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Wind ~~turbines~~ energy generation systems – Part 25-4: Communications for monitoring and control of wind power plants – Mapping to communication profile

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WIND ~~TURBINES~~ ENERGY GENERATION SYSTEMS –

Part 25-4: Communications for monitoring and control of wind power plants – Mapping to communication profile

FOREWORD

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International Standard IEC 61400-25-4 has been prepared by IEC technical committee 88: Wind energy generation systems.

This second edition cancels and replaces the first edition published in 2008. This edition constitutes a technical revision.

The main technical changes with regard to the previous edition are as follows:

General harmonization with information models in IEC 61400-25-2 and information exchange services in IEC 61400-25-3.

Reduction of overlap between standards and simplification by increased referencing.

For Annex A Webservices: Changes are limited to harmonization with IEC 61850 and with other parts of IEC 61400-25. Updating of webservices to use soap over websockets have been considered.

Maintenance of Annex B OPC/XML-DA included an evaluation of the use of custom item properties. OPC UA was not chosen as basis for IEC 61850-8-2, however the work of TS 61400-25-41 is currently considering if OPC UA can replace the existing OPC/XML-DA mapping in future editions of IEC 61400-25-4. A mapping to OPC UA is thus not part of this second edition of IEC 61400-25-4, but could be submitted as a separate document.

The mapping to IEC 61850-8-1 in Annex C is harmonized with the latest edition of IEC 61850-8-1.

The mapping to IEC 60870-5-104 in Annex D includes further harmonization with IEC 61850-80-1.

Finally, Annex E DNP3 is harmonized with the latest version of IEEE 1815-1. This includes an adaptation to support wind power specific models.

a) Mapping of AddSubscription and RemoveSubscription services have been removed, to be in line with IEC 61400-25-3.
b) Tables indicating services supported have been replaced by tables in accordance with IEC 61400-25-3:2015 Annex D including ACSI conformance statements for clients and servers, individually.
c) Technical issues (Tissues) for IEC 61850-7-2:2010 have been considered and changes have been made accordingly
d) Technical issues (Tissues), as collected by the IEC 61400-25 users group USE61400-25, have been considered, and changes have been made accordingly.
e) The changes made to Annex A includes the following: Mapping to object classes has been removed for objects (Server, LD, LN, Data Set, RCB, UCB, LCB and Log) not used in the services. Object names are defined as names of complex types instead of elements. Faulty references have been removed. WSDL tags have been renamed for better alignment and consistency. Values for maximum message size are specified. Mapping to service GetAllDataValues have been added. Examples have been introduced for typical service requests and responses. A new version of the WSDL has been created, validated with XmlSpy.
f) The changes to Annex B OPC/XML-DA have been made in accordance with the scope of the revision. Main focus has been on the mapping of the Array type, of the GetAllDataValues service, of the report model and the control services.
g) The technical change made to Annex C is an adaptation of TCP/IP Profile services according to the changes in IEC 61850-8-1:2011 (Communication and link redundancy added).

h) The most important change in Annex D is the synchronization with the second edition of referenced IEC 61850 standards. In accordance with the work on IEC 61850-80-1 Edition 2 the new CDCs are mapped to IEC 60870-5-104. Also an interoperability list for the IEC 61400-25-4 Mapping IEC 60870-5-104 has been created, as a subset of the interoperability list of IEC 61850-80-1.

i) Annex E (DNP3) has been updated to use the same approach as IEEE 1815.1. It describes how to translate the IEC 61400-25-2 common data class attributes to DNP3 points. The use of DNP3 datasets described in IEC 61400-25-4:2008 has been removed, as it did not offer a flexible approach to map the IEC 61400-25-2 information.

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

FDIS	Report on voting
88/600/FDIS	88/607/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.

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

For the user's convenience, a file containing the text of Clause A.7 is included with this document.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under "http://webstore.iec.ch" in the data related to the specific document. At this date, the document will be

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

IMPORTANT – The 'colour inside' logo on the cover page of this publication indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.

INTRODUCTION

The IEC 61400-25 series defines communications for monitoring and control of wind power plants. The architecture of the IEC 61400-25 series has been selected to provide an abstract definition of classes and services such that the specifications are independent of specific protocol stacks, implementations, and operating systems. This part of IEC 61400-25 specifies the mapping of these abstract classes and services to protocol stacks.

NOTE 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).

WIND ~~TURBINES~~ ENERGY GENERATION SYSTEMS –

Part 25-4: Communications for monitoring and control of wind power plants – Mapping to communication profile

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:

a) wind power plant information model,

b) information exchange model, and

c) 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 information. 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. 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 IEC 61400-25-3.

– Mapping to a communication profile, providing a protocol stack to carry the messages, i.e. the service requests and responses and the values from the modelled information (IEC 61400-25-4).

IEC 61400-25-5 defines test cases associated with information, services and protocol stacks for conformance testing of both servers and clients.

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 the IEC 61400-25 series specifies the specific mappings to protocol stacks encoding the messages required for the information exchange between a client and a remote 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.

The mappings specified in this part of IEC 61400-25 comprise:

- a mapping to SOAP-based web services,
- a mapping to OPC/XML-DA,
- a mapping to IEC 61850-8-1 MMS,
- a mapping to IEC 60870-5-104,
- a mapping to DNP3.

All mappings are optional, but at least one optional mapping ~~shall~~ needs to be selected in order to be compliant with this part of IEC 61400-25.

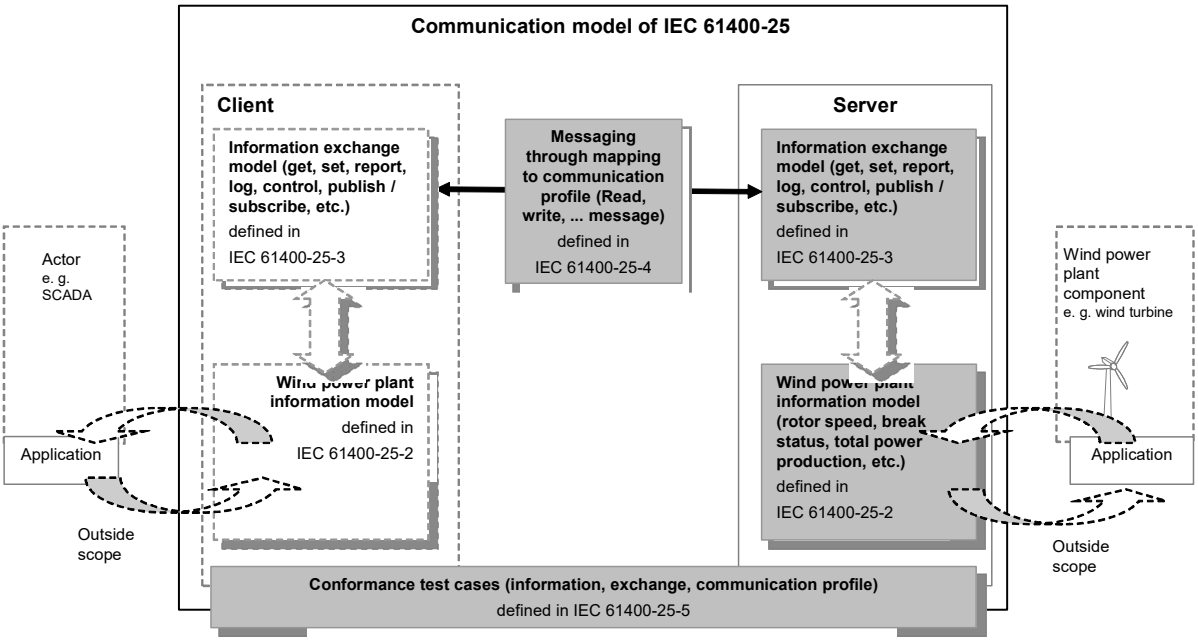


Figure 1 – Conceptual communication model of IEC 61400-25 series

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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.

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IEC 61400-25-4

Edition 2.0 2016-11

INTERNATIONAL STANDARD

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Wind energy generation systems – Part 25-4: Communications for monitoring and control of wind power plants – Mapping to communication profile

Systèmes de génération d'énergie éolienne – Partie 25-4: Communications pour la surveillance et la commande des centrales éoliennes – Mapping pour les profils de communication



IEC 61400-25-4:2016-11(en-fr)

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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WIND ENERGY GENERATION SYSTEMS –

Part 25-4: Communications for monitoring and control of wind power plants – Mapping to communication profile

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 61400-25-4 has been prepared by IEC technical committee 88: Wind energy generation systems.

This second edition cancels and replaces the first edition published in 2008. This edition constitutes a technical revision.

The main technical changes with regard to the previous edition are as follows:

General harmonization with information models in IEC 61400-25-2 and information exchange services in IEC 61400-25-3.

Reduction of overlap between standards and simplification by increased referencing.

For Annex A Webservices: Changes are limited to harmonization with IEC 61850 and with other parts of IEC 61400-25. Updating of webservices to use soap over websockets have been considered.

Maintenance of Annex B OPC/XML-DA included an evaluation of the use of custom item properties. OPC UA was not chosen as basis for IEC 61850-8-2, however the work of TS 61400-25-41 is currently considering if OPC UA can replace the existing OPC/XML-DA mapping in future editions of IEC 61400-25-4. A mapping to OPC UA is thus not part of this second edition of IEC 61400-25-4, but could be submitted as a separate document.

The mapping to IEC 61850-8-1 in Annex C is harmonized with the latest edition of IEC 61850-8-1.

The mapping to IEC 60870-5-104 in Annex D includes further harmonization with IEC 61850-80-1.

Finally, Annex E DNP3 is harmonized with the latest version of IEEE 1815-1. This includes an adaptation to support wind power specific models.

a) Mapping of AddSubscription and RemoveSubscription services have been removed, to be in line with IEC 61400-25-3.

b) Tables indicating services supported have been replaced by tables in accordance with IEC 61400-25-3:2015 Annex D including ACSI conformance statements for clients and servers, individually.

c) Technical issues (Tissues) for IEC 61850-7-2:2010 have been considered and changes have been made accordingly

d) Technical issues (Tissues), as collected by the IEC 61400-25 users group USE61400-25, have been considered, and changes have been made accordingly.

e) The changes made to Annex A includes the following: Mapping to object classes has been removed for objects (Server, LD, LN, Data Set, RCB, UCB, LCB and Log) not used in the services. Object names are defined as names of complex types instead of elements. Faulty references have been removed. WSDL tags have been renamed for better alignment and consistency. Values for maximum message size are specified. Mapping to service GetAllDataValues have been added. Examples have been introduced for typical service requests and responses. A new version of the WSDL has been created, validated with XmlSpy.

f) The changes to Annex B OPC/XML-DA have been made in accordance with the scope of the revision. Main focus has been on the mapping of the Array type, of the GetAllDataValues service, of the report model and the control services.

g) The technical change made to Annex C is an adaptation of TCP/IP Profile services according to the changes in IEC 61850-8-1:2011 (Communication and link redundancy added).

h) The most important change in Annex D is the synchronization with the second edition of referenced IEC 61850 standards. In accordance with the work on IEC 61850-80-1 Edition 2 the new CDCs are mapped to IEC 60870-5-104. Also an interoperability list for the IEC 61400-25-4 Mapping IEC 60870-5-104 has been created, as a subset of the interoperability list of IEC 61850-80-1.

i) Annex E (DNP3) has been updated to use the same approach as IEEE 1815.1. It describes how to translate the IEC 61400-25-2 common data class attributes to DNP3 points. The use of DNP3 datasets described in IEC 61400-25-4:2008 has been removed, as it did not offer a flexible approach to map the IEC 61400-25-2 information.

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

FDIS	Report on voting
88/600/FDIS	88/607/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.

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

For the user's convenience, a file containing the text of Clause A.7 is included with this document.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under "http://webstore.iec.ch" in the data related to the specific document. At this date, the document will be

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

IMPORTANT – The 'colour inside' logo on the cover page of this publication indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.

INTRODUCTION

The IEC 61400-25 series defines communications for monitoring and control of wind power plants. The architecture of the IEC 61400-25 series has been selected to provide an abstract definition of classes and services such that the specifications are independent of specific protocol stacks, implementations, and operating systems. This part of IEC 61400-25 specifies the mapping of these abstract classes and services to protocol stacks.

NOTE 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).

WIND ENERGY GENERATION SYSTEMS –

Part 25-4: Communications for monitoring and control of wind power plants – Mapping to communication profile

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:

a) wind power plant information model,

b) information exchange model, and

c) 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 information. 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. 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 IEC 61400-25-3.

– Mapping to a communication profile, providing a protocol stack to carry the messages, i.e. the service requests and responses and the values from the modelled information (IEC 61400-25-4).

IEC 61400-25-5 defines test cases associated with information, services and protocol stacks for conformance testing of both servers and clients.

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 the IEC 61400-25 series specifies the specific mappings to protocol stacks encoding the messages required for the information exchange between a client and a remote 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.

The mappings specified in this part of IEC 61400-25 comprise:

- a mapping to SOAP-based web services,
- a mapping to OPC/XML-DA,
- a mapping to IEC 61850-8-1 MMS,
- a mapping to IEC 60870-5-104,
- a mapping to DNP3.

All mappings are optional, but at least one optional mapping needs to be selected in order to be compliant with this part of IEC 61400-25.

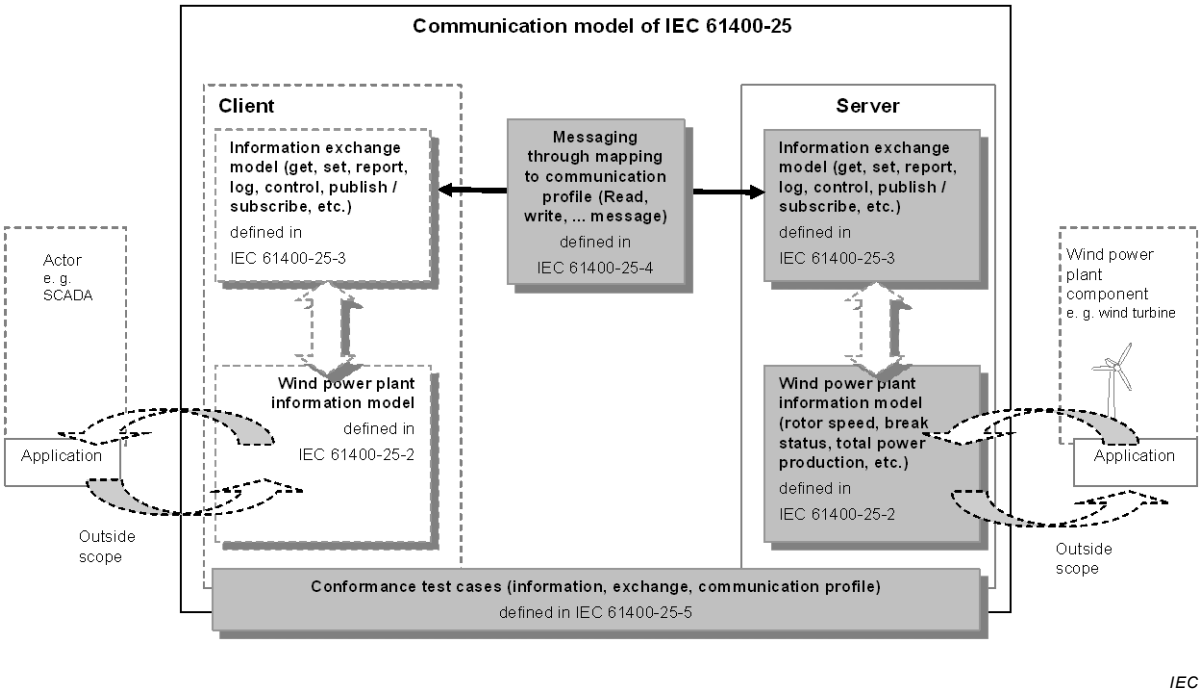


Figure 1 – Conceptual communication model of IEC 61400-25 series

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 60870-5-4:1993, *Telecontrol equipment and systems – Part 5: Transmission protocols – Section 4: Definition and coding of application information elements*

IEC 60870-5-5:1995, *Telecontrol equipment and systems – Part 5: Transmission protocols – Section 5: Basic application functions*

IEC 60870-5-101:2003, *Telecontrol equipment and systems – Part 5-101: Transmission protocols – Companion standard for basic telecontrol tasks*

IEC 60870-5-104:2006, *Telecontrol equipment and systems – Part 5-104: Transmission protocols – Network access for IEC 60870-5-101 using standard transport profiles*

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*

IEC 61400-25-2:2015, *Wind turbines – Part 25-2: Communications for monitoring and control of wind power plants – Information models*

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

IEC 61400-25-5:2006, *Wind turbines – Part 25-5: Communications for monitoring and control of wind power plants – Conformance testing*

IEC 61850-6:2009, *Communication networks and systems for power utility automation – Part 6: Configuration description language for communication in electrical substations related to IEDs*

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 61850-8-1:2011, *Communication networks and systems for power utility automation – Part 8-1: Specific Communication Service Mapping (SCSM) – Mappings to MMS (ISO 9506-1 and ISO 9506-2) and to ISO/IEC 8802-3*

IEC TS 61850-80-1:2008, *Communication networks and systems for power utility automation – Part 80-1: Guideline to exchanging information from a CDC-based data model using IEC 60870-5-101 or IEC 60870-5-104*

IEC 62439-3:2016, *Industrial communication networks – High availability automation networks – Part 3: Parallel Redundancy Protocol (PRP) and High-availability Seamless Redundancy (HSR)*

ISO 639-2, *Codes for the representation of names of languages – Part 2: Alpha-3 code*

ISO/IEC 8326:1996, *Information technology – Open Systems Interconnection – Session service definition*

ISO/IEC 8327-1:1996, *Information technology – Open Systems Interconnection – Connection-oriented Session protocol: Protocol specification*

ISO/IEC 8649:1996, *Information technology – Open Systems Interconnection – Service definition for the Association Control Service Element*

ISO/IEC 8650-1:1996, *Information technology – Open Systems Interconnection – Connection-oriented protocol for the Association Control Service Element: Protocol specification*

ISO/IEC 8822:1994, *Information technology – Open Systems Interconnection – Presentation service definition*

ISO/IEC 8823-1:1994, *Information technology – Open Systems Interconnection – Connection-oriented presentation protocol: Protocol specification*

ISO/IEC 8824-1:2015, *Information technology – Abstract Syntax Notation One (ASN.1): Specification of basic notation*

ISO/IEC 8825-1:2015, *Information technology – ASN.1 encoding rules: Specification of Basic Encoding Rules (BER), Canonical Encoding Rules (CER) and Distinguished Encoding Rules (DER)*

ISO 9506-1:2003, *Industrial automation systems – Manufacturing Message Specification – Part 1: Service definition*

ISO 9506-2:2003, *Industrial automation systems – Manufacturing Message Specification – Part 2: Protocol specification*

W3C, *Web Services Architecture,* http://www.w3.org/TR/2002/WD-ws-arch-20021114/

W3C, *Extensible Markup Language (XML) 1.0*, http://www.w3.org/TR/2000/REC-xml-20001006

SOAP ver. 1.1*, W3C Note Simple Object Access Protocol (SOAP) 1.1,* 8 May 2000. http://www.w3.org/TR/2006/NOTE-soap11-ror-httpbinding-20060321/#reqoptrespbinding and http://www.w3.org/TR/2000/NOTE-SOAP-20000508/
(Referenced in Annex B)

SOAP ver. 1.2*, W3C, 27. April 2007:* http://www.w3.org/TR/soap
(Referenced in Annex A)

RFC 791, *Internet Protocol specification (IP)*

RFC 792, *Internet Control Message Protocol (ICMP)*

RFC 793, *Transmission Control Protocol (TCP)*

RFC 826, *Ethernet Address Resolution Protocol*

RFC 919, *Broadcasting internet datagrams*

RFC 922, *Broadcasting internet datagrams in presence of subnets*

RFC 950, *Internet Standard Subnetting Procedure*

RFC 1006, *ISO Transport Service on top of the TCP Version: 3*

RFC 1112, *Host Extensions for IP Multicasting*

RFC 1122, *Requirements for Internet Hosts – Communication Layers, IETF*

RFC 2200, *Internet Official Protocol Standards, Request for Comments 2200, June 1997*

RFC 2616, *Hypertext Transfer Protocol – HTTP/1.1*

RFC 2817, *Upgrading to TLS Within HTTP/1.1*

RFC 4122, *Universally Unique IDentifier (UUID) URN Namespace*

RFC 5246, *Transport Layer Security (TLS version 1.2) protocol*

OPC XML-DA Specification. Version1.01, 18 December 2004

IEEE Std 754:1985,*IEEE Standard for Binary Floating-Point Arithmetic*

IEEE 802.1D:2004, *IEEE Standard for Local and Metropolitan Area Networks: Media access control (MAC) Bridges*

IEEE P1815.1:2015, *Standard for exchanging Information between networks implementing IEC 61850 and IEEE Std 1815 (Distributed Network Protocol – DNP3)*

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COMMISSION ÉLECTROTECHNIQUE INTERNATIONALE

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SYSTÈMES DE GÉNÉRATION D'ÉNERGIE ÉOLIENNE –

Partie 25-4: Communications pour la surveillance et la commande des centrales éoliennes – Mapping pour les profils de communication

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La Norme internationale IEC 61400-25-4 a été établie par le comité d'études 88 de l'IEC: Systèmes de génération d'énergie éolienne.

Cette deuxième édition annule et remplace la première édition parue en 2008. Cette édition constitue une révision technique.

Cette édition inclut les modifications techniques majeures suivantes par rapport à l'édition précédente:

Harmonisation générale avec les modèles d'information de l'IEC 61400-25-2 et les services d'échange d'information de l'IEC 61400-25-3.

Réduction de l'écart entre les normes et simplification grâce à un référencement amélioré.

Pour les services web de l'Annexe A: les modifications sont limitées à l'harmonisation avec l'IEC 61850 et avec d'autres parties de l'IEC 61400-25. La mise à jour des services web pour l'utilisation de SOAP plutôt que de websockets a été prise en compte.

La maintenance du service OPC/XML-DA de l'Annexe B a inclus une évaluation de l'utilisation de propriétés d'éléments personnalisés. L'OPC UA n'a pas été choisie comme base pour l'IEC 61850-8-2. Toutefois, dans le cadre des travaux sur la TS 61400-25-41, l'OPC UA est actuellement envisagée pour remplacer le mapping pour OPC/XML-DA existant dans les éditions futures de l'IEC 61400-25-4. Par conséquent, la deuxième édition de l'IEC 61400-25-4 ne comprend pas de mapping pour OPC UA, mais cela pourrait faire l'objet d'un document séparé.

Le mapping de l'Annexe C pour l'IEC 61850-8-1 est harmonisé avec la dernière édition de l'IEC 61850-8-1.

Le mapping de l'Annexe D pour l'IEC 60870-5-104 inclut une harmonisation supplémentaire avec l'IEC 61850-80-1.

Enfin, le DNP3 de l'Annexe E est harmonisé avec la dernière édition de l'IEEE 1815-1. Elle comprend une adaptation pour la prise en charge des modèles spécifiques d'éoliennes.

a) Le mapping des services AddSubscription et RemoveSubscription a été supprimé pour alignement avec l'IEC 61400-25-3.

b) Les tableaux indiquant les services pris en charge ont été remplacés par des tableaux conformes à l'Annexe D de l'IEC 61400-25-3:2015 et comprenant les déclarations de conformité ACSI pour les clients et les serveurs, de façon individuelle.

c) Les problèmes techniques (Tissues) de l'IEC 61850-7-2:2010 ont été pris en considération et des modifications ont été apportées en conséquence.

d) Les problèmes techniques (Tissues), tels que rassemblés par le groupe d'utilisateurs USE61400-25 de l'IEC 61400-25, ont été pris en considération et des modifications ont été apportées en conséquence.

e) Les modifications apportées à l'Annexe A incluent les éléments suivants: le mapping pour les classes d'objets a été supprimé pour les objets (Server, LD, LN, Data Set, RCB, UCB, LCB et Log) non utilisés dans les services. Les noms d'objets sont définis comme étant des noms de types complexes au lieu d'éléments. Les références erronées ont été supprimées. Les balises WSDL ont été renommées pour un meilleur alignement et une meilleure cohérence. Les valeurs de la taille maximale des messages sont indiquées. Le mapping pour le service GetAllDataValues a été ajouté. Des exemples de demandes et de réponses types de services ont été ajoutés. Une nouvelle version de WSDL a été créée et validée par XmlSpy.

f) Les modifications apportées à l'Annexe B OPC/XML-DA ont été effectuées conformément à l'étendue de la révision. L'accent a été mis sur le mapping du type Array, du service GetAllDataValues, du modèle de rapport et des services de commande.

g) La modification technique apportée à l'Annexe C est une adaptation des services de Profil TCP/IP selon les modifications apportées à l'IEC 61850-8-1:2011 (la redondance de communication et de liaison a été ajoutée).

h) La modification la plus importante de l'Annexe D est la synchronisation avec la deuxième édition des normes IEC 61850 référencées. Conformément aux travaux réalisés sur l'Édition 2 de l'IEC 61850-80-1, les nouveaux CDC sont mappés pour l'IEC 60870-5-104. Une liste d'interopérabilité pour le mapping de l'IEC 61400-25-4 et de l'IEC 60870-5-104 a également été créée sous la forme d'un sous-ensemble de la liste d'interopérabilité de l'IEC 61850-80-1.

i) L'Annexe E (DNP3) a été mise à jour afin d'utiliser la même approche que l'IEEE 1815.1. Elle décrit la façon de traduire les attributs des classes de données communes de l'IEC 61400-25-2 en points DNP3. L'utilisation d'ensembles de données DNP3 décrite

dans l'IEC 61400-25-4:2008 a été supprimée car elle n'offrait pas une approche suffisamment souple du mapping pour les informations de l'IEC 61400-25-2.

Le texte de cette norme est issu des documents suivants:

FDIS	Rapport de vote
88/600/FDIS	88/607/RVD

Le rapport de vote indiqué dans le tableau ci-dessus donne toute information sur le vote ayant abouti à l'approbation de cette norme.

Cette publication a été rédigée selon les Directives ISO/IEC, Partie 2.

Une liste de toutes les parties de la série IEC 61400, publiées sous le titre général *Systèmes de génération d'énergie éolienne,* peut être consultée sur le site web de l'IEC.

Un fichier contenant le texte de l'Article A.7 est joint au présent document à l'intention des utilisateurs.

Le comité a décidé que le contenu de cette publication ne sera pas modifié avant la date de stabilité indiquée sur le site web de l'IEC sous "http://webstore.iec.ch" dans les données relatives à la publication recherchée. A cette date, la publication sera

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- supprimée,
- remplacée par une édition révisée, ou
- amendée.

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INTRODUCTION

La série IEC 61400-25 définit les communications pour la surveillance et la commande des centrales éoliennes. L'architecture de la série IEC 61400-25 a été choisie de manière à fournir une définition abstraite des classes et services afin que les spécifications soient indépendantes des spécificités des piles de protocoles de communication, de leurs mises en œuvre et des systèmes d'exploitation. La présente partie de l'IEC 61400-25 spécifie le mapping de ces classes et services abstraits pour les piles de protocoles.

NOTE Les performances liées à la mise en œuvre de la série IEC 61400-25 sont spécifiques à l'application. La série IEC 61400-25 ne garantit pas un certain niveau de performance. Ce type de garantie ne relève pas du domaine d'application de la série IEC 61400-25. Toutefois, il n'y a pas de limitation sous-jacente à la technologie de communication qui interdit des applications à haut débit (réponses de l'ordre de la milliseconde).

SYSTÈMES DE GÉNÉRATION D'ÉNERGIE ÉOLIENNE –

Partie 25-4: Communications pour la surveillance et la commande des centrales éoliennes – Mapping pour les profils de communication

1 Domaine d'application

La série IEC 61400-25 concerne essentiellement les communications entre les composants des centrales éoliennes tels que les éoliennes et des acteurs tels que les systèmes SCADA. La communication interne entre les composants des centrales éoliennes ne relève pas du domaine d'application de la série IEC 61400-25.

La série IEC 61400-25 est conçue pour un environnement de communication fondé sur un modèle client-serveur. Trois domaines sont définis et ils sont modélisés séparément pour assurer l'extensibilité des systèmes mis en œuvre:

a) le modèle d'information de centrale éolienne,

b) le modèle d'échange d'information, et

c) le mapping de ces deux modèles pour un profil de communication standard.

Le modèle d'information de centrale éolienne et le modèle d'échange d'information, considérés ensemble, constituent une interface entre le client et le serveur. Dans cette combinaison, le modèle d'information de centrale éolienne sert de trame pour interpréter les informations disponibles de la centrale éolienne. Le modèle d'information de centrale éolienne est utilisé par le serveur pour fournir au client une vue uniforme, orientée composant, des données de la centrale éolienne. Le modèle d'échange d'information représente toutes les fonctions actives du serveur. La série IEC 61400-25 permet de connecter entre eux une combinaison hétérogène de clients et de serveurs issus de différents constructeurs et fournisseurs.

Comme cela est représenté à la Figure 1, la série IEC 61400-25 définit un serveur ayant les aspects suivants:

– Les informations fournies par un composant de centrale éolienne, par exemple, la "vitesse de rotor d'une éolienne" ou la "production d'électricité totale durant un certain intervalle de temps" sont modélisées et rendues accessibles. Les informations modélisées dans la série IEC 61400-25 sont définies dans l'IEC 61400-25-2.
– Les services pour échanger les valeurs des informations modélisées définies dans l'IEC 61400 25-3.
– Le mapping pour un profil de communication, fournissant une pile de protocoles pour transporter les messages, c'est-à-dire les demandes et réponses de service et les valeurs provenant des informations modélisées (IEC 61400-25-4).

L'IEC 61400-25-5 définit les essais associés aux informations, services et piles de protocoles, pour les essais de conformité des serveurs comme des clients.

La série IEC 61400-25 définit uniquement la façon de modéliser les informations, l'échange d'information et le mapping pour des protocoles de communication spécifiques. La série IEC 61400-25 ne définit pas comment et où mettre en œuvre l'interface de communication, l'interface de programmation d'application et les recommandations de mise en œuvre. Toutefois, la série IEC 61400-25 a pour objet de permettre l'accès aux informations associées à un composant individuel de la centrale éolienne (tel qu'une éolienne) à travers un dispositif logique correspondant.

La présente partie de la série IEC 61400-25 indique les mappings spécifiques pour les piles de protocoles qui codent les messages exigés pour les échanges d'information entre un client et un serveur à distance, pour:

– l'accès et la récupération de données,
– la commande de dispositif,
– l'établissement de rapports et la journalisation,
– l'éditeur/l'abonné,
– l'autodescription des dispositifs (dictionnaire de données des dispositifs),
– l'établissement de types de données et la découverte des types de données.

Les mappings indiqués dans la présente partie de l'IEC 61400-25 comprennent:

– un mapping pour les services web basés sur SOAP,
– un mapping pour OPC/XML-DA,
– un mapping pour l'IEC 61850-8-1 MMS,
– un mapping pour l'IEC 60870-5-104,
– un mapping pour DNP3.

Tous les mappings sont facultatifs, mais il est nécessaire de sélectionner au moins un mapping facultatif afin d'être conforme à la présente partie de l'IEC 61400-25.

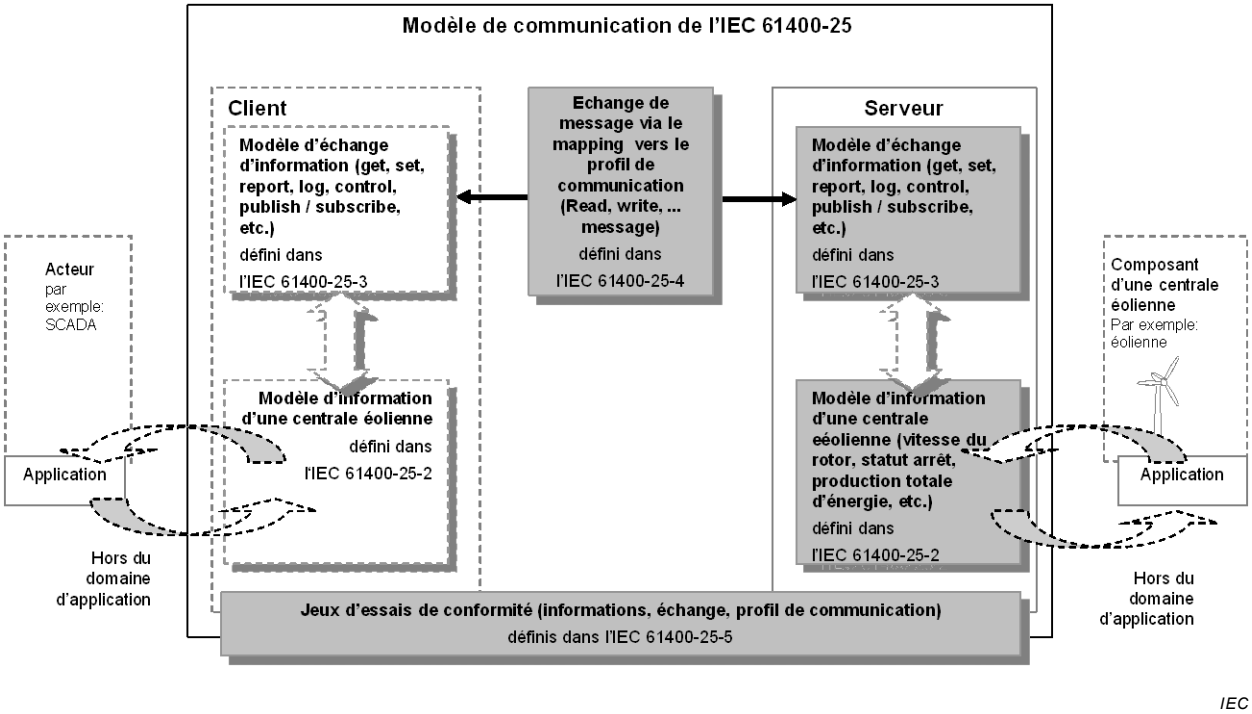


Figure 1 – Modèle de communication conceptuelle de la série IEC 61400-25

2 Références normatives

Les documents suivants cités dans le texte constituent, pour tout ou partie de leur contenu, des exigences du présent document. Pour les références datées, seule l'édition citée s'applique. Pour les références non datées, la dernière édition du document de référence s'applique (y compris les éventuels amendements).

IEC 60870-5-4:1993, *Matériels et systèmes de téléconduite – Partie 5: Protocoles de transmission – Section 4: Définition et codages des éléments d'information d'application*

IEC 60870-5-5:1995, *Matériels et systèmes de téléconduite – Partie 5: Protocoles de transmission Section – Section 5: Fonctions d'application de base*

IEC 60870-5-101:2003, *Telecontrol equipment and systems – Part 5-101: Transmission protocols – Companion standard for basic telecontrol tasks* (disponible en anglais seulement)

IEC 60870-5-104:2006, *Matériels et systèmes de téléconduite – Partie 5-104: Protocoles de transmission – Accès aux réseaux utilisant des profils de transport normalisés pour la CEI 60870-5-101*

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* (disponible en anglais seulement)

IEC 61400-25-2:2015, *Eoliennes – Partie 25-2: Communications pour la surveillance et la commande des centrales éoliennes – Modèles d'information*

IEC 61400-25-3:2015, *Eoliennes – Partie 25-3: Communications pour la surveillance et la commande des centrales éoliennes – Modèles d'échange d'information*

IEC 61400-25-5:2006, *Wind turbines – Part 25-5: Communications for monitoring and control of wind power plants – Conformance testing* (disponible en anglais seulement)

IEC 61850-6:2009, *Communication networks and systems in substations – Part 6: Configuration description language for communication in electrical substations related to IEDs* (disponible en anglais seulement)

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)* (disponible en anglais seulement)

IEC 61850-7-3:2010, *Réseaux et systèmes de communication pour l'automatisation des systèmes électriques – Partie 7-3: Structure de communication de base – Classes de données communes*

IEC 61850-8-1:2011, *Réseaux et systèmes de communication pour l'automatisation des systèmes électriques – Partie 8-1: Mise en correspondance des services de communication spécifiques (SCSM) – Mise en correspondance pour MMS (ISO 9506-1 et ISO 9506-2) et pour l'ISO/CEI 8802-3*

IEC TS 61850-80-1:2008, *Communication networks and systems for power utility automation – Part 80-1: Guideline to exchanging information from a CDC-based data model using IEC 60870-5-101 or IEC 60870-5-104* (disponible en anglais seulement)

IEC 62439-3:2016, *Réseaux de communication industriels – Réseaux d'automatisme à haute disponibilité – Partie 3: Protocole de redondance en parallèle (PRP) et redondance transparente de haute disponibilité (HSR)*

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