

BS ISO 18436-3:2012



BSI Standards Publication

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

Part 3: Requirements for training bodies
and the training process

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National foreword

This British Standard is the UK implementation of ISO 18436-3:2012. It supersedes BS ISO 18436-3:2008+A1:2009 which is withdrawn.

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A list of organizations represented on this committee can be obtained on request to its secretary.

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

**Part 3:
Requirements for training bodies and the
training process**

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

*Partie 3: Exigences relatives aux organismes de formation et au
processus de formation*





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Case postale 56 • CH-1211 Geneva 20
Tel. + 41 22 749 01 11
Fax + 41 22 749 09 47
E-mail copyright@iso.org
Web www.iso.org

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Contents	Page
Foreword	iv
Introduction	v
1 Scope	1
2 Normative references	1
3 Terms and definitions	1
4 Training body	2
4.1 Purpose	2
4.2 Requirements	2
4.3 Responsibilities	2
4.4 Training body organizational structure	3
4.5 Training body management	3
4.6 Training centres	4
4.7 Technical training committees	4
4.8 Records	5
4.9 Confidentiality	5
5 Requirements for training body personnel	5
5.1 General provisions	5
5.2 Additional criteria for trainers	5
5.3 Classification of trainers	6
6 Training procedures	6
7 Eligibility for training	6
7.1 General	6
7.2 Education	6
7.3 Training	6
7.4 Experience	7
8 Training examinations	7
8.1 Examination type and content	7
8.2 Conduct of training examinations	7
8.3 Grading	7
9 Recognition of training	7
9.1 Administration	7
9.2 Certificates of completion	7
10 Files	8
Annex A (normative) Qualification of trainers	9
Annex B (normative) Code of ethics	10
Bibliography	11

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.

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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 18436-3 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 18436-3:2008), which has been technically revised. It also incorporates the Amendment ISO 18436-3:2008/Amd. 1:2009.

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*

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 electrical signature analysis. In many instances these technologies act as complementary 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 bodies operating training programmes in the non-intrusive machine condition monitoring, diagnostic, and correction technologies. General requirements for training body personnel are contained in this part of ISO 18436. Specific requirements for personnel in condition monitoring and diagnostics are covered in other parts of ISO 18436.

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

Part 3: Requirements for training bodies and the training process

1 Scope

This part of ISO 18436 defines the requirements for bodies operating training programmes for personnel who perform machinery condition monitoring, identify machine faults, and recommend corrective action. Procedures for training of condition monitoring and diagnostics personnel are specified.

2 Normative references

The following referenced documents are indispensable for the application 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 9000, *Quality management systems — Fundamentals and vocabulary*

ISO 13372, *Condition monitoring and diagnostics of machines — Vocabulary*

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 9000 and the following apply.

3.1

administrative committee

advisory committee

committee advising a training body

3.2

certificate of completion

written testimony of completion of training issued under the rules of a training programme

3.3

invigilator

person authorized by the training body to supervise examinations

3.4

technical training committee

committee organized by a training body to direct the technical aspects of a training programme

3.5

trainer

person with relevant technical and personal qualifications who is entrusted with training candidates for qualification

3.6
training body
organization competent to administer a programme to train personnel in machinery condition monitoring and diagnostics technology

3.7
training centre
centre authorized and monitored by a training body where theoretical and practical instruction are administered

3.8
training process
procedures by which a training body provides instruction to candidates for qualification

3.9
training programme
programme system having its own rules of procedure and management for training through the use of verbal, visual and practical instruction

4 Training body

4.1 Purpose

The training body shall be responsible for development and implementation of procedures to prepare individuals to carry out tasks in machinery condition monitoring and diagnostics.

4.2 Requirements

A training body shall:

- a) have the relevant technical, educational and financial resources to ensure effective training in accordance with the relevant part(s) of ISO 18436 (see the complete listing in the Foreword);
- b) have the administrative resources needed to organize and implement training programmes;
- c) manage training that can lead to classification in accordance with the relevant part(s) of ISO 18436 (see the complete listing in the Foreword) and shall not promote specific commercial products or services;
- d) use non-discriminatory policies and procedures in the administration of the training programme;
- e) have a quality system that reflects the intent of ISO 9001.^[1]

4.3 Responsibilities

A training body shall:

- a) develop, maintain and implement a technically based, practical training programme that prepares an individual to carry out tasks in machinery condition monitoring and diagnosis and which may lead to classification as evidence of their qualifications;
- b) administer the procedures and operations for training with modern educational procedures and facilities;
- c) take the ultimate responsibility for the training procedures and content, including technical and administrative requirements;
- d) ensure the adherence to training curricula as specified in the relevant part(s) of ISO 18436 (see the complete listing in the Foreword), and use the terminology given in ISO 13372;
- e) approve properly staffed and equipped training centres which it shall monitor on a periodic basis;
- f) approve the candidate's eligibility for training on the basis of prerequisite fulfilment;

- g) authorize the time, location of the training, training centre, and instructor for each course or programme;
- h) prepare and distribute training materials consistent with the technical requirements in the relevant part(s) of ISO 18436 (see the complete listing in the Foreword);
- i) select, evaluate and instruct qualified trainers based on education and experience;
- j) prepare and implement training examinations at the training sessions and provide assessment of progress to participants;
- k) issue certificates of completion of training;
- l) keep appropriate records of the operations of training;
- m) maintain records of training examinations;
- n) maintain records of training evaluation forms;
- o) monitor all delegated functions.

4.4 Training body organizational structure

4.4.1 General

A training body shall have an organizational structure whose details shall be accessible to public examination, and which invites and permits participation by all interested parties.

4.4.2 Responsibilities

A training body shall:

- a) identify the persons, groups, and/or committees responsible for:
 - 1) procedures, curriculum and surveillance as defined in this part of ISO 18436 and the applicable competency standards and normative documents,
 - 2) the formulation of policy matters relating to the operation of the training body,
 - 3) decisions on the training programme,
 - 4) supervision of the implementation of its policies, and
 - 5) supervision of the finances of the training body;
- b) delegate authority to administrative committees, advisory committees or individuals, as required, to undertake defined activities on its behalf.

4.5 Training body management

The management of each training body shall define and document its policy for quality. The management shall ensure that this policy is understood and implemented on all levels of the organization.

The training body shall operate a documented management system, which covers all the requirements of this part of ISO 18436 and ensures the effective application of these requirements.

4.6 Training centres

4.6.1 General

Training centres, which can include technical organizations, vendors, companies, academic institutions, and independent training organizations, are bodies that meet the requirements specified in 4.6.2 and have the responsibilities specified in 4.6.3.

4.6.2 Requirements

Training centres shall be delegated by a training body and shall, as a minimum requirement:

- a) work under the direction of the training body;
- b) have adequate qualified staff to organize and conduct training programmes as prescribed by the training body and in compliance with curricula specified in the relevant part(s) of ISO 18436 (see the complete listing in the Foreword);
- c) have adequate physical and financial resources to implement training programmes;
- d) provide evaluation forms and training examination records to the training body; and
- e) follow the instructions in this part of ISO 18436.

4.6.3 Responsibilities

The training centres shall:

- a) conduct training programmes following the prescribed procedures of the training body using qualified trainers (see Annex A);
- b) use only current materials provided by the training body;
- c) return all original examinations to the training body;
- d) ensure that the integrity of proprietary materials is not compromised in any way.

4.7 Technical training committees

4.7.1 General

Technical training committees are groups assigned by a training body that meet the requirements specified in 4.7.2 and have the responsibilities specified in 4.7.3.

4.7.2 Requirements

Separate technical training committees may be formed by a training body to monitor and direct technical efforts associated with training. The committees shall have, as a minimum requirement, membership that is qualified to the level of the training that the committee represents.

4.7.3 Responsibilities

The technical training committees shall:

- a) develop or rework training procedures and/or methodology for best practices in training;
- b) develop training examinations to evaluate candidates' progress;
- c) adhere to the technical areas of proficiency, as defined by other parts of ISO 18436, for each level of training.

4.8 Records

The training body shall maintain a permanent record system to comply with existing regulations. The records shall demonstrate that the training procedures have been effectively fulfilled, particularly with respect to application forms, evaluation reports, surveillance activities and any other documents relating to this process. The records shall be identified, managed, and disposed of in such a way as to ensure the integrity of the process and the confidentiality of the information. The records shall be kept for a period of time so that continued confidence may be demonstrated for at least one full classification cycle (initial period of validity plus first renewal period) or 10 years. The training body shall have a policy and procedure concerning access to these records consistent with 4.9.

4.9 Confidentiality

The training body shall have adequate arrangements consistent with applicable laws to safeguard confidentiality of the information obtained in the course of its training activities at all levels of its organization.

Except as required in this part of ISO 18436 or by law, information gained in the course of training activities about a particular person shall not be disclosed to a third party without the written consent of that person. Where the law requires information to be disclosed to a third party, that person shall be informed of the information provided as permitted by the law.

5 Requirements for training body personnel

5.1 General provisions

In order to ensure that the training process is carried out effectively and uniformly, the competence requirements for training body personnel shall be defined as stated in Annex A and validated by the training body through its responsible committee.

The training 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 training body, including those relating to confidentiality.

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

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

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

5.2 Additional criteria for trainers

Trainers shall meet the requirements of the training body based upon applicable standards and normative documents as well as the requirements of Annex A and Annex B.

When selecting trainers for the whole or a part of a specific training programme, the training body shall ensure that the competence brought to each assignment is sufficient. Trainers shall:

- a) be familiar with the relevant training system and the appropriate training requirements of ISO 18436;
- b) have a thorough knowledge of the relevant training methods;
- c) have appropriate in-depth technical knowledge and experience in the topics of the training;
- d) be able to communicate effectively both in writing and orally (through an interpreter if necessary) in the language of training;
- e) be able to make impartial and non-discriminatory technical presentations.

5.3 Classification of trainers

Individuals selected to train in accordance with ISO 18436 (all parts) shall be classified in one of several categories depending on their qualifications (see Annex A). They shall have demonstrated competence in the concepts of machinery condition monitoring and diagnostics for their classification category as indicated in other parts of ISO 18436 which relate directly to the specific technologies.

6 Training procedures

The duration of training shall be guided by the technical requirements and recommendations of the relevant part of ISO 18436. Prerequisites for training programmes shall be established based on the classification categories of the relevant parts of ISO 18436. Training shall be conducted in the form of lectures, demonstrations, and practical exercises with visual, audio, and written communication. All training shall be scientifically based and empirically tempered by proven experience. Training content shall reflect best industrial practice. The training topics shall be selected from the technical areas presented in the relevant part(s) of ISO 18436. Training shall include examinations to ensure that the subject matter has been understood.

7 Eligibility for training

7.1 General

Candidates should have a combination of background education, training, and experience to ensure that they can understand the principles and procedures applicable to machinery condition monitoring and diagnosis technology in which they have chosen to train.

7.2 Education

Each part of ISO 18436 dealing with individual technologies specifies the required or recommended formal education for each training and classification category, for example secondary school, technical school, and/or university.

7.3 Training

The minimum duration of the recommended or required background training has been established for each technology covered by the relevant part of ISO 18436. Training topics and requirements are shown in an annex for each technology covered by the relevant part of ISO 18436. An overview shows hours of training for each classification category and major subject area. The major subject areas shall be broken down in a detailed list of topics where hours of instruction are given for each classification category. The prerequisites for training shall be based on the categories detailed in the classification clauses in the relevant part of ISO 18436 and shall be specified.

Evidence of completion of training prerequisites can include:

- a) a certificate of completion from a qualified training body;

- b) a record of time devoted to the study of each topic as specified in the annex on subject areas.

Subject areas chosen for self-study, as required for each technology, shall be documented in detail or training examinations shall be taken from approved trainers.

7.4 Experience

Prior to application for training in a given category, it is recommended that candidates be required to provide written evidence of experience in the field of machinery condition monitoring and diagnosis. The minimum experience recommendations are defined for each technology covered by ISO 18436.

8 Training examinations

8.1 Examination type and content

For each training category, the candidates shall be required to answer a number of questions in a specified time duration. The examination shall be closed book; however, formula sheets or a standard text reference, or other resources, may be permitted at the discretion of the training body. The examination may be partially oral or demonstrative depending on the requirements of each part of ISO 18436.

The training questions, covering the technical subjects shown in each part of ISO 18436, shall be selected from a database of questions constructed and administered by the technical training committee of the training body. Questions shall be of a practical nature, yet test the candidate on concepts and principles required to conduct machinery condition evaluations. The questions may involve the interpretation of charts and plots. Simple mathematical calculations may be required. A summary of common formulas may be provided along with the examination by the appropriate technical training committee of a training body assigned to the given technology.

8.2 Conduct of training examinations

All training examinations shall be conducted after the completion of the training. Candidates shall have no questions answered by the course trainer. Examinations may be administered by an invigilator or any competent person designated by the training body.

8.3 Grading

All training examinations shall be scored by the trainer or an invigilator on site. A written summary of the results along with a score shall be given to the candidate.

9 Recognition of training

9.1 Administration

After the candidate satisfies all requirements for training in a given category, the training body shall issue a certificate of completion indicating successful completion of training requirements.

9.2 Certificates of completion

Certificates of completion shall include at least:

- a) the full name of the individual;
- b) the date of completion;
- c) the number of educational units, if applicable;
- d) the category of training;

- e) the applicable machinery condition monitoring technology, i.e. “condition monitoring and diagnostics of machines”;
- f) name of the training body;
- g) a unique personal identification number;
- h) the signature, on the certificate, of a designated representative of the training body;
- i) the seal or logo of the training body.

NOTE By issuing the certificate, the training body attests to the completion of the training by the individual, but does not give any authority to perform machinery measurements or analysis.

10 Files

The training body shall maintain:

- a) an updated list of all individuals trained in each category;
- b) an individual file for each trained individual, containing:
 - 1) application forms;
 - 2) training examination documents, including questionnaires and grade sheets; and
 - 3) data contained on the certificates of completion.

Individual files shall be kept under suitable conditions of safety and discretion for a period of not less than 10 years.

Annex A (normative)

Qualification of trainers

Assessment of trainers shall be carried out in accordance with relevant parts of ISO 18436. Trainers shall be assessed to at least category II (category III for vibration) on the particular field of application. For categories above category I (category II for vibration), trainers shall be assessed to at least the same category.

When a training body initially applies the training scheme, it may appoint personnel as trainers during 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) have the ability to conduct training in accordance with the relevant part of ISO 18436.

All trainers shall sign a statement that they have received and carried out the set of rules for proper conduct of training programmes in which they participate.

Annex B (normative)

Code of ethics

Individuals who train according to ISO 18436 (all parts) shall recognize the precepts of personal integrity and professional competence according to international principles. Accordingly, these individuals shall:

- a) perform their professional duties without bias and commercialism whether it be for products or services;
- b) undertake only those training duties for which they are competent by virtue of their training and experience;
- 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 to 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 classification and training programme based on this part of ISO 18436;
- f) avoid conflicts of interest with any employer or client, and if any such conflicts should arise in the performance of work, inform the affected persons promptly of the circumstances;
- g) strive to maintain their proficiency by updating their technical knowledge as required to properly perform condition monitoring measurement and analysis techniques; and
- h) ensure that end-user confidentiality is conserved if their data are used in training material, unless there is prior agreement.

Bibliography

- [1] ISO 9001, *Quality management systems — Requirements*

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