# SLOVENSKI PREDSTANDARD

# oSIST prEN 61400-25-1:2005

november 2005

**Sistemi generatorjev vetrne turbine – 25-1. del: Komunikacije za spremljanje in nadzor vetrnih elektrarn – Celoten opis načel in modelov**

Wind turbines – Part 25-1: Communications for monitoring and control of wind power plants – Overall description of principles and models



ICS 27.180; 35.240.50

Referenčna številka
oSIST prEN 61400-25-1:2005(en)

# 88/238/CDV

**COMMITTEE DRAFT (CD)**

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| **IEC/TC or SC**:<br>TC 88 | Project number<br>IEC 61400-25-1 Ed.1 | |
| Title of TC/SC:<br>Wind Turbines | Date of circulation<br>**2005-08-05** | Closing date for comments<br>**2006-01-06** |
| Also of interest to the following committees<br>TC 57 | Supersedes document<br>88/213/CD & 88/233/CC | |
| Functions concerned:<br>☐ Safety ☐ EMC ☐ Environment ☐ Quality assurance | | |
| Secretary:<br>A.C. van der Giessen | THIS DOCUMENT IS STILL UNDER STUDY AND SUBJECT TO CHANGE. IT SHOULD NOT BE USED FOR REFERENCE PURPOSES.<br>RECIPIENTS OF THIS DOCUMENT ARE INVITED TO SUBMIT, WITH THEIR COMMENTS, NOTIFICATION OF ANY RELEVANT PATENT RIGHTS OF WHICH THEY ARE AWARE AND TO PROVIDE SUPPORTING DOCUMENTATION. | |

Title: Wind turbines - Part 25-1: Communications for monitoring and control of wind power plants - Overall description of principles and models

Introductory note

This CDV contains a solution for communications for monitoring and control of wind power plants. IEC 61400-25 defines wind power plant specific information, the mechanisms for information exchange and the mapping to communication protocols.

IEC 61400-25 consists of the following parts, under the general title Communications for monitoring and control of wind power plants:

Part 25-1 Overall description of principles and models
Part 25-2: Information models
Part 25-3: Information exchange models
Part 25-4: Mapping to communication profile
Part 25-5: Conformance testing

The documents have been drawn up by IEC TC88 Project Team 25, consisting of experts from many of the large vendors as well as representatives of utilities, consultants and suppliers of third-party products.

All parts are distributed for comments and voting simultaneously, as committee drafts for voting (CDV).

No major technical changes have been made as a result of the comments and proposals received on second CD (88/213/CD), most comments having been editorial.



| ATTENTION | ATTENTION |
|---|---|
| **CDV soumis en parallèle au vote (CEI) et à l'enquête (CENELEC)** | **Parallel IEC CDV/CENELEC Enquiry** |

1CDV IEC 61400-25-1

# WIND TURBINES

## Part 25-1:
## Communications for monitoring and control of wind power plants – Overall description of principles and models



**Version:** 61400-25-1_R0-4 Draft1CDV_2005-07-11

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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# WIND TURBINES –

# Part 25-1: Communications for monitoring and control of wind power plants – Overall description of principles and models

## FOREWORD

1) The IEC (International Electrotechnical Commission) is a worldwide organisation for standardisation comprising all national electrotechnical committees (IEC National Committees). The object of the IEC is to promote international co-operation on all questions concerning standardisation in the electrical and electronic fields. To this end and in addition to other activities, the IEC publishes International Standards. Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organisations liaising with the IEC also participate in this preparation. The IEC collaborates closely with the International Organisation for Standardisation (ISO) in accordance with conditions determined by agreement between the two organisations.

2) The formal decisions or agreements of the IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested National Committees.

3) The documents produced have the form of recommendations for international use and are published in the form of standards, technical specifications, technical reports or guides and they are accepted by the National Committees in that sense.

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6) Attention is drawn to the possibility that some of the elements of this International Standard may be the subject of patent rights. The IEC shall not be held responsible for identifying any or all such patent rights.

**Recipients of this document are invited to submit, with their comments, notification of any relevant patent rights of which they are aware and to provide supporting documentation.**

This committee draft for voting of the International Standard IEC 61400-25 has been prepared by IEC technical committee 88: Wind turbines Project team 25.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

IEC 61400-25 consists of the following parts, under the general title *Communications for monitoring and control of wind power plants*:

Part 25-1 Overall description of principles and models[1]

Part 25-2: Information models[1]

Part 25-3: Information exchange models[1]

Part 25-4: Mapping to communication profile[1]

Part 25-5: Conformance testing[1]

[1] To be published

# INTRODUCTION

This document addresses vendors (manufacturers, suppliers), operators, owners, planners, and designers of wind power plants as well as system integrators and utility companies operating in the wind energy market. IEC 61400-25 is intended to be accepted and to be used world-wide as the international standard for communications in the domain of wind power plants.

IEC 61400-25 has been developed in order to provide a uniform communications basis for the monitoring and control of wind power plants. It defines wind power plant specific information, the mechanisms for information exchange, the mapping to communication protocols, and the system configuration. In this regard the standard defines all details required to connect wind power plant components in a multi-vendor environment and to exchange the information made available by a component. This is done by definitions made in this document or by reference to other commonly used standards.

The wind power plant specific information describes the crucial and common process data, meta-data (data about data, e. g. scale factor or engineering unit), and configuration data of a wind power plant. Process information is hierarchically structured and covers for example common process information found in the rotor, generator, converter, grid connection and the like. The data may be simple (value, timestamp, and quality) or more comprehensive (adding more meta-data, for example engineering unit, scale, description, short hand reference, statistical and historical information of the process value). All information of a wind power plant defined in this standard is name tagged – it defines a comprehensive name space. A concise meaning of each signal is given. The standardised wind power plant information can be easily extended by means of a name space extension rule.



All process and meta-data can be exchanged by corresponding services. Access to the meta-data (including configuration information with regard to the wind power plant information model and services and communication stacks) provides the so-called self-description of a device.



This standard allows SCADA systems (supervisory control and data acquisition) to communicate with wind turbine controllers from multiple vendors. The standardised self-description (contained either in a XML file or retrieved online from a device) can be used to configure SCADA applications. Standardisation of SCADA applications are excluded in IEC 61400-25 but standardised common wind turbine information provides means for re-use of applications and operator screens for wind turbines from different vendors. From a utility perspective unified definitions of common data minimise conversion and re-calculation of data values for evaluation and comparison of all their wind power plants.

The standard can be applied to any wind power plant operation concept, i.e., both in individual and integrated operations. The application area of IEC 61400-25 covers all components required for the operation of wind power plants, i.e., not only the wind turbine, but also the meteorological system (reference wind mast), the electrical system, and the wind power plant management system. The wind power plant specific information in IEC 61400-25 excludes information associated with feeders and substations. Substation communication is covered within the IEC 61850 series of standards.

IEC 61400-25 puts an end to the communication difficulties arising from the wide variety of protocols, labels, semantics etc. thus offering the possibility to manage different wind power plants independently of the vendor. It enables components from different vendors to easily communicate with other components, at any location, at any time. Object-oriented data structures make the engineering and handling of huge amounts of information provided by wind power plants less time-consuming and more efficient. Scalability, connectivity, and interoperability can be maximised to reduce cost and needed man power.

This standard is a basis for simplifying the contracting of the roles the wind turbine and SCADA systems have to play. The crucial part of the wind power plant information, the infor-

mation exchange methods, and the communication stacks are standardised. They build a basis to which procurement specifications and contracts could easily refer.

The standard IEC 61400-25 is organised in several parts. Part IEC 61400-25-1 offers an introductory orientation, crucial requirements, and a modelling guide.

INTERIMS NOTE (for 1CDV review only): An XML file will be provided for the final version of the information models.

NOTE 1 Performance of IEC 61400-25 implementations are application specific. The standard does not guarantee a certain level of performance. That's out of the scope. However there is no underlying limitation in the communications technology to prevent high speed application (millisecond level responses).

NOTE 2 The standard IEC 61400-25 has a close relation with other IEC projects like IEC 61850 Addendum 1 (Communication networks and systems in substations - Power Quality Monitoring), IEC 62350 (Communications Systems for Distributed Energy Resources (DER)), and IEC 62344 (Hydroelectric power plants – Communication for monitoring and control).

# WIND TURBINES –

# Part 25-1: Communications for monitoring and control of wind power plants – Overall description of principles and models

## 1 Scope

The focus of IEC 61400-25 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 this standard.

IEC 61400-25 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 available 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. IEC 61400-25 enables connectivity between a heterogeneous combination of client and servers from different manufacturers and suppliers.



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

- **information** provided by a real application of 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 standard is defined in part 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)

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

NOTE 1 IEC 61400-25 focuses on the common, non-vendor-specific information. Those information items that tend to vary greatly between vendor-specific implementations can for example be specified in bilateral agreements, in user groups, or in amendments to this standard.

NOTE 2 IEC 61400-25 excludes definition of an application program interface and implementation recommendations.

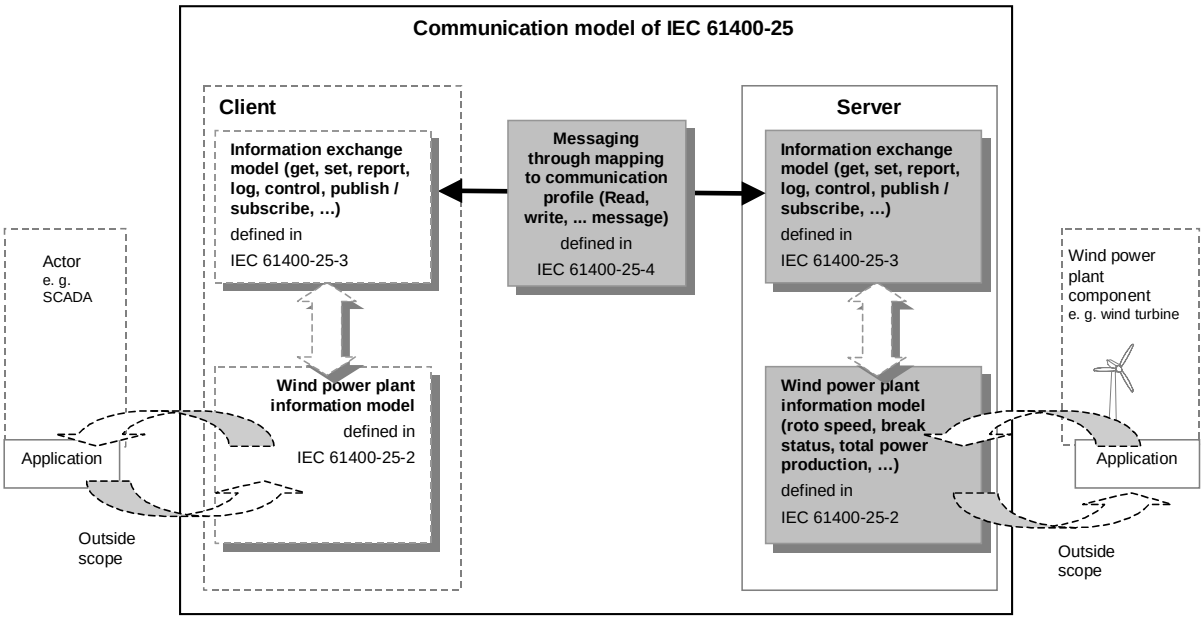


**Figure 1 – Conceptual communication model of IEC 61400-25**

## 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/IEC 7498-1:1994, *Information technology – Open Systems Interconnection – Basic Reference Model: The Basic Model*

IEC 61850-7-1:2003, *Communication networks and systems in substations – Part 7-1: Basic communication structure for substations and feeder equipment – Principles and models*

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 61850-7-3:2003, *Communication networks and systems in substations – Part 7-3: Basic communication structure for substation and feeder equipment – Common data classes*

IEC 61850-7-4:2003, *Communication networks and systems in substations – Part 7-4: Basic communication structure for substation and feeder equipment – Compatible logical node classes and data classes*

IEC 61850-8-1:2004, *Communication networks and systems in substations – Part 8-1: Specific communication service mapping (SCSM) – Mappings to MMS (ISO/IEC 9506-1 and ISO/IEC 9506-2) and to ISO/IEC 8802-3*