International Standard

ISO 16079-1

Condition monitoring and diagnostics of wind turbines —

Part 1: General guidelines

Surveillance et diagnostic d'état des éoliennes de production d'électricité —

Partie 1: Lignes directrices générales

Second edition
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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).

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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 108, *Mechanical vibration, shock and condition monitoring*, Subcommittee SC 5, *Condition monitoring and diagnostics of machine systems*.

This second edition cancels and replaces the first edition (ISO 16079-1:2017), which has been editorially revised.

The main changes are as follows:

— editorial changes throughout the document.

A list of all parts in the ISO 16079 series can be found on the ISO website.

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 https://www.iso.org/about/members.

Introduction

0.1 General

Power production from wind turbines represents a significant and growing part of the global energy market. As a consequence, predictability of the power production from wind power plants has become as crucial as the predictability of power production from conventional power plants. As for conventional power plants, an efficient maintenance programme for wind power plants adds significant value to the reliability and predictability of the supply of energy. This document is the first in a series of International Standards addressing the application of condition monitoring to wind turbines. It is an application of the recommendations and best practices described in the generic standards developed under ISO/TC 108.

0.2 Aims of the ISO 16079 series

This document and subsequent documents in the ISO 16079 enable manufacturers and operators of wind turbines, as well as developers of condition monitoring systems for these turbines to adopt shared concepts and terminology. Additionally, these provide a methodology enabling users of this document to prioritize and select which components to be monitored and which failure modes to be detected. This is intended to implement the most efficient condition monitoring system, taking into account cost, detection capability, complexity of the condition monitoring system and methods, as well as the available resources and qualification levels of the monitoring personnel.

It is not the intention of this document or subsequent documents in the ISO 16079 series to cover any aspects of safety monitoring systems.

0.3 Time-proven experience

The condition monitoring strategies presented in the ISO 16079 series are based on time-proven experience. Only conservative, well-proven methods and best practices are applied. This means that the detection of certain failure modes may be left out if their behaviour and their related symptoms are not well-documented. As new condition monitoring techniques mature, this document and subsequent documents in the ISO 16079 series will be updated accordingly, see Figure 1.

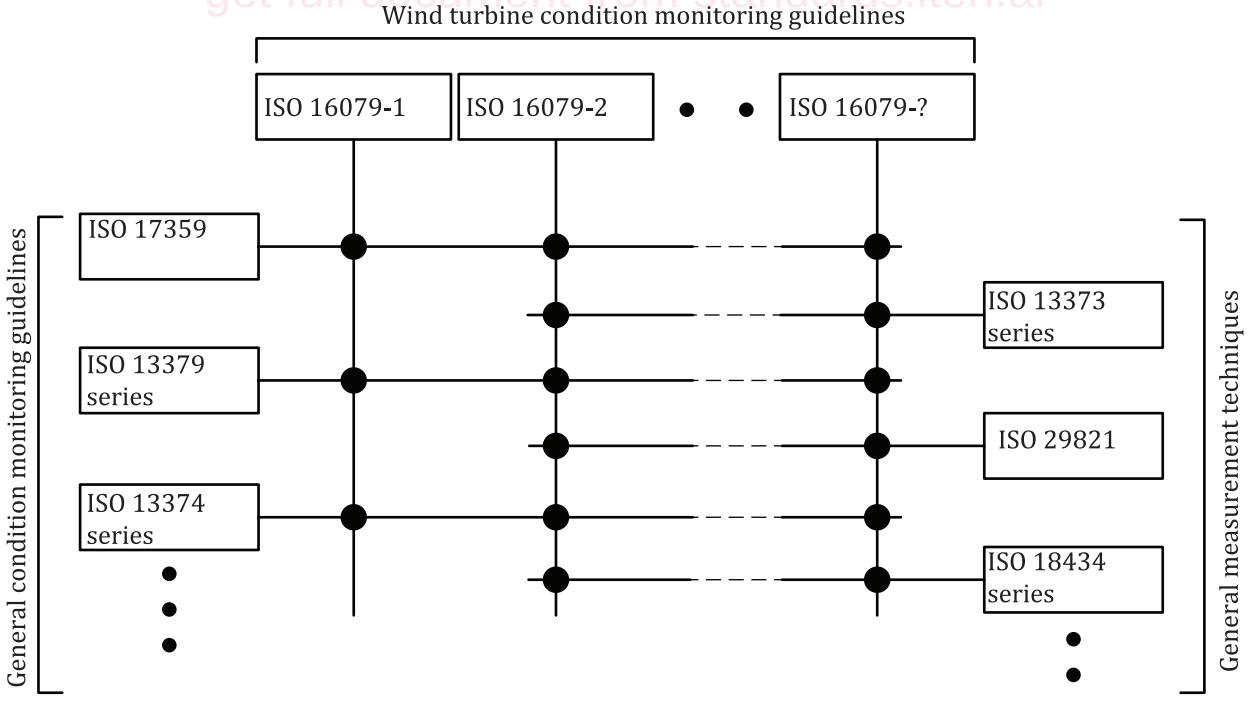

Figure 1 — Links between the wind turbine-specific International Standards and the general International Standards (relation to the generic standards of ISO/TC 108)

Condition monitoring and diagnostics of wind turbines —

Part 1:
General guidelines

1 Scope

This document establishes basic guidelines for choosing condition monitoring methods for failure mode detection, diagnostics and prognostics of wind power plant components.

This document does not specify IT systems used for condition monitoring of wind turbines.

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 2041, *Mechanical vibration, shock and condition monitoring — Vocabulary*

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

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 2041 and ISO 13372 and the following 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/ui

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

3.1
alarm
operational signal or message designed to notify personnel when a selected *anomaly* (3.2), or a logical combination of anomalies, which requires a corrective action, is encountered

[SOURCE: ISO 13372:2012, 4.2, modified — “requiring” has been replaced by “which requires”]

3.2
anomaly
irregularity or abnormality in a system

[SOURCE: ISO 13372:2012, 4.4]

3.3
component
sub-component
component part
part of a geared wind turbine, typically the main bearing, gearbox and generator

Note 1 to entry: Each of these components in the strictest sense of the definition can also contain several sub-components or component parts such as a generator bearing or planet gear.

3.4
consequential damage
secondary damage
subsequent damage
phenomena whereby degradation of one *component* (3.3) can cause *failures* (3.7) in other components

3.5
descriptor
condition monitoring descriptor
data item derived from raw or processed parameters or external observation

Note 1 to entry: Descriptors are used to express *symptoms* (3.15) and *anomalies* (3.2). The descriptors used for condition monitoring and diagnostics are generally those obtained from condition monitoring systems. However, operational parameters, like any other measurement, can be considered as descriptors.

[SOURCE: ISO 13372:2012, 6.2, modified — the admitted term "feature" has been replaced by “condition monitoring descriptor” and the Note 1 to entry has been added.]

3.6
estimated time to failure
ETTF
lead time
estimation of the period from the current point in time to the point in time where the monitored machine has a *functional failure* (3.8)

[SOURCE: ISO 13381-1:2025, 3.8, modified — the term "lead time" has been added.]

3.7
failure
termination of the ability of a *component* (3.3) or a machine to perform a required function

Note 1 to entry: Failure is an event as distinguished from *fault* (3.10), which is a state.

[SOURCE: ISO 13372:2012, 1.7, modified — “item” has been replaced with "component" and “machine”.]

3.8
functional failure
F
point in time when the machine stops performing its function

3.9
failure mode
manner in which an equipment or machine *failure* (3.7) can occur

Note 1 to entry: A machine can have several failure modes (e.g. rubbing, spalling, unbalance, electrical discharge damage and looseness). A failure mode produces *symptoms* (3.15) indicating the presence of a *fault* (3.10).

3.10
fault
condition of a machine that occurs when one of its *components* (3.3) or assembly degrades or exhibits abnormal behaviour, which can lead to *functional failure* (3.8) of the machine

Note 1 to entry: See also *potential failure* (3.12).

Note 2 to entry: A fault can be the result of a *failure* (3.7) but can exist without a failure.

[SOURCE: ISO 13372:2012, 1.8, modified — the scope of application has been added, "failure" has been replaced by "functional failure" and the Notes to entry have been changed.]

3.11
P-F interval
estimate of the period from the detection of a *fault* (3.10) [*potential failure* (3.12)] and *functional failure* (3.8)

Note 1 to entry: *ETTF* (3.6) is equal to or less than the P-F interval.

Note 2 to entry: See also *estimated time to failure* (3.6).

Note 3 to entry: For efficient planning of a maintenance action, it is useful to know the P-F interval of a specific *failure mode* (3.9). Refer to Annex A for further explanation of P-F interval, *ETTF* (3.6) and *RUL* (3.13).

3.12
potential failure
P
potential for failure
point in time when a *fault* (3.10) becomes detectable

3.13
remaining useful life
RUL
remaining time before system health falls below a failure threshold defined by the confidence level of the *ETTF* (3.6) and the acceptable risk

Note 1 to entry: The capability to predict RUL is the goal of the prognostic process.

Note 2 to entry: Refer to Annex A for further explanation of *P-F interval* (3.11), *ETTF* (3.6) and *RUL*.

3.15
symptom

perception, made by means of human observations and measurements [*descriptors* (3.5)], which can indicate the presence of one or more *faults* (3.10) with a certain probability

[SOURCE: ISO 13372:2012, 9.4, modified — the scope of application has been added and the term “with a certain probability” has been added]

4 Overview of a condition monitoring implementation — Set-up and diagnostic requirements

4.1 General

An efficient condition monitoring system is an important part of an effective maintenance programme for wind power plants to:

a) obtain predictability in power production;

b) providing stable power production;

c) lower wind turbine maintenance costs by

   1) reducing the development of failures to a serious state,

   2) reducing consequential damage, and