

# INTERNATIONAL STANDARD

**IEC**  
**61850-7-4**

First edition  
2003-05

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## Communication networks and systems in substations –

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

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

COMMUNICATION NETWORKS AND SYSTEMS IN SUBSTATIONS –

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

FOREWORD

- 1) The IEC (International Electrotechnical Commission) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of the IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, the IEC publishes International Standards. Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. The IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
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International Standard IEC 61850-7-4 has been prepared by IEC technical committee 57: Power system control and associated communications.

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

FDIS	Report on voting
57/622/FDIS	57/640/RVD

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

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



IEC 61850 consists of the following parts, under the general title *Communication networks and systems in substations*:

Part 1: Introduction and overview

Part 2: Glossary <sup>1</sup>

Part 3: General requirements

Part 4: System and project management

Part 5: Communication requirements for functions and device models <sup>2</sup>

Part 6: Configuration description language for communication in electrical substations related to IEDs <sup>1</sup>

Part 7-1: Basic communication structure for substation and feeder equipment – Principles and models

Part 7-2: Basic communication structure for substation and feeder equipment – Abstract communication service interface (ACSI)

Part 7-3: Basic communication structure for substation and feeder equipment – Common data classes

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

Part 8-1: Specific communication service mapping (SCSM) – Mappings to MMS (ISO/IEC 9506-1 and ISO/IEC 9506-2) and to ISO/IEC 8802-3 <sup>1</sup>

Part 9-1: Specific communication service mapping (SCSM) – Sampled values over serial unidirectional multidrop point to point link

Part 9-2: Specific communication service mapping (SCSM) – Sampled values over ISO/IEC 8802-3 <sup>1</sup>

Part 10: Conformance testing <sup>1</sup>

The content of this part of IEC 61850 is based on existing or emerging standards and applications. In particular the definitions are based upon:

- the specific data types defined in IEC 60870-5-101 and IEC 60870-5-103;
- the common class definitions from the Utility Communication Architecture 2.0: Generic Object Models for Substation and Feeder Equipment (GOMSFE) (IEEE TR 1550);
- CIGRE Report 34-03, Communication requirements in terms of data flow within substations, December 1996.

The committee has decided that the contents of this publication will remain unchanged until 2005. At this date, the publication will be

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

<sup>1</sup> Under consideration.

<sup>2</sup> To be published.

## 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.

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## 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:

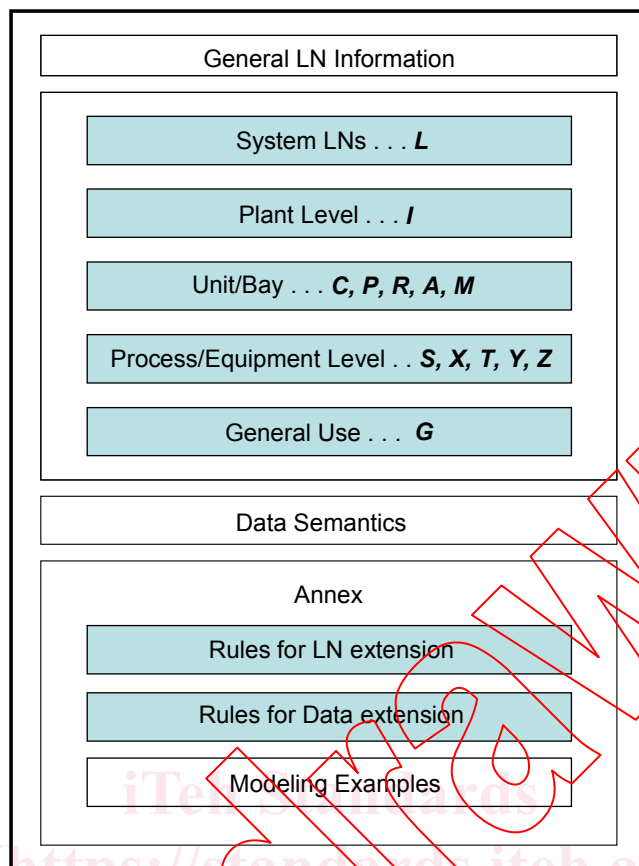
- the use of Logical Nodes in complex situations like line protection schemes;
- multiple instances of Logical Nodes with different levels of functionality.

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*<sup>3</sup>

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)*

<sup>3</sup> 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 61850-2<sup>4</sup> 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

<sup>4</sup> Under consideration.

Term	Description	Term	Description
Cyc	Cycle	Gri	Grid
Dea	Dead	H	Harmonics (phase related)
Den	Density	H <sub>2</sub>	Hydrogen
Det	Detected	H <sub>2</sub> 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
DIt	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