IEC 61400-25-4

Edition 2.0 2016-11

INTERNATIONAL STANDARD

NORME INTERNATIONALE

colour inside

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 (en-fr)

IEC Central Office
3, rue de Varembé
CH-1211 Geneva 20
Switzerland

Tel.: +41 22 919 02 11
Fax: +41 22 919 03 00
info@iec.ch
www.iec.ch

About the IEC
The International Electrotechnical Commission (IEC) is the leading global organization that prepares and publishes International Standards for all electrical, electronic and related technologies.

About IEC publications
The technical content of IEC publications is kept under constant review by the IEC. Please make sure that you have the latest edition, a corrigenda or an amendment might have been published.

IEC Catalogue - webstore.iec.ch/catalogue
The stand-alone application for consulting the entire bibliographical information on IEC International Standards, Technical Specifications, Technical Reports and other documents. Available for PC, Mac OS, Android Tablets and iPad.

IEC publications search - www.iec.ch/searchpub
The advanced search enables to find IEC publications by a variety of criteria (reference number, text, technical committee,…). It also gives information on projects, replaced and withdrawn publications.

IEC Just Published - webstore.iec.ch/justpublished
Stay up to date on all new IEC publications. Just Published details all new publications released. Available online and also once a month by email.

Electropedia - www.electropedia.org
The world's leading online dictionary of electronic and electrical terms containing 20 000 terms and definitions in English and French, with equivalent terms in 15 additional languages. Also known as the International Electrotechnical Vocabulary (IEV) online.

IEC Glossary - std.iec.ch/glossary
65 000 electrotechnical terminology entries in English and French extracted from the Terms and Definitions clause of IEC publications issued since 2002. Some entries have been collected from earlier publications of IEC TC 37, 77, 86 and CISPR.

IEC Customer Service Centre - webstore.iec.ch/csc
If you wish to give us your feedback on this publication or need further assistance, please contact the Customer Service Centre: csc@iec.ch.

A propos de l'IEC
La Commission Electrotechnique Internationale (IEC) est la première organisation mondiale qui élabore et publie des Normes internationales pour tout ce qui a trait à l'électricité, à l'électronique et aux technologies apparentées.

A propos des publications IEC
Le contenu technique des publications IEC est constamment revu. Veuillez vous assurer que vous possédez l'édition la plus récente, un corrigendum ou amendement peut avoir été publié.

Catalogue IEC - webstore.iec.ch/catalogue
Application autonome pour consulter tous les renseignements bibliographiques sur les Normes internationales, Spécifications techniques, Rapports techniques et autres documents de l'IEC. Disponible pour PC, Mac OS, tablettes Android et iPad.

Recherche de publications IEC - www.iec.ch/searchpub
La recherche avancée permet de trouver des publications IEC en utilisant différents critères (numéro de référence, texte, comité d'études,…). Elle donne aussi des informations sur les projets et les publications remplacées ou retirées.

IEC Just Published - webstore.iec.ch/justpublished
Restez informé sur les nouvelles publications IEC. Just Published détaille les nouvelles publications parues. Disponible en ligne et aussi une fois par mois par email.

Electropedia - www.electropedia.org
Le premier dictionnaire en ligne de termes électroniques et électriques. Il contient 20 000 termes et définitions en anglais et en français, ainsi que les termes équivalents dans 15 langues additionnelles. Egalement appelé Vocabulaire Electrotechnique International (IEV) en ligne.

Glossaire IEC - std.iec.ch/glossary
65 000 entrées terminologiques électrotechniques, en anglais et en français, extraites des articles Termes et Définitions des publications IEC parues depuis 2002. Plus certaines entrées antérieures extraites des publications des CE 37, 77, 86 et CISPR de l'IEC.

Service Clients - webstore.iec.ch/csc
Si vous désirez nous donner des commentaires sur cette publication ou si vous avez des questions contactez-nous: csc@iec.ch.

IEC 61400-25-4

Edition 2.0 2016-11

INTERNATIONAL STANDARD

NORME INTERNATIONALE

colour inside

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

INTERNATIONAL ELECTROTECHNICAL COMMISSION

COMMISSION ELECTROTECHNIQUE INTERNATIONALE

ICS 27.180

ISBN 978-2-8322-3760-1

CONTENTS

INTERNATIONAL ELECTROTECHNICAL COMMISSION

_____

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.
2) The formal decisions or agreements of 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 IEC National Committees.
3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
6) All users should ensure that they have the latest edition of this publication.
7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

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: