



IEC 61850-7-1

Edition 2.1 2020-08
CONSOLIDATED VERSION

Corrected version
2026-08

INTERNATIONAL STANDARD



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



IEC 61850-7-1

Edition 2.1 2020-08
CONSOLIDATED VERSION

Corrected version
2026-08

INTERNATIONAL STANDARD



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

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

ICS 33.200

ISBN 978-2-8322-8823-8

Warning! Make sure that you obtained this publication from an authorized distributor.

CONTENTS

FOREWORD.....	11
INTRODUCTION.....	13
1 Scope.....	14
2 Normative references	15
3 Terms and definitions	16
4 Abbreviated terms	16
5 Overview of the IEC 61850 series concepts.....	17
5.1 Objective	17
5.2 Topology and communication functions of substation automation systems	19
5.3 The information models of substation automation systems	20
5.4 Applications modelled by logical nodes defined in IEC 61850-7-4	22
5.5 The semantic is attached to data	25
5.6 The services to exchange information	27
5.7 Services mapped to concrete communication protocols.....	29
5.8 The configuration of the automation system	29
5.9 Summary	30
6 Modelling approach of the IEC 61850 series.....	31
6.1 Decomposition of application functions and information	31
6.2 Creating information models by stepwise composition.....	33
6.3 Example of an IED composition	35
6.4 Information exchange models	36
6.4.1 General.....	36
6.4.2 Output model	37
6.4.3 Input model.....	41
6.4.4 Model for statistical and historical statistical data.....	51
6.4.5 Model for system functions	54
7 Application view.....	56
7.1 General.....	56
7.2 First modelling step – Logical nodes and data.....	58
7.3 Mode and behaviour of a logical node	61
7.4 Use of measurement ranges and alarms for supervision functions	61
7.5 Data used for limiting the access to control actions	62
7.6 Data used for blocking functions described by logical nodes	62
7.7 Data used for logical node inputs/outputs blocking (operational blocking)	62
7.7.1 General.....	62
7.7.2 Blocking incoming commands	63
7.7.3 Blocking process outputs	63
7.7.4 Blocking the communication of status outputs updates.....	64
7.8 Data used for testing.....	64
7.8.1 General.....	64
7.8.2 Multicast signals used for simulation.....	64
7.8.3 Input signals used for testing	66
7.8.4 Test mode.....	68
7.9 Logical node used for extended logging functions	68
8 Device view	69
8.1 General.....	69

8.2	Second modelling step – logical device model	70
8.2.1	The logical device concept.....	70
8.2.2	The device nameplate.....	71
8.2.3	Gateways and proxies.....	72
8.2.4	Logical devices for monitoring external device health.....	76
8.2.5	Logical devices management hierarchy.....	76
9	Communication view.....	78
9.1	General.....	78
9.2	The service models of the IEC 61850 series	78
9.3	The virtualisation	80
9.4	Basic information exchange mechanisms	81
9.5	The client-server building blocks.....	83
9.5.1	Server.....	83
9.5.2	Client-server roles	84
9.6	Logical nodes communicate with logical nodes	85
9.7	Interfaces inside and between devices	86
10	Where physical devices, application models and communication meet.....	87
11	Relationships between IEC 61850-7-2, IEC 61850-7-3 and IEC 61850-7-4	88
11.1	Refinements of class definitions.....	88
11.2	Example 1 – Logical node and data object class	89
11.3	Example 2 – Relationship of IEC 61850-7-2, IEC 61850-7-3, and IEC 61850-7-4	93
12	Formal specification method	95
12.1	Notation of ACSI classes	95
12.2	Class modelling	95
12.2.1	Overview	95
12.2.2	Common data class	97
12.2.3	Logical node class	101
12.3	Service parameters tables	103
12.4	Referencing instances	104
13	Namespaces.....	107
13.1	General.....	107
13.2	Namespaces defined in the IEC 61850-7-x series	108
13.3	Namespaces dependencies	112
13.3.1	General.....	112
13.3.2	Basic namespaces dependencies	112
13.3.3	Other namespaces dependencies	114
13.4	Specification of namespaces.....	115
13.5	Attributes for references to namespaces	115
13.5.1	General.....	115
13.5.2	Attribute for logical device namespace (IdNs)	116
13.5.3	Attribute for logical device basic namespace (LLN0.NamPit.InNs).....	116
13.5.4	Attribute for logical node namespace (InNs).....	117
13.5.5	Attribute for data namespace (dataNs).....	117
13.5.6	Attribute for common data class namespace (cdcNs)	117
13.5.7	Attribute for naming a common data class name (cdcName)	117
13.6	Deprecation of namespaces	118
14	Common rules for new version of classes and for extension of object classes	118

14.1	General.....	118
14.2	Basic rules	118
14.2.1	General.....	118
14.2.2	Use of optional information	121
14.2.3	General rules for enumerations types and enumeration-based data objects and attributes	121
14.3	Rules for extensions within private namespace	121
14.3.1	Rules for LN classes	121
14.3.2	New LN classes	122
14.3.3	Rules for Common Data Classes	122
14.3.4	Rules for enumeration types and enumeration-based data objects and attributes	123
14.4	Extensions made within product standard namespaces	123
14.5	Extensions made within transitional namespaces	123
14.6	Extensions made within basic and domain namespaces	123
14.7	Multiple instances of LN classes for dedicated and complex functions	124
14.7.1	Example for time overcurrent	124
14.7.2	Example for PDIS	124
14.7.3	Example for power transformer	124
14.7.4	Example for auxiliary network	124
14.8	Specialisation of data by use of number extensions	125
14.9	Examples for new LNs	125
14.10	Example for new Data.....	125
15	Compatibility between different versions of the standard	126
Annex A	(informative) Overview of logical nodes and data	127
A.1	Compatible logical node classes and data classes (IEC 61850-7-4)	127
A.1.1	List of LN groups (IEC 61850-7-4)	127
A.1.2	LN classes (IEC 61850-7-4).....	127
A.1.3	Data object classes (IEC 61850-7-4).....	127
A.2	Common data class specifications (IEC 61850-7-3)	127
Annex B	(informative) Allocation of data to logical nodes	129
Annex C	(informative) Use of the substation configuration language (SCL)	132
C.1	General.....	132
C.2	SCL and options in logical nodes	132
C.3	SCL and options in data	133
Annex D	(xxx)	134
Annex E	(informative) Relation between logical nodes and PICOMs	135
Annex F	(informative) Mapping the ACSI to real communication systems.....	136
F.1	General.....	136
F.1.1	Mapping example (IEC 61850-8-1).....	138
Annex G	(normative) LGOS/LSVS engineering	144
G.1	General.....	144
G.2	LGOS/LSVS engineering by the ICT	145
G.3	LGOS/LSVS engineering by the SCT	146
Annex H	(normative) GOOSE/SMV Subscription Configuration	148
H.1	General.....	148
H.2	SCT supplied input binding workflow.....	149
H.3	ICT supplied input binding (for later binding).....	150

Annex I (informative) Specification of namespaces for Edition 3	151
Annex J (normative) Use case scenarios examples for clarifying the common rules of Clause 14	152
J.1 General.....	152
J.2 Example 1 – Private LN using standardized DOs	152
J.3 Example 2 – Standardized data objects used in standardized LNs	153
J.4 Example 3 – Edition 2 device: standardized data object introduced in IEC61850-7-4:2007B	153
J.5 Example 4 – Edition 2 device: standardized LN introduced in IEC61850-7- 4:2007B	154
J.6 Example 5 – Edition 1 or 2 device: Logical nodes in technical reports	155
J.7 Example 6- Edition 2.1 device: Logical nodes in technical reports defining new CDCs.....	157
J.8 Example 7- Edition 2.1 device: devices for product family standards	158
J.9 Example 8 – Standardized logical nodes introduced by other domain applications	159
J.10 Example 9 – Standardized logical nodes introduced by other domain applications than moved to IEC 61850-7-4	161
Annex K (normative) General requirements and recommendations regarding compatibility issues between different versions of IEC 61850.....	164
K.1 Overview.....	164
K.1.1 General.....	164
K.1.2 Definitions (to go to part 2):	164
K.1.3 Introduction to compatibility discussion	165
K.1.4 Assumptions	165
K.1.5 Generic rules	166
K.1.6 Overview on use cases	167
K.2 Use cases related to the data model	171
K.2.1 Use case 1: Add new type	171
K.2.2 Use case 2: Add new FC.....	171
K.2.3 Use case 3: Extend CDC with elements of existing types and FCs	172
K.2.4 Use case 4: Add a new DataObject (DO) based on new CDCs	173
K.2.5 Use case 5: Add a new DO based on existing CDCs	174
K.2.6 Use case 6: Rename a DO.....	174
K.2.7 Use case 7: Rename a DA, subDO or subDA	174
K.2.8 Use case 8: Deprecation of a FC	175
K.2.9 Use case 9: Deprecation of a DA	176
K.2.10 Use case 10: Removal of a DA	176
K.2.11 Use case 11: Deprecation of a DO	177
K.2.12 Use case 12: Use a weaker presence condition	177
K.2.13 Use case 13: Use a stronger presence condition	178
K.2.14 Use case 14: Extend Enumeration List with an enumerated value	178
K.2.15 Use case 15: Modification of an Enumerated value	179
K.2.16 Use case 16: Deprecation of an Enumerated value	180
K.2.17 Use case 17: Extension of a PACKED LIST	180
K.2.18 Use case 18: Extend Name Length	180
K.3 Use cases related to the services	181
K.3.1 Use case 30: Add new type.....	181
K.3.2 Use case 31: Using new control block class	182
K.3.3 Use case 32: Using new services	182

K.3.4	Use case 33: Extending control block class with an attribute of existing type	183
K.3.5	Use case 34: Rename a service parameter not associated with a control block attribute	183
K.3.6	Use case 35: Removing / Deprecating Control Block Classes	183
K.3.7	Use case 36: Using a stronger presence condition	184
Bibliography		185
Figure 1 – Relations between modelling and mapping parts of the IEC 61850 series		18
Figure 2 – Sample substation automation topology		20
Figure 3 – Modelling approach (conceptual)		21
Figure 4 – Logical node information categories		24
Figure 5 – Build-up of devices (principle)		24
Figure 6 – Position information depicted as a tree (conceptual)		25
Figure 7 – Service excerpt		28
Figure 8 – Example of communication mapping		29
Figure 9 – Summary		31
Figure 10 – Decomposition and composition process (conceptual)		32
Figure 11 – XCBR1 information depicted as a tree		34
Figure 12 – Example of IED composition		36
Figure 13 – Output and input model (principle)		37
Figure 14 – Output model (step 1) (conceptual)		38
Figure 15 – Output model (step 2) (conceptual)		39
Figure 16 – GSE output model (conceptual)		39
Figure 17 – Setting data (conceptual)		40
Figure 18 – Input model for analogue values (step 1) (conceptual)		42
Figure 19 – Range and deadbanded value (conceptual)		43
Figure 20 – Input model for analogue values (step 2) (conceptual)		44
Figure 21 – Reporting and logging model (conceptual)		45
Figure 22 – Data set members and reporting		46
Figure 23 – Buffered report control block (conceptual)		47
Figure 24 – Buffer time		48
Figure 25 – Data set members and inclusion-bitstring		49
Figure 26 – Log control block (conceptual)		49
Figure 27 – Peer-to-peer data value publishing model (conceptual)		50
Figure 28 – Conceptual model of statistical and historical statistical data (1)		52
Figure 29 – Conceptual model of statistical and historical statistical data (2)		54
Figure 30 – Concept of the service tracking model – Example: control service tracking		56
Figure 31 – Real world devices		57
Figure 32 – Logical nodes and data (IEC 61850-7-2)		58
Figure 33 – Simple example of modelling		59
Figure 34 – Basic building blocks		59
Figure 35 – Logical nodes and PICOM		60
Figure 36 – Logical nodes connected (outside view in IEC 61850-7-x series)		60

Figure 37 – Mode and behaviour data (IEC 61850-7-4)	61
Figure 38 – Data used for limiting the access to control actions (IEC 61850-7-4)	62
Figure 39 – Data used for logical node inputs/outputs blocking (IEC 61850-7-4)	63
Figure 40 – Data used for receiving simulation signals	65
Figure 80 – GOOSE subscription supervision state machine	66
Figure 81 – SV subscription supervision state machine	66
Figure 41 – Example of input signals used for testing	67
Figure 42 – Test mode example	68
Figure 43 – Logical node used for extended logging functions (GLOG)	69
Figure 44 – Logical device building block	70
Figure 45 – Logical devices and LLN0/LPHD	71
Figure 46 – The common data class DPL	72
Figure 47 – Logical devices in proxies or gateways	74
Figure 79 – Logical devices in proxies or gateways (functional naming)	75
Figure 48 – Logical devices for monitoring external device health	76
Figure 49 – Logical devices management hierarchy	77
Figure 50 – ACSI communication methods	79
Figure 51 – Virtualisation	81
Figure 52 – Virtualisation and usage	81
Figure 53 – Information flow and modelling	82
Figure 54 – Application of the GSE model	82
Figure 55 – Server building blocks	83
Figure 56 – Interaction between application process and application layer (client/server)	84
Figure 57 – Example for a service	84
Figure 58 – Client/server and logical nodes	84
Figure 59 – Client and server roles	85
Figure 60 – Logical nodes communicate with logical nodes	86
Figure 61 – Interfaces inside and between devices	87
Figure 62 – Component hierarchy of different views (excerpt)	88
Figure 63 – Refinement of the DATA class	89
Figure 64 – Instances of a Data object class (conceptual)	93
Figure 65 – Relation between parts of the IEC 61850 series	94
Figure 66 – Abstract data model example for IEC 61850-7-x	96
Figure 67 – Relation of TrgOp and Reporting	101
Figure 68 – Sequence diagram	104
Figure 69 – References	104
Figure 70 – Use of FCD and FCDA	105
Figure 71 – Object names and object reference	107
Figure 72 – Definition of names and semantics	108
Figure 73 – Name space as class repository	109
Figure 74 – All instances derived from classes in a single name space	110
Figure 75 – Instances derived from multiple namespaces	111

Figure 76 – Inherited namespaces	111
Figure 77 – Basic namespaces dependencies.....	113
Figure 78 – Other namespaces dependencies.....	114
Figure 79 – Basic extension rules diagram.....	119
Figure B.1 – Example for control and protection LNs combined in one physical device	129
Figure B.2 – Merging unit and sampled value exchange (topology)	130
Figure B.3 – Merging unit and sampled value exchange (data)	130
Figure C.1 – Application of SCL for LNs (conceptual)	132
Figure C.2 – Application of SCL for data (conceptual).....	133
Figure E.1 – Exchanged data between subfunctions (logical nodes)	135
Figure E.2 – Relationship between PICOMS and client/server model	135
Figure F.1 – ACSI mapping to an application layer.....	136
Figure F.2 – ACSI mappings (conceptual).....	137
Figure F.3 – ACSI mapping to communication stacks/profiles	138
Figure F.4 – Mapping to MMS (conceptual).....	138
Figure F.5 – Mapping approach	139
Figure F.6 – Mapping detail of mapping to a MMS named variable.....	140
Figure F.7 – Example of MMS named variable (process values)	140
Figure F.8 – Use of MMS named variables and named variable list.....	141
Figure F.9 – MMS information report message.....	142
Figure F.10 – Mapping example.....	143
Figure G.1 – LGOS/LSVS engineering	145
Figure G.2 – LGOS/LSVS engineering by ICT.....	146
Figure G.3 – LGOS/LSVS engineering by the SCT.....	147
Figure H.1 – GOOSE/SMV subscription engineering workflow.....	148
Figure H.2 – SCT supplied input binding	149
Figure H.3 – ICT supplied input binding (for later binding).....	150
Figure J.1 – Private LN using standardized DOs (Edition 2)	152
Figure J.2 –Standardized data objects used in standardized LNs	153
Figure J.3 – Edition 2 device: standardized data object introduced in IEC61850-7-4:2007B	154
Figure J.4 – Edition 2 device: standardized LN introduced in IEC61850-7-4:2007B	155
Figure J.5 – Edition 1 device: Logical nodes in technical reports.....	156
Figure J.6 – Edition 2 device: Logical nodes in technical reports.....	157
Figure J.7 – Edition 2.1 device: Logical nodes in technical reports defining new CDCs	158
Figure J.8 – Edition 2.1 device: standardized LNs extended by other domains	159
Figure J.9 – Edition 2 device: standardized LN introduced in IEC 61850-7-420:2009	160
Figure J.10 – Edition 2.1 device: standardized LN introduced in IEC 61850-7-420:2015	161
Figure J.11 – Edition 2 device: standardized LN moved from introduced in IEC 61850-7-420:2009 to IEC 61850-7-4:2007	162
Figure J.12 – Edition 2.1 device: standardized LN moved from introduced in IEC 61850-7-420:2009 to IEC 61850-7-4:2007	163

Table 1 – LN groups	22
Table 2 – Logical node class XCBR (conceptual)	33
Table 3 – Excerpt of integer status setting	41
Table 4 – Comparison of the data access methods	46
Table 5 – ACSI models and services	79
Table 6 – Logical node circuit breaker	90
Table 7 – Controllable double point (DPC)	92
Table 8 – ACSI class definition	95
Table 9 – Single point status common data class (SPS)	97
Table 10 – Quality components attribute definition	98
Table 16 – Attributes of DetailQual	99
Table 11– Functional constraints (excerpt)	100
Table 12– Trigger option	100
Table 13 – GenLogicalNodeClass definition	102
Table 14 – Excerpt of logical node name plate common data class (LPL)	116
Table 15 – Excerpt of the abstract common data class BasePrimitiveCDC	116
Table A.2 – List of common data classes (excerpt)	127
Table K.1 – Information users and information providers	165
Table K.2 – Data model use cases	167
Table K.3 – Services use cases	169
Table K.4 – Data Forbidden cases	170
Table K.5 – Add new basic type	171
Table K.6 – Extend CDC with DA of new FC	172
Table K.7 – Add new DA using existing type and FCs	172
Table K.8 – Add a new DO based on new CDC using existing types and FCs	173
Table K.9 – Adding a new DO based on existing CDC	174
Table K.10 – Renaming a DO	174
Table K.11 – Renaming a DA, subDO or subDA	175
Table K.12 – Deprecation of a FC	176
Table K.13 – Deprecation of a DA	176
Table K.14 – Removal of a DA	177
Table K.15 – Deprecation of a DO	177
Table K.16 – Use of a weaker presence condition	178
Table K.17 – Use of a stronger presence condition	178
Table K.18 – Extend an enumeration with an enumerated value	179
Table K.19 – Modification of an enumerated value from an enumeration list	179
Table K.20 – Deprecate an enumerated value from an enumeration list	180
Table K.21 – Extension of a PACKED LIST	180
Table K.22 – Extend size of names / references	181
Table K.23 – Add new basic type	181
Table K.24 – Adding new Control Blocks	182
Table K.25 – Adding new services	182
Table K.26 – Add new attributes in control block	183

Table K.27 – Deprecating control block class	183
Table K.28 – Using a stronger presence condition	184

INTERNATIONAL ELECTROTECHNICAL COMMISSION

COMMUNICATION NETWORKS AND SYSTEMS FOR POWER UTILITY AUTOMATION –

Part 7-1: Basic communication structure – Principles and 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.
- 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.

This consolidated version of the official IEC Standard and its amendment has been prepared for user convenience.

IEC 61850-7-1 edition 2.1 contains the second edition (2011-07) [documents 57/1121/FDIS and 57/1145/RVD], its amendment 1 (2020-08) [documents 57/2201/FDIS and 57/2221/RVD] and the corrigendum of amendment 1 (2026-08).

International Standard IEC 61850-7-1 has been prepared by IEC technical committee 57: Power systems management and associated information exchange.

This second edition edition constitutes a technical revision.

Compared to the first edition, this second edition introduces:

- the model for statistical and historical statistical data,
- the concepts of proxies, gateways, LD hierarchy and LN inputs,
- the model for time synchronisation,
- the concepts behind different testing facilities,
- the extended logging function.

It also clarifies the following points:

- the use of numbers for data extension,
- the use of namespaces,
- the mode and behaviour of a logical node,
- the use of range and deadbanded values,
- the access to control actions and others.

Compared to the second edition, this first revision of the second edition:

- provides clarifications and corrections to the second edition of IEC 61850-7-1, based 55 on the tissues = {828, 874, 948, 1060, 1072, 1129, 1151, 1196, 1251, 1268, 1312, 1396, 1437, 1468, 1491};
- re-edit the Clause 8.2.3 on gateways and proxies;
- re-edit the complete Clauses 13 and 14 about namespaces and rules for extension of object classes;
- include three new normative annexes respectively for LGOS/LSVS engineering (G), GOOSE/SMV Subscription Configuration (H) and use case scenarios examples for clarifying the common rules of Clause 14 (J);
- introduces in the informative annex I, the concept of decoupling domain namespaces from basic namespaces in edition 3 of this document;

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

A list of all parts of the IEC 61850 series, under the general title: *Communication networks and systems for power utility automation*, can be found on the IEC website.

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

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

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

This part of the IEC 61850 series provides an overview of the architecture for communication and interactions between systems for power utility automation such as protection devices, breakers, transformers, substation hosts etc.

This document is part of a set of specifications which details a layered communication architecture for power utility automation. This architecture has been chosen to provide abstract definitions of classes (representing hierarchical information models) and services such that the specifications are independent of specific protocol stacks, implementations, and operating systems.

The goal of the IEC 61850 series is to provide interoperability between the IEDs from different suppliers or, more precisely, between functions to be performed by systems for power utility automation but residing in equipment (physical devices) from different suppliers. Interoperable functions may be those functions that represent interfaces to the process (for example, circuit breakers) or substation automation functions such as protection functions. This part of the IEC 61850 series uses simple examples of functions to describe the concepts and methods applied in the IEC 61850 series.

This part of the IEC 61850 series describes the relationships between other parts of the IEC 61850 series. Finally this part defines how interoperability is reached.

NOTE Interchangeability is the ability to replace a device from the same vendor, or from different vendors, utilising the same communication interface and as a minimum, providing the same functionality, with no impact on the rest of the system. If differences in functionality are accepted, the exchange may also require some changes somewhere else in the system. Interchangeability implies a standardisation of functions and, in a strong sense, of devices which are outside the scope of this standard. Interchangeability is outside the scope, but it will be supported following this standard for interoperability.

This part of the IEC 61850 series is intended for all stakeholders of standardised communication and standardised systems in the utility industry. It provides an overview of and an introduction to IEC 61850-7-4, IEC 61850-7-3, IEC 61850-7-2, IEC 61850-6, and IEC 61850-8-1.

COMMUNICATION NETWORKS AND SYSTEMS FOR POWER UTILITY AUTOMATION –

Part 7-1: Basic communication structure – Principles and models

1 Scope

This part of the IEC 61850 series introduces the modelling methods, communication principles, and information models that are used in the various parts of the IEC 61850-7-x series. The purpose of this part of the IEC 61850 series is to provide – from a conceptual point of view – assistance to understand the basic modelling concepts and description methods for:

- substation-specific information models for power utility automation systems,
- device functions used for power utility automation purposes, and
- communication systems to provide interoperability within power utility facilities.

Furthermore, this part of the IEC 61850 series provides explanations and provides detailed requirements relating to the relation between IEC 61850-7-4, IEC 61850-7-3, IEC 61850-7-2 and IEC 61850-5. This part explains how the abstract services and models of the IEC 61850-7-x series are mapped to concrete communication protocols as defined in IEC 61850-8-1.

The concepts and models provided in this part of the IEC 61850 series may also be applied to describe, among others, information models and functions for:

- hydroelectric power plants,
- substation to substation information exchange,
- information exchange for distributed automation,
- substation to control centre information exchange,
- information exchange for metering,
- condition monitoring and diagnosis, and
- information exchange with engineering systems for device configuration.

Table – Published version of the standard

Edition	Publication date	Webstore
Edition 1.0	2003-07	IEC 61850-7-1:2003
Edition 2.0	2011-07	IEC 61850-7-1:2011
Amendment 1 of Edition 2.0	2020-08	IEC 61850-7-1:2011/AMD1
Edition 2.1	2020-08	IEC 61850-7-1:2011+AMD1:2020 CSV
Amendment 1 of Edition 2.0/COR1	2025-04	IEC 61850-7-1:2011/AMD1/COR1:2025

NOTE 1 This part of IEC 61850 uses examples and excerpts from other parts of the IEC 61850 series. These excerpts are used to explain concepts and methods. These examples and excerpts are informative in this part of IEC 61850.

NOTE 2 Examples in this part use names of classes (e.g. XCBR for a class of a logical node) defined in IEC 61850-7-4, IEC 61850-7-3, and service names defined in IEC 61850-7-2. The normative names are defined in IEC 61850-7-4, IEC 61850-7-3, and IEC 61850-7-2 only.

NOTE 3 This part of IEC 61850 does not provide a comprehensive tutorial. It is recommended that this part be read first – in conjunction with IEC 61850-7-4, IEC 61850-7-3, and IEC 61850-7-2. In addition, it is recommended that IEC 61850-1 and IEC 61850-5 also be read.

NOTE 4 This part of IEC 61850 does not discuss implementation issues.

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 61850-2, *Communication networks and systems in substations – Part 2: Glossary*

IEC 61850-3, *Communication networks and systems in substations – Part 3: General requirements*

IEC 61850-4, *Communication networks and systems for power utility automation – Part 4: System and project management*

IEC 61850-5, *Communication networks and systems in substations – Part 5: Communication requirements for functions and device models*

IEC 61850-6, *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, *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, *Communication networks and systems for power utility automation – Part 7-3: Basic communication structure – Common data classes*

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

IEC 61850-8-1, *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 61850-9-2, *Communication networks and systems in substations – Part 9-2: Specific Communication Service Mapping (SCSM) – Sampled values over ISO/IEC 8802-3*

IEC 61850-10, *Communication networks and systems in substations – Part 10: Conformance testing*

ISO/IEC 8802-3, *Information technology – Telecommunications and information exchange between systems – Local and metropolitan area networks – Specific requirements – Part 3: Carrier sense multiple access with collision detection (CSMA/CD) access method and physical layer specifications*

ISO/IEC 8825 (all parts), *Information technology – ASN.1 encoding rules*

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

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

Bibliography

IEC 60050-101:1998, *International Electrotechnical Vocabulary – Part 1: Mathematics*

IEC 61346-1, *Industrial systems, installations and equipment and industrial products – Structuring principles and reference designations – Part 1: Basic rules* (withdrawn)

IEC 61346-2, *Industrial systems, installations and equipment and industrial products – Structuring principles and reference designations – Part 2: Classification of objects and codes for classes* (withdrawn)

IEC 61850-10-3: *Communication networks and systems for power utility automation – Part 10-3: Functional testing of IEC 61850 systems*
