



*When Recognition Matters*



# **EXAM PREPARATION GUIDE**

**PECB Certified AS9100 Lead Auditor**

The objective of the “**PECB Certified AS9100 Lead Auditor**” exam is to ensure that the candidate possesses has mastered the audit concepts and techniques and is able to participate in aerospace quality management system audits based on AS9100 standard.

**The AS9100 Lead Auditor exam is intended for:**

- Auditors seeking to perform and lead Aerospace Quality Management System (AQMS) certification audits
- Managers or consultants seeking to master an Aerospace Quality Management System audit process
- Individuals responsible for maintaining conformance with the AQMS requirements
- Technical experts seeking to prepare for an Aerospace Quality Management System audit
- Expert advisors in Aerospace Quality Management

**The exam content covers the following competency domains:**

- **Domain 1:** Fundamental principles and concepts of an Aerospace Quality Management System (AQMS)
- **Domain 2:** Aerospace Quality Management System (AQMS)
- **Domain 3:** Fundamental audit concepts and principles
- **Domain 4:** Preparation for an AS9100 audit
- **Domain 5:** Conducting an AS9100 audit
- **Domain 6:** Closing an AS9100 audit
- **Domain 7:** Managing an AS9100 audit program

The content of the exam is divided as follows:

## Domain 1: Fundamental principles and concepts of an Aerospace Quality Management System (AQMS)

**Main objective:** Ensure that the AS9100 Lead Auditor candidate can understand, interpret and illustrate the main quality management concepts related to an Aerospace Quality Management System (AQMS).

Competencies	Knowledge statements
<ol style="list-style-type: none"> <li>1. Ability to understand and explain the AS9100 and the development of Aerospace Quality Management standards.</li> <li>2. Ability to identify, analyze and evaluate the Quality Management compliance requirements for an organization.</li> <li>3. Ability to understand the Quality Management methods and techniques.</li> <li>4. Ability to explain and illustrate the main concepts in Quality Management.</li> </ol>	<ol style="list-style-type: none"> <li>1. Knowledge of the application of ISO management principles in Quality Management.</li> <li>2. Knowledge of the main standards in Quality Management.</li> <li>3. Knowledge of the main advantages of an AS9100 certification for an organization.</li> <li>4. Knowledge of Quality Circles, Total Quality Management, Six Sigma, Lean, Kaizen, Just-in-Time, etc.</li> <li>5. Knowledge of the main Quality Management concepts and terminology as described in ISO 9000.</li> <li>6. Knowledge of the concepts of process approach and risk-based thinking in Quality Management.</li> </ol>

## Domain 2: Aerospace Quality Management System (AQMS)

**Main objective:** Ensure that the AS9100 Lead Auditor candidate can understand, interpret and illustrate the main concepts and components of an Aerospace Quality Management System based on the AS9100.

<b>Competencies</b>	<b>Knowledge statements</b>
<ol style="list-style-type: none"> <li>1. Ability to identify, understand, classify and explain the clauses with requirements from AS9100.</li> <li>2. Ability to understand and explain the components of an Aerospace Quality Management System based on the AS9100 and its principal processes.</li> <li>3. Ability to interpret and analyze the requirements of AS9100.</li> <li>4. Ability to understand, explain and illustrate the main steps to establish, implement, operate, monitor, review, maintain and improve an organization's AQMS.</li> <li>5. Ability to understand and explain the concept of continual improvement application to an AQMS</li> </ol>	<ol style="list-style-type: none"> <li>1. Knowledge of the concepts, principles and terminology related to management systems and the "Plan-Do-Check-Act" (PDCA) model.</li> <li>2. Knowledge of the principal characteristics of an integrated management system.</li> <li>3. Knowledge of the AS9100 requirements presented in clauses 4 to 10.</li> <li>4. Knowledge of the main steps to establish the AQMS policies, objectives, processes and procedures relevant to managing risk and improving Aerospace Quality Management to deliver results in accordance with an organization's overall policies and objectives (awareness level).</li> <li>5. Knowledge of the concept of continual improvement and its application to an AQMS.</li> </ol>

## Domain 3: Fundamental audit concepts and principles

**Main objective:** Ensure that the AS9100 Lead Auditor candidate can understand, interpret and apply the main concepts and principles related to an AQMS audit in the context of AS9100.

Competencies	Knowledge statements
<ol style="list-style-type: none"> <li>1. Ability to understand, explain and illustrate the application of the audit principles in the context of an AS9100 audit.</li> <li>2. Ability to identify and judge situations that would discredit the professionalism of the auditor and the PECB Code of Ethics.</li> <li>3. Ability to identify and evaluate ethical problems taking into account the obligations related to the audit client, auditee, and law enforcement and regulatory authorities.</li> <li>4. Ability to explain, illustrate and apply the audit evidence approach in the context of an AS9100 audit.</li> <li>5. Ability to explain and compare the types and characteristics of evidence.</li> <li>6. Ability to determine and justify what type of evidence and how much evidence will be required in the context of a specific AQMS audit mission.</li> <li>7. Ability to determine and evaluate the level of materiality and apply the risk based approach during the different phases of an AS9100 audit.</li> <li>8. Ability to judge the appropriate level of reasonable assurance needed for a specific AS9100 audit mission.</li> </ol>	<ol style="list-style-type: none"> <li>1. Knowledge of the main audit concepts and terminology as described in the AS9100.</li> <li>2. Knowledge of the main requirements for bodies providing audit and certification of management systems based on ISO/IEC 17021-1.</li> <li>3. Knowledge of the differences between first party, second party and third party audits.</li> <li>4. Knowledge of the following audit principles: integrity, fair presentation, due professional care, professional judgment, professional skepticism, confidentiality and independence.</li> <li>5. Knowledge of the professional responsibility of an auditor and the PECB Code of Ethics.</li> <li>6. Knowledge of evidence based approach in an audit.</li> <li>7. Knowledge of the different types of evidences: physical, mathematical, confirmative, technical, analytical, documentary and verbal.</li> <li>8. Knowledge of the quality of audit evidences (competent, appropriate, reliable and sufficient) and the factors that will influence them.</li> <li>9. Knowledge of the risk-based approach in an audit and the different types of risks related to audit activities.</li> <li>10. Knowledge of the concept of materiality and its application in an audit.</li> <li>11. Knowledge of the concept of reasonable assurance and its applicability in an audit.</li> </ol>

## Domain 4: Preparation for an AS9100 audit

**Main objective:** Ensure that the AS9100 Lead Auditor candidate can appropriately prepare an AQMS audit in the context of AS9100.

Competencies	Knowledge statements
<ol style="list-style-type: none"> <li>1. Ability to understand and explain the steps and activities to prepare an AQMS audit taking into consideration the specific context and conditions of the audit mission.</li> <li>2. Ability to understand and explain the roles and responsibilities of the audit team leader, audit team members and technical experts.</li> <li>3. Ability to determine, evaluate and confirm the audit objectives, the audit criteria and the audit scope for a specific AS9100 audit mission.</li> <li>4. Ability to conduct a feasibility study of an audit in the context of a specific AS9100 audit mission.</li> <li>5. Ability to explain, illustrate and define the characteristics of the audit terms of engagement and apply the best practices to establish a first contact with an auditee in the context of a specific AS9100 audit mission.</li> <li>6. Ability to develop audit working papers and elaborate appropriate audit test plans in the context of a specific AS9100 audit mission.</li> </ol>	<ol style="list-style-type: none"> <li>1. Knowledge of the main responsibilities of the audit team leader and audit team members.</li> <li>2. Knowledge of the roles and responsibilities of technical experts in an audit.</li> <li>3. Knowledge of the definition of audit objectives, audit scope and audit criteria.</li> <li>4. Knowledge of the difference between the AQMS scope and the audit scope.</li> <li>5. Knowledge of the elements to review during the feasibility study of an audit.</li> <li>6. Knowledge of the cultural aspects to consider in an audit.</li> <li>7. Knowledge of the characteristics of audit terms of engagement and the best practices to establish a first contact with an auditee.</li> <li>8. Knowledge of the preparation of an audit plan.</li> <li>9. Knowledge of determining the time the audit should last by the number of employees for auditing AS9100</li> <li>10. Knowledge of the preparation and development of audit working papers.</li> <li>11. Knowledge of the advantages and disadvantages of using audit checklists.</li> <li>12. Knowledge of the best practices for the creation of audit test plans.</li> </ol>

## Domain 5: Conducting an AS9100 audit

**Main objective:** Ensure that the AS9100 Lead Auditor candidate can efficiently conduct an AQMS audit in the context of AS9100.

Competencies	Knowledge statements
<ol style="list-style-type: none"> <li>1. Ability to organize and conduct the opening meeting in the context of a specific AS9100 audit mission.</li> <li>2. Ability to conduct a stage 1 audit in the context of a specific AS9100 audit mission and taking into account the documentation review conditions and criteria.</li> <li>3. Ability to conduct a stage 2 audit in the context of a specific AS9100 audit mission by applying the best practices of communication to collect the appropriate evidence and taking into account the roles and responsibilities of all people involved.</li> <li>4. Ability to explain, illustrate and apply statistical techniques and main audit sampling methods.</li> <li>5. Ability to objectively gather appropriate evidence from the available information during an audit and evaluate it objectively.</li> <li>6. Ability of preparing, opening, conducting and closing an Interview.</li> </ol>	<ol style="list-style-type: none"> <li>1. Knowledge of the objectives and the content of the opening meeting of an audit.</li> <li>2. Knowledge of the difference between stage 1 audit and stage 2 audit.</li> <li>3. Knowledge of stage 1 audit requirements, steps and activities.</li> <li>4. Knowledge of the documentation review criteria.</li> <li>5. Knowledge of the documentation requirements stated in AS9100.</li> <li>6. Knowledge of stage 2 audit requirements, steps and activities.</li> <li>7. Knowledge of the best practices of communication during an audit.</li> <li>8. Knowledge of the roles and responsibilities of guides and observers during an audit.</li> <li>9. Knowledge of the conflict resolution techniques.</li> <li>10. Knowledge of evidence collection procedures: observation, documentation review, interviews, analysis and technical verification.</li> <li>11. Knowledge of evidence analysis procedures: corroboration and evaluation.</li> <li>12. Knowledge of the main concepts, principles and statistical techniques used in an audit.</li> <li>13. Knowledge of the main audit sampling methods and their characteristics.</li> <li>14. Knowledge of preparing interview questions, checklist, closing an interview and evaluation of the intervention.</li> </ol>

## Domain 6: Closing an AS9100 audit

**Main objective:** Ensure that the AS9100 Lead Auditor candidate can conclude an AQMS audit and conduct follow-up activities in the context of AS9100.

Competencies	Knowledge statements
<ol style="list-style-type: none"> <li>1. Ability to explain and apply the evaluation process of evidences to draft audit findings and prepare audit conclusions.</li> <li>2. Ability to understand, explain and illustrate the different levels of conformity and the concept of the benefit of the doubt.</li> <li>3. Ability to report appropriate audit observations in order to help an organization improve an AQMS with respect to audit rules and principles.</li> <li>4. Ability to complete audit working documents and conduct a quality review of an AS9100 audit.</li> <li>5. Ability to draft audit conclusions and present these to the management of the audited organization.</li> <li>6. Ability to organize and conduct an audit closing meeting.</li> <li>7. Ability to write an AS9100 audit report and justify a certification recommendation.</li> <li>8. Ability to conduct the activities following an initial audit including the evaluation of action plans, follow-up audits, surveillance audits and recertification audits.</li> </ol>	<ol style="list-style-type: none"> <li>1. Knowledge of the evaluation process of evidences to draft audit findings and prepare audit conclusions.</li> <li>2. Knowledge of the differences and the characteristics between the concepts of conformity, minor nonconformity, major nonconformity, anomaly and observation.</li> <li>3. Knowledge of the guidelines and best practices to write nonconformity reports.</li> <li>4. Knowledge of the guidelines and best practices to draft and report audit observations.</li> <li>5. Knowledge of the principle of the benefit of the doubt and its application in the context of an audit.</li> <li>6. Knowledge of the guidelines and best practices to complete audit working documents and perform a quality review of an audit.</li> <li>7. Knowledge of the guidelines and best practices to present audit findings and conclusions to the management of an audited organization.</li> <li>8. Knowledge of the possible recommendations that an auditor can issue in the context of a certification audit and the certification decision process.</li> <li>9. Knowledge of the guidelines and best practices to evaluate action plans.</li> <li>10. Knowledge of follow-up audits, surveillance audits and recertification audit requirements, steps and activities.</li> <li>11. Knowledge of the conditions for modification, extension, suspension or withdrawal of a certification for an organization.</li> </ol>

## Domain 7: Managing an AS9100 audit program

**Main objective:** Ensure that the AS9100 Lead Auditor understands how to establish and manage an AQMS audit program.

Competencies	Knowledge statements
<ol style="list-style-type: none"> <li>1. Ability to understand and explain the establishment of an audit program and the application of the PDCA model.</li> <li>2. Ability to understand and explain the implementation of an AS9100 audit program (first party, second party and third party).</li> <li>3. Ability to understand and explain the responsibilities to protect the integrity, availability and confidentiality of audit records.</li> <li>4. Ability to understand the requirements related to the components of the management system of an audit program as aerospace quality management, record management, and complaint management.</li> <li>5. Ability to understand the evaluation of the efficiency of the audit program by monitoring the performance of each auditor, each team and the entire certification body.</li> <li>6. Ability to demonstrate the application of the personal attributes and behaviors associated with professional auditors.</li> </ol>	<ol style="list-style-type: none"> <li>1. Knowledge of the application of the PDCA model in the management of an audit program.</li> <li>2. Knowledge of the requirements, guidelines and best practices regarding audit resources, procedures and policies.</li> <li>3. Knowledge of the types of tools used by professional auditors.</li> <li>4. Knowledge of the requirements, guidelines and best practices regarding the management of audit records.</li> <li>5. Knowledge of the application of the concept of continual improvement to the management of an audit program.</li> <li>6. Knowledge of the particularities to implement and manage a first, second or third party audit program.</li> <li>7. Knowledge of the concept of competency and its application to auditors.</li> <li>8. Knowledge of the personal attributes and behavior of a professional auditor.</li> </ol>

Based on these 7 domains and their relevance, 12 questions are included in the exam, as summarized in the following table:

				Level of Understanding (Cognitive/Taxonomy) Required					
		Points per Question	Questions that measure Comprehension, Application and Analysis	Questions that measure Synthesis and Evaluation	Number of Questions per competen cy domain	% of test devoted to each competency domain	Number of Points per competency domain	% of Points per competency domain	
Competency Domains	Fundamental principles and concepts of an Aerospace Quality Management System (AQMS)	5	X		1	8.33	5	6.67	
	Aerospace Quality Management System (AQMS)	5	X		2	16.67	10	13.34	
		5	X						
	Fundamental audit concepts and principles	5	X		1	8.33	5	6.67	
	Preparation for an AS9100 audit	5	X		1	8.33	5	6.67	
	Conducting an AS9100 audit	10		X	4	33.32	30	40.00	
		5		X					
		5		X					
		10		X					
	Closing an AS9100 Audit	5		X	2	16.67	15	20.00	
		10		X					
	Managing an AS9100 audit program	5		X	1	8.33	5	6.67	
Total points		75							
Number of Questions per level of understanding			5	7					
% of Test Devoted to each level of understanding (cognitive/taxonomy)			41.67	58.33					

The passing score is established at **70%**.

After successfully passing the exam, candidates will be able to apply for the “PECB Certified AS9100 Lead Auditor”, depending on their level of experience.

## TAKE A CERTIFICATION EXAM

Candidates will be required to arrive at least thirty (30) minutes before the start of the certification exam. Candidates arriving late will not be given compensatory time for the late arrival and may be denied entry to the exam.

All candidates are required to present a valid identity card such as a national ID card, driver's license, or passport to the invigilator.

The exam duration is three (3) hours. Non-native speakers receive an additional thirty (30) minutes.

**The exam contains essay type questions:** This type of format was selected as a means of determining whether an examinee can clearly answer training related questions, by assessing problem solving techniques and formulating arguments supported with reasoning and evidence.

The exam is set to be "open book", and does not measure the recall of data or information. The examination evaluates the candidates' comprehension, application and analyzing skills. Therefore, candidates will have to justify their answers by providing concrete explanations as to demonstrate that they have been capable of understanding the training concepts. At the end of this document, you will find samples of exam questions and potential answers.

As the exam is "open book"; candidates are authorized to use:

- A copy of the AS9100 standard,
- Course notes from the Participant Handout,
- Any personal notes made by the student during the course, and
- A hard copy dictionary.

### **The use of electronic devices, such as laptops, cell phones, etc., is not allowed.**

All attempts to copy, collude or otherwise cheat during the exam will automatically lead to the failure of the exam.

PECB exams are available in English. For availability of the exam in a language other than English, please contact [examination@pecb.com](mailto:examination@pecb.com).

## RECEIVE YOUR EXAM RESULTS

Results will be communicated by email within a period of 6 to 8 weeks from your examination date. The candidate will be provided with only two possible examination results: pass or fail, rather than an exact grade.

Candidates who successfully complete the examination will be able to apply for a certified scheme.

In case of a failure, the results will be accompanied with the list of domains where the candidate failed to fully answer the question. This can help the candidate better prepare for a retake exam.

Candidates who disagree with the exam results may file a complaint by writing to [examination@pecb.com](mailto:examination@pecb.com). For more information, please refer to [www.pecb.com](http://www.pecb.com).

## EXAM RETAKE POLICY

There is no limit on the number of times a candidate may retake an exam. However, there are some limitations in terms of the allowed time-frame in between exam retakes, such as:

- If a candidate does not pass the exam on the first attempt, he/she must wait 15 days for the next attempt (1<sup>st</sup> retake). Retake fee applies.

**Note:** *Students, who have completed the full training but failed the written exam, are eligible to retake the exam once for free within a 12 month period from the initial date of the exam.*

- If a candidate does not pass the exam on the second attempt, he/she must wait 3 months (from the initial date of the exam) for the next attempt (2<sup>nd</sup> retake). Retake fee applies.
- If a candidate does not pass the exam on the third attempt, he/she must wait 6 months (from the initial date of the exam) for the next attempt (3<sup>rd</sup> retake). Retake fee applies.

After the fourth attempt, a waiting period of 12 months from the last session date is required in order for the candidate to retake the same exam. Regular fee applies.

For the candidates that fail the exam in the 2<sup>nd</sup> retake, PECB recommends to attend an official training in order to be better prepared for the exam.

To arrange exam retakes (date, time, place, costs), the candidate needs to contact the PECB partner who has initially organized the session.

**CLOSING FILES**

If an applicant does not apply for his/her certificate within three years, their case will be closed. Even though an applicant's certification period expires they have the right to reopen their case, however, PECB will no longer be responsible for any changes regarding the conditions, standards, policies, candidate handbook or exam preparation guide that were applicable before the applicant's case was closed. Applicants requesting their case to reopen must do so in writing, and pay the required fees.

**EXAMINATION SECURITY**

A significant component of a successful and respected professional certification credential is maintaining the security and confidentiality of the examination. PECB relies upon the ethical behavior of certificate holders and applicants to maintain the security and confidentiality of PECB examinations. When someone who holds PECB credentials reveals information about PECB examination content, he/she violates the PECB Code of Ethics. PECB will take action against individuals who violate PECB Policies and the Code of Ethics. Actions taken may include permanently barring individuals from pursuing PECB credentials and revoking certifications from those who have been awarded the credential. PECB will also pursue legal action against individuals or organizations who infringe upon its copyrights, proprietary rights, and intellectual property.

## **SAMPLE EXAM QUESTIONS AND POSSIBLE ANSWERS**

### **Question 1:**

For each of the following clauses of AS9100, please provide at least two different evidences that would be acceptable to ensure conformity to the clause.

#### **Clause 8.2.4 Changes to Requirements for Products and Services**

##### **Possible answers:**

- Documented information of the changed requirements for products and services
- Documented information of the relevant persons made aware of such changes

### **Question 2:**

Clause 9.2 of AS9100 indicates that the organization must conduct internal Aerospace Quality Management System (AQMS) audits at planned intervals. The audit criteria, scope, frequency and methods should also be defined. Please give at least five reasons to justify the importance of setting up an internal audit programme for the AQMS? Moreover, discuss the role of the internal auditor in an organization.

##### **Possible answer:**

Setting up internal audits at planned intervals is crucial for organizations due to several reasons:

- Maintain conformity with policies, procedures and requirements of the AQMS,
- Take into consideration both the effectiveness and efficiency of the AQMS,
- Support the fulfillment of objectives and targets of aerospace quality,
- Provide an advisory role for continual improvement within the organization and its AQMS,
- Improve the aerospace quality performance,
- Assist the organization to get prepared for external audits.

The role of the internal auditor in an organization is to establish audit processes and procedures, with the intention of ensuring compliance with regulatory, contractual and law requirements, and requirements of the AQMS. Provide advice to continually improve the AQMS while providing reliability and integrity of information necessary for the organization's operations. Besides, improve the effectiveness and efficiency of the organization's operations and the aerospace quality performance. Finally, the internal auditor provides assistance to preparation for external audits that will be conducted.

**Question 3:**

You have received a corrective action plan for review. Please evaluate the effectiveness of the proposed corrective actions. If you agree with these corrective actions, please explain why. If you do not agree with them, please indicate why and propose what would be the adequate corrective action.

Nonconformity 1: The auditor has issued a nonconformity because the production personnel were not aware of the aerospace quality objectives. The production personnel did not make an effort to plan the achievement of the aerospace quality objectives within the production department.

Corrective action plan 1: Inform (Timeframe: immediately) the production personnel on the aerospace quality objectives and their significance in enhancing customer satisfaction. Inform the related actual or potential impact associated with their work, then train them and require that each member of the team shows their contribution to the effectiveness of the aerospace quality management system.

**Possible answer:**

*I agree with the proposed corrective action. This solves the issue of lacking communication of the aerospace quality objectives. As an auditor, a sampling will be performed during the surveillance audit to find out if the procedure is followed.*