

Wind turbines —

Part 25-3: Communications for monitoring and control of wind power plants — Information exchange models

The European Standard EN 61400-25-3:2007 has the status of a
British Standard

ICS 27.180

National foreword

This British Standard was published by BSI. It is the UK implementation of EN 61400-25-3:2007. It is identical with IEC 61400-25-3:2006.

The UK participation in its preparation was entrusted to Technical Committee PEL/88, Windturbine systems.

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

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This British Standard was published under the authority of the Standards Policy and Strategy Committee on 31 May 2007

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ISBN 978 0 580 50676 5

Amendments issued since publication

Amd. No.	Date	Comments

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

Eoliennes -
Partie 25-3: Communications
pour la surveillance et la commande
des centrales éoliennes -
Modèles d'échange d'informations
(CEI 61400-25-3:2006)

Windenergieanlagen -
Teil 25-3: Kommunikation
für die Überwachung und Steuerung
von Windenergieanlagen -
Dienste-Modelle für den
Informationsaustausch
(IEC 61400-25-3:2006)

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CENELEC

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

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Foreword

The text of document 88/276/FDIS, future edition 1 of IEC 61400-25-3, prepared by IEC TC 88, Wind turbines, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as EN 61400-25-3 on 2007-02-01.

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) 2007-11-01
- latest date by which the national standards conflicting
with the EN have to be withdrawn (dow) 2010-02-01

Annex ZA has been added by CENELEC.

Endorsement notice

The text of the International Standard IEC 61400-25-3:2006 was approved by CENELEC as a European Standard without any modification.

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INTRODUCTION

The IEC 61400-25 series defines communications for monitoring and control of wind power plants. The modeling approach of the IEC 61400-25 series has been selected to provide abstract definitions of classes and services such that the specifications are independent of specific protocol stacks, implementations, and operating systems. The mapping of these abstract classes and services to a specific communication profile is not inside the scope of this part (IEC 61400-25-3) but inside the scope of IEC 61400-25-4¹.

This part of IEC 61400-25 defines services of the model of the information exchange of intelligent electronic devices in wind power plants. The services are referred to as the Abstract Communication Service Interface (ACSI). The ACSI has been defined so as to be independent of the underlying communication systems.

The information exchange model is defined in terms of

- a hierarchical class model of all information that can be accessed,
- information exchange services that operate on these classes,
- parameters associated with each information exchange service.

The ACSI description technique abstracts away from all the different approaches to implement the cooperation of the various devices.

These abstract service definitions shall be mapped into concrete object definitions that are to be used for a particular protocol. Mapping to specific protocol stacks is specified in IEC 61400-25-4.

NOTE 1 Abstraction in ACSI has two meanings. Firstly, only those aspects of a real device (for example, a rotor) or a real function that are visible and accessible over a communication network are modelled. This abstraction leads to the hierarchical class models and their behaviour defined in IEC 61400-25-2. Secondly, the ACSI abstracts from the aspect of concrete definitions on how the devices exchange information; only a conceptual cooperation is defined. The concrete information exchange is defined in IEC 61400-25-4.

NOTE 2 Performance of the IEC 61400-25 series implementations are application specific. The IEC 61400-25 series does not guarantee a certain level of performance. This is beyond the scope of the IEC 61400-25 series. However, there is no underlying limitation in the communications technology to prevent high speed application (millisecond level responses).

¹ To be published.

WIND TURBINES –**Part 25-3: Communications for monitoring
and control of wind power plants –
Information exchange models****1 Scope**

The focus of the IEC 61400-25 series is on the communications between wind power plant components such as wind turbines and actors such as SCADA Systems. Internal communication within wind power plant components is outside the scope of the IEC 61400-25 series.

The IEC 61400-25 series is designed for a communication environment supported by a client-server model. Three areas are defined, that are modelled separately to ensure the scalability of implementations: (1) wind power plant information models, (2) information exchange model, and (3) mapping of these two models to a standard communication profile.

The wind power plant information model and the information exchange model, viewed together, constitute an interface between client and server. In this conjunction, the wind power plant information model serves as an interpretation frame for accessible wind power plant data. The wind power plant information model is used by the server to offer the client a uniform, component-oriented view of the wind power plant data. The information exchange model reflects the whole active functionality of the server. The IEC 61400-25 series enables connectivity between a heterogeneous combination of client and servers from different manufacturers and suppliers.

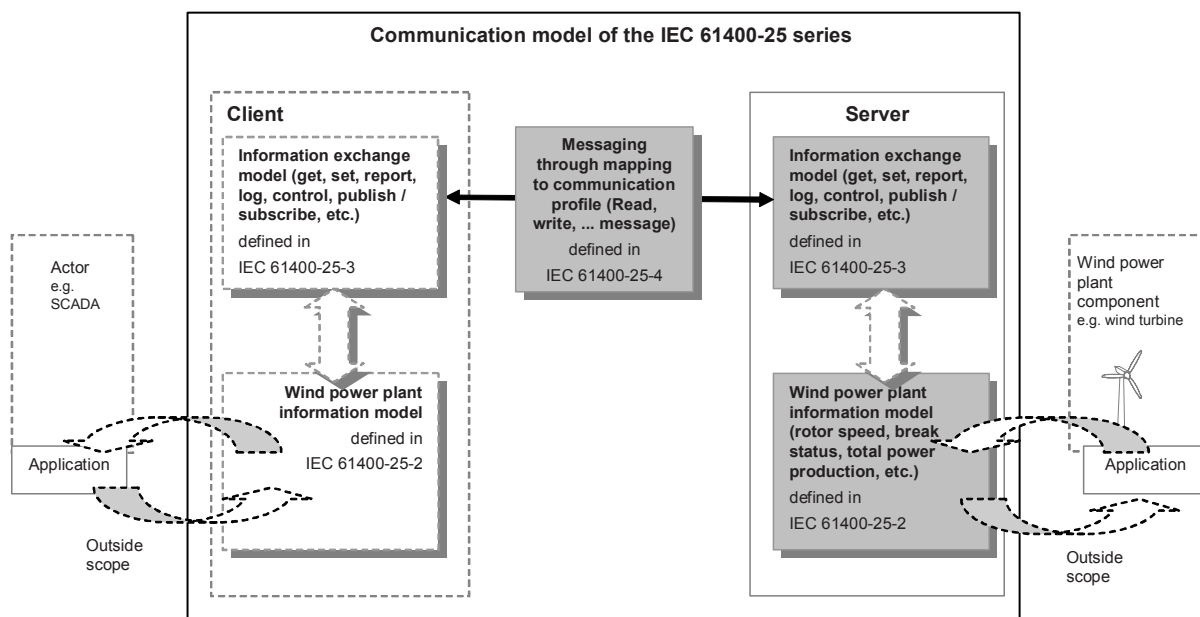
As depicted in Figure 1, the IEC 61400-25 series defines a server with the following aspects:

- information provided by a wind power plant component, e. g., “wind turbine rotor speed” or “total power production of a certain time interval” is modelled and made available for access. The information modelled in the IEC 61400-25 series is defined in IEC 61400-25-2;
- services to exchange values of the modelled information defined in part IEC 61400-25-3;
- mapping to a communication profile, providing a protocol stack to carry the exchanged values from the modelled information (part IEC 61400-25-4).

The IEC 61400-25 series only defines how to model the information, information exchange and mapping to specific communication protocols. The IEC 61400-25 series excludes a definition of how and where to implement the communication interface, the application program interface and implementation recommendations. However, the objective of the IEC 61400-25 series is that the information associated with a single wind power plant component (such as a wind turbine) is accessible through a corresponding logical device.

This part of IEC 61400-25 specifies an abstract communication service interface describing the information exchange between a client and a server for:

- data access and retrieval,
- device control,
- event reporting and logging,
- publisher/subscriber,
- self-description of devices (device data dictionary),
- data typing and discovery of data types.



IEC 2172/06

Figure 1 – Conceptual communication model of the IEC 61400-25 series

2 Normative references

The following referenced documents are indispensable for the application of this part of the IEC 61400-25 series. 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 (all parts), *Wind turbines – Part 25: Communications for monitoring and control of wind power plants*

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

3 Terms and definitions

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

3.1

actor

role a system plays in the context of monitoring and control, while it is not directly involved in wind power plant operation, such as Supervisory Control and Data Acquisition System (SCADA)

NOTE There are many other designations, for example, Central Management System, Monitoring and Control System, Remote Control System.

3.2

alarm

state information. Statement of safety intervention by the wind turbine control system (i.e on/off)

3.3

command

controllable data for system behaviour (enable/disable, active/deactivate, etc.)

3.4

communication function

used by an actor to configure, perform and monitor the information exchange with wind power plants, for example operational and management function

3.5

control

operational function used for changing and modifying, intervening, switching, controlling, parameterisation and optimising of wind power plants

3.6

data retrieval

operational function used for collecting of wind power plant data

3.7

diagnostics

management function used to set up and provide for self-monitoring of the communication system

3.8

event

state transition (status, alarm, command)

3.9

intelligent Electronic Device

IED

any device incorporating one or more processors, with the capability to receive data from an external sender or to send data to an external receiver

NOTE For example, wind turbine controller. An IED may have connections as a client, or as a server, or both, with other IED.

3.10 information

content of communication. Information is defined as data (usually processed and derived data, and information describing other data). The basic element is raw data from the wind power plant component, which should be processed into specified information according to the IEC 61400-25 series

NOTE Wind power plant information categories: source information (analogue and state information), control information, derived information (statistical and historical information).

3.11 information exchange

communication process between two systems, such as wind power component and actor, with the goal to provide and to get relevant information. Requires specific communication functions, consisting of one or more services

3.12 log

historical information. Chronological list of source information for a period of time

3.13 logging

operational function The praxis of recording sequential data often chronologically. The result of the logging is a log

3.14 logical device

Entity that represent a set of typical wind power plant functions

3.15 management function

function required for the administration of the information exchange in a certain level

NOTE Management functions are user/access management, time synchronisation, diagnostics, and configuration.

3.16 mandatory

defined content shall be provided in compliance with the IEC 61400-25 series

3.17 measured data

sampled value of a process quantity with associated data attributes such as time stamp and quality

3.18 meteorological system

component of a wind power plant responsible for the monitoring of the ambient conditions, for example the wind speed, wind direction, pressure, temperature etc. It supplies data for various purposes for example to correlate the meteorological data to the electrical energy output by individual wind turbines to the potentially usable wind energy

3.19 monitoring

operational function used for local or remote observation of a system or a process for any changes which may occur over time. The term can also be used for observation of the behaviour of a data value or a group of data values