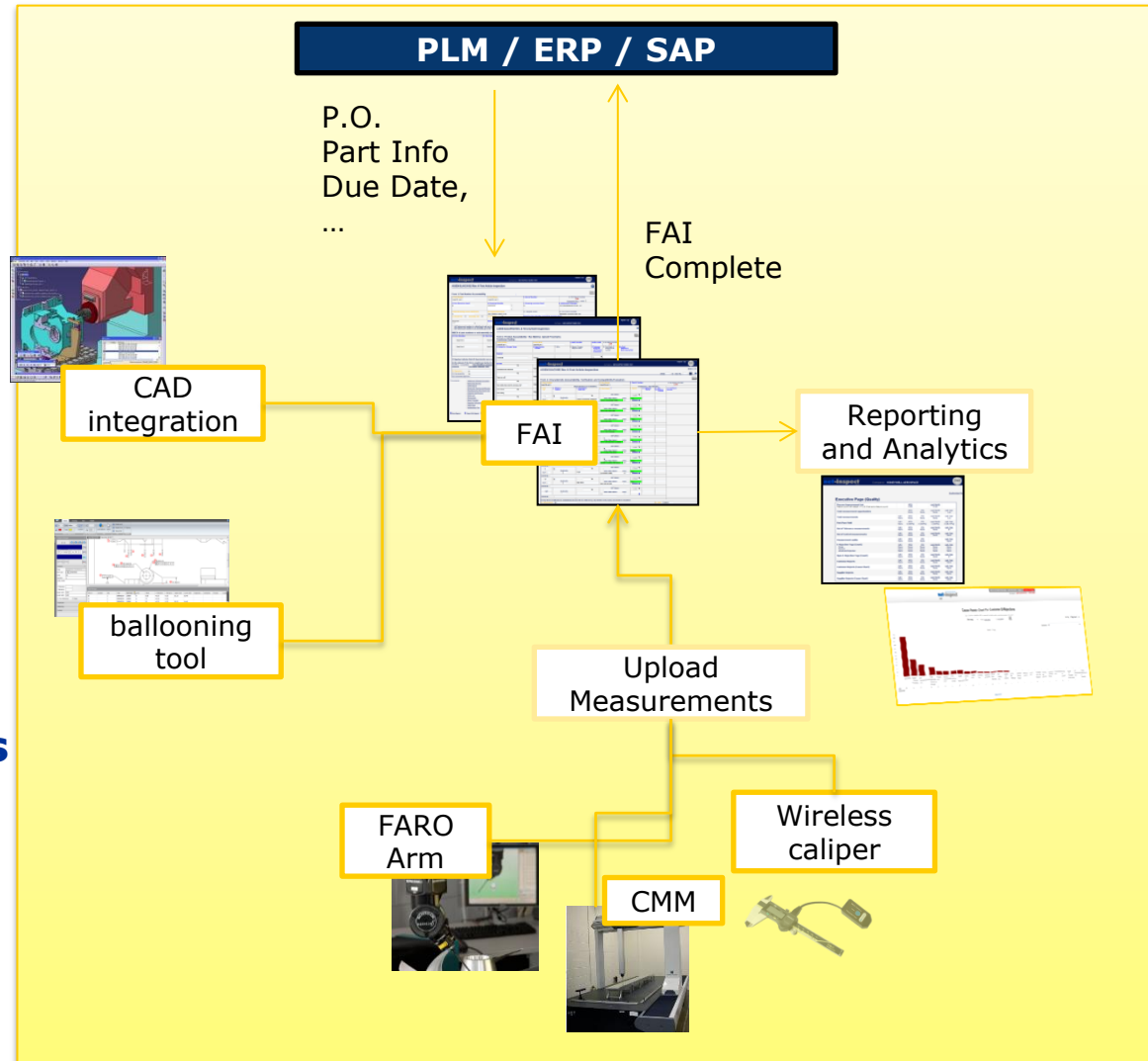
Automate Measurements

- 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**

Sheet 1 of 1

Form 3: Characteristic Accountability, Verification and Compatibility Evaluation

1. Part Number		2. Part Name			3. Serial Number		4. FAI Report	
41227311-7		Stringer						
Characteristic Accountability				Inspection / Test Results				
5. Char No.	6. Reference Location	7. Characteristic Designator	8. Requirement	9. Results	10. Design/Feeling	11. Non-Conformance Number	14. (Insert columns, etc. as required by Organization or Customer)	
							See CMM Report	
				No, this is not an acceptable 9102 Form 3				
The signature indicates that all characteristics are accounted for; meet drawing requirements or are properly documented for disposition.								
12. Prepared by							13. Date	
J. Browning								

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*



Common Issues – Flow-down & Oversight

- **9102 Flow down and oversight inconsistent and ineffective**
 - Sub-tier FAI review
 - Sub-tier FAI visibility

Supplier FAI Visibility Tool Project (A.K.A. Net-Inspect)

FAI Resources

FAI Resources – IAQG



- Home
- SCMH
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- News Highlights**
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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.

- Quick Links**
- Members Only
 - QASIS Database
 - 9100 Deployment Support Materials
 - IAQG Sanctioned Aerospace Auditor Transition Training Support Material
 - Supply Chain Management Handbook (SCMH)

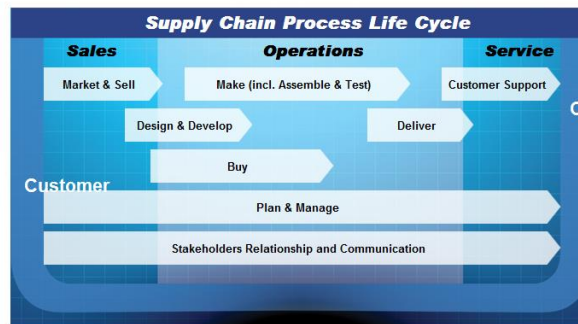


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- 2 Design & Develop
- 3 Make
- 4 Buy
- 5 Deliver
- 6 Customer Support
- 7 Plan & Manage
- 8 Stakeholder Relationship
- Appendices



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Section 3: Make (including Assembly & Test)

- 3.1: Managing Product and Process Variation 9103 (03 Apr 2014)**
 - 3.1.1: [Managing Product and Process Variation 9103 Introduction -April 2014 \(pdf\)](#)
 - 3.1.2: [Managing Product and Process Variation 9103 Overview -April 2014 \(pdf\)](#)
 - 3.1.3: [Managing Product and Process Variation 9103 GM -April 2014 \(pdf\)](#)
 - 3.1.4: [Managing Product and Process Variation 9103 PPT Version -April 2014 \(pptx\)](#)
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 - 3.3.3: [Control of Nonconforming Product Guidance Document -April 2014 \(pdf\)](#)
 - 3.3.4: [Nonconforming Product Excel Version -April 2014 \(xls\)](#)
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 - 3.4.2: [FOD Prevention -April 2014 \(pdf\)](#)
 - 3.4.3: [FOD Prevention Training Program -April 2014 \(pdf\)](#)

FAI Resources – IAQG FAQs

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



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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](#)

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.

SAE AS9102 Revision A			
Form 1: Part Number Accountability			Sheet 1 of ____
1. Part Number	2. Part Name	3. Serial Number	4. FAI Report Number
5. Part Revision Level	6. Drawing Number	7. Drawing revision level	8. Additional Changes
9. Manufacturing Process Reference	10. Organization Name	11. Supplier Code	12. P.O. Number

- 9) (R) **Manufacturing Process Reference:** A reference number that provides traceability to the manufacturing record of the FAI part (e.g., router number, manufacturing plan number, etc.)

FAI Resources – IAQG SCMH

http://www.sae.org/servlets/registration?PORTAL_CODE=IAQG&OBJECT_PKG=iaqg.businessClasses&OBJECT_TYPE=SCMHGeneral&PAGE=gotoSCMH



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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.

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- **Registration is free**

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Supply Chain Process Life Cycle

Sales **Operations** **Service**

Market & Sell Make (incl. Assemble & Test) Customer Support

Design & Develop Deliver

Buy

Customer Plan & Manage

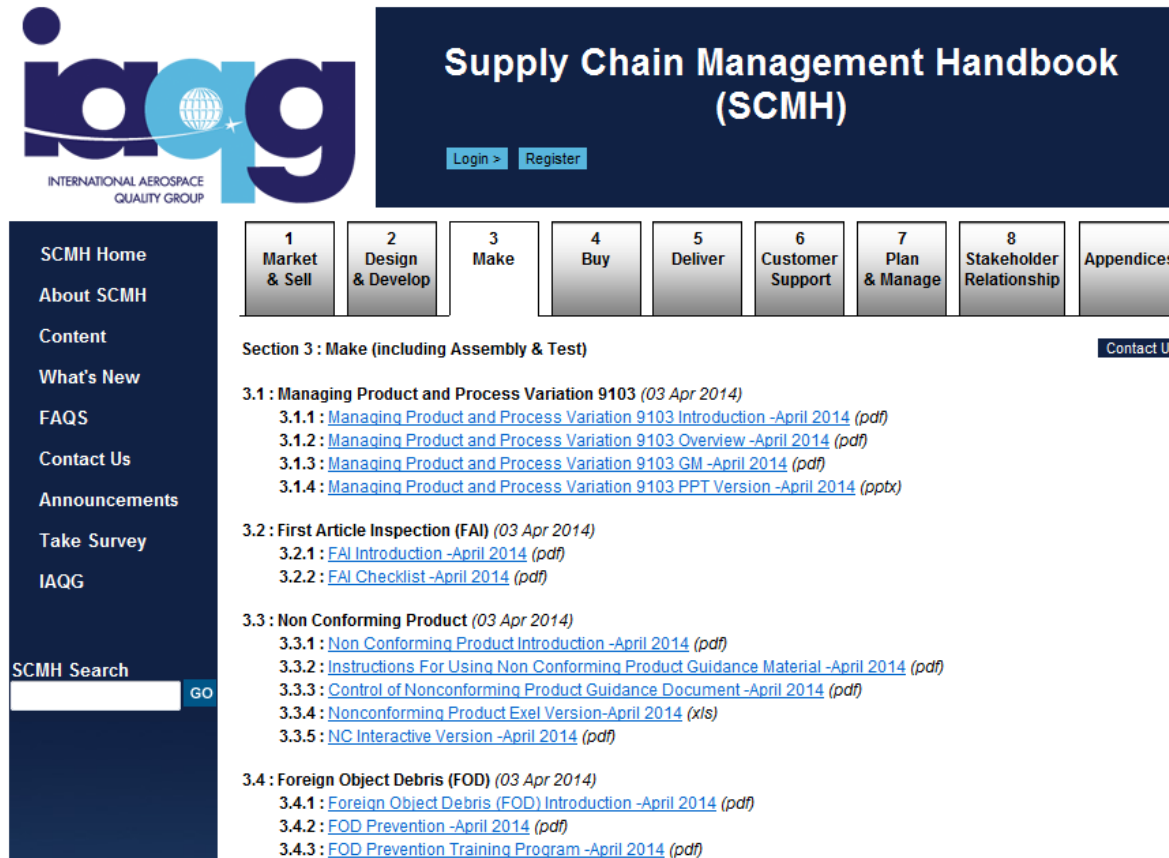
Stakeholders Relationship and Communication

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IAQG Supply Chain Management Handbook

■ Chapter 3.2 First Article Inspection (FAI)



The screenshot shows the IAQG Supply Chain Management Handbook (SCMH) website. At the top left is the IAQG logo with the text "INTERNATIONAL AEROSPACE QUALITY GROUP". To the right is a dark blue header with the title "Supply Chain Management Handbook (SCMH)" and buttons for "Login >" and "Register". Below the header is a navigation bar with nine categories: 1 Market & Sell, 2 Design & Develop, 3 Make, 4 Buy, 5 Deliver, 6 Customer Support, 7 Plan & Manage, 8 Stakeholder Relationship, and Appendices. The "3 Make" category is selected. Below the navigation bar is a sidebar on the left with links: SCM Home, About SCMH, Content, What's New, FAQs, Contact Us, Announcements, Take Survey, and IAQG. At the bottom of the sidebar is a "SCMH Search" box with a "GO" button. The main content area displays "Section 3 : Make (including Assembly & Test)" with a "Contact Us" button. Underneath, it lists sub-sections 3.1 through 3.4, each with a date "(03 Apr 2014)" and several links to PDF documents and PPT versions.

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Questions??