AS IEC 61850.7.1:2025

IEC 61850-7-1:2011+AMD1:2020 CSV

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Communication networks and systems for power utility automation

Part 7.1: Basic communication structure — Principles and models



AS IEC 61850.7.1:2025

This Australian Standard® was prepared by EL-050, Power System Control and Communication. It was approved on behalf of Standards Australia's Standards Development and Accreditation Committee on 26 November 2025.

This Standard was published on 19 December 2025.

The following are represented on Committee EL-050:

Australian Energy Market Operator
Australian Industry Group
CIGRE Australia
Clean Energy Council
Energy Networks Australia
Engineers Australia
Victoria University

This Standard was issued for comment as DR AS IEC 61850.7.1:2025

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ISBN: 978 1 76175 546 0

AS IEC 61850.7.1:2025
IEC 61850-7-1:2011+AMD1:2020 CSV

Australian Standard®

Communication networks and systems for power utility automation

Part 7.1: Basic communication structure — Principles and models

Originated as AS 61850.7.1—2005.
Revised and redesignated as AS IEC 61850.7.1:2025.

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(3) A Bibliography lists documents referenced in the Standard but not as part of requirements.

Many Standards include notes. Notes provide recommendations and/or guidance only. They never contain requirements.

Preface

This Standard was prepared by the Standards Australia Committee EL-050, Power System Control and Communication, to supersede AS 61850.7.1-2005, *Communication networks and systems in substations, Part 7.1: Basic communication structure for substation and feeder equipment — Principles and models.*

The objective of this document is to introduce the modelling methods, communication principles, and information models that are used in the various parts of the IEC 61850-7 series. The purpose is to provide, from a conceptual point of view, assistance to understand the basic modelling concepts and description methods for —

(a) substation-specific information models for power utility automation systems;

(b) device functions used for power utility automation purposes; and

(c) communication systems to provide interoperability within power utility facilities. Compared to the first edition, this second edition introduces —

  (i) the model for statistical and historical statistical data;

  (ii) the concepts of proxies, gateways, LD hierarchy and LN inputs;

  (iii) the model for time synchronization;

  (iv) the concepts behind different testing facilities; and

  (v) the extended logging function. It also clarifies certain items.

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FOREWORD

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

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

FDIS	Report on voting
57/1121/FDIS	57/1145/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 second edition cancels and replaces the first edition published in 2003. This second edition constitutes a technical revision.

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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 name spaces,
- the mode and behaviour of a logical node,
- the use of range and deadbanded values,
- the access to control actions and others.

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 this publication 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.**

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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.

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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 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.

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 referenced documents are indispensable for the application 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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