SVENSK STANDARD SS-EN 61400-25-4

Fastställd	Utgåva	Sida	Ansvarig kommitté
2017-04-19	2	1 (1+245)	SEK TK 88

Vindkraftverk – Kommunikation för övervakning och styrning av vindkraftverk – Del 25-4: Mappning till kommunikationsprofil

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

Som svensk standard gäller europastandarden EN 61400-25-4:2017. Den svenska standarden innehåller den officiella engelska språkversionen av EN 61400-25-4:2017.

Nationellt förord

Europastandarden EN 61400-25-4:2017

består av:

– **europastandardens ikraftsättningsdokument,** utarbetat inom CENELEC
– **IEC 61400-25-4, Second edition, 2016 - Wind energy generation systems - Part 25-4: Communications for monitoring and control of wind power plants - Mapping to communication profile**

utarbetad inom International Electrotechnical Commission, IEC.

Tidigare fastställd svensk standard SS-EN 61400-25-4, utgåva 1, 2009, gäller ej fr o m 2020-01-04.

ICS 27.180.00

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EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 61400-25-4

March 2017

ICS 27.180

Supersedes EN 61400-25-4:2008

English Version

Wind energy generation systems - Part 25-4: Communications for monitoring and control of wind power plants - Mapping to communication profile (IEC 61400-25-4:2016)

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)

Windenergieanlagen - Teil 25-4: Kommunikation für die Überwachung und Steuerung von Windenergieanlagen - Abbildung auf ein Kommunikationsprofil (IEC 61400-25-4:2016)

European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

CEN-CENELEC Management Centre: Avenue Marnix 17, B-1000 Brussels

Ref. No. EN 61400-25-4:2017 E

SEK Svensk Elstandard

European foreword

The text of document 88/600/FDIS, future edition 2 of IEC 61400-25-4, prepared by IEC/TC 88 "Wind energy generation systems" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN 61400-25-4:2017.

The following dates are fixed:

- latest date by which the document has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2017-10-04
- latest date by which the national standards conflicting with the document have to be withdrawn (dow) 2020-01-04

This document supersedes EN 61400-25-4:2008.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CENELEC [and/or CEN] shall not be held responsible for identifying any or all such patent rights.

This document has been prepared under a mandate given to CENELEC by the European Commission and the European Free Trade Association.

Endorsement notice

The text of the International Standard IEC 61400-25-4:2016 was approved by CENELEC as a European Standard without any modification.

In the official version, for Bibliography, the following notes have to be added for the standards indicated:

IEC 60870-5-3:1992	NOTE	Harmonized as EN 60870-5-3:1992 (not modified).
IEC 61850-7-1:2011	NOTE	Harmonized as EN 61850-7-1:2011 (not modified).

Annex ZA
(normative)

Normative references to international publications with their corresponding European publications

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.

NOTE 1 When an International Publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

NOTE 2 Up-to-date information on the latest versions of the European Standards listed in this annex is available here: www.cenelec.eu.

Publication	Year	Title	EN/HD	Year
IEC 60870-5-4	1993	Telecontrol equipment and systems - Part 5: Transmission protocols - Section 4: Definition and coding of application information elements	EN 60870-5-4	1993
IEC 60870-5-5	1995	Telecontrol equipment and systems - Part 5: Transmission protocols - Section 5: Basic application functions	EN 60870-5-5	1995
IEC 60870-5-101	2003	Telecontrol equipment and systems - Part 5-101: Transmission protocols - Companion standard for basic telecontrol tasks	EN 60870-5-101	2003
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	EN 60870-5-104	2006
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	EN 61400-25-1	2007
IEC 61400-25-2	2015	Wind turbines - Part 25-2: Communications for monitoring and control of wind power plants - Information models	EN 61400-25-2	2015
IEC 61400-25-3	2015	Wind turbines - Part 25-3: Communications for monitoring and control of wind power plants - Information exchange models	EN 61400-25-3	2015
IEC 61400-25-5	2006	Wind turbines - Part 25-5: Communications for monitoring and control of wind power plants - Conformance testing	EN 61400-25-5	2007

Publication	Year	Title	EN/HD	Year
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	EN 61850-6	2010
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)	EN 61850-7-2	2010
IEC 61850-7-3	2010	Communication networks and systems for power utility automation - Part 7-3: Basic communication structure - Common data classes	EN 61850-7-3	2011
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	EN 61850-8-1	2011
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	CLC/TS 61850-80-1	2010
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	-	-

Publication	Year	Title	EN/HD	Year
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	2002	Web Services Architecture	-	-
W3C XML 1.0	2000	Extensible Markup Language (XML) 1.0	-	-
W3C SOAP 1.1 Note	2000	Simple Object Access Protocol (SOAP) 1.1, Note	-	-
W3C SOAP 1.2	2007	Simple Object Access Protocol (SOAP) 1.2	-	-
RFC 791	-	Internet Protocol - DARPA Internet Program Protocol Specification	-	-
RFC 792	-	Internet Control Message Protocol	-	-
RFC 793	-	Transmission Control Protocol - DARPA Internet Program Protocol Specification	-	-
RFC 826	-	Ethernet Address Resolution Protocol: Or Converting Network Protocol Addresses to 48.bit Ethernet Address for Transmission on Ethernet Hardware	-	-
RFC 919	-	Broadcasting Internet Datagrams	-	-
RFC 922	-	Broadcasting Internet datagrams in the presence of subnets	-	-
RFC 950	-	Internet Standard Subnetting Procedure	-	-
RFC 1006	-	ISO Transport Service on top of the TCP	-	-
RFC 1112	-	Host Extensions for IP Multicasting	-	-
RFC 1122	-	Requirements for Internet Hosts - Communication Layers	-	-
RFC 2200	1997	Internet official protocol Standards	-	-
RFC 2616	-	Hypertext Transfer Protocol - HTTP/1.1	-	-
RFC 2817	-	Upgrading to TLS Within HTTP/1.1	-	-

Publication	Year	Title	EN/HD	Year
RFC 4122	-	A Universally Unique IDentifier (UUID) URN Namespace	-	-
RFC 5246	-	The Transport Layer Security (TLS) Protocol Version 1.2	-	-
OPC XML-DA	2004	OPC XML-DA Specification (Version 1.01)	-	-
IEEE 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	IEEE Unapproved Draft Standard for Exchanging Information between networks Implementing IEC 61850 and IEEE Std 1815(TM) (Distributed Network Protocol - DNP3)	-	-

CONTENTS

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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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:

- 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.

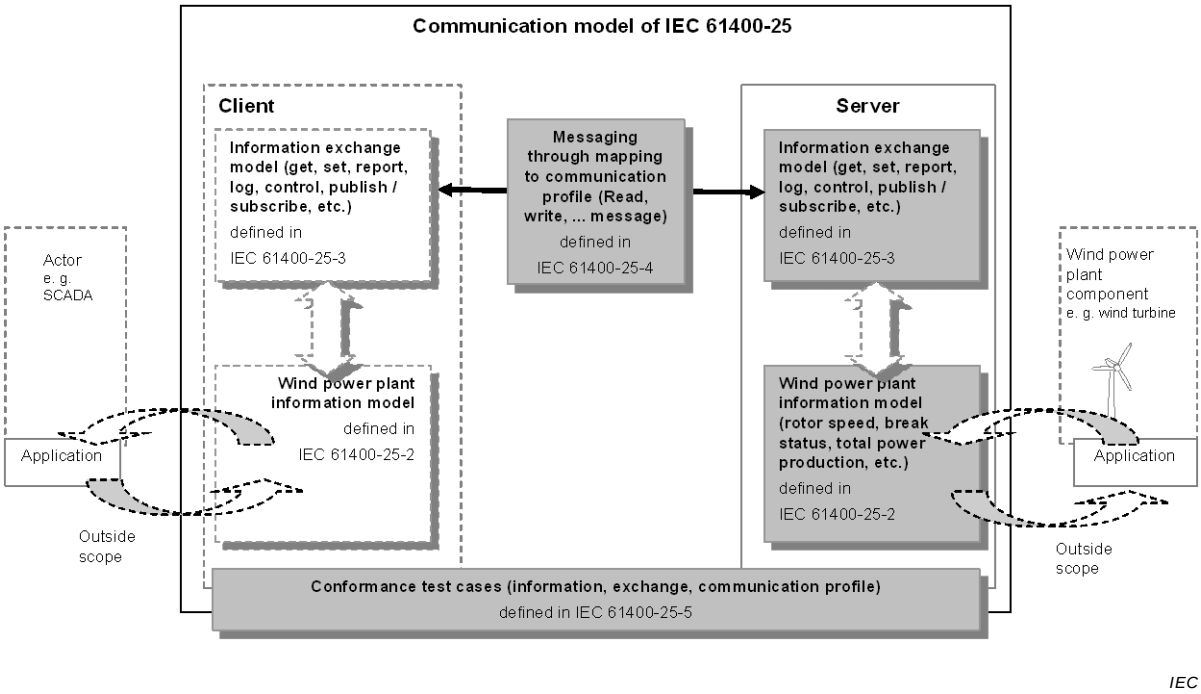

Figure 1 – Conceptual communication model of IEC 61400-25 series

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*

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