IEC 61400-25-2

Edition 2.0 2015-06

INTERNATIONAL STANDARD

NORME INTERNATIONALE

colour inside

Wind turbines –
Part 25-2: Communications for monitoring and control of wind power plants – Information models

Eoliennes –
Partie 25-2: Communications pour la surveillance et la commande des centrales éoliennes – Modèles d'information

IEC 61400-25-2:2015-06(en-fr)

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CONTENTS

INTERNATIONAL ELECTROTECHNICAL COMMISSION

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WIND TURBINES –

Part 25-2: Communications for monitoring and control of wind power plants – Information models

FOREWORD

1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). 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 organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
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International Standard IEC 61400-25-2 has been prepared by IEC technical committee 88: Wind turbines.

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

FDIS	Report on voting
88/539FDIS	88/551/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.

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

The scope of revision includes:

- harmonization with Common Data Classes in Edition 2 of IEC 61850-7-3,
- harmonization with Logical node classes in Edition 2 of IEC 61850-7-4,
- harmonization with Information models in IEC 61850-7-410 and IEC 61850-7-420,
- reduction of overlap between standards and simplification by increased referencing,
- extension of Data objects for operation of smart grids (in US and other areas),
- extended and enhanced semantics for existing data objects,

and includes the following significant technical changes with respect to the previous edition:

a) The model on alarm handling has been revised and the logical node WALM and associated cdc's have been modified.

b) A new logical node class WPPD that represents general data for non-turbine devices has been added.

c) A new logical node class WAVL that represents availibilty data has been added.

d) WMET has been revised and harmonized with MMET. If MMET is extended with data object for altitude and ice then WMET may be deleted in future editions.

e) External Met sensors (WndDir, WndSpd, Humidity, Pressure, Temperature) have been removed from WNAC and moved to WMET.

f) Some data types, such as CtxInt, are not supported by IEC 61850 so other data types need to be used.

g) Abbreviations have been changed to resolve inconsistencies with IEC 61850. This affects several data names.

h) Enumeration values and definitions in the standard have been harmonized.

i) Additional data objects regarding smart grid have been added.

j) Wind power specific CDCs that in Edition 1 contained subsets of attributes of CDCs from IEC 61850-7-3 now implicitly include all attributes of these CDCs.

k) Technical issues related to IEC 61400-25-2:2006 have been resolved and results incorporated in the standard.

l) The presence conditions for statistical information has been modified compared to IEC 61850-7-4:2010.

This second edition cancels and replaces the first edition published in 2006. This edition constitutes a technical revision.

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 stability date indicated on the IEC website 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.

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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 is not within the scope of this part of the IEC 61400-25 series but within the scope of IEC 61400-25-4.

To reach interoperability, all data in the information model need a strong definition with regard to syntax and semantics. The semantics of the data are mainly provided by names assigned to logical nodes and data they contain, as defined in this part of the IEC 61400-25 series. Interoperability is easiest if as many as possible of the data are defined as mandatory.

It should be noted that data with full semantics is only one of the elements required to achieve interoperability. Since data and services are hosted by intelligent electronic devices (IED), a proper device model is needed along with compatible domain specific services (see IEC 61400-25-3).

This part is used to specify the abstract definitions of a logical device class, logical node classes, data classes, and abstract common data classes. These abstract definitions are mapped into concrete object definitions that are to be used for a particular protocol.

The compatible logical node name, data object name and data attribute name definitions found in this part and the associated semantics are fixed.

NOTE 1 Performance of the IEC 61400-25 series implementations is 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).

NOTE 2 Authorisation processes using PKI, role based access control as e.g. defined in the IEC 62351 series of standards or other security and access safety methods are beyond the scope of this standard.

WIND TURBINES –

Part 25-2: Communications for monitoring and control of wind power plants – Information 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, for example “wind turbine rotor speed” or “total power production of a certain time interval”, is modelled and made available for access;
– services to exchange values of the modelled information defined in IEC 61400-25-3;
– mapping to a communication profile, providing a protocol stack, to carry the exchanged values from the modelled information (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 standard excludes a definition of how and where to implement the communication interface, the application program interface and implementation recommendations. However, the objective of the standard is that the information associated with a single wind power plant component (such as a wind turbine) is accessible through a corresponding logical device.

IEC 61400-25-2 specifies the information model of devices and functions related to wind power plant applications. In particular, it specifies the compatible logical node names, and data names for communication between wind power plant components. This includes the relationship between logical devices, logical nodes and data. The names defined in the IEC 61400-25 series are used to build the hierarchical object references applied for communicating with components in wind power plants.

This part of IEC 61400-25 specifies common attribute types and common data classes related to wind turbine applications. In particular it specifies common data classes for:

- setpoint value,
- status value,
- alarm,
- command,
- event counting,
- state timing,
- alarm set status.

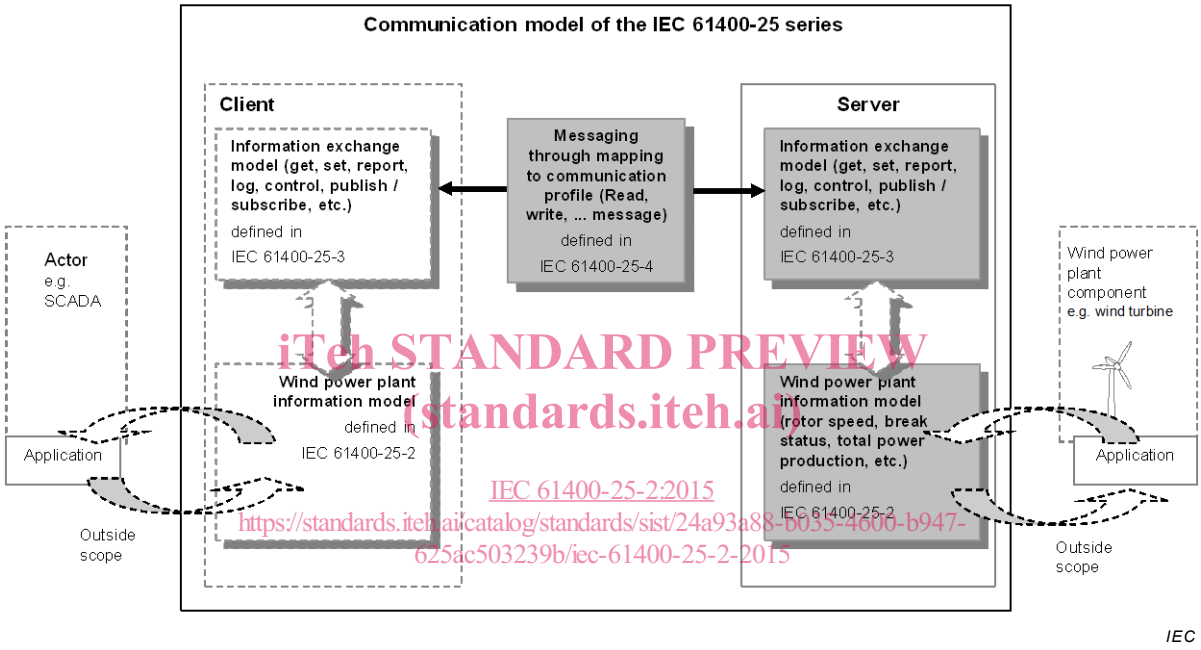

Figure 1 – Conceptual communication model of the IEC 61400-25 series

Devices implementing the information model of this part choose one or more logical nodes as required by the application.

NOTE 1 The IEC 61400-25 series 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 or by user groups.

NOTE 2 This part does not provide tutorial material.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. 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 61400-25-1, *Wind turbines – Part 25-1: Communications for monitoring and control of wind power plants – Overall description of principles and models*

IEC 61400-25-3:2015, *Wind turbines – Part 25-3: Communications for monitoring and control of wind power plants – Information exchange models*

IEC 61400-25-4:___[1], *Wind turbines – Part 25-4: Communications for monitoring and ontrol of wind power plants – Mapping to communication profile*

IEC TS 61400-26-1:2011, *Wind turbines – Part 26-1: Time-based availability for wind turbine generating systems*

IEC 61850-5, *Communication networks and systems for power utility automation – Part 5: Communication requirements for functions and device models*

IEC 61850-7-1:2011, *Communication networks and systems for power utility automation – Part 7-1: Basic communication structure – Principles and models*

IEC 61850-7-2:2010, *Communication networks and systems for power utility automation – Part 7-2: Basic information and communication structure – Abstract communication service interface (ACSI)*

IEC 61850-7-3:2010, *Communication networks and systems for power utility automation – Part 7-3: Basic communication structure – Common data classes*

IEC 61850-7-4:2010, *Communication networks and systems for power utility automation – Part 7-4: Basic communication structure – Compatible logical node classes and data object classes*

ISO 639 (all parts), *Codes for the representation of names of languages*

ISO 80000-1, *Quantities and units – Part 1: General*

ISO 3166 (all parts), *Codes for the representation of names of countries and their subdivisions*

IEEE 754, *Standard for Binary Floating-Point Arithmetic*

[1] To be published.

3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 61400-25-1 as well as the following apply.

3.1
conditional
attribute of a common data class provided by an implementation of the IEC 61400-25 series if a certain condition corresponding with the attribute is true

3.2
mandatory
defined content shall be provided in compliance with the IEC 61400-25 series

3.3
optional
defined content can be optionally provided in compliance with the IEC 61400-25 series

4 Abbreviated terms

CDC	Common Data Class
DC	Data Class
IED	Intelligent Electronic Device
LCB	Log Control Block
LD	Logical Device
LN	Logical Node
LPHD	Logical node Physical Device information
RCB	Report Control Block
SBO	Select Before Operate
WPP	Wind Power Plant
WT	Wind Turbine
XML	Extensible Markup Language

Abbreviated terms used to build names of data objects found in LNs shall be as listed below.

EXAMPLE RotPos is constructed by using two names "Rot" which stands for Rotor and "Pos" which stands for "Position". Thus the concatenated name represents a "Rotor Position".

Term	Description
A	Current
AC	AC, alternating current
Acs	Access
Act	Action, activity, active, activate
Alm	Alarm
Alt	Altitude
An	Analogue
Ane	Anemometer
Ang	Angle
Avl	Availability
Bec	Beacon
Beh	Behaviour
Bl	Blade
Blb	Bulb
Blk	Block, blocked
Brg	Bearing
Brk	Brake
Cab	Cable
Cap	Capability, capacity
Ccw	Counter clockwise
Chk	Check
Chr	Characteristic
Cl	Cooling, cooling system
Clc	Calculate, calculated, calculation
Cloud	Cloud
Cmd	Command
Cnt	Counter, counting
Cnv	Converter
Ctl	Control
Cut	Cut, cut-out, cut-in
Cvr	Cover, cover level
Cw	Clockwise
DC	DC, direct current
Dcl	DC-link
Dct	Direct
Dehum	De-humidifier
Del	Delta
Den	Density
Dev	Device
Dew	Dew
Dff	Diffuse
Dir	Direction
Dl	Daylight
Dmd	Demand
Dn	Down, downstream
Drp	Droop
Dsp	Displacement
Dur	Duration
EE	External equipment
Emg	Emergency

Term	Description
Ena	Enabled, enable, allow operation
Env	Environment
Eq	Equalization, equal
Exp	Expired
Expt	Export
Ext	Excitation
Fil	Filter, filtration, filtration system
Fll	Fall
Flsh	Flash, flashing
Gbx	Gearbox
Gn	Generator
Gr	Group
Gra	Gradient
Gri	Grid
Gs	Grease
Gust	Gust
Health	Health
Hi	High, highest
Hor	Horizontal
Ht	Heating, heating system
Htex	Heat-exchanger
Hub	Hub
Hum	Humidity
Hy	Hydraulic, hydraulic system
Hz	Frequency
Ia	Information available
Iafm	Information available force majeure
Iano	Information available nonoperative
Ianofo	Information available nonoperative forced outage
Ianopca	Information available nonoperative planned corrective actions
Ianos	Information available nonoperative suspended
Ianosm	Information available nonoperative scheduled maintenance
Iao	Information available operative
Iaog	Information available operative generating
Iaogfp	Information available operative generating with full performance
Iaogpp	Information available operative generating with partial performance
Iaong	Information available operative nongenerating
Iaongel	Information available operative nongenerating out of electrical specification
Iaongen	Information available operative nongenerating out of environmental specification
Iaongrs	Information available operative nongenerating requested shutdown
Iaongts	Information available operative nongenerating technical standby