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Communication networks and systems for power utility automation - Part 7-410: Basic communication structure - Hydroelectric power plants, steam and gas turbines - Logical node classes

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IEC 61850-7-410 has been prepared by IEC technical committee 57: Power systems management and associated information exchange. It is an International Standard.

This third edition cancels and replaces the second edition published in 2012 and Amendment 1:2016. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

a) New concepts and constructs for modelling of large power generation;
b) Addition of new Logical Nodes to cover systems and details of the power generation domain previously not modelled in a sufficient way;
c) Review of existing Logical Nodes concerning structure, use of Common Data Classes and naming;

d) Fixes and improvements of some names and descriptions of Data Objects;

e) Improvements of the structure and enumerations within the Domain Logical Nodes;

f) Addition of new Logical Nodes with respect to maintenance and supervision functionality;

g) Updating of Logical Nodes for PSS functionality (LNs: APSS, APST and APSF) reflecting the updated PSS standard IEEE 421.5:2016;

h) Incorporation of Amendment 1, including among other things the Group E Logical Nodes;

i) Resolutions to all known UML Issues related to IEC 61850-7-410;

j) This 3rd edition is autogenerated from the UML file;

k) Upon publication the updated IEC 61850-7-410 NameSpace will be made available as a Code Component on the TC57 web page.

In the Edition 3 of this document, a new modelling approach is applied. In order to achieve greater efficiency and harmonization of the IEC 61850 information model by streamlining the Namespaces it is divided into, the structure of the latest revisions of the Namespaces related to the power generation domain, aims to:

– share common concepts, approaches, and models in the generation domains,

– increase the modularity of the model itself and enable its extension.

This edition hence introduces a new modeling approach, which is further explained in Clause 5. The pillars upon which the new approach is founded are as follows:

– a layered architecture for the power station model, in accordance with the control hierarchy concepts defined in IEC 60050-351-55;

– a comprehensive review of the models considering the approach outlined in IEC 61850-7-420:2021, aimed at harmonizing fundamental concepts in the power generation domain;

– a systematic alignment with the concepts outlined in IEC 61850-7-500:2017.

Specific aspects typical of the large power generation domain are also addressed in the present document. The relationship between concepts described in this document and the ones of related standards can be found in Annex B and Annex C.

In addition to this objective, Edition 3 provides clarifications on the purposes and intended use of such information model in a new set of explanatory clauses, which were not present in the previous editions.

The text of this International Standard is based on the following documents:

Draft	Report on voting
57/2885/FDIS	57/2917/RVD

Full information on the voting for its approval can be found in the report on voting indicated in the above table.

The language used for the development of this International Standard is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/publications.

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Such content is any text found between the markers <CODE BEGINS> and <CODE ENDS>, or otherwise is clearly labelled in this standard as a Code Component.

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Table 1 shows all tracking information of IEC 61850-7-410:2024A namespace building-up

Table 1 – Tracking information of IEC 61850-7-410:2024A namespace building-up

Attribute	Content
Namespace IEC specific information	
Version of the UML model used for generating the document (informative)	WG18built8
Date of the UML model used for generating the document (informative)	2026-05-10
Autogeneration software name and version(informative)	j61850DocBuilder 02.04 based on jCleanCim beta9.4 (derived from jCleanCim 02-02)

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

– reconfirmed,
– withdrawn, or
– revised.

INTRODUCTION

This document addresses the IEC 61850 information modelling for hydro power plants, as well as for steam and gas turbines. This document provides an information model that can be applied for basic power plant facilities as well as for more complex installations of multiple production units and supporting auxiliary systems, including dams and water ways for hydro power. This document provides information on how interactions between resource capabilities, operational functions and intra-system power plant coordination are modelled.

Other IEC 61850 documents address the services modelling (IEC 61850-7-2) and the mapping to communication protocols (IEC 61850-8-x).

1 Scope

1.1 General

This part of IEC 61850 specifies the logical node classes for use in the domain of hydroelectric power stations, steam and gas turbines.

This IEC61850 domain information model standard utilizes the existing Logical Node (LN) classes defined in IEC 61850-7-4, *Basic communication structure – Compatible logical node classes and data object classes* where possible, while defining new and extended domain specific LN classes to provide the necessary data objects for application to functions and systems in the domain of hydroelectric power stations, steam and gas turbines. The domain information model includes the interface towards a central operator centre's control functions.

The Scope of this document, related to steam and gas turbine specifics, is limited to overall control functions and generator and turbine control functions. For hydroelectric power, the scope includes the entire power station automation system.

Edition 3 is intended to form a basis for extensions in local implementations. Such extensions may be defined in profiles. Many of the Logical Nodes defined in this document are designed to be suitable for use in domains beyond the scope of hydro power plants and steam and gas turbines. A suggested structure of the Logical Nodes into packages for integration with other domains is provided in Annex G (informative), *Migration of this document to the future edition of IEC 61850*.

1.2 Published versions of the standard and related namespace names

Table 2 provides a reference between all published editions, amendments or corrigenda of this document and the full name of the namespace.

Table 2 - Published versions

Edition	Publication date	Webstore	Namespace	OCL namespace
Edition 1.0	2007-08	IEC 61850-7-410:2007	NA	NA
Edition 2.0	2012-10	IEC 61850-7-410:2012	NA	NA
Edition 2.1	2015-11	IEC 61850-7-410:2012 +AMD1:2015 CSV	NA	NA

1.3 Identification of the Code Component(s)

1.3.1 Identification of the namespace description

The namespace associated with this document is an NSD (Namespace Definition) file as defined in IEC 61850-7-7.

NOTE The NSD files are distributed as a Full (complete machine-readable file) Code Component and as a Light (reduced machine-readable content version) Code Component.

Table 3 shows all attributes of IEC 61850-7-410:2024A namespace.

Table 3 – Attributes of IEC 61850-7-410:2024A namespace

Attribute	Content
Namespace nameplate	
Namespace Identifier	IEC 61850-7-410
Version	2024
Revision	A
Release	4
Full Namespace Name	IEC 61850-7-410:2024A
Full Code Component Name	IEC_61850-7-410.NSD.2024A4.Full
Light Code Component Name	IEC_61850-7-410.NSD.2024A4.Light
Namespace Type	domain
Namespace dependencies	
includes	IEC 61850-7-4:2007B version:2007 revision:B

1.4 Code Component distribution

Each Code Component is a .zip package containing the electronic representation of the Code Component itself, with a file describing the content of the package (IECManifest.xml).

The life cycle of a Code Component is not restricted to the life cycle of the related publication. The publication life cycle goes through two stages, Version (corresponding to an edition) and Revision (corresponding to an amendment). A third publication stage (Release) allows publication of Code Component in case of urgent fixes of InterOp Tissues, thus without need to publish an amendment.

Consequently, new releases of the Code Component may be released, which supersede the previous releases, and will be distributed through the IEC TC57 web site at:

https://www.iec.ch/tc57/supportdocuments

The latest version/release of a Code Component will be found by selecting the file for the Code Component with the highest value for VersionStateInfo, e.g. IEC_61850-7-410.NSD.{VersionStateInfo}.full.zip.

For conformance testing, implementations should always use the latest downloadable Code Components, as the Code Components may be subject to updates. See technical corrigenda and XSD history files.

When the Code Components associated with this document have a full version and a light version, the light version is freely accessible.

When the Code Components associated with this document have a full version only, the full version is freely accessible.

The freely accessible Code Components are available on the IEC website for download at https://www.iec.ch/tc57/supportdocuments, but the usage remains under the licensing conditions.

1.5 Application of the logical node classes

Examples of modelling according to IEC 61850 in the domains of hydroelectric power stations, steam and gas turbines are found in IEC TR 61850-7-510, *Basic communication structure – Hydroelectric power plants, steam and gas turbines – Modelling concepts and guidelines*. In that Technical Report, examples are given showing how to use the model for hydroelectric power plants, steam and gas turbines in a Reference Designation System according to, for example, ISO/IEC 81346.

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 60034:2022, *Rotating electrical machines - Part 1: Rating and performance*

IEC 60041:1991, *Field acceptance tests to determine the hydraulic performance of hydraulic turbines, storage pumps and pump-turbines*
IEC 60041:1991/COR1:1996.

IEC 60050-351:2013, *International Electrotechnical Vocabulary (IEV) - Part 351: Control technology*

IEC 60545:2021, *Guidelines for commissioning and operation of hydraulic turbines, pump-turbines and storage pumps*

IEC 61362:2024, *Guide to specification of hydraulic turbine governing systems*

IEC TS 61850-1-2:2020, *Communication networks and systems for power utility automation - Part 1-2: Guideline on extending IEC 61850*
IEC TS 61850-1-2:2020/AMD1:2022

IEC TS 61850-2:2019, *Communication networks and systems for power utility automation - Part 2: Glossary*

IEC 61850-5:2013, *Communication networks and systems for power utility automation - Part 5: Communication requirements for functions and device models*
IEC 61850-5:2013/AMD1:2022

IEC 61850-7-1:2011, *Communication networks and systems for power utility automation - Part 7-1: Basic communication structure - Principles and models*
IEC 61850-7-1:2011/AMD1:2020

IEC 61850-7-3:2010, *Communication networks and systems for power utility automation - Part 7-3: Basic communication structure - Common data classes*
IEC 61850-7-3:2010/AMD1:2020

IEC 61850-7-4:2010, *Communication networks and systems for power utility automation - Part 7-4: Basic communication structure - Compatible logical node classes and data object classes*
IEC 61850-7-4:2010/AMD1:2020.

IEC 61850-7-6:2024, *Communication networks and systems for power utility automation - Part 7-6: Guideline for definition of Basic Application Profiles (BAPs) using IEC 61850*

IEC 61850-7-420:2021, *Communication networks and systems for power utility automation - Part 7-420: Basic communication structure - Distributed energy resources and distribution automation logical nodes*

IEC TR 61850-7-500:2017, *Communication networks and systems for power utility automation - Part 7-500: Basic information and communication structure - Use of logical nodes for modeling application functions and related concepts and guidelines for substations*.

ISO/IEC 81346 (all parts), *Industrial systems, installations and equipment and industrial products - Structuring principles and reference designations*

IEC 62270:2013, *Hydroelectric power plant automation - Guide for computer-based control*

IEC 62361-103:2013, *Power systems management and associated information exchange - Interoperability in the long term - Part 103: Standard profiling*

IEC/IEEE 63198-2775:2023, *Technical guidelines for smart hydroelectric power plant*

IEC 63200:2021, *Definition of extended SGAM smart energy grid reference architecture model*

IEEE 421.1-2021, *IEEE Standard Definitions for Excitation Systems for Synchronous Machines*

IEEE 421.5-2016, *IEEE Recommended Practice for Excitation System Models for Power System Stability Studies*

ANSI/ASSP Z244.1:2024, *The Control Of Hazardous Energy - Lockout, Tagout, And Alternative Methods*

Bibliography

Further information and reading on information models in large power generation can be found in the documents listed below:

IEC 61400-25-2, *Communications for monitoring and control of wind power plants - Information models*

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 61850-6:2009/AMD1:2018
IEC 61850-6:2009/AMD2:2024

IEC 61850-10, *Communication networks and systems for power utility automation - Part 10: Conformance testing*

IEC 61970-301, *Energy management system application program interface (EMS-API) - Part 301: Common information model (CIM) base*

IEC 62264-1:2013, *Enterprise-control system integration - Part 1: Models and terminology*

EUROPEAN COMMISSION REGULATION (EU) 2016/631 of 14 April 2016 establishing a network code on requirements for grid connection of generators also called RfG

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