ARMSTRONG

RAPID MANUFACTURING

NEWS
B U L L E T I N

Armstrong RM is pleased to announce we have now received our AS9100 Rev C registration certificate and are eligible to bid on non-flight safety AS9100 contracts in the Aerospace market.

Our team has worked hard to earn this accreditation that will be a major benefit as we sell into this market.

In the upcoming weeks and months ARM will be marketing this exciting news via website announcement, e-blasts to applicable OEM's, press release to media, AS9100 logos on materials, etc. We ask that you reinforce this by keeping the following in mind…

All ARM customers will benefit from our enhanced attention to detail and level of quality systems that AS9100 will breed but many commercial OEM's may feel they don't gain added value for their company. The majority of our customers are non- AS9001 OEM's so please emphasize the following as you present the news and they ask questions:

BENEFITS OF AS 9100

- Qualification to be considered as an aerospace supplier.
- Increased customer confidence in capability of ARM to meet their expectations.
- Increased assurance for meeting relevant product safety standards
- Decreased number of competitors bidding on work
- Positioning of ARM as a top supplier in their niche

SELLING POINTS TO NON-AS9100 OEM's

- Pricing for non-AS9100 work will remain the same with a premium being adding to AS9100 RFQ's
- All customers benefit from the increased quality standards AS9100 provides
- ARM is capable of providing service to the most critical, demanding customers in the market
- ARM is in continuous improvement mode

SIGNIFICANCE OF AS 9100

AS9100 was published by **SAE - Society for Automotive Engineers** in 1999. AS9100 resulted from cooperation between major aerospace corporations - American Aerospace Quality Group (AAQG) - with input from ANAB and the Independent Association of Accredited Registrars (IAAR).

Major manufacturers in the aircraft and aerospace industry identified quality suppliers as a valuable link in the supply chain. Instead of writing their own quality management system standard, the manufacturers chose to build off the well-known ISO 9001:2000 quality management system standard. By incorporating sector specific supplier requirements, the aircraft and aerospace industry established AS9100 and AS9100b as quality standards.

The aircraft and aerospace industries are quickly embracing AS9100 as a means of improving quality and on-time delivery within their supply chain. Public demand for safety and reliability drives the need for product quality to approach near perfection. The only way to work towards perfection is to work through continuous improvement. Quality management systems in conjunction with third party audits are integral to continuous improvement.

For additional AS9100 info please review the following white paper.

METAL & PLASTIC: PROTOTYPE TO LOW-VOLUME MANUFACTURING   **ArmstrongRM.com**

AS9100C

An Overview of the AS9100 Revision C Aerospace and Defense Quality Standard and How it Can Benefit Your Organization

Excellence. Assured.

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Background to AS9100:2009 Revision C
– The Next Level of Aerospace Certification

Early in 2009, the IAQG released Revision C to AS9100, the aerospace quality management system (QMS) standard. This revision marks the first significant change to the standard since its initial release. AS9100 Series standards are maintained and harmonized through the workings of the IAQG and are recognized worldwide. The IAQG is composed of OEMs & prime suppliers across the Americas, European and Asia-Pacific sectors.

The process of rewriting AS9100 started back in 2005 by gathering stakeholder input. These stakeholders included civil aviation authorities, defense and space authorities, certification bodies, trade associations, suppliers and IAQG member companies. The input came in the form of comments and each comment (approximately 350) had to be addressed as part of the process.

Based on this stakeholder input and the IAQG Charter, the re-write team was given five key objectives:

1. Incorporate the ISO 9001:2008 base requirements
2. Expand the scope from an aerospace standard to an aviation, space and defense standard
3. Ensure alignment with IAQG strategies for on-time, on-quality delivery
4. Incorporate new requirements based on the needs of stakeholders
5. Improve existing requirements based on needs identified by stakeholders

Revising this standard entailed a process of survey, discussion and review, which due to the broad and international nature of stakeholders took several years to complete. The outcome is a valuable standard applicable to a wider array of complex systems heavily dependent on international networks of suppliers throughout the supply chain. It is suitable to be used by all sizes of organizations engaged in the various levels of product complexity and is no longer just an "aerospace standard", but an "aviation, space and defense" standard.

To gain an understanding of what has changed in AS9100C, We can consider the changes as being an Addition, Revision or a Deletion

Key Additions: There have been six key additions during this revision.
(Note that these are only the KEY changes and many more minor changes were made during the revision process)

Addition #1 – The term **Risk** was introduced and is now mentioned throughout the standard from system planning to contracts, to supply chain management and through planning and production. An organization must be able to identify risks, manage them and have risk mitigation plans in place. Risk has been defined as, "An undesirable situation or circumstance that has both the likelihood of occurring and a potentially negative outcome." Understanding risk is important in developing a proactive aerospace QMS.

Addition #2 – The term **Special Requirements** has been added and defined as, "Those Requirements that have a high risk of being achieved, thus requiring their inclusion into the risk management process." Factors used to determine special requirements are product or process complexity, past experience and/or product or process maturity. It will be important to understand the potential flow from special requirements to critical items and/or key characteristics.

Addition #3 – The term **Critical Item** has been added and defined as, "Those items having significant effect on product realization and the use of products that require specific actions to ensure they are managed." Organizations will need to understand critical items coming from special requirements and ensure they are systematically addressed and linked to risk management.

Addition #4 – **Customer Focus/Satisfaction** (ref clause 5.2/8.2.1) – This is a new requirement that requires on-time delivery and product quality be measured, as well as appropriate actions put into place when customer objectives are not met. The evaluation of customer satisfaction shall include monitoring of product conformity, delivery performance, complaints, or corrective action requests. This requirement will establish a clear relationship between the QMS and organizational performance.

Addition #5 – **Project Management** (7.1.1) – A new requirement for planning and managing product realization in a structured and controlled way. Most aerospace products are complex and involve multi-tier partners and suppliers. Organizations will need to have a process to manage product realization to ensure quality and that schedules are not compromised.

Addition #6 – **Risk Management** (7.1.2) – This new requirement under clause 7.1 is risk management. It requires an organization to implement a risk management process. This clause will require organizations to identify and classify risk, determine levels of acceptable risk for the organization and have effective risk mitigation plans for unacceptable risk. This requirement puts a focus on product risk during product realization. This is vital as new technologies in aircraft, space vehicles, defense systems and materials are introduced. Organizations will need to ensure a risk management process is in place and that the risks are appropriately applied in the process and that they are successfully managed.

Key Revisions: There have been eight key revisions during this process.

Revision #1 - **The scope of the standard was revised so that it incorporated the defense industry** as well as aviation and space (aerospace). The basis for this broadening was that a QMS suitable for aviation and space would also be applicable to the defense industry due to the complex nature of systems and the prevalence of international supply chains.

Revision #2 - **QMS General Requirements** – The organization's QMS shall address customer and applicable statutory and regulatory QMS requirements. The concept of basic QMS can be used, but the documents such AS9100C: The Updated Standard 2 as quality management plans, which addresses specific customers' requirements, shall be considered as part of the QMS.

Revision #3 - **Configuration Management** (7.1.3) – The existing configuration management clause was simply moved from section 4 to section 7. This puts the focus on product instead of documentation. Some level of configuration management is expected for all products at all levels of the supply chain.

Revision #4 – **Work Transfer** (7.1.4) – The existing work transfer clause was moved from section 7.5 to 7.1 and expanded to cover permanent transfer from one organization to another. A process must exist to control the transfer of work, including planning and subsequent control of the transfer.

Revision #5 - **Recognition of Supplier Quality Data** (7.4.1) – This change is in the form of a guidance note that encourages the use of data from external sources in the supplier selection/evaluation process. The Industry trend is to use externally provided supplier performance data (e.g. OASIS).

Revision #6 - **Approval Status of Suppliers** (7.4.1) – This will require organizations to define the various status levels they use along with the scope of approval for each. They will also have to define the process for supplier approval status decisions and changes. This requirement stems from the increased emphasis on supply chain management throughout the aerospace industry. Conditions for using a supplier must depend on the approval status and an organization must be able to demonstrate the logic used in making those decisions. Process, responsibilities and authorities must be defined.

Revision # 7 - **Production Process Validation** (7.5.1.1) – This change basically moves the First Article Inspection requirement from clause 8.2.4. It will require organizations to verify the production processes, documentation and tooling are capable of producing parts and assemblies that meet requirements. AS9102 will still be referenced as the guidance and is often flowed down from major aerospace companies.

Revision #8 - **Sampling Inspection** (8.2.4) – The revision is that, when the organization uses sampling inspection as a means of product acceptance, the sampling plan shall be justified on the basis of recognized statistical principles and appropriate for use. The rationale was that numerous requests were received to improve the sampling clause and the way it was previously written confined organizations under other plans that could still be proven statistically valid.

Key Deletions: There have been three key deletions during this revision.

Deletion #1 - **Quality Manual Relationships** (4.2.2) – This change deleted the previous requirement to create a document showing the relationship between AS9100 requirements and the organization's documented procedures. The stakeholder input received during the revision process was that this requirement had no impact on product quality and was viewed as prescriptive.

Deletion #2 - **Validation of Test Reports** (7.4.3) – The previous revision required organizations to periodically validate test reports for raw material. This was often a misunderstood concept, frequently misapplied and viewed as prescriptive and subject to varying interpretations. The rationale going forward will be that if an organization is making critical items, where the material chemical and physical requirements are important, they should be verifying test reports as part of the risk management process.

Deletion #3 - **Detailed Tools and Techniques** (8.2.2) – This change removed the requirement for organizations to use detailed tools and techniques such as check sheets, flow charts, etc. to support the internal audit process. Industry considered this to be too prescriptive and decided it was best to leave the identification of tools up to the supplier.

AS9100 - The Benchmark for Aerospace Quality

The benefits of certification to AS9100 can deliver a positive impact to your organization's ROI with heightened customer satisfaction.

Not Yet AS9100 Certified?

Certification to AS9100 can enable an organization to realize the processes required to realize a sustainable Aerospace Quality Management System (AQMS) with improved performance measures in quality, delivery and costs. Ultimately, these benefits can deliver a positive impact to your organization's return on investment (ROI) with heightened customer satisfaction.

Within the aerospace industry, companies have little choice on whether or not to establish a QMS. The Federal Aviation Administration (FAA) defines individual manufacturing approvals through its Federal Aviation Regulations (FARs) and laws mandating compliance. Companies can choose to implement a QMS that exceeds FAA requirements. That choice is rapidly becoming a prerequisite for doing business because many aerospace OEMs are demanding that suppliers be certified to the new AS9100 quality standard.

AS9100 Quality Management Systems - Requirements for Aviation, Space and Defense Organizations focuses on aerospace requirements that support the FAA's FAR Title 14 Part 21 requirements. Safety, airworthiness, product conformity and reliability are key aspects. These quality requirements are crucial to aerospace OEMs, which maintain a high level of liability for their product. Suppliers must also demonstrate superior performance to succeed in today's competitive and cyclical aerospace market.

A Foundation for Success

AS9100 is based on ISO 9001:2008 but with approximately 100 additional requirements specific to aerospace. AS9100 provides suppliers with a comprehensive quality system focused on areas directly impacting product safety and reliability, including:

- **Configuration Management** – requires that a management discipline be applied over the life cycle of a product to provide visibility and control of its functional and physical characteristics

- **Design** – ensures that design responsible organizations have a robust design process to meet safety and reliability requirements demanded by the aerospace industry

- **Purchasing** – requires effective controls over the organization's entire supply chain

- **Product Realization** – ensures that each phase of product realization, from planning to shipment, is tightly controlled for delivery of conforming products

- **Product Monitoring/Measurement** – that defines requirements for product validation prior to shipment

Other technical additions that relate to product safety, reliability and maintenance include:

- Regulatory Requirements
- Quality Requirements Flow Downs
- First Article Inspection
- Positive Recall
- Aerospace Material Traceability
- Requirements
- Foreign Object Detection Program
- Requirements
- Tooling Control and Validation
- Stamp Control
- Control of Special Processes
- Aerospace Subcontractor
- Approval/Controls
- Nonconforming Material System
- Control of Production Process Changes
- Aerospace Accountability Requirements
- Key/Critical Characteristic Classification
- Sampling Inspection
- Requirements/Limitations
- Variation Management

Areas for identifying and maintaining suppliers include supplier approval, accurate communication of requirements from the OEM through the entire supply chain, clarification of engineering requirements, management of test specimens, and establishment of access to suppliers' facilities. Additional controls are in place for verification of purchased products.

The standard also addresses supplier rating systems, used to establish adequate control over supplier performance and to allow for disapproval of suppliers who do not meet customer requirements.

AS9100 Certification - Supplier Benefits

ISO identifies eight quality management principles that top management can use to lead the organization toward improved performance. These eight principles form the basis for the quality management system standards within the ISO 9000 family, and are listed in the table below.

Perhaps the greatest benefit of adoption of the AS9100 standard is a reduction in waste, due to a focus on customer satisfaction and continual improvement. Efficiency enhancements can transfer immediately to the organization's bottom line.
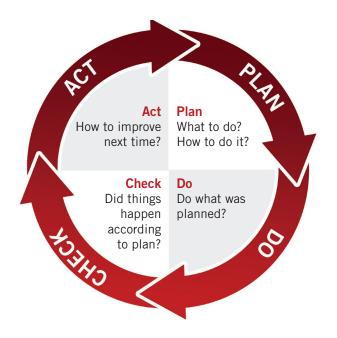
Quality Management Principles from ISO 9000-2005	
1) Customer Focus	Organizations depend on their customers and therefore should understand current and future customer needs, should meet customer requirements and strive to exceed customer expectations.
2) Leadership	Leaders establish unity of purpose and direction of the organization. They should create and maintain the internal environment in which people can become fully involved in achieving the organization's objectives.
3) Involvement of People	People at all levels are the essence of an organization, and their full involve ment enables their abilities to be used for the organization's benefit.
4) Process Approach	A desired result is achieved more efficiently when activities and related resources are managed as a process.
5) System Approach to Management	Identifying, understanding and managing interrelated processes as a system contributes to the organization's effectiveness and efficiency in achieving its objectives.
6) Continual Improvement	Continual improvement of the organization's overall performance should be a permanent objective of the organization.
7) Factual Approach to decision making	Effective decisions are based on the analysis of data and information.
8) Mutually beneficial supplier relationships	An organization and its suppliers are interdependent and a mutually beneficial relationship enhances the ability of both to create value.

Before applying the eight quality management principles, the company should establish quality objectives appropriate for its particular organization, industry and goals. Goals should apply not only to product quality, but also across all business performance metrics (manufacturing efficiency, speed to market, cost of quality, cycle time reduction, delivery speed, etc.). A continual improvement program that best meets the organization's needs can then be chosen and implemented.

Current ISO standards incorporate a process approach for implementing the quality management system, replacing the "20 element structure" of ISO 9001:1994. ISO 9001:2008 stresses the importance of identifying, implementing, managing and continually improving quality management system processes, as well as managing their interactions to achieve the organization's objectives. Processes needed for the quality management system include not only product realization processes, but also management, monitoring and measurement processes. These include resource management, communication, internal auditing, management review and others.

A process is a set of interrelated or interacting activities that transform inputs into outputs. Customers play a significant role in defining inputs, and feedback on their satisfaction with process outputs is essential to continual improvement. The process approach is truly customer driven, and affords the perfect opportunity for continual improvement in your organization.

The "Plan-Do-Check-Act" cycle can be deployed within each of the organization's processes, and to the entire system of processes. The PDCA concept, in the table below, can be used at all organizational levels to maintain and continually improve process effectiveness.

The "Plan-Do-Check-Act" Cycle

Plan - Establish objectives and processes necessary to deliver results according to customer requirements and organization policies.

Do - Implement the processes.

Check - Monitor and measure processes and product against policies, objectives and requirements for the product. Report the results.

Act - Take actions to continually improve process performance.

The process approach, the PDCA cycle, and the focus on customer satisfaction and continual improvement provide an overall framework for managing the business.

A Foundation for Success

AS9100C registration requires an extensive audit led by an aerospace experienced auditor (AEA). This designation requires that four years within the last ten must have been spent in the aerospace industry in areas such as design, manufacturing, quality assurance, process control, engineering or inspection.

The Registrar Accreditation Board (RABQSA) must approve AEAs, providing assurance that the registrar continues operating according to internationally accepted criteria. RABQSA's activities are monitored and authenticated by the AAQG's Registration Management Committee (RMC). Monitoring can include random in-field "witness audits" during which the registrar, the RABQSA and the RMC may all be present. This rigorous oversight provides the registering company confidence in the quality of its audit and registration processes.

Suppliers that wish to register to AS9100 should first have an effective and efficient quality management system in place. Companies implementing an AS9100-compliant system must make sure that any additional customer requirements, as well as those of applicable regulatory agencies or local, state and federal laws, are referenced within the system's documentation.

Other benefits that OEMs and their suppliers experience include:

- AEAs identify opportunities for operational improvements and cost reductions
- Improvement in audit and surveillance efficiency
- Reduction in the number of customer audits, and a corresponding reduction in needed resources
- Improved supplier performance due to higher quality, waste reduction and a customer satisfaction focus
- Streamlined documentation

Additional Aerospace Standards in the AS9100 Series

AS9110 - The Maintenance, Repair and Overhaul Segment
The aerospace industry realized that the needs of the Maintenance, Repair and Overhaul (MRO) segment were different than those of the OEM segment. Products are designed to perform for 50 years and beyond, so proper maintenance is crucial for safe operation. To address this need, the IAQG developed AS9110, (Quality Management Systems - Aerospace - Requirements for Maintenance Organizations). This standard is focused on the control of repair schemes and maintenance plans configuration management, and the skills and qualifications necessary to perform MRO tasks within the aerospace community.

AS9110 complements use of ISO 9001 by aerospace repair stations worldwide. It provides guidance for compliance with the FAA's new requirements that concur with revisions to FAR Part 145. AS9110 is also applicable for non-commercial applications, such as DoD military depots.

AS9120 - The Distribution Segment

Distributors, or stockists, buy and resell aerospace commodity items such as raw materials, fasteners, bearings, paints and coatings, and gaskets. While not adding value to these products, distributors affect product performance if they fail to handle parts and materials properly, or lose a part's traceability from OEM to customer.

AS9120 - (Quality Management Systems - Aerospace Requirements for Stockist Distributors), was developed for pass-through distributors of aerospace commodity items. This standard addresses chain of custody, traceability, control, and availability of records.

OASIS:

In order for OEMs to recognize audit results among several aerospace CBs, there needed to be a process in place where supplier certification and audit data is housed and can be accessed by OEMs. This is managed through the On-Line Aerospace Supplier Information System (OASIS). OASIS is a database that runs 24/7, 365 days a year. OASIS houses all certificate and assessment information for certified suppliers. The certificate information is public information, while the assessment information is confidential.

What's Happening in the Aerospace Industry?

Suppliers manage their assessment data through the use of an OASIS Administrator. An Administrator can "grant" access to a specific OEM upon request for a specified time-frame. Suppliers are responsible for setting up their organizational information and an administrator. A CB can no longer issue a certificate to a supplier unless they have completed these activities. Upon certification, the CB uploads the certificate and all audit reports and corrective actions.

Five Key Areas of Focus:

The aerospace industry is a network of thousands of suppliers that supply varying levels of complex products. Suppliers range in size from just a few people to a few thousand. Regardless of size, the level within the supply chain, or the complexity of products being produced, there are common areas of emphasis for the IAQG and its member companies.

Many of these areas have surfaced through sanctioned and supplemental oversight. This is not a complete list of every aerospace expectation, but if suppliers are effective in these areas, they are well on their way to having a robust AS9100 system in place.

1. Customer Requirements: It is imperative that suppliers conduct in-depth reviews of their customer flow-down requirements and ensure they are effectively deployed, including down to the sub-tier suppliers.

2. Supply Chain Management: This is an ever-increasing area of concern within the aerospace industry. So much that an IAQG Project team was tasked with developing a "Supply Chain Management Handbook" (SCMH). The SCMH is available in the OASIS database (which is described at the end of this paper), and includes a erospace's best practices for managing suppliers. Organizations must ensure that they have robust processes in place for approving suppliers and that supplier monitoring is data driven with an emphasis on continual improvement.

3. Root Cause & Corrective Action: Suppliers who are able to demonstrate good, sound, root- cause evaluation with effective corrective action will be well on their way to establishing a strong aerospace management system.

4. On-Time & On-Quality Delivery: It is imperative that aerospace suppliers deliver quality products on-time. These concepts are addressed in AS9100C and are hot buttons for OEMs. If product shows up at a production plant late and/or defective, it causes problems for the OEMs. Not only do they have to deal with the supplier, but they must show the authorities how they have contained and managed the problem.

5. Measurable Objectives: This is for all management system processes. The aerospace industry expects processes to be managed by data so an organization can drive continual improvement.

Summary

The release of AS9100C raises the bar of aerospace standards and certification. A well managed, effective Aerospace Quality Management System (AQMS) can enable an organization to realize the processes required to realize a sustainable Aerospace Quality Management System (AQMS) with improved performance measures in quality, delivery and costs. It can open up new opportunities in new markets and can deliver a positive impact on an organization's ROI.

Your organization's management system has huge potential because AS9100C incorporates so much of what needs to be done right within an organization and is what major OEMs expect. The certification is the starting point. With innovative adaption of the requirements and open mindedness about various ways AS9100C can contribute, your aerospace management system can move you through the continuum of benefits and provide increasing value to the organization so that it becomes a competitive asset.

SAI GLOBAL ASSURANCE SERVICES

SAI Global is one of the largest aerospace registrars in the Americas. We have the in-depth, broad based aerospace industry experience your company requires to meet the expectations of aerospace OEMs, prime suppliers, and other key stakeholders in the aerospace industry.

Our highly-qualified aerospace experienced auditors (AEAs), with extensive aerospace work experience, have registered some of the leading aerospace OEMs and prime suppliers, as well as regulatory bodies and the aerospace supply chain.

Aaron Troschinetz is the Aerospace Technical Manager for SAI Global. Aaron closely interfaces with aerospace OEMs, accreditation bodies and oversight groups, and he also maintains active involvement in various industry action groups and forums. He has over 10 years experience within progressive manufacturing and quality roles at Daimler Truck (formerly Detroit Diesel), where he was engaged in the design and manufacture of diesel engines for on-highway and off-highway applications (including government).

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To request a quote for any of these standards, call (800) 465-3717.