INTERNATIONAL STANDARD

ISO 9712

Fifth edition
2021-12

Non-destructive testing — Qualification and certification of NDT personnel

Essais non destructifs — Qualification et certification du personnel END

Reference number
ISO 9712:2021(E)

ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Email: copyright@iso.org
Website: www.iso.org

Published in Switzerland

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 135, *Non-destructive testing*, Subcommittee SC 7, *Personnel qualification,* in collaboration with the European Committee for Standardization (CEN) Technical Committee CEN/TC 138, *Non-destructive testing,* in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

This fifth edition cancels and replaces the fourth edition (ISO 9712:2012), which has been technically revised.

The main changes compared to the previous edition are as follows:

— clarified responsibilities for the certification body, the authorized qualification body, the examination centre and the employer;

— added and revised definitions;

— defined responsibilities for examiners and referees;

— revised requirements for the duration of training and industrial experience;

— modified requirements for visual acuity testing;

— revised requirements for examinations;

— included an option for the use of a psychometric process at the discretion of the certification body;

— revised requirements for the certification documents;

— revised requirements for the conditions of certification;

— added requirements for candidates for the renewal of certificates;

— revised structured credit system for Level 3 recertification;

— included a new Annex F for techniques;

— included a new Annex G for psychometric principles;

— other minor technical and editorial changes.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

Since the effectiveness of any application of non-destructive testing (NDT) depends upon the capabilities of the persons who perform or are responsible for the test, a procedure has been developed to provide a means of evaluating and documenting the competence of personnel whose duties require the appropriate theoretical and practical knowledge of the non-destructive tests they perform, specify, supervise, monitor or evaluate. An added incentive stems from the worldwide comparability of a wide range of industrial applications requiring common non-destructive testing approaches.

When certification of NDT personnel is required in product standards, regulations, codes or specifications, it is important to certify the personnel in accordance with this document. When latitude is provided in the criteria within this document, the certification body has the final decision in determining specific requirements.

When there is no requirement in legislation, in standard or in the order for certification of NDT personnel, it is for employers of such personnel to decide how to assure themselves that they are competent to do the work assignments. Thus, they may employ people who are already certified or they may apply their own expertise so as to assure themselves that their employee has the necessary competence. In this last case, prudent employers would no doubt use this document as a reference document.

Non-destructive testing — Qualification and certification of NDT personnel

1 Scope

This document specifies requirements for the qualification and certification of personnel who perform industrial non-destructive testing (NDT) in the following methods.

a) acoustic emission testing;

b) eddy current testing;

c) leak testing (hydraulic pressure tests excluded);

d) magnetic testing;

e) penetrant testing;

f) radiographic testing;

g) strain gauge testing;

h) thermographic testing;

i) ultrasonic testing;

j) visual testing (direct unaided visual tests and visual tests carried out during the application of another NDT method are excluded).

The system specified in this document is also applicable to other NDT methods or to NDT techniques within an established NDT method, provided a comprehensive scheme of certification exists and the NDT method or NDT technique is covered by international, regional or national standards or the NDT method or the NDT technique has been demonstrated to be effective to the satisfaction of the certification body.

NOTE 1 The term "industrial" implies the exclusion of applications in the field of medicine.

NOTE 2 CEN/TR 14748 provides guidance on the methodology for qualification of non-destructive tests.

NOTE 3 This document specifies requirements for what are, in effect, third party conformity assessment schemes. These requirements do not directly apply to conformity assessment by second or first parties, but relevant parts of this document can be referred to in such arrangements.

NOTE 4 The term “direct unaided visual testing” implies where there is an uninterrupted optical path from the observer’s eye to the test area and the observer uses no tools or devices (e.g. mirror, endoscope, fibre optic).

NOTE 5 Calculations of strain based on other NDT methods are excluded.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO/IEC 17024:2012, *Conformity assessment — General requirements for bodies operating certification of persons*

ISO 18490:2015, *Non-destructive testing — Evaluation of vision acuity of NDT personnel*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at https://www.electropedia.org/

3.1
applicant
person who has submitted an application to be admitted into the *certification process* (3.8)

3.2
authorized qualification body
body, independent of the *employer* (3.11), authorized by the *certification body* (3.6) to prepare and administer *examinations* (3.12)

3.3
basic examination element
written *examination* (3.12), at Level 3, which demonstrates the *candidate's* (3.4) knowledge of the materials science and process technology and types of discontinuities, the specific *qualification* (3.33) and certification system, and the basic principles of *NDT methods* (3.25) as required for Level 2

Note 1 to entry: For an explanation of the three levels of qualification, see Clause 6.

Note 2 to entry: The qualification and certification system is specified in this document.

3.4
candidate
applicant (3.1) who has fulfilled specified prerequisites and has been admitted to the *certification process* (3.8)

3.5
certificate
document in the form of a letter, card or other medium (e.g. digital certificate), issued by a *certification body* (3.6) under the provisions of this document, indicating that the named person has fulfilled the *certification requirements* (3.9)

3.6
certification body
body that administers procedures for certification according to specified requirements

3.7
certification cycle
maximum period of time permitted from the date of certification to the date of *recertification* (3.34) inclusive of the *renewal* (3.36) period

3.8
certification process
activities by which a *certification body* (3.6) determines that a person fulfils *certification requirements* (3.9), including application, assessment, decision on certification, *renewal* (3.36), *recertification* (3.34) and use of *certificates* (3.5) and logos/marks

3.9
certification requirements
set of specified requirements, including requirements of the scheme to be fulfilled in order to establish or maintain certification

3.10
competence
ability to apply knowledge and skills to achieve intended results

3.11
employer
legal entity by whom the *candidate* (3.4) is employed

Note 1 to entry: A candidate may be self-employed.

3.12
examination
mechanism that is part of the assessment which measures a *candidate's* (3.4) *competence* (3.10) by one or more means

3.13
examination centre
centre approved by the *certification body* (3.6) where *examinations* (3.12) are carried out

3.14
examination element
component of an *examination* (3.12)

3.15
examiner
person competent to conduct and score an *examination* (3.12), where the examination requires professional judgement

3.16
general examination element
written *examination* (3.12), at Level 1 or Level 2, concerned with the principles of an *NDT method* (3.25)

3.17
higher education
formal learning that occurs after completion of secondary education in the field of engineering or science

3.18
industrial experience
work activities (3.46) performed under *supervision* (3.45), in the *NDT method* (3.25) in the *sector* (3.37) concerned, needed to acquire the skill and knowledge to fulfil the provisions of *qualification* (3.33)

3.19
invigilator
proctor
test administrator
person authorized by the *certification body* (3.6) who supervises an *examination* (3.12), but does not evaluate the *competence* (3.10) of the *candidate* (3.4)

3.20
job-specific training
training, provided by the *employer* (3.11) (or their agent) to the *certificate* (3.5) holder in aspects of non-destructive testing specific to the employer's products, NDT equipment, *NDT procedures* (3.27), and applicable codes, standards, *specifications* (3.40) and procedures, leading to the award of *operating authorizations* (3.30)

3.21
main method examination element
written *examination* (3.12), at Level 3, which demonstrates the *candidate's* (3.4) general and specific knowledge, and the ability to write *NDT procedures* (3.27) for the *NDT method* (3.25) as applied in the industrial or product *sector(s)* (3.37) for which certification is sought

3.22
multiple choice examination question
wording of a question giving rise to potential replies, only one of which is correct, the remaining being incorrect or incomplete

3.23
NDT instruction
written description of the precise steps to be followed in testing to an established standard, code, *specification* (3.40) or *NDT procedure* (3.27)

3.24
NDT media
testing products used to create visible indications caused by imperfections or flaws

EXAMPLE Magnetic powder, contrast aid paints, colour contrast penetrant, developer.

3.25
NDT method
discipline applying a physical principle in non-destructive testing

EXAMPLE Ultrasonic testing.

3.26
NDT personnel
personnel who perform non-destructive testing

3.27
NDT procedure
written description of all essential parameters and precautions to be applied when non-destructively testing products in accordance with standard(s), code(s) or *specification(s)* (3.40)

3.28
NDT technique
specific way of utilizing an *NDT method* (3.25)

3.29
NDT training
process of instruction in theory and practice in the *NDT method* (3.25) in which certification is sought, which takes the form of training courses to a syllabus approved by the *certification body* (3.6)

3.30
operating authorization
written statement issued by the *employer* (3.11), based upon the scope of certification, authorizing the individual to carry out specified tasks

Note 1 to entry: Such authorization can be dependent on the provision of *job-specific training* (3.20).

3.31
practical examination element
assessment of practical skills, in which the *candidate* (3.4) demonstrates familiarity with, and the ability to perform, the test

3.32
psychometric process
statistical process to verify *examinations* (3.12) are fair, reliable and discriminate between a competent and non-competent individual

3.33
qualification
demonstrated education, training, and work experience

3.34
recertification
process for revalidation of a *certificate* (3.5) by *examination* (3.12) or by otherwise satisfying the *certification body* (3.6) that the published criteria for recertification have been met

3.35
referee
individual that attests the validity of the *candidate's* (3.4) *industrial experience* (3.18)

3.36
renewal
process for revalidation of a certification at any time up to five years after success in an initial, supplementary or *recertification* (3.34) *examination* (3.12)

3.37
sector
section of industry or technology where specialized NDT practices are used, requiring specific product-related knowledge, skill, equipment or training

Note 1 to entry: A sector can be interpreted to mean a product (welded products, castings) or an industry (aerospace, in-service testing). See Annex A.

3.38
significant interruption
absence or change of *work activity* (3.46) which prevents the certified individual from practising the duties corresponding to the level in the method and the *sector(s)* (3.37) within the certified scope, for either a continuous period in excess of one year, or two or more periods for a total time exceeding two years

Note 1 to entry: Legal holidays or periods of sickness or training courses of less than 30 days are not taken into account when calculating the interruption.

3.39
specific examination element
written *examination* (3.12), at Level 1 or Level 2, concerned with testing techniques applied in a particular *sector(s)* (3.37), including knowledge of the product(s) tested and of codes, standards, *specifications* (3.40), procedures and acceptance criteria

3.40
specification
document stating requirements

3.41
specimen
sample used in practical *examinations* (3.12), possibly including radiographs and data sets, which is representative of products typically tested in the applicable *sector* (3.37)

Note 1 to entry: A specimen can include more than one area or volume to be tested.

3.42
specimen master report
model answer, indicating the optimum result for a practical *examination* (3.12) given a specified set of conditions (equipment type, settings, technique, *specimen* (3.41), etc.) against which the *candidate's* (3.4) test report is graded

3.43
structured credit system
point system based on the NDT activities of the *candidate* (3.4) used as an alternative to *examination* (3.12) for *renewal* (3.36) or *recertification* (3.34)

3.44
structured experience program
SEP
program approved by the *certification body* (3.6) to reduce *industrial experience* (3.18)

3.45
supervision
act of directing the application of NDT performed by other *NDT personnel* (3.26), which includes the control of actions involved in the preparation of the test, performance of the test and reporting of the results

3.46
work activity
performance of NDT-related functions and tasks

Note 1 to entry: See Clause 6.

4 Abbreviated terms

For the purposes of this document, the abbreviated terms listed in Table 1 are used to identify NDT methods.

Table 1 — Methods and abbreviated terms

NDT method	Abbreviated terms
Acoustic emission testing	AT
Eddy current testing	ET
Leak testing	LT
Magnetic testing	MT
Penetrant testing	PT
Radiographic testing	RT
Strain gauge testing	ST
Thermographic testing	TT
Ultrasonic testing	UT
Visual testing	VT

5 Responsibilities

5.1 General

The certification system, which shall be controlled and administered by a certification body, includes all procedures necessary to demonstrate the qualification and the competence of an individual to carry out tasks in a specific NDT method and product or industrial sector, leading to certification.

5.2 Certification body

5.2.1 The certification body shall fulfil the requirements of ISO/IEC 17024.

5.2.2 The certification body:

a) shall initiate, promote, maintain and administer the certification scheme according to ISO/IEC 17024 and this document;

b) shall be independent of any single interest;