Wind turbines - Part 25-6: Communications for monitoring and control of wind power plants - Logical node classes and data classes for condition monitoring

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NATIONAL FOREWORD

Käesolev Eesti standard EVS-EN 61400-25-6:2011 sisaldab Euroopa standardi EN 61400-25-6:2011 ingliskeelset teksti.	This Estonian standard EVS-EN 61400-25-6:2011 consists of the English text of the European standard EN 61400-25-6:2011.
Standard on kinnitatud Eesti Standardikeskuse 28.02.2011 käskkirjaga ja jõustub sellekohase teate avaldamisel EVS Teatajas.	This standard is ratified with the order of Estonian Centre for Standardisation dated 28.02.2011 and is endorsed with the notification published in the official bulletin of the Estonian national standardisation organisation.
Euroopa standardimisorganisatsioonide poolt rahvuslikele liikmetele Euroopa standardi teksti kättesaadavaks tegemise kuupäev on 21.01.2011.	Date of Availability of the European standard text 21.01.2011.
Standard on kättesaadav Eesti standardiorganisatsioonist.	The standard is available from Estonian standardisation organisation.

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EUROPEAN STANDARD

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English version

Wind turbines - Part 25-6: Communications for monitoring and control of wind power plants - Logical node classes and data classes for condition monitoring

(IEC 61400-25-6:2010)

Eoliennes -
Partie 25-6: Communications pour la surveillance et la commande des centrales éoliennes -
Classes de noeuds logiques et classes de données pour la surveillance d'état
(CEI 61400-25-6:2010)

Windenergieanlagen -
Teil 25-6: Kommunikation für die Überwachung und Steuerung von Windenergieanlagen -
Klassen logischer Knoten und Datenklassen für die Zustandsüberwachung
(IEC 61400-25-6:2010)

This European Standard was approved by CENELEC on 2011-01-03. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CENELEC member.

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CENELEC

European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

Management Centre: Avenue Marnix 17, B - 1000 Brussels

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Foreword

The text of document 88/377A/FDIS, future edition 1 of IEC 61400-25-6, prepared by IEC TC 88, Wind turbines, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as EN 61400-25-6 on 2011-01-03.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN and CENELEC shall not be held responsible for identifying any or all such patent rights.

The following dates were fixed:

– latest date by which the EN has to be implemented at national level by publication of an identical national standard or by endorsement	(dop)	2011-10-03
– latest date by which the national standards conflicting with the EN have to be withdrawn	(dow)	2014-01-03

Annex ZA has been added by CENELEC.

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Endorsement notice

The text of the International Standard IEC 61400-25-6:2010 was approved by CENELEC as a European Standard without any modification.

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Annex ZA
(normative)

Normative references to international publications with their corresponding European publications

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.

NOTE When an international publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

Publication	Year	Title	EN/HD	Year
IEC 61400-25-1	2006	Wind turbines - Part 25-1: Communications for monitoring and control of wind power plants - Overall description of principles and models	EN 61400-25-1	2007
IEC 61400-25-2	2006	Wind turbines - Part 25-2: Communications for monitoring and control of wind power plants - Information models	EN 61400-25-2	2007
IEC 61400-25-3	2006	Wind turbines - Part 25-3: Communications for monitoring and control of wind power plants - Information exchange models	EN 61400-25-3	2007
IEC 61400-25-4	-	Wind turbines - Part 25-4: Communications for monitoring and control of wind power plants - Mapping to communication profile	EN 61400-25-4	-
IEC 61400-25-5	-	Wind turbines - Part 25-5: Communications for monitoring and control of wind power plants - Conformance testing	EN 61400-25-5	-
IEC 61850-7-2	2003	Communication networks and systems in substations - Part 7-2: Basic communication structure for substation and feeder equipment - Abstract communication service interface (ACSI)	EN 61850-7-2[1)]	2003
IEC 61850-7-3	-	Communication networks and systems for power utility automation - Part 7-3: Basic communication structure - Common data classes	EN 61850-7-3	-
ISO 10816	Series	Mechanical vibration - Evaluation of machine vibration by measurement on non-rotating parts	-	-
ISO 13373-1	2002	Condition monitoring and diagnostics of machines - Vibration condition monitoring - Part 1: General procedures	-	-

[1)] EN 61850-7-2 is superseded by EN 61850-7-2:2010, which is based on IEC 61850-7-2:2010.

CONTENTS

INTRODUCTION

The IEC 61400-25 series defines information models and information exchange models for monitoring and control of wind power plants. The modelling approach (for information models and information exchange models) of IEC 61400-25-2 and IEC 61400-25-3 uses abstract definitions of classes and services such that the specifications are independent of specific communication protocol stacks, implementations, and operating systems. The mapping of these abstract definitions to specific communication profiles is defined in IEC 61400-25-4.

Conformance to IEC 61400-25-6 requires in principle conformance to IEC 61400-25-2, IEC 61400-25-3 and IEC 61400-25-4.

The definitions in parts IEC 61400-25-1 to IEC 61400-25-5 apply also for this part 6 of the standard series.

The purpose of this part of IEC 61400 is to define an information model for condition monitoring information and to define how to use the existing definitions of IEC 61400-25-2 and to define the required extensions in order to describe and exchange information related to condition monitoring of wind turbines. The models of condition monitoring information defined in this standard may represent information provided by sensors or by calculation.

In the context of this standard, condition monitoring means a process with the purpose of observing components or structures of a wind turbine or wind power plant for a period of time in order to evaluate the state of the components or structures and any changes to it, in order to detect early indications of impending failures. With the objective to be able to monitor components and structures in approximately the same conditions, this standard introduces a concept of sorting production or power levels of a wind turbine into power bins. The power bins concept is multidimensional in order to fit the purpose of sorting complex operational conditions into comparable circumstances.

Condition monitoring is most frequently used as a predictive or condition-based maintenance technique (CBM). However, there are other predictive maintenance techniques that can also be used, including the use of the human senses (look, listen, feel, smell) or machine performance monitoring techniques. These could be considered to be part of the condition monitoring.

Condition monitoring techniques

Condition monitoring techniques that generate information to be modelled include, but are not limited to, measured or processed values such as:

- vibration measurements and analysis;
- oil debris measurement and analysis;
- temperature measurement and analysis;
- strain gauge measurement and analysis;
- acoustic measurement and analysis.

Components and structures can be monitored by using automatic measurement retrieval or via a manual process.

Condition monitoring devices

The condition monitoring functions may be located in different physical devices. Some information may be exposed by a turbine controller device (TCD) while other information may be exposed by an additional condition monitoring device (CMD). Various actors may request to exchange data values located in the TCD and/or CMD. A SCADA device may request data values from a TCD and/or CMD; a CMD may request data values from a TCD. The information

exchange between an actor and a device in a wind power plant requires the use of information exchange services as defined in IEC 61400-25-3 and the additional required exchange services specified in this part 6. A summary of the above is depicted in Figure 1.

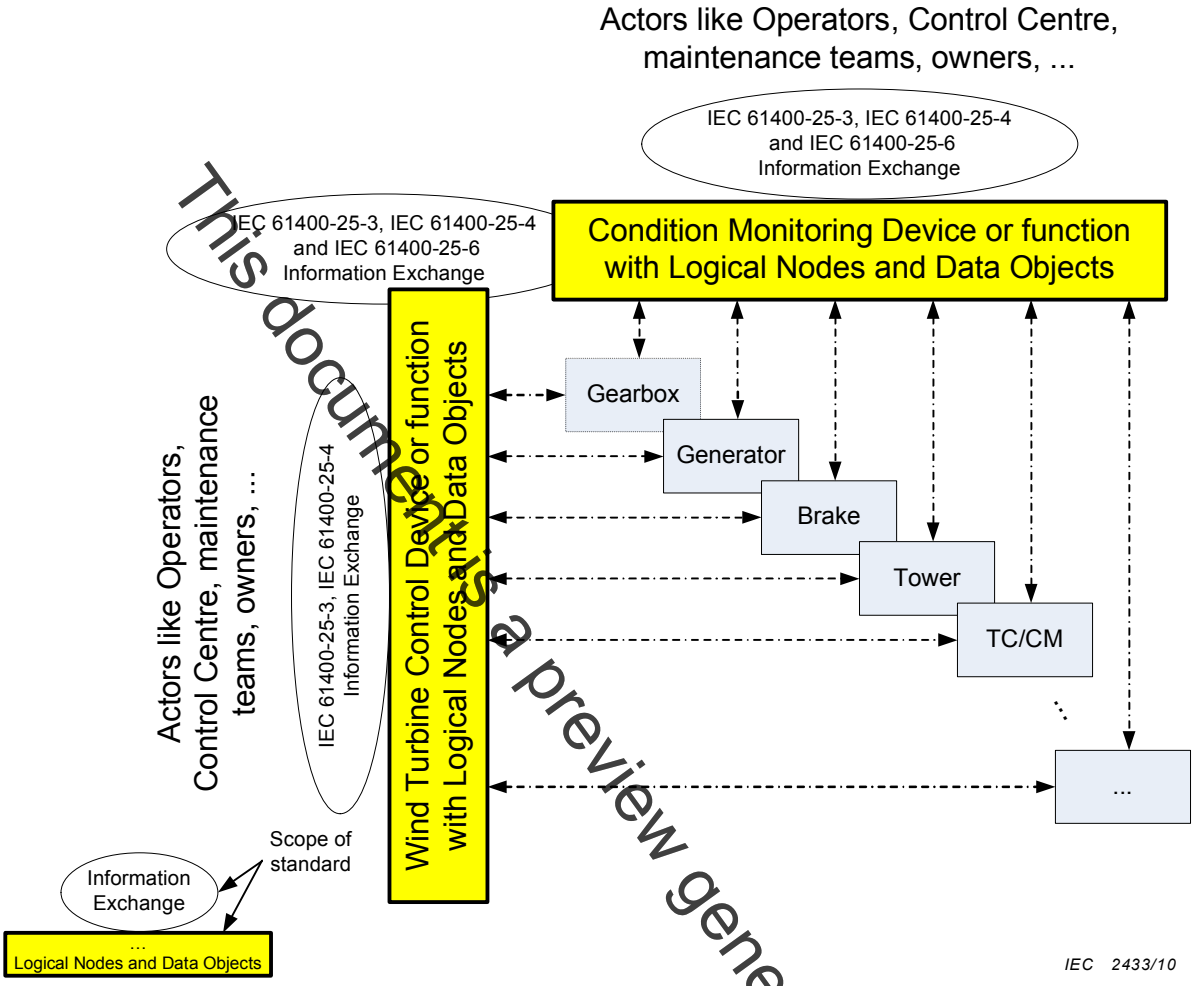

Figure 1 – Condition monitoring with separated TCD/CMD functions

The state of the art in the wind power industry is a topology with separated devices for control and condition monitoring applications. Based on this fact, the information and information exchange modelling in the present document is based on a topology with a TCD and a CMD.

IEC 61400-25-6 must be perceived as an extension of the IEC 61400-25 series of standards with the focus on condition monitoring.

WIND TURBINES –

Part 25-6: Communications for monitoring and control of wind power plants – Logical node classes and data classes for condition monitoring

1 Scope

This part of the IEC 61400-25 series specifies the information models related to condition monitoring for wind power plants and the information exchange of data values related to these models.

Figure 2 illustrates the information flow of a system using condition monitoring to perform condition based maintenance. The figure illustrates how data values are refined and concentrated through the information flow, ending up with the ultimate goal of condition based maintenance – actions to be performed via issuing work orders to maintenance teams in order to prevent the wind power plant device to stop providing its intended service.

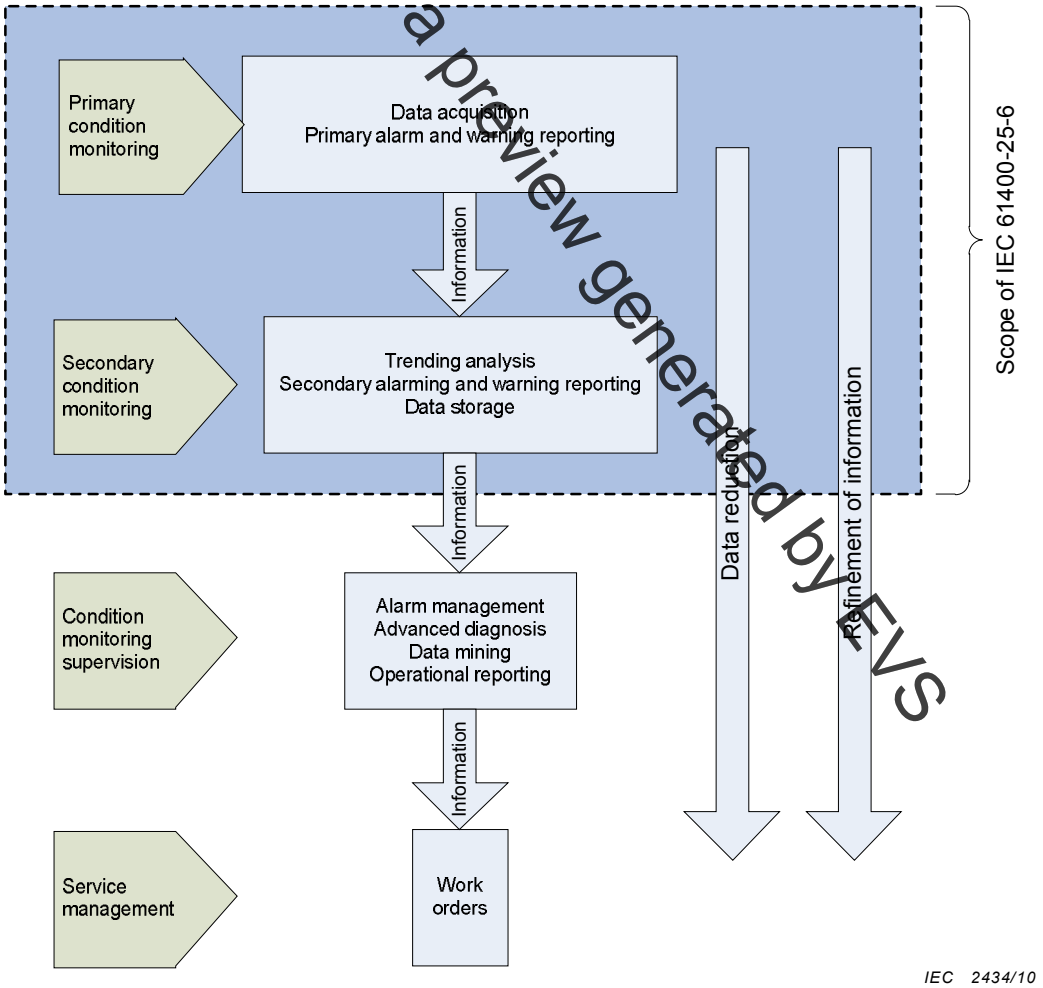

Figure 2 – Schematic flow of condition monitoring information

Condition monitoring is mainly based on the following kinds of information.

- Time waveform records (samples) of a specific time interval to be exchanged in real-time or by files for analysis (e.g. acceleration, position detection, speed, stress detection).
- Status information and measurements (synchronized with the waveform records) representing the turbine operation conditions.
- Results of time waveform record analysis of vibration data (scalar values, array values, statistical values, historical (statistical) values, counters and status information).
- Results of, for example, oil debris analysis.

It is the purpose of this standard to model condition monitoring information by using the information modelling approach as described in 6.2.2 of IEC 61400-25-1 and by extending the existing information model as specified in Clause 6 of IEC 61400-25-2, the information exchange models specified in Clause 9 of IEC 61400-25-3 and the mapping to communication profiles as specified in IEC 61400-25-4.

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.

IEC 61400-25-1:2006, *Wind turbines – Communications for monitoring and control of wind power plants – Overall description of principles and models*

IEC 61400-25-2:2006, *Wind turbines – Communications for monitoring and control of wind power plants – Information models*

IEC 61400-25-3:2006, *Wind turbines – Communications for monitoring and control of wind power plants – Information exchange models*

IEC 61400-25-4, *Wind turbines – Communications for monitoring and control of wind power plants – Mapping to communication profile*

IEC 61400-25-5, *Communications for monitoring and control of wind power plants – Conformance testing*

IEC 61850-7-2:2003, *Communication networks and systems in substations – Part 7-2: Basic communication structure for substation and feeder equipment – Abstract communication service interface (ACSI)*

IEC 61850-7-3, *Communication networks and systems in substations – Part 7-3: Basic communication structure for substation and feeder equipment – Common data classes*

ISO 10816 (all parts), *Mechanical vibration – Evaluation of machine vibration by measurements on non-rotating parts*

ISO 13373-1:2002, *Condition monitoring and diagnostics of machines – Vibration condition monitoring – Part 1: General procedures*