KONGSBERG

Supplier Quality Assurance Requirements (SQAR)

Generic Text Document

Document ID: P10098

Revision: L

Status: Release Date:2024-11-01

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Table of Contents

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List of Figures

List of Tables

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1. Scope

1.1 Identification

This document is identified as P10098. The document name is Supplier Quality Assurance Requirements, hereafter called SQAR.

1.2 System and Document Overview

The SQAR defines quality assurance (QA) requirements for suppliers. Product specific requirements are defined in separate product requirement specifications (e.g., Technical Data Package (TDP)).

The SQAR uses as a basis the requirements in Quality management systems – Requirements (ISO 9001:2015) [31].

The SQAR defines additional KONGSBERG requirements. The requirements of ISO 9001:2015 [31] are incorporated herein by reference and shall have the same force and effect as if the chapters were included in full text. Chapters where KONGSBERG does not have additional requirements to ISO 9001:2015 [31] contain the statement: "*No additional or supplemental requirements to ISO 9001:2015*".

"Shall" indicates a requirement

"Should" indicates a recommendation.

In the SQAR the term "supplier" is synonymous with the term "organization" as used in ISO 9001:2015, and the term "product" shall be understood as "service" if the deliverable to KONGSBERG is a service provided by the supplier.

The ISO 9001:2015 chapter numbering scheme has been used similarly for the numbering of chapters in the SQAR.

An example of chapter numbering, naming and requirements:

7. Support

   Chapter numbering and name according to ISO 9001:2015 [31].

7.1 Resources

   Chapter numbering and name according to ISO 9001:2015 [31].

7.1.3 Infrastructure

   Chapter numbering, name and requirements according to ISO 9001:2015 [31], and additional KONGSBERG requirements

7.1.3.1 Security classification

   Additional KONGSBERG chapter numbering, name and requirements.

The supplier shall establish a SQAR Compliance Matrix [38], i.a.w chapter 11.1 of this document.

The SQAR Compliance Matrix shall contain a statement for each requirement in the SQAR, with a reference to the process, procedure or document that ensures compliance to the requirement. Any noncompliance or partial compliance requires a justification.

If the supplier in the SQAR Compliance Matrix claims compliance to a recommendation (i.e. "should"), then the SQAR Compliance Matrix shall contain a compliance statement or reference as if it was a "shall" requirement.

1.3 Relationship to Other Documents

See chapters 1.2 and 1.3.

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1.4 Document history

Table 1 – Document history

Rev.	Date	Changes
J	May-18	• Improved the alignment to ISO 9001:2015 structure by including heading level 3. • Removed SQAR requirements covered by ISO 9001:2015 • Adjusted requirement wording to align with latest revisions of AS9100 and AQAP-2110 • Added applicable requirements from latest revisions of AS9100 and AQAP-2110 • Removed classification of non-conformance (major/minor) • Added Chapter 11 describing SQAR related templates • Removed SQAR related templates as separate appendices
K	Dec-20	• Combined chapter 1.2 and 1.3 into one system and document overview • Clarified “shall” vs. “should” in chapter 1.2 • Removed duplication of header 4.2.2 • Replaced “Contractors Area” with “Supplier Portal” as per www.kongsberg.com • Added abbreviation for Manufacturer (MFR) and Original Design Activity (ODA) • Moved “System Assessment” to chapter 4.2.3 • Restructured chapter 4.4. for clarification • Added requirement in chapter 4.4.2 on authorization for issuance of QAPP/ SQAR compliance matrix • Added MIL-STD-130 limitations to ensure unique serial number in chapter 8.1.2.5.4 • Removed digit limitation and lot allocation in serial numbers in chapter 8.1.2.5.4 • Removed limitation to RoHS II in chapter 8.1.3.1 • Clarified design activity in chapter 7.5.1 • Adjusted the sequence of steps in the FAI in chapter 8.5.1.8 • Updated delivery addresses for submittal of BLA-6167 in chapter 8.1.2.6.3 & 8.5.5.1 • Clarified the definition of conflict minerals in chapter 8.4.2.3 • Removed requirement on SCP from chapter 4.4.4. • Added requirement of MFR marking on non-serialized items in chapter 8.5.2.2
L	Apr-03	• Changed formatting for header and footer • Labelled the document as “PUBLIC” • Changed wording to comply with AQAP-2310 in chapter 4.2.1 • Clarified restrictions for transferring information classified as CUI and ITAR in chapter 8.1.2.6.3 • Corrected a line-shift error in chapter 8.5.1.8 • Updated the requirements for CoC to be in line with AS9163 chapter 8.6.1 • Removed sentence on how to fill out block 13 in BLA-6167 in chapter 8.7.1 • Clarified supplier responsibility for ensuring compliance in chapter 11.1 • Corrected formatting for standards referenced throughout the document • Fixed multiple reference errors

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2. Referenced Documents

Table 2 – Referenced documents

Reference and Title	Doc ID	Publisher
[1] National Consensus Standard for Configuration Management	ANSI/EIA-649	SAE International
[2] European Agreement concerning the International Carriage of Dangerous Goods by Road	ADR (ECE/TRANS/257)	UNECE
[3] ESD Association Standard for the Development of an Electrostatic Discharge Control Program for Protection of Electrical and Electronic Parts, Assemblies and Equipment (Excluding Electrically Initiated Explosive Devices)	ANSI/ESD S20.20	EOS/ESD Association, Inc.
[4] NATO quality assurance requirements for design, development and production	AQAP-2110	NATO
[5] NATO Supplementary Software Quality Assurance Requirements to AQAP-2110 or AQAP-2130	AQAP-2210	NATO
[6] Counterfeit Electronic Parts; Avoidance, Detection, Mitigation, and Disposition	AS5553	SAE International
[7] Counterfeit Materiel; Assuring Acquisition of Authentic and Conforming Materiel	AS6174	SAE International
[8] Aerospace First Article Inspection Requirement	AS9102	SAE International
[9] Quality Management Systems – Requirements for Aviation, Space and Defense Organizations – Deliverable Software (Supplement to 9100:2016)	AS9115	SAE International
[10] Aerospace Certificate of Conformity Requirements	AS9163	SAE International
[11] Request for Change	BLA-6167 / (e)BLA-6167	KONGSBERG
[12] Regulation concerning the making available on the market and use of biocidal products	BPR (EC 528/2012)	EU
[13] Regulation on classification, labelling and packaging of substances and mixtures	CLP (EC 1272/2008)	EU
[14] http://www.kongsberg.com	Supplier Portal	KONGSBERG
[15] Department of Defence Federal Acquisition Regulation Supplement	DFARS	US DoD
[16] IATA Dangerous Goods Regulations	DGR	IATA
[17] Federal Acquisition Regulation	FAR	US Gov
[18] ESD Protection of electronic devices from electrostatic phenomena - General requirements	IEC 61340-5-1	IEC
[19] ESD Protection of electronic devices from electrostatic phenomena – User guide	IEC 61340-5-2	IEC

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Reference and Title	Doc ID	Publisher
[20] Systems and software engineering - Software life cycle processes	ISO/IEC/IEEE 12207	ISO
[21] International Maritime Dangerous Goods Code	IMDG Code	IMO
[22] Requirements for Soldering Electrical and Electronic Assemblies	IPC/EIA J-STD-001	IPC
[23] Handling, packing, shipping and use of Moisture/Reflow sensitive surface mount devices	IPC/JEDEC J-STD-033	JEDEC/IPC
[24] Requirements and Acceptance of Cable and Wire Harness Assemblies	IPC/WHMA-A-620	IPC/WHMA
[25] Rework, Modification and Repair of Electronic Assemblies	IPC-7711/21	IPC
[26] Acceptability of electronic assemblies	IPC-A-610	IPC
[27] Quality management – Guidelines for configuration management	ISO 10007	ISO
[28] Measurement management systems – Requirements for measurement processes and measuring equipment	ISO 10012	ISO
[29] Environmental management systems – Requirements with guidance for use	ISO 14001	ISO
[30] Risk management - Guidelines	ISO 31000	ISO
[31] Quality management systems – Requirements	ISO 9001:2015	ISO
[32] Information technology – Automatic identification and data capture techniques – Code 39 bar code symbology specification	ISO/IEC 16388	ISO
[33] General Requirements for the competence of testing and calibration laboratories	ISO/IEC 17025	ISO
[34] Information technology – Security techniques – Information security management systems – Requirements	ISO/IEC 27001	ISO
[35] Regulation of wood packaging material in international trade	ISPM 15	IPPC
[36] Contractual Baseline (CBL)	KDA-TMPL-0186	KONGSBERG
[37] Contractual Data Requirement List (CDRL)	KDA-TMPL-0187	KONGSBERG
[38] SQAR Compliance Matrix Template	KDA-TMPL-0210	KONGSBERG
[39] Verification Cross Reference Matrix (VCRM)	KDA-TMPL-0189	KONGSBERG
[40] Product Baseline (PBL)	KDA-TMPL-0217	KONGSBERG
[41] KONGSBERG Supplier Conduct Principles (SCP)	KOG-DIR-0038	KONGSBERG
[42] Environmental stress screening process for electronic equipment	MIL-HDBK-2164	US DoD
[43] General guidelines for electronic equipment	MIL-HDBK-454	US DoD
[44] Configuration management guidance	MIL-HDBK-61	US DoD
[45] Military marking for shipment and storage	MIL-STD-129	US DoD

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Reference and Title	Doc ID	Publisher
[46] Identification Marking of U.S. Military Property	MIL-STD-130	US DoD
[47] Procedures for performing a failure mode, effects, and criticality analysis	MIL-STD-1629	US DoD
[48] Electrostatic discharge control program for protection of electrical and electronic parts, assemblies and equipment (excluding electrically initiated explosive devices)	MIL-STD-1686	US DoD
[49] Finishing of Metal and Wood Surfaces	MIL-STD-171	US DoD
[50] Requirements for The Control of Electromagnetic Interference Characteristics of Subsystems and Equipment	MIL-STD-461	US DoD
[51] System Safety	MIL-STD-882	US DoD
[52] Defence and Program-unique Specifications Format and Content	MIL-STD-961	US DoD
[53] Foreign Object Damage (FOD) Prevention Guidance Document	NAS 412	AIA/NAS
[54] Regulation on the Registration, Evaluation, Authorization and Restriction of Chemicals (REACH)	REACH (EC 1907/2006)	EU
[55] Regulation concerning the International Carriage of Dangerous Goods by Rail	RID 2017	OTIF
[56] Directive on the restriction of the use of certain hazardous substances in electrical and electronic equipment RoHS	ROHS (2011/65/EU)	EU
[57] Cleaning Methods for Ferrous Surfaces and Pretreatments for Organic Coatings	TT-C-490	Federal Standard
[58] Quality Management Systems – Fundamentals and vocabulary	ISO 9000	ISO
[59] Guidelines for auditing management systems	ISO 19011	ISO
[60] Foreign Object Damage (FOD) Prevention Program – Requirements for Aviation, Space and Defense Organizations	AS9146	SAE International
[61] Variation Management of Key Characteristics	AS9103	SAE International

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3. Terms and Definitions

Supplemental to the terms and definitions in ISO 9000 [58], the following applies:

Table 3 – Abbreviations, Terms and Definitions

ABL	The Allocated Baseline. The initially approved documentation that describes: - an item's functional and interface characteristics that are allocated from a higher-level configuration item; and - interface requirements with interfacing configuration items; and - design constraints; and - the verification required to demonstrate the achievement of those specified functional and interface characteristics.
ADP	Acceptance Data Package
ADR	European Agreement concerning the International Carriage of Dangerous Goods by Road
ANSI	American National Standards Institute
AQAP	Allied Quality Assurance Publications
AS	Aerospace Standard
AT	Acceptance Test
Audit	A systematic, independent and documented process for obtaining audit evidence and evaluating it objectively to determine the extent to which the audit criteria are fulfilled.
BPR	Biocidal Product Regulation
CAGE	Commercial and Government Entity Code. The CAGE code or NATO CAGE (NCAGE) code is a five-character unique ID number issued by the US Defence Logistics Agency or NATO.
CAS	Chemical Abstracts Service
CBL	Contractual Baseline
CCB	Configuration Control Board
CDR	Critical Design Review
CDRL	Contract Data Requirement List
CFE	Customer Furnished Equipment
CFM	Customer Furnished Material
CI	Configuration Item
CLP	Regulation of classification, labelling and packaging of substances and mixtures
CNC	Computer Numerical Control
CoC	Certificate of Conformance
Supplier Portal	A KONGSBERG website where suppliers can access electronic versions of applicable documents. Login credentials are obtained from the KONGSBERG PoC.
COTS	Commercial Off the Shelf
Counterfeit Parts	An unauthorized copy, imitation, substitute, or modified part (e.g., material, part, component), which is knowingly misrepresented as a specified genuine part of an original or authorized manufacturer. Examples of a counterfeit part can include, but are not limited to, the false identification of marking or labeling, grade, serial number, date code, documentation, or performance characteristics.

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Critical Items	Those items (e.g., functions, parts, software, characteristics, processes) having significant effect on the product realization and use of the product; including safety, performance, form, fit, function, manufacturability, service life, etc.; that require specific actions to ensure they are adequately managed. Examples of critical items include safety critical items, fracture critical items, mission critical items, key characteristics, etc.
CSA	Configuration status accounting
CSR	Corporate Social Responsibility
Dangerous Goods	Materials or items with hazardous properties which, if not properly controlled, present a potential hazard to human health and safety, infrastructure and/ or their means of transport. See Recommendations on the Transport of Dangerous Goods – UN Model Regulations
DFARS	Department of Defence Federal Acquisition Regulation Supplement
DGR	Dangerous Goods Regulations
DLS	Land Systems (Division of Kongsberg Defence & Aerospace)
DM	Missile Systems (Division of Kongsberg Defence & Aerospace)
DMA	Aerostructures (Division of Kongsberg Defence & Aerospace)
DR	Delivery Review
DSS	Space and Surveillance (Division of Kongsberg Defence & Aerospace)
DTL	Detail
ECHA	European Chemicals Agency
ECO	Engineering Change Order
EEA	European Economic Area
EEOL	Estimated End-of-Life
EOL	End-of-Life
ESD	Electrostatic Discharge
ESS	Environmental Stress Screening
EU	European Union
FAI	First Article Inspection
FAQT	First Article Qualification Test
FAR	Federal Acquisition Regulations
FAT	Factory Acceptance Test. The acronym FAT is also used by some contracts for Final Acceptance Test, and US contracts tends to use the expression “Acceptance Test” for the same purpose. In addition, FAT is also used by US contracts for the term First Article Test. KONGSBERG's official definition shall be Factory Acceptance Test.
FATR	Factory Acceptance Test Report
FBL	Functional Baseline. The initially approved documentation that describes - a system's or item's functional characteristics, and - the verification required to demonstrate the achievement of those specified functional characteristics.
FCA	Functional Configuration Audit
FDR	Final Design Review
FMEA	Failure Mode and Effect Analysis
FMECA	Failure Mode, Effects and Criticality Analysis

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FOD	Foreign Object Damage/ Debris
FQR	Final Qualification Review
FRACAS	Failure Reporting Analyzing and Corrective Action System
FTA	Fault Tree Analysis
GQA	Government Quality Assurance. The process by which the appropriate national authorities establish confidence that the requirements of the contract/ purchase order related to quality are met.
GQAR	Government Quality Assurance Representative. The personnel with the responsibility for GQA, acting on behalf of the government.
Hazardous Sources	Significant levels and amount of stored energy and dangerous materials and substances.
HDBK	Handbook
HFE	Human Factors Engineering
HRS	Hardware Requirement Specification
IATA	The International Air Transport Association
ICD	Interface Control Drawing
IDS	Integrated Defence Systems (Division of Kongsberg Defence & Aerospace)
IEEE	Institution of Electrical and Electronics Engineers
ILS	Integrated Logistics Support
IMDG Code	International Maritime Dangerous Goods Code
IMO	International Maritime Organization
INS	KONGSBERG Instruction
IPC	Institute for Printed Circuits
ISO	International Organization for Standardization
ITAR	International Traffic in Arms Regulations
Key Characteristics	An attribute of feature whose variation has a significant effect on product fit, form, function, performance, service life or producibility, that requires specific actions for the purpose of controlling variation.
KONGSBERG	Kongsberg Defence & Aerospace AS
KVS	KONGSBERG Work Standard
LLI	Life Limited Items. Components that over time will have reduced functionality and may possibly stop working as intended, which will decrease the reliability and the lifetime of the total product.
LTB	Last Time Buy
MFR	Manufacturer
MIL	Military
MMI	Man, Machine Interface
MRB	Material Review Board
MTBF	Mean Time Between Failure
NAS	National Aerospace Standard
NDT	Non-Destructive Test
NSN	NATO Stock Number

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OCM	Original Component Manufacturer
ODA	Original Design Activity
OECD	Organization for Economic Co-operation and Development
OEM	Original Equipment Manufacturer
OTIF	Intergovernmental Organization for International Carriage by Rail
PBL	Product Baseline
PBS	Product Breakdown Structure
PCA	Physical Configuration Audit
PDM	Product Data Management
PDR	Preliminary Design Review
PMP	Program Management Plan
PoC	Point of Contact
PRR	Production Readiness Review
QA	Quality Assurance
QAPP	Quality Assurance Program Plan
QMS	Quality Management System
QRR	Qualification Readiness Review
RCA	Root Cause Analysis
REACH	Regulation of the Registration, Evaluation, Authorization and Restriction of Chemicals
REPSHIP	Report of Shipment
RID	Regulation concerning the International Carriage of Dangerous Goods by Rail
RMI	Responsible Minerals Initiative (formerly Conflict-Free Sourcing Initiative (CFSI))
RoHS	Directive on the restriction of the use of certain hazardous substances in electrical and electronic equipment
SAT	System Acceptance Test
SCD	Source Control Document
SCP	KONGSBERG Supplier Conduct Principles
SDR	System Design Review
Special Processes	Processes for production and service provision where the resulting output cannot be verified by subsequent monitoring or measurement
Special Requirements	Those requirements identified by KONGSBERG, or determined by the supplier, which have high risks to being achieved, thus requiring their inclusion in the risk management process. Factors used in the determination of special requirements include product or process complexity, past experience, and product or process maturity. Examples of special requirements include performance requirements imposed by KONGSBERG that are limit to industry`s capability, or requirements determined by the supplier to be at the limit of its technical or process capabilities.
SQAR	Supplier Quality Assurance Requirements
SRR	System Requirements Review
SRS	Software Requirement Specification
STD	Standard

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STTE	Special Tools and Test Equipment
SW	Software
TDP	Technical Data Package which constitute product specifications and production documentation
TMPL	Template
TRR	Test Readiness Review
UNECE	United Nations Economic Commission for Europe
VCRM	Verification Cross Reference Matrix
WHMA	The Wiring Harness Manufacturing Association

4. Context of the organization

4.1 Understanding the organization and its context

No additional or supplemental requirements to ISO 9001:2015.

4.2 Understanding the needs and expectations of interested parties

4.2.1 Government surveillance

All requirements of this contract may be subject to GQA. You will be notified of any GQA activity to be performed.

Note that

- The term “contract” does also include “Purchase order”
- GQA activities at supplier’s facilities do not relieve the supplier from any contractual quality responsibilities towards KONGSBERG.

4.2.2 Right to access for quality assurance activities

Any KONGSBERG personnel, KONGSBERG representative, KONGSBERG’s customer, government and regulatory representative shall have the right to:

- Access facilities where activities under the contract/ purchase order are being performed; and
- Receive information pertaining to the fulfillment of requirements in the contract/ purchase order; and
- Conduct on-site assessments and Audits to:
    - Evaluate supplier compliance with the SQAR; and
    - Evaluate lower tier suppliers’ compliance with the requirements flown down from the SQAR.; and
    - Conduct verification of product conformity with the requirements of the contract/ purchase order.

  Any KONGSBERG Audit will be performed by an authorized KONGSBERG lead auditor in accordance with the guidelines of ISO 19011 [59].

4.2.3 System assessment

KONGSBERG may conduct a system assessment which will be performed as a KONGSBERG Audit. The system assessment is defined as a formal examination of the supplier’s capability and capacity, and to verify if the supplier’s Quality Management System (QMS) is in compliance with the requirements of either a

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prospective or an existing contract/ purchase order. Included in the assessment is an evaluation of the supplier's compliance to the KONGSBERG Supplier Conduct Principles (SCP) [41].

The system assessment will be conducted on those areas described in the agenda forwarded by KONGSBERG.

Input

A contract/ purchase order, or a request for information/proposal/quotation has been issued by KONGSBERG with a data package that may include both technical and non-technical requirements (e.g., Statement of Work (SOW), system segment specification, hardware requirement specification, drawings, QA, and commercial terms and conditions).

Process

The assessment shall enable KONGSBERG to become familiar with the supplier's established management system, organization, capabilities and capacity. The Audit team will conduct on-site assessments of documentation, facilities, procedures, processes, and other relevant physical evidence required for an orderly development/production program. The Audit team is composed so that all topics of the Audit shall be covered with limited resources. Subject matter experts will be involved based on the requirements and scope of the prospective or existing contract/ purchase order.

Output

The system assessment shall conclude on one of the following states of approval as a KONGSBERG supplier:

1. Approved; or
2. Conditionally approved; or
3. Not approved.

The approval, as well as potential actions and opportunities for improvement, shall be defined on the basis of the Audit team's consideration of, and identified risks associated with, the supplier's ability to meet the requirements and obligations of a possible contract/ purchase order in due time, with the available infrastructure and resources.

An Audit report will be prepared by KONGSBERG, and will contain conclusions, including identified risk areas, potential for improvements and a summary of required corrective actions, as agreed on the final meeting concluding the system assessment.

4.2.4 Site representative

KONGSBERG may, at its own discretion, and for such period as it deems necessary, assign resident representative personnel to the supplier's facility.

Any such site representative from KONGSBERG shall be allowed access to all subject program work areas, program related documentation and meetings necessary to monitor the supplier's conformance with the contract/ purchase order and to provide support as requested.

The supplier shall support the KONGSBERG site representative with office facilities, including internet access, in order to facilitate the site representative's work.

4.2.5 Supplier Conduct Principles

The supplier shall be committed to conduct its business activities in a fair, honest, responsible, ethical, and lawful manner as outlined in the SCP [41]. The SCP is available at www.kongsberg.com.

The SCP is part of the general terms and conditions of the contract/ purchase order, and the supplier is expected to comply with these principles.

The supplier shall flow down the substance of the SCP to its lower tier suppliers.

4.3 Determining the scope of the quality management system

No additional or supplemental requirements to ISO 9001:2015

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4.4 Quality management system and its processes

4.4.1 ISO 9001 certification

The supplier shall have a QMS that is certified to be in compliance with the International Organization for Standardization document ISO 9001:2015 [31]. Independent certification/registration is required under the authority of a recognized accreditation process by the International Accreditation Forum requirements.

4.4.2 QAPP

The supplier shall prepare and maintain a Quality Assurance Program Plan (QAPP) that documents how the supplier will utilize its QMS to achieve compliance with the requirements of the contract/ purchase order. Any deviations or noncompliance to the requirements shall be approved by KONGSBERG. A SQAR Compliance Matrix shall be completed, and may constitute the QAPP when approved by KONGSBERG.

The SQAR Compliance Matrix shall be completed by the head of the supplier's quality assurance function, or authorized person.

4.4.3 AQAP compliance

No exclusions to requirements in this document shall in any way diminish, alter, or relieve any AQAP-2110 – NATO Quality assurance requirements for design, development and production [4] requirements of any contract/ purchase order between the supplier and KONGSBERG.

No exclusions to requirements in this document shall in any way diminish, alter, or relieve any AQAP-2210 – NATO Supplementary software quality assurance requirements [5]of any contract/ purchase order between the supplier and KONGSBERG.

4.4.4 Compliance to supplemental requirements

The supplier‘s QMS should secure compliance to

- ISO 14001 Environmental Management System [29]; and
- ISO 27001 Information Security Management System [34].

When delivering products containing standalone and/ or embedded software (SW), the supplier‘s QMS shall secure compliance with one of the following standards:

- ISO/IEC/IEEE 12207 Software engineering [20]; or
- AQAP-2210 Supplementary Software Quality Assurance Requirements [5] to AQAP-2110 [4]; or
- AS9115 Quality Management Systems – Requirements for Aviation, Space and Defence organizations – Deliverable Software [9].

The implementation of and compliance with one of the above alternatives is required when SW (i.e., computer programs and related data and documentation) shall be obtained either separately or as part of a system or subsystem.

The supplier shall plan, organize and control his activities in such a manner that the contractual, statutory and regulatory requirements are systematically achieved, and deficiencies are detected, corrected and prevented from recurring.

4.4.5 Documented information on compliance

Objective evidence shall be produced to demonstrate that the supplier has maintained control of all his operations and performed such evaluation of the product as to assure that it conforms to the contractual requirements agreed with KONGSBERG.

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5. Leadership

5.1 Leadership and commitment

5.1.1 General

No additional or supplemental requirements to ISO 9001:2015.

5.1.2 Customer focus

Product and service conformity and on-time delivery performance shall be measured and appropriate action shall be taken if planned results are not, or will not be, achieved.

5.2 Policy

No additional or supplemental requirements to ISO 9001:2015.

5.3 Organizational roles, responsibilities and authorities

The supplier is responsible for managing any delegation of authorities within the company (e.g., certification of testers, Material Review Board (MRB) authorities, lead auditors, and signing of Certificate of Conformity (CoC).

The supplier shall appoint a specific member of the management (e.g., QA manager) who shall have the responsibility and authority for oversight of the QMS and compliance with the SQAR requirements.

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6. Planning

No additional or supplemental requirements to ISO 9001:2015.

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7. Support

7.1 Resources

7.1.1 General

No additional or supplemental requirements to ISO 9001:2015.

7.1.2 People

No additional or supplemental requirements to ISO 9001:2015.

7.1.3 Infrastructure

The supplier shall include equipment utilization planning, back-up solutions, and equipment adequacy, when determining the necessary infrastructure (e.g., to reduce the impact of potential bottlenecks).

7.1.3.1 Security classification

If the contract/ purchase order entails KONGSBERG and the supplier to share with each other classified information, hardware or SW, then all necessary approvals from the appropriate national security authorities must be in place prior to such taking place.

If KONGSBERG is to share with the supplier, then KONGSBERG shall initiate the necessary process and activities. Alternatively, if the supplier is to share with KONGSBERG, then the supplier shall initiate the necessary process and activities.

7.1.3.2 ESD control

The supplier shall implement and maintain an Electrostatic Discharge Control (ESD) program according to an ESD standard, e.g.:

- ANSI/ ESD S20.20 Electrostatic Discharge Control [3]; or
- MIL-STD-1686: Electrostatic discharge control program for protection of electrical and electronic parts, assemblies and equipment (excluding electrically initiated explosive devices) [48]; or
- MIL-STD-461: Requirements for The Control of Electromagnetic Interference Characteristics of Subsystems and Equipment [50]; or
- IEC 61340-5-1: ESD Protection of electronic devices from electrostatic phenomena – General requirements [18]; and IEC 61340-5-2: ESD Protection of electronic devices from electrostatic phenomena – User guide [19].

7.1.4 Environment for the operation of processes

No additional or supplemental requirements to ISO 9001:2015.

7.1.5 Monitoring and measuring resources

7.1.5.1 General

No additional or supplemental requirements to ISO 9001:2015.

7.1.5.2 Measurement traceability

Calibration or verification of monitoring and measuring equipment shall be carried out under suitable environmental conditions.

Testing and calibration services (including first-, second- and third-party laboratory services) shall be conducted in accordance with:

- Testing and calibration procedures accredited to ISO 17025 [33]; or
- Measurement processes managed in accordance with ISO 10012 [28]

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and the supplier shall provide traceability to national/international standards.

7.1.6 Organizational knowledge

No additional or supplemental requirements to ISO 9001:2015.

7.2 Competence

No additional or supplemental requirements to ISO 9001:2015.

7.3 Awareness

Persons involved in work related to the contract/ purchase order shall be made aware of their contribution to conformity and safety of the product or service, and the importance of ethical behavior. Employees shall receive training to maintain knowledge of the supplier's current QMS.

7.4 Communication

No additional or supplemental requirements to ISO 9001:2015.

7.5 Documented information

7.5.1 General

For design and development contracts based on KONGSBERG interface and design specifications, a KONGSBERG part number will be issued. KONGSBERG shall be assigned Original Design Activity (ODA) on products developed or adapted based on the KONGSBERG specifications. The product shall be maintained and managed in line with the KONGSBERG specification requirements.

Product management driven by other interests than requirements and interface definitions included in the KONGSBERG specification shall be maintained on separate supplier part number without interfering with the baselined KONGSBERG product.

7.5.2 Creating and updating

For program related documents not written in the English language, but which shall be reviewed during Audits, reviews or process approvals due to criticality, a summary with the important contents shall be provided in English, as needed

7.5.3 Control of documented information

The supplier shall prevent the unintended use of obsolete documented information by removal or by application of suitable identification or controls.

Documented information retained as evidence of conformity shall be stored systematically by the supplier in a record file. 10 (ten) years after last delivery to KONGSBERG, the record file may only be destroyed upon written permission from KONGSBERG. The supplier must flow down this requirement to its lower tier suppliers. Documented information shall be available for review upon request at any time during this period.

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8. Operation

8.1 Operational planning and control

8.1.1 Operational risk management

The supplier shall identify the risks and opportunities associated with each stage of the contract/ purchase order. An integrated approach of risk mitigation shall be applied, involving cost, schedule, and technical performance, including control of Special Requirements. Risk mitigation shall be an integral part of all reviews and meetings. Risk and opportunity management should be based on ISO 31000 [30] as a guideline.

8.1.2 Configuration management

8.1.2.1 Configuration management process

The supplier shall plan, implement and control a configuration management process in accordance with one of the following standards:

- ANSI/EIA-649 [1] or
- ISO 10007 [27]; or
- A similar configuration management standard.

The principles in MIL-HDBK-61, "Configuration Management Guidance" [44] may be used as a reference.

The supplier shall be responsible for identification, control, and changes of physical and functional attributes to ensure that the product conforms to the requirements of the contract/ purchase order. This includes traceability to all applicable requirements through the lifecycle of any product or component manufactured to KONGSBERG' or the supplier's drawings, specifications, or Special Processes procedures.

The configuration management process shall ensure that the documented information (e.g., requirements, design, verification, validation and acceptance documentation) is consistent with the actual attributes of the product.

8.1.2.2 Contractual Data Requirement List (CDRL)

A Contractual Data Requirement List (CDRL) may be used to summarize the defined contractual data/ document deliverables of the contract/ purchase order. Changes to the CDRL content that occur after contract award, will necessitate a formal change to the contract/ purchase order. The template KDA-TMPL-0187 Contractual Data Requirement List (CDRL) [37] may be used.

8.1.2.3 Product Baseline (PBL)

The Product Baseline (PBL) is the approved technical documentation which describes the configuration of a Configuration Item (CI) during production, fielding/deployment and operational support phases of its lifecycle. The PBL is based on:

- Functional Baseline (FBL), released at System Design Review (SDR) ref. chapter 8.3.3.2; and
- Allocated Baseline (ABL), released at Critical Design Review (CDR) ref. chapter 8.3.4.2.

The PBL shall describe or reference:

- All necessary physical or form, fit, and function characteristic of a CI; and
- The TDP required for production of the CI; and
- The selected functional characteristics designated for product acceptance testing; and
- The product acceptance test requirements.

The template KDA-TMPL-0217 Product Baseline (PBL) [40] may be used. Alternatively, the PBL may be a report generated from either KONGSBERG's or the supplier's Product Data Management (PDM) system. The PBL shall be frozen at First Article Inspection (FAI), or the closest contractual milestone defined where the CI is approved for start of (serial) production.

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Any subsequent changes to the PBL, or contents therein, shall be communicated to KONGSBERG through the use of BLA-6167 Request for Change [11].

8.1.2.4 Contractual Baseline (CBL)

The CBL is the sum of the PBL and any additional contractual agreements (e.g., contract/ purchase order, commercial terms and conditions, QAPP, and SQAR Compliance Matrix) between the supplier and KONGSBERG. The template KDA-TMPL-0186 Contractual Baseline (CBL) [36] may be used.

8.1.2.5 KONGSBERG configuration identification standard

This chapter explains the KONGSBERG configuration identification standard for products and documentation controlled by KONGSBERG, and hence contains no QA requirements.

Figure 1 outlines the principles used by KONGSBERG in identification of parts and related documents.

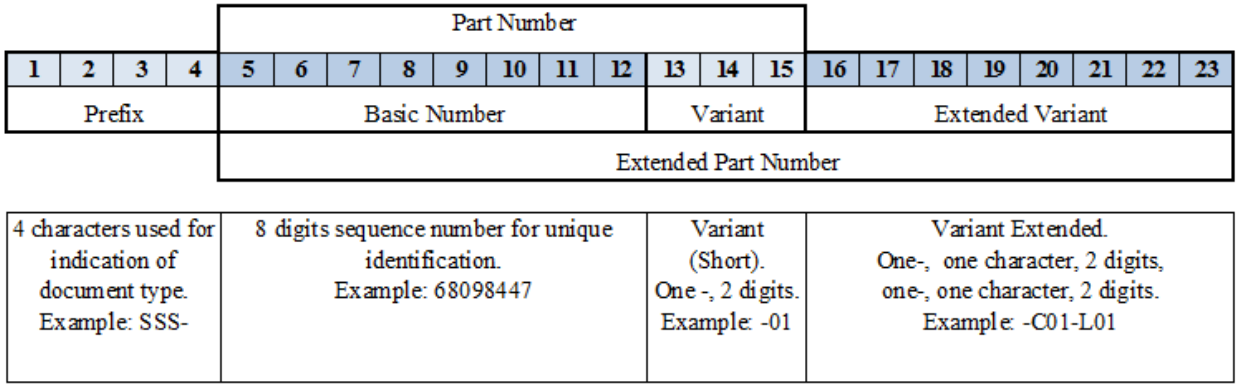

Figure 1 - Part and document number definition

8.1.2.5.1 Part number

A part number is assigned in line with the principles illustrated in Figure 1 - Part and document number definition.

8.1.2.5.2 Product data number (document number)

The revision of a document related to a part may differ from the revision of the part. Consequently, a part may have related documents revised without affecting the revision of the part.

Documents related to a part may use auto numbering from the PDM system, or document numbering in line with Figure 1 - Part and document number definition.

Examples of applicable prefixes that may be used for documents in the contract/ purchase order are shown in table 4.

Table 4 – Sample prefixes used for KONGSBERG documents

Prefix	Document type	Prefix	Document type
SSS	System Segment Specification	ASSY	Assembly Drawing
HRS	Hardware Requirement Specification	DDWG	Detail Drawing
SRS	Software Requirement Specification	ICD	Interface Control Document
SCD	Source Control Document	WD	Wiring Diagram

8.1.2.5.3 Revision

Revision letters are used for documents, parts and models.

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The first revision starts with "-" (hyphen). The following revisions continue in the English alphabetic order (A, B, C, etc.) using capital letters. The following letters are not used in the English alphabet: I, O, Q, S, X and Z. If the number of revisions requires using the entire alphabet, the revision letters continues as AA, then AB, AC, etc.

8.1.2.5.4 Serial numbers

Serial numbers, for parts produced, comprise of the following:

- 11 (or more) characters, of which the 5 first represents the manufacturer's (MFR) Commercial and Government Entity (CAGE) code, followed by 6 (or more) characters.

The CAGE code shall ensure uniqueness of the serial or lot number in cases where the same part is produced by several suppliers.

The part of the serial number following the CAGE code can only contain the capitalized letter "A" – "Z", the digits "0" – "9", and the special characters "/" and "-". The following characters shall not be used for the part of the serial numbers following CAGE: I, L, O, Q, S, X, Z.

When a part is modified, it retains its original serial or lot number even though the part number is changed to reflect a new configuration. The manufacturer shall achieve this by using a unique serial or lot number sequence for all part numbers within the manufacturer's CAGE or within the parts produced for KONGSBERG.

8.1.2.6 Change management

When a SW or hardware product, including its related documentation, has been released for its intended use, all changes shall be formally approved. The configuration change control includes the following elements:

8.1.2.6.1 Configuration Control Board (CCB)

The supplier shall establish a Configuration Control Board (CCB). As a minimum, the program/project manager, a technical representative and the QA manager shall be members of the CCB. Documented information from CCB shall be filed in accordance with the requirements in 7.5.3 Control of documented information.

The CCB shall classify and process proposed technical changes to the contract/ purchase order. The impact on cost and schedule shall be identified and reported to KONGSBERG:

- For KONGSBERG induced changes: As part of the Engineering Change Order (ECO) confirmation; or
- For supplier induced changes: As part of the supplier's change request (i.e., BLA-6167 Request for Change [11]).

8.1.2.6.2 Classification of changes

The supplier's system for classification of changes shall be described and shall follow the guidelines of this chapter.

A change shall be classified as class I if affecting the CBL with one or more of the following criteria:

- Contractual issues, e.g.:
    - Price; or
    - Guarantee or warranties; or
    - Delivery dates; or
    - Scheduled contract milestones; or
    - Product marking and identification; or
    - Any change to baselines, or content therein.

  ; or

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- Technical issues, e.g.:
  - Function and performance; or
  - Firmware modification; or
  - Reliability, maintainability or survivability; or
  - Impact on interchangeability, exchangeability, or replaceability; or
  - Weight, balance or moment of inertia; or
  - Interface characteristics; or
  - Change of material; or
  - Special Requirements; or
  - Electromagnetic characteristics; or
  - Other technical requirements in the contractual specification.

  ; or
- Other issues, e.g.:
  - Affecting Customer Furnished Material (CFM)/Customer Furnished Equipment (CFE); or
  - Safety; or
  - Compatibility or specified interoperability with interfacing CI, support equipment or support SW, spares, trainers, or training devices/equipment/SW; or
  - When retrofit action is required; or
  - Affecting delivered products; or
  - Affecting delivered operation or maintenance manuals; or
  - Impact on pre-set adjustments or schedules affecting operating limits or performance; or
  - Skills, manning, training, human-engineering design; or
  - Obsolescence as defined in chapter 8.1.7 Obsolescence / Last Time Buy (LTB); or
  - Counterfeit material.

Elements other than those mentioned above as class I are classified as class II. In cases of doubt, a change shall be classified as class I.

8.1.2.6.3 Change request submittal

No changes to the requirements of the contract/ purchase order shall be valid without a written approval from KONGSBERG. Any change request shall be submitted using form BLA-6167 Request for Change [11].

Please use one of the following e-mail addresses when submitting BLA-6167

- AEROSTRUCTURES (DMA): bla-6167.dma@kongsberg.com
- INTEGRATED DEFENCE SYSTEMS (IDS): bla-6167.ids@kongsberg.com
- LAND SYSTEMS (DLS) Previous DEFENCE COMMUNICATIONS (DK) and PROTECH SYSTEMS (DY): bla-6167.dls@kongsberg.com
- MISSILE SYSTEMS (DM): bla-6167.dm@kongsberg.com
- SPACE AND SURVEILLANCE (DSS): bla-6167.dss@kongsberg.com

When using the (e)BLA-6167, follow as instructed on the form.

If BLA-6167 contains data classified as CUI (Controlled Unclassified Information) or data that is subject to ITAR restrictions, secured means of communication, such as KDA ShareFile or other compliant FTP solution, must be used.

8.1.2.7 COTS/ firmware/ embedded products

Products defined as Commercial Off The Shelf (COTS)/firmware/embedded products shall be configuration controlled through the use of a Source Control Document (SCD) specifying the exact source part number and revision/version.

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Any planned use of new COTS/firmware products in the deliverable product shall be approved by KONGSBERG prior to implementation.

8.1.2.8 Interchangeability, exchangeability and replaceability

Each revision of any part shall be directly interchangeable in form, fit and function with other products with the same part number. The performance characteristics and dimensions of each such product shall be uniform to permit interchange with a minimum of adjustment and recalibration.

8.1.2.9 Configuration status accounting

The supplier shall establish a Configuration Status Accounting (CSA) system, which, as a minimum, shall assure documentation of the baseline of the supplier's design and the approved changes thereto. The control of the "as planned", "as built" and "as maintained" configuration shall be a part of the CSA system.

8.1.3 Product safety

Unless otherwise specified in product and production documentation, the supplier shall plan, implement and control the processes needed to assure product safety during the entire product life cycle, as appropriate to the organization and the product (e.g., in accordance with MIL-STD-882 [51] or equivalent industry standards).

The product safety work shall be described in the Program Management Plan (PMP) and the applicable documents for the products shall be specified in the CDRL.

For each of the safety critical failure modes of the product, as identified in the requirement specification, the supplier shall provide documentation of the Fault Tree Analysis (FTA), complete with minimal cut set (min CS) of root causes, and Mean Time between Failure (MTBF).

8.1.3.1 Restrictions of Hazardous Substances (RoHS)

The supplier shall deliver a hazardous materials list, which documents any hazardous materials used in the product, using RoHS [56] as a guideline. The report shall include:

- Chemical Abstracts Service (CAS) number as available and applicable data; and
- Quantification of the hazardous material; and
- Lifecycle; state when the hazardous material is hazardous (operational/test/maintenance/fire situation/disposal); and
- State the reason why the hazardous material is used; and
- State if the hazardous material can be recycled or if the substance must be handled with special procedures.

The supplier shall prioritize RoHS compliant parts, assemblies and processes in deliveries to KONGSBERG. If such is not available, a justification and plan for RoHS compliance shall be documented.

8.1.3.2 Hazardous Sources

If the product contains any Hazardous Sources, the supplier shall:

- Provide documentation on the Hazardous Sources contained within the product; and
- Ensure proper documentation of any product regulated as Dangerous Goods, according to UN Model Regulations.

8.1.3.3 Regulation on the Registration, Evaluation, Authorization and Restriction of Chemicals (REACH)

All products, parts of products and/or materials delivered in the European Economic Area (EEA) shall be supplied and delivered in full compliance with the provisions of the Regulation on the Registration, Evaluation, Authorization and Restriction of Chemicals (REACH) [54].

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For products containing substances found in the Candidate list of substances of very high concern for Authorization, the supplier shall provide to KONGSBERG information regarding identified substances name, amount contained by weight, total product weight and safe usage information. The information shall be provided in a format acceptable to KONGSBERG.

Please use the following e-mail addresses when submitting Material Declaration:
kda.declaration@kongsberg.com

For any assistance please contact kda.reach@kongsberg.com.

8.1.3.4 Biocidal Product Regulation (BPR)

The BPR Regulation [12] concerning the making available on the market and use of biocidal products (BPR) concerns the placing on the market and use of biocidal products, which are used to protect humans, animals, materials or articles against harmful organisms, like pests or bacteria, by the action of the active substances contained in the biocidal product.

The supplier shall comply with the BPR for treated articles as well as continues regulation of individual biocidal substances, biocidal substances in preparations, and biocidal substances in articles.

The list of approved active substances is maintained by the European Chemicals Agency (ECHA).

8.1.4 Prevention of counterfeit parts

The supplier shall ensure that only new and authentic materials are used in deliveries to KONGSBERG. The supplier may only purchase directly from original manufacturers (OEM/OCM), OEM/OCM authorized distributors, franchised distributors, or authorized aftermarket manufacturers. Independent distributors or brokers shall not be used unless approved in advance in writing by KONGSBERG.

The supplier shall plan, implement and control appropriate counterfeit parts / material prevention and control processes, using AS5553 [6] and/or AS6174 [7] as guidelines to ensure that counterfeit or suspect counterfeit parts are not used in the manufacturing of, or included in, products delivered to KONGSBERG.

Without delay upon retrieval of information on suspect counterfeit parts, the supplier shall inform KONGSBERG with a proposed corrective action.

8.1.5 Program Management Plan (PMP)

The supplier shall prepare and implement a PMP which specifically defines the management organization, schedules, milestones, tasks, responsibilities and activities engaged to conform to the requirements of the contract/ purchase order. The SQAR Compliance Matrix may when approved constitute a PMP for the supplier.

The PMP shall describe in detail the interfaces between the supplier and KONGSBERG, and will be the guide for both teams in accomplishing all program phases.

The content of the PMP shall reflect the contractual requirements, including applicable documents such as the SQAR.

As a minimum the following shall be included:

- General:
  - Change history; and
  - Contents list; and
  - Referenced documents, including contract or purchase order number.

  ; and
- Program management:
  - Risk management, including mitigation; and
  - Description of compliance to contractual scope and management system requirements; and
  - Program overview with project breakdown structures and interfaces; and
  - Program network including milestones and main activities; and
  - Project organization with responsibility and authority of the individual functions; and

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  - Project phasing and planning including risk management and criticality assessment; and
  - Cost and schedule management; and
  - The SQAR Compliance Matrix shall be attached.

  ; and
- QA management, describing how to meet applicable QA requirements; and
- Configuration management, describing how to meet applicable configuration management requirements; and
- Safety engineering, describing how to meet applicable safety engineering requirements; and
- Reliability engineering, describing how to meet applicable reliability engineering requirements; and
- Integrated Logistic Support (ILS), including maintainability and availability.

8.1.6 SW license control

The supplier shall have control of all SW licenses (e.g., the supplier's own SW, third party SW, and open source SW) used for and in the product delivered to KONGSBERG. The supplier shall verify that the SW licenses imposes no limitations to the intended use of the product by KONGSBERG or in KONGSBERG's end-product. All applicable licenses used in the product shall be documented in the Acceptance Data Package (ADP) (see chapter 8.6.4 Acceptance Data Package (ADP)).

8.1.7 Obsolescence / Last Time Buy (LTB)

The supplier's obsolescence management shall be described. The obsolescence management shall include processes, components, and other resources necessary for delivery of the product. Suppliers can obtain access to KONGSBERG component data while manufacturing for KONGSBERG, by use of the NOTEfied preferred parts database.

The supplier shall actively monitor the market and immediately notify KONGSBERG of any current or potential obsolescence's issues, using BLA-6167 Request for Change [11].

For an obsolete product, the supplier shall in BLA-6167 Request for Change either propose a second source, or an alternative/similar product that performs the same function. If the supplier identifies that a redesign is required, the supplier shall also include a request for Engineering Design Change in BLA-6167 Request for Change. The notification shall contain any known Estimated End-of-Life (EEOL), End-of-Life (EOL) and Last Time Buy (LTB) dates.

Obsolescence and LTB status for parts and/or the product shall be reported to KONGSBERG within agreed periodic intervals and format.

8.2 Requirements for products and services

8.2.1 Customer communication

No additional or supplemental requirements to ISO 9001:2015.

8.2.2 Determining the requirements for products and services

8.2.2.1 Communication of requirements

Product specific requirements are defined in the TDP, i.e., Hardware Requirement Specification (HRS), Software Requirement Specification (SRS), drawings, etc. KVS-/INS-documents referred to, but not included in the TDP, can be obtained from the Supplier Portal [14]. The supplier is responsible for obtaining the latest versions of KVS/INS that are referred to in the TDP.

8.2.2.2 Export control

The supplier shall properly notify KONGSBERG if any part of the product or any documented information to be shared with or delivered to KONGSBERG are subject to export control laws or regulations or similar applicable restrictions, such as transit/transport restrictions, and if so, of the applicable classification(s).

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The supplier shall handle information/documents according to applicable export licenses (e.g., ITAR).

Prior to delivery, the supplier shall provide KONGSBERG with copies of all applicable export licenses (both from the supplier's own country, as well as any other relevant countries) for the product or any documented information to be delivered to KONGSBERG. In particular, the supplier shall provide copies of all ITAR licenses applicable to the product (including any part embedded, incorporated, or otherwise being part thereof) and/or any documented information to be shared with or delivered to KONGSBERG.

8.2.2.3 Federal Acquisition Regulation / Department of Defence Federal Acquisition Regulation Supplement (FAR/DFARS)

The supplier shall ensure that compliance to applicable FAR [17]/DFARS [15] clauses defined in the contract/ purchase order is documented.

8.2.3 Review of the requirements for products and services

The review shall be coordinated with appropriate supplier resources (e.g., sales, design, production, QA, and procurement). In the event that the supplier identifies any missing documentation, deficiencies, discrepancies or concerns as part of their review, KONGSBERG shall be contacted for clarification.

The supplier's review of the contract/ purchase order shall include an assessment of the competence required, and the supplier shall initiate necessary training activities.

8.2.3.1 Special Requirements, Critical Items and Key Characteristics

The supplier shall identify the Special Requirements when determining the requirements of the contract/ purchase order. The Special Requirements may be specified by KONGSBERG, or determined by the supplier.

The Special Requirements may then require the identification of Critical Items. Some Critical Items may be further classified as Key Characteristics.

The supplier shall conduct a design and/or process risk analysis (e.g., Failure Mode and Effect Analysis (FMEA)) to secure that Critical Items/ Key Characteristics are systematically addressed and adequately managed within the organization. The Key Characteristics' variation needs to be closely monitored and controlled

The supplier shall present the risk analysis at appropriate design and production reviews, with the objective to mitigate the risks prior to start of production.

8.2.4 Changes to requirements for products and services

No additional or supplemental requirements to ISO 9001:2015.

8.3 Design and development of products and services

8.3.1 General

No additional or supplemental requirements to ISO 9001:2015.

8.3.2 Design and development planning

8.3.2.1 Milestone reviews

The objective of milestone reviews is to establish the relevant CBL and provide KONGSBERG with an assessment of the conformance to contractual requirements. KONGSBERG personnel shall support and participate in reviews. The documentation relevant to each review is described in the contract/ purchase order. Figure 2 – System milestones with configuration management baselines illustrates the sequence and progression intended from these reviews.

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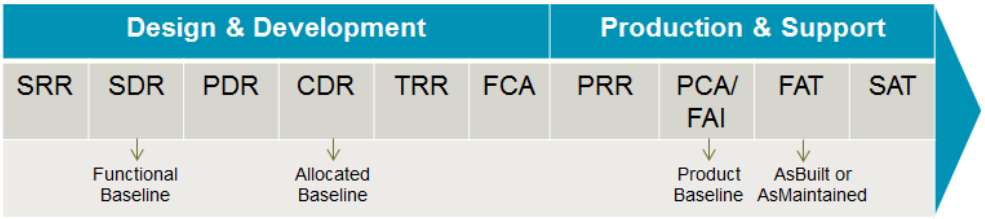

Figure 2 – System milestones with configuration management baselines

The following technical reviews shall be conducted at the appropriate phases of a program, if not otherwise defined in the contract/ purchase order (e.g., in a SOW):

- Design & Development:
  - System Requirements Review (SRR); and
  - System Design Review (SDR); and
  - Preliminary Design Review (PDR); and
  - Critical Design Review (CDR); and
  - Test Readiness Review (TRR); and
  - Functional Configuration Audit (FCA); and

  ; and
- Production & Support:
  - Production Readiness Review (PRR); and
  - Physical Configuration Audit (PCA); and
  - First Article Inspection (FAI); and
  - Factory Acceptance Test (FAT); and
  - System Acceptance Test (SAT).

The agenda and participants shall be tailored and agreed by both parties before execution of the milestones. The documentation according to the CDRL shall be available to KONGSBERG minimum two weeks before the reviews. Minutes from the design reviews, including updated action list, shall be prepared and issued by the supplier or as otherwise agreed.

8.3.3 Design and development inputs

8.3.3.1 System Requirements Review (SRR)

The supplier shall perform an SRR to ascertain the adequacy of the supplier's efforts in defining a conceptual solution and the system requirements to meet the stakeholder requirements and needs. An SRR may be combined with a contract review.

Input

- Initial conceptual system model; and
- Stakeholder requirements; and
- Top level system requirements.

Process

The SRR will be conducted when a significant portion of the system requirements have been established. Typical areas to be evaluated, but not limited to, are:

- Presentation of concepts; and
- Presentation of system requirements and verification plan; and
- Get approval from stakeholders; and
- Document results from review in a review report and create issues when required.

Output

- SRR report; and
- Issue list.

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8.3.3.2 System Design Review (SDR)

The supplier shall perform an SDR to evaluate the manner in which a project's system requirements have been allocated to CIs. This review is conducted when the system definition is at a point where system characteristics and CIs are defined. SDR establishes an FBL.

Input

- System model; and
- System requirements.

Process

Typical areas to be evaluated, but not limited to, are:

- Ensure all top-level system requirements are allocated to CIs; and
- Master schedule; and
- Safety; and
- Security; and
- Risk; and
- ILS; and
- Interface status; and
- Test and verification concept.

Document results from review in a review report and create issues when required.

Output

- SDR report; and
- Issues; and
- FBL.

8.3.4 Design and development controls

8.3.4.1 Preliminary Design Review (PDR)

The supplier shall perform a PDR to demonstrate that the preliminary design meets all system requirements with acceptable risk and within the cost and schedule constraints, and establishes the basis for proceeding with detailed design. It will show that the correct design options have been selected, interfaces have been identified, and verification methods have been described.

Typical objectives of a PDR, but not limited to, are:

- Ensure that all system requirements have been allocated, the requirements are complete, and the flow down is adequate to verify system performance; and
- Show that the proposed design is expected to meet the functional and performance requirements; and
- Show sufficient maturity in the proposed design approach to proceed to detailed design; and
- Show that the design is verifiable and that the risks have been identified, characterized, and mitigated where appropriate.

Input

- If relevant, alternative design solutions with analysis a justification for recommended design solution; and
- System architecture; and
- Implementation requirements (hardware, SW, etc.); and
- Interface descriptions.

Process

A review implemented for each CI/cluster of CIs before detailed design commences. Typical areas to be evaluated, but not limited to, are:

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- Overall presentation of the described technical solution and requirements, and mapping of all system requirements; and
- Requirements allocation to SW/ hardware components from the product specification, including traceability and verification methods to all requirement for detailed design; and
- Master schedule; and
- Safety; and
- Security; and
- Risk; and
- ILS; and
- Interface status; and
- Test and verification concept; and
- Address requirements allocated for verification at level PDR

The technical data at this level shall as a minimum disclose engineering design information sufficient to evaluate an engineering concept and may provide information sufficient to fabricate engineering development units/mockups.

Output

- PDR report; and
- Issues.

8.3.4.2 Critical Design Review (CDR)

The supplier shall perform a CDR for each CI, or clusters of CIs, when detailed design is approaching completion, to:

- Determine, based on the item´s development specification, if the detailed design complies with the functional and physical requirements; and
- Determine if this item is in accordance with other interfacing items (equipment, SW, or personnel); and
- Evaluate the item´s areas of risk based on technique, cost, and progress; and
- Ensure that the design has been reviewed with focus on optimizing production setup, including product verification, and ILS; and
- Evaluate the identification of Critical Items, Key Characteristics, Critical processes and Critical Characteristic Control; and
- Define and conclude the ABL to start formal design verification.

Input

- Detailed requirements; and
- Detailed design; and
- Detailed interface descriptions; and
- Draft qualification plans and procedures.

Process

A review implemented for each CI/cluster of CIs when detailed design is approaching completion. Typical areas to be evaluated, but not limited to, are:

- Status of actions from PDR; and
- Project schedule; and
- Risk mitigation; and
- Contractual delivered documentation as per the CDRL; and
- Overall presentation of the described technical solution and requirements; and
- ABL; and
- CI and subsystem architecture (hardware and SW), e.g., Product Breakdown Structure (PBS); and
- Presentation of detailed design solution, requirements and interface definition of each CI; and

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- Requirements allocation to SW/hardware components from the product specification, including traceability and verification methods to all requirement for detailed design; and
- User interface, e.g., Man Machine Interface (MMI) and Human Factors Engineering (HFE); and
- Weight and envelope data; and
- Target cost considerations for production on CI level; and
- ILS data, including manuals, spare part list and reliability data initiated; and
- Determine qualitative and quantitative adequacy of provisioning drawings and data; and
- Packaging, handling and storage provisions; and
- Nomenclature, identification plate, and serial number assignment; and
- Life cycle cost analysis; and
- Safety analysis; and
- Qualification test plan and path ahead for qualification testing; and
- System test plan presented with test objects, test activities, and schedule; and
- Define long lead items and impact on delivery schedule; and
- Purchasing specification (lower tier supplier) and documentation for parts and equipment; and
- Production and manufacturing considerations (e.g., materials, tooling, test equipment, critical or Special Processes; and
- Production test procedures for each CI; and
- List of materials (including hazardous material), COTS parts, and strategy for obsolescence; and
- Requirements for facilities, skills, test and inspection techniques; and
- Address requirements allocated for verification at level CDR.

Output

- Establishment of ABL, including hardware, firmware and SW; and
- Procedures including method and acceptance criteria for qualification testing; and
- Production documentation for qualification units (including described Special Processes); and
- Released documentation according to the CDRL; and
- A path ahead for resolution of action items; and
- ABL.

8.3.5 Design and development outputs

8.3.5.1 Test Readiness Review (TRR)

The supplier shall perform a TRR. The TRR is a multi-disciplined formal technical review of a CI, or a cluster of CIs, to determine readiness to proceed into formal test. The objective is to verify that all planned prerequisites are fulfilled, identify any remaining risk that needs to be mitigated prior to test, and make a formal decision whether to proceed into test or not. TRR may have different variations depending on the test objective/scenario, CI being tested, or the test arena.

TRR may in some contracts/ purchase orders include Qualification Readiness Review (QRR).

TRR at the system level may involve KONGSBERG. Typical areas to be evaluated, but not limited to, are:

- Test objective:
  - Mission objective, success criteria, and exit criteria; and
  - System requirements and any changes to requirement since CDR.

  ; and
- CI (system / subsystem/ product / SW / part / item / equipment) under test:
  - Configuration management control of specifications, documentation and any design changes since CDR; and
  - As built status of CI including deviations/waivers (nonconformances), ECOs, issues and known errors; and
  - Test reports from informal/ development test prior to TRR; and

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  - Configuration and maturity of the production- and/or development environment used to produce the CI.

  ; and
- Test arena (test facility, -SW, -equipment, - range, etc.):
  - General characteristics of the arena (location, availability, authorizations, track record, etc.); and
  - Calibration / testing of arena; and
  - Health and safety at arena; and
  - Security at arena; and
  - Logistics to/ within/ from arena; and
  - Configuration management control of test arena.

  ; and
- Test scenarios (intended behavior):
  - Test scenarios versus CI functional and performance characteristics; and
  - Risk related to mission success and safety; and
  - Configuration management control of scenarios.

  ; and
- Test plans:
  - Schedules; and
  - Availability of resources; and
  - Authorizations (export control, agencies, and range safety); and
  - Test procedures, test descriptions and test report template; and
  - Roles and responsibilities; and
  - Training; and
  - Safety and security; and
  - Configuration management control of all plans.

Input

- CI under test; and
- Test plan.

Process

The process depends on the test objective and needs to be tailored accordingly. A typical process may include:

- Prepare TRR; and
- Perform TRR; and
- Report TRR.

Output

- TRR report (including risk matrix and any actions pending to go ahead); and
- Formal decision to proceed into formal testing.

8.3.5.2 Functional Configuration Audit (FCA)

The supplier shall perform an FCA. The FCA is the formal examination of documented information related to test data and QA for a CI, to check that the CI has achieved the performance and functional characteristics specified in its configuration documentation. The FCA shall be conducted on the CI, which is representative of the configuration to be released for production.

FCA is conducted after formal qualification testing of the system, and documented information is available to show that the system meets its requirements.

FCA should be conducted before the PCA if there is any possibility that amendments will arise as a result of the FCA.

FCA may in some contracts/ purchase orders be named Final Design Review (FDR) or Final Qualification Review (FQR).

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Input

- Functional requirements to the CI, including verification requirements and method; and
- Verification Cross Reference Matrix (VCRM); and
- Test results for the CI.

Process

- Ensure that all requirements for the CI have a verification method and procedure defined; and
- Record "pass/fail" status for all elements in the VCRM. Add, if relevant, other details/issues; and
- Review the test reports that are called out from the VCRM and ensure that the test was adequate to verify the CI requirements; and
- Document Audit results in an FCA report and create an issue list of identified findings; and
- Resolve findings and other issues with CI owner.

Output

- FCA report; and
- Issue list; and
- Documented, verified and qualified product ready for production.

8.3.5.3 Design and development verification

The verification activities may include, but is not limited to; design review, inspection, test, analysis, demonstration, environmental tests, reliability tests, reliability and maintainability demonstrations, hardware validation, and failure analysis. The verification plan and progress shall be addressed and agreed at the milestone reviews. Testing by similarity may be used for qualification and must be approved by KONGSBERG.

All verification activities shall be documented in a VCRM, a similar document, or as specified in a product requirement specification. The template KDA-TMPL-0189 Verification Cross Reference Matrix (VCRM) [39] may be used.

8.3.6 Design and development changes

No additional or supplemental requirements to ISO 9001:2015.

8.4 Control of externally provided processes, products and services

8.4.1 General

When KONGSBERG designated sources are defined, the supplier shall ensure that they are used and the supplier is responsible for the conformity of the externally provided processes, products or services.

8.4.2 Type and extent of control

For externally provided processes, products or services containing Special Requirements, Critical Items or Key Characteristics, the supplier shall strengthen the verification activity as appropriate.

When raw material has been identified as a significant operational risk (e.g., Critical Items), the supplier shall implement a process to validate the accuracy of test reports.

When external provider test reports are utilized to verify externally provided products, the supplier shall implement a process to evaluate the data in the test reports to confirm that the product meets requirements.

8.4.2.1 Traceability of purchased material

Traceability shall be ensured for material purchased by the supplier. The level of traceability shall be as defined by the design authority. Examples of traceability include name or CAGE code of manufacturer or distributor, serial number, or batch/lot/date code.

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8.4.2.2 Audits

To ensure that KONGSBERG requirements are implemented, the supplier shall establish an internal and external (i.e., lower tier suppliers) audit program covering the applicable requirements of the contract/ purchase order.

Audits shall be conducted to cover all program phases. Follow-up audits shall be performed as necessary until deviations have been resolved and appropriate risk mitigation has been fully implemented.

8.4.2.3 Conflict minerals

KONGSBERG is determined to comply with regulatory and customer requirements regarding the prohibition and restriction of conflict minerals.

To support the responsible sourcing of conflict minerals within our supply chain, KONGSBERG's suppliers are, with regards to tin, tantalum, tungsten and gold (including their derivatives), expected to have in place a supply chain policy and processes to undertake:

- a reasonable inquiry into the country of origin of conflict minerals incorporated into products it provides KONGSBERG; and
- due diligence (with reference to OECD/RMI guidance or similar) of its supply chain, as necessary, to determine if conflict minerals originating in the Democratic Republic of the Congo or adjoining countries directly or indirectly finance or benefit armed groups; and
- actions necessary to mitigate the risk that necessary conflict minerals finance or benefit armed groups, including any steps to improve due diligence.

8.4.3 Information for external providers

8.4.3.1 Flow-down of Supplier Quality Assurance Requirements

To assure conformance to all contractual requirements, the supplier shall flow-down as necessary and applicable requirements contained in the SQAR to all of its own (lower tier) suppliers. A compliance matrix should be used to document compliance to these flown down requirements.

The supplier shall be responsible for the conformity of all products purchased from its own (lower tier) suppliers, including product from suppliers/manufacturers defined by KONGSBERG.

8.5 Production and service provision

8.5.1 Control of production and service provision

Documented information that constitutes the product and production documentation needed for a compliant realization of the product may include, but is not limited to: A complete set of drawings, procedures, manufacturing flow charts/traveler cards, etc., which are configuration controlled and which fully define all technical requirements, materials, products, processes, workmanship standards and in-process inspections needed.

CNC machines and programs, special tools and test equipment shall be defined, identified and listed in the production documentation to ensure suitability for a repeated production run.

Storage requirements shall be defined for production equipment and tooling, including any necessary periodic preservation or condition checks.

All production documentation should be prepared in accordance with relevant sections of MIL-STD-961 [52] and shall be managed as documented information i.a.w. chapter 7.5 Documented information.

8.5.1.1 Verification of product

It shall be verified that the product conforms with the requirements of the contract/ purchase order.

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This verification shall include, but not limited to, identification and markings, accuracy of dimensions, quality of workmanship, maximum weight allowed, and use of proper materials, parts, and processes, and absence of visible defects or any other imperfections that would result in rejection of the unit.

All moving parts shall be examined to ensure that they operate freely without sticking or binding, yet fit with the accuracy required by the specification or the applicable drawing.

Verification shall be carried out by trained and authorized personnel.

Documented information that provides evidence of contract/ purchase order conformity may include, but is not limited to:

- Evidence of inspection to assure adherence to applicable drawings or specifications and revisions; and
- FAI/ test reports; and
- Periodic inspection and control of inspection media; and
- Documented information to indicate control of special tooling and special test equipment; and
- Documented information in the form of test data of all qualification and acceptance tests performed; and
- Certification of personnel as required by specification and/or contract/ purchase order; and
- Raw material and process certifications; and
- Material review reports.

Documented information shall be made available to KONGSBERG upon request.

8.5.1.2 Verification capabilities

Environmental conditions shall be controlled and documented in those areas used for final verification/test.

Methods to measure variable data shall be defined and documented for all inspection and test operations.

8.5.1.3 Workmanship

If not otherwise specified, the following shall apply:

- Electronic production:
  - IPC-A-610, Acceptability standard of electronic assemblies [26], Class 3; and
  - IPC-7711/7721 Rework, Modification and Repair of Electronic Assemblies [25], Class 3; and
  - IPC/EIA J-STD-001, Requirements for Soldering Electrical and Electronic Assemblies [22], Class 3; and
  - IPC/JEDEC J-STD-033 Handling, packing, shipping and use of Moisture/Reflow sensitive surface mount devices [23]; and
  - IPC/WHMA-A-620, Requirements and Acceptance of Cable and Wire Harness Assemblies [24], Class 3; and
  - MIL-HDBK-454, General guidelines for electronic equipment [43] – Guideline 9.

  ; and
- Mechanical production:
  - All work operations shall be done in accordance with good practice and workmanship.

  ; and
- Cleaning and surface treatment:
  - If not otherwise specified, products shall be cleaned and surface treated in accordance with MIL-STD-171 [49] and TT-C-490 [57].

8.5.1.4 Special Processes

Special Processes – i.e., processes that affect the product in such a way that the result of the process cannot be verified without a destructive verification test – shall be qualified. This qualification shall be the responsibility of the supplier of the Special Processes, and be carried out by an independent laboratory when necessary. Any change in the Special Processes after qualification will require a re-qualification.

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It is the supplier's responsibility to ensure lower tier supplier compliance to requirements related to Special Processes, including qualification and approval of the lower tier supplier as part of the KONGSBERG supply chain. Any change of the supplier's use of lower tier suppliers of Special Processes shall be submitted as a change request (i.e., BLA-6167 Request for Change [11]) to KONGSBERG prior to implementation.

For each product or lot, the recorded Special Processes values shall be documented as required by the Special Processes documentation (e.g., as defined on drawing, or as specified in the applicable Special Processes standards).

8.5.1.5 Control of Critical Items and Key Characteristics

Identified Critical Items, including Key Characteristics, shall be controlled and monitored in accordance with established processes. This includes marking and identification of Critical Items and Key Characteristics in applicable product and production documentation. Use of AS9103 Standard [61] is recommended as guideline.

8.5.1.6 Foreign Object Damage (FOD)

For products susceptible to Foreign Object Damage (FOD), the supplier shall ensure articles are free from foreign objects resulting from processing or assembly and packing operations. Use of AS9146 [60] or NAS 412 standard [53] for guidance is recommended.

8.5.1.7 Production Readiness Review (PRR)

The PRR is defined as a formal examination of a program to determine if the product, service and supporting structure subject for review meets the requirements of the contract and the production readiness level to minimize the risk of exercising the production go-ahead decision.

The objective of the PRR is to verify that:

- The product definition and the program have reached a mature level of production readiness; and
- That planning for production has been accomplished and documented; and
- That the program is able to implement the production program as scheduled.

KONGSBERG is responsible for conducting the initial PRR, and it will be conducted as a KONGSBERG Audit.

The supplier shall inform KONGSBERG in advance with at agreed time when PRR can be performed to allow for KONGSBERG participation.

Input

- PRR technical products have been made available to the cognizant PRR participants prior to the review, including:
  - Results of the lower level CI PRRs, conducted at the major lower tier suppliers; and
  - Transition to production and/or manufacturing plan; and
  - Identified and prepared facilities, tooling and equipment, including SW to operate this equipment; and
  - Change control process has been established; and
  - Criteria for manufacturing/ producibility and product verification and production testing have been defined; and
  - Make sure that Critical Items and Key Characteristics are handled; and
  - Critical Characteristics Control for critical processes and items have been integrated in the production technical data. This shall include Special Processes to be certified and controlled (e.g., welding, soldering, or surface treatment); and
  - Requirements for training and certification of personnel; and
  - Current risk assessment is updated.

  ; and
- A CDR, or similar, milestone event has been successfully completed with all actions closed.

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; and
- All system performance specification qualification test requirements have been successfully concluded, e.g., by reference to a completed FCA.

Process

The team will conduct on-site assessments documentation, facilities, procedures, processes, and other relevant physical evidence required for an orderly production program.

The PRR encompasses all considerations relating to the auditee capability of meeting system requirements, and to the managerial and physical preparations necessary for initiating and sustaining the production phase activities. Listed and described below are the functional areas to be evaluated during the PRR.

Depth of the review shall be to a level sufficient to yield evidence supporting conclusive findings. Sampling techniques shall be employed where practical. The functional areas are:

- Program management; and
- Engineering and product design; and
- Production engineering and planning; and
- Material and purchased parts; and
- Industrial resources; and
- QA; and
- Configuration management; and
- Corporate Social Responsibility (CSR), based on KONGSBERG SCP.

The PRR shall confirm state of production readiness and the assessed risk level of the program or product defined in the scope.

Output

A PRR report indicating risk level and the overall production level, which shall as a minimum, conclude on the following:

- Verified readiness of facilities, equipment/tooling and production line set-up; and
- Verified availability and competence of all categories of personnel needed; and
- Verified readiness of the manufacturer processes and procedures to comply to all product requirements; and
- Verified special tooling and equipment; and
- Verified level of implemented structure of SCR control; and
- Identified necessary outsourcing/supply chain process capability; and
- Define open issues in transition into production; and
- Emphasized possible improvements; and
- Identify risk level and mitigation; and
- Define an assessment conclusion, including scope of approval (including possible limitations) and risk level with necessary mitigation.

8.5.1.8 First Article Inspection (FAI)

Input

A FAI shall be conducted by the supplier when the following conditions exist:

- New part, not previously manufactured by the supplier.
- New production site (incl. sub-supplier)
- Manufacturing and/or special processes, or suppliers of these, are changed
- More than two years break in production.

The FAI shall be repeated when changes occur that invalidate or are not represented in the original results, as determined by a multi-disciplinary team (e.g., members from responsible functions).

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KONGSBERG reserves the right to participate in the FAI/PCA. Additionally, the supplier shall notify KONGSBERG in advance of a planned FAI/PCA.

On Configuration Items (functional units/assemblies) or Critical items, as well as for anything involving Special Processes, KONGSBERG reserves the right to take lead in performing the FAI/PCA.

For a KONGSBERG lead FAI, the program/agenda and the report with a conclusion and the product baseline (PBL) will be issued by KONGSBERG.

Process
The purpose of the FAI is to establish or update a product baseline for the subject part, and to provide objective evidence that the Technical Data Package (TDP)/Submittal, is effectively implemented for reliable and repeated production orders. This includes production setup, equipment, tooling, production documentation, verification methods and criteria as well procedures for record keeping and traceability with as built documentation.

AS9102 Aerospace First Article Inspection Requirement [8] shall be used as a guideline. The planning shall include selecting a sample part or unit for the FAI, and to include the following areas as applicable:

- Planning; and
- Purchase order requirements; and
- Personnel qualification; and
- Material properties verification as applicable; and
- Dimensional inspection, including measuring machine result examination; and
- Special Processes qualification i.e. heat treatment condition, temper and hardness, soldering, welding; and
- Non-Destructive Testing (NDT); and
- Functional tests (FAT/Environmental Stress Screening (ESS) etc.); and
- Item identification and marking, including interchangeability (including unique serial number with cage number prefix); and
- Manufacturing documentation/assembly documentation, including shop travelers; and
- Manufacturing facilities and industrial resources, including layout; STTE; storage; handling; facilities control (e.g. temperature, humidity, ESD, FOD); and
- Configuration control; and
- CSR aspects.

Evidence of objective and/or accredited tests that have been conducted to verify functional/non-functional requirements, may be subject for verification as applicable.

Output
A report, summarizing the conclusion and including all associated documentation, i.e. dimensional inspection reports, material reports, process data, environmental data, inspection/test data, drawings, specifications, and quality assurance documentation associated with the first article sample. AS9102 report format may be used.

The FAI report shall be submitted to KONGSBERG (Purchase POC) upon completion/closure of all actions.

Delivery cannot commence until actions are closed or a plan of action has been agreed with KONGSBERG.

The FAI may be combined with the PCA (8.5.1.9) as applicable, i.e. for Configuration Item (Functional Unit/Assemblies).

8.5.1.9 Physical Configuration Audit (PCA)

Upon two weeks' notice from KONGSBERG, a PCA shall be carried out on the first production lot.

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PCA is the formal examination of the "as-built" configuration for the CI to ensure it conforms to its product configuration documentation. The PCA is performed for the new production item, on the first article of its kind of the production line.

The PCA may be combined with the FAI (8.5.1.8).

Input

- FCA report; and
- Issues list.

Process

Typical areas to be evaluated, but not limited to, are:

- Ensure that required inputs (data and documents) are available to perform the PCA; and
- Review the FCA report, including issue list, and verify incorporation of action items/findings; and
- Ensure that requirements are implemented in the CI design; and
- Review test reports and ensure that there are no open issues; and
- Document Audit results in a PCA report and create an issue list of identified findings; and
- Resolve findings and other issues with CI owner.

Output

- PCA report; and
- Issue list; and
- PBL.

8.5.1.10 Factory Acceptance Test (FAT)

The product shall be subject to a FAT in accordance with an agreed procedure.

FAT is a formal test conducted to determine whether a Configuration Item/system satisfies its acceptance criteria derived from the functional specification. This test shall be performed on each individual unit.

The FAT procedure shall give a detailed description of required performance and functional test requirements.

The FAT procedure shall be prepared by the supplier and submitted to KONGSBERG for approval. The procedure shall include failure and re-testing criteria.

On request KONGSBERG shall be notified prior to a FAT. Notification will be given to the supplier if KONGSBERG and/or KONGSBERG's customer intend to attend the FAT.

Input

- A CI or a cluster of CIs defined by the CI part number; and
- PCA report; and
- FAT procedure.

Process

Prior to the formal FAT, the supplier shall perform an internal pre-FAT to verify compliance with the specified requirements. If the pre-FAT fails, KONGSBERG shall be notified immediately.

The test shall be performed by authorized test personnel independent to the production operation.

ESS is applicable as determined by the design authority to detect possible workmanship issues imposed by the production line. This is normally mandatory for critical electronic CIs.

ESS may be prepared using MIL-HDBK-2164 [42] as a guide. An ESS procedure shall be prepared for this purpose, or can be combined with the FAT procedure. The procedure shall include acceptance/failure and re-testing criteria.

Areas to be evaluated, but not limited to, are:

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- Test provisions and equipment incl. criteria of calibration, maintenance, equipment list, tolerances, etc.; and
- Responsibilities; and
- Failure/acceptance/re-testing criteria; and
- Test procedure with step by step guidance; and
- Figure of test set-up.

Output

- Factory Acceptance Test Report (FATR); and
- Issue list; and
- As-built/As-maintained.

8.5.1.11 System Acceptance Test (SAT)

The supplier shall perform a SAT. The SAT is a formal acceptance test of a complete system delivered to the KONGSBERG. The system can be a standalone system or a system integrated into a higher-level system controlled by KONGSBERG. The SAT can be tailored in projects with different names such as Harbor - Acceptance Test (AT), Sea AT, Hangar AT, Site AT, etc. The successful SAT is normally a milestone identified in the payment plan and will be accompanied with a CoC.

Input

- System to be delivered; and
- Test equipment; and
- Acceptance plan, -procedure and –criteria; and
- Contract/ purchase order; and
- SAT procedure; and

Process

Typical areas to be evaluated, but not limited to, are:

- Agree on plans, procedures and acceptance criteria; and
- Schedule the SAT; and
- Perform SAT according to contract and plans; and
- Issue SAT report and CoC.

Output

- System delivered to and accepted by KONGSBERG; and
- CoC; and
- SAT report.

8.5.2 Identification and traceability

8.5.2.1 Marking requirements

The marking of products and shipping containers shall be according to product or production documentation. If not otherwise specified, EN 2851 [56] applies:

- The text height may be specified on drawing. If not, the supplier can decide suitable height depending on the available space; and
- CAGE and serial numbers shall be assigned according to 8.5.2.2 Configuration and traceability; and
- Marking shall be permanent with good visibility.

Example Part: 68013460-00, Revision: A, CAGE: R1234, Serial number 123456.

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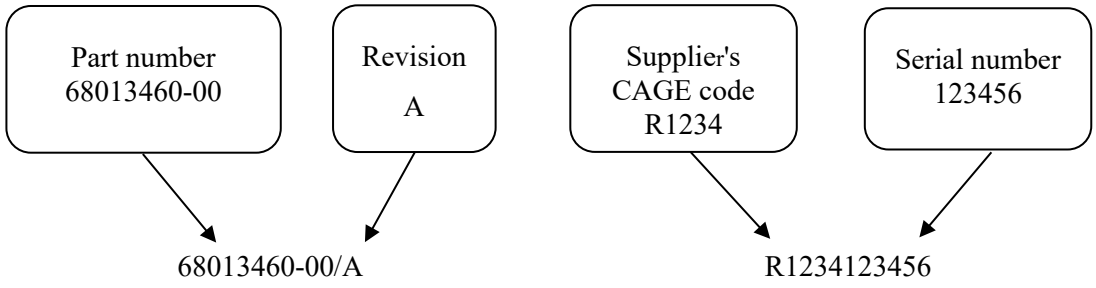

Figure 3 - Example of product marking

When implemented on a part the text can be horizontally or vertically.

Horizontal	**Vertical**
68013460-00/A/R1234123456	68013460-00/A R1234123456

8.5.2.2 Configuration and traceability

The supplier shall make sure that the product and its parts have identification, name, part and revision number, in addition to the manufacturers CAGE code (MFR).

If applicable; a serial number shall be assigned, providing traceability to design, planning and delivery documentation. The CAGE code shall be prefixed to the serial number. The serial number shall be allocated by the supplier. Recommended number of digits is 6 (six).

Parts with the same basis number shall have unique serial numbers, i.e. serial numbers shall only be allocated based on the basis number.

The supplier must keep records of serial numbers used to make sure that a number never is reused regardless of elapsed time between contracts/ purchase orders.

8.5.2.3 As-maintained configuration

Supplier engaged in maintenance (i.e., repair and overhaul) of KONGSBERG products during the operational phase of a system, shall register "as-received" configuration and "as-maintained" configuration after performed maintenance. The "as-maintained" configuration shall be reported to KONGSBERG on an agreed format.

8.5.3 Property belonging to KONGSBERG or external providers

The supplier shall assure that applicable security regulations are met for property belonging to KONGSBERG, KONGSBERG's customers (including higher tier) or other external providers. An inventory list shall be kept updated and presented upon request. Disposal of any property cannot take place unless prior written approval from KONGSBERG.

Property belonging to KONGSBERG, KONGSBERG's customers (including higher tier) or other external providers may also be referred to as CFM/CFE. The supplier shall ensure that all CFM/CFE is clearly marked to show its ownership (e.g., "KONGSBERG PROPERTY").

8.5.3.1 US Government property

Property belonging to the US Government shall be marked and controlled in accordance with MIL-STD-130 [46].

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8.5.4 Preservation

No additional or supplemental requirements to ISO 9001:2015.

8.5.5 Post-delivery activities

8.5.5.1 Alert or recall of delivered product

A process shall be implemented by the supplier to ensure an effective alert notification or recall of delivered product(s) that have been identified as defective either by the supplier, lower-tier suppliers, KONGSBERG, or through end-user feedback (i.e escape).

The supplier shall forward an alert (clearly marked as defective product/alert) without any delay by e-mail, using BLA-6167, to KONGSBERG as indicated in chapter 8.1.2.6.3, or as instructed on the (e)BLA-6167 form.

KONGSBERG shall respond to this alert in writing.

8.5.6 Control of changes

No additional or supplemental requirements to ISO 9001:2015.

8.5.7 Integrated Logistics Support (ILS)

The primary aim of the ILS program is to influence the product design, control life costs and optimize operational availability (reliability and MTBF) and to supply KONGSBERG with relevant source data for technical manuals. The management of the ILS program shall be described in detail in the PMP, and the applicable documents for the product shall be specified in the CDRL. As a minimum the following data need to be provided as applicable, as described in chapter 8.5.7.1 through 8.5.7.6.

8.5.7.1 Reliability

The reliability work shall be described in the PMP and the applicable documents for the product shall be specified in the CDRL.

8.5.7.1.1 Failure Mode, Effect and Criticality Analysis (FMECA)

The supplier shall have a process for performing Failure Mode, Effect and Criticality Analysis (FMECA) on its product. Design and process FMEA may be used by the supplier to determine Special Requirements.

The supplier shall perform a FMECA with respect to mission success for the product. MIL-STD-1629 [47] may be used as a guideline.

8.5.7.1.2 Reliability analysis

The supplier shall perform a reliability analysis of the product. The reliability of the product shall be verified through failure rate prediction and/or reliability testing/experience. Claimed component failure rates shall be traceable to recognized databases, statistically significant reliability testing and/or comprehensive field data. The documentation of failure rates shall clearly identify the methods used in the analysis. The applied methods and data sources shall comply with the specific project requirements and product life profile.

8.5.7.1.3 Life Limited Items (LLI)

The supplier shall provide Life Limited Items (LLI) information. The supplier shall deliver detailed overview of all LLI components in the product. This information will be used as input in an LLI analysis of the total system, which the product will be a part of.

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8.5.7.2 Maintenance plan

Necessary maintenance tasks shall be identified and documented in a maintenance plan. The maintenance plan should as a minimum list the following:

- True manufacturer name; and
- True manufacturer part number; and
- True manufacturer product name; and
- Maintenance tasks; and
- Frequency of each maintenance task; and
- Estimated time to preform each maintenance task; and
- Spare parts and consumables needed to perform each maintenance task.

8.5.7.3 Technical manuals

Operator Manual - The supplier shall deliver an operator manual describing the operation of the product to ensure that the product is operated in a safe and correct manner. This is to ensure the full potential of the product is fully utilized and operated in a safe manner to avoid potential injuries

Maintenance Manual - The supplier shall describe all maintenance actions necessary to support the product if the product shall be maintained by KONGSBERG or a higher tier customer. Life limited items shall be specified.

8.5.7.4 Spare parts list

Necessary spares and consumables shall be identified, and if the equipment does not already bear a NATO Stock Number (NSN) the supplier shall forward the following data for codification purposes:

- True manufacturer name; and
- True manufacturer part number; and
- True manufacturer product name; and
- Manufacturer name; and
- Manufacturer part number; and
- Manufacturer product name; and
- True manufacturer CAGE code; and
- Weight of the product including packing; and
- Size (length, height, and width) including packing, in millimeters.

8.5.7.5 Packing, handling, storage and transportation

The following data shall be delivered:

- Weight and size of packed and unpacked products; and
- Level of packing required.

Details are to be provided of any product or parts that represent a potential hazard when operating or maintaining the product.

Details shall be provided of any product that requires maintenance actions prior to, whilst in or on removal from long-term storage.

8.5.7.6 Tools and test equipment

The supplier shall identify and deliver any tools and test equipment needed to maintain the product. The supplier shall ensure the correct maintenance and working order of the special tools and test equipment.

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8.6 Release of products and services

8.6.1 Delivery certification

A Certificate of Conformity (CoC) shall be issued for each delivery, and accompany each shipment, to attest compliance to the requirements of the contract/ purchase order.

AS9163[10] is recommended as a guideline for the content and format of the CoC. As a minimum, the CoC shall contain:

- Name and address of supplier and customer
- Contract/ purchase order number
- Contract/ purchase order line item number, if required to maintain traceability of multiple shipments
- Part number, revision and description as defined by the contract/ purchase order
- Quantity and traceability (Batch/Lot/Serial numbers, as applicable) of delivered parts
- Reference numbers of approved nonconformances
- Statement of conformity text, indicating, or equivalent to the following
    - It is hereby certified that apart from the deviations/waivers (nonconformances) concessions, noted herein, the product(s)/(service(s) detailed herein has (have) been manufactured / maintained / reworked / performed / inspected / tested and conform to the applicable specifications, drawings, and purchase order and contract requirements.
- Name and signature of the individual authorized to release products or services to the customer

8.6.2 Packing

Appropriate packing methods and materials shall be used in order to protect products from mechanical and other damages during sea, land or air transportation to KONGSBERG.

Unit packaging shall use ESD-safe materials and be packed in accordance with IEC 61340-5-1 [18] , IEC 61340-5-2 [19] and ANSI/ESD S20.20 [3] in order to avoid affecting ESD sensitive components at KONGSBERG.

Wood Packaging Material: All non-manufactured wood used in packaging or unitization shall be handled according to ISPM 15 [35].

If not otherwise specified, the packing of product for shipment (container, intermediate container, and boxes) shall be marked according to MIL-STD-129 [45].

Appropriate marking of hazardous materials and products in accordance with applicable rules and regulations, including the Regulation on classification, labelling and packaging of substances and mixtures (CLP) [13].

Supplier shall mark all unit containers, intermediate containers and shipping containers in accordance with the requirements of the contract/ purchase order.

Unless otherwise specified, the unit package quantity shall be one each part, set, assembly, kit, etc.

8.6.3 Packing documentation

Packing documentation shall as a minimum contain the following information:

- Contract/ purchase order number; and
- Contract/ purchase order line item number; and
- Part number and revision as defined by the contract/ purchase order; and
- Supplier part number and revision if part number under previous bullet point is a KONGSBERG part number; and
- Manufacturer CAGE code (if applicable); and
- Serial numbers delivered (if applicable) - can be provided on a separate list; and
- Quantity delivered

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The above information shall be bar coded using Code 39 extended, see ISO/IEC 16388 [32].

8.6.4 Acceptance Data Package (ADP)

The following documentation shall be presented upon final delivery review/source inspection:

- Bill of material (as–planned); and
- AT results (test documentation); and
- As-built configuration list; and
- Copy of CoC; and
- Documented evidence of repairs or test failures; and
- Evidence of inspection and acceptance by the supplier; and
- Material certifications, including shelf life; and
- Approved waiver and deviation (nonconformance) summary; and
- Applicable licenses (e.g., SW, and export control).

The ADP shall be retained at the supplier's premises, ref chapter 7.5.3 Control of documented information.

8.6.5 Delivery Review / Source Inspection

Delivery Review (DR) is a source inspection and may be performed by KONGSBERG. The purpose of the DR is to verify that the product(s) comply with the requirements of the contract/ purchase order. The review shall be performed when the product(s) are ready for delivery, but not packed. All supporting/relevant documents shall be available and complete (including ADP).

The date for the DR shall be confirmed by the supplier minimum 10 working days in advance to the KONGSBERG purchaser. KONGSBERG will then decide if a DR will be performed.

8.6.6 Delivery

Delivery (shipping) shall be according to the contract/ purchase order.

Dangerous Goods shall be shipped according to regulations given in the European Agreement concerning the International Carriage of Dangerous Goods by Road (ADR) [2], the Regulation concerning the International Carriage of Dangerous Goods by Rail (RID) [55], the International Maritime Dangerous Goods Code (IMDG Code) [21], or the IATA Dangerous Goods Regulations (DGR) [16].

When the delivery is specified to be from the supplier to KONGSBERG's customer, the following process shall be applied:

- The supplier shall send prior notification of each shipment to KONGSBERG and include the following information:
    - Description and amount of material; and
    - Weight of package; and
    - Dimensions of package; and
    - Special handling requirements (if applicable).

- When the material has been approved by the supplier's quality activity the following completed documents shall be submitted to KONGSBERG:
    - Advice note; and
    - CoC; and
    - List of approved deviations/waivers (nonconformances); and
    - Test and inspection records.

- KONGSBERG shall prepare an advice note and a CoC. The advice note and the CoC "shipment copy" will be submitted to the supplier to initiate the shipment. The following documents shall accompany the shipped material as applicable:

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- Mandatory:
  - Advice note (KONGSBERG issued); and
  - CoC "shipment copy" (KONGSBERG issued).

- If applicable:
  - As-built list; and
  - Test and inspection records.

- The supplier shall submit to KONGSBERG a Report of Shipment (REPSHIP) concurrent with each shipment. This REPSHIP shall include:
  - Shipping number; and
  - Date of shipment; and
  - Nomenclature, part number, serial number or lot number; and
  - Quantity; and
  - Export classification (e.g., ITAR restrictions/reference); and
  - Value; and
  - Size volume of each package; and
  - Weight of each package; and
  - Special handling requirements.

Any change on parts or initial documentation will require a new delivery process.

8.7 Control of nonconforming outputs

8.7.1 Product nonconformity

The supplier shall have an effective, documented system for the control, documentation, segregation and disposition of non-conforming product.

If the supplier intends to:
- Prior to delivery; repair a product with a nonconformity; or
- Deliver a product with a nonconformity as-is;

then the supplier shall request and be granted a deviation or waiver (nonconformance) approval through the use of BLA-6167 or (e)BLA-6167 [11].

BLA-6167 shall be submitted to the mail addresses indicated in chapter 8.1.2.6.3, or as instructed on the (e)BLA-6167 form.

Nonconformities approved by KONGSBERG shall be referenced on the CoC.

Rework of nonconformity per an approved rework procedure, resulting in a compliant product does not require KONGSBERG approval prior to delivery.

Product dispositioned for scrap shall be conspicuously and permanently marked, or positively controlled, until physically rendered unusable. Remove or make partmark unreadable.

8.7.2 Material Review Board (MRB)

The supplier shall establish and maintain an MRB for design controlled by the supplier. The design responsible shall be an MRB member.

The MRB members shall be clearly defined, including responsibility, authority and required training.

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8.7.3 Replaced components list

For all returned products or material, the supplier shall provide a report listing replaced components. The report has to be available to KONGSBERG at the time of the returned products or material.

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9. Performance evaluation

No additional or supplemental requirements to ISO 9001:2015.

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10. Improvement

10.1 General

No additional or supplemental requirements to ISO 9001:2015.

10.2 Nonconformity and corrective action

10.2.1 Failure Reporting and Corrective Action System (FRACAS)

The supplier shall implement a closed-loop Failure Reporting and Corrective Action System (FRACAS) program. Visibility and traceability of all reported failures shall be provided. This applies to failure recorded during module-test, FAT, qualification tests, KONGSBERG rejections and maintenance.

The FRACAS system shall include enough data to support a Root Cause Analysis (RCA) and experienced reliability.

10.2.1.1 Root Cause Analyses (RCA)

The supplier shall maintain a procedure for RCA encompassing as a minimum all failures from qualification testing, KONGSBERG rejections, and FRACAS statistics.

KONGSBERG may request an RCA from the supplier.

The request may be based on experienced data or based on an event which has negative consequences to quality, reliability, safety, health, environmental or production.

The supplier shall provide an RCA report in a timely manner, using an appropriate technique (e.g., 8D/5WHY) to identify, analyze and validate potential causes.

The report shall clearly identify *what, how* and *why* the incident occurred with the overall objective to prevent a similar event from occurring again, including actions taken to determine if other items are affected by the same deficiency and action taken regarding those items.

The response to such requests shall be provided in read only files. Supplier report format is acceptable.

Failed products shall not be disposed until KONGSBERG have approved the RCA report.

10.3 Continual improvement

No additional or supplemental requirements to ISO 9001:2015.

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11. Related SQAR templates

All templates and forms referenced in this chapter is located at the supplier pages at www.kongsberg.com.

11.1 KDA-TMPL-0210 SQAR Compliance Matrix

The SQAR Compliance Matrix has a pre-assigned requirement category, depending on the scope of supply:

- **Design & Production**. Used for supplier design and/or (serial) production of a product.
- **Build to Print**. Used for (serial) production of a KONGSBERG design product (KONGSBERG TDP).
- **Services**. Used for service providers (e.g., laboratory services, calibration, or testing).
- **Maintenance**. Used for providers of maintenance on KONGSBERG's (or KONGSBERG's customers') product or infrastructure.

For each scope of supply there may be a corresponding column in the SQAR Compliance Matrix containing a KONGSBERG tailoring code. It defines if the requirement applies (code "R"), does not apply (code "N/A"), or defines a tailoring to the requirement (code "T"). For each requirement the supplier shall fill out a compliance statement, with a reference to the process, procedure or document that ensures compliance to the requirement. Any non-compliance or partially compliance requires a justification. The supplier is responsible for ensuring that the requirement is covered by the process, procedure or document. KDA does not assume any responsibility for ensuring compliance.

Any contract/ purchase order issued by KONGSBERG to the supplier will refer to the specific SQAR Compliance Matrix that applies for the work. If a defined compliance matrix has not been established, the supplier shall initiate one and submit to KONGSBERG for approval.

The SQAR Compliance Matrix may when approved constitute a QAPP and/or PMP for the supplier.

The SQAR Compliance Matrix shall be completed by the head of the supplier's quality assurance function, or authorized person.

11.2 KDA-TMPL-0187 Contractual Data Requirement List (CDRL)

The template KDA-TMPL-0187 [37] may be used, ref. chapter 8.1.2.2 Contractual Data Requirement List (CDRL).

11.3 KDA-TMPL-0186 Contractual Baseline (CBL)

The template KDA-TMPL-0186 [36] may be used, ref. chapter 8.1.2.4 Contractual Baseline (CBL).

11.4 KDA-TMPL-0217 Product Baseline (PBL)

The template KDA-TMPL-0217 [40] may be used, ref. chapter 8.1.2.3 Product Baseline (PBL).

11.5 BLA-6167 Request for Change

The form BLA-6167 [11] is used by the supplier to request KONGSBERG for Change of Contract, Engineering Design Change, Deviation or Waiver (nonconformance), or to inform KONGSBERG about LTB/obsolescence.

11.6 KDA-TMPL-0189 Verification Cross Reference Matrix (VCRM)

The template KDA-TMPL-0189 [39] may be used, ref. chapter 8.3.5.3 Design and development verification.

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