DIN EN 61850-7-4/A1

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Entwurf

Einsprüche bis 2018-07-04
Vorgesehen als Änderung von
DIN EN 61850-7-4:2010-11

Kommunikationsnetze und -systeme für die Automatisierung in der elektrischen Energieversorgung – Teil 7-4: Grundlegende Kommunikationsstruktur – Kompatible Logikknoten und Datenklassen (IEC 57/1644/CDV:2016); Englische Fassung EN 61850-7-4:2010/FprA1:2016

Communication networks and systems for power utility automation –
Part 7-4: Basic communication structure –
Compatible logical node classes and data object classes
(IEC 57/1644/CDV:2016);
English version EN 61850-7-4:2010/FprA1:2016

Réseaux et systèmes de communication pour l'automatisation des systèmes électriques –
Partie 7-4: Structure de communication de base –
Classes de noeud logique et classes de donnée objet compatibles
(IEC 57/1644/CDV:2016);
Version anglaise EN 61850-7-4:2010/FprA1:2016

Anwendungswarnvermerk

Dieser Norm-Entwurf mit Erscheinungsdatum 2018-05-04 wird der Öffentlichkeit zur Prüfung und Stellungnahme vorgelegt.

Weil die beabsichtigte Norm von der vorliegenden Fassung abweichen kann, ist die Anwendung dieses Entwurfs besonders zu vereinbaren.

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- oder in Papierform an die DKE Deutsche Kommission Elektrotechnik Elektronik Informationstechnik in DIN und VDE, Stresemannallee 15, 60596 Frankfurt am Main.

Die Empfänger dieses Norm-Entwurfs werden gebeten, mit ihren Kommentaren jegliche relevanten Patentrechte, die sie kennen, mitzuteilen und unterstützende Dokumentationen zur Verfügung zu stellen.

Gesamtumfang 273 Seiten

DKE Deutsche Kommission Elektrotechnik Elektronik Informationstechnik in DIN und VDE

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Nationales Vorwort

Die Englische Fassung des europäischen Dokuments EN 61850-7-4:2010/FprA1:2016 „Kommunikationsnetze und -systeme für die Automatisierung in der elektrischen Energieversorgung – Teil 7-4: Grundlegende Kommunikationsstruktur – Kompatible Logikknoten und Datenklassen“ (Entwurf in der Umfrage) ist unverändert in diesen Norm-Entwurf übernommen worden.

Die Internationale Elektrotechnische Kommission (IEC) und das Europäische Komitee für Elektrotechnische Normung (CENELEC) haben vereinbart, dass ein auf IEC-Ebene erarbeiteter Entwurf für eine Internationale Norm zeitgleich (parallel) bei IEC und CENELEC zur Umfrage (CDV-Stadium) und Abstimmung als FDIS (en: Final Draft International Standard) bzw. Schluss-Entwurf für eine Europäische Norm gestellt wird, um eine Beschleunigung und Straffung der Normungsarbeit zu erreichen. Dem entsprechend ist das internationale Dokument IEC 57/1644/CDV:2016 „Communication networks and systems for power utility automation – Part 7-4: Basic communication structure – Compatible logical node classes and data object classes“ unverändert in den Entwurf EN 61850-7-4:2010/FprA1:2016 übernommen worden.

Das internationale Dokument wurde vom TC 57 „Power systems management and associated information exchange“ der Internationalen Elektrotechnischen Kommission (IEC) erarbeitet.

Bei der Abstimmung zu dem Europäischen Schluss-Entwurf bei CENELEC und dem Internationalen Schluss-Entwurf bei IEC [Final Draft International Standard (FDIS)] sind jeweils nur „JA/NEIN“-Entscheidungen möglich, wobei „NEIN“-Entscheidungen fundiert begründet werden müssen. Dokumente, die bei CENELEC als Europäische Norm angenommen und ratifiziert werden, sind unverändert als Deutsche Normen zu übernehmen.

Für dieses Dokument ist das nationale Arbeitsgremium K 952 „Netzleittechnik“ der DKE Deutsche Kommission Elektrotechnik Elektronik Informationstechnik in DIN und VDE (www.dke.de) zuständig.

Für den Fall einer undatierten Verweisung im normativen Text (Verweisung auf ein Dokument ohne Angabe des Ausgabedatums und ohne Hinweis auf eine Abschnittsnummer, eine Tabelle, ein Bild usw.) bezieht sich die Verweisung auf die jeweils aktuellste Ausgabe des in Bezug genommenen Dokuments.

Für den Fall einer datierten Verweisung im normativen Text bezieht sich die Verweisung immer auf die in Bezug genommene Ausgabe des Dokuments.

Der Zusammenhang der zitierten Dokumente mit den entsprechenden deutschen Dokumenten ergibt sich, soweit ein Zusammenhang besteht, grundsätzlich über die Nummer der entsprechenden IEC-Publikation. Beispiel: IEC 60068 ist als EN 60068 als Europäische Norm durch CENELEC übernommen und als DIN EN 60068 ins Deutsche Normenwerk aufgenommen.

Das Präsidium des DIN hat mit Präsidialbeschluss 1/2004 festgelegt, dass DIN-Normen, deren Inhalt sich auf internationale Arbeitsergebnisse der Informationsverarbeitung gründet, unter bestimmten Bedingungen allein in englischer Sprache veröffentlicht werden dürfen. Diese Bedingungen sind für den vorliegenden Normentwurf erfüllt.

Da sich die Benutzer des vorliegenden Normentwurfs der englischen Sprache als Fachsprache bedienen, wird die Englische Fassung der EN 61850-7-4:2010/FprA1:2016 veröffentlicht. Zu deren Abschnitt 1, der den Anwendungsbereich festlegt, und Abschnitt 3, der die Begriffe festlegt, wurde eine Übersetzung angefertigt und als informativer Nationaler Anhang NA des vorliegenden Normentwurfs hinzugefügt. Für viele der verwendeten Begriffe existieren keine gebräuchlichen deutschen Benennungen, da sich die deutschen Anwender in der Regel ebenfalls der englischen Benennungen bedienen. Dieser Normentwurf steht nicht in unmittelbarem Zusammenhang mit Rechtsvorschriften und ist nicht als Sicherheitsnorm anzusehen.

Es ist vorgesehen, auch bei der entsprechenden zukünftigen Deutschen Norm auf die deutsche Sprachfassung zu verzichten und diese in der englischsprachigen Fassung zu veröffentlichen.

Es wird auf die Möglichkeit hingewiesen, dass einige Elemente dieses Dokuments Patentrechte berühren können. IEC ist nicht dafür verantwortlich, einige oder alle diesbezüglichen Patentrechte zu identifizieren.

Das Original-Dokument enthält Bilder in Farbe, die in der Papierversion in einer Graustufen-Darstellung wiedergegeben werden. Elektronische Versionen dieses Dokuments enthalten die Bilder in der originalen Farbdarstellung.

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Nationaler Anhang NA
(informativ)

Auszugsweise Übersetzung [N1)]

1 Anwendungsbereich

1.1 Allgemeines

Dieser Teil der Norm DIN EN 61850 legt das Informationsmodell für Betriebsmittel und Funktionen in Bezug auf die allgemeine Verwendung in Systemen für die Automatisierung der elektrischen Energieversorgung fest. Er enthält ebenfalls das Informationsmodell der Betriebsmittel und funktionsbezogenen Anwendungen in Stationen. Insbesondere werden kompatible Namen für logische Knoten und Datenobjekte für die Kommunikation zwischen intelligenten elektronischen Geräten (IED) festgelegt, einschließlich der Beziehung zwischen den logischen Knoten und Datenobjekten.

Die im vorliegenden Dokument definierten Namen der logischen Knoten und Datenobjekte sind Teil des Klassenmodells, das in den Normen DIN EN 61850-7-1 und DIN EN 61850-7-2 eingeführt wird. Die im vorliegenden Dokument definierten Namen werden beim Erstellen von hierarchischen Objektverweisen verwendet, die in Systemen für die Automatisierung der elektrischen Energieversorgung insbesondere für die Kommunikation mit intelligenten elektronischen Geräten in Stationen und an Abzweigen verwendet wird. In diesem Teil gelten die Benennungskonventionen nach DIN EN 61850-7-2.

Um proprietäre, inkompatible Erweiterungen zu vermeiden, legt der vorliegende Teil normative Benennungsregeln für mehrere Instanzen sowie für proprietäre, kompatible Erweiterungen von Klassen logischer Knoten und Datenobjektnamen fest. Jede Definition basiert auf der Norm DIN EN 61850 oder auf sorgfältig untersuchten öffentlichen Dokumenten, auf die verwiesen wird.

Der vorliegende Teil stellt keinen Anwendungsleitfaden bereit. Es wird empfohlen, zunächst die Teile DIN EN 61850-5 und DIN EN 61850-7-1 zusammen mit den Teilen DIN EN 61850-7-3 sowie DIN EN 61850-7-2 zu lesen.

In der vorliegenden Norm werden Gerätemodelle und Funktionen für Betriebsmittel in Stationen und Abzweigen beschrieben. Die in der vorliegenden Norm definierten Konzepte dienen auch zur Beschreibung der Gerätemodelle und Funktionen für Folgendes:

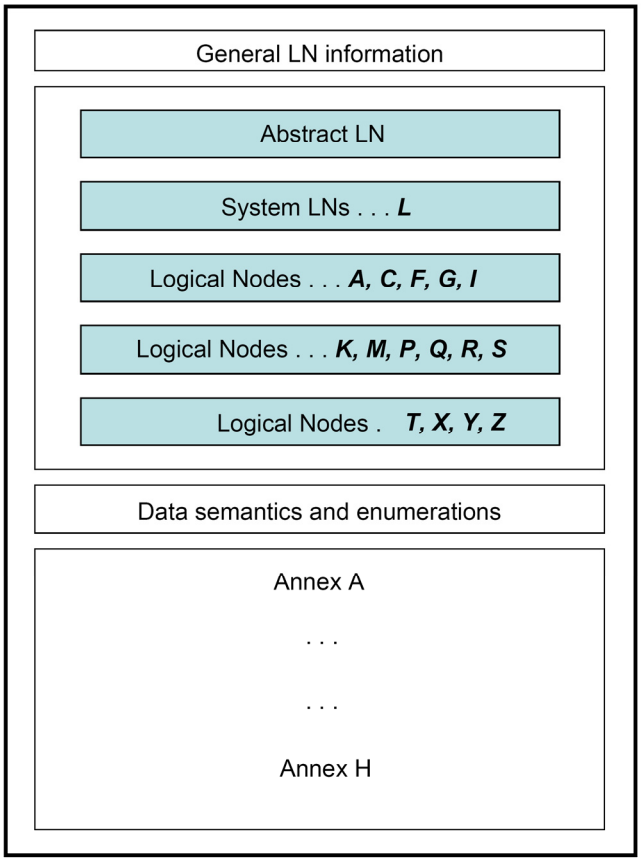
- Informationsaustausch von Station zu Station
- Informationsaustausch von Station zu Leitstelle
- Informationsaustausch von Energieerzeugungsanlage zu Leitstelle
- Informationsaustausch für die dezentrale Energieerzeugung
- Informationsaustausch für die automatisierte Energieverteilung
- Informationsaustausch für die Zählerwerterfassung
- Informationsaustausch für Wasserkraftwerke
- Informationsaustausch für Windkraftanlagen

Bild 1 bietet einen allgemeinen Überblick über diese Norm. Es zeigt die in dieser Norm definierten Gruppen logischer Knoten. Zur besseren Übersicht sind die logischen Knoten weiter unten in alphabetischer Reihenfolge definiert.

[N1)] Nationale Fußnote: Die Nummerierung aus IEC 57/1644/CDV:2016-01 wurde beibehalten.

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Text im Bild:

englisch	**deutsch**
General LN information	Allgemeine Informationen zu logischen Knoten
Abstract LN	Abstrakte logische Knoten
System LNs … L	Systembezogene logische Knoten … L
Logical Nodes … A,C, F, G, I	Logische Knoten … A, C, F, G, I
Logical Nodes … K, M, P, Q, R, S	Logische Knoten … K, M, P, Q, R, S
Logical Nodes . T, X, Y, Z	Logische Knoten … T, X, Y, Z
Data semantics and enumerations	Datensemantik und Enumerationen
Annex A	Anhang A
Annex H	Anhang H

Bild 1 – Überblick über die vorliegende Norm

1.2 Name und Version des Namensraums

Dieser neue Abschnitt ist obligatorisch für alle IEC 61850-Namensräume (wie in Teil 7-1 von DIN EN 61850, Ausgabe 2 festgelegt).

Die folgenden Parameter identifizieren diese neue Version dieses Namensraums:

- Version des Namensraums: 2007
- Überarbeitung des Namensraums: B
- UML-Modelldatei mit dieser Namensraumversion: wg10uml02v17-wg18uml02v11b-wg17uml02v17a-jwg25uml02v04c.eap, UML-Modellversion WG10UML02v17
- Veröffentlichungsdatum des Namensraums: 2015-08-17
- Name des Namensraums: „IEC 61850-7-4:B“

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3 Begriffe

Definitionen 3.1-3.3 hinzufügen.

3.1
abstract
eine Klasse abstrakter logischer Knoten, die nie instanziiert wird und dazu dient, allgemeine Datenobjekte in semantisch bedeutsamen Entitäten zusammenzufassen, sodass sie für die Wiederverwendung in eine konkrete Klasse logischer Knoten übernommen werden können

3.2
admin
eine Klasse administrativer logischer Knoten, die der Klasse abstrakter logischer Knoten zugehörig ist und eine spezielle Regel für das Ändern der Anwesenheitsbedingung einiger der Datenobjekte aufweist, wenn diese in den Kontext der abgeleiteten Statistik (en: derived statistics (ds)) übernommen werden

Anmerkung 1 zum Begriff: In einem logischen Knoten, der keine Elemente aus dem statistischen logischen Knoten (d. h., aus der Gruppe L) übernimmt, ist die übernommene Anwesenheitsbedingung „ds“ nicht gültig (en: not applicable (na)).

3.3
abgelehntes Element
wird in der aktuellen Ausgabe der Norm weiterhin unterstützt, um eine ausreichende Abwärtskompatibilität zu gewährleisten, entfällt aber planmäßig ab der nächsten Version der Norm

Anmerkung 1 zum Begriff: Zu einem abgelehnten Element werden die entsprechenden Informationen darüber bereitgestellt, welche alternativen Elemente stattdessen zu verwenden sind.

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478 **COMMUNICATION NETWORKS AND**
479 **SYSTEMS FOR POWER UTILITY AUTOMATION –**
480
481 **Amendment to Part 7-4: Basic communication structure –**
482 **Compatible logical node classes and data object classes**
483
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485 **Document history**

486

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489 introduced and the intervening persons.

490 Any important message to IEC editors should also be included in the table below.

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Name of intervening person	Document received		Brief description of the changes introduced	Document sent	
	From	Date		To	Date
H. Dawidczak			Initial draft of IEC 61850-7-4 amd2.1-r18	WG10 Convenor Ch.Brunner	2015-08-19
Ch. Brunner	H. Dawidczak	2015-08-19	Draft to be sent to IEC Geneva. A correction was made on a header	TC 57 Secretary	2015-10-16

492

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International Standard IEC 61850-7-4 has been prepared by IEC technical committee 57: Power systems management and associated information exchange.

The motivation and goal of this amendment is to improve consistency of the data model over all application domains of IEC 61850. Data (Logical Nodes, Data Objects, Data Attributes) with the same semantics shall have the same naming where this part IEC 61850-7-4 refers to Logical Nodes and Data Objects and the part IEC 61850-7-3 to the Data Attributes.

Therefore, this amendement complements and updates the second edition of this part published in 2010. It constitutes editorial revisions for consistency and and technical corrections of bugs as far as interoperability is touched.

To reach this goal and to keep it for all future as common working source a comprehensive back-office UML version was created and will be maintained for future standard development. The published standard parts IEC 61850-7-x like the part IEC 61850-7-4 Ed2.1, where the amendment is based on, are generated automatically from the UML version. This allows publishing, voting and reading the standard parts as in the past.

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

- provides clarifications and corrections to the second edition of IEC 61850-7-4, based on the tissues = { 650, 671, 672, 674, 675, 676, 677, 679, 680, 682, 683, 685, 686, 689, 693, 694, 695, 696, 712, 713, 714, 715, 716, 722, 724, 725, 726, 727, 732, 734, 735, 736, 742, 743, 744, 748, 749, 772, 773, 774, 775, 776, 800, 802, 808, 819, 830, 831, 835, 838, 842, 843, 844, 849, 871, 877, 878, 879, 881, 882, 902, 908, 909, 910, 911, 912, 913, 920, 928, 932, 933, 937, 939, 940, 952, 967, 991, 1007, 1029, 1044, 1046, 1071, 1075, 1076, 1077, 1081, 1086, 1117, 1119, 1128, 1137, 1139, 1176, 1177, 1190, 1191, 1203, 1205, 1229, 1235, 1236, 1244, 1250, 1256, 1258, 1259

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1261, 1269, 1273, 1278, 1282, 1292, 1294, 1310, 1316, 1323, 1330, 1331, 1333, 1339, 1347, 1364, 1368, 1375, 1380, 1390, 1404, 1411, 1423, 1425, 1426 };

- adds to each functional LN group a parent abstract Logical node where the functional nodes alre children from (full object oriented model). Since all abstract LNs are in together in a common clause, the relative position of the functional LNs is not changed within their clause.
- adds new abbreviated terms
- has extension of the list of abbreviate terms to be used for object names
- has more precise combination rules for abbreviated terms to object names
- has extensions by new logical nodes mainly from power quality domains and others
- has corrections of editorial errors.

Clauses 4 through 8 and their sub-clauses (except for 5.1, 5.2, and 5.3) and XML enumerations from Annex H are automatically generated from the UML model.

The structure of the document has been changed because of

- Split the description of logical nodes preliminaries (clause 5) from logical node specification (clause 6). Some content of this clause has been moved from the previous description of logical nodes (was in revision A - clause 5.1 and 5.2).
- Include abstract logical nodes. These abstract logical nodes have been described in clause 6.2.
- The specification of logical nodes begins with clause 6.3 (was in revision A – clause 5.3). In consequence all clauses in revision A beginning with 5.3 count one number higher (beginning with 6.3) than they were in revision A.
- The description of data object semantics and enumerations starts with clause 7. A new clause has been included to specify the enumerations used in part 7-4 separately.

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

FDIS	Report on voting

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.

A bilingual version of this publication may be issued at a later date.

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 IEC 61850 is part of a set of standards, the IEC 61850 series. IEC 61850 defines communication networks and systems for power utility automation, and more specially the communication architecture for subsystems such as substation automation systems. The sum of all subsystems may result also in the description of the communication architecture for the overall power system management. The defined architecture provided in specific parts of IEC 61850-7-x gives both a power utility specific data model and a substation domain specific data model with abstract definitions of data objects classes and services independently from the specific protocol stacks, implementations, and operating systems. The mapping of these abstract classes and services to communication stacks is outside the scope of IEC 61850-7-x and may be found in IEC 61850-8-x and in IEC 61850-9-x.

IEC 61850-7-1 gives an overview of the basic communication architecture to be used for all applications in the power system domain. IEC 61850-7-3 defines common attribute types and common data classes related to all applications in the power system domain. The attributes of the common data classes may be accessed using services defined in IEC 61850-7-2. These common data classes are used in this part to define the compatible data object classes.

To reach interoperability, all data objects in the data model need a strong definition with regard to syntax and semantics. The semantics of the data objects is mainly provided by names assigned to common logical nodes defined in this part and the data objects they contain, as defined in this basic part, and dedicated logical nodes defined in domain specific parts such as for hydro power control systems. Interoperability is easiest if as much as possible of the data objects are defined as mandatory. Because of different approaches and technical features, some data objects, especially settings, were declared as optional in this edition of the standard. There are also data objects which were declared as conditional, i.e. they will become mandatory under some well-defined conditions. After some experience has been gained with this standard, this decision may be reviewed in the next edition of this part.

It should be noted that data objects with full semantics are only one of the elements required to achieve interoperability. The standardized access to the data objects is defined in compatible, power utility and domain specific services (see IEC 61850-7-2). Since data objects and services are hosted by devices (IED), a proper device model is also needed. To describe both the device capabilities and the interaction of the devices in the related system, a configuration language is also needed, as defined in IEC 61850-6 by the system configuration description language (SCL).

The compatible logical node name and data object name definitions found in this part and the associated semantics are fixed. The syntax of the type definitions of all data objects classes is governed by abstract definitions provided in IEC 61850-7-2 and IEC 61850-7-3. Not all features of logical nodes are listed in this part; for example, data sets and logs are covered in IEC 61850-7-2.

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COMMUNICATION NETWORKS AND SYSTEMS FOR POWER UTILITY AUTOMATION –

Amendment to Part 7-4 Edition2: Basic communication structure – Compatible logical node classes and data object classes

1 Scope

1.1 General

This part of IEC 61850 specifies the information model of devices and functions generally related to common use regarding applications in systems for power utility automation. It also contains the information model of devices and function-related applications in substations. In particular, it specifies the compatible logical node names and data object names for communication between intelligent electronic devices (IED). This includes the relationship between logical nodes and data objects.

The logical node names and data object names defined in this document are part of the class model introduced in IEC 61850-7-1 and defined in IEC 61850-7-2. The names defined in this document are used to build the hierarchical object references applied for communicating with IEDs in systems for power utility automation and, especially, with IEDs in substations and on distribution feeders. The naming conventions of IEC 61850-7-2 are applied in this part.

To avoid private, incompatible extensions, this part specifies normative naming rules for multiple instances and private, compatible extensions of logical node (LN) classes and data object names. Any definition is based on IEC 61850 or on referenced well identified public documents.

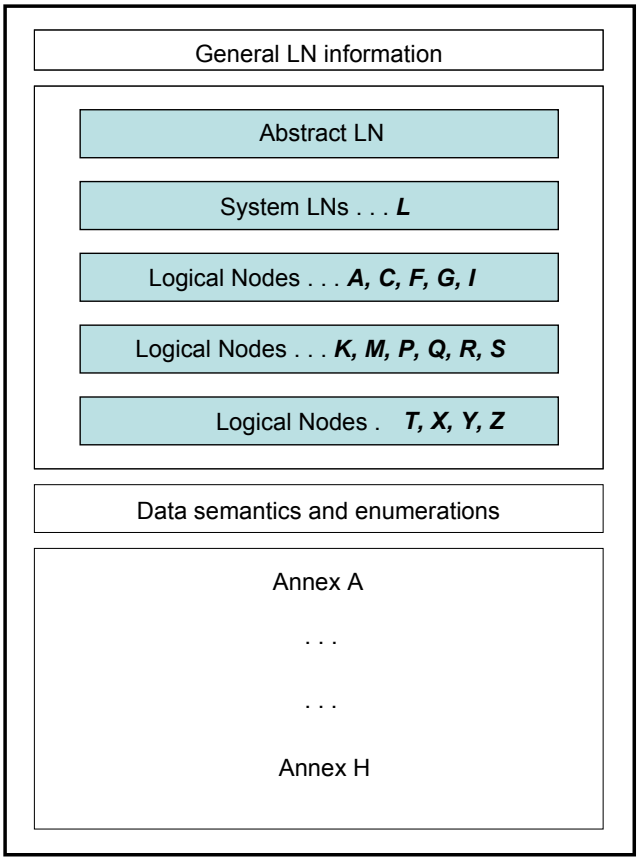
This part does not provide tutorial material. It is recommended to read parts IEC 61850-5 and IEC 61850-7-1 first, in conjunction with IEC 61850-7-3, and IEC 61850-7-2.

This standard is applicable to describe device models and functions of substation and feeder equipment. The concepts defined in this standard are also applied to describe device models and functions for:

- substation-to-substation information exchange,
- substation-to-control centre information exchange,
- power plant-to-control centre information exchange,
- information exchange for distributed generation,
- information exchange for distribution automation, or
- information exchange for metering
- information exchanged for hydro power plants
- information exchange for wind generation plants

Figure 1 provides a general overview of this standard. The groups of logical nodes defined in this standard are shown in Figure 1. For convenience, the logical nodes are defined below in alphabetical order.

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IEC 1102/03

Figure 1 – Overview of this standard

1.2 Namespace name and version

This new section is mandatory for any IEC 61850 namespace (as defined by the part 7-1 of IEC 61850 Edition 2).

The parameters which are identifying this new release of this namespace are:

- Namespace Version : 2007
- Namespace Revision : B
- UML model file which reflects this namespace edition : wg10uml02v17-wg18uml02v11b-wg17uml02v17a-jwg25uml02v04c.eap, UML model version WG10UML02v17
- Namespace release date : 2015-08-17
- Namespace name : “IEC 61850-7-4:B”

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.

IEC 60270:2000, *High-voltage test techniques – Partial discharge measurements*

IEC 61000-4-7:2002, *Electromagnetic compatibility (EMC) – Part 4-7: Testing and measurement techniques – General guide on harmonics and interharmonics measurements and instrumentation, for power supply systems and equipment connected thereto*

IEC 61000-4-15, *Electromagnetic compatibility (EMC) – Part 4-15: Testing and measurement techniques – Flickermeter – Functional and design specifications*

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

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

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

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 61850-9-2, *Communication networks and systems for power utility automation – Part 9-2: Specific Communication Service Mapping (SCSM) – Sampled values over ISO/IEC 8802-3*

IEEE C37.111:1999, *IEEE Standard Common Format for Transient Data Exchange (COMTRADE) for Power Systems*

IEEE 519:1992, *IEEE Recommended Practises and Requirements for Harmonic Control in Electrical Power Systems*

IEEE C37.2:1996, *Electrical Power System Device Function Numbers and Contact Designation*

IEEE 1459:2000, *IEEE Trial-Use Standard Definitions for the Measurement of Electric Power Quantities Under Sinusoidal, Nonsinusoidal, Balanced, or Unbalanced Conditions*

IEC 61850-9-3: Communication Networks and Systems for Power Utility Automation - Part 9-3: Precision Time Protocol - Profile for Power Utility Automation

IEEE 1588, *Precision clock synchronization protocol for networked measurement and control systems*

3 Terms and definitions

Add the definitions 3.1-3.3.

3.1
<<abstract>> logical node class
An abstract logical node class is never instantiated. It is used to group common data objects into a semantically meaningful entity and reuse them in a concrete logical node class through inheritance.

3.2
<<admin>> logical node class
An administrative logical node class is an abstract logical node class with one special rule for changing the presence condition of some of its data objects when they get inherited in the derived statistics (“ds”) context: in a logical node that does not inherit from statistics logical node (i.e., Group L), the inherited “ds” presence condition is not applicable (‘na’).

3.3
Deprecated element

An element marked as deprecated is still maintained in this edition of the standard, for backwards compatibility purpose, but is intended to be phased out in the next version of the standard. With a deprecated element it is shown what should be used instead.

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4 Abbreviated terms

Add section 4.1.including the headline.

4.1 General purpose abbreviated terms

CT	current transducer / transformer
ds	derived statistics
LD	logical device
LN	logical node
PresCond	-presence condition
nds	not derived statistics
R0	zero sequence resistance
RMS	root mean square
SCSM	specific communication service mapping
VT	voltage transducer / transformer
Z0	zero sequence impedance
Z1	positive sequence impedance

Add headline 4.2.

4.2 Abbreviated terms used in data object names

The following terms are used to build concatenated data object names. For example, ChNum is constructed by using two terms "Ch" which stands for "Channel" and "Num" which stands for "Number". Thus the concatenated name represents a "channel number".

Add the following sentence.

Table 1 shows normative terms that are combined to create data object names for all domains of IEC 61850 and for the domain of IEC 61400-25.

Replace table 1 by the following table.

Table 1 – Normative abbreviations for data object names

Term	Description
A	Current; phase A (L1)
AC	AC, alternating current
AGC	Automatic generation control
ASG	Analogue setting CDC
AWatt	Wattmetric component of current
Abr	Abrasion
Abs	Absolute
Absb	Absorbing
Acc	Accuracy; acceleration (deprecated: use Accl instead)
Accl	Acceleration
Acc	Accuracy; acceleration
Accm	Accumulated
Ack	Acknowledgement, acknowledge
Acs	Access
Act	Action, activity, active, activate
Actr	Actuator
Acu	Acoustic
Adj	Adjustment
Adp	Adapter, adaptation
Aff	Affected
Age	Ageing
Ahr	Ampere hours
Air	Air
Alg	Algorithm
Alm	Alarm
Alt	Altitude
Amnt	Amount
Amp	Ampere, current DC or non-phase-related AC
An	Analogue

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Term	Description
Anc	Ancillary
Ane	Anemometer
Ang	Angle
Ap	Access point
Apc	Analogue point control
App	Apparent
Ar	Amperes reactive (reactive current)
Arc	Arc
Area	Area
Arr	Array
At	At
Auth	Authorisation
Auto	Automatic
Aux	Auxiliary
Av	Average
Avl	Availability
Ax	Axial
Azi	Azimuth
B	Bushing; phase B (L2)
BG	Before Gain
Bac	Binary-controlled analogue value
Base	Base
Bat	Battery
Bck	Backup
Bec	Beacon
Beh	Behaviour
Ber	Bit error rate
Bias	Bias
Bl	Blade
Blb	Bulb
Blk	Block, blocked
Blow	Blowby
Bnd	Band, bandwidth
Boil	Boiler
Bot	Bottom
Brcb	Buffered report control block
Brg	Bearing
Brk	Brake
Bsc	Binary status control
Bst	Boost
Bt	Heartbeat
Bus	Bus
C	Carbon; phase C (L3)
C2H2	Acetylene

Term	Description
C2H4	Ethylene
C2H6	Ethane
CB	Circuit breaker
CE	Cooling equipment (see also Cl)
CG	Core ground
CH4	Methane
CHP	Combined heat and power
CO	Carbon monoxide
CO2	Carbon dioxide
Cab	Cable
Cal	Calorie, caloric
Cam	Cam, e.g. rotating non-circular disk
Cap	Capability, capacity
Capac	Capacitance
Car	Carrier
Cbr	Calibration
Ccw	Counter clockwise
Ccy	Currency
Ceil	Ceiling
Cel	Cell
Cf	Crest factor
Cff	Coefficient
Cfg	Configuration
Ch	Channel
Cha	Charger
Chg	Change
Chk	Check
Chr	Characteristic
Circ	Circulating, circuit
Cl	Cooling, coolant, cooling system (see also CE)
Clc	Calculate, calculated
Clip	Clip
Clk	Clock
Cloud	Cloud
Clr	Clear
Cls	Close, closed
Cm	Centimetres
Cmbu	Combustible, combustion
Cmd	Command
Cmpl	Completed, completion, complete
Cmut	Commute, commutator
Cndct	Conductivity
Cnt	Counter

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Term	Description
Cntt	Contractual
Cnv	Converter
Col	Coil
Comm	Communication
Comp	Compensation
ConfRev	Configuration revision (confRev from IEC 61850-7-2)
Conn	Connected, connections
Cons	Constant (general)
Cor	Correction
Core	Core
Cost	Cost
Crank	Crank
Crd	Coordination
Crit	Critical
Crl	Correlation
Crp	Creeping, slow movement
Crv	Curve
Csmp	Consumption, consumed
Ctl	Control
Ctr	Center
Cur	Current
Cut	Cut, cut-out, cut-in
Cvr	Cover, cover level
Cw	Clockwise
Cwb	Crowbar
Cyc	Cycle
D	Derivate
DC	DC, direct current
DER	Distributed energy resource
DExt	De-excitation
DPCSO	Double point controllable status output
DQ0	Direct, quadrature, and zero axis quantities
DS	Device state
DT	Daylight saving time
Dam	Dam
Damp	Damping
Date	Date, date and time of action
Day	Day
Db	Deadband
Dcl	DC-link
Dct	Direct
De	De (prefix)
Dea	Dead

Term	Description
Dec	Decrease
Deg	Degrees
Dehum	De-humidifier
Del	Delta
Den	Density
Dep	Dependent
Det	Detected
Detun	Detuning
Dev	Device
Dew	Dew
Dff	Diffuse
Dfl	Deflector (used in Pelton turbines)
Dia	Diaphragm
Diag	Diagnostics
Dif	Differential, difference
Dig	Digital
Dip	Dip
Dir	Direction
Dis	Distance
Dith	Dither
Dl	Delay
Dlt	Delete
Dlv	Delivery
Dmd	Demand
Dn	Down, downstream
Dpc	Double point control
Dpt	Departure
Drag	Drag hand
Dropout	Dropout
Drp	Droop
Drt	Derate
Drtb	Draft tube
Drv	Drive
Dsa	Disable, disabled
Dsc	Discrepancy
Dsch	Discharge
Dscon	Disconnected
Dsp	Displacement
Dtc	Detection
Dur	Duration
Dust	Dust
Dv	Deviation
Dw	Delta Omega
ECP	Electrical connection point

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Term	Description
EE	External equipment
EF	Earth fault
EFN	Earth-fault neutriliser (Petersen coil)
ENG	Enumerated status setting CDC
ENS	Enumerated status CDC
EV	Electrical Vehicle
EVSE	EV Supply Equipment
Echo	Echo
Edt	Edit, edited
Efc	Efficiency
El	Elevation
Em	Emission
Emg	Emergency
En	Energy
Ena	Enabled, enable, allow operation
Enc	Enumerated control
Encl	Enclosure
End	End
Eng	Engine
Ent	Entity, entities
Entr	Entry, entries
Env	Environment
Eq	Equalization, equal, equivalent
Err	Error
Est	Estimated
Ev	Evaluation
Evn	Even
Evt	Event
Ex	External
ExIm	Export/import
Exc	Exceeded
Excl	Exclusion
Exp	Expired
Expt	Export
Ext	Excitation
F	Float
FA	Fault arc
FPM	Fuel processing module
Fa	"Fire all" sequence (to thyristors)
Fact	Factor
Fail	Failure
Fan	Fan
Fbc	Field breaker configuration
Fer	Frame error rate

Term	Description
Fil	Filter, filtration system
Fish	Fish
Fix	Fixed
Fld	Field
Fll	Fall
Flm	Flame
Flood	Flood
Flsh	Flash, flashing
Flt	Fault
Flush	Flush
Flw	Flow, flowing
Fol	Follower, following
Forc	Forced
Fu	Fuse
Fuel	Fuel
Full	Full
Fwd	Forward
Gain	Gain
Gas	Gas
Gbx	Gearbox
Gdv	Guide vane
Gen	General
Gn	Generator
Gnd	Ground
GoCBRef	GOOSE control block reference
Gocb	GOOSE control block
Gr	Group
Gra	Gradient
Grd	Guard
Gri	Grid
Gross	Gross
Gs	Grease
Gte	Gate
Gust	Gust
H	Harmonics (phase-related)
H2	Hydrogen
H2O	Water (chemical aspect: liquid, steam, etc.)
HP	Hot point
HPh	Harmonics phase
Ha	Harmonics (non-phase-related AC)
Hd	Head
Hdr	Hydrological, hydro, water
Health	Health

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Term	Description
Heat	Heater, heating, heat (see also Ht)
Hi	High, highest
Hold	Hold
Hor	Horizontal
Horn	Horn
Ht	Heating, heating system (see also Heat)
Htex	Heat-exchanger
Hub	Hub
Hum	Humidity
Hy	Hydraulic, hydraulic system
Hyd	Hydrological, hydro, water
Hys	Hysteresis
Hz	Frequency
Hz1	Frequency at side 1
Hz2	Frequency at side 2
I	Integral, integration
ING	Integer status setting CDC
INS	Integer status CDC
ISCSO	Integer status controllable status output
Ia	Information available
Iafm	Information available force majeure
Iano	Information available non-operative
Ianofo	Information available non-operative forced outage
Ianopca	Information available non-operative planned corrective action
Ianos	Information available non-operative suspended
Ianosm	Information available non-operative scheduled maintenance
Iao	Information available operative
Iaog	Information available operative generating
Iaogfp	Information available operative generating with full performance
Iaogpp	Information available operative generating with partial performance
Iaong	Information available operative non-generating
Iaongel	Information available operative non-generating out of electrical specification
Iaongen	Information available operative non-generating out of environment specification
Iaongrs	Information available operative non-generating requested shutdown
Iaongts	Information available operative non-generating technical standby
Ice	Ice

Term	Description
Id	Identity, identifier
Ieee	IEEE definition
IeeeKH	Proportional gain HF (High Frequency). Defined in IEEE 421.5
IeeeKH1	Proportional gain HF positive. Defined in IEEE 421.5
IeeeKH11	Lead gain HF positive. Defined in IEEE 421.5
IeeeKH17	Lead gain HF negative. Defined in IEEE 421.5
IeeeKH2	Proportional gain HF negative. Defined in IEEE 421.5
IeeeKI	Proportional gain IF (Intermediate Frequency). Defined in IEEE 421.5
IeeeKI1	Proportional gain IF positive. Defined in IEEE 421.5
IeeeKI11	Lead gain IF positive. Defined in IEEE 421.5
IeeeKI17	Lead gain IF negative. Defined in IEEE 421.5
IeeeKI2	Proportional gain IF negative. Defined in IEEE 421.5
IeeeKL	Proportional gain LF (Low Frequency). Defined in IEEE 421.5
IeeeKL1	Proportional gain LF positive. Defined in IEEE 421.5
IeeeKL11	Lead gain LF positive. Defined in IEEE 421.5
IeeeKL17	Lead gain LF negative. Defined in IEEE 421.5
IeeeKL2	Proportional gain LF negative. Defined in IEEE 421.5
IeeeKs1	Gain Ks1. Defined in IEEE 421.5
IeeeKs2	Gain Ks2. Defined in IEEE 421.5
IeeeKs3	Gain Ks3. Defined in IEEE 421.5
IeeeM	Ramptrack lowpass degree M. Defined in IEEE 421.R
IeeeN	Ramptrack overall degree N. Defined in IEEE 421.5
IeeeT1	Time constant T1. Defined in IEEE 421.5
IeeeT10	Time constant T10. Defined in IEEE 421.5
IeeeT11	Time constant T11. Defined in IEEE 421.5
IeeeT2	Time constant T2. Defined in IEEE 421.5
IeeeT3	Time constant T3. Defined in IEEE 421.5
IeeeT4	Time constant T4. Defined in IEEE 421.5
IeeeT7	Time constant T7. Defined in IEEE 421.5
IeeeT8	Time constant T8. Defined in IEEE 421.5
IeeeT9	Time constant T9. Defined in IEEE 421.5
IeeeTH1	Time constant TH1 (High frequency positive). Defined in IEEE 421.5

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Term	Description
IeeeTH10	Time constant TH10 (High frequency negative). Defined in IEEE 421.5
IeeeTH11	Time constant TH11 (High frequency negative). Defined in IEEE 421.5
IeeeTH12	Time constant TH12 (High frequency negative). Defined in IEEE 421.5
IeeeTH2	Time constant TH2 (High frequency positive). Defined in IEEE 421.5
IeeeTH3	Time constant TH3 (High frequency positive). Defined in IEEE 421.5
IeeeTH4	Time constant TH4 (High frequency positive). Defined in IEEE 421.5
IeeeTH5	Time constant TH5 (High frequency positive). Defined in IEEE 421.5
IeeeTH6	Time constant TH6 (High frequency positive). Defined in IEEE 421.5
IeeeTH7	Time constant TH7 (High frequency negative). Defined in IEEE 421.5
IeeeTH8	Time constant TH8 (High frequency negative). Defined in IEEE 421.5
IeeeTH9	Time constant TH9 (High frequency negative). Defined in IEEE 421.5
IeeeTI1	Time constant TI1 (Intermediate frequency positive). Defined in IEEE 421.5
IeeeTI10	Time constant TI10 (Intermediate frequency negative). Defined in IEEE 421.5
IeeeTI11	Time constant TI11 (Intermediate frequency negative). Defined in IEEE 421.5
IeeeTI12	Time constant TI12 (Intermediate frequency negative). Defined in IEEE 421.5
IeeeTI2	Time constant TI2 (Intermediate frequency positive). Defined in IEEE 421.5
IeeeTI3	Time constant TI3 (Intermediate frequency positive). Defined in IEEE 421.5
IeeeTI4	Time constant TI4 (Intermediate frequency positive). Defined in IEEE 421.5
IeeeTI5	Time constant TI5 (Intermediate frequency positive). Defined in IEEE 421.5
IeeeTI6	Time constant TI6 (Intermediate frequency positive). Defined in IEEE 421.5
IeeeTI7	Time constant TI7 (Intermediate frequency negative). Defined in IEEE 421.5
IeeeTI8	Time constant TI8 (Intermediate frequency negative). Defined in IEEE 421.5
IeeeTI9	Time constant TI9 (Intermediate frequency negative). Defined in IEEE 421.5

Term	Description
IeeeTL1	Time constant TL1 (Low frequency positive). Defined in IEEE 421.5
IeeeTL10	Time constant TL10 (Low frequency negative). Defined in IEEE 421.5
IeeeTL11	Time constant TL11 (Low frequency negative). Defined in IEEE 421.5
IeeeTL12	Time constant TL12 (Low frequency negative). Defined in IEEE 421.5
IeeeTL2	Time constant TL2 (Low frequency positive). Defined in IEEE 421.5
IeeeTL3	Time constant TL3 (Low frequency positive). Defined in IEEE 421.5
IeeeTL4	Time constant TL4 (Low frequency positive). Defined in IEEE 421.5
IeeeTL5	Time constant TL5 (Low frequency positive). Defined in IEEE 421.5
IeeeTL6	Time constant TL6 (Low frequency positive). Defined in IEEE 421.5
IeeeTL7	Time constant TL7 (Low frequency negative). Defined in IEEE 421.5
IeeeTL8	Time constant TL8 (Low frequency negative). Defined in IEEE 421.5
IeeeTL9	Time constant TL9 (Low frequency negative). Defined in IEEE 421.5
IeeeTw1	Time constant wash out Tw1. Defined in IEEE 421.5
IeeeTw2	Time constant wash out Tw2. Defined in IEEE 421.5
IeeeTw3	Time constant wash out Tw3. Defined in IEEE 421.5
IeeeTw4	Time constant wash out Tw4. Defined in IEEE 421.5
IeeeVHMax	Maximum limit set-point HF. Defined in IEEE 421.5
IeeeVHMin	Minimum limit set-point HF. Defined in IEEE 421.5
IeeeVIMax	Maximum limit set-point IF. Defined in IEEE 421.5
IeeeVIMin	Minimum limit set-point IF. Defined in IEEE 421.5
IeeeVLMax	Maximum limit set-point LF. Defined in IEEE 421.5
IeeeVLMin	Minimum limit set-point LF. Defined in IEEE 421.5
IeeeVsi1Max	Input High Limit 1. Defined in IEEE 421.5
IeeeVsi1Min	Input Low Limit 1. Defined in IEEE 421.5
IeeeVsi2Max	Input High Limit 2. Defined in IEEE 421.5
IeeeVsi2Min	Input Low Limit 2. Defined in IEEE 421.5
IeeeVstMax	Output High Limit. Defined in IEEE 421.5
IeeeVstMin	Output Low Limit. Defined in IEEE 421.5

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Term	Description
Imb	Imbalance
Imp	Impedance non-phase-related AC
Impact	Impact
Impt	Import
In	Input
Ina	Inactivity
Inc	Integer control
Incr	Increment, increase
Ind	Indication
Indp	Independent
Iner	Inertia
Inh	Inhibit
Inl	Inline
Inlet	Inlet
Ins	Insulation
Insol	Insolation
Inst	Instantaneous
Int	Integer
Intn	Internal
Intr	Interrupt, interruption
Intv	Interval
Inv	Inverter, inverted, inverse
Isc	Integer status control
Isld	Islanded
Iso	Isolation
Iu	Information unavailable
Ix	Index
Jmp	Jump
Jnt	Joint
K	Constant (regulation)
K0Fact	Zero-sequence (residual) compensation factor
KFact	K factor (harmonics)
Kck	Kicker
Key	Key, physical control device
L	Lower (action)
LDC	Line drop compensation
LDCR	Line drop compensation resistance
LDCX	Line drop compensation reactance
LDCZ	Line drop compensation impedance
LED	Light-emitting diode
LTC	Load tap changer
Last	Last
Ld	Lead

Term	Description
Leap	Leap (second)
Len	Length
Lev	Level
Lft	Lifting, lift
Lg	Lag
Life	Lifetime
Lim	Limit
Lin	Line
Liv	Live
Lkd	Locked
Lkg	Leakage
Ll	Last long (interval)
Lo	Low (state or value)
Loc	Local
Locb	Log control block
Lod	Load, loading
Log	Log
Lok	(use Lkd instead) Locked
Loop	Loop
Los	Loss
Ls	Last short (interval)
Lst	List
Lu	Lubrication
Lub	Lubrication
Lum	Luminosity
M	Minutes
MV	Measured value CDC
Made	Made
Mag	Magnetic, magnitude
Maint	Maintenance
Man	Manual
Mat	Material
Max	Maximum
Mbr	Membrane
Mdul	Module
Mech	Mechanical
Media	Media
Mem	Memory
Min	Minimum
Mlt	Multiple
Mod	Mode
Mot	Motor
Mrk	Market
Mst	Moisture

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Term	Description
Msvcb	Multicast sampled values control block
Mth	Method
Mult	Multiplier
Mvm	Movement, moving
Mx	Maximum
N2	Nitrogen
NOx	Nitrogen oxide
NQS	Average partial discharge current
Nam	Name
Name	Name (reserved for use in data objects EEName and LNName only)
Ndl	Needle (used in Pelton turbines)
NdsCom	Needs commissioning
Neut	Neutral
Ng	Negative
Nhd	Net head
Night	Night
No	No, not
Nom	Nominal, normalising
Num	Number
Nxt	Next
O2	Oxygen
O3	Ozon, trioxygen
Obl	Obligation
Oc	Open circuit
Odd	Odd
Of	Offline
Off	Off, device disengaged, not running
Ofs	Offset
Oil	Oil
On	On, device applied, running
Oo	Out of
Op	Operate, operating, operation
Operate	Operate order to any device
Opn	Open, opened
Out	Output
Ov	Over, override, overflow
Ovl	Overload
Ox	Oxidant
P	Proportional
PF	Power factor
PH	Acidity, value of pH
PNV	Phase-to-neutral voltage
POW	Point on wave switching

Term	Description
PP	Phase to phase
PPV	Phase to phase voltage
PT1	Low-pass exponential time rate filter
Pa	Partial
Pair	Pair, paired
Pap	Paper
Par	Parallel
Pas	Passive
Pcb	Power quality qualifier bin
Pct	Percent, percentage
Pdm	Power quality demodulation
Pe	Electric Power
Per	Periodic, period
Ph	Phase to reference
Phs	Phase
Phy	Physical
Pi	Instantaneous real power
Pin	Pin
Pipe	Pipe
Pk	Peak
Pl	Plant
Plg	Plug
Pls	Pulse
Plt	Plate; long-term flicker severity
Pmp	Pump
Po	Polar
Pol	Polarizing
Polytr	Polytropic
Pos	Position
Pot	Potentiometer
Prc	Price, pricing
Pre	Pre-
Prec	Precondition, initial status
Pres	Pressure
Prg	Progress, in progress
Prm	Permissive
Pro	Protection
Proc	Process
Proxy	Proxy
Prt	Parts, part
Ps	Positive
Psk	Penstock
Pss	PSS, power system stabiliser function
Pst	Post, short-term flicker severity

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Term	Description
Pt	Point
Pth	Pitch
Pwr	Power
Qty	Quantity
Qu	Queue
Qud	Quad
R	Raise, increase
Rad	Radiation
Ral	Rail
Ramp	Ramp
Rat	Ratio
Rb	Runner blade
Rcd	Record, recording
Rch	Reach
Rcl	Reclaim
Rct	Reaction
Rdy	Ready
Re	Retry
React	Reactance, reactive
Rec	Reclose
Rec1	Reclose after single phase fault
Rec13	Reclose after evolving fault
Rec3	Reclose after three phase fault
Recha	Recharge, recharging
Rect	Rectifier
Red	Redundant; (deprecated meaning) reduction
Ref	Reference
Reg	Regulation
Rel	Release
Req	Requested
Res	Residual
Reso	Resonance
Reuse	Reuse
Rf	Refreshment
Ris	Resistance
Rl	Relation, relative
Rm	Mutual resistance
Rmp	Ramping, ramp
Rms	Root mean square
Rn	Rain
Rnbk	Runback
Rng	Range
Rod	Rod

Term	Description
Root	Root
Rot	Rotation, rotor
Rpt	Repeat, repetition
Rs	Reset, resettable
Rsl	Result
Rst	Restraint, restriction
Rsv	Reserve
Rt	Ride-through
Rte	Rate
Rtg	Rating
Rv	Reverse
Rvrt	Revert
Rwy	Runaway, e.g. in runaway speed
Rx	Receive, received
S10	Coefficient S1.0
S12	Coefficient S1.2
SM	Servo, servo-motor
SNL	Speed-no-load, connected but not generating
SOx	Sulphur oxide
SPCSO	Single point controllable status output
SPG	Single point setting CDC
SPS	Single point status CDC
SPl	Single pole/phase
ST	Standard time
Saf	Safety
Sag	Sag
Sar	Surge arrestor
Sat	Saturation
Sc	Short circuit
Scale	Scale
Schd	Schedule
Sco	Supply change over
Sec	Security
Sel	Select
Self	Self
Seq	Sequence
Ser	Series, serial
Set	Setting
Sgcb	Setting group control block
Sh	Shunt
Shar	Shared
Shft	Shaft
Sig	Signal

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Term	Description
Sign	Sign
Sim	Simulation, simulated
Sld	Solidity
Slnt	Salinity, saline content
Slp	Sleep; slip
Smok	Smoke
Smp	Sampling
Snd	Sound pressure
Snpt	Snapshot
Snr	Signal to noise ratio
Snw	Snow
Soc	State of charge
Sof	Switch on to fault
Spc	Single point control
Spcf	Specific
Spd	Speed
Spec	Spectra
Spir	Spiral
Spt	Setpoint
Src	Source
Srfc	Surface
St	Status, state
Sta	Station, function at plant level
Stab	Stabilizer
Stat	Statistics
Stc	Stack
Stdby	Standby
Step	Step
Stk	Stroke
Stl	Still, not moving
Stnd	Stand, standing
Sto	Storage, e.g. activity of storing data
Stop	Stop
Storm	Storm
Stow	Stow
Str	Start
Strg	String
Stt	Stator
Stuck	Stuck, cannot move
Sub	Sub
Sum	Sum
Sup	Supply
Sv	Sampled value
SvCBRe	SV control block reference

Term	Description
f	
Svc	Service
Sw	Switch, switched
Swg	Swing
Swl	Power quality event swell
Syn	Synchronisation, synchronous, synchronism, synchrocheck
Sys	System
TP	Three pole/phase
Ta	Armature time constant
Tag	Tag (maintenance work in progress)
Tap	Tap
Task	Task
Td	Transformer derating
Td0p	Td0'
Td0s	Td0''
Tdd	Total demand distortion
Tdf	Transformer derating factor
Tdp	Td'
Tds	Td''
Tech	Technology
Term	Termination
Test	Test
Tgt	Target
Thd	Total harmonic distortion
Thm	Thermal
Ti	Telephone influence
Tilt	Tilt
Tm	Time
Tm1	Time constant 1
Tm2	Time constant 2
Tm3	Time constant 3
Tmh	Time in h
Tmm	Time in min
Tmms	Time in ms
Tmp	Temperature (°C)
Tms	Time in s
Tnk	Tank
Tns	Tension (stress)
Top	Top (position)
Torq	Torque
Tot	Total
Tp	Test Point
Tpc	Teleprotection
Tq0p	Tq0'

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Term	Description
Tq0s	Tq0''
Tqp	Tq'
Tqs	Tq''
Tr	Trip (electrical protection function)
Trb	Turbine
Trf	Transformer
Trg	Trigger
Trip	Trip (non-electrical function)
Trk	Track, tracking
Trs	Transient
Ts	Total signed
Tu	Total unsigned
Tun	Tuning
Tur	Turbine
Tx	Transmit, transmitted
Typ	Type
UPS	Uninterruptible power supply
Uhf	Ultra-high-frequency
Un	Un-; under
Unav	Unavailable
Unb	Unbalanced
Unld	Unload
Unt	Unit, production unit
Up	Up, upstream
Urcb	Unbuffered report control block
Use	Use
Used	Used
Usvcb	Unicast sampled values control block
Util	Utility
V	Voltage
V1	Voltage at side 1
V2	Voltage at side 2
VA	Apparent power (volt amperes)
VAh	Apparent energy
VAr	Reactive power (volt amperes reactive)
VArh	Reactive energy
Va	Variation
Vac	Vacuum
Val	Value
Vbr	Vibration
Ver	Vertical
Viol	Violation
Vis	Visibility
Visc	Viscosity

Term	Description
Vld	Valid, validate, validated
Vlm	Volume
Vlv	Valve
Vol	Voltage DC or non-phase-related AC
VolAmpr	Non-phase-related AC reactive power
W	Active power
W200	Watts peak at 200 W/m2
Wac	Watchdog
Wash	Washout
Watt	Active power non-phase-related AC
Wav	Wave, waveform
Wd	Wind
Week	Week
Wei	Weak end infeed
Wet	Wet
Wh	Watt hours
Wid	Width
Win	Window
Wkup	Wake up
Wld	Welding
Wrm	Warm
Wrn	Warning
Wtr	Water (physical aspect: river, cooling, etc.)
Wup	Windup
X	Reactance (imaginary part of impedance)
X0	Zero sequence reactance
X1	Positive sequence reactance
X2	Negative sequence reactance X2
Xd	Synchronous reactance Xd
Xdir	X-direction
Xdp	Transient synchronous reactance Xd'
Xds	Subtransient reactance Xd''
Xm	Mutual reactance
Xq	Synchronous reactance Xq
Xqp	Transient synchronous reactance Xq'
Xqs	Subtransient reactance Xq''
Xsec	Cross-section
Ydir	Y-direction
Yw	Yaw
Z	Impedance
Zer	Zero
Zero	(use 'Zer' instead) Zero
Zm	Mutual impedance

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Term	Description
Zn	Zone
Zro	Zero sequence
km	Kilometre
ppm	Parts per million

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Add an additional section as follows.

5 Logical node preliminaries

Move previous section 5.1 from edition 2 about logical node groups into this additional section as follows:

5.1 Logical node groups

The content of the section 5.1 has not been changed.

Add section 5.2.

5.2 Derived logical nodes and associated presence conditions nds/ds

Edition 2 of IEC 61850 introduces the concept of derived logical nodes for statistical calculation purpose, as explained in Annex F. These principles have however some direct impacts on whether to accept the presence of data objects in selected logical nodes.

IEC 61850-7-3 already includes a stereotype to "tag" the CDCs on which "derived" statistical calculation may apply, by using the <<statistics>> prefix in front of the sections dealing with these CDC which may support this derivation capability (a needed condition), i.e may be present in the context of derived LNs instances for statistical purpose.

This part of IEC 61850 is going further by indicating explicitely for each data object, which presence condition applies in the context of derived LN, for statistical purpose.

Two contexts are then introduced in the tables presenting the LN contents:

- nds is the common context of Non Derived Statistical case
- ds is the specific context where the LN instance is derived from another one (Derived Statistical) of same class, to expose the result of one calculation method (expressed in the ClcMth object and all other objects associated to specifiy the parameters of the method) on some selected objects derived from the original one.

Then for each data object the column of the LN table, which title is "PresCond nds/ds", two fields are present:

- a first field expressing the presence condition of the corresponding data object in case of nds context - chosen among the presence conditions expressed in Clause 5 of IEC 61850-7-3.
- a second field expressing the presence condition of the same object in case of ds context - chosen among the presence conditions expressed in Clause 5 of IEC 61850-7-3.

For example, consider the logical node STMP. A first instance of STMP (let's call it STMP1) is expecting to expose:

- the Temperature measurement
- The Trip information, based on a selected threshold

with no specific satistical calculation method indicated. This LN is not derived from any other source of information.

Table 143 indicates that CDCs and presence conditons (M/O/C nds/ns) are respectively

- "MV" with "O/O" for Tmp
- "SPS" with "O/F" for Trip
- "ENG" with "O/M" for ClcMth

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- "ORG" with "F/M" for ClcSrc

Then in compliance with the standard, this instance of STMP may contain (among other) Tmp, and Trip, and ClcMth may be absent. ClcSrc shall not be present (F - forbidden).

Let's now consider the need for getting the average on a sliding time interval of one hour, of the temperature measurement provided by STMP1. Then a new instance of STMP will be created, derived from STMP1 which will contain:

- ClcSrc shall be present to indicate a reference to STMP1, the source of information - said mandatory (M) in case of statistical derived LN
- Tmp - said optional (O) in case of derived statistical LN
- ClcMth shall be present and indicate "AVERAGE" - said mandatory (M) in case of derived statistical LN
- ClcMod, ClcIntvTyp, ClcIntvPer may be present to indicate that calculation is performed on a sliding window of time of one hour - said optional (O) in case of derived statistical LN

Trip cannot be present because it is forbidden (F) in case of derived statistical LN.

Move the previous section 5.2 into section 5.3.

5.3 Interpretation of logical node tables

The interpretation of the headings for the logical node tables is presented in Table 2.

Replace the table 2 as follows.

Table 2 – Interpretation of logical node tables

Column heading	Description
Data object name	Name of the data object
Common data class	Common data class that defines the structure of the data object. See IEC 61850-7-3. For common data classes regarding the service tracking logical node (LTRK), see IEC 61850-7-2.
Explanation	Explanation of the data object and how it is used.
T	Transient data objects – the status of data objects with this designation are momentary and must be logged or reported to provide evidence of their momentary state. Some T may be only valid on a modelling level. The TRANSIENT property of DATA OBJECTS only applies to BOOLEAN process data attributes (FC=ST) of that DATA OBJECTS. A transient DATA OBJECT is identical to normal DATA OBJECT, except that for the process state change from TRUE to FALSE no event may be generated for reporting and for logging. For transient data objects, the falling edge is not reported if the transient attribute is set to true in the SCL-ICD file.[1] It is recommended to report both states (TRUE to FALSE, and FALSE to TRUE), i.e. not to set the transient attribute in the SCL-ICD file for those DOs, and that the clients filter the transitions that are not "desired". For GOOSE or SMV services this attribute does not apply.

1 Transient is an attribute of the element DO of the LNodeType of the SCL (IEC 61850-6).

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PresCond nds / ds	This column defines whether a data object is mandatory (M), optional (O) or has some other presence condition for a non-derived-statistics (nds) and derived-statistics (ds) instance of a logical node. When a data object is marked mandatory (M), it shall be contained in the instance of the logical node. When a data object is marked optional (O), it may be contained in the instance of the logical node; the decision if the data object is contained or not is outside the scope of this standard. Other more complex presence conditions all have their semantic defined in IEC 61850-7-2 and for the convenience of the reader they are also reprinted (as informative) in Annex I. In case of a condition that is not machine processable, the text of the condition is given outside the LN table. NOTE1 Procurement specifications may require specific data objects marked optional to be provided for a particular project. The amount of optional information to be provided needs to be negotiated. NOTE 2 The attributes for data objects that are instantiated may also be mandatory or optional based on the CDC (attribute type) definition in IEC 61850-7-3.

Replace the next two paragraphs by the following ones.

The LN class names are individually given in the logical node tables. The LN instance name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2, Clause 22.

All data object names are listed alphabetically in Clause 7. Despite some overlapping, the data objects in the logical node classes are grouped for the convenience of the reader into the following categories, according to their respective common data class categories defined in IEC 61850-7-3:

– Status information
  Status information contains data object, which show either the status of the process or of the function allocated to the LN class. This information is produced locally and cannot be changed via communication for operational reasons unless substitution is applicable. Data objects such as “start” or “trip” are listed in this category. Most of these data objects are mandatory.

– Measured and metered values
  Measured values are analogue data objects measured from the process or calculated in the functions such as currents, voltages, power, etc. This information is produced locally and cannot be changed remotely unless substitution is applicable.
  Metered values are analogue data objects representing quantities measured over time, for example energy. This information is produced locally and cannot be changed remotely unless substitution is applicable.

– Controls
  Controls contain data objects which are changed by commands such as switchgear state (ON/OFF), tap changer position or resettable counters. They are typically changed remotely, and are changed during operation much more often than settings.

– Settings
  Settings are data objects which configure the function for its operation. Since many settings are dependent on the implementation of the function, only a commonly agreed minimum is standardised. They may be changed from remote, but normally not very often.

– Descriptions
  Descriptions are data objects, which give information about the LN itself or an allocated device. This information consists of identification information and general properties like configuration revision, hard and software revisions, etc.

Add the additional section 5.4 as follows:

5.4 Relationship between this standard and IEC 61850-5

This subclause presents the mappings between the logical nodes defined in IEC 61850-5 (as functional requirements) and the concrete logical nodes in this IEC 61850-7-4, in form of table.

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The meaning of the table columns is as follows:

- Functionality: Domain concept represented by the function.

- IEEE C37.2: Device function numbers and contact designations used in IEEE C37.2-2008, if applicable. Note that the reference to the IEEE device number does not mean the related device, but its core functionality in the context of the IEC 61850. Because of their device related definition there is not always a 1:1 relation to the function related definition of logical nodes.

- IEC 60617: Alphanumeric representation of graphical symbols according to IEC 60617, if applicable.

- LN IEC 61850-5: "requirements" logical node designation.

- LN IEC 61850-7-4: Standard (concrete) logical node designation. Note that mappings may not be one-to-one.

- Description: slightly modified description of the IEEE device number if applicable, or/and other descriptive text.

Table 3 shows mappings between IEC 61850-5 and IEC 61850-7-4 logical nodes.

Table 3 – Logical nodes mappings

Functionality	IEEE C37.2	IEC 60617	LN IEC 61850-5	LN IEC 61850-7-4	Description
OverspeedProt	12	\u03C9 >	POVS		A function that operates on machine overspeed.
SystemSupervision			SSYS		Function used to start, collect and process all data for system supervision. NOTE It is dependent on functions in the system and therefore, implemented distributed in the IEDs of the system (Example: health information from the LNs and services information, such as reception of GOOSE messages within Tmax). Some dedicated system supervision is provided by the system logical nodes (group L).
TestGenerator			GTES		Test generator is used to start tests by using process signals but avoiding any impact on the process (blocking of process outputs). NOTE Complex not-modelled function depending on test services provided which cannot be allocated to one single LN. For testing, see IEC 61850-10.
TimeMaster			STIM		A function that provides the time to the system (configuration, setting and synchronization).
PetersenCoilControl			ANCR	ANCR, ARIS	Petersen coil (or earth fault neutraliser) control dynamically determines the grounding of the transformer star point, which influences the short circuit in a network.
ReactivePowerControl			ARCO	ARCO	Reactive power control is an automatic function that keeps the reactive power flow in a substation within a specific range, using capacitors and/or reactances.
AutomaticTapChangerControl			ATCC	ATCC	Automatic tap changer control keeps the voltage of a busbar within a specific range using tap changers. This node operates the tap changer automatically according to given setpoints, or by direct operator commands (manual mode).

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Functionality	IEEE C37.2	IEC 60617	LN IEC 61850-5	LN IEC 61850-7-4	Description
AutomaticVoltageControl			AVCO	AVCO	Automatic voltage control keeps the voltage of a busbar within a specific range independently of the means.
AlarmHandler			CALH	CALH	Alarm handler, responsible for creating group alarms and group events. For the communication, there is no difference between alarms and events, if a time tag is added to any data transmitted. If several events or alarms have to be combined to group alarms, a separate, configurable function is needed, which may be used to calculate new data out of individual data from different other functions. Remote acknowledgement with different priority and authority shall be possible. The definition and handling of alarms is an engineering issue.
CoolingGroupControl			CCGR	CCGR	Cooling group control controls the cooling equipment. One instance per cooling group shall be used.
Interlocking	3		CILO	CILO	A function that issues a release or a block for a command in response to the position of one or more other devices or predetermined conditions in a piece of equipment or circuit, to allow an operating sequence to proceed, or to stop, or to provide check of the position of these devices or conditions for any purpose. Interlocking may be totally centralized or totally decentralized, and this function includes all interlocking rules referring to either bay or station level: - Interlocking of switchgear at bay level: Releases or blockings of requested commands are issued. In case of status changes affecting interlocking, blocking commands are issued. - Interlocking of switchgear at station level: Releases or blockings of requested commands are issued. Information with the bay interlocking functions is exchanged.
PointOnWaveBreakerControl			CPOW	CPOW	Point-on-wave breaker controller controls a CircuitBreaker with point-on-wave switching capability. It provides all the functionality to close or open a circuit breaker at a certain instant of time, i.e. at a certain point of the voltage or current wave. It is started by a request either from SwitchgearController or from Recloser. Comparing the voltages on both sides of the open breaker in the same way as the Synchrocheck function, it tries to close the contacts exactly at this time when the voltage difference is at an absolute minimum (preferable zero) to get the lowest stress for switchgear and line. This also applies if one of the voltages is zero. For opening, the point of minimum stress is calculated referring to the zero crossing of current wave. Normally, the current and one voltage are locally available at any time. For closing 't' the selection command detects and activates the remote voltage sending either from the v.t. at the busbar if applicable or in any connected bay.

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Functionality	IEEE C37.2	IEC 60617	LN IEC 61850-5	LN IEC 61850-7-4	Description
					For these calculations, the conditions in all three phases are considered. If switching per phase is applicable, three execution times are provided.
SwitchgearControl			CSWI	CSWI	Switchgear control controls any switchgear, i.e. CircuitBreaker and Switch. It handles all switchgear operations from the operators and from related automatics. It checks the authorisation of the commands. It supervises the command execution and gives an alarm in case if improper ending of the command. It asks for releases from Interlocking, Synchrocheck function, Autorecloser, etc. if applicable.
SynchroniserControl			CSYN	CSYN	Function used to control the synchronizing conditions i.e. voltage, frequency and phase.
Counter			FCNT	FCNT	A function that counts incoming pulses not related to the electrical network, i.e. not for energy counting.
OutputCurve			FCSD	FCSD	A function that represents curve shaped output values. The values can be dynamically modified online. The curves entered in the table can be based on statistics obtained following a series of index tests. The allocated function is used to adapt an incoming value to a specified curve function. For example, it may adjust 2-dimensionally nonlinear transmitters to the correct physical values or, by instantiation, for 3-dimensional surface mapping.
GenericFilter			FFIL	FFIL	A function that filters an incoming value with the following transfer function: G(s) = K(1+sT1)/(1+sT3+sT22).
OutputLimit			FLIM	FLIM	A function used to set temporary or permanent operational limits to an output analogue signal from a control function. It should not be used to replace ActionAtOverThreshold / ActionAtUnderThreshold.
PIDRegulator			FPID	FPID	A function comprising data that represent proportional, integral and derivative information for a PID controller.
RampFunction			FRMP	FRMP	A function used as a generic ramp for an analogue setpoint if a continuous change is needed.
SetpointControlFunction			FSPT	FSPT	A function that provides the common setpoint control characteristics found in controllers or regulators.
ActionAtOverThreshold			FXOT	FXOT	A function used to set a high-level threshold value if needed in control sequences. If a second level is necessary, a second instance can be modelled. This function can typically be used whenever a protection, control or alarm function is based on other physical measurements than primary electrical data.
ActionAtUnderThreshold			FXUT	FXUT	A function used to set a low-level threshold value if needed in control sequences. If a second level is necessary, a second instance can be modelled. This function can typically be used whenever a protection, control or alarm function is based on other physical measurements

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Functionality	IEEE C37.2	IEC 60617	LN IEC 61850-5	LN IEC 61850-7-4	Description
					than primary electric data.
GenericAutomaticControl			GAPC	GAPC	Generic automatic process control is a generic, programmable function for sequences, unknown functions, etc. The sequences may be implemented with standard PLC languages. The data access and exchange is entirely the same as for all other functions. Examples are: 1. Load shedding: To shed in a very selective way parts of the consumers to avoid the collapse of the network in overload situations. This load shedding function may not be restricted only on frequency criteria such as PFRQ but include actual power balance, etc. 2. Infeed transfer switching: To detect a weak infeed (for example to an industrial plant) and to switch over to another feeding line. Boundary conditions have to be considered such as the synchronization of motors, if applicable. 3. Transformer change: To switchover in case of overload to another transformer or to distribute the load more evenly to all related transformers on the busbar. 4. Busbar change: To start by one single operator command a sequence of switching operations resulting in a busbar change of a dedicated line or transformer, if applicable. 5. Automatic clearing and voltage restoration: To trip all circuits connected to a busbar after detecting zero-voltage conditions (black-out) and to close the same breakers following certain pre-defined rules.
GenericIO			GGIO	GGIO	Generic process IO, as seen by the automation system (i.e., group of I/Os), used to represent primary or auxiliary equipment non-predefined in groups X, Y or Z: (1) outputs such as analogue outputs, auxiliary relays, etc., (2) IOs representing devices such as horn, bell, target value etc., and (3) IOs from non-defined auxiliary devices.
GenericLog				GLOG	A function which allows logging not only changed data itself but also any related data being defined in the settings of this function. The logging may be started by data change or by operator request.
GenericSecurityApplication			GSAL	GSAL	Generic system and device security application contains logs about security violations.
Archiving			IARC	IARC	Archiving is sink and source for long-term historical data, normally used globally for the complete substation on station level.
HumanMachineInterface			IHMI	IHMI	Operator interface for local control (bay level) and global control (station level): (1) front-panel operator interface at bay level to be used for configuration, etc. and local control, and, (2) operator interface at station level, i.e., workplace. The role of the different HMI is not fixed for most of the functions and is defined in the engineering phase.
SafetyAlarm			ISAF	ISAF	Safety alarm function represents an alarm pushbutton or any other device that is

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Functionality	IEEE C37.2	IEC 60617	LN IEC 61850-5	LN IEC 61850-7-4	Description
					used to set an alarm in case of danger to persons or property.
TelecontrolInterface			ITCI	ITCI	Telecontrol (remote control) interface is used for remote control from a higher control level. Basically, it communicates the same data as the station level HMI, or a subset of these data. The role of the different interfaces is not fixed for most of the functions and is defined in the engineering phase. In case of seamless communication, telecontrol interface may exist only virtually. Depending on the outside world, it may be a proxy server or also any kind of gateway.
TelemonitoringInterface			ITMI	ITMI	Telemonitoring (remote monitoring) interface is used for remote monitoring and maintenance using a subset of all information available in the substation. It allows no control. The role of the different interfaces is not fixed for most of the functions and is defined in the engineering phase. In case of seamless communication, this function may exist only virtually. Depending on the outside world, it may be a proxy server or also any kind of gateway.
TeleprotectionInterface			ITPI	ITPC	Teleprotection (remote protection) interface is used for remote protection, i.e. for line protection where exchange of data between the two substations on both sides of the line is needed. It is applicable also for multi-end lines (T-connections). The role of the different interfaces is not fixed for most of the functions and defined in the engineering phase.
Fan			KFAN	KFAN	Physical device of a fan.
Filter			KFIL	KFIL	Physical device of a filter (mechanical)
Pump			KPMP	KPMP	Physical device of a pump.
Tank			KTNK	KTNK	Physical device of a tank, such as a hydraulic oil tank. The tank can be pressurised or not. If used to represent a tank for pressurised gas, only the pressure measurement will be used. If used for an oil sump, only the level measurement will be used. For a simple level sensor, the MediaLevelSensor can be used instead.
Valve			KVLV	KVLV	Valve or gate where the position can be given as a percentage of full open position (optionally, the angle 0°-90° may be used).
PhysicalChannelSupervision			LCCH	LCCH	Physical channel supervision models common issues for physical communication channels. It is instantiated for each physical channel or each pair of link level redundant physical channels.
GooseSubscriptionSupervision				LGOS	Not defined in IEC61850-5.
LogicalDeviceData			LLN0	LLN0	Logical device data, independent from all application function related functions, such as device identification/name plate, messages from device self-supervision, etc. It may be used also for actions common to all included functions (mode setting, settings, etc.) if applicable. It does not restrict the dedicated access to any single function by definition; Possible restrictions are a matter of implementation

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Functionality	IEEE C37.2	IEC 60617	LN IEC 61850-5	LN IEC 61850-7-4	Description
					and engineering.
PhysicalDeviceData			LPHD	LPHD, LTIM	Models common features of physical device (IED).
SvSubscriptionSupervision				LSVS	Not defined in IEC61850-5.
ServiceTracking				LTRK	Not defined in IEC61850-5.
EnvironmentalMeasurement			MENV	MENV	Models characteristics of environmental conditions such as emissions, and other key environmental data. As many of the environmental sensors may be located remotely, this function may therefore represent a collection of environmental information from many sources. It does, however, not include basic MeteorologicalMeasurement and HydrologicalMeasurement data.
FlickerMeasurement			MFLK	MFLK	Calculation of flicker inducing voltage fluctuations according to IEC 61000-4-15. The main use is for operative applications.
ThreePhaseHarmonicsAndInterharmonics			MHAI	MHAI	Harmonics and interharmonics (3ph) calculation, used for power quality assessment. This function acquires values from CTs and VTs and calculates harmonics, interharmonics and related values in the power system.
SimpleHarmonicsAndInterharmonics			MHAI	MHAN	Harmonics and interharmonics (non-phase-related AC) calculation, used for power quality assessment. See ThreePhaseHarmonicsAndInterharmonics.
HydrologicalMeasurement			MHYD	MHYD	Hydrological information such as river, lake, pond, or oceanic water related information. This may represent a collection of meteorological information from many sources.
DcMeasurement			MMXU	MMDC	Measuring DC quantity for operational purpose. See ThreePhaseMeasurement.
MeteorologicalMeasurement				MMET	Not defined in 61850-5.
SinglePhaseMetering			MMTR	MMTN	Measuring (1ph) for commercial purpose. See ThreePhaseMetering.
ThreePhaseMetering			MMTR	MMTR	Metering acquires (1) sampled voltage and current values directly from CTs and VTs and calculates the energy (integrated values), or, (2) energy values from external meters, for example, by pulses. It has to provide the requested accuracy, as the result is used for billing purposes.
SimpleMeasurement			MMXU	MMXN	Measuring (non-phase-related AC) for operative purpose. See ThreePhaseMeasurement.
ThreePhaseMeasurement			MMXU	MMXU	Acquires sampled values from CTs and VTs and calculates 3-phase measurands like r.m.s. values for current and voltage or power flows. These values are normally used for operational purposes like power flow supervision and management, screen displays, state estimation, etc. The requested accuracy for these functions has to be provided. Note: The measuring procedures in the protection devices are part of the dedicated protection algorithm represented by the protection functions.

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Functionality	IEEE C37.2	IEC 60617	LN IEC 61850-5	LN IEC 61850-7-4	Description
					and thus outside the scope of the communication standard. Therefore, measurement functions shall not be used as input for protection algorithms. Fault related data like fault peak value, etc. are always provided by the protection functions, and not measurement functions.
SequenceAndImbalance Calculation			MSQI	MSQI	Sequences and imbalances calculation, used for stability assessment. This function acquires values from CTs and VTs and calculates the sequences and imbalances in a three/multi-phase power system.
DirectionalProt	87B		PDIR	PDIR, RDIR	A function that operates based on an agreement of the fault direction signals from all directional fault sensors (for example directional relays) surrounding the fault. The directional fault sensors may be represented by any directional functions like AcDirectionalOvercurrentProt and DirectionalEarthFaultProt. The directional comparison for lines is made in combination with protection scheme (DistanceProt). NOTE In the comparison table provided in IEEE C37.2-2008 PDIR has the IEEE device number 87B associated.
LossOfFieldOrUnderexcitationProt	40		PUEX	PDUP, PDIS	A function that operates upon a given or abnormally high or low value or failure of machine field current, or on an excessive value of the reactive component of armature current in an ac machine indicating abnormally high or low field excitation. Underexcitation results in under power.
HarmonicRestraintProt			PHAR	PHAR	Used to represent the harmonic restraint data object especially for transformer differential protection function (TransformerDifferentialProt). There may be multiple instantiations with different settings.
EarthfaultProt	64	IE>	PHIZ	PHIZ, PTOC	A function that operates upon the insulation failure of a machine or other apparatus to ground. NOTE This function is not applied to a device connected in the secondary circuit of current transformers in a normally grounded power system where other overcurrent device numbers with the suffix G or N should be used; for example, 51N for an a.c. time overcurrent function operating at a desired value of ac overcurrent flowing in a predetermined direction of the secondary neutral of the current transformers.
InstantaneousOvercurrentProt	50	I>>	PIOC	PIOC	A function that operates with no intentional time delay when the current exceeds a preset value. The suffix TD should be used (e.g., 50TD) to describe a definite time overcurrent function. Use 50BF for a current monitored breaker failure function.
MotorStartupProt	48, 49, 51LR, 66		PMSU	PMRI, PMSS	Function that prevents any overload of the motor. (48) A function that returns the equipment to the normal or off position and locks it out if the normal starting, operating, or stopping sequence is not properly

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Functionality	IEEE C37.2	IEC 60617	LN IEC 61850-5	LN IEC 61850-7-4	Description
					completed within a predetermined time. (49) See ThermalOverload. (51LR) See AcTimeOvercurrent. (66) A function that operates to allow only a specified number of operations of a given device or piece of equipment, or a specified number of successive operations within a given time of each other. It is also a device that functions to energize a circuit periodically or for fractions of specified time intervals, or that is used to permit intermittent acceleration or jogging of a machine at low speeds for mechanical positioning.
PhaseAngleOrOutOfStepProt	78	\u03C6 >	PPAM	PPAM	A function that operates at a predetermined phase angle between two voltages, between two currents, or between a voltage and a current. See also PowerSwingBlockingProt.
RotorProt	49R, 64R, (40), 50, 51		PROT	PRTR, PTOC, PHIZ, PDUP, PDIS	Field short-circuit protection based on the 6th harmonic (300 Hz). Normally included in the excitation system. See also (49) ThermalOverloadProt, (64) RotorEarthFaultProt, (40) LossOfFieldOrUnderexcitationProt, (50) InstantaneousOvercurrentProt, and (51) AcTimeOvercurrentProt.
CarrierOrPilotWireProt	85		RCPW	PSCH	A function that is operated, restrained, or has its function modified by communications transmitted or received via any media used for relaying.
SwitchOnToFaultProt			PSOF	PSOF	A protection function intended to trip the circuit breaker breaker when the breaker is closed onto a fault. Different methods to detect the switch-on-to-fault situation may be applied.
VoltageDifferentialProt	87V		PTDV	PTDV	A function that works as a capacitor unbalance function to detect internal C-element faults. This function is applied if the capacitor offers a voltage tap to measure the 3-phase voltage within the capacitor installation. By also measuring the 3-phase bus voltage, a differential voltage is calculated.
TransientEarthfaultProt			PTEF	PTEF, RDIR	Transient earth faults happen if there is a fault to ground (isolation breakdown) in compensated networks. The fault disappears very fast since there is not sufficient current to feed it. No trip happens but the fault direction/location has to be detected to repair the faulted part. At least the degradation of the impacted line/cable is reported.
ThyristorProt			PTHF	PTHF	Thyristor (valve) protection in a power plant. Typically included in the excitation system.
AcTimeOvercurrentProt	50TD, 51	I>,t	PTOC	PTOC	A function that operates when the ac input current exceeds a predetermined value, and in which the input current and operating time are inversely related through a substantial portion of the performance range.
DcTimeOvercurrentProt	76		PDCO	PTOC	A function that operates when the current in a dc circuit exceeds a given value.
InterturnFaultProt	64W		PITF	PTOC	See EarthFaultProt.

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Functionality	IEEE C37.2	IEC 60617	LN IEC 61850-5	LN IEC 61850-7-4	Description
ReversePhaseOrPhaseBalanceCurrentProt	46	I2>	PPBR	PTOC	A function in a polyphase circuit that operates when the polyphase currents are of reverse-phase sequence, or when the polyphase currents are unbalanced, or when the negative phase sequence current exceeds a preset value.
RotorEarthFaultProt	64R		PREF	PTOC, PHIZ	See EarthFaultProt.
StatorEarthFaultProt	64S		PSEF	PTOC, PHIZ	See EarthFaultProt.
DcOvervoltageProt	59DC		PDOV	PTOV	See TimeOvervoltageProt.
PhaseSequenceOrBalanceVoltageProt	47	U2>	PPBV	PTOV	A function in a polyphase circuit that operates upon a pre-determined value of polyphase voltage in the desired phase sequence when the polyphase voltages are unbalanced, or when the negative phase-sequence voltage exceeds a preset value.
TimeOvervoltageProt	59	U>	PTOV	PTOV	A function which operates when its input voltage exceeds a predetermined value.
VoltageOrCurrentBalanceProt	60		PVCB	PTOV, PTOC	A function that operates on a given difference in voltage, or current input or output, of two circuits.
ProtectionTripConditioning			PTRC	PTRC	Connects the 'operate' outputs of one or more protection functions to a common 'trip' to be transmitted to CircuitBreaker, similar to a conventional trip matrix. In addition or alternatively, any combination of 'operate' outputs of the protection functions may be combined to a new 'operate' of this function.
OvertemperatureProt	26	\u03D1 >	PTTR	PTTR	A function that operates when the temperature of the protected apparatus (other than the load-carrying windings of machines and transformers as covered by device function number 49), or that of a liquid or other medium, exceeds a predetermined value; or when the temperature of the protected apparatus or that of a liquid or other medium exceeds a predetermined value or decreases below a predetermined value.
RotorThermalOverloadProt	49R		PROL	PTTR	See ThermalOverloadProt.
StatorThermalOverloadProt	49S		PSOL	PTTR	See ThermalOverloadProt.
ThermalOverloadProt	49	\u03F4 >	PTTR	PTTR	A function that operates when the temperature of a machine armature winding or other load-carrying winding or element of a machine or power transformer exceeds a predetermined value.
UndercurrentOrUnderpowerProt	37	P<	PUCP	PTUC, PDUP, RDIR	A function that operates when the current or power flow decreases below a predetermined value.
FrequencyProt	81, 7		PFRQ	PTUF, PTOF, PFRC	A function that responds to the frequency of an electrical quantity, operating when the frequency or rate of change of frequency exceeds or is less than a predetermined value.
UndervoltageProt	27	U<	PTUV	PTUV	A function that operates when its input voltage is less than a predetermined value.

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Functionality	IEEE C37.2	IEC 60617	LN IEC 61850-5	LN IEC 61850-7-4	Description
ZeroVoltageTripping			AZVT	PTUV	A function that automatically switches off the line connected to a substation, if the line is without voltage longer than a predefined time.
PowerFactorProt	55	cos\u03C6>, cos\u03C6<	PPFR	PUPF, POPF	A function that operates when the power factor in an a.c. circuit rises above or falls below a predetermined value.
VoltageControlledTimeOvercurrentProt	51V		PVOC	PVOC	As AcTimeOvercurrentProt, with voltage control/dependency.
VoltsPerHzProt	24		PVPH	PVPH	A function that operates when the ratio of voltage to frequency is above a preset value or is below a different preset value. The function may have any combination of instantaneous or time-delayed characteristics.
UnderspeedOrZeroSpeedProt	14	\u03C9<	PZSU	PZSU	A function that operates when the speed of a machine falls below a predetermined value.
SwitchOnToFaultProt			PSOF	PSOF	A protection function intended to trip the circuit breaker when the breaker is closed onto a fault. Different methods to detect the switch-on-to-fault situation may be applied.
FrequencyPQSupervision			QFVR	QFVR	The frequency variation event is started if the frequency exceeds the settable boundary for the frequency and finalized if the frequency comes back into the normal range as defined by the boundary. The maximum frequency deviation and the length of this event are registered. The occurrences of these events are registered in a histogram (ranges both of deviation and event time length). Over and under frequency events may be detected and registered separately. Definition based on IEC 61000-4-30.
CurrentPQSupervision			QITR	QITR	The current transient event is started if the r.m.s. current exceeds the settable boundary for current and finalized if the current comes back into the normal range as defined by the boundary. The maximum current transient excess and the length of this event are registered. The occurrences of these events are registered in a histogram (ranges both of excess and event time length). Definition based on IEC 61000-4-30.
CurrentUnbalancePQSupervision			QIUB	QIUB	The current unbalance variation event is started if in a poly-phase circuit the r.m.s. phase currents are unbalanced (the negative sequence current exceeds a settable boundary) and finalized if the negative sequence current comes back into the normal range as defined by the boundary. The maximum current unbalance and the length of this event are registered. The occurrences of these events are registered in a histogram (ranges both of unbalance and event time length). Definition based on IEC 61000-4-30.
VoltagePQSupervision			QVTR	QVTR	The voltage transient event is started if the r.m.s. voltage exceeds the settable boundary for voltage and finalized if the voltage comes back into the normal range as defined by the boundary. The maximum

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