

The Definitive Technical Guide to AS9120 and the AS Series of Aerospace Quality Management Standards

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In the high-stakes sectors of aviation, space, and defense (AS&D), the margin for error is non-existent. A single component failure can lead to catastrophic mission failure or loss of life. To mitigate these risks, the International Aerospace Quality Group (IAQG) established a rigorous framework of standards known as the **AS series**. While AS9100 is often the most cited, **AS9120** represents a critical pillar specifically designed for stockist distributors and organizations that procure parts and materials for the aerospace industry. This technical guide provides an exhaustive analysis of the AS9120 standard, its relationship with the broader AS series, and the procedural mechanics required for global certification.

1. The Theoretical Framework of Aerospace Quality Management

The AS series is built upon the foundation of **ISO 9001**, the international standard for Quality Management Systems (QMS). However, the aerospace industry requires significantly more stringent controls regarding traceability, risk management, and product safety. The AS series supplements ISO 9001 with approximately 100 additional requirements specific to the aerospace supply chain.

The AS Standards Ecosystem

Before diving into AS9120, it is essential to understand the hierarchy of the AS standards and how they apply to different organizational roles within the industry:

- **AS9100 (Design and Manufacturing)**: Applicable to organizations that design, develop, or produce aerospace products from scratch.
- **AS9110 (Maintenance, Repair, and Overhaul)**: Specifically tailored for MRO stations and facilities that provide sustainment services for aircraft.
- **AS9120 (Distributors)**: Designed for organizations that purchase components and resell them to aerospace customers without performing value-added manufacturing (though they may perform splitting or basic packaging).
- **AS6081 (Counterfeit Mitigation)**: A specialized standard for electronic distributors to detect and prevent the entry of fraudulent parts into the supply chain.

2. Deep Dive into AS9120: Requirements for Distributors

AS9120 (currently in Revision B) is unique because it addresses the specific risks associated with the distribution process. Unlike manufacturers, distributors do not have control over the design or production of the part; their primary responsibility is **chain of custody** and **traceability**.

Core Principles of AS9120 Rev B

The standard follows the **Annex SL High-Level Structure (HLS)**, which aligns it with other modern ISO standards. This allows for easier integration with ISO 14001 (Environmental) or ISO 45001 (Occupational Health and Safety). The technical core of AS9120 focuses on several critical areas:

- **Traceability**: The ability to track a part from its origin (the original equipment manufacturer or OEM) through every hand it has passed until it reaches the end user.
- **Product Safety**: Ensuring that the handling, storage, and transport of the product do not compromise its

integrity or performance.

- **Prevention of Counterfeit Parts:** Implementing rigorous verification processes to ensure that fraudulent or unapproved parts do not enter the supply chain.
- **Risk-Based Thinking:** Identifying operational risks, such as supplier insolvency or geopolitical disruptions, that could impact delivery or quality.

3. Technical Analysis: AS9120 vs. ISO 9001

To understand why AS9120 is necessary, one must examine the specific technical gaps it fills in the ISO 9001 framework. The following table provides a side-by-side evaluation of the enhancements introduced by the aerospace standard.

Feature/Requirement	ISO 9001:2015	AS9120 Rev B (Aerospace)
Context of Organization	Standard business context analysis.	Must include aerospace-specific regulatory requirements and product safety considerations.
Risk Management	General risk-based thinking.	Formalized Operational Risk Management (Clause 8.1.1) focusing on product realization.
Configuration Management	Limited mention.	Strict requirements to manage the physical and functional attributes of products throughout their life.
Control of Counterfeit Parts	Not specifically addressed.	Detailed requirements for prevention, detection, and notification of counterfeit parts (Clause 8.1.4).
Traceability/Records	Basic records retention.	Indefinite or long-term retention of Certificates of Conformity (CoC) and test reports.
Supplier Control	Evaluate and select suppliers.	Extensive evaluation, including the use of customer-approved sources and monitoring of delivery performance.

4. Operational Mechanics: Implementing AS9120

Achieving AS9120 certification requires a fundamental shift in how a distribution warehouse operates. The implementation process follows a systematic workflow that prioritizes technical accuracy and documentation.

Step 1: Gap Analysis and Scoping

An organization must first determine the scope of its QMS. For AS9120, this typically includes the procurement, storage, and distribution of aerospace components. The **Gap Analysis** identifies where existing processes fall short of the standard's 105+ aerospace-specific requirements.

Step 2: Operational Risk Management (ORM)

Clause 8.1.1 requires a structured approach to risk. Technical writers and quality managers must develop a **Risk Register**. This involves:

1. Risk Identification: Identifying potential failures (e.g., damage during bulk splitting).
2. Risk Assessment: Using tools like FMEA (Failure Mode and Effects Analysis) to assign a Risk Priority Number (RPN) based on severity, occurrence, and detectability.
3. Risk Mitigation: Implementing controls to reduce RPNs to acceptable levels.

Step 3: Documented Information and Traceability

In AS9120, the "product" is often accompanied by more weight in documentation than physical mass. Every shipment must have a **Certificate of Conformity (CoC)**. If a distributor splits a bulk lot of 10,000 fasteners into 10 bags of 1,000, they must maintain a technical link back to the original manufacturer's test report. This is known as **Lot Integrity**.

Step 4: Prevention of Counterfeit Parts

Distributors are the primary line of defense against counterfeit electronics and hardware. AS9120 requires a formal program that includes:

- Training personnel in the identification of fraudulent markings.
- Quarantining and reporting suspected parts to the Government-Industry Data Exchange Program (GIDEP).
- Strict procurement policies that prioritize OEMs or authorized distributors over "grey market" brokers.

5. The Certification Pathway: Auditing and Compliance

The path to AS9120 certification is governed by the **AS9104/1** standard, which dictates how certification bodies (CBs) must conduct aerospace audits. The process is significantly more rigorous than a standard ISO audit.

The Two-Stage Audit Process

1. Stage 1 (Readiness Review): The auditor evaluates the organization's documentation, QMS structure, and internal audit results to ensure the foundation is in place.
2. Stage 2 (On-Site Assessment): A deep dive into the facility. The auditor will follow "audit trails"—picking a random part in the warehouse and tracing it back to the purchase order, the manufacturer's certs, and the training records of the employee who received it.

OASIS Database Integration

Upon successful certification, the organization is entered into the **Online Aerospace Supplier Information System (OASIS)** maintained by the IAQG. This database is used by major aerospace primes (like Boeing, Airbus, and Lockheed Martin) to verify the certification status of their global supply chain.

6. Technical Challenges and Common Non-Conformances

Even well-prepared organizations encounter hurdles during AS9120 implementation. Analyzing common **Non-Conformance Reports (NCRs)** provides insight into the standard's most demanding sections.

Failure Mode: Improper Lot Splitting

A common technical failure occurs when a distributor splits a lot but fails to carry over the original batch number or fails to provide the secondary certification required by the customer. In aerospace, a part without a traceable paper trail is effectively scrap.

Failure Mode: Foreign Object Debris (FOD) Control

AS9120 Clause 8.5.1 requires a **FOD Prevention Program**. Auditors often find issues where shipping areas are not clean, or packing materials (like loose staples or foam peanuts) could potentially enter sensitive engine components or electronic assemblies.

Failure Mode: Monitoring and Measurement Equipment

Any tool used to verify a product—such as calipers, micrometers, or scales—must be calibrated against NIST-traceable standards. A common NCR involves using "expired" tools or failing to define the environment (temperature/humidity) in which measurements are taken.

7. Mathematical Models in Quality Assurance

For large-scale distributors, **Statistical Process Control (SPC)** and sampling plans are critical. AS9120 does not mandate a specific sampling plan, but it requires that the plan be statistically valid. Many organizations utilize the

ANSI/ASQ Z1.4 standard for sampling.

The probability of accepting a lot with a certain percentage of defects can be calculated using the **Binomial Distribution formula**:

$$P(X = k) = \frac{n!}{k!(n-k)!} * p^k * (1-p)^{(n-k)}$$

Where:

- n: Number of items in the sample.
- k: Number of defects found.
- p: Probability of an individual item being defective.

Distributors must mathematically justify why their sampling plan (e.g., inspecting 13 pieces out of a lot of 100) provides the necessary confidence level required by aerospace customers.

8. The Future of Aerospace Standards: Digital Transformation

The next evolution of AS9120 involves **Digital Thread** and **Model-Based Enterprise (MBE)** integration. As the industry moves away from paper CoCs toward **Blockchain-based traceability**, distributors must prepare for digital audits. This involves **Electronic Data Interchange (EDI)** and automated QMS software that can flag shelf-life expirations or supplier de-certifications in real-time.

Shelf-Life Management

Many aerospace components (O-rings, sealants, adhesives) have strict shelf lives. A technical requirement of AS9120 is the system-driven prevention of shipping expired goods. Advanced ERP systems must calculate the **Remaining Shelf Life (RSL)** based on the Manufacture Date (DOM) and the customer's specific RSL requirements (e.g., 80% remaining shelf life required upon delivery).

9. Strategic Implications for Global Market Access

Certification to AS9120 is not merely a badge of quality; it is a "license to trade." Most Tier 1 and Tier 2 aerospace suppliers are contractually forbidden from purchasing from non-certified distributors. By adhering to these standards, organizations minimize the risk of **Product Liability**. In the event of a field failure, a certified QMS provides the documented evidence that the distributor exercised **Due Diligence** in following industry-best practices for storage, handling, and verification.

The integration of AS9120 into an organization's culture fosters a environment of continuous improvement. By utilizing the **Plan-Do-Check-Act (PDCA)** cycle, distributors can identify inefficiencies in their logistics chain, reduce waste (Lean principles), and ultimately enhance customer satisfaction through improved On-Time Delivery (OTD) and Quality (PPM) metrics.

In conclusion, the AS series of standards represents the pinnacle of quality management. For distributors, AS9120 provides the technical roadmap necessary to navigate the complexities of the aerospace supply chain. Through rigorous traceability, proactive risk management, and a culture of safety, AS9120 certified organizations ensure that every component they deliver contributes to the continued safety and success of the global aviation and space industries.

Tags: **#AS9120 #AS9100 #Aerospace Standards #Quality Management System #IAQG #ISO 9001**

