

INTERNATIONAL STANDARD

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First edition
2006-12

Wind turbines –

**Part 25-5:
Communications for monitoring
and control of wind power plants –
Conformance testing**

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

WIND TURBINES –

**Part 25-5: Communications for monitoring
and control of wind power plants –
Conformance testing**

FOREWORD

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International Standard IEC 61400-25-5 has been prepared by IEC technical committee 88: Wind turbines.

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

The text of this standard is based on the following documents:

FDIS	Report on voting
88/277/FDIS	88/283/RVD

Full information on the voting for the approval of this standard can be found in the report on voting indicated in the above table.

A list of all parts of the IEC 61400 series, under the general title *Wind turbines* can be found on the IEC website.

The committee has decided that the contents of this publication will remain unchanged until the maintenance result date indicated on the IEC web site under "<http://webstore.iec.ch>" in the data related to the specific publication. At this date, the publication will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

A bilingual version of this publication may be issued at a later date.

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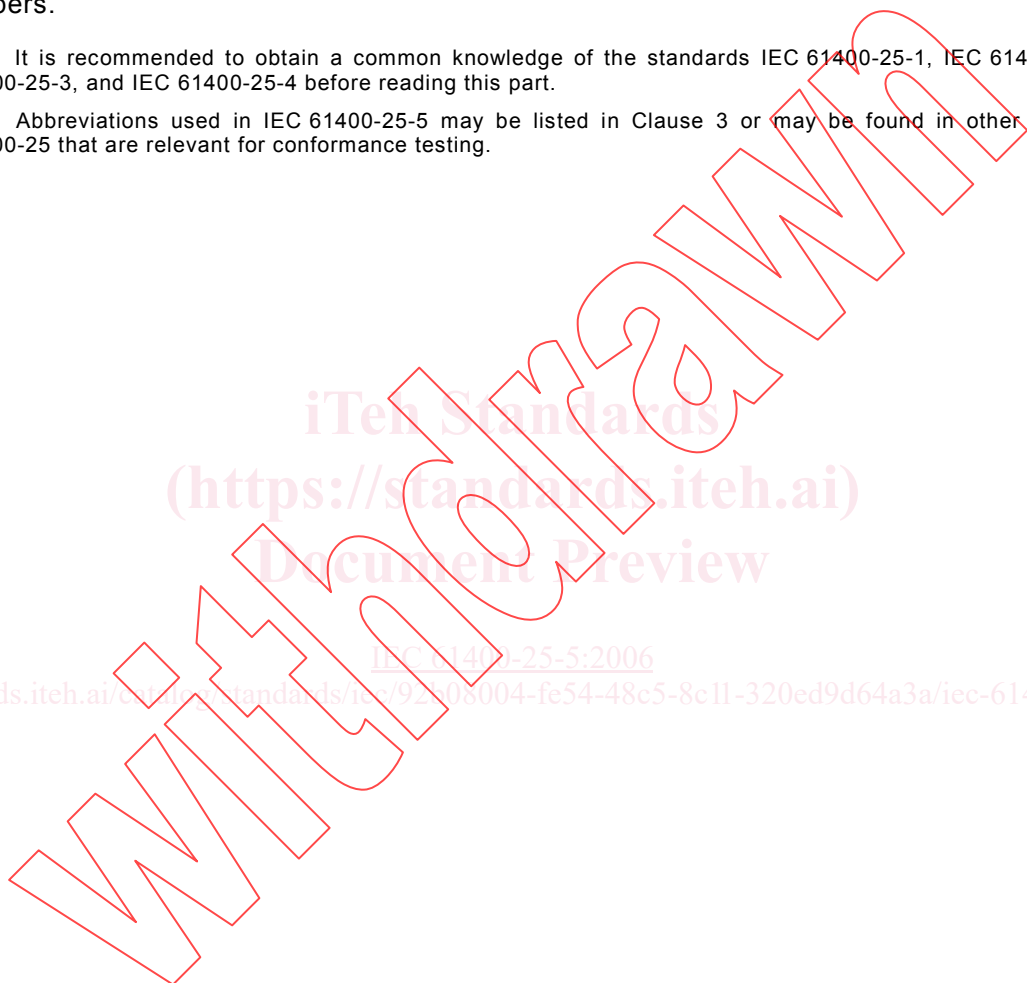
INTRODUCTION

The IEC 61400-25 series defines communication 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 may be found in IEC 61400-25-41.

This part of IEC 61400-25 defines the methods and abstract test cases for conformance testing of devices used in wind power plants. The intended readers are test system developers.

NOTE 1 It is recommended to obtain a common knowledge of the standards IEC 61400-25-1, IEC 61400-25-2, IEC 61400-25-3, and IEC 61400-25-4 before reading this part.

NOTE 2 Abbreviations used in IEC 61400-25-5 may be listed in Clause 3 or may be found in other parts of IEC 61400-25 that are relevant for conformance testing.



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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 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).

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 the wind turbine) is accessible through a corresponding logical device.

This part of IEC 61400-25 specifies standard techniques for testing of conformance of implementations, as well as specific measurement techniques to be applied when declaring performance parameters. The use of these techniques will enhance the ability of users to purchase systems that integrate easily, operate correctly, and support the applications as intended.

NOTE The role of the test facilities for conformance testing and certifying the results are outside of the scope of IEC 61400-25-5.

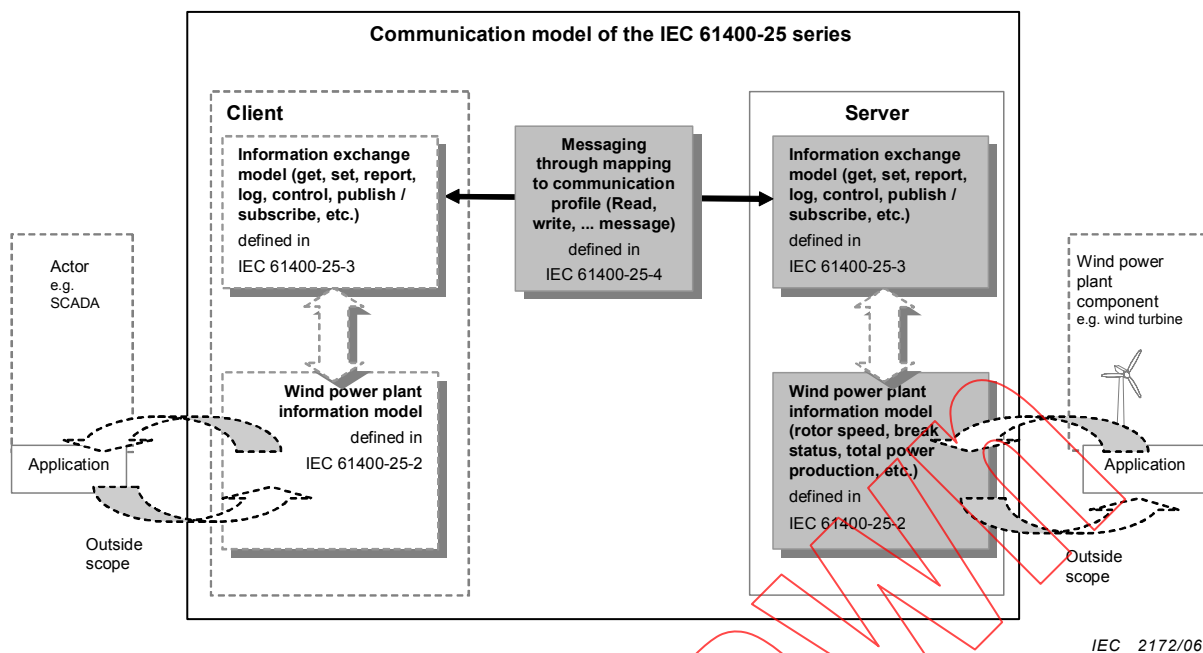


Figure 1 – Conceptual communication model of the IEC 61400-25 series

2 Normative references

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

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 substations and feeder equipment – Abstract communication service interface (ACSI)*

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

ISO/IEC 9646 (all parts), *Information technology – Open Systems Interconnection – Conformance testing methodology and framework*

3 Terms and definitions

For the purpose of this document, the terms and definitions defined in IEC 61400-25-1 and the following apply.

3.1

Factory Acceptance Test FAT

customer agreed functional tests of the specifically manufactured substation automation system or its parts using the parameter set for the planned application.

The FAT shall be carried out in the factory of the manufacturer or other agreed-upon location by the use of process simulating test equipment

**3.2
interoperability**

ability of two or more devices from the same vendor (or different vendors) to exchange information and use that information for correct co-operation. A set of values defined corresponds with the quantities or values of another set

**3.3
Model Implementation Conformance Statement
MICS**

details the standard data object model elements supported by the system or device

**3.4
negative test**

test to verify the correct response of a device or a system when subjected to:

- IEC 61400-25 series conformant information and services which are not implemented in the device or system under test,
- non IEC 61400-25 series conformant information and services sent to the device or system under test.

**3.5
Protocol Implementation Conformance Statement
PICS**

summary of the capabilities of the system to be tested

**3.6
Protocol Implementation Extra Information For Testing
PIXIT**

the Protocol Implementation eXtra Information for Testing document contains system specific information regarding the capabilities of the system to be tested and which are outside the scope of the IEC 61400-25 series

NOTE The PIXIT is not subject to standardisation.

**3.7
routine test**

performed by the manufacturer in order to ensure device operation and safety

**3.8
Site Acceptance Test
SAT**

verification of each data and control point and the correct functionality within the WPP and its operating environment at the whole installed plant by use of the final parameter set. The SAT is the precondition for the WPP being put into operation.

**3.9
system test**

verification of correct behaviour of the WPP components and of the overall WPP under various application conditions

NOTE The system test marks the final stage of the development of a WPP system component.

3.10**test equipment**

all tools and instruments which simulate and verify the input/outputs of the operating environment of the WPP such as wind turbine, switchgear, transformers, network control centres or connected telecommunication units on the one side, and the communication links between the system components of the WPP on the other

3.11**test facility**

organisation able to provide appropriate test equipment and trained staff for conformance testing

NOTE The management of conformance tests and the resulting information should follow a quality system.

3.12**type test**

verification of correct behaviour of the systems components of the WPP by use of the system tested software under the test conditions corresponding with the technical data

NOTE The type test marks the final stage of the hardware development and is the precondition for the start of the production. This test shall be carried out with system components which have been manufactured through the normal production cycle.

3.13**witness point**

point, defined in the appropriate document at which an inspection will take place on an activity. The activity may proceed without the approval of the initiator of the conformance test. The test facility provides a written notice to the initiator at an agreed time prior to the witness point. The initiator or his representative has the right, but is NOT obligated, to verify the witness point

4 Abbreviated terms

ACSI	Abstract Communication Service Interface
BRCB	Buffered Report Control Block
DUT	Device Under Test
FAT	Factory Acceptance Test
GI	General Interrogation
HMI	Human Machine Interface
IED	Intelligent Electronic Device
IP	Inter-networking protocol internet Protocol
LCB	Log Control Block
LD	Logical Device
LN	Logical Node
MICS	Model Implementation Conformance Statement
PICS	Protocol Implementation Conformance Statement
PIXIT	Protocol Implementation eXtra Information for Testing
RCB	Report Control Block
RTU	Remote Terminal Unit
SAT	Site Acceptance Test
SCADA	Supervisory Control And Data Acquisition
SCSM	Specific Communication Service Mapping
SoE	Sequence-of-Events
SUT	System Under Test
TPAA	Two Party Application Association
URCB	Unbuffered Report Control Block
UTC	Coordinated Universal Time
WPP	Wind Power Plant