

DIN EN 61850-7-4

ICS 33.040.40

**Kommunikationsnetze und -systeme in Stationen –
Teil 7-4: Grundlegende Kommunikationsstruktur für stations- und
feldbezogene Ausrüstung –
Kompatible Logikknoten- und Datenklassen (IEC 61850-7-4:2003);
Deutsche Fassung EN 61850-7-4:2003, Text in Englisch**

Communication networks and systems in substations –
Part 7-4: Basic communication structure for substation and feeder equipment –
Compatible logical node classes and data classes (IEC 61850-7-4:2003);
German version EN 61850-7-4:2003, text in English

Réseaux et systèmes de communication dans les postes –
Partie 7-4: Structure des communications de base pour les postes électriques et les
équipements de lignes –
Classes de données et classes de noeuds logiques compatibles (CEI 61850-7-4:2003);
Version allemande EN 61850-7-4:2003, texte en anglais

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Beginn der Gültigkeit

Die von CENELEC am 2003-06-01 angenommene EN 61850-7-4 gilt als Norm ab 2005-10-01.

Nationales Vorwort

Vorausgegangener Norm-Entwurf: E DIN EN 61850-7-4:2003-06.

Für die vorliegende Norm ist das nationale Arbeitsgremium K 952 „Netzleittechnik“ der DKE Deutsche Kommission Elektrotechnik Elektronik Informationstechnik im DIN und VDE zuständig.

Die enthaltene IEC-Publikation wurde vom TC 57 „Power systems management and associated information exchange“ erarbeitet.

Das IEC-Komitee hat entschieden, dass der Inhalt dieser Publikation bis zum Jahr 2005 unverändert bleiben soll. Zu diesem Zeitpunkt wird entsprechend der Entscheidung des Komitees die Publikation

- bestätigt,
- zurückgezogen,
- durch eine Folgeausgabe ersetzt oder
- geändert.

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

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

Der Zusammenhang der zitierten Normen mit den entsprechenden Deutschen Normen 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.

K 952 hat auf seiner Sitzung am 20. April 2005 festgestellt, dass die Bedingungen des DIN-Präsidialbeschlusses 1/2004 für die vorliegende Norm erfüllt sind. Demnach besteht die Europäische Norm EN 61850-7-4 nur in einer englischen Sprachfassung, weil sie nicht unmittelbar im Zusammenhang mit Rechtsvorschriften steht und nicht als Sicherheitsnorm anzusehen ist. Es kann davon ausgegangen werden, dass die Anwender dieser Norm über hinreichende englische Sprachkenntnisse verfügen. Für die meisten der verwendeten Begriffe existieren keine gebräuchlichen deutschen Benennungen, da sich die deutschen Anwender in der Regel ebenfalls der englischen Benennung bedienen.

Einführung in die DIN EN 61850-7-4

Dieser Teil der DIN EN 61850 legt ein Modell für Geräte und Funktionen, die in Stationen zur Anwendung kommen, fest. Insbesondere legt es zum Zwecke der Kommunikation zwischen intelligenten elektronischen Geräten die Namen von logischen Knoten und deren Arten fest. Hierzu gehören auch die Beziehungen zwischen logischen Knoten und Daten.

Die in der vorliegenden Norm festgelegten Namen von logischen Knoten und deren Daten gehören zu den in der DIN EN 6185-7-1 eingeführten und in der DIN EN 61850-7-2 festgelegten Klassenmodellen. Die in der vorliegenden Norm festgelegten Namen werden benutzt, um hierarchische Objektreferenzen aufzubauen zur Anwendung in der Kommunikation mit intelligenten elektronischen Geräten in Stationen und deren Feldern. Die Regeln zur Namensgebung nach DIN EN 61850-7-2 werden in der vorliegenden Norm angewendet.

Die vorliegende Norm legt Regeln zur Namensgebung für mehrfache Instanzen und Erweiterungen von Klassen von logischen Knoten und Datennamen fest, um zu vermeiden, dass dieses auf nicht genormte und unverträgliche Art und Weise stattfindet.

Zur weiteren Einführung in die Normen der Reihe DIN EN 61850 wird auf E DIN IEC 57/401/CD: IEC 61850-1, Kommunikationsnetze und -systeme in Stationen – Teil 1: Grundlegende Prinzipien sowie auf den Aufsatz „Modellierung einer kombinierten Hoch- und Mittelspannungsschaltanlage nach IEC 61850“ auf der DKE-Homepage verwiesen. Siehe hierzu www.dke.de und Eingabe von z. B. „61850“.

– Leerseite –

Kommunikationsnetze und -systeme in Stationen
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logiques compatibles
(CEI 61850-7-4:2003)

Diese Europäische Norm wurde von CENELEC am 2003-06-01 angenommen. Die CENELEC-Mitglieder sind gehalten, die CEN/CENELEC-Geschäftsordnung zu erfüllen, in der die Bedingungen festgelegt sind, unter denen dieser Europäischen Norm ohne jede Änderung der Status einer nationalen Norm zu geben ist.

Auf dem letzten Stand befindliche Listen dieser nationalen Normen mit ihren bibliographischen Angaben sind beim Zentralsekretariat oder bei jedem CENELEC-Mitglied auf Anfrage erhältlich.

Diese Europäische Norm besteht in drei offiziellen Fassungen (Deutsch, Englisch, Französisch). Eine Fassung in einer anderen Sprache, die von einem CENELEC-Mitglied in eigener Verantwortung durch Übersetzung in seine Landessprache gemacht und dem Zentralsekretariat mitgeteilt worden ist, hat den gleichen Status wie die offiziellen Fassungen.

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CENELEC

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European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique

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Ref. Nr. EN 61850-7-4:2003 D

Vorwort

Der Text des Schriftstücks 57/622/FDIS, zukünftige 1. Ausgabe von IEC 61850-7-4, ausgearbeitet von dem IEC/TC 57 „Power system control and associated communications“, wurde der IEC-CENELEC Parallelen Abstimmung unterworfen und von CENELEC am 2003-06-01 als EN 61850-7-4 angenommen.

Nachstehende Daten wurden festgelegt:

- spätestes Datum, zu dem die EN auf nationaler Ebene durch Veröffentlichung einer identischen nationalen Norm oder durch Anerkennung übernommen werden muss (dop): 2004-03-01
- spätestes Datum, zu dem nationale Normen, die der EN entgegenstehen, zurückgezogen werden müssen (dow): 2006-06-01

Anhänge, die als „normativ“ bezeichnet sind, gehören zum Norminhalt.

Anhänge, die als „informativ“ bezeichnet sind, enthalten nur Informationen.

In dieser Norm sind die Anhänge A und ZA normativ und die Anhänge B und C informativ.

Der Anhang ZA wurde von CENELEC hinzugefügt.

Anerkennungsnotiz

Der Text der Internationalen Norm IEC 61850-7-4:2003 wurde von CENELEC ohne irgendeine Abänderung als Europäische Norm angenommen.

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INTRODUCTION

This part of IEC 61850 is a part of set of specifications (IEC 61850). IEC 61850 defines a substation communication architecture. This architecture has been chosen to provide abstract definitions of classes and services such that the specifications are independent of 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 this communication architecture. IEC 61850-7-3 defines common attribute types and common data classes related to substation applications. 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 classes.

To reach interoperability, all data in the data model need a strong definition with regard to syntax and semantics. The semantics of the data is mainly provided by names assigned to logical nodes and data they contain, as defined in this part. Interoperability is easiest if as much as possible of the data are defined as mandatory. Because of different philosophies and technical features, settings were declared as optional in this edition of the standard. After some experience has been gained with this standard, this decision may be reviewed in an amendment or in the next revision of this part.

It should be noted that data with full semantics is only one of the elements required to achieve interoperability. Since data and services are hosted by devices (IED), a proper device model is needed along with compatible, domain specific services (see IEC 61850-7-2).

The compatible logical node name and data name definitions found in this part and the associated semantics are fixed. The syntax of the type definitions of all data classes are 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.

COMMUNICATION NETWORKS AND SYSTEMS IN SUBSTATIONS –

Part 7-4: Basic communication structure for substation and feeder equipment – Compatible logical node classes and data classes

1 Scope

This part of IEC 61850 specifies the information model of devices and functions related to substation applications. In particular, it specifies the compatible logical node names and data names for communication between Intelligent Electronic Devices (IED). This includes the relationship between Logical Nodes and Data.

The Logical Node Names and Data 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 substations and on distribution feeders. The naming conventions of IEC 61850-7-2 are applied in this part.

To avoid private, incompatible extension rules this part specifies normative naming rules for multiple instances and private extensions of Logical Node (LN) Classes and Data Names.

In Annex A, all rules are given (making use of examples) for:

- multiple instances of logical node classes by use of a LN instance identification (ID);
- multiple instances of data by use of a data instance ID;
- selecting data not included in LN out of the complete data name set;
- creating new logical node classes and data names.

In Annex B, examples are given for:

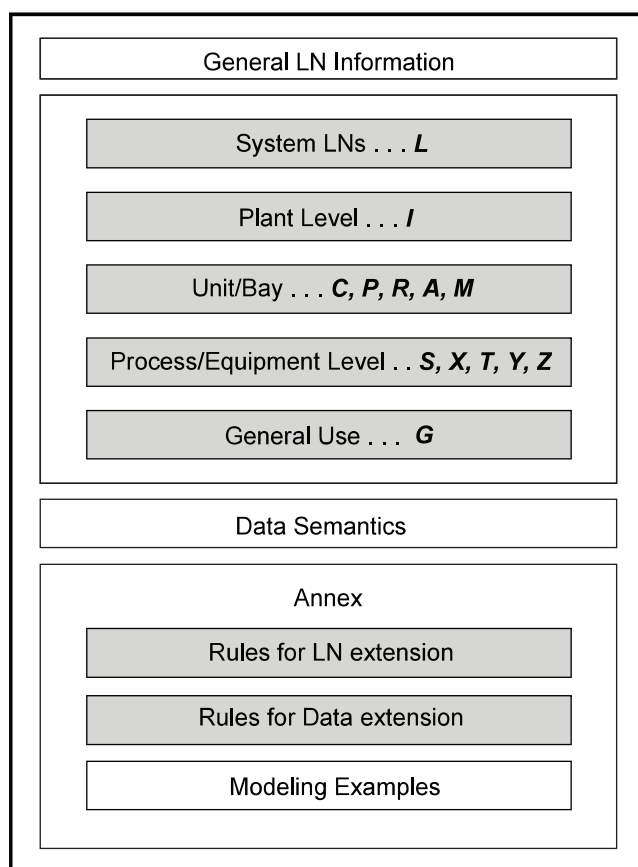
- the use of Logical Nodes in complex situations like line protection schemes;
- multiple instances of Logical Nodes with different levels of functionality.

This part does not provide tutorial material. It is recommended those parts IEC 61850-5 and IEC 61850-7-1 be read first, in conjunction with IEC 61850-7-3, and IEC 61850-7-2. This part does not discuss implementation issues. The relationship between this standard and IEC 61850-5 is outlined in Annex C.

This standard is applicable to describe device models and functions of substation and feeder equipment. The concepts defined in this standard may also be 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 distributed automation, or
- information exchange for metering.

Figure 1 provides a general overview of this document.



IEC 1102/03

Figure 1 – Overview of this standard

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 60255-24, *Electrical relays – Part 24: Common format for transient data exchange (COMTRADE) for power systems*

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

IEC 61850-2, *Communication networks and system in substations – Part 2: Glossary*¹

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

IEC 61850-7-1, *Communication networks and systems in substations – Part 7-1: Basic communication structure for substation and feeder equipment – Principles and models*

IEC 61850-7-2, *Communication networks and systems in substations – Part 7-2: Basic communication structure for substation and feeder equipment – Abstract communication service interface (ACSI)*

¹ To be published.

IEC 61850-7-3, *Communication networks and systems in substations – Part 7-3: Basic communication structure for substation and feeder equipment – Common data classes*

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

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

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

3 Terms and definitions

For the purpose of this international standard the terms and definitions given in IEC 61850-2² and IEC 61850-7-2 apply.

4 Abbreviated terms

The following terms are used to build concatenated Data 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".

Term	Description	Term	Description
A	Current	CB	Circuit Breaker
Acs	Access	CDC	Common Data Class
ACSI	Abstract Communication Service Interface	CE	Cooling Equipment
Acu	Acoustic	Cf	Crest factor
Age	Ageing	Cfg	Configuration
Alm	Alarm	CG	Core Ground
Amp	Current non phase related	Ch	Channel
An	Analogue	Cha	Charger
Ang	Angle	Chg	Change
Auth	Authorisation	Chk	Check
Auto	Automatic	Chr	Characteristic
Aux	Auxiliary	Cir	Circulating
Av	Average	Clc	Calculate
B	Bushing	Clk	Clock, clockwise
Bat	Battery	Cls	Close
Beh	Behaviour	Cnt	Counter
Bin	Binary	Col	Coil
Blk	Block, blocked	Cor	Correction
Bnd	Band	Crd	Coordination
Bo	Bottom	Crv	Curve
Cap	Capability	CT	Current Transducer
Capac	Capacitance	Ctl	Control
Car	Carrier	Ctr	Center

² Under consideration.

Term	Description	Term	Description
Cyc	Cycle	Gri	Grid
Dea	Dead	H	Harmonics (phase related)
Den	Density	H ₂	Hydrogen
Det	Detected	H ₂ O	Water
DExt	De-excitation	Ha	Harmonics (non phase related)
Diag	Diagnostics	Hi	High, highest
Dif	Differential, difference	HP	Hot point
Dir	Direction	Hz	Frequency
Dis	Distance	IEEE	Institute of Electrical and Electronic Engineers
DI	Delay	Imb	Imbalance
Dlt	Delete	Imp	Impedance non phase related
Dmd	Demand	In	Input
Dn	Down	Ina	Inactivity
DPCSO	Double point controllable status output	Incr	Increment
DQ0	Direct, Quadrature, and zero axis quantities	Ind	Indication
Drag	Drag hand	Inh	Inhibit
Drv	Drive	Ins	Insulation
DS	Device State	Int	Integer
Dsch	Discharge	ISCSO	Integer status controllable status output
Dur	Duration	km	Kilometre
EC	Earth Coil	L	Lower
EE	External Equipment	LD	Logical Device
EF	Earth Fault	LDC	Line Drop Compensation
Ena	Enabled	LDCR	Line Drop Compensation Resistance
Eq	Equalization, Equal	LDCX	Line Drop Compensation Reactance
Ev	Evaluation	LDCZ	Line Drop Compensation Impedance
Ex	External	LED	Light Emitting Diode
Exc	Exceeded	Len	Length
Excl	Exclusion	Lev	Level
Ext	Excitation	Lg	Lag
FA	Fault Arc	Lim	Limit
Fact	Factor	Lin	Line
Fan	Fan	Liv	Live
Flt	Fault	LN	Logical Node
Flw	Flow	Lo	Low
FPF	Forward Power Flow	LO	Lockout
Fu	Fuse	Loc	Local
Fwd	Forward	Lod	Load, loading
Gen	General	Lok	Locked
Gn	Generator	Los	Loss
Gnd	Ground	Lst	List
Gr	Group	LTC	Load Tap Changer
Grd	Guard	m	minutes

Term	Description	Term	Description
M/O	Data Object is Mandatory or Optional	R	Raise
Max	Maximum	R0	Zero sequence resistance
Mem	Memory	R1	Positive sequence resistance
Min	Minimum	Rat	Winding ratio
Mod	Mode	Rcd	Record, recording
Mot	Motor	Rch	Reach
Ms	Milliseconds	Rcl	Reclaim
Mst	Moisture	Re	Retry
MT	Main Tank	React	Reactance; Reactive
N	Neutral	Rec	Reclose
Nam	Name	Red	Reduction
Net	Net sum	Rel	Release
Ng	Negative	Rem	Remote
Nom	Nominal, Normalising	Res	Residual
Num	Number	Ris	Resistance
Ofs	Offset	RI	Relation, relative
Op	Operate, Operating	Rms	Root mean square
Opn	Open	Rot	Rotation, Rotor
Out	Output	Rs	Reset, Resettable
Ov	Over, Override, Overflow	Rsl	Result
Pa	Partial	Rst	Restraint
Par	Parallel	Rsv	Reserve
Pct	Percent	Rte	Rate
Per	Periodic	Rtg	Rating
PF	Power Factor	Rv	Reverse
Ph	Phase	Rx	Receive, received
Phy	Physical	S1	Step one
Pls	Pulse	S2	Step two
Plt	Plate	Sch	Scheme
Pmp	Pump	SCO	Supply change over
Po	Polar	SCSM	Specific Communication Service Mapping
Pol	Polarizing	Sec	Security
Pos	Position	Seq	Sequence
POW	Point on wave switching	Set	Setting
PP	Phase to phase	Sh	Shunt
PPV	Phase to phase voltage	Spd	Speed
Pres	Pressure	SPI	Single Pole
Prg	Progress, in progress	SPCSO	Single point controllable status output
Pri	Primary	Src	Source
Pro	Protection	St	Status
Ps	Positive	Stat	Statistics
Pst	Post	Stop	Stop
Pwr	Power	Std	Standard
Qty	Quantity	Str	Start

Term	Description	Term	Description
Sup	Supply	Un	Under
Svc	Service	V	Voltage
Sw	Switch	VA	Volt Amperes
Swg	Swing	Vac	Vacuum
Syn	Synchronisation	Val	Value
Tap	Tap	VAr	Volt Amperes Reactive
Td	Total distortion	Vlv	Valve
Tdf	Transformer derating factor	Vol	Voltage non phase related
Test	Test	VT	Voltage Transducer
Thd	Total Harmonic Distortion	W	Active Power
Thm	Thermal	Wac	Watchdog
TiF	Telephone influence factor	Watt	Active Power non phase related
Tm	Time	Wei	Weak End Infeed
	Tmh = Time in h	Wh	Watt hours
	Tmm = Time in min	Wid	Width
	Tms = Time in s	Win	Window
	Tmms = Time in ms	Wrm	Warm
Tmp	Temperature (°C)	X0	Zero sequence reactance
To	Top	X1	Positive sequence reactance
Tot	Total	Z	Impedance
TP	Three pole	Z0	Zero sequence impedance
Tr	Trip	Z1	Positive sequence impedance
Trg	Trigger	Zer	Zero
Ts	Total signed	Zn	Zone
Tu	Total unsigned	Zro	Zero sequence method
Tx	Transmit, transmitted		
Typ	Type		

5 Logical node classes

5.1 Logical Node groups

Logical nodes are grouped according to the Logical Node Groups listed in Table 1. The names of Logical Nodes shall begin with the character representing the group to which the Logical Node belongs. For modelling per phase (for example switches or instrument transformers), one instance per phase shall be created (see A.2.3 for example).

Table 1 – List of Logical Node Groups

Group Indicator	Logical node groups
A	Automatic Control
C	Supervisory control
G	Generic Function References
I	Interfacing and Archiving
L	System Logical Nodes
M	Metering and Measurement
P	Protection Functions

R	Protection Related Functions
S ^{a)}	Sensors, Monitoring
T ^{a)}	Instrument Transformer
X ^{a)}	Switchgear
Y ^{a)}	Power Transformer and Related Functions
Z ^{a)}	Further (power system) Equipment
^{a)} LNs of this group exist in dedicated IEDs if a process bus is used. Without a process bus, LNs of this group are the I/Os in the hardwired IED one level higher (for example in a bay unit) representing the external device by its inputs and outputs (process image – see Figure B.5 for example).	

NOTE The following letters are recommended for use by other technical committees: H-Hydropower, F-Fuel cells, W-Wind, O-Solar, B-Battery, N-Power plant.

5.2 Interpretation of Logical Node tables

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

Table 2 – Interpretation of Logical Node tables

Column heading	Description
Attribute Name	Name of the Data
Attr. Type	Common Data Class that defines the structure of the data. See IEC 61850-7-3.
Explanation	Short explanation of the data and how it is used.
T	Transient Data – the status of data with this designation is 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 only applies to BOOLEAN process data attributes (FC=ST) of that DATA. Transient DATA is identical to normal DATA, except that for the process state change from TRUE to FALSE no event may be generated for reporting and for logging.
M/O	This column defines whether data, data sets, control blocks or services are mandatory (M) or optional (O) for the instantiation of a specific Logical Node. NOTE The attributes for data that are instantiated may also be mandatory or optional based on the CDC (Attribute Type) definition in IEC 61850-7-3. Where the letter C is used for "conditional", at least one of the items of data labelled with C shall be used from each category where C occurs.

All Attribute Names (Data Names) are listed alphabetically in Clause 6. The data in the Logical Nodes Classes are grouped into various categories (as described below) for the convenience of the reader. This grouping may result in some overlapping.

All Attribute Names (Data Names) are listed alphabetically in Clause 6. Despite some overlapping, the data in the Logical Nodes Classes are grouped for the convenience of the reader into some of the following categories.

Common Logical Node Information

is information independent of the dedicated function represented by the LN class. Mandatory data (M) are common to all LN classes; optional data (O) are valid for a reasonable subset of LN classes.

Status Information

is data, which shows either the status of the process or of the function allocated to the LN class. This information is produced locally and cannot be changed remotely unless substitution is applicable. Data such as "start" or "trip" are listed in this category. Most of these data are mandatory.

Settings

are data which are needed for the function to operate. Since many settings are dependent on the

implementation of the function, only a commonly agreed minimum is standardised. They may be changed remotely, but normally not very often.

Measured values

are analogue data 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.

Controls

are data 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 than Settings.

Metered values

are analogue data representing quantities measured over time, e.g. energy. This information is produced locally and cannot be changed remotely unless substitution is applicable.

5.3 System Logical Nodes LN Group: L

5.3.1 General

In this subclause, the system specific information is defined. This includes Common Logical Node Information (for example logical node mode control, nameplate information, operation counters) as well as information related to the physical device (LPHD) implementing the logical devices and logical nodes. These logical nodes (LPHD and Common LN) are independent of the application domain. All other logical nodes are domain specific, but inherit mandatory and optional Data from these system logical nodes.

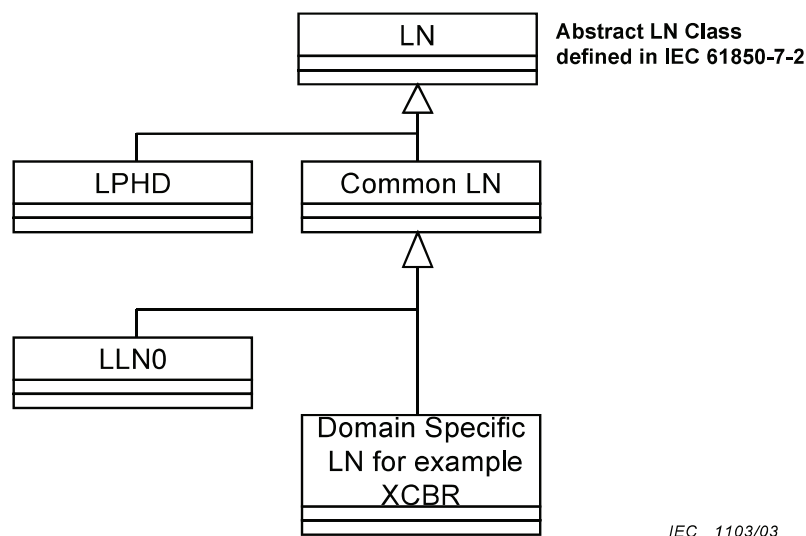


Figure 2 – LN Relationships

All logical node classes defined in this document inherit their structure from the abstract logical node class (LN, see Figure 2) defined in IEC 61850-7-2. Apart from the logical node class 'Physical Device Information' (LPHD) all logical node classes (LLN0 and domain specific LNs) defined in this document inherit at least the mandatory data of the common logical node (Common LN).

5.3.2 LN: Physical device information Name: LPHD

This LN is introduced in this part to model common issues for physical devices.

LPHD class				
Attribute Name	Attr. Type	Explanation	T	M/O
LNNName		Shall be inherited from Logical-Node Class (see IEC 61850-7-2)		
Data				
PhyNam	DPL	Physical device name plate		M
PhyHealth	INS	Physical device health		M
OutOv	SPS	Output communications buffer overflow		O
Proxy	SPS	Indicates if this LN is a proxy		M
InOv	SPS	Input communications buffer overflow		O
NumPwrUp	INS	Number of Power ups		O
WrmStr	INS	Number of Warm Starts		O
WacTrg	INS	Number of watchdog device resets detected		O
PwrUp	SPS	Power Up detected		O
PwrDn	SPS	Power Down detected		O
PwrSupAlm	SPS	External power supply alarm		O
RsStat	SPC	Reset device statistics	T	O

5.3.3 Common Logical Node

The compatible logical nodes classes defined in this document are specialisations of this common logical node class.

Common Logical Node class				
Attribute Name	Attr. Type	Explanation	T	M/O
LNNName		Shall be inherited from Logical-Node Class (see IEC 61850-7-2)		
Data				
Mandatory Logical Node Information (Shall be inherited by ALL LN but LPHD)				
Mod	INC	Mode		M
Beh	INS	Behaviour		M
Health	INS	Health		M
NamPlt	LPL	Name plate		M
Optional Logical Node Information				
Loc	SPS	Local operation		O
EEHealth	INS	External equipment health		O
EENam	DPL	External equipment name plate		O
OpCntRs	INC	Operation counter resetable		O
OpCnt	INS	Operation counter		O
OpTmh	INS	Operation time		O
Data Sets (see IEC 61850-7-2)				
Inherited and specialised from Logical Node class (see IEC 61850-7-2)				
Control Blocks (see IEC 61850-7-2)				
Inherited and specialised from Logical Node class (see IEC 61850-7-2)				
Services (see IEC 61850-7-2)				
Inherited and specialised from Logical Node class (see IEC 61850-7-2)				

A specialisation of this Common Logical Node class shall inherit all Data, Data Sets, Control Blocks and Services that are mandatory. For the optional data, there are three possibilities for specialisation:

- not to inherit these items;
- inherit these items and leave them as optional;
- inherit these items and define them as mandatory.

5.3.4 LN: Logical node zero Name: LLN0

This LN shall be used to address common issues for Logical Devices.

LLNO class				
Attribute Name	Attr. Type	Explanation	T	M/O
LNNName		Shall be inherited from Logical-Node Class (see IEC 61850-7-2)		
Data				
<i>Common Logical Node Information</i>				
		LN shall inherit all Mandatory Data from Common Logical Node Class		M
Loc	SPS	Local operation for complete logical device		O
OpTmh	INS	Operation time		O
Controls				
Diag	SPC	Run Diagnostics		O
LEDRs	SPC	LED reset	T	O

5.4 Logical Nodes for protection functions LN Group: P

5.4.1 Modelling remarks

This section refers to modelling of protection and protection related Logical Nodes and shows the relation (see Table 3) between IEC 61850-5 and the Logical Node class definitions according to this document.

- If there are several stages to one function (i.e. for multi-zone relay), each stage shall be a separate instance of the LN. Examples are PDIS (n zones) or PTOV (2 stages).
- Multiple instances shall be used if LNs of the same LN class are operating with different setting groups in parallel.
- If different measuring principles such as phase or ground are required, each shall be represented by an instance of the same basic function. An example is PTOC (used for phase or ground in dedicated instances).
- The logical nodes are defined in IEC 61850-5 from protection requirements, however for modelling purposes, some logical nodes have been split (see table below).
- Logical Nodes from IEC 61850-5 are modelled using combinations of the LNs defined in this part (see table below).
- Other logical nodes have been added to model complex protection devices and schemes (see the following clauses). As an example, line protection uses LN PSCH to combine the outputs from multiple protection LNs.
- The protection functions provide (if applicable) the data Str (Start) with direction information. In the case of a protection function which provides no direction information, the direction “unknown” shall be transmitted. The data Str is summarised by LN PTRC.
- If the fault direction is provided in Str (Start), the directional protection may be modelled without the Directional Element LN RDIR. If any of the settings provided by LN RDIR are needed, the LN RDIR shall be used.
- The protection functions provide (if applicable) the data Op (Operate) without direction information. The data Op is conditioned by LN PTRC resulting in the data Tr (Real Trip), i.e. between every protection LN and the circuit breaker node XCBB shall be a LN PTRC.

**Table 3 – Relation between IEC 61850-5 and IEC 61850-7-4 (this standard)
for protection LNs**

Functionality	IEEE C37.2 reference	Defined in IEC 61850-5	Modelled in IEC 61850-7-4	Comments
Transient earthfault		PTEF	PTEF	Use shown in Annex B.1
Directional earth fault wattmetric protection		PWDE	PSDE	Sensitive earth fault protection Use shown in Annex B.1
Zero speed and underspeed	14	PZSU	PZSU	
Distance	21	PDIS	PDIS PSCH	Use one instance per zone. To build line protection schemes
Volt per Hz	24	PVPH	PVPH	
(Time) Undervoltage	27	PTUV	PTUV	
Directional power /reverse power	32	PDPR	PDOP or PDUP	Directional over power Directional under power Reverse power modelled by PDOP plus directional mode "reverse"
Undercurrent/underpower	37	PUCP	PTUC PDUP	Undercurrent Underpower
Loss of field/Underexcitation	40	PUEX	PDUP	Directional under power
Reverse phase or phase balance current	46	PPBR	PTOC	Time overcurrent (PTOC) with three-phase information with sequence current as an input or even ratio of negative and positive sequence currents
Phase sequence voltage	47	PPBV	PTOV	Three-phase information and processing
Thermal overload	49	PTTR	PTTR	
Rotor thermal overload	49R	PROL	PTTR	Thermal overload
Stator thermal overload	49S	PSOL	PTTR	Thermal overload
Instantaneous overcurrent or rate of rise	50	PIOC	PIOC	
AC time overcurrent	51	PTOC	PTOC	
Voltage controlled/dependent time overcurrent	51V	PVOC	PVOC	
Power factor	55	PPFR	POPF PUPF	Over power factor Under power factor
(Time) Overvoltage	59	PTOV	PTOV	
DC-overvoltage	59DC	PDOV	PTOV	Both for DC and AC
Voltage or current balance	60	PVCB	PTOV PTOC	Overvoltage or overcurrent regarding the magnitude of the difference
Earth fault / Ground detection	64	PHIZ	PHIZ	
Rotor earth fault	64R	PREF	PTOC	Time overcurrent
Stator earth fault	64S	PSEF	PTOC	Time overcurrent
Interturn fault	64W	PITF	PTOC	Time overcurrent
AC directional overcurrent	67	PDOC	PTOC	Time overcurrent
Directional earth fault	67N	PDEF	PTOC	Time overcurrent
DC time overcurrent	76	PDCO	PTOC	Time overcurrent for AC and DC
Phase angle or out-of-step	78	PPAM	PPAM	

Functionality	IEEE C37.2 reference	Defined in IEC 61850-5	Modelled in IEC 61850-7-4	Comments
Frequency	81	PFRQ	PTOF PTUF PFRC	Over frequency Under frequency Rate of change of frequency
Carrier or pilot wire protection	85	RCPW	PSCH	PSCH is used for line protection schemes instead of RCPW
Differential	87	PDIF	PDIF	
Phase comparison	87P	PPDF	PDIF	
Differential line	87L	PLDF	PDIF	
Restricted earth fault	87N	PNDF	PDIF	
Differential transformer	87T	PTDF	PDIF PHAR	Differential transformer Harmonic restraint
Busbar	87B	PBDF	PDIF or PDIR	Busbar differential or Fault direction comparison
Motor differential	87M	PMDF	PDIF	
Generator differential	87G	PGDF	PDIF	
Motor Startup	49R, 66 48, 51LR	PMSU	PMRI PMSS	Motor Restart Inhibition Motor Starting Time Supervision

5.4.2 LN: Differential Name: PDIF

See IEC 61850-5 (LNs PLDF, PNDF, PTDF, PBDF, PMDF, and PPDF). This LN shall be used for all kind of current differential protection. Proper current samples for the dedicated application shall be subscribed.

PDIF class				
Attribute Name	Attr. Type	Explanation	T	M/O
LNName		Shall be inherited from Logical-Node Class (see IEC 61850-7-2)		
Data				
Common Logical Node Information				
		LN shall inherit all Mandatory Data from Common Logical Node Class		M
OpCntRs	INC	Resetable operation counter		O
Status Information				
Str	ACD	Start		O
Op	ACT	Operate	T	M
TmASt	CSD	Active curve characteristic		O
Measured Values				
DifACIc	WYE	Differential Current		O
RstA	WYE	Restraint Current		O
Settings				
LinCapac	ASG	Line capacitance (for load currents)		O
LoSet	ING	Low operate value, percentage of the nominal current		O
HiSet	ING	High operate value, percentage of the nominal current		O
MinOpTmms	ING	Minimum Operate Time		O
MaxOpTmms	ING	Maximum Operate Time		O
RstMod	ING	Restraint Mode		O
RsdITmms	ING	Reset Delay Time		O
TmAcrv	CURVE	Operating Curve Type		O

5.4.3 LN: Direction comparison Name: PDIR

For a description of this LN, see IEC 61850-5. The operate decision is based on an agreement of the fault direction signals from all directional fault sensors (for example directional relays) surrounding the fault. The directional comparison for lines is made with PSCH.

PDIR class				
Attribute Name	Attr. Type	Explanation	T	M/O
LNNName		Shall be inherited from Logical-Node Class (see IEC 61850-7-2)		
Data				
Common Logical Node Information				
		LN shall inherit all Mandatory Data from Common Logical Node Class		M
OpCntRs	INC	Resetable operation counter		O
Status Information				
Str	ACD	Start (appearance of the first related fault direction)		M
Op	ACT	Operate (decision from all sensors that the surrounded object is faulted)	T	M
Settings				
RsDITmms	ING	Reset Delay Time		O

5.4.4 LN: Distance Name: PDIS

For a description of this LN, see IEC 61850-5. The phase start value and ground start value are minimum thresholds to release the impedance measurements depending on the distance function characteristic given by the algorithm and defined by the settings. The settings replace the data curve as used for the characteristic on some other protection LNs.

PDIS class				
Attribute Name	Attr. Type	Explanation	T	M/O
LNNName		Shall be inherited from Logical-Node Class (see IEC 61850-7-2)		
Data				
Common Logical Node Information				
		LN shall inherit all Mandatory Data from Common Logical Node Class		M
OpCntRs	INC	Resetable operation counter		O
Status Information				
Str	ACD	Start		M
Op	ACT	Operate	T	M
Settings				
PoRch	ASG	Polar Reach is the diameter of the Mho diagram		O
PhStr	ASG	Phase Start Value		O
GndStr	ASG	Ground Start Value		O
DirMod	ING	Directional Mode		O
PctRch	ASG	Percent Reach		O
Ofs	ASG	Offset		O
PctOfs	ASG	Percent Offset		O
RisLod	ASG	Resistive reach for load area		O
AngLod	ASG	Angle for load area		O
TmDIMod	SPG	Operate Time Delay Mode		O
OpDITmms	ING	Operate Time Delay		O
PhDIMod	SPG	Operate Time Delay Multiphase Mode		O
PhDITmms	ING	Operate Time Delay for Multiphase Faults		O
GndDIMod	SPG	Operate Time Delay for Single Phase Ground Mode		O
GndDITmms	ING	Operate Time Delay for single phase ground faults		O

PDIS class				
Attribute Name	Attr. Type	Explanation	T	M/O
X1	ASG	Positive sequence line (reach) reactance		O
LinAng	ASG	Line Angle		O
RisGndRch	ASG	Resistive Ground Reach		O
RisPhRch	ASG	Resistive Phase Reach		O
K0Fact	ASG	Residual Compensation Factor K_0		O
K0FactAng	ASG	Residual Compensation Factor Angle		O
RsDITmms	ING	Reset Time Delay		O

5.4.5 LN: Directional overpower Name: PDOP

For a description of this LN, see IEC 61850-5 (LN PDPR). This LN shall be used for the overpower part of PDPR. Additionally, PDOP is used to model a reverse overpower function (IEEE device function number 32R, from IEEE 32R.2,1996) when the DirMod is set to reverse.

PDOP class				
Attribute Name	Attr. Type	Explanation	T	M/O
LNNName		Shall be inherited from Logical-Node Class (see IEC 61850-7-2)		
Data				
Common Logical Node Information				
		LN shall inherit all Mandatory Data from Common Logical Node Class		M
OpCntRs	INC	Resetable operation counter		O
Status Information				
Str	ACD	Start		M
Op	ACT	Operate	T	M
Settings				
DirMod	ING	Directional Mode		O
StrVal	ASG	Start Value		O
OpDITmms	ING	Operate Delay Time		O
RsDITmms	ING	Reset Delay Time		O

5.4.6 LN: Directional underpower Name: PDUP

For a description of this LN, see IEC 61850-5 (LN PDPR). This LN shall be used for the underpower part of PDPR.

PDUP class				
Attribute Name	Attr. Type	Explanation	T	M/O
LNNName		Shall be inherited from Logical-Node Class (see IEC 61850-7-2)		
Data				
Common Logical Node Information				
		LN shall inherit all Mandatory Data from Common Logical Node Class		M
OpCntRs	INC	Resetable operation counter		O
Status Information				
Str	ACD	Start		M
Op	ACT	Operate	T	M
Settings				
StrVal	ASG	Start Value		O
OpDITmms	ING	Operate Delay Time		O
RsDITmms	ING	Reset Delay Time		O
DirMod	ING	Directional Mode		O

5.4.7 LN: Rate of change of frequency Name: PFRC

For a description of this LN, see IEC 61850-5 (LN PFRQ). This LN shall be used to model the rate of frequency change of PFRQ. One instance shall be used per stage.

PFRC class				
Attribute Name	Attr. Type	Explanation	T	M/O
LNNName		Shall be inherited from Logical-Node Class (see IEC 61850-7-2)		
Data				
Common Logical Node Information				
		LN shall inherit all Mandatory Data from Common Logical Node Class		M
OpCntRs	INC	Resettable operation counter		O
Status Information				
Str	ACD	Start		M
Op	ACT	Operate	T	M
BlkV	SPS	Blocked because of voltage		O
Settings				
StrVal	ASG	Start Value df/dt		O
BlkVal	ASG	Voltage Block Value		O
OpDITmms	ING	Operate Delay Time		O
RsDITmms	ING	Reset Delay Time		O

5.4.8 LN: Harmonic restraint Name: PHAR

This LN shall be used to represent the harmonic restraint data of the transformer differential protection (see PDIF) in a dedicated node. There may be multiple instantiations of this LN with different settings, especially with different data HaRst.

PHAR class				
Attribute Name	Attr. Type	Explanation	T	M/O
LNNName		Shall be inherited from Logical-Node Class (see IEC 61850-7-2)		
Data				
Common Logical Node Information				
		LN shall inherit all Mandatory Data from Common Logical Node Class		M
OpCntRs	INC	Resettable operation counter		O
Status Information				
Str	ACD	Start (active when restraint is needed)		M
Settings				
HaRst	ING	Number of harmonic restrained		O
PhStr	ASG	Start Value		O
PhStop	ASG	Stop Value		O
OpDITmms	ING	Operate Delay Time		O
RsDITmms	ING	Reset Delay Time		O

5.4.9 LN: Ground detector Name: PHIZ

For a description of this LN, see IEC 61850-5. This LN shall be used for high-impedance isolation faults only.

PHIZ class				
Attribute Name	Attr. Type	Explanation	T	M/O
LNNName		Shall be inherited from Logical-Node Class (see IEC 61850-7-2)		
Data				
Common Logical Node Information				
		LN shall inherit all Mandatory Data from Common Logical Node Class		M
OpCntRs	INC	Resetable operation counter		O
Status Information				
Str	ACD	Start		M
Op	ACT	Operate	T	M
Settings				
AStr	ASG	Current Start Value		O
VStr	ASG	Voltage Start Value		O
HVStr	ASG	Third Harmonic Voltage Start Value		O
OpDITmms	ING	Operate Delay Time		O
RsDITmms	ING	Reset Delay Time		O

5.4.10 LN: Instantaneous overcurrent Name: PIOC

For a description of this LN, see IEC 61850-5. This LN shall be used for instantaneous overcurrent protection only.

PIOC class				
Attribute Name	Attr. Type	Explanation	T	M/O
LNNName		Shall be inherited from Logical-Node Class (see IEC 61850-7-2)		
Data				
Common Logical Node Information				
		LN shall inherit all Mandatory Data from Common Logical Node Class		M
OpCntRs	INC	Resetable operation counter		O
Status Information				
Str	ACD	Start		O
Op	ACT	Operate	T	M
Settings				
StrVal	ASG	Start Value		O

5.4.11 LN: Motor restart inhibition Name: PMRI

For a description of this LN, see IEC 61850-5 (LN PMSU). This LN shall be used to model from LN PMSU the part which protects a motor against thermal overload during start-up in a dedicated LN.

PMRI class				
Attribute Name	Attr. Type	Explanation	T	M/O
LNNName		Shall be inherited from Logical-Node Class (see IEC 61850-7-2)		
Data				
Common Logical Node Information				
		LN shall inherit all Mandatory Data from Common Logical Node Class		M
OpCntRs	INC	Resetable operation counter		O

PMRI class				
Attribute Name	Attr. Type	Explanation	T	M/O
Status Information				
Op	ACT	Operate	T	O
StrInh	SPS	Restart inhibited		O
StrInhTmm	INS	Restart Inhibition Time		O
Settings				
SetA	ASG	Current setting for motor start-up		O
SetTms	ING	Time Setting for motor start-up		O
MaxNumStr	ING	Maximum number of starts (also for cold starts)		O
MaxWrmStr	ING	Maximum Warm Starts, permissible number of warm starts		O
MaxStrTmm	ING	Time period for the maximum number of starts		O
EqTmm	ING	Temperature Equalisation Time		O
InhTmm	ING	Restart Inhibit Time		O

5.4.12 LN: Motor starting time supervision Name: PMSS

For a description of this LN, see IEC 61850-5 (LN PMSU). This LN shall be used to model from LN PMSU the part which protects a motor against excessive starting time/locked rotor during start-up in a dedicated LN.

PMSS class				
Attribute Name	Attr. Type	Explanation	T	M/O
LNName		Shall be inherited from Logical-Node Class (see IEC 61850-7-2)		
Data				
Common Logical Node Information				
		LN shall inherit all Mandatory Data from Common Logical Node Class		M
OpCntRs	INC	Resetable operation counter		O
Status Information				
Str	ACD	Start		O
Op	ACT	Operate	T	O
Settings				
SetA	ASG	Current setting for motor start-up		O
SetTms	ING	Time Setting for motor start-up		O
MotStr	ASG	I Motor Startup, (current pickup value of motor starting)		O
LokRotTms	ING	Lock Rotor Time, permissible locked rotor time		O

5.4.13 LN: Over power factor Name: POPF

For a description of this LN, see IEC 61850-5 (LN PPFR). This LN shall be used for the over power factor part of PPFR.

POPF class				
Attribute Name	Attr. Type	Explanation	T	M/O
LNName		Shall be inherited from Logical-Node Class (see IEC 61850-7-2)		
Data				
Common Logical Node Information				
		LN shall inherit all Mandatory Data from Common Logical Node Class		M
OpCntRs	INC	Resetable operation counter		O

POPF class				
Attribute Name	Attr. Type	Explanation	T	M/O
Status Information				
Str	ACD	Start		M
Op	ACT	Operate	T	M
BlkA	SPS	Blocked below minimum operating current		O
BlkV	SPS	Blocked below minimum operating voltage		O
Settings				
StrVal	ASG	Start Value		O
OpDITmms	ING	Operate Delay Time		O
RsDITmms	ING	Reset Delay Time		O
BlkValA	ASG	Block Value (Minimum operating current)		O
BlkValV	ASG	Block Value (Minimum operating voltage)		O

5.4.14 LN: Phase angle measuring Name: PPAM

For a description of this LN, see IEC 61850-5. This function shall be used to model “out-of-step” protection of generators.

PPAM class				
Attribute Name	Attr. Type	Explanation	T	M/O
LNNName		Shall be inherited from Logical-Node Class (see IEC 61850-7-2)		
Data				
Common Logical Node Information				
		LN shall inherit all Mandatory Data from Common Logical Node Class		M
OpCntRs	INC	Resetable operation counter		O
Status Information				
Str	ACD	Start		M
Op	ACT	Operate	T	M
Settings				
StrVal	ASG	Start Value		O

5.4.15 LN: Protection scheme Name: PSCH

This LN shall be used to model the logic scheme for line protection function co-ordination. The protection scheme allows the exchange of the “operate” outputs of different protection functions and conditions for line protection schemes. It includes data for teleprotection if applicable. In this case, all appropriate data shall be subscribed.

PSCH class				
Attribute Name	Attr. Type	Explanation	T	M/O
LNNName		Shall be inherited from Logical-Node Class (see IEC 61850-7-2)		
Data				
Common Logical Node Information				
		LN shall inherit all Mandatory Data from Common Logical Node Class		M
OpCntRs	INC	Resetable operation counter		O
Status Information				
ProTx	SPS	Teleprotection signal transmitted	T	M
ProRx	SPS	Teleprotection signal received	T	M
Str	ACD	Carrier Send		M
Op	ACT	Operate	T	M

PSCH class				
Attribute Name	Attr. Type	Explanation	T	M/O
CarRx	ACT	Carrier received after unblock logic		O
LosOfGrd	SPS	Loss of guard		O
Echo	ACT	Echo signal from weak end infeed function		O
WeiOp	ACT	Operate signal from weak end infeed function		O
RvABlk	ACT	Block signal from current reversal function		O
GrdRx	SPS	Guard Received		O
Settings				
SchTyp	ING	Scheme Type		O
OpDITmms	ING	Operate Delay Time		O
CrdTmms	ING	Co-ordination timer for blocking scheme		O
DurTmms	ING	Minimum duration of carrier send signal		O
UnBlkMod	ING	Unblock function mode for scheme type		O
SecTmms	ING	Pickup security timer on loss of carrier guard signal		O
WeiMod	ING	Mode of weak end infeed function		O
WeiTmms	ING	Co-ordination time for weak end infeed function		O
PPVVal	ASG	Voltage level for weak end infeed function – phase-phase		O
PhGndVal	ASG	Voltage level for weak end infeed function – phase-ground		O
RvAMod	ING	Mode of current reversal function		O
RvATmms	ING	Pickup time for current reversal logic		O
RvRsTmms	ING	Delay time for reset of current reversal output		O

5.4.16 LN: Sensitive directional earthfault Name: PSDE

For a general description of directed earth fault protection, see IEC 61850-5. This LN is used for directional earthfault handling in compensated and isolated networks. The use of “operate” is optional and depends both on protection philosophy and on instrument transformer capabilities. For compensated networks, this function is often called wattmetric directional earthfault. The very high accuracy needed for fault current measurement in compensated networks may require phase angle compensation. This shall be realised by the related LN TCTR.

PSDE class				
Attribute Name	Attr. Type	Explanation	T	M/O
LNNName		Shall be inherited from Logical-Node Class (see IEC 61850-7-2)		
Data				
Common Logical Node Information				
		LN shall inherit all Mandatory Data from Common Logical Node Class		M
OpCntRs	INC	Resetable operation counter		O
Status Information				
Str	ACD	Start		M
Op	ACT	Operate	T	O
Settings				
Ang	ASG	Angle between voltage (U_0) and current (I_0)		O
GndStr	ASG	Ground Start Value (3 U_0)		O
GndOp	ASG	Ground Operate Value (3 I_0)		O
StrDITmms	ING	Start Delay Time		O
OpDITmms	ING	Operate Delay Time		O
DirMod	ING	Directional Mode		O

5.4.17 LN: Transient earth fault Name: PTEF

For a description of this LN, see IEC 61850-5. This LN shall be used to detect ("start") transient earth fault in compensated networks.

PTEF class				
Attribute Name	Attr. Type	Explanation	T	M/O
LNName		Shall be inherited from Logical-Node Class (see IEC 61850-7-2)		
Data				
Common Logical Node Information				
		LN shall inherit all Mandatory Data from Common Logical Node Class		M
OpCntRs	INC	Resetable operation counter		O
Status Information				
Str	ACD	Start (Transient earth fault)		C
Op	ACT	Operate (Transient earth fault)	T	C
Settings				
GndStr	ASG	Ground Start Value		O
DirMod	ING	Directional Mode		O

Condition C: at least one of the two status information (Str, Op) shall be used.

5.4.18 LN: Time overcurrent Name: PTOC

For a description of this LN, see IEC 61850-5 (LN PTOC). This LN shall also be used to model the Directional Time Overcurrent (PDOC/IEEE 67). The Definite Time overcurrent (also PTOC/IEEE 51) shall be modelled by use of PTOC and selecting the related curve.

PTOC class				
Attribute Name	Attr. Type	Explanation	T	M/O
LNName		Shall be inherited from Logical-Node Class (see IEC 61850-7-2)		
Data				
Common Logical Node Information				
		LN shall inherit all Mandatory Data from Common Logical Node Class		M
OpCntRs	INC	Resetable operation counter		O
Status Information				
Str	ACD	Start		M
Op	ACT	Operate	T	M
TmASt	CSD	Active curve characteristic		O
Settings				
TmAcrv	CURVE	Operating Curve Type		O
StrVal	ASG	Start Value		O
TmMult	ASG	Time Dial Multiplier		O
MinOpTmms	ING	Minimum Operate Time		O
MaxOpTmms	ING	Maximum Operate Time		O
OpDITmms	ING	Operate Delay Time		O
TypRsCrv	ING	Type of Reset Curve		O
RsDITmms	ING	Reset Delay Time		O
DirMod	ING	Directional Mode		O

5.4.19 LN: Overfrequency Name: PTOF

For a description of this LN, see IEC 61850-5 (LN PFRQ). This LN shall be used to model the overcurrent part of PFRQ. One instance shall be used per stage.

PTOF class				
Attribute Name	Attr. Type	Explanation	T	M/O
LNNName		Shall be inherited from Logical-Node Class (see IEC 61850-7-2)		
Data				
Common Logical Node Information				
		LN shall inherit all Mandatory Data from Common Logical Node Class		M
OpCntRs	INC	Resetable operation counter		O
Status Information				
Str	ACD	Start		M
Op	ACT	Operate	T	M
BlkV	SPS	Blocked because of voltage		O
Settings				
StrVal	ASG	Start Value (frequency)		O
BlkVal	ASG	Voltage Block Value		O
OpDITmms	ING	Operate Delay Time		O
RsDITmms	ING	Reset Delay Time		O

5.4.20 LN: Overvoltage Name: PTOV

For a description of this LN, see IEC 61850-5. For some applications such as transformer star-point or delta supervision, "operate" may not be used.

PTOV class				
Attribute Name	Attr. Type	Explanation	T	M/O
LNNName		Shall be inherited from Logical-Node Class (see IEC 61850-7-2)		
Data				
Common Logical Node Information				
		LN shall inherit all Mandatory Data from Common Logical Node Class		M
OpCntRs	INC	Resetable operation counter		O
Status Information				
Str	ACD	Start		M
Op	ACT	Operate	T	O
TmVSt	CSD	Active curve characteristic		O
Settings				
TmVCrv	CURVE	Operating Curve Type		O
StrVal	ASG	Start Value		O
TmMult	ASG	Time Dial Multiplier		O
MinOpTmms	ING	Minimum Operate Time		O
MaxOpTmms	ING	Maximum Operate Time		O
OpDITmms	ING	Operate Delay Time		O
RsDITmms	ING	Reset Delay Time		O

5.4.21 LN: Protection trip conditioning Name: PTRC

This LN shall be used to connect the “operate” outputs of one or more protection functions to a common “trip” to be transmitted to XCBR. In addition or alternatively, any combination of “operate” outputs of the protection functions may be combined to a new “operate” of PTRC.

PTRC class				
Attribute Name	Attr. Type	Explanation	T	M/O
LNNName		Shall be inherited from Logical-Node Class (see IEC 61850-7-2)		
Data				
Common Logical Node Information				
		LN shall inherit all Mandatory Data from Common Logical Node Class		M
OpCntRs	INC	Resetable operation counter		O
Status Information				
Tr	ACT	Trip		C
Op	ACT	Operate (combination of subscribed Op from protection functions)		C
Str	ACD	Sum of all starts of all connected Logical Nodes		O
Settings				
TrMod	ING	Trip Mode		O
TrPlsTmms	ING	Trip Pulse Time		O

Condition C: At least one of the two status information (Tr, Op) shall be used.

5.4.22 LN: Thermal overload Name: PTTR

For a description of this LN, see IEC 61850-5 (LNs PROL, PSOL). PTTR shall be used for all thermal overload functions. Depending on the algorithm, the LN describes either a temperature or a current (thermal model). Temperature data are also provided by other LNs. Examples are the Hot spot temperature in LN YPTR or the Isolation gas temperature in LN SIMG.

PTTR class				
Attribute Name	Attr. Type	Explanation	T	M/O
LNNName		Shall be inherited from Logical-Node Class (see IEC 61850-7-2)		
Data				
Common Logical Node Information				
		LN shall inherit all Mandatory Data from Common Logical Node Class		M
OpCntRs	INC	Resetable operation counter		O
Measured Values				
Amp	MV	Current for thermal load model		O
Tmp	MV	Temperature for thermal load		O
TmpRI	MV	Relation between temperature and max. temperature		O
LodRsvAlm	MV	Load reserve to alarm		O
LodRsvTr	MV	Load reserve to trip		O
AgeRat	MV	Ageing rate		O
Status Information				
Str	ACD	Start		O
Op	ACT	Operate	T	M
AlmThm	ACT	Thermal Alarm		O
TmTmpSt	CSD	Active curve characteristic		O
TmASst	CSD	Active curve characteristic		O
Settings				
TmTmpCrv	CURVE	Characteristic Curve for temperature measurement		O