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**Communication networks and systems for power utility automation –
Part 7-4: Basic communication structure – Compatible logical node classes and
data object classes**

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CONTENTS

FOREWORD.....	8
INTRODUCTION.....	10
1 Scope.....	11
2 Normative references.....	12
3 Terms and definitions	13
4 Abbreviated terms.....	13
5 Logical node classes.....	19
5.1 Logical node groups	19
5.2 Interpretation of logical node tables	20
5.3 System logical nodes LN group: L.....	21
5.3.1 LN relationships.....	21
5.3.2 LN: Physical device information Name: LPHD.....	22
5.3.3 LN: common logical node Name: Common LN.....	22
5.3.4 LN: Logical node zero Name: LLN0.....	24
5.3.5 LN: Physical communication channel supervision Name: LCCH.....	24
5.3.6 LN: GOOSE subscription Name: LGOS.....	25
5.3.7 LN: Sampled value subscription Name: LSVS.....	25
5.3.8 LN: Time management Name: LTIM.....	26
5.3.9 LN: Time master supervision Name: LTMS.....	26
5.3.10 LN: Service tracking Name: LTRK.....	27
5.4 Logical nodes for automatic control LN Group: A.....	27
5.4.1 Modelling remarks	27
5.4.2 LN: Neutral current regulator Name: ANCR	27
5.4.3 LN: Reactive power control Name: ARCO.....	29
5.4.4 LN: Resistor control Name: ARIS	29
5.4.5 LN: Automatic tap changer controller Name: ATCC	30
5.4.6 LN: Voltage control Name: AVCO.....	31
5.5 Logical nodes for control LN Group: C	32
5.5.1 Modelling remarks	32
5.5.2 LN: Alarm handling Name: CALH	32
5.5.3 LN: Cooling group control Name: CCGR.....	32
5.5.4 LN: Interlocking Name: CILO.....	33
5.5.5 LN: Point-on-wave switching Name: CPOW.....	33
5.5.6 LN: Switch controller Name: CSWI.....	34
5.5.7 LN: Synchronizer controller Name: CSYN.....	35
5.6 Logical nodes for functional blocks LN group F	36
5.6.1 Modelling remarks	36
5.6.2 LN: Counter Name: FCNT.....	36
5.6.3 LN: Curve shape description Name: FCSD	37
5.6.4 LN: Generic filter Name: FFIL	37
5.6.5 LN: Control function output limitation Name: FLIM.....	38
5.6.6 LN: PID regulator Name: FPID	38
5.6.7 LN: Ramp function Name: FRMP.....	39
5.6.8 LN: Set-point control function Name: FSPT	39
5.6.9 LN: Action at over threshold Name: FXOT.....	40
5.6.10 LN: Action at under threshold Name: FXUT	40

5.7	Logical nodes for generic references	LN Group: G	41
5.7.1	Modelling remarks		41
5.7.2	LN: Generic automatic process control	Name: GAPC	41
5.7.3	LN: Generic process I/O	Name: GGIO	42
5.7.4	LN: Generic log	Name: GLOG	42
5.7.5	LN: Generic security application	Name: GSAL	43
5.8	Logical nodes for interfacing and archiving	LN Group: I	43
5.8.1	Modelling remarks		43
5.8.2	LN: Archiving	Name: IARC	43
5.8.3	LN: Human machine interface	Name: IHMI	44
5.8.4	LN: Safety alarm function	Name: ISAF	44
5.8.5	LN: Telecontrol interface	Name: ITCI	45
5.8.6	LN: Telemonitoring interface	Name: ITMI	45
5.8.7	LN: Teleprotection communication interfaces	Name: ITPC	45
5.9	Logical nodes for mechanical and non-electric primary equipment	LN group K	46
5.9.1	Modelling remarks		46
5.9.2	LN: Fan	Name: KFAN	47
5.9.3	LN: Filter	Name: KFIL	47
5.9.4	LN: Pump	Name: KPMP	48
5.9.5	LN: Tank	Name: KTNK	48
5.9.6	LN: Valve control	Name: KVLV	49
5.10	Logical nodes for metering and measurement	LN Group: M	50
5.10.1	Modelling remarks		50
5.10.2	LN: Environmental information	Name: MENV	50
5.10.3	LN: Flicker measurement name	Name: MFLK	51
5.10.4	LN: Harmonics or interharmonics	Name: MHAI	52
5.10.5	LN: Non-phase-related harmonics or interharmonics	Name: MHAN	53
5.10.6	LN: Hydrological information	Name: MHYD	55
5.10.7	LN: DC measurement	Name: MMDC	55
5.10.8	LN: Meteorological information	Name: MMET	55
5.10.9	LN: Metering	Name: MMTN	56
5.10.10	LN: Metering	Name: MMTR	57
5.10.11	LN: Non-phase-related measurement	Name: MMXN	57
5.10.12	LN: Measurement	Name: MMXU	57
5.10.13	LN: Sequence and imbalance	Name: MSQI	59
5.10.14	LN: Metering statistics	Name: MSTA	60
5.11	Logical nodes for protection functions	LN Group: P	60
5.11.1	Modelling remarks		60
5.11.2	LN: Differential	Name: PDIF	61
5.11.3	LN: Direction comparison	Name: PDIR	62
5.11.4	LN: Distance	Name: PDIS	63
5.11.5	LN: Directional overpower	Name: PDOP	63
5.11.6	LN: Directional underpower	Name: PDUP	64
5.11.7	LN: Rate of change of frequency	Name: PFRC	64
5.11.8	LN: Harmonic restraint	Name: PHAR	65
5.11.9	LN: Ground detector	Name: PHIZ	65
5.11.10	LN: Instantaneous overcurrent	Name: PIOC	66
5.11.11	LN: Motor restart inhibition	Name: PMRI	66
5.11.12	LN: Motor starting time supervision	Name: PMSS	67

5.11.13	LN: Over power factor	Name: POPF	67
5.11.14	LN: Phase angle measuring	Name: PPAM	67
5.11.15	LN: Rotor protection	Name: PRTR	68
5.11.16	LN: Protection scheme	Name: PSCH	68
5.11.17	LN: Sensitive directional earthfault	Name: PSDE	69
5.11.18	LN: Transient earth fault	Name: PTEF	70
5.11.19	LN: Thyristor protection	Name: PTHF	70
5.11.20	LN: Time overcurrent	Name: PTOC	70
5.11.21	LN: Overfrequency	Name: PTOF	71
5.11.22	LN: Overvoltage	Name: PTOV	72
5.11.23	LN: Protection trip conditioning	Name: PTRC	72
5.11.24	LN: Thermal overload	Name: PTTR	73
5.11.25	LN: Undercurrent	Name: PTUC	73
5.11.26	LN: Underfrequency	Name: PTUF	74
5.11.27	LN: Undervoltage	Name: PTUV	74
5.11.28	LN: Underpower factor	Name: PUPF	75
5.11.29	LN: Voltage controlled time overcurrent	Name: PVOC	75
5.11.30	LN: Volts per Hz	Name: PVPH	76
5.11.31	LN: Zero speed or underspeed	Name: PZSU	77
5.12	Logical nodes for power quality events	LN Group: Q	77
5.12.1	Modelling remarks		77
5.12.2	LN: Frequency variation	Name: QFVR	77
5.12.3	LN: Current transient	Name: QITR	78
5.12.4	LN: Current unbalance variation	Name: QIUB	78
5.12.5	LN: Voltage transient	Name: QVTR	79
5.12.6	LN: Voltage unbalance variation	Name: QVUB	79
5.12.7	LN: Voltage variation	Name: QVVR	80
5.13	Logical nodes for protection related functions	LN Group: R	80
5.13.1	Modelling remarks		80
5.13.2	LN: Disturbance recorder channel analogue	Name: RADR	81
5.13.3	LN: Disturbance recorder channel binary	Name: RBDR	81
5.13.4	LN: Breaker failure	Name: RBRF	82
5.13.5	LN: Directional element	Name: RDIR	82
5.13.6	LN: Disturbance recorder function	Name: RDRE	83
5.13.7	LN: Disturbance record handling	Name: RDRS	84
5.13.8	LN: Fault locator	Name: RFLO	84
5.13.9	LN: Differential measurements	Name: RMXU	84
5.13.10	LN: Power swing detection/blocking	Name: RPSB	85
5.13.11	LN: Autoreclosing	Name: RREC	86
5.13.12	LN: Synchronism-check	Name: RSYN	86
5.14	Logical nodes for supervision and monitoring	LN Group: S	87
5.14.1	Modelling remarks		87
5.14.2	LN: Monitoring and diagnostics for arcs	Name: SARC	88
5.14.3	LN: Circuit breaker supervision	Name: SCBR	88
5.14.4	LN: Insulation medium supervision (gas)	Name: SIMG	89
5.14.5	LN: Insulation medium supervision (liquid)	Name: SIML	90
5.14.6	LN: Tap changer supervision	Name: SLTC	91
5.14.7	LN: Supervision of operating mechanism	Name: SOPM	91
5.14.8	LN: Monitoring and diagnostics for partial discharges	Name: SPDC	92

5.14.9	LN: Power transformer supervision	Name: SPTR	93
5.14.10	LN: Circuit switch supervision	Name: SSWI	93
5.14.11	LN: Temperature supervision	Name: STMP	94
5.14.12	LN: Vibration supervision	Name: SVBR	95
5.15	Logical nodes for instrument transformers and sensors	LN Group: T	96
5.15.1	Modelling remarks		96
5.15.2	LN: Angle	Name: TANG	96
5.15.3	LN: Axial displacement	Name: TAXD	96
5.15.4	LN: Current transformer	Name: TCTR	97
5.15.5	LN: Distance	Name: TDST	97
5.15.6	LN: Liquid flow	Name: TFLW	98
5.15.7	LN: Frequency	Name: TFRQ	98
5.15.8	LN: Generic sensor	Name: TGSN	99
5.15.9	LN: Humidity	Name: THUM	99
5.15.10	LN: Media level	Name: TLVL	100
5.15.11	LN: Magnetic field	Name: TMGF	100
5.15.12	LN: Movement sensor	Name: TMVM	100
5.15.13	LN: Position indicator	Name: TPOS	101
5.15.14	LN: Pressure sensor	Name: TPRS	101
5.15.15	LN: Rotation transmitter	Name: TRTN	102
5.15.16	LN: Sound pressure sensor	Name: TSND	102
5.15.17	LN: Temperature sensor	Name: TTMP	103
5.15.18	LN: Mechanical tension / stress	Name: TTNS	103
5.15.19	LN: Vibration sensor	Name: TVBR	104
5.15.20	LN: Voltage transformer	Name: TVTR	104
5.15.21	LN: Water acidity	Name: TWPH	105
5.16	Logical nodes for switchgear	LN Group: X	105
5.16.1	Modelling remarks		105
5.16.2	LN: Circuit breaker	Name: XCBR	105
5.16.3	LN: Circuit switch	Name: XSWI	106
5.17	Logical nodes for power transformers	LN Group: Y	107
5.17.1	Modelling remarks		107
5.17.2	LN: Earth fault neutralizer (Petersen coil)	Name: YEFN	107
5.17.3	LN: Tap changer	Name: YLTC	107
5.17.4	LN: Power shunt	Name: YPSH	108
5.17.5	LN: Power transformer	Name: YPTR	108
5.18	Logical nodes for further power system equipment	LN Group: Z	109
5.18.1	Modelling remarks		109
5.18.2	LN: Auxiliary network	Name: ZAXN	109
5.18.3	LN: Battery	Name: ZBAT	109
5.18.4	LN: Bushing	Name: ZBSH	110
5.18.5	LN: Power cable	Name: ZCAB	110
5.18.6	LN: Capacitor bank	Name: ZCAP	111
5.18.7	LN: Converter	Name: ZCON	111
5.18.8	LN: Generator	Name: ZGEN	111
5.18.9	LN: Gas insulated line	Name: ZGIL	112
5.18.10	LN: Power overhead line	Name: ZLIN	112
5.18.11	LN: Motor	Name: ZMOT	113
5.18.12	LN: Reactor	Name: ZREA	113

5.18.13 LN: Resistor Name: ZRES	114
5.18.14 LN: Rotating reactive component Name: ZRRC	114
5.18.15 LN: Surge arrestor Name: ZSAR	115
5.18.16 LN: Semi-conductor controlled rectifier Name: ZSCR	115
5.18.17 LN: Synchronous machine Name: ZSMC	115
5.18.18 LN: Thyristor controlled frequency converter Name: ZTCF	117
5.18.19 LN: Thyristor controlled reactive component Name: ZTCR	117
6 Data object name semantics	117
Annex A (normative) Interpretation of mode and behaviour	156
Annex B (normative) Local / Remote concept	158
Annex C (informative) Deprecated logical node classes	160
Annex D (informative) Relationship between this standard and IEC 61850-5	161
Annex E (informative) Algorithms used in logical nodes for automatic control	162
Annex F (normative) Statistical calculation	167
Annex G (normative) Functional relationship of data objects of autorecloser RREC	172
Annex H (normative) SCL enumerations	173
Bibliography	179
Figure 1 – Overview of this standard	12
Figure 2 – LOGICAL NODE relationships	21
Figure E.1 – Example of curve based on an indexed gate position providing water flow	162
Figure E.2 – Example of curve based on an indexed guide vane position (x axis) vs. net head (y axis) giving an interpolated runner blade position (Z axis)	163
Figure E.3 – Example of a proportional-integral-derivate controller	164
Figure E.4 – Example of a power stabilisation system	165
Figure E.5 – Example of a ramp generator	165
Figure E.6 – Example of an interface with a set-point algorithm	166
Figure F.1 – Statistical calculation of a vector	168
Figure F.2 – Examples of statistical calculations	170
Figure G.1 – Diagram of autorecloser function	172
Table 1 – List of logical node groups	19
Table 2 – Interpretation of logical node tables	20
Table 3 – Relation between IEC 61850-5 and IEC 61850-7-4 for automatic control LNs	27
Table 4 – Relation between IEC 61850-5 and IEC 61850-7-4 for control LNs	32
Table 5 – Conditional attributes in FPID	39
Table 6 – Relation between IEC 61850-5 and IEC 61850-7-4 for metering and measurement LNs	50
Table 7 – Relation between IEC 61850-5 and IEC 61850-7-4 (this standard) for protection LNs	60
Table 8 – Relation between IEC 61850-5 and IEC 61850-7-4 for protection related LN	80
Table 9 – Relation between IEC 61850-5 and IEC 61850-7-4 for supervision and monitoring LNs	87
Table 10 – Description of data objects	117
Table A.1 – Values of mode and behaviour	156
Table A.2 – Definition of mode and behaviour	157

Table B.1 – Relationship between Loc/Rem data objects and control authority	159
Table D.1 – Relationship between IEC 61850-5 and this standard for some miscellaneous LNs	161

INTERNATIONAL ELECTROTECHNICAL COMMISSION

COMMUNICATION NETWORKS AND SYSTEMS FOR POWER UTILITY AUTOMATION –

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

FOREWORD

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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.

This second edition cancels and replaces the first edition published in 2003. It constitutes a technical revision.

Future standards in this series will carry the new general title as cited above. Titles of existing standards in this series will be updated at the time of the next edition.

The major technical changes with regard to the previous edition are as follows:

- corrections and clarifications according to information letter "IEC 61850-technical issues by the IEC TC 57" (see document 57/963/INF, 2008-07-18);
- extensions for new logical nodes for the power quality domain;

- extensions for the model for statistical and historical statistical data;
- extensions regarding IEC 61850-90-1 (substation-substation communication);
- extensions for new logical nodes for monitoring functions according to IEC 62271;
- new logical nodes from IEC 61850-7-410 and IEC 61850-7-420 of general interest.

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

FDIS	Report on voting
57/1045/FDIS	57/1051/RVD

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

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 objects 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.

A list of all parts of the IEC 61850 series under the general title *Communication networks and systems in substations*, 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.

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 substation 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.

COMMUNICATION NETWORKS AND SYSTEMS FOR POWER UTILITY AUTOMATION –

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

1 Scope

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.

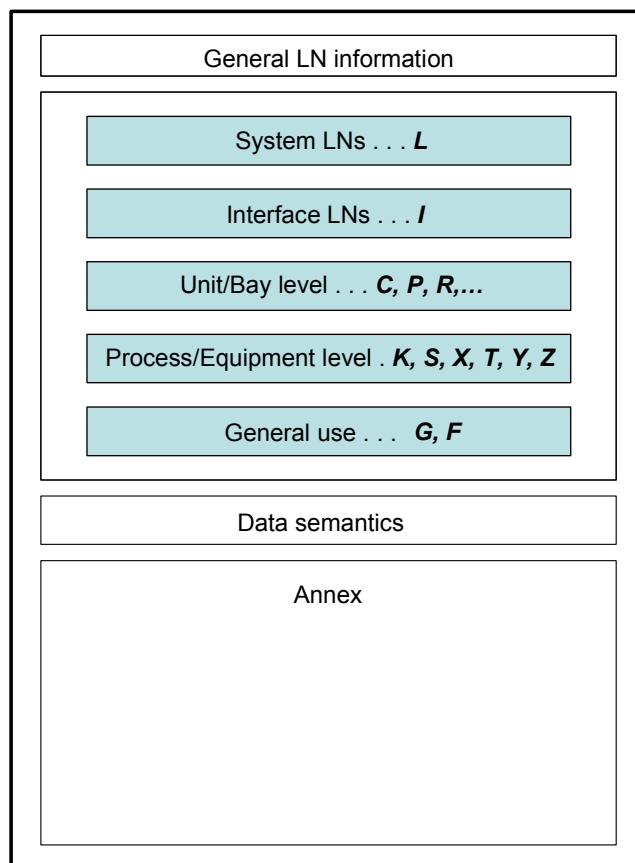
To avoid private, incompatible extensions, this part specifies normative naming rules for multiple instances and private, compatible extensions of logical node (LN) classes and data object names. Any definition is based on IEC 61850 or on referenced well identified public documents.

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 distributed automation, or
- information exchange for metering.

Figure 1 provides a general overview of this standard. The groups of logical nodes defined in this standard are shown in Figure 1, ordered according to some semantic meaning, for instance different control levels such as plant level, unit level, etc. For convenience, the logical nodes are defined below in alphabetical order.



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 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*

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

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

IEC 61850-7-1:____¹, *Communication networks and systems for power utility automation – Part 7-1: Basic communication structure – Principles and models*

¹ To be published.

IEC 61850-7-2:____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:____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 Practices 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*

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

² To be published.

³ To be published.