Requirements for Quality Engineering Personnel

- Quality Engineering Professional (QEP)

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Foreword

The European Organization for Quality EOQ, established 1956, is an association under Belgian law of now 58 organizations: National Representatives (European, non-profit quality organizations) and Associated Members, Affiliated Members and Partners worldwide.

The major goal of EOQ is to promote quality in the widest sense.

EOQ National Representatives (Full Member Organizations) are:
AEC (Spain), **AFQP** (France), **APQ** (Portugal), **ARC** (Romania), **CQI (**UK), **CSQ** (Czech Republic), **CYAQ** (Cyprus), **DGQ** (Germany), **EAQ** (Estonia), **HNC** (Hungary), **KOQIM** (Kazakhstan), **Quality Kosova** (Kosovo), **Finish Association for Quality** (Finland), **QRN** (Norway), **NNK** (Netherlands), **QA** (Austria), **RFATRM** (Russia), **SAQ** (Switzerland), **SFK** (Sweden), **SRMEK** (Serbia), **SSK** (Slovakia), **SZKO** (Slovenia), **TSE** (Turkey), **VCK** (Belgium)

The EOQ Competence Center has maintained a Harmonized Personnel Registration Scheme since the 80-ies of the last century. Parts of this scheme were and are competence requirements for quality professionals but also for professionals from other fields like environmental management.

This Competence Specification (CoS) describes the areas of knowledge and the competence requirements for the professional profiles of Quality Engineering Professional to be effective in their profession.

The CoS is defined and enhanced by the European Organization for Quality (EOQ) based on decades of experience certifying Quality Management professionals. The job profiles and competence requirements have been updated based on a broad analysis of actual needs in the field of Quality Engineering related professions including the positions of interested parties.

This document is intended to be a normative reference in conjunction with certification schemes but may also be used for other purposes by interested parties.

When used as part of a certification scheme, these requirements will be the basis for developing examinations.

This document has been developed under consideration of EOQ internal rules. This Competence Specification has been prepared by the EOQ Technical Working Group and was submitted as Draft for public comment according to the EOQ Rules for Normative Documents.

The Competence Specification has been approved and released for publication by the EOQ General Assembly on 24.06.2022. Queries regarding technical content can be addressed to the EOQ Technical Working Group. Please direct your queries to: eoq@eoq.org

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1 Introduction

The certification of Quality Management Personnel has a long tradition in Europe and worldwide. Recently a demand for a harmonized training and certification based on requirements concerning competent personnel related to functions in design and quality has emerged.

In Europe the EOQ developed harmonized schemes for Quality Management personnel with broad acceptance.

In the meantime, several different approaches and competence-profiles have been developed by many organizations. For personnel certification bodies and national accreditation bodies using ISO/IEC 17024 there is a need for common European criteria as a basis for accreditation and certification of persons.

These EOQ certification schemes have been developed by experts of the national agents of EOQ and can be used in accreditation processes of personnel certification bodies. These schemes have been developed on order of and issued by majority vote through the EOQ Competence Center, as the responsible scheme committee.

This edition of CoS QEP was developed to fulfil the needs of the market and the interested parties regarding the competence of quality engineering personnel.

To comply with certification scheme requirements of ISO/IEC 17024:2012 and 17007:2021 the content for the certification scheme was divided into two parts:

- CS QEP defines the requirements concerning the certification process.
- Corresponding CoS QEP defines the knowledge and competence requirements

The main content of this Competence Specification is dealing with the following aspects:

- Definition of job profiles and task descriptions for Quality engineering personnel
- Definition of competence requirements

This Competence Specification is intended to serve amongst others as normative document for the use of training, the definition of competence profiles for quality engineering personnel e.g. in job description and as accreditation basis for personnel certification organizations.

2 Scope and Application

The scope of this Competence Specification is to define the specific competence criteria for

- Quality Engineering Professional (QEP)

within the countries with National Representative Organizations of EOQ. This does not exclude the usage of these criteria in other countries.

ISO/IEC 17024 applies when using this CoS for personnel certification purposes.

Claims of conformity to this Competence Specification shall not refer to the terms

- Quality Engineering Professional (QEP)

unless the certification procedures comply with the management system documentation and the specific Certification Scheme of the EOQ Competence Center.

3 Terms and definitions

- Certification: third party attestation related to products, processes, systems or persons
- Competence: ability to apply knowledge and skills to achieve intended results
- Qualification: demonstrated education, training and work experience were applicable

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3.1 References

(1) The ISO 9000 family of International Standards
(2) ISO 19011
(3) ISO/IEC 17024
(4) ISO/IEC 17007:2021
(5) Set of EOQ Personnel Registration Unit documents, specific to this scheme.
(6) IEC 60300
(7) IEC 60812
(8) ISO 2859

All Documents in their valid version.

4 Job Profiles and Task Description

EOQ Quality Engineering Professional have the knowledge and skills needed for quality control and evaluation to assure the conformity of products / services and to support the implementation of quality management system, on the basis of normative requirements (ISO 9000 series with interfaces to other rules and standards as well as legal requirements.
Through the application of suitable methods including the application of statistics, and the ability to use the appropriate Statistical Software tools, they are able to analyse, evaluate and present quality-related data as well as to make them available for decisions.

5 Competence Requirements

5.1 Personal behaviour and mind set

They should be able to
• take decisions
• think and act holistically
• work in a results-oriented manner
• recognize and communicate the significance and value of facts
• motivate, persuade
• communicate appropriately, focusing on the target group
• communicate using suitable language
• act appropriately according to the situation
• deal appropriately with conflict
• give feedback
• lead and also be a team player
The mind set and philosophy are geared towards the following:
• Value to the organization (e.g. taking into account cost/benefit relevance of own actions)
• Consideration of customer satisfaction
• Opportunities and risks for the organization (e.g. expose and reduce risks; promote innovation and best practice)
• Continuous improvement (e.g. stimulating and promoting CIP)
• Promotion and support of learning processes and know-how transfer
• Monitoring of changes
• Thinking in terms of overall context, Business processes and process chains
• Application of the PDCA principle
• Promotion of commitment
• Exemplary personal conduct

5.2 Quality Engineering Professional – Knowledge and Skills

Quality Engineering Professional (QEP)shall have generic knowledge and skills on a level which can be usually achieved by a university / higher education degree and appropriate professional experience (e.g. minimum full-time work-place experience of 4 years, including at least 2 years in the field of quality assurance, engineering and management).

Quality Engineering Professional (QEP) is a professional who is familiar with the principles of process, product and service quality evaluation, assurance, and control.

This understanding, knowledge, applied technologies and techniques should include:

- Quality definitions, quality philosophies, standards, and approaches,

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- application and analysis of testing and inspection procedures, including Non-destructive and destructive testing, measurement tools and metrology basics,
- understanding drawings, dimensioning and tolerance, and production readiness,
- ability to use basic and advanced statistical methods and statistical software tools, including Design of Experiments,
- diagnose and correct improper quality control practices,
- understanding of human factors and motivation,
- fluency with quality cost concepts and techniques,
- understanding reliability, availability, maintainability, safety, and risk management
- knowledge and ability to develop and administer management/quality information systems,
- familiarity with audit of quality systems for deficiency identification and correction,
- shall be able to judge quality systems, related to standards and normative documents and to apply relevant quality engineering techniques, development and operation of quality control systems,

This includes knowledge and skills as defined in the following table related to the relevant tasks:

Learning taxonomy
A recognize (have an overview of)
B understand
C apply
D analyse results and evaluate them

Task descriptions for Quality Engineering Professional	**Related knowledge and skills**	**Learning taxonomy**
(a) Recognize quality concept, history, philosophies, principles, quality standards and systems, organizational dynamics, professional ethics, management and leadership, improvement theory and practice.	Introducing quality movement history, understanding modern quality approach, quality control and quality assurance up to total quality management and leadership principles (including Deming's fourteen points and seven deadly diseases of management).	A
	Recognize national and international standards and other requirements and guidelines, including the MBNQA and EFQM. Recognize the objectives, scope, approach, structure and differences of the ISO standards.	A
(b) Apply quality engineering (QE) Rules, Methods and Tools.	Implement product and process control methods including control plan development, critical control point identification, and work instruction development and validation.	D
	Be capable to perform material identification, status, and traceability, define and distinguish between the concepts their application. Define material segregation and its importance and evaluate appropriate application methods and cases.	C
	Classify product and process defects and nonconformities. Describe the purpose and function of Material review board (MRB) and methods of evaluation nonconforming products and materials.	B
	Be able to establish the acceptance sampling in accordance with contemporary standards and practice.	D

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Task descriptions for Quality Engineering Professional	Related knowledge and skills	Learning taxonomy
	Interpret the concepts of producer and consumer risk and related terms, including operating characteristic (OC) curves, acceptable quality limit (AQL), limited quality (LQ)/lot tolerance percent defective (LTPD), average outgoing quality (AOQ), and average outgoing quality limit (AOQL). Identify, interpret, and apply acceptance sampling procedures as per ISO 28598, ISO 3951, ISO 2859, ISO/TR 18532	
	Identify and distinguish between single, double, multiple, sequential, and continuous sampling methods. Identify the characteristics of Dodge-Romig sampling tables and when they should be used.	D
	Be able to select and describe appropriate uses of inspection and measurement tools, including gage blocks, callipers, micrometres, and optical comparators. Identify when destructive and non-destructive measurement test methods and their application.	C
	Apply metrology techniques such as calibration, traceability to calibration standards, measurement error, control and maintenance of measurement standards and tools. Be capable to perform Measurement System Analysis (MSA), to calculate, analyze, and interpret gage repeatability and reproducibility (gage R&R) studies, measurement correlation, capability, linearity, precision, stability and accuracy, and related MSA quantitative and graphical methods.	D
(c) Analyse quality-related data arising from monitoring and measurement, assess facts, consolidate and present (and also report) them, in order to facilitate assessment and evaluation of the Product, Service and Process, Quality System and Business results.	Be able to apply the principles of collecting data methods, including tally or check sheets, data coding, automatic gaging, and identify the strengths and weaknesses of the methods data analysis; Selection of data, extraction of data, data handling, and presentation of data (distributions, trends, charts, histograms, diagrams etc.)	D
	Be competent in Descriptive statistics, be experienced in describe, calculate, and interpret measures of central tendency and dispersion, and construct and interpret frequency distributions, density and cumulative, including simple, categorical, grouped, ungrouped, for variables and attributes. Be able to select, produce and interpret graphical presentation methods for statistical data (diagrams, charts)	C
(d) Recognize and understand the conformity, effectiveness, efficiency, and sustainability of the quality management system	Describe the features and properties of Quality Management System (QMS), Strategic planning, Deployment techniques, Stakeholder, Performance, and the Quality Information System (QIS).	A
	Understand various deployment tools in support of the QMS such as benchmarking, stakeholder identification and analysis, Performance management and	B

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Task descriptions for Quality Engineering Professional	Related knowledge and skills	Learning taxonomy
	improvement tools, project management, including seven classical tools (the Magnificent Seven: Flowchart, Pareto chart, Cause and effect diagram, Control chart, Check sheets, Scatter diagrams, Histograms), New Seven (Affinity diagram, Force field analysis, Tree diagram, Process decision program chart (PDPC), Matrix diagram, Prioritization matrices, Interrelationship digraph), as well as Activity network diagrams, PERT charts, Gantt charts, critical path method (CPM), resource allocation, cost estimation and control.	
	Recognize the basic elements of a QMS, mainly as per Juran Trilogy (planning, control, and improvement) from product and process design through quality cost systems and audit programs. Identify and describe quality system documentation components, including quality policies and procedures to support the system. Recognize configuration management, maintenance, and document control to manage work instructions and quality records. Recognize Cost of Quality (COQ) concepts, including cost categorization, data collection, reporting, and interpreting results.	A
(e) Process adherence and performance (e.g., time aspects, defect rates, etc.)	Be able to define criteria and methods for an effective operation and control of processes (including measurement and performance indicators) Evaluate process performance and opportunities for improvement of processes. Understand the objectives and benefits of Statistical Process Control (SPC). Describe, identify, and distinguish between Common and Special causes. Be able to identify and select characteristics for monitoring by control chart. Define and apply the principles of rational subgrouping. Identify, define, select, create, apply and be able to read and interpret various control charts, including pre-control charts and charts for variables [X-R, X-s, individuals and moving range (ImR or XmR), moving average and moving range (MamR)], and attributes (p, np, c, and u), short-run SPC	D
	Be able to perform control chart analysis and apply rules for determining statistical control, process capability studies, identify characteristics, specifications and tolerances, develop sampling plans for such studies, and establish statistical control. Define, select, and calculate Cp, Cpk, Cpm, and Cr, and evaluate process capability - performance vs. specifications. Distinguish between a process and a specification limit, and calculate process capability indices, percent defective, defects per million opportunities (DPMO), and	D

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Task descriptions for Quality Engineering Professional	Related knowledge and skills	Learning taxonomy
	parts per million (PPM). Be able to evaluate the process performance indices, mainly Pp and Ppk, and evaluate process performance.	
(f) Conformity of products and services to requirements and expectations - during the whole life cycle (design, production, testing, Operation & Maintenance, Phase off)	Translate design inputs such as customer needs, regulatory requirements, and risk assessment into robust design using techniques such as failure mode and effects analysis (FMEA), quality function deployment (QFD), Design for X (DFX), and Design for Six Sigma (DFSS).	C
	Define, interpret, and classify quality characteristics for new and existing products, processes, and services. Interpret specification requirements in relation to product and technical drawings, including characteristics such as views, title blocks, dimensioning and tolerancing, then process characteristics	C
	Identify and apply Verification and Validation procedures, including design review process, with roles and responsibilities of participants, as well as the field qualification as the validation of the design of products. Interpret the results of evaluations and tests used to verify and validate the design of products, processes, and services.	D
	Be able to apply, review and analyse the Reliability and Maintainability requirements, including indices such as MTTF, MTBF, MTTR, availability, hazard and failure rate. Be capable to identify and define the basic elements of reliability models such as bathtub curve, normal, exponential, Weibull distributions application. Be capable to apply the Reliability/Safety/Hazard Assessment Tools, such as the failure mode and effects analysis (FMEA), Risk priority Number (RPN) approach, failure mode, effects, and criticality analysis (FMECA), and fault tree analysis (FTA).	D
(g) Improvement opportunities and methodologies	Define, describe, and apply the following continuous improvement methodologies: Plan-do-check-act (PDCA), Kaizen, Six Sigma, Theory of constraints (ToC), Theory of Inventive Problem Solving (TRIZ), as well as the following lean tools:5S, Value stream mapping, Kanban, Visual control, Waste (Muda) Elimination, Standardized work, Takt time, Single minute exchange of die (SMED).	C
(h) Apply quantitative methods and tools	Define and apply quantitative terms, including population, parameter, sample, statistic, random sampling, and expected value. Distinguish between numeric and analytical studies. Assess the validity of statistical conclusions by analyzing the assumptions used and the robustness of the technique used. Describe concepts such as independence, mutually exclusive, multiplication rules, complementary probability, and joint occurrence of events. Define and distinguish between different continuous distributions such as normal, uniform, bivariate normal,	D

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Task descriptions for Quality Engineering Professional	Related knowledge and skills	Learning taxonomy
	exponential, lognormal, Weibull, chi square, Student's t and F. Define and distinguish between Discrete distributions such as binomial, Poisson, hypergeometric, and multinomial.	
	Be familiar with the Statistical Decision Making Define, describe, and assess the efficiency and bias of estimators. Calculate and interpret standard error, tolerance intervals, and confidence intervals. Define, interpret, and apply hypothesis tests for means, variances, and proportions. Apply and interpret the concepts of significance level, power, and type I and type II errors. Define and distinguish between statistical and practical significance. Define and use paired comparison (parametric) hypothesis tests and interpret the results. Define chi square and other goodness-of-fit tests and understand the results.	C
	Define and use ANOVAs and interpret the results. Define and use contingency tables to evaluate statistical significance. Calculate and use the regression equation for simple regressions and least squares estimate. Construct and interpret hypothesis tests for regression statistics Calculate the correlation coefficient and its confidence interval, and construct and interpret a hypothesis test for correlation statistics. Define, describe, and use time-series analysis, including moving average to identify trends and seasonal or cyclical variation.	C
	Design and Analysis of Experiments (DOE) Planning and organizing experiments. Identify the basic elements of designed experiments, including determining the experiment objective, selecting factors, responses, and measurement methods, and choosing the appropriate design. Define and apply the principles of power and sample size, balance, replication, order, efficiency, randomization, blocking, interaction, and confounding. Construct one-factor experiments such as completely randomized, randomized block, and Latin square designs, full-factorial designs, and two-level fractional factorial designs, and use computational and graphical methods to analyze the significance of results.	C

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Task descriptions for Quality Engineering Professional	Related knowledge and skills	Learning taxonomy
(i) Address risks and opportunities	Understand identification, planning, prioritization, and oversight of risk. Understand and interpret risk mitigation plan. Understand categorization methods and evaluation tools to assess risk Understand, identify and document risks, gaps, and controls.	B
(j) Be an internal QE service provider / consultant for all levels of the company	Be able to explain complex issues appropriately to different target groups. Be able to organise persons in teams, projects and programmes. Describe the facilitator's roles and responsibilities on a team. Apply various tools used with teams, including brainstorming, nominal group technique, conflict resolution, and force-field analysis. Identify specific communication methods that are used for delivering information and messages in a variety of situations across all levels of the organization. Apply moderation techniques in group meetings Recognize group-dynamic processes and resolve conflicts and be able to moderate them. Coordinate and lead quality management activities within the organization	C
(k) Be able to act as internal trainer/instructor for QE topics and tools relevant to company Quality System	Be able to provide trainings, promote and advice topics to different target groups Know techniques for analysing training needs. Organize and evaluate training Identify and apply key elements of a training program, including conducting a needs analysis, developing curricula and materials, and determining the program's effectiveness.	C

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6 Basic Requirements related to Quality Engineering Professional (QEP) profile

Generic knowledge and skills	Generic knowledge and skills on a level which can be usually achieved by a **university/ higher education** degree
Specific knowledge and skills	shall be achieved through: • specific **training programme** in Quality Engineering content of the training programme: the learning targets and objectives shall refer to the 'Quality Engineering Professional' specific knowledge and skills defined in section 5 duration and methods: At least 200 hours (per 45 min.) classroom-based or distant training. Alternative learning forms (e.g. self-study, eLearning) may be defined in the training program, if suitable to the learning objectives. Alternative learning forms may be applied when the following conditions are fulfilled: The learning form is suitable to the learning objectives. Any learning form has to be specified in a training plan by the training institution. The fulfilment of the training plan has to be documented by the training institution. and • **workplace experience** in the specific field of quality management/quality engineering (two years is considered as sufficient). • Generic work skills in a professional or technical position involving the exercise of judgement, problem solving and communication with other managerial or professional personnel, peers, customers and/or interested parties and managing a group of people in a job situation at a level which can be awaited after minimum five years of work experience. • Mind set and personal behaviour shall be geared to the approach defined in chapter 5.1 and be demonstrated by signing the **EOQ Code of Professional Conduct**.

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