



SUPPLIER FIRST ARTICLE INSPECTION (FAI) GUIDELINES (REV B)

LOCKHEED MARTIN (LM) - ROTARY & MISSION SYSTEMS (RMS)

Abstract

This document serves to provide entities fulfilling FAI Requirements under Procured Goods and Services to RMS, a comprehensive guide to completing a successful FAI in accordance with AS9102.

APPLICABILITY

- This document applies to Rotary & Mission Systems (RMS) procured material.

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INTRODUCTION

PURPOSE

- This document provides guidance towards the acceptance of an AS9102 First Article Inspection Report for all organizations producing design characteristics for Lockheed Martin Rotary Mission Systems (LM RMS).
 - For Sikorsky purchase orders reference the supplier quality requirements SSQR-01 or Procure-2-011 which have been incorporated into your purchase order.
- This document provides directions on how to identify, plan for, and satisfy AS9102 requirements for completing a compliant First Article Inspection (FAI). It is based on the latest revision of AS9102, Lockheed Martin Purchase Order Text Note FAI_REVW, QARQTS, and overall RMS expectations.
- This document applies to all LM RMS Purchase Orders when QA-RQTS and/or FAI_REVW text keys are flowed in the quality requirements, or any reference documents (e.g., Statement of Work) and applies to all sub-tiers who produce design characteristics and/or sub-assemblies.

Benefit

- The benefit acquired from this document will result in improved 1st pass yield of first article document reviews in association with continuous deliveries of compliant material that enhance a supplier's reputation.

Target Audience

- The document is addressed to all organizations producing design characteristics for delivery to an LM RMS contract/purchase order requirement of an AS9102 First Article Inspection. Organizations include at a minimum all Quality Managers, Quality Engineers, and Manufacturing managers.

REFERENCES

Reference Documents

- International Aerospace Standard 9102 Latest Released Revision
- Lockheed Martin Purchase Order Requirement References
 - QA-RQTS
 - FAI_REVW
 - SQBMP13800
 - TDFAIREV
 - ALISFAIREV
 - SSQR-1

Required Forms

- Organizations are permitted to utilize their own version of the AS9102 forms, granted they contain all Required and Conditionally Required fields per AS9102, and have the same field reference numbers. AS9102 Form Templates are available for your use on the same page that directed you to this document.
- List of Forms:
 - AS9102 Form 1: PART NUMBER ACCOUNTABILITY ○ AS9102 Form 2: PRODUCT ACCOUNTABILITY - MATERIALS, SPECIAL PROCESSES, AND FUNCTIONAL TESTING ○ AS9102 Form 3: CHARACTERISTIC ACCOUNTABILITY, VERIFICATION and COMPATIBILITY EVALUATION

IMPORTANT: PLEASE READ!!!!

- Improper completion and/or missing data from the AS9102 Forms is the greatest cause for rejection of a First Article Inspection Report (FAIR).
- Follow the recommendations on proper form completion provided in this section to ensure you are submitting a compliant AS9102 FAIR. Failure to comply with the precedence set forth in this document will be a cause for rejection.
- All three Forms and supporting documentation are to be provided in the First Article Inspection Report (FAIR) for review and acceptance.
- RMS requires a New Full FAI to be delivered for a 2-year lapse in production. The lapse is from the end of the last production operation to the start of the new production operation. This requirement supersedes the statement within AS9102 for performing an evaluation to determine if a new FAI is required.

FORM COMPLETION CRITERIA

Form 1

Form 1		
Field #		RMS Form 1 Completion Criteria
Field Description		Failure to comply with this criteria will result in rejection
		If condition does not exist, annotate N/A.
1	Part Number	Purchase Order (PO) Line Item (LI) Part Number.
2	Part Name	Purchase Order Line Item Description.
3	Serial Number	Document Serial Number if part is serialized. Must be completed if SERIAL Text key is on Purchase Order.
4	FAIR Identifier	Provide a First Article Inspection Report number.
5	Part Revision Level	Populate with the Material revision, sometimes called Product revision level from the PO LI.
6	Drawing Number	Populate this Field with the drawing number, ensuring the drawing number matches the base part number on your PO LI.
7	Drawing Revision Level	Populate this Field with the drawing revision level, ensuring the dwg rev matches on the PO LI and the drawing provided.
8	Additional Changes	Populate this Field when additional changes exist (i.e., approved redlines, ensuring if the NOR Field on the PO is filled in this is reflected in this Field).
9	Manufacturing Process Reference	Traceability to the manufacturing record of the FAI part.
10	Organization Name	Name of the organization performing the FAI.
11	Supplier Code	Enter the LM supplier code for the organization performing the FAI. If no supplier code, use the RMS PO supplier LMID.
12	Purchase Order Number	For all RMS FAIs, enter the Purchase Order number.
13	Detail/Assembly	Check as appropriate.
14	Full FAI/Partial FAI	Check as appropriate.
15	Sub-assembly Part Number	When applicable, populate Field 15 per the same instructions as Field 1.
16	Sub-assembly Part Name	When applicable, populate Field 16 per the same instructions as Field 2.
17	Sub-assembly Part Type	When applicable, populate Field 17 by entering whether the part is a detail part, sub-assembly, software, standard catalogue item, or COTS (or equivalent).
18	FAIR Identifier	When applicable, populate Field 18 per the same instructions as Field 4.
19	Does FAIR Contain a Documented Nonconformance(s)?	Check as appropriate.
20	FAIR Verified By	Printed name and signature of person "Verifying" the FAIR.
21	Date	Date when Field 20 was signed.
22	FAIR Reviewed/Approved By	Printed name and signature of person "Approving" the FAIR. Must be different than Field 20.
23	Date	Date when Field 22 was signed.
24	Customer Approval	Source Inspection review/approval requires signature. Note: If the Purchase Order contains a text key that requires customer approval prior to ship, this Field must be signed by the RMS Quality representative reviewing the report.
25	Date	Date when Field 24 was signed.
26	Comments	Add any additional comments, as required.

Figure 1: RMS FAI Supplier Form 1

Form 2

Form 2		
Field # Field Description		RMS Form 2 Completion Criteria Failure to comply with this criteria will result in rejection If condition does not exist, annotate N/A.
1	Part Number	Purchase Order (PO) Line Item (LI) Part Number.
2	Part Name	Purchase Order Line Item Description.
3	Serial Number	Document Serial Number if part is serialized. Must be completed if SERIAL Text key is on Purchase Order.
4	FAIR Identifier	Provide a First Article Inspection Report number.
5	Material or Process Name	This Field is to be populated with the raw material and the special process, when specified on the drawing.
6	Specification Number	Enter Material Spec, Material Form, and Special process specifications associated to material and/or process documented in Field 5. If modified COTS, list the COTS item (i.e, Part Number).
7	Code	Document the Lockheed Martin special process code specified on the Purchase Order.
8	Supplier	Special Process Suppliers: Identify supplier name, address, and LM ID performing special processes. Material Suppliers: Identify supplier name and address providing the material.
9	Customer Approval Verification	For special processors state "YES" as this Field shows an RMS approved supplier was used. "No" is only acceptable with SQE approval, N/A when customer approval is not required.
10	Certificate of Conformance Number	Acceptable data in this Field would be (special process cert, raw material cert, modified COTS compliance report number, or some type of traceability number).
11	Functional Test Procedure Number	Function Test Procedure Number (FTP) if an FTP was identified as a design characteristic on the LM drawing or SOW. Examples include Qualification Test Procedure, Acceptance Test Procedure, Production Test Procedure.
12	Acceptance Report Number	The functional test certification indicating all test requirements have been met.
13	Comments	Add any additional comments, as required.

Figure 2: RMS FAI Supplier Form 2

Form 3

Form 3		
RMS Form 3 Completion Criteria		
Failure to comply with this criteria will result in rejection		
If condition does not exist, annotate N/A.		
Field #	Field Description	
1	Part Number	Purchase Order (PO) Line Item (LI) Part Number.
2	Part Name	Purchase Order Line Item Description.
3	Serial Number	Document Serial Number if part is serialized. Must be completed if SERIAL Text key is on Purchase Order.
4	FAIR Identifier	Provide a First Article Inspection Report number.
5	Characteristic Number	Unique number assigned to each design characteristic.
6	Reference Location	Drawing Zone (page and section), DPD model location, or specification callout.
7	Characteristic Designator	If applicable, record characteristic type (critical items, key characteristics, flight safety, as defined by customer.
8	Requirement	Specified requirement for the design characterisic.
9	Results	List measurement(s) obtained for the design characteristic per AS9102. Note: requirements shall be recorded in the units specified on the drawing, DPD, or specification unless otherwise approved by a RMS Supplier Quality Representative.
10	Designed/Qualified Tooling	List all designed and qualified tooling used for attritibute acceptance, record the gauge value or range as applicable.
11	Nonconformance Number	If a characteristic is nonconforming, record a nonconformance number.
12	Additional Data/Comments	This Field is reserved for any additional data/comments.

Figure 3: RMS FAI Supplier Form 3

FAI SUBMITTAL

- In accordance with QA-RQTS First Article Inspection requirements:
 - FAI Reports, when applicable, shall be uploaded to the inspection lot during the “Ship-To LMC” process. Where FAI Reports cannot be uploaded electronically, the supplier shall send the report with the material shipment.

NOTE: For additional guidance on how to upload FAIRs into Inspection lots, refer to Page 80-85 of the P2P Reference Guide for Suppliers "Ship to LMC" found here: <https://www.myexostar.com/wp-content/uploads/2022/06/LMP2P-Quality-Ship-To.pdf>

NOTE: For latest QA-RQTS requirements, please refer to the Quality Assurance Section of the Business Area Procurement Website, select "Quality Requirement Procure 2-011": <http://www.lockheedmartin.com/en-us/suppliers/business-area-procurement/rms.html>

- In accordance with FAI_REVW First Article Inspection requirements (When this PO Code/Text Key is flowed on the LM Purchase Order):
 - For parts that require FAI and Source Inspection, requests must be made no less than 10 working days in advance of the planned inspection to allow for Buyer's participation if required. Scheduling shall accommodate any in process inspections identified during PO review. Requests are via P2P Ship To module by accessing your Exostar account at <http://portal.exostar.com/>
 - **CAUTION:** Export Control Documentation cannot be uploaded into Exostar. Please refer to any additional PO Requirements outlining the handling of Export Control Data or reach out to the buyer listed on the PO.
 - The FAI report shall be reviewed and approved by an RMS Supplier Quality Representative prior to any material shipment. Material received without an approved FAIR is subject to immediate return and formal Supplier Corrective Action Request

(SCAR). Permission to ship shall come from the procurement representative/buyer after the FAI has been reviewed and approved by an RMS Supplier Quality Representative, or after supplier has received authorization via P2P Ship To module.

- All documentation associated with the FAI shall be submitted with the completed FAI report for review, verification, and approval.
- Questions regarding FAI submittals should be directed to the buyer listed on the Purchase Order.

NOTE: For additional guidance on how to upload FAIRs into Inspection lots, refer to Page 80-85 of the P2P Reference Guide for Suppliers "Ship to LMC" found here: <https://www.myexostar.com/wp-content/uploads/2022/06/LMP2P-Quality-Ship-To.pdf>

- For other RMS Text Keys invoking FAI, such as *TDFAIREV* and *ALISFAIREV*, follow the instructions within the text key.

DOCUMENTATION

- Ensure all documentation associated with the special processes and materials used are provided for review. This includes any certificate of conformance (CofC), material certifications, special process certifications, test data, ballooned design characteristics, etc.

EQUIPMENT

- Ensure all equipment is calibrated.
- The tooling used to create the characteristic, cannot be the tool that measured the characteristic for the FAI.
- Ensure equipment accuracy (i.e., at least 10x accuracy), and ensure it can perform the measurement. Supplier should always consider measurement system analysis studies for close tolerances such as Gage R&R.

ELECTRONIC MEDIA SOFTWARE

- Ensure use of RMS supplied models (this should be the latest approved model, revision, and version provided in accordance with the Purchase Order), software, etc.
- Referenced model is not to be used for manufacturing or acceptance except when noted by the Reduced Dimension Drawing and Model Based Design Requirements.
- Software/Firmware – If applicable, the PO lists the Statement of Work (SOW) or Drawing, which contains the FAI software/firmware requirements. In the case of a SOW, the document provides detailed instructions on the process and methods that shall be used when conducting a FAI for software/firmware requirements. Software/firmware revisions must comply with appropriate forms and specifications.
- Include required Model/Software/Gerber file revision on Form 1 of the FAI.

PARTIAL/DELTA FAI

- For information on Partial or Re-accomplishment of First Article Inspection refer to section 4.6 of the most recent revision of AS9102.

DIGITAL PRODUCT DEFINITION (DPD) FAI REQUIREMENTS

- DPD First Article Inspection shall be in accordance with AS9102. Additional RMS requirements are listed below.

LMCO RMS Data Set Rating (DSR)

Reduced Dimension Drawing (DSR4) - A documentation method that combines 2D drawing requirements with 3D model file(s) to fully define all the product geometry and requirements.

All three AS9102 Forms and supporting documentation shall be included in the First Article Inspection Report (FAIR).

AS9102 Form 3 shall contain:

- All notes and dimensions annotated on the Reduced Dimension Drawing (RDD)
- An automated inspection report equivalent to a CMM report or 3D scan results showing profile and positional tolerances relative to datums for all features with deviation from acceptable represented by a color spectrum for go/no-go.
- A report only depicting deviation from nominal in multiple axes is not acceptable; the report shall reflect an actual geometric value.
- The Bubble/Ballooned drawing will be the RDD and shall capture all notes and dimensions annotated on the 2D drawing.

Fully Model Based Design (DSR6) – A 3D pdf that includes all information required to manufacture and inspect to a model-based data set. Within the pdf will be the native digital files, all notes, statements and design characteristics including tolerances.

All three AS9102 Forms and supporting documentation shall be included in the First Article Inspection Report (FAIR).

AS9102 Form 3 shall contain:

- All notes and dimensions annotated within the 3D pdf
- An automated inspection report equivalent to a CMM report or 3D scan results showing profile and positional tolerances relative to datums for all features with deviation from acceptable represented by a color spectrum for go/no-go.
- A report only depicting deviation from nominal in multiple axes is not acceptable; the report shall reflect an actual geometric value.
- The Bubble/Ballooned drawing using the 3D pdf which shall include all notes and dimensions annotated within each view.

Suppliers must be approved by RMS Supplier Quality to be able to receive and work with DPD parts; approval code: **SQBMP13800**. If the supplier utilizes sub-tiers, the supplier's plan or Quality Management System **shall** document how they approve their sub-tier suppliers.

NOTE 1 If providing RMS Digital Data to sub-tiers for measurement and acceptance, the sub-tier supplier must also be surveyed and approved to **SQBMP13800** by RMS.

NOTE 2. If the sub-tier supplier will be using 2D drawings to produce design characteristics, LM approval is not required

COMMON ERRORS THAT CAUSE FAI REJECTION

The topics listed below are common mistakes found by RMS during FAI Reviews.

- Revision Levels improperly captured on Form 1.
 - Use this PO view as reference in conjunction with the Form Field Criteria provided within this document.

The screenshot displays the 'PO View in P2P' interface. At the top, it shows 'Standard PO 4104656508 Created by Gerald Gardner'. Below this is a header section with fields for 'PO Document Type' (NB Standard PO), 'Vendor' (LM0034697 TTI, INC.), and 'Document Date' (09/23/2020). A table lists PO line items, with item 1 highlighted: '5223711-19:BL HEATER ASSY-UP TAK...'. The 'Item' tab is selected, showing various data fields. A red box highlights the 'Product Revision Level' field, which contains the value '_B_004_C'. A red arrow points to this field. Other fields include 'Material Revision' (_B), 'NOR' (_004), 'Drawing Revision' (_C), and 'Property Type' (C). The interface also includes tabs for 'Material Data', 'Quantities/Weights', 'Delivery Schedule', 'Delivery', 'Invoice', 'Conditions', 'Account Assignment', 'Texts', 'Delivery Address', 'Confirmations', and 'Customer Data'.

Figure 4: PO View for Reference on Revisions

- For any PO Line Item with a value in the NOR field this means discrete changes to the drawing revision shall be reviewed. These may be reflected with numbered redlines on the drawing or may be separate documents. Ensure that you have reviewed each individual NOR as these are additive to the drawing and are usually standalone documents.

- Ensure PO revisions match the form criteria set in this document. If Material revision is not identified on the PO, contact RMS Buyer prior to initiating FAI submittal.
 - Verify the required revision of specifications required by the design. Indicate all revision levels in Field 6 of AS9102 Form 2.
 - Ensure through RMS Procurement that you are working to the latest released engineering.
 - Special Process certifications should be to the latest revision. This is a standard PO Note for all PO's (QA-RQTS – Section 3.2 Special Processes).
- Form 3, Field 9 not being properly completed in accordance with AS9102 as show here:

Results: List measurement(s) obtained for the design characteristics.

The organization shall record the results in the units (e.g., metric, imperial systems) specified on the drawing, DPD, unless otherwise approved by the customer (see 4.7.3.a).

- For multiple characteristics list each characteristic as individual values or list once with the minimum and maximum of measured values attained. If a characteristic is found to be nonconforming, then that characteristic shall be listed separately with the measured value noted.
- When qualified tooling (e.g., radius gauges) is used as a go/no-go gauge (see 4.7.3.b), record the results as an attribute (e.g., pass/fail).
- When automated inspection equipment produces measurement results, those results may be referenced on Form 3 identified as pass/fail and attached only when:
 - The characteristic numbers are clearly linked in the attached report [e.g., characteristic identification on Coordinate Measurement System (CMS) report is the same as on this form].
 - The results in the attached reports are clearly traceable to the characteristic numbers.
 - The results are directly comparable to the design characteristic.
- A CMS report only depicting deviation from nominal in multiple axes is not acceptable; the report shall reflect an actual geometric value.
- If a design requirement requires verification testing, record the actual results on the form. If a laboratory report or certificate of test is included in the FAIR, the results may be recorded as an attribute (e.g., pass/fail) and the test reference number recorded on the form. The laboratory report or certificate of test shall show specific values for requirements and actual results.
- For characteristics with visual verification requirements that are rated against standard photographs/master samples/standards; list the unique identifier of the closest comparison. A statement of conformance is acceptable; record the reference number on the forms.
- For processes that require verification per design characteristics, include a statement of conformance (e.g., certification of conformance, verification indicator - accept).
- For characteristics verified by attribute inspection, include statement of conformance (e.g., accept).

Figure 5: Form 3, Field 9 Language as per AS9102

- Missing or hidden requirements for Detailed Commercial Off the shelf “COTS” Parts where dimensions are not included on the assembly drawing.

- When required, requirements for detail parts/hardware installation must comply with the document specified. In this example, D38999 requires a hole for the installation of the connector to the assembly. The dimensions are located in the D38999 spec and not the drawing.
- These dimensions shall be included in the FAI package.

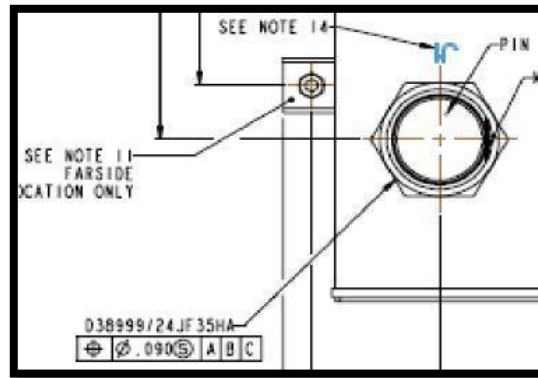


Figure 6: Example, MIL-DTL-38999 has the requirements for the hole size for the connector illustrated as well as torque requirements.

- All Dimensions and/or notes not accounted for.
 - Any notes that contain a dimension shall have a physical measurement recorded. The use of “accept” or “OK” is not permitted.
- Incorrect or missing special process flow down requirements such as:
 - Special process supplier shall be RMS approved per purchase order requirements.
 - Supplier shall be certified to build to RDD (Reduced Dimension Drawing) per purchase order requirements.
- Incorrect tolerances assigned to dimension resulting in part non-conformance.

- - Standard dimension tolerances such as .100 (three place decimal meaning +/- .010) are found in the tolerance block located in the lower right part of the drawing.
 - NOTE: This is an example of a true position calculator: https://www.engineersedge.com/calculators/true_position_pop.htm*
- Incorrect Raw material/adhesives information provided.
 - Shelf life shall not be expired; appropriate adhesive shall be used on labels, etc.
 - Raw Material required to be indicated on AS9102 Form 2.
- Parts for an assembly identified on the wrong form.
 - Parts for an assembly are required to be indicated on AS9102 Form 1.
- Incorrect inspection equipment used or not noted on FAI report.
 - When inspection equipment is listed, ensure that inspection equipment has sufficient measurement accuracy for requirements being measured and ensure it is recorded on AS9102 Form 3 (Field 10). Use of Gage Repeatability and Reproducibility (R&R) to validate measurement repeatability should be a part of the process development effort.
- Wrong part number identified on FAI form(s).
 - There shall be no typos, missing dash numbers, and/or missing designators such as Q1, D1, TPSS, etc.
Example: If the purchase order requires P/N 7979797-003 Q1 the FAI form shall read the full P/N: 7979797-003 Q1.
- Missing Certificates of Conformance, test reports, and FAI forms as part of the FAI package.
 - Ensure there is no Missing/Incomplete sub-tier supplier data such as:
 - Improper material alloy listed
 - Incorrect special process used

- - Incorrect specification revision levels listed
 - Ensure supplier equivalent forms meet the RMS/AS9102 form requirements.
 - Ensure all forms are provided in the FAI package.
 - FAI Form 1 not signed by appropriate representatives and/or dated.
- Incomplete recording of “multiple actuals”.
- A feature that is required multiple times requires recording multiple actuals.
 Example: An identical feature must be installed in 12 places (need to indicate 12 places or measurements as defined by engineering). This can include a range with max/min indicated.
- Requesting FAI via P2P Portal with no attached documentation

FREQUENTLY ASKED QUESTIONS

- For frequently asked questions on AS9102 please refer to the IAGQ website at this link:
<https://iaqg.org/wp-content/uploads/2019/10/9102-FAQ.pdf>