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**Condition monitoring and diagnostics of
machines — Requirements for qualification
and assessment of personnel —**

Part 1:

**Requirements for assessment bodies and
the assessment process**

*Surveillance et diagnostic d'état des machines — Exigences relatives à
la qualification et à l'évaluation du personnel —*

*Partie 1: Exigences relatives aux organismes d'évaluation et au mode
opératoire d'évaluation*



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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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

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.

ISO 18436-1 was prepared by Technical Committee ISO/TC 108, *Mechanical vibration, shock and condition monitoring*, Subcommittee SC 5, *Condition monitoring and diagnostics of machines*.

This second edition cancels and replaces the first edition (ISO 18436-1:2004), which has been technically revised. It also incorporates the Technical Corrigendum ISO 18436-1:2004/Cor. 1:2006.

ISO 18436 consists of the following parts, under the general title *Condition monitoring and diagnostics of machines — Requirements for qualification and assessment of personnel*:

- *Part 1: Requirements for assessment bodies and the assessment process*
- *Part 2: Vibration condition monitoring and diagnostics*
- *Part 3: Requirements for training bodies and the training process*
- *Part 4: Field lubricant analysis*
- *Part 5: Lubricant laboratory technician/analyst*
- *Part 6: Acoustic emission*
- *Part 7: Thermography*

The following part is under preparation:

- *Part 8: Ultrasound*

The following part is planned:

- *Part 9: Condition monitoring specialists*

This corrected version of ISO 18436-1:2012 incorporates a revised text of 7.2.

Introduction

Condition monitoring and diagnostics of machines are integral parts of an effective maintenance programme. Non-intrusive technologies used in condition monitoring and fault diagnosis include vibration, infrared thermography, oil and wear debris analysis, acoustic and ultrasonic analysis, and electric signature analysis. In many instances, these technologies act as complimentary condition monitoring tools. The skills and expertise of the practitioners performing the measurements and analysing the data are critical to the effective application of these technologies.

This part of ISO 18436 defines the requirements for persons and organizations operating assessment systems in the non-intrusive machine condition monitoring and diagnostic technologies that use the technology parts of ISO 18436. General requirements for assessment body personnel are contained in this part of ISO 18436. Specific requirements for the assessment of personnel in condition monitoring and diagnostics are contained in ISO 18436-2 and ISO 18436-4 to ISO 18436-9.

In accordance with ISO/IEC 17000, an assessment body (person or organization) may be a first-party conformity assessment organization issuing a declaration of conformity, a second party issuing an attestation of conformity or it may be a third-party certification body compliant with ISO/IEC 17024 issuing certificates of conformity. This part of ISO 18436 specifies the general provisions for certification bodies; however, where applicable, they should apply to first and second parties.

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Condition monitoring and diagnostics of machines — Requirements for qualification and assessment of personnel —

Part 1: Requirements for assessment bodies and the assessment process

1 Scope

This part of ISO 18436 specifies requirements for persons and organizations (“assessment body”) operating conformity assessment systems for personnel who perform machinery condition monitoring, identify machine faults, and recommend corrective action. Procedures for the conformity assessment of condition monitoring and diagnostic personnel are specified.

NOTE These requirements are in addition to those of ISO/IEC 17000, ISO/IEC 17024, and ISO/IEC 17050-1.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO/IEC 17000:2004, *Conformity assessment — Vocabulary and general principles*

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

ISO/IEC 17050 (all parts), *Conformity assessment — Supplier’s declaration of conformity*

ISO 18436 (all relevant parts), *Condition monitoring and diagnostics of machines — Requirements for qualification and assessment of personnel*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO/IEC 17000, ISO/IEC 17024, ISO/IEC 17050 and the following apply.

3.1

certificate

certificate issued by a certification body in accordance with the conditions of its accreditation and bearing an accreditation symbol or statement

Note 1 to entry: The certificate shall state the relevant part of ISO 18436 dealing with the specific technology concerned

3.2

certification body

organization that meets the requirements of ISO/IEC 17024 for third-party certification bodies and issues a certificate of conformity

3.3

examination centre

centre approved by the certification body where qualification examinations are carried out

[SOURCE: ISO 9712:2012,^[1] 3.8.]

3.4

invigilator

person authorized by the certification body to supervise examinations

[SOURCE: ISO 9712:2012,^[1] 3.12.]

3.5

technical committee for certification

TCC

committee organized by an assigned certification body to direct the technical aspects of certification

3.6

significant interruption

absence or change of activity which prevents the certified individual from practising the duties corresponding to the category in the method and the sector(s) 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 courses of less than 30 days are not taken into account when calculating the interruption.

[SOURCE: ISO 9712:2012,^[1] 3.27, modified.]

3.7

first-party assessment

conformity assessment activity that is performed by the person or organization that provides the condition monitoring personnel and issues a declaration (written attestation) of conformity

[SOURCE: ISO/IEC 17000:2004, 2.2, modified]

3.8

second-party assessment

conformity assessment activity that is performed by a person or organization that has a user interest in the condition monitoring personnel of another organization

[SOURCE: ISO/IEC 17000:2004, 2.3, modified]

3.9

third-party assessment

conformity assessment activity that is performed by an organization which is recognized to assess (evaluate) the competence of personnel and issue a certificate

[SOURCE: ISO/IEC 17000:2004, 2.4, modified]

4 Assessment body

4.1 Charter

The assessment process, which includes all procedures adopted to demonstrate the conformity of individuals with the requirements specified in this International Standard and leads to a written attestation of their qualifications, shall be administered by an assessment body.

4.2 General provisions

Qualifications for recognition shall not be based on limiting conditions, such as undue financial commitment, training by a specific organization, or membership in any specific organization. However, specific training courses involving standard curricula are required for recognition of compliance by an assessment body, which shall have a process to ensure adherence to the curricula.

There shall be no limit to the number of persons certified in any category.

The assessment body shall be responsible for granting, maintaining, renewing, extending, restricting and withdrawing certificates or recognition.

4.3 Requirements

An assessment body shall:

- a) conform to this part of ISO 18436 and to other relevant parts of ISO 18436 (see the complete listing in the Foreword) for personnel involved in the condition monitoring and diagnostics of machines;
- b) have the administrative resources needed to conduct examinations and administer examination centres;
- c) be independent of any commercial interest;
- d) use non-discriminatory policies and procedures in the administration of the certification system;
- e) comply with all applicable national and international laws.

In addition, a certification body shall be in accordance with ISO/IEC 17024:2012, Clauses 5 to 8.

4.4 Responsibilities

An assessment body shall:

- a) initiate, maintain and promote the assessment procedures to demonstrate the qualification of an individual to carry out tasks in machinery condition monitoring and diagnosis, which leads to written attestation of their qualifications;
- b) administer the procedures and operations for conformity assessment in accordance with the requirements of this part of ISO 18436, and a stringent code of ethics (see Annex A), including sanctions, that will apply to certificate holders and recognized persons;
- c) take the ultimate responsibility for the assessment procedures, including technical and administrative requirements;
- d) ensure the adherence to training curricula as specified in the individual technical parts of ISO 18436 (see the complete listing in the Foreword);
- e) approve properly staffed and equipped examination centres, which it shall monitor on a periodic basis;
- f) develop or approve suitable assessment examination questions;
- g) approve the eligibility of candidates for examination;
- h) authorize the time and location of the examination, the examination centre, and the invigilator or examiner for each examination;
- i) prepare and distribute examinations to the examination centre;
- j) receive and evaluate the completed examinations;
- k) notify the examinee of the results of the examination;
- l) issue the certificate or recognition of conformity to successful examinees;
- m) keep appropriate records of the operations of conformity;
- n) provide an overview of the examination results to the examinee upon written request;
- o) develop and implement renewal and recertification procedures and requirements;
- p) monitor all delegated functions.

4.5 Organizational structure of the assessment body

The assessment body shall have an organizational structure, accessible to the public that invites and permits participation by all interested persons.

4.6 Examination centres

4.6.1 General

Examination centres, which can include technical organizations, vendors, companies and independent training organizations, are parties that meet the requirements of 4.6.2 and have the responsibilities of 4.6.3.

4.6.2 Requirements

Examination centres shall be designated by an assessment body and, as a minimum, shall:

- a) work under the direction of the assessment body;
- b) have adequately qualified staff to organize and conduct qualification examinations;
- c) have adequate physical and financial resources to sponsor examinations;
- d) follow the instructions specified in this part of ISO 18436.

4.6.3 Responsibilities

The examination centres shall:

- a) conduct examinations following the prescribed procedures of the assessment body, using authorized examination invigilators (see Annex B);
- b) use only current original examinations provided by the assessment body;
- c) return all original examinations (including unused examinations) to the assessment body;
- d) ensure that the integrity of the examinations is not compromised in any way.

4.7 Technical committees for certification

4.7.1 General

Technical committees for certification (TCCs) are groups assigned by an assessment body that meet the requirements stated in 4.7.2 and have the responsibilities given in 4.7.3.

4.7.2 Requirements

Separate TCCs shall be formed by an assessment body to monitor and direct technical efforts associated with conformity evaluations. The TCCs shall have, as a minimum requirement, membership that is certified to the level of the certification the committee represents, or equivalent competence during a start-up period.

4.7.3 Responsibilities

The TCCs:

- a) shall develop or rework examination questions;
- b) should adhere to the technical areas of proficiency, as defined in the relevant part(s) of ISO 18436 which relate directly to the specific technologies (see the complete listing in the Foreword) for each level of assessment.

5 Requirements for assessment body personnel

5.1 General provisions

In order to ensure that the assessment process is carried out effectively and uniformly, the competence requirements for personnel involved in the entire process shall be defined by the assessment body and, in the case of a third party, be approved by the responsible TCC (in accordance with ISO/IEC 17024).

The assessment body shall require its personnel (internal or external) to sign a contract, or other document, by which they commit themselves to comply with the rules defined by the assessment body, including those relating to confidentiality and those relating to independence from commercial and other interests, and from any prior or present link with the persons to be examined that would, in the opinion of the interested parties, compromise impartiality.

Clearly documented instructions shall be available to the personnel, describing their duties and responsibilities. These instructions shall be maintained up to date. All personnel involved in any aspect of assessment activities shall possess appropriate educational qualifications, experience and technical expertise, which satisfy defined competency criteria for the tasks identified. They shall be trained for their specific responsibilities within the assessment body and shall be made aware of the significance of the certification or recognition offered.

The assessment body shall establish and maintain up-to-date documentation on the qualification, training and experience relevant to the assessment activity of each individual. This information shall be accessible to the individual(s) concerned and shall include the following:

- a) name and address;
- b) organization affiliation and position held;
- c) educational qualifications and professional status;
- d) experience and training in each field of the assessment body's competence;
- e) their specific responsibilities and obligations within the assessment body;
- f) performance appraisals;
- g) date of most recent updating of records.

5.2 Additional criteria for examiners

Examiners shall meet the requirements of the assessment body, based upon applicable standards and normative documents.

When selecting examiners for a specific examination or part of one, the assessment body shall ensure that the competence brought to each assignment is sufficient. Examiners shall:

- a) be familiar with the relevant assessment system;
- b) have a thorough knowledge of the relevant examination methods and examination documents;
- c) have appropriate technical knowledge of the activities which are to be examined;
- d) be able to communicate effectively, both in writing and orally (through an interpreter if necessary), in the language of the examination;
- e) be free from any conflicting interests so that they can make impartial and non-discriminatory assessments.

Provisions shall be made by the assessment body to ensure that the examination is not compromised. If conditions exist which force the participation of the trainer or instructor in the testing of the candidates trained or instructed by him or her, the instructor, who acts as an invigilator, shall not have access to the examination. Candidates shall be provided with sealed examination papers and shall return the sealed results to the invigilator, who shall take no part in the qualification process.

6 Classification of personnel

6.1 General

Individuals certified in accordance with any of the technical parts of ISO 18436 shall be classified in one of several categories depending on their qualifications and assessment. They should demonstrate competence in the concepts of machinery condition monitoring and diagnostics for their classification category, as indicated in the relevant part of ISO 18436 (see the complete listing in the Foreword) which relate directly to the specific technologies.

6.2 Categories

It is recommended that each technology be divided into three general categories (basic, intermediate and advanced), based on natural boundaries of technical difficulty. If required, a technology may be divided into more or fewer categories.

6.3 Employer

The employer shall provide applications for the candidates to the assessment body and shall document the validity of the personal information provided, including the declaration of training and experience needed to establish the eligibility of candidates, but shall not be directly involved in the assessment procedure itself. The employer shall be fully responsible for the authorization of the candidate to work and to perform machinery condition monitoring and diagnosis, and the quality and validity of the results of such work. An employer may require additional training and qualification of employees on specialized machinery beyond attestation in accordance with this International Standard before authority to work is given. If the candidates are self-employed, they shall assume all responsibilities described for the employer.

7 Eligibility for examination

7.1 General

Candidates shall have the combination of education, training and experience specified in the relevant technical part of ISO 18436 (see the complete listing in the Foreword) to ensure that they understand the principles and procedures applicable to the machinery condition monitoring and diagnosis technology in which they have chosen to qualify.

7.2 Mature candidate entry

Mature candidate entry may be allowed at the discretion of the assessment body.

If the assessment body permits mature candidate entry, candidates may apply for direct entry to categories higher than category I and not including the highest category in a technology, without the need to have previously held classifications at lower categories, providing they can produce evidence of training and/or experience that satisfies the requirements of the assessment body. Mature candidates may not need to have attended an assessment body validated course of training.

To be eligible to apply for assessment as a mature candidate entry, the candidates shall be required to provide evidence of training and experience relevant to the requirements of the respective technical part of ISO 18436 which should also comply with the requirements of ISO 18436-3. The minimum duration of recommended training is shown in each technical part of ISO 18436.

Such candidates should apply to the assessment body under the mature candidate route. Candidates for mature entry are required to satisfy the experience and training requirements specified in the relevant technical part of ISO 18436 without significant interruption. If a significant interruption exists the candidate may be required to undertake further training as determined by the assessment body.

8 Qualification examinations

8.1 Conduct of examinations

All examinations shall be conducted at examination sites approved by the assessment body and according to the following requirements:

- a) at the examination, the candidates shall have in their possession valid proof of identification and a notification of the examination, which shall be shown to the invigilator upon request;
- b) the examination shall be closed book, except for material provided by the assessment body (e.g. a summary of common formulae) — however, the examination for the highest category may, at the discretion of the assessment body, be open book;
- c) the candidates shall have access to simple drafting instruments and basic, non-programmable scientific calculators;
- d) except where test papers are to be scored by electronic means, candidates shall be prohibited from answering questions in pencil or using correction fluid, and shall be required to initial any corrections they may make on examination papers;
- e) at the start of the examination, the individual sealed envelopes, labelled with the candidates' names and containing the examination questions, shall be distributed to the candidates by the invigilator;
- f) upon instructions from the invigilator, the candidates shall open their envelopes and answer the questions;
- g) at the completion of a written examination, the candidates shall place their examination papers into the envelopes provided, seal and sign them, and give them to the invigilator, who shall forward them directly to the assessment body;
- h) no examination related materials shall be retained by the candidate;
- i) any candidate who, during the course of the examination, does not abide by the examination rules or who perpetrates, or is an accessory to, fraudulent conduct shall be excluded from further participation in that examination session (see also 8.3);
- j) all examiners or invigilators of condition monitoring examinations shall sign a statement indicating that they understand and have observed the rules of examination conduct.

8.2 Grading

All examinations shall be scored by a person authorized by the assessment body. To achieve certification, the candidates shall obtain the percentage of correct answers as required in the relevant part of ISO 18436 for that specific technology. The test scores shall be held confidential to the assessment body.

8.3 Re-examination

A candidate who fails to obtain the pass grade required for recognition may be re-examined twice, provided that the re-examinations take place not sooner than 30 days after the previous examination. An assessment body may use its discretion in allowing an earlier re-examination. A candidate who fails three consecutive attempts shall be excluded from reassessment for 12 months. Such candidate shall be required to reapply as an initial candidate.

Candidates excluded for reasons of unethical behaviour shall wait at least 12 months before reapplying.

9 Certification

9.1 Administration

After the candidate satisfies all requirements for assessment at a given technology and category, the assessment body shall announce the award, and issue attestation of conformity directly to the candidate.

9.2 Recognition documents

Recognition documents shall identify the standard to which the conformity is claimed and at least the following, which may also be posted on the Internet for verification purposes:

- a) the full name of the individual certified;
- b) the date of recognition;
- c) the date upon which recognition expires;
- d) the applicable machinery condition monitoring technology and abbreviations for sector, and category;
- e) the name of the assessment body;
- f) a unique personal identification number;
- g) a method to prevent falsification of the recognition documents (i.e. use of a hidden UV seal);
- h) the signature, on the recognition documents, of a designated representative of the assessment body;
- i) the seal of the assessment body.

There may be a special space on the recognition document for a statement of limitations, and for the signature and stamp of the employer authorizing the holder of the recognition to operate, and taking responsibility for the test results.

NOTE By issuing the recognition, the assessment body attests to the qualification of the individual as defined in the technical parts of ISO 18436, but does not give any authority to perform machinery condition monitoring. This authority is only given by the employer or client.

10 Validity and renewal of recognition

10.1 Validity of recognition

The period of validity shall not exceed 5 years from the date of recognition indicated on the recognition documents. Recognition shall become invalid when:

- a) this time period has elapsed;
- b) an individual becomes physically or mentally incapable of performing the duties;
- c) at the option of the assessment body, after reviewing evidence of unethical behaviour.

10.2 Renewal of recognition

Recognition may be renewed by the assessment body for a new 5 year period from the original expiration date so long as the recognition holder provides verifiable evidence of continued satisfactory work activity without significant interruption.

10.3 Late renewal of recognition

Applications for renewal after a certificate has expired may be considered after expiry subject to the requirements of the assessment body.

10.4 Reassessment

If the renewal criteria are not met, the individual shall apply for recognition following the procedure for new candidates.

11 Files

The assessment body shall maintain the following:

- a) an updated list of all individuals certified at each category;
- b) an individual file for each candidate who has not been certified, for at least 3 years from the date of the application or examination, whichever is the latest;
- c) an individual file for each individual certified and for each individual whose recognition has lapsed or has been withdrawn, containing:
 - 1) application forms,
 - 2) examination documents, including questionnaires and grade sheets,
 - 3) renewal documents, including evidence of continuous activity and significant interruptions,
 - 4) reasons for withdrawal or cancellation of recognition.

Individual files shall be kept under suitable conditions of safety and discretion according to the requirements of ISO/IEC 17024:2012, 8.3 and 8.4.

12 Transition period

When an assessment body initially applies the recognition scheme, it may appoint personnel as examiners, for a period not exceeding 5 years, who meet the following requirements:

- a) have knowledge of the principles of condition monitoring and diagnostics of machines;
- b) have industrial experience of the application of condition monitoring and diagnostics of machines;
- c) are able to interpret and score the examinations.

Annex A

(normative)

Code of ethics

Individuals recognized according to this part of ISO 18436 shall recognize the precepts of personal integrity and professional competence according to international principles. Accordingly, recognized individuals shall:

- a) perform their professional duties with proper regard for the physical environment and the safety, health, and well-being of the public;
- b) undertake only those measurements and analysis for which they are competent by virtue of their training and experience and, where warranted, engage or advise the engagement of such specialists as are required to enable them to properly complete assignments;
- c) conduct themselves in a responsible manner and utilize fair and equitable business practices in dealing with colleagues, clients and associates;
- d) protect to the fullest extent possible, consistent with the well-being of the public, any information given them in confidence by an employer, client, colleague or member of the public;
- e) refrain from making unjustified statements or from performing unethical acts which would discredit the certification programme based on this part of ISO 18436;
- f) indicate to the employer or client any adverse consequences which may result from an overruling of their technical judgement by a non-technical authority;
- g) avoid conflicts of interest with any employer or client and, if any such conflicts should arise in the performance of work, shall inform the affected persons promptly of the circumstances;
- h) strive to maintain their proficiency by updating their technical knowledge as required to properly perform condition monitoring measurement and analysis techniques.