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Quality requirements for the supply of Raw Materials and Semi- Finished Products

SUMMARY:

The document contains specific quality requirements for supplies of raw and semi-finished materials to the Leonardo S.p.a. Defence Systems Business Unit.

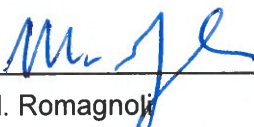
The general quality requirements for supplies to Leonardo-SDI are defined in PQA004-L-IT-D

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| 02 | 28/06/2022 | 704 | <p>Changed the document code according to the new BMS standard;</p> <p><u>Whole document</u> (changes not traced): Used new template QUA049-T-IT-D rev. 03 - Replaced "Division" with "Business Unit" - Updated references to transcoded BMS documents (e.g., PQA004-L → PQA004-L-IT-D) - Replaced "Classification Index (CI)" with "RQF Code."</p> <p><u>Para. 1.3:</u> Changed title; Introduced definition of RQF Code and related clauses - Introduced RQF codes in Table 1;</p> <p><u>Para. 2.1:</u> Added ref. to AQAP-2310; updated ref. to ISO-10013 and ISO-19011;</p> <p><u>Para. 4.2.1 (Custom-made blanks):</u> Extended the qualification methods to all suppliers (not just Underwater);</p> <p><u>Para. 6.2:</u> Added indications for delivered Quality Plans - Introduced concept of "representative sample";</p> <p><u>Para. 6.3.2 (Ballistic Plates):</u> Added details for Metallographic Examination and Ballistic Test Certificates;</p> <p><u>Para. 6.3.4 (Pressings and Forgings):</u> Added details for Certificate of Metallographic Examination - Replaced Magnetoscopic Inspection with NDI - Added FAI Report ;</p> <p><u>Para. 6.3.5 (Castings):</u> Replaced Radiographic Examination with NDI - Added FAI Report;</p> <p><u>Para. 6.5:</u> Modified requirements for Acceptance criteria;</p> <p><u>Para. 6.6:</u> Modified requirements for Control of Nonconforming Products;</p> <p><u>Para. A.1.1/1:</u> Introduced concept of "representative sample";</p> <p><u>Para. A.2:</u> Added definition of Key Characteristic;</p> <p><u>Para. A.3:</u> Modified introduction and FAI Requirements nr. 1, 6, 7,10 for better specification;</p> <p><u>Para. A.4.6:</u> Clarified requirements for use of FAI Forms;</p> <p><u>Para. A.5:</u> New section (includes the contents of former Appendixes B, C, D).</p> | C. Pagni |

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1 INTRODUCTION

1.1 Purpose

The purpose of this document is to specify the specific quality requirements applicable to the supply of Raw Materials and Semi-Finished products to the Defence Systems Business Unit of Leonardo S.p.A. (Leonardo-SDI) and in particular:

- a) the requirements to be met by the supplier to control the activities and materials supplied to Leonardo-SDI,
- b) The documentation required in order to provide evidence of the controls performed on the activities and material supplied.

Additional more general quality requirements that apply to all supplies are defined in the PQA004-L-IT-D procedure.

1.2 Applicability

This document applies to **Type F** supplies as identified in document PQA004-L-IT-D, i.e. supplies of raw materials and semi-finished products to be incorporated into products intended for, or used in the manufacture of, Leonardo-SDI's customers.

1.3 RQF Code

As stipulated in document PQA004-L-IT-D, for quality purposes each supply is classified through a code (RQF Code) consisting of a letter (Type) and a number (Classification Index) that depend on the characteristics of the product/service requested.

An RQF Code is associated with each item in Leonardo-SDI Purchase Orders and allows the identification, in this procedure, of the activities and documents required from the supplier.

RQF Code = <Type> + < Classification Index >

*Example: **RQF = F3** is associated with order items for provision of Non-Ballistic Sheet Metal (Type F, Index 3).*

In cases where the RQF code is not indicated for one or more order items, the Supplier shall request the applicable RQF value from Leonardo-SDI.

The possible values and meaning of the RQF Code for Type F supplies (raw materials and semi-finished products) are listed below. The related activities and documents required from the supplier are described in Sections 4 and 6

| RQF | Characteristics of the supply |
|-----|--|
| F1 | Custom-made blanks (metal pieces) <i>(include the raw materials required for the manufacture of barrels, gun tubes, breech blocks, bolts, jackets for gun tubes, sleeves for gun tubes, all raw materials required for producing underwater products, ...etc.).</i> |
| F2 | Ballistic Plates |
| F3 | Non-Ballistic Plates |
| F4 | Pressings and forgings <i>(excluding those used for Underwater products).</i> |
| F5 | Castings <i>(materials derived from casting, excluding those used for Underwater products)</i> |
| F6 | Other commercial raw materials <i>(bars, sections, sheets, extrusions, drawn rods, etc.)</i> |

Table 1- RQF Codes for Raw Materials and Semi-Finished Products

2 REFERENCES¹

2.1 Documents

| Ref. | Code | Title |
|------|------------------|---|
| D1. | UNI EN 9100:2018 | Quality Management Systems - Requirements for Aviation, Space and Defense Organizations. |
| D2. | UNI EN/AS 9102 | Quality Systems - First Article Inspection |
| D3. | UNI EN 10204 | Metallic products – Types of inspection documents |
| D4. | ISO 9001:2015 | Quality Management System – Requirements |
| D5. | ISO 19011:2018 | Guidelines for auditing management systems |
| D6. | ISO 10013:2021 | Guidelines for Quality Management System Documentation. |
| D7. | EN 10204:2004 | Metallic Products – Types of Inspection Documents |
| D8. | AQAP 2070 | NATO Mutual Government Quality Assurance (GQA) Process |
| D9. | AQAP 2110 Ed D | NATO Quality Assurance Requirements for Design, Development and Production |
| D10. | AQAP-2310 ed. B | NATO Quality management system requirements for aviation, space and defence suppliers |
| D11. | STANAG 4107 | Mutual Acceptance of Government Quality Assurance and Usage of the Allied Quality Assurance Publications (AQAP) |
| D12. | STANAG 4427 | Introduction of Allied Configuration Management Publications (ACMP's) |
| D13. | S ST 0000-3169 | Technical Specification barrel blanks for naval and artillery canons with a calibre of 60mm and above |
| D14. | S ST 0000-9212 | Technical Specification breech block blanks for naval and artillery canons with a calibre of 60mm and above |
| D15. | OTO CO 163 | Testing Procedure for barrel blanks |
| D16. | OTO CO 137 | Testing Procedure for breech block blanks |
| D17. | OTO CO 139 | Testing Procedure for bolt blanks |
| D18. | SCQ-228 | Acceptance Specification for barrels, calibre 20mm dis. 812.10.1000 for 20mm automatic gun M61A1 and M197 |
| D19. | MIL DTL 46027 | Detail Specification - Armor Plate, Aluminum Alloy, Weldable 5083, 5456, & 5059 |
| D20. | OTO-AB-01 | Materials for the construction of armoured vehicles |
| D21. | TL 2350-0000 | Technical conditions for supply of second-generation ballistic steel |

¹ Standard and publications cited without a revision date or index are to be considered for reference in the latest released version.

| Ref. | Code | Title |
|------|---------------|--|
| D22. | NC78M001 | Control Standard - Classification and Testing of Castings |
| D23. | PQA004-L-IT-D | Quality Requirements for Supplies to the Defence Systems Business Unit of Leonardo S.p.A. |
| D24. | PQA008-L | Requirements for the supply of Special Processes |
| D25. | QUA017-T-IT-D | List of approved suppliers of Special Processes/NDT and their sub-tier supply chain including internal processes |

2.2 Template/Form/Checklist

| Ref. | Code | Title |
|------|----------------|---|
| T1. | Form 1, EN9102 | Part Number Accountability https://www.sae.org/aaqg/publications/as9102af1.doc |
| T2. | Form 2, EN9102 | Product Accountability (<i>Raw Material, Specifications and Special Process(es), Functional Testing</i>) https://www.sae.org/aaqg/publications/as9102af2.doc |
| T3. | Form 3, EN9102 | Characteristic Accountability, (<i>Verification and Compatibility Evaluation</i>) https://www.sae.org/aaqg/publications/as9102af3.doc |

3 DEFINITIONS AND ACRONYMS

3.1 Definitions

The terms and definitions given in PQA004-L-IT-D apply.

3.2 Acronyms

| Acronym | Description |
|----------------|---|
| AC | Certified Chemical Analysis |
| ATP | Acceptance Test Procedure |
| NDT | Non-Destructive Tests |
| CoC | Certificate of Conformity |
| COTS | Commercial Off-The-Shelf |
| DT | Heat Treatment Diagram |
| EM | Certified Metallographic Examination |
| FAI | First Article Inspection |
| FAIR | First Article Inspection Report |
| GQAR | Government Quality Assurance Representative |
| HB | Brinell hardness |
| NC | Nonconformity |
| PO | Purchase Order |
| PB | Ballistic Tests |
| PBS | Product Breakdown Structure |
| MCP | Manufacturing and Control Plan |
| PR | Impact Test Certificate |
| PRR | Production Readiness Review |
| PT | Tensile Test Certificate |

4 RELATIONS BETWEEN LEONARDO-SDI AND SUPPLIERS

4.1 General requirements

The following requirements specified in PQA004-L-IT-D apply:

- Supplier evaluation and monitoring;
- Transmission of supply requirements;
- Leonardo-SDI Interfaces with the Supplier.

4.2 Supplier Approval

Suppliers of blanks and semi-finished products designed by Leonardo shall be approved in advance by Leonardo-SDI in accordance with PQA004-L-IT-D, through a verification of the company's quality system and validation of its production process.

Approved suppliers may not produce all types of blanks or semi-finished products but, where required by the applicable technical documentation, shall also undergo qualification of the raw P/N blank they intends to supply.

In this case, Leonardo-SDI will issue a qualification certificate after performing all the necessary tests to verify the supplier; the qualification issued is intended to apply only to the manufacture of the blank identified by the qualified Part Number.

Approval is required if the supplier has never worked with Leonardo-SDI or if more than two years have elapsed since the last supply.

4.2.1 Qualification of suppliers of custom-made blanks (RQF = F1)

Qualification of suppliers of custom-made blanks is performed in accordance with the documentation below:

- a) Barrel Blanks: the supplier shall apply the requirements given in the applicable technical documentation and in documents S ST 0000-3169 and OTO CO 163.
 - b) Breech Block Blanks: the supplier shall apply the requirements given in the applicable technical documentation and in documents S ST 0000-9212 and OTO CO 137.
 - c) Bolt Blanks: the supplier shall apply the requirements given in the applicable technical documentation and in OTO CO 139.
 - d) Jacket Blanks: the supplier shall apply the requirements given in the applicable technical documentation.
- Blanks for Torpedo Compartments and other Underwater products: the supplier shall apply the requirements contained in the applicable technical documentation and in document NC78M001.

For all the above cases, qualification of suppliers is performed in two separate stages:

- i. Verification of documents for release of provisional approval that allow the manufacturer to receive Purchase Orders (PO);
- ii. Production of a pilot batch for FAI (if required by PO).

Point (ii) shall be performed for each type of blank (each P/N) that the supplier intends to produce.

A sacrificial blank shall be also produced if required by the applicable technical documentation.

4.2.2 Qualification of suppliers of ballistic plates (RQF = F2)

The supplier shall select his sub-tiers from the manufacturer's authorized vendors, ensuring that the type of product supplied is the vendor's core business.

The qualification requirements are specified in the applicable technical documentation of the specific product the supplier intends to produce.

4.2.3 Qualification of suppliers of non-ballistic plates (RQF = F3)

The supplier shall select his sub-tiers from the manufacturer's authorized vendors, ensuring that the type of product supplied represents the vendor's core business.

The qualification requirements are specified in the applicable technical documentation of the specific product the supplier intends to produce.

4.2.4 Qualification of suppliers of pressings and forgings (RQF = F4)

The supplier shall select his sub-tiers from the manufacturer's authorized vendors, ensuring that the type of supplied product is the vendor's core business.

The qualification requirements are specified in the applicable technical documentation of the specific product the supplier intends to produce.

4.2.5 Qualification of suppliers of castings (RQF = F5)

Qualification of suppliers of Steel or Light Alloy castings is performed in two separate steps:

- 1) Verification of documents for release of provisional approval that allow the manufacturer to receive Purchase Orders (PO);
- 2) Production of a pilot batch for FAI.

Point (2) shall be performed for each type of casting blanks (each P/N) the supplier intends to produce.

If required by the applicable technical documentation, a sacrificial casting shall be also produced for qualification.

4.2.6 Qualification of suppliers of other commercial raw materials (RQF = F6)

The supplier shall select his sub-tiers from the manufacturer's authorized vendors, ensuring that the type of product supplied is the vendor's core business.

The qualification requirements are specified in the applicable technical documentation of the specific product the supplier intends to produce.

5 SUPPLIER QUALITY SYSTEM

The general requirements for the supplier's Quality System are specified in:

- PQA004-L-IT-D ("*Requirements for the Supplier's Quality System*");

6 REQUIREMENTS FOR PRODUCT REALISATION

6.1 Subcontractor Management

The requirements of PQA004-L-IT-D ("*Subcontractor management*") apply.

6.2 Control of production

The supplier shall carry out production activities under controlled conditions, which include preparation and application of:

- a) Activity scheduling (GANTT to be sent within one month after receipt of purchase order, and in case of changes one month before starting activities);
- b) Quality Plan, to be provided if requested in the Purchase Order. In such case the document shall be prepared in accordance with indications of PQA004-L-IT-D, and submitted for Leonardo-SDI's approval within one month after receipt of the purchase order. If requested in the PO, the Quality Plan shall include the supplier's plans for Configuration Management;
- c) Manufacturing and Control Plan (mandatory for materials with RQF Code = F1, F2, F4 or F5; subject to order request for other materials). The document shall be submitted for Leonardo-SDI's approval at least one month before starting activities;
- d) Special Processes Control Procedures (mandatory for materials with RQF Code = F1, F2, F3, F4 or F5; subject to order request for other materials). The documents shall be submitted for Leonardo-SDI's approval at least one month before starting activities.
For provision of Special Processes, the supplier shall also apply the requirements of PQA008-L.
- e) Acceptance Testing Procedure to be applied for Leonardo-SDI's acceptance of the supply (mandatory for materials with RQF Code = F1, F2, F4 or F5; subject to order request for other materials). The document shall be submitted for approval at least one month prior to Leonardo-SDI acceptance testing;
- f) Packaging and Shipping Procedure (mandatory for materials with RQF Code = F1, F2, F4 or F5; subject to order request for other materials). The document shall be submitted for approval at least one month prior to Leonardo-SDI acceptance testing;
- g) Technical documents describing the product characteristics (to be delivered for product acceptance);

and:

- h) Use of equipment suitable for production and availability of work instructions (as necessary);
- i) Monitoring and measurement of product conformity through the use of appropriate equipment, for which suitability for use and periodic calibration shall be continuously ensured. Product conformity shall be documented.

The supplier shall verify the supplied materials against the requirements of the drawing and other applicable technical documentation referred to in the order.

If it is expressly indicated in the purchase order or required by the applicable technical documentation referred to in the order, the supplier shall carry out FAI on a representative sample of the first production batch as specified in Appendix A, in accordance with UNI EN/AS 9102 (see also Section 4.2).

6.3 Supply documentation

All certification related to the supply shall meet the traceability requirement.

If STANAG 4107 is invoked in the PO, the supplier shall agree with Leonardo-SDI on how the activities will be carried out. In addition, the documentation shall be countersigned by Government Quality Assurance before submission to Leonardo-SDI.

The following paragraphs list the documents that suppliers shall deliver, in addition to those specified in Section 6.2.

6.3.1 Documentation for Blanks (RQF = F1)

For each batch of supply, the required certification is indicated in the applicable technical documentation.

Where no specific indications are given, the following documents shall be provided:

1. CoC (accompanied by any waiver/concession requests previously approved by Leonardo-SDI);
2. Manufacturing & Control Plan (MCP), properly completed;
3. FAIR (if applicable);
4. Certificate of Chemical Analysis of the material with evidence of casting;
5. Certificate of HB Hardness;
6. Certificates of Mechanical Characteristics (e.g.: tensile test, resilience, ...etc.);
7. Certificate of Heat Treatment with the relative temperature-time diagram;
8. Certificate of Metallographic examination (with verification of austenitic grain and micro inclusions);
9. Certificate of Magnetoscopic Inspection;
10. Certificate of Ultrasonic Inspection;
11. Certificate of Dimensional Control;
12. Certificate of Radiographic Examination (only if required in the technical documentation);
13. Certificate of liquid penetrant inspection (only if required in the technical documentation);
14. Certificate of Electrical Conductivity test (only if required in the technical documentation);
15. For each batch of supply, if requested in the Leonardo-SDI documentation, the supplier shall deliver a surplus that is representative of the supply batch and homogeneous in terms of chemical analysis and heat treatment, for verification by Leonardo-SDI through laboratory tests.

6.3.2 Documentation for Ballistic Plates (RQF = F2)

For each batch of supply, the required certification is indicated in the applicable technical documentation.

Where no specific indications are given, the following documents shall be provided:

- 1 CoC (accompanied by any waiver/concession requests previously approved by Leonardo-SDI);
- 2 Manufacturing & Control Plan (MCP), properly completed;
- 3 FAIR (if applicable);
- 4 Certificate of Chemical Analysis of the material with evidence of casting and plate;
- 5 Certificate of HB Hardness;
- 6 Certificates of Mechanical Characteristics (e.g.: tensile test, resilience, ...etc.);
- 7 Certificate of Metallographic examination (if required by applicable documentation);
- 8 Certificate of Ultrasonic Inspection;
- 9 Certificate of Dimensional Control;
- 10 Ballistic Testing Certificate (as specified in the applicable technical documentation)..

Ballistic plates shall be identified through identification of plate and casting according to MIL DTL 46027, as specified in OTO-AB-01 or TL 2350-0000.

6.3.3 Documentation for Non-Ballistic Plates (RQF = F3)

For each batch of supply, the supplier shall deliver:

- 1 CoC (accompanied by any waiver/concession requests previously approved by Leonardo-SDI);
- 2 Certificate of Chemical Analysis of the material with evidence of casting;
- 3 Certificate of HB Hardness;
- 4 Certificate of Mechanical Characteristics;
- 5 Certificate of Ultrasonic Inspection;
- 6 Certificate of Dimensional Control.

6.3.4 Documentation for Pressings and Forgings (RQF = F4)

For each batch of supply, the supplier shall deliver a surplus that is representative of the supply batch and homogeneous in terms of chemical analysis and heat treatment for verifications by Leonardo-SDI.

For each batch of supply, the required certification is indicated in the applicable technical documentation; if no specific information are given, the following documents shall be provided:

- 1 CoC (accompanied by any waiver requests previously approved by Leonardo-SDI);
- 2 Manufacturing & Control Plan (MCP), properly completed;
- 3 Certificate of Chemical Analysis of the material with evidence of casting;
- 4 Certificate of HB Hardness;
- 5 Certificate of Mechanical Characteristics (e.g.: tensile, impact test certificates, ... etc.);
- 6 Certificate of Heat Treatment with the relative temperature-time diagram;
- 7 Certificate of Metallographic Examination (if required by the applicable documentation);
- 8 Certificate of Non-Destructive Inspection in accordance with the applicable technical documentation;
- 9 Certificate of Dimensional Inspection;
- 10 FAIR (if applicable).

6.3.5 Documentation for Castings (RQF = F5)

For each supply batch, the supplier shall deliver a surplus that is representative of the supply batch and homogeneous in terms of chemical analysis and heat treatment, for verifications by Leonardo-SDI. The castings shall be permanently identified with the casting and serial number. All documentation shall ensure traceability of the individual piece

For each batch of the supply, the certification required is indicated in the applicable technical documentation; in the absence of specific information, the following documents shall be provided:

- 1 CoC (accompanied by any waiver/concession requests previously approved by Leonardo-SDI);
- 2 Manufacturing & Control Plan (MCP), properly completed;
- 3 Certificate of Chemical Analysis of the material with evidence of casting;
- 4 Certificate of Mechanical Characteristics (e.g.: tensile, impact test certificates, ... etc.);
- 5 Certificate of Dimensional Inspection;
- 6 Certificate of Non-Destructive Inspection in accordance with the applicable technical documentation;
- 7 FAIR (if applicable).

For acceptance criteria and methods of defect repairs, the supplier shall apply the requirements in the applicable technical documentation; if no information are given in such documents, the supplier shall contact Leonardo-SDI to agree on how to operate.

6.3.6 Documentation for other commercial raw materials (RQF = F6)

For each supply batch of commercial raw materials (*bars, sections, laminate, extruded, drawn, ...etc.*), the supplier shall deliver:

- 1 CoC (accompanied by any waiver requests previously approved by Leonardo-SDI);
- 2 Certificate of Chemical Analysis of the material with evidence of casting;
- 3 Certificate of HB Hardness;
- 4 Certificate of Mechanical Characteristics;
- 5 Certificate of Dimensional Control;
- 6 In the case of authorized dealers: CoC of the dealer which states that the materials are part of a supply certified by the manufacturer.

6.4 Identification and Traceability

The supplier shall ensure product traceability with appropriate identification methods according to the requirements of PQA004-L-IT-D (paragraph "*Identification and traceability*").

The supplier shall implement a Configuration Management System that meets the requirements of AQAP 2110 (see also PQA004-L-IT-D, paragraph "Configuration Management System").

6.5 Acceptance of the supply

The requirements of PQA004-L-IT-D ("Acceptance of the supply") apply.

6.5.1 Certificate of Conformity (CoC)

The CoC shall comply with type 3.1 of UNI EN 10204 that is also applicable to non-metallic products. If the supply is subject to Government Quality Assurance, the CoC shall comply with AQAP 2070.

6.5.2 Prevention of Counterfeit Parts

The supplier shall certify the materials with suitable documentation to ensure the originality of the supply materials and the absence of counterfeiting.

6.6 Control of nonconforming products

The requirements of PQA004-L-IT-D ("Control of Nonconforming Products") apply.

6.7 Product preservation

The requirements of PQA004-L-IT-D ("Product preservation") apply.

7 RIGHT OF ACCESS AND SUPPORT FOR THE CUSTOMER AND GQAR

The requirements of PQA004-L-IT-D ("*Right of access and support for the Customer and GQAR* ") apply.

Appendix A. FIRST ARTICLE INSPECTION (FAI)

A.1. INTRODUCTION

A.1.1. Purpose

The purpose of First Article Inspection (FAI) is:

1. Validate the Supplier's production process, verifying on a representative sample of the first production run that the manufacturing processes are able to produce articles that meet the applicable requirements.
2. Verify that the production processes are applied systematically and therefore they are stable and repeatable.

The purpose of this appendix is to define:

- ✓ The requirements to be met by the supplier for First Article Inspection on products supplied to Leonardo-SDI,
- ✓ The documentation required to provide evidence of the controls carried out on the work cycle and the equipment used.

A.1.2. Applicability

This appendix applies to all provisions of raw materials and semi-finished products in which the execution of the FAI is expressly indicated on the purchase order.

A.2. Glossary

| Definition | Description |
|---|--|
| Attribute | The result of the control of a characteristic or property that is evaluated only as to whether it conforms or not to the requirement but is not numerically quantified (e.g. pass-not pass or conforms-does not conform). |
| Balloon drawing | A drawing in which each characteristic or requirement is clearly marked with a unique identification number. The number can be within a circle or box for easy visual identification |
| Key Characteristic | Attribute or characteristic whose variation has a significant effect on product fit, form, function, performance, service life, or producibility, and which requires specific actions to keep its variation under control. |
| Design Characteristic | <p>"Design Characteristics" are all of the dimensional, visual, functional (mechanical, electrical, embedded software, etc.) and property or performance characteristics of the materials constituting the object, as specified in the design documentation.</p> <p>"Design Characteristics" include process variables (e.g. heat treatment temperature and time), acceptability criteria (e.g. inspection class with penetrating liquids, acceptability standards), control procedures and welding sequences.</p> |
| Drawing Requirements | <p>These are the requirements indicated in the drawing, the bill of materials (if not mentioned in the drawing), the specifications or the purchase documents according to which the article is produced.</p> <p>They also include all notes, specifications and lower-level drawings.</p> |
| Evaluation | Measurement, inspection or test to determine conformity of a characteristic with the requirements of the design. |
| FAI | A complete, independent and documented physical and functional verification process to confirm that the production methods adopted have produced an acceptable item as specified in the drawings, purchase order, technical specifications and/or other applicable documents. |
| FAI Plan | See "FAI Planning" |
| FAIR (FAI Report) | The FAIR is a set of documents and records, issued or prepared for each individual part and/or assembly constituting the object of the FAI and organized according to a specific standard established in standard UNI EN/ AS AS 9102. |
| Form, Fit and Function (3F or FFF) | Form, Fit and Function (FFF or 3F) represent the identifying characteristics of a component. If the fit, form and function requirements of two parts are identical then the parts are interchangeable. |
| Inaccessible Characteristic | <p>A characteristic that can only be assessed when it is generated without sacrificing the part.</p> <p>For example, inaccessible dimensions such as internal dimensions of castings or welded joints</p> <p>Or inaccessible non-dimensional characteristics such as chemical and physical properties</p> |
| FAI Planning | All of the activities that shall be carried out before production begins and that are included in a document called an FAI Plan |
| First Production Run | <p>The first group of one or more parts which are the result of a defined production process which is to be used for the future production of the same part.</p> <p>Prototype parts or parts made using methods other than those envisaged by the production process shall not be considered as part of the First Production Run.</p> |

A.3. REQUIREMENTS

The supplier shall perform the FAI in accordance with the guidance in UNI EN 9102 and this document. Upon completion of the FAI activity, the supplier shall submit the FAI Report and its attachments to Leonardo-SDI Industrial Engineering for approval, together with the notice for FAI acceptance test.

The requirements for the supplier to conduct and document the FAI are specified below.

In case of conflict between UNI EN 9102 and this document, the latter shall take precedence.

Requirement 1

The outcome of the FAI is binding for the continuation of serial production and shall be performed on an article representative of the first production run. The Supplier shall not proceed with delivery before the FAI has been approved by Leonardo-SDI.

The FAI requirement shall be extended to all sub-tiers.

Requirement 2

The Supplier shall submit the FAI Plan to Leonardo-SDI within one month of receiving the order. The document shall contain the activities carried out by the sub-tiers.

The FAIs carried out by sub-tiers are an integral part of the FAI for the material covered by the PO and shall be sent with it.

Requirement 3

FAIs carried out on individual components (FAI Form 1 / field 13= Detail) of the supplied product, are an integral part of the FAI of the supplied product (FAI Form 1 / field 13= Assembly).

Requirement 4

The Supplier shall notify Leonardo-SDI of the start of planned activities at least 15 working days prior to the start of the activities.

Leonardo-SDI reserves the right to participate in any phase indicated in the FAI Plan.

In addition, the supplier shall notify Leonardo-SDI by written communication of his intention to apply changes to the FAI Plan at least 10 working days prior to their actual application.

Requirement 5

The Supplier shall carry out the FAI on the first production run: any exceptions are to be authorized in writing by Leonardo-SDI.

Requirement 6

The Supplier shall repeat the FAI in whole or in part when:

- 1 Design changes are made that affect interchangeability (3F);
- 2 Changes are made on the production process, the control methods, the production site, the source materials, or equipment that could affect interchangeability (3F);
- 3 Changes are made on numerical control programs or other programming languages that could affect interchangeability (3F);
- 4 Natural events or events caused by human factors occur that could affect the production process;
- 5 Two or more years (or as otherwise specified by Leonardo-SDI) have passed since the last batch was produced.

Requirement 7

The FAI requirement can be met by a partial FAI (FAI Form 1 /field 14= Partial FAI), rather than a full FAI (FAI - Form 1 / field 14= Full FAI). In such case the partial FAI shall address only the differences between the current configuration and a previously approved configuration.

The FAI requirement can be fulfilled by a previously approved FAI carried out on identical characteristics of a similar product manufactured with the same equipment, the same production cycle, the same materials, and at the same site.

Requirement 8

FAI does not apply to:

- 1 COTS materials;
- 2 "Deliverable" software;
- 3 Commercial metallic and non-metallic raw materials;
- 4 Prototypes;
- 5 Repaired materials.

Requirement 9

The FAI is not complete (FAI Form 1 / field 19= Not Complete) until all nonconformities affecting the product have been closed and the corrective actions necessary to eliminate the causes have been implemented. In such case a partial FAI (FAI Form 1 / field 14= Partial FAI) shall be repeated only on nonconforming characteristics.

Requirement 10

FAI results shall be documented by the supplier (see details at para. A.4.4/5/6)

Requirement 11

The Supplier shall properly retain the FAI documentation for at least 15 years unless otherwise specified in the PO, and shall provide Leonardo-SDI with a copy of the FAI, if requested, at no additional cost unless stated in the PO.

Requirement 12

If the FAI is incomplete, or partially incorrect or failed, Leonardo-SDI reserves the right to have the Supplier partially or completely repeat the FAI at no additional cost.

Requirement 13

The item submitted to FAI shall be identified by marking as specified in the drawing. If the drawing does not provide for identification, a label shall be used to identify the item or the identification shall be marked on its packaging.

A.4. KEY FEATURES OF THE FAI

A.4.1. Action plan for conducting the FAI

The Supplier shall carry out the FAI under its own responsibility, on one or more items (if agreed with Leonardo-SDI) representative of the first production batch.

The FAI action plan is the set of activities to be performed before starting the production process of a supply subject to FAI. The plan shall provide to:

1. Verify that the applicable configuration referenced in the PO matches the product received; Identify all characteristics to be verified, as indicated in the applicable technical documentation. These characteristics shall be traced during the FAI process and shall be identified in drawings (e.g. Balloon Drawing), specifications and other applicable technical documentation, and shall be recorded in FAIR Form 3.
2. Identify the key characteristics to ensure that these are properly verified during the production process;
3. Define the methods for validation of 3D measurement programs, including evidences necessary to support the validation results;
4. Review manufacturing plans, working instructions and applicable technical documentation, for verification of clarity, level of detail, and definition of control sampling methods;
5. Verify that the qualifications of personnel assigned to the production activities are appropriate for the planned special processes and critical operations;
6. Verify that sub-tiers, if required, are able to provide all evidences related to the FAI;
7. Verify that sub-tiers of special processes, critical processes and NDT are included in QUA017-T-IT-D. Identify the equipment to be used to support the production process and verify that calibrations are still valid during the period of use, in accordance with the procedures of the supplier's Quality Management System;
8. Verify the presence of the functional test procedure and submit to Leonardo-SDI for approval;
9. Verify the presence of the packaging and shipping procedures, according to the supplier's Quality Management System and submit to Leonardo-SDI for approval;
10. Check for past recorded nonconformities (if any), and take appropriate corrections to the manufacturing process.

A.4.2. FAI PLAN

The supplier shall submit the FAI Plan to Leonardo-SDI within one month of receiving the PO. The schedule is essentially a table or GANTT that states:

1. The planned date of availability at the supplier's premises of the procured materials needed to carry out the activities, with proper identification of all the supplied items;
2. The planned dates of the activities reported in the Manufacturing Control Plan (MCP), including cially those related to special processes and all control inspections (with identification of Holding Points and Witness Points). The FAI Plan and the MCP shall contain all the necessary controls to verify the characteristics identified on the drawings by the "ballooning" method;
3. The delivery date of the MCP, ATP and FAIR;
4. The dates of the final tests.

Periodically, on a monthly basis (to be agreed between Leonardo-SDI and the supplier), Leonardo-SDI and the supplier will jointly verify the actual completion of planned activities. In case of significant deviations between planning and progress, the frequency of meetings shall be increased.

A.4.3. Preliminary activities to the FAI

Leonardo-SDI's approval of the following documents is required prior to the execution of FAI activities:

1. FAI Plan;
2. Test procedure (ATP);
3. Manufacturing control documents (e.g. MCP).

A.4.4. Conduct of the FAI

- 1 The FAI shall be performed on one or more items (as agreed with Leonardo-SDI) representative of the first production batch, known as the First Production Run;
- 2 The FAI shall be performed on all components which make up the assembly;
- 3 The FAI shall be performed and documented in accordance with UNI EN 9102 and the instructions in this document;
- 4 Results from FAI shall be recorded in a FAI Report (FAIR), prepared according to the forms provided by UNI EN 9102 and in accordance with the indications of this document;;
- 5 Evidence of all verifications referred to in FAIR shall be an integral part of the FAIR itself;
- 6 The FAI shall be performed after the Product Readiness Review (PRR) where requested in the purchase order.

A.4.5. Status of the FAI

The status of the FAI (Complete / Not Complete) shall be recorded in the appropriate field of FAI Form-1.

The status is "Not Complete" when there are still open nonconformities related to the inspected part and any corrective actions have yet to be introduced. In such a case the supplier shall repeat the FAI of the non-conforming characteristics only.

A.4.6. Compiling FAI forms

In order to document the results of the FAI, the Supplier shall use the Forms 1/2/3 contained in UNI EN 9102 (standard available on the SAE website), or may use other company formats as long as containing the same fields of the standard. Fields indicated as optional (O) can be excluded.

The forms shall be compiled in Italian or English language unless otherwise specified in the order;

FAI documentation shall include the records necessary to provide evidence that the product fully meets the requirements.

All fields of the UNI EN 9102 Forms are "colour coded" and "text-font-coded" as follows:

| | |
|---|--|
| Required (R) | "Yellow" background and bold font |
| Required, under certain conditions (CR) | "Blue" background and <i>bold italic</i> font |
| Optional (O) | "White" background 2 regular font |

Form 1 - Part Number Accountability

Used to identify the item subject to FAI and the related sub-assemblies,

Form 2 - Product Accountability (Raw Material, Specifications and Special Process(s), Functional Testing)

Used to identify materials and/or special processes and/or functional tests that have been defined as "design requirements".

Form 3 - Characteristic Accountability, Verification and Compatibility (Evaluation)

Shall be used to record the results of inspections carried out

