



IEC 61850-7-4

Edition 2.1 2020-02
CONSOLIDATED VERSION

INTERNATIONAL STANDARD

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

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

ICS 33.200

ISBN 978-2-8322-7890-1

Warning! Make sure that you obtained this publication from an authorized distributor.

CONTENTS

FOREWORD.....	18
INTRODUCTION.....	21
1 Scope.....	22
1.1 General.....	22
1.2 Namespace name and version	23
1.3 Code Component distribution	24
2 Normative references	24
3 Terms and definitions	25
4 Abbreviated terms	26
4.1 General purpose abbreviated terms	26
4.2 Abbreviated terms used in data object names	27
5 Logical node preliminaries	38
5.1 Logical node groups.....	38
5.2 Derived logical nodes and associated presence conditions nds/ds	39
5.3 Interpretation of logical node tables	40
5.4 Relationship between this standard and IEC 61850-5	42
6 Logical node classes	61
6.1 General.....	61
6.2 Abstract logical nodes (AbstractLNs)	64
6.2.1 General	64
6.2.2 Common abstract logical nodes (AbstractLNsCommon)	64
6.2.3 Abstract GroupL logical nodes (AbstractLNsGroupL)	79
6.2.4 Abstract GroupA logical nodes (AbstractLNsGroupA)	81
6.2.5 Abstract GroupC logical nodes (AbstractLNsGroupC)	81
6.2.6 Abstract GroupG logical nodes (AbstractLNsGroupG).....	81
6.2.7 Abstract GroupI logical nodes (AbstractLNsGroupI)	81
6.2.8 Abstract GroupK logical nodes (AbstractLNsGroupK)	81
6.2.9 Abstract GroupF logical nodes (AbstractLNsGroupF).....	81
6.2.10 Abstract GroupM logical nodes (AbstractLNsGroupM)	84
6.2.11 Abstract GroupP logical nodes (AbstractLNsGroupP)	88
6.2.12 Abstract GroupQ logical nodes (AbstractLNsGroupQ).....	100
6.2.13 Abstract GroupR logical nodes (AbstractLNsGroupR)	103
6.2.14 Abstract GroupS logical nodes (AbstractLNsGroupS)	107
6.2.15 Abstract GroupT logical nodes (AbstractLNsGroupT).....	113
6.2.16 Abstract GroupX logical nodes (AbstractLNsGroupX)	116
6.2.17 Abstract GroupY logical nodes (AbstractLNsGroupY)	118
6.2.18 Abstract GroupZ logical nodes (AbstractLNsGroupZ).....	119
6.3 System logical nodes (LNGroupL).....	123
6.3.1 General	123
6.3.2 LN: Physical device LN Name: LPHD.....	124
6.3.3 LN: Logical device LN Name: LLN0	125
6.3.4 LN: Physical communication channel supervision Name: LCCH.....	127
6.3.5 LN: GOOSE subscription Name: LGOS.....	128
6.3.6 LN: Sampled value subscription Name: LSVS	129
6.3.7 LN: Time management Name: LTIM.....	130
6.3.8 LN: Time master supervision Name: LTMS	131

6.3.9	LN: Service tracking Name: LTRK	132
6.4	Logical nodes for automatic control (LNGroupA)	133
6.4.1	General	133
6.4.2	LN: Neutral current regulator Name: ANCR.....	135
6.4.3	LN: Reactive power control Name: ARCO.....	137
6.4.4	LN: Resistor control Name: ARIS.....	138
6.4.5	LN: Automatic tap changer controller Name: ATCC.....	139
6.4.6	LN: Voltage control Name: AVCO	142
6.5	Logical nodes for control (LNGroupC)	144
6.5.1	General	144
6.5.2	LN: Alarm handling Name: CALH.....	146
6.5.3	LN: Cooling group control Name: CCGR.....	147
6.5.4	LN: Interlocking Name: CILO	149
6.5.5	LN: Point-on-wave switching Name: CPOW	150
6.5.6	LN: Switch controller Name: CSWI	151
6.5.7	LN: Synchronizer controller Name: CSYN.....	153
6.6	Logical nodes for functional blocks (LNGroupF)	156
6.6.1	General	156
6.6.2	LN: Counter LN Name: FCNT	158
6.6.3	LN: Curve shape description LN Name: FCSD	159
6.6.4	LN: Generic filter LN Name: FFIL.....	160
6.6.5	LN: Control function output limitation LN Name: FLIM.....	161
6.6.6	LN: PID regulator LN Name: FPID	162
6.6.7	LN: Ramp function LN Name: FRMP.....	164
6.6.8	LN: Schedule controller Name: FSCC	165
6.6.9	LN: Schedule Name: FSCH	166
6.6.10	LN: Setpoint control function LN Name: FSPT	169
6.6.11	LN: Action at over threshold LN Name: FXOT	171
6.6.12	LN: Action at under threshold LN Name: FXUT	172
6.7	Logical nodes for generic references (LNGroupG)	173
6.7.1	General	173
6.7.2	LN: Generic automatic process control Name: GAPC.....	174
6.7.3	LN: Generic process I/O Name: GGIO	175
6.7.4	LN: Generic log Name: GLOG	176
6.7.5	LN: Generic security application Name: GSAL	178
6.8	Logical nodes for interfacing and archiving (LNGroupI)	179
6.8.1	General	179
6.8.2	LN: Archiving Name: IARC.....	180
6.8.3	LN: Human machine interface Name: IHMI	182
6.8.4	LN: Safety alarm function Name: ISAF.....	183
6.8.5	LN: Telecontrol interface Name: ITCI.....	183
6.8.6	LN: Telemonitoring interface Name: ITMI.....	184
6.8.7	LN: Teleprotection communication interfaces Name: ITPC.....	185
6.9	Logical nodes for mechanical and non-electric primary equipment (LNGroupK)	187
6.9.1	General	187
6.9.2	LN: Fan Name: KFAN	188
6.9.3	LN: Filter Name: KFIL	190
6.9.4	LN: Pump Name: KPMP.....	191

6.9.5	LN: Tank Name: KTNK	192
6.9.6	LN: Valve control Name: KVLV	194
6.10	Logical nodes for metering and measurement (LNGroupM)	195
6.10.1	General	195
6.10.2	LN: Environmental information Name: MENV	197
6.10.3	LN: Flicker measurement Name: MFLK	199
6.10.4	LN: Flow measurements Name: MFLW	200
6.10.5	LN: Harmonics or interharmonics Name: MHAI	202
6.10.6	LN: Non-phase-related AC harmonics and interharmonics Name: MHAN	204
6.10.7	LN: Heat measured values Name: MHET	206
6.10.8	LN: Hydrological information Name: MHYD	208
6.10.9	LN: DC measurement Name: MMDC	209
6.10.10	LN: Meteorological information Name: MMET	210
6.10.11	LN: Metering single phase Name: MMTN	212
6.10.12	LN: Metering 3 phase Name: MMTR	212
6.10.13	LN: Non-phase-related AC measurement Name: MMXN	214
6.10.14	LN: Measurement Name: MMXU	215
6.10.15	LN: Sequence and imbalance Name: MSQI	217
6.11	Logical nodes for protection functions (LNGroupP)	219
6.11.1	General	219
6.11.2	LN: Differential Name: PDIF	222
6.11.3	LN: Direction comparison Name: PDIR	224
6.11.4	LN: Distance Name: PDIS	225
6.11.5	LN: Directional overpower Name: PDOP	228
6.11.6	LN: Directional underpower Name: PDUP	230
6.11.7	LN: Rate of change of frequency Name: PFRC	231
6.11.8	LN: Harmonic restraint Name: PHAR	232
6.11.9	LN: Ground detector Name: PHIZ	233
6.11.10	LN: Instantaneous overcurrent Name: PIOC	235
6.11.11	LN: Motor restart inhibition Name: PMRI	236
6.11.12	LN: Motor starting time supervision Name: PMSS	237
6.11.13	LN: Over power factor Name: POPF	239
6.11.14	LN: Phase angle measuring Name: PPAM	240
6.11.15	LN: Rotor protection Name: PRTR	241
6.11.16	LN: Protection scheme Name: PSCH	242
6.11.17	LN: Sensitive directional earthfault Name: PSDE	244
6.11.18	LN: Switch on to fault Name: PSOF	246
6.11.19	LN: Voltage differential Name: PTDV	247
6.11.20	LN: Transient earth fault Name: PTEF	248
6.11.21	LN: Thyristor protection Name: PTHF	250
6.11.22	LN: Time overcurrent Name: PTOC	251
6.11.23	LN: Overfrequency Name: PTOF	252
6.11.24	LN: Overvoltage Name: PTOV	254
6.11.25	LN: Protection trip conditioning Name: PTRC	255
6.11.26	LN: Thermal overload Name: PTTR	256
6.11.27	LN: Undercurrent Name: PTUC	258
6.11.28	LN: Underfrequency Name: PTUF	260
6.11.29	LN: Undervoltage Name: PTUV	261

6.11.30	LN: Underpower factor Name: PUPF	263
6.11.31	LN: Voltage controlled time overcurrent Name: PVOC	264
6.11.32	LN: Volts per Hz Name: PVPH	266
6.11.33	LN: Zero speed or underspeed Name: PZSU	267
6.12	Logical nodes for power quality events (LNGroupQ)	268
6.12.1	General	268
6.12.2	LN: Frequency variation Name: QFVR	269
6.12.3	LN: Current transient Name: QITR	270
6.12.4	LN: Current unbalance variation Name: QIUB	272
6.12.5	LN: Voltage transient Name: QVTR	273
6.12.6	LN: Voltage unbalance variation Name: QVUB	274
6.12.7	LN: Voltage variation Name: QVVR	275
6.13	Logical nodes for protection related functions (LNGroupR)	277
6.13.1	General	277
6.13.2	LN: Disturbance recorder channel analogue Name: RADR	279
6.13.3	LN: Disturbance recorder channel binary Name: RBDR	281
6.13.4	LN: Breaker failure Name: RBRF	282
6.13.5	LN: Directional element Name: RDIR	283
6.13.6	LN: Disturbance recorder function Name: RDRE	285
6.13.7	LN: Disturbance record handling Name: RDRS	287
6.13.8	LN: Fault locator Name: RFLO	288
6.13.9	LN: Differential measurements Name: RMXU	289
6.13.10	LN: Power swing detection/blocking Name: RPSB	290
6.13.11	LN: Autoreclosing Name: RREC	292
6.13.12	LN: Synchronism check Name: RSYN	294
6.14	Logical nodes for supervision and monitoring (LNGroupS)	296
6.14.1	General	296
6.14.2	LN: Monitoring and diagnostics for arcs Name: SARC	297
6.14.3	LN: Circuit breaker supervision Name: SCBR	299
6.14.4	LN: Insulation medium supervision (gas) Name: SIMG	300
6.14.5	LN: Insulation medium supervision (liquid) Name: SIML	302
6.14.6	LN: Tap changer supervision Name: SLTC	304
6.14.7	LN: Supervision of operating mechanism Name: SOPM	305
6.14.8	LN: Monitoring and diagnostics for partial discharges Name: SPDC	307
6.14.9	LN: Pressure supervision Name: SPRS	308
6.14.10	LN: Power transformer supervision Name: SPTR	310
6.14.11	LN: Circuit switch supervision Name: SSWI	311
6.14.12	LN: Temperature supervision Name: STMP	313
6.14.13	LN: Vibration supervision Name: SVBR	314
6.15	Logical nodes for instrument transformers and sensors (LNGroupT)	315
6.15.1	General	315
6.15.2	LN: Angle sensor Name: TANG	317
6.15.3	LN: Axial displacement sensor Name: TAXD	318
6.15.4	LN: Current transformer Name: TCTR	319
6.15.5	LN: Distance sensor Name: TDST	320
6.15.6	LN: Liquid flow sensor Name: TFLW	322
6.15.7	LN: Frequency sensor Name: TFRQ	323
6.15.8	LN: Generic sensor Name: TGSN	324
6.15.9	LN: Humidity sensor Name: THUM	325

6.15.10	LN: Media level sensor Name: TLVL	326
6.15.11	LN: Magnetic field sensor Name: TMGF	327
6.15.12	LN: Movement sensor Name: TMVM	328
6.15.13	LN: Position indicator Name: TPOS	329
6.15.14	LN: Pressure sensor Name: TPRS	331
6.15.15	LN: Rotation transmitter Name: TRTN	332
6.15.16	LN: Sound pressure sensor Name: TSND	333
6.15.17	LN: Temperature sensor Name: TTMP	334
6.15.18	LN: Mechanical tension / stress sensor Name: TTNS	335
6.15.19	LN: Vibration sensor Name: TVBR	336
6.15.20	LN: Voltage transformer Name: TVTR	337
6.15.21	LN: Water acidity sensor Name: TWPH	339
6.16	Logical nodes for switchgear (LNGroupX)	340
6.16.1	General	340
6.16.2	LN: Circuit breaker Name: XCBR	341
6.16.3	LN: Fuse Name: XFUS	344
6.16.4	LN: Circuit switch Name: XSWI	345
6.17	Logical nodes for power transformers (LNGroupY)	346
6.17.1	General	346
6.17.2	LN: Earth fault neutralizer (Petersen coil) Name: YEFN	347
6.17.3	LN: Tap changer Name: YLTC	349
6.17.4	LN: Power shunt Name: YPSH	350
6.17.5	LN: Power transformer Name: YPTR	352
6.18	Logical nodes for further power system equipment (LNGroupZ)	353
6.18.1	General	353
6.18.2	LN: Auxiliary network Name: ZAXN	356
6.18.3	LN: Battery Name: ZBAT	357
6.18.4	LN: Bushing Name: ZBSH	359
6.18.5	LN: Power cable Name: ZCAB	360
6.18.6	LN: Capacitor bank Name: ZCAP	361
6.18.7	LN: Converter Name: ZCON	362
6.18.8	LN: Generator Name: ZGEN	363
6.18.9	LN: Gas insulated line Name: ZGIL	365
6.18.10	LN: Power overhead line Name: ZLIN	366
6.18.11	LN: Motor Name: ZMOT	367
6.18.12	LN: Reactor Name: ZREA	369
6.18.13	LN: Resistor Name: ZRES	370
6.18.14	LN: Rotating reactive component Name: ZRRC	371
6.18.15	LN: Surge arrester Name: ZSAR	372
6.18.16	LN: Semi-conductor controlled rectifier Name: ZSCR	373
6.18.17	LN: Synchronous machine Name: ZSMC	375
6.18.18	LN: Thyristor controlled frequency converter Name: ZTCF	377
6.18.19	LN: Thyristor controlled reactive component Name: ZTCR	378
7	Data object name semantics and enumerations	379
7.1	Data semantics	379
7.2	Enumerated data attribute types	428
7.2.1	General	428
7.2.2	Adjustment (AdjustmentKind enumeration)	428
7.2.3	Affected phases (AffectedPhasesKind enumeration)	429

7.2.4	Auto-reclosing (AutoReclosingKind enumeration)	429
7.2.5	Behaviour or mode (BehaviourModeKind enumeration).....	429
7.2.6	Breaker operate capability (BreakerOpCapabilityKind enumeration)	430
7.2.7	Calculation interval (CalcIntervalKind enumeration).....	431
7.2.8	Calculation method (CalcMethodKind enumeration).....	431
7.2.9	Calculation mode (CalcModeKind enumeration).....	432
7.2.10	Clock source (ClockSourceKind enumeration)	432
7.2.11	Clock synchronisation (ClockSyncKind enumeration).....	433
7.2.12	Clock synchronisation locking (ClockSyncLockingKind enumeration)	433
7.2.13	Direction mode (DirectionModeKind enumeration)	433
7.2.14	Failure detection (FailureDetectionKind enumeration).....	434
7.2.15	Fault loop (FaultLoopKind enumeration)	434
7.2.16	FaultMeasuredValueTypeKind enumeration	434
7.2.17	Filter function (FilterFunctionKind enumeration).....	435
7.2.18	Fuse function (FuseFunctionKind enumeration)	435
7.2.19	Health (HealthKind enumeration)	435
7.2.20	Instrument Transformer Measurement Rating (InstrumentTransformerMeasurementRatingKind enumeration).....	436
7.2.21	Instrument Transformer Protection Rating (InstrumentTransformerProtectionRatingKind enumeration)	436
7.2.22	Leap Second Consideration (LeapSecondKind enumeration)	437
7.2.23	Level trigger mode (LevelTriggerModeKind enumeration)	437
7.2.24	Live-dead mode (LiveDeadModeKind enumeration)	437
7.2.25	Material (MaterialKind enumeration)	438
7.2.26	State of material (MaterialStateKind enumeration)	438
7.2.27	Power factor sign (PFSignKind enumeration).....	438
7.2.28	PID algorithm (PIDAlgorithmKind enumeration).....	440
7.2.29	Point-on-wave switching capability (POWSwitchingCapabilityKind enumeration)	441
7.2.30	Parallel coil mode (ParallelCoilModeKind enumeration)	441
7.2.31	Parallel control mode (ParallelCtrlModeKind enumeration)	441
7.2.32	Parallel transformer mode (ParallelTransfModeKind enumeration).....	442
7.2.33	Polarizing quantity (PolarizingQuantityKind enumeration)	442
7.2.34	Recording mode (RecordingModeKind enumeration)	442
7.2.35	Rectifier control mode (RectifierControlModeKind enumeration)	443
7.2.36	Reset curve (ResetCurveKind enumeration)	443
7.2.37	Restraint mode (RestraintModeKind enumeration)	443
7.2.38	Re-trip mode (RetripModeKind enumeration)	444
7.2.39	Rotating machine state (RotatingMachineStateKind enumeration)	444
7.2.40	Rotational direction (RotationalDirectionKind enumeration).....	445
7.2.41	Rotor thermal state (RotorThermalStateKind enumeration)	445
7.2.42	Enabling mode for switch on fault (SOFEnablingModeKind enumeration).....	445
7.2.43	Operation mode for switch on fault (SOFOperationModeKind enumeration)	445
7.2.44	Calculation method for apparent power (STotalCalcMethodKind enumeration)	446
7.2.45	Schedule enabling errors (ScheduleEnablingErrorKind enumeration).....	446
7.2.46	Schedule states (ScheduleStateKind enumeration).....	446
7.2.47	Setpoint end (SetpointEndKind enumeration).....	447
7.2.48	Stage control (StageControlKind enumeration)	447

7.2.49	Start Week Day (StrWeekDayKind enumeration)	448
7.2.50	Switch function (SwitchFunctionKind enumeration)	448
7.2.51	Switching capability (SwitchingCapabilityKind enumeration)	448
7.2.52	Synchronised operation mode (SynchOperationModeKind enumeration)	449
7.2.53	Tank fill (TankFillKind enumeration)	449
7.2.54	Transient Performance Class (TransientPerformanceClassKind enumeration)	449
7.2.55	Teleprotection application mode (TpcAppModeKind enumeration)	450
7.2.56	Trigger source (TriggerSourceKind enumeration)	450
7.2.57	Tripping behaviour (TripBehaviourKind enumeration)	450
7.2.58	Tripping mode (TripModeKind enumeration)	451
7.2.59	Tuning (TuningKind enumeration)	451
7.2.60	Unbalance detection method (UnbalanceDetectionKind enumeration)	451
7.2.61	Unblock mode (UnblockModeKind enumeration)	452
7.2.62	Voltage interrupt detection (VoltInterruptDetectionKind enumeration)	452
7.2.63	Weak end infeed mode (WeakEndInfeedModeKind enumeration)	452
Annex A (normative)	Interpretation of mode and behaviour	454
Annex B (normative)	Local / Remote concept	457
Annex C (informative)	Deprecated logical node classes	459
C.1	General	459
C.2	LN: Metering statistics Name: MSTA	459
Annex D (informative)	Relationship between this standard and IEC 61850-5	460
Annex E (informative)	Algorithms used in logical nodes for automatic control	461
E.1	General	461
E.2	Logical node FCSD (curve shape description)	461
E.3	Logical node FCSV (curve shape group)	461
E.4	Logical node FPID (PID regulator function)	462
E.5	Logical node FFIL (filter function)	463
E.6	Logical node FRMP (setpoint ramping function)	464
E.7	Logical node FSPT (setpoint control function)	464
Annex F (normative)	Statistical calculation	466
F.1	Statistical calculation basis	466
F.2	Time interval definitions (relating to statistical calculation)	467
F.2.1	Examples	468
F.3	Calculation start	469
F.3.1	Start of statistical calculation means that	469
F.3.2	The three possible start conditions available in the model	469
Annex G (informative)	Functional relationship of data objects of autorecloser RREC	471
Annex H (normative)	SCL enumerations (from DOEnums)	472
Annex I (informative)	Conditions for element presence	473
Annex J (normative)	Compatibility of the different revisions of the standard	475
J.1	General	475
J.2	List of the modifications to consider for backward / forward compatibility	475
J.3	List of modifications requiring specific treatment	478
Annex K (normative)	Models principles and requirements for scheduling	479
K.1	Schedules introduction	479
K.2	Principles for modelling schedules	479
K.2.1	General	479

K.2.2	Schedule controllers and their schedules	479
K.2.3	Scheduling and direct control / setting	480
K.2.4	Schedule behaviour	481
K.2.5	Schedule structure	483
K.2.6	Managing schedules	483
K.2.7	Configuration of schedules	488
K.2.8	CDCs of supported scheduled entities	488
K.3	Examples and further explanations	489
K.4	Impact of Mode (Mod) on the schedule status and on the controllable entity	489
	Bibliography	490

Figure 1	– Overview of this standard	23
Figure 2	– Class diagram LogicalNodes::LogicalNodesGroups	62
Figure 3	– Class diagram LogicalNodes::TopLevelLogicalNodes	63
Figure 4	– Class diagram AbstractLNs::AbstractLNs	64
Figure 5	– Class diagram AbstractLNsCommon::AbstractLNsCommon	65
Figure 6	– Adaptation angle	77
Figure 7	– Class diagram AbstractLNsGroupL::AbstractLNsGroupL	80
Figure 8	– Class diagram AbstractLNsGroupF::AbstractLNsGroupF	82
Figure 9	– Class diagram AbstractLNsGroupM::AbstractLNsGroupM	85
Figure 10	– Class diagram AbstractLNsGroupP::AbstractLNsGroupP	88
Figure 11	– Class diagram AbstractLNsGroupQ::AbstractLNsGroupQ	101
Figure 12	– Class diagram AbstractLNsGroupR::AbstractLNsGroupR	104
Figure 13	– Class diagram AbstractLNsGroupS::AbstractLNsGroupS	108
Figure 14	– Class diagram AbstractLNsGroupT::AbstractLNsGroupT	113
Figure 15	– Class diagram AbstractLNsGroupX::AbstractLNsGroupX	117
Figure 16	– Class diagram AbstractLNsGroupZ::AbstractLNsGroupZ	119
Figure 17	– Class diagram LNGroupL::LNGroupL	124
Figure 18	– Class diagram LNGroupA::LNGroupA	134
Figure 19	– Class diagram LNGroupC::LNGroupC1	144
Figure 20	– Class diagram LNGroupC::LNGroupC2	145
Figure 21	– Class diagram LNGroupF::LNGroupF	157
Figure 22	– State machine of FSCH	167
Figure 23	– Class diagram LNGroupG::LNGroupG	173
Figure 24	– Class diagram LNGroupI::LNGroupI	180
Figure 25	– Class diagram LNGroupK::LNGroupK	188
Figure 26	– Class diagram LNGroupM::LNGroupM1	196
Figure 27	– Class diagram LNGroupM::LNGroupM2	197
Figure 28	– Class diagram LNGroupP::LNGroupP1	220
Figure 29	– Class diagram LNGroupP::LNGroupP2	221
Figure 30	– Class diagram LNGroupP::LNGroupP3	222
Figure 31	– Load area and reach settings	226
Figure 32	– Class diagram LNGroupQ::LNGroupQ	269
Figure 33	– Class diagram LNGroupR::LNGroupR1	278

Figure 34 – Class diagram LNGroupR::LNGroupR2	279
Figure 35 – Swing value	291
Figure 36 – Class diagram LNGroupS::LNGroupS	297
Figure 37 – Class diagram LNGroupT::LNGroupT	316
Figure 38 – Class diagram LNGroupX::LNGroupX	341
Figure 39 – Breaker closing time	342
Figure 40 – Class diagram LNGroupY::LNGroupY	347
Figure 41 – Class diagram LNGroupZ::LNGroupZ1	354
Figure 42 – Class diagram LNGroupZ::LNGroupZ2	355
Figure 43 – Class diagram LNGroupZ::LNGroupZ3	356
Figure 44 – Behaviour values as a function of mode	430
Figure 45 – IEC power factor sign convention	439
Figure 46 – EEI power factor sign convention	440
Figure E.1 – Example of curve based on an indexed gate position providing water flow	461
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)	462
Figure E.3 – Example of a proportional-integral-derivate controller	463
Figure E.4 – Example of a power stabilisation system	464
Figure E.5 – Example of a ramp generator	464
Figure E.6 – Example of an interface with a setpoint algorithm	465
Figure F.1 – Statistical calculation of a vector	467
Figure F.2 – Examples of statistical calculations	469
Figure K.1 – Scheduling principle	480
Figure K.2 – State diagram for schedule	484
Figure K.3 – Flow chart for transition out of running state	485
Figure K.4 – Handling priorities of schedules to determine the <i>Active</i> one	487
Figure K.5 – Relation between schedule controller, schedules and entity controlled	488
Table 1 – Normative abbreviations for data object names	27
Table 2 – List of logical node groups	39
Table 3 – Interpretation of logical node tables	41
Table 4 – Logical nodes mappings	43
Table 5 – Data objects of DomainLN	66
Table 6 – Data objects of StatisticsLN	67
Table 7 – Data objects of NonProcessInterfaceLN	68
Table 8 – Data objects of NonProcessControllingEquipmentInterfaceLN	69
Table 9 – Data objects of FunctionLN	70
Table 10 – Data objects of EquipmentInterfaceLN	71
Table 11 – Data objects of CmdEquipmentInterfaceLN	72
Table 12 – Data objects of ControllingLN	73
Table 13 – Data objects of ControlledLN	74
Table 14 – Data objects of ControlEquipmentInterfaceLN	75
Table 15 – Data objects of AutomaticControlLN	76

Table 16 – Data objects of SynchronisationLN	77
Table 17 – Data objects of SubscriptionSupervisionLN	80
Table 18 – Data objects of FunctionOutputLN	82
Table 19 – Data objects of ThresholdLN	83
Table 20 – Data objects of EnergyLN	85
Table 21 – Data objects of HarmonicsLN	87
Table 22 – Data objects of ProtectionLN	89
Table 23 – Data objects of CurrentProtectionLN	90
Table 24 – Data objects of EarthfaultProtectionLN	92
Table 25 – Data objects of FrequencyProtectionLN	93
Table 26 – Data objects of GeneratorProtectionLN	94
Table 27 – Data objects of MotorStartupProtectionLN	95
Table 28 – Data objects of PowerProtectionLN	97
Table 29 – Data objects of PowerFactorProtectionLN	98
Table 30 – Data objects of VoltageProtectionLN	99
Table 31 – Data objects of PowerQualityLN	101
Table 32 – Data objects of UnbalanceDetectionLN	102
Table 33 – Data objects of RecorderLN	104
Table 34 – Data objects of DRChannelLN	106
Table 35 – Data objects of SupervisionLN	109
Table 36 – Data objects of LineSupervisionLN	110
Table 37 – Data objects of SwitchgearSupervisionLN	111
Table 38 – Data objects of InstrumentTransformerLN	114
Table 39 – Data objects of SensorLN	115
Table 40 – Data objects of SwitchingEquipmentLN	117
Table 41 – Data objects of BaseConverterLN	120
Table 42 – Data objects of BatteryLN	121
Table 43 – Data objects of ConductorLN	122
Table 44 – Data objects of LPHD	125
Table 45 – Data objects of LLN0	126
Table 46 – Data objects of LCCH	127
Table 47 – Data objects of LGOS	129
Table 48 – Data objects of LSVS	130
Table 49 – Data objects of LTIM	130
Table 50 – Data objects of LTMS	131
Table 51 – Data objects of LTRK	132
Table 52 – Data objects of ANCR	135
Table 53 – Data objects of ARCO	137
Table 54 – Data objects of ARIS	138
Table 55 – Data objects of ATCC	140
Table 56 – Data objects of AVCO	143
Table 57 – Data objects of CALH	146
Table 58 – Data objects of CCGR	147

Table 59 – Data objects of CILO	149
Table 60 – Data objects of CPOW	150
Table 61 – Data objects of CSWI	152
Table 62 – Data objects of CSYN	153
Table 63 – Data objects of FCNT	158
Table 64 – Data objects of FCSD	159
Table 65 – Data objects of FFIL	160
Table 66 – Data objects of FLIM	161
Table 67 – Data objects of FPID	163
Table 68 – Data objects of FRMP	164
Table 69 – Data objects of FSCC	165
Table 70 – Data objects of FSCH	167
Table 71 – Data objects of FSPT	169
Table 72 – Data objects of FXOT	171
Table 73 – Data objects of FXUT	172
Table 74 – Data objects of GAPC	174
Table 75 – Data objects of GGIO	175
Table 76 – Data objects of GLOG	177
Table 77 – Data objects of GSAL	178
Table 78 – Data objects of IARC	181
Table 79 – Data objects of IHMI	182
Table 80 – Data objects of ISAF	183
Table 81 – Data objects of ITCI	184
Table 82 – Data objects of ITMI	185
Table 83 – Data objects of ITPC	186
Table 84 – Data objects of KFAN	189
Table 85 – Data objects of KFIL	190
Table 86 – Data objects of KPMP	191
Table 87 – Data objects of KTNK	193
Table 88 – Data objects of KVLV	194
Table 89 – Data objects of MENV	198
Table 90 – Data objects of MFLK	199
Table 91 – Data objects of MFLW	201
Table 92 – Data objects of MHAI	202
Table 93 – Data objects of MHAN	205
Table 94 – Data objects of MHET	207
Table 95 – Data objects of MHYD	208
Table 96 – Data objects of MMDC	209
Table 97 – Data objects of MMET	210
Table 98 – Data objects of MMTN	212
Table 99 – Data objects of MMTR	213
Table 100 – Data objects of MMXN	214
Table 101 – Data objects of MMXU	215

Table 102 – Data objects of MSQI	218
Table 103 – Data objects of PDIF	223
Table 104 – Data objects of PDIR	224
Table 105 – Data objects of PDIS	227
Table 106 – Data objects of PDOP	229
Table 107 – Data objects of PDUP	230
Table 108 – Data objects of PFRC	231
Table 109 – Data objects of PHAR	232
Table 110 – Data objects of PHIZ	234
Table 111 – Data objects of PIOC	235
Table 112 – Data objects of PMRI	236
Table 113 – Data objects of PMSS	238
Table 114 – Data objects of POPF	239
Table 115 – Data objects of PPAM	240
Table 116 – Data objects of PRTR	241
Table 117 – Data objects of PSCH	243
Table 118 – Data objects of PSDE	245
Table 119 – Data objects of PSOF	246
Table 120 – Data objects of PTDV	248
Table 121 – Data objects of PTEF	249
Table 122 – Data objects of PTHF	250
Table 123 – Data objects of PTOC	251
Table 124 – Data objects of PTOF	253
Table 125 – Data objects of PTOV	254
Table 126 – Data objects of PTRC	255
Table 127 – Data objects of PTTR	257
Table 128 – Data objects of PTUC	259
Table 129 – Data objects of PTUF	260
Table 130 – Data objects of PTUV	262
Table 131 – Data objects of PUPF	263
Table 132 – Data objects of PVOC	264
Table 133 – Data objects of PVPH	266
Table 134 – Data objects of PZSU	267
Table 135 – Data objects of QFVR	269
Table 136 – Data objects of QITR	271
Table 137 – Data objects of QIUB	272
Table 138 – Data objects of QVTR	273
Table 139 – Data objects of QVUB	274
Table 140 – Data objects of QVVR	275
Table 141 – Data objects of RADR	280
Table 142 – Data objects of RBDR	281
Table 143 – Data objects of RBRF	282
Table 144 – Data objects of RDIR	284

Table 145 – Data objects of RDRE	285
Table 146 – Data objects of RDRS	287
Table 147 – Data objects of RFLO	288
Table 148 – Data objects of RMXU	289
Table 149 – Data objects of RPSB	291
Table 150 – Data objects of RREC	293
Table 151 – Data objects of RSYN	294
Table 152 – Data objects of SARC	298
Table 153 – Data objects of SCBR	299
Table 154 – Data objects of SIMG	301
Table 155 – Data objects of SIML	302
Table 156 – Data objects of SLTC	304
Table 157 – Data objects of SOPM	306
Table 158 – Data objects of SPDC	307
Table 159 – Data objects of SPRS	309
Table 160 – Data objects of SPTR	310
Table 161 – Data objects of SSWI	311
Table 162 – Data objects of STMP	313
Table 163 – Data objects of SVBR	314
Table 164 – Data objects of TANG	317
Table 165 – Data objects of TAXD	318
Table 166 – Data objects of TCTR	319
Table 167 – Data objects of TDST	321
Table 168 – Data objects of TFLW	322
Table 169 – Data objects of TFRQ	323
Table 170 – Data objects of TGSN	324
Table 171 – Data objects of THUM	325
Table 172 – Data objects of TLVL	326
Table 173 – Data objects of TMGF	327
Table 174 – Data objects of TMVM	329
Table 175 – Data objects of TPOS	330
Table 176 – Data objects of TPRS	331
Table 177 – Data objects of TRTN	332
Table 178 – Data objects of TSND	333
Table 179 – Data objects of TTMP	334
Table 180 – Data objects of TTNS	335
Table 181 – Data objects of TVBR	336
Table 182 – Data objects of TVTR	338
Table 183 – Data objects of TWPH	339
Table 184 – Data objects of XCBR	342
Table 185 – Data objects of XFUS	344
Table 186 – Data objects of XSWI	345
Table 187 – Data objects of YEFN	348

Table 188 – Data objects of YLTC	349
Table 189 – Data objects of YPSH	351
Table 190 – Data objects of YPTR	352
Table 191 – Data objects of ZAXN	356
Table 192 – Data objects of ZBAT	358
Table 193 – Data objects of ZBSH	359
Table 194 – Data objects of ZCAB	360
Table 195 – Data objects of ZCAP	362
Table 196 – Data objects of ZCON	363
Table 197 – Data objects of ZGEN	364
Table 198 – Data objects of ZGIL	365
Table 199 – Data objects of ZLIN	366
Table 200 – Data objects of ZMOT	368
Table 201 – Data objects of ZREA	369
Table 202 – Data objects of ZRES	370
Table 203 – Data objects of ZRRC	371
Table 204 – Data objects of ZSAR	372
Table 205 – Data objects of ZSCR	374
Table 206 – Data objects of ZSMC	375
Table 207 – Data objects of ZTCF	377
Table 208 – Data objects of ZTCR	378
Table 209 – Attributes defined on classes of LogicalNodes package	379
Table 210 – Literals of AdjustmentKind	428
Table 211 – Literals of AffectedPhasesKind	429
Table 212 – Literals of AutoReclosingKind	429
Table 213 – Literals of BehaviourModeKind	430
Table 214 – Literals of BreakerOpCapabilityKind	431
Table 215 – Literals of CalcIntervalKind	431
Table 216 – Literals of CalcMethodKind	431
Table 217 – Literals of CalcModeKind	432
Table 218 – Literals of ClockSourceKind	433
Table 219 – Literals of ClockSyncKind	433
Table 220 – Literals of ClockSyncLockingKind	433
Table 221 – Literals of DirectionModeKind	434
Table 222 – Literals of FailureDetectionKind	434
Table 223 – Literals of FaultLoopKind	434
Table 224 – Literals of FaultMeasuredValueTypeKind	435
Table 225 – Literals of FilterFunctionKind	435
Table 226 – Literals of FuseFunctionKind	435
Table 227 – Literals of HealthKind	436
Table 228 – Literals of InstrumentTransformerMeasurementRatingKind	436
Table 229 – Literals of InstrumentTransformerProtectionRatingKind	436
Table 230 – Literals of LeapSecondKind	437

Table 231 – Literals of LevelTriggerModeKind	437
Table 232 – Literals of LiveDeadModeKind	437
Table 233 – Literals of MaterialKind	438
Table 234 – Literals of MaterialStateKind	438
Table 235 – Literals of PFSignKind	440
Table 236 – Literals of PIDAlgorithmKind	441
Table 237 – Literals of POWSwitchingCapabilityKind	441
Table 238 – Literals of ParallelCoilModeKind	441
Table 239 – Literals of ParallelCtrlModeKind	442
Table 240 – Literals of ParallelTransfModeKind	442
Table 241 – Literals of PolarizingQuantityKind	442
Table 242 – Literals of RecordingModeKind	443
Table 243 – Literals of RectifierControlModeKind	443
Table 244 – Literals of ResetCurveKind	443
Table 245 – Literals of RestraintModeKind	444
Table 246 – Literals of RetripModeKind	444
Table 247 – Literals of RotatingMachineStateKind	444
Table 248 – Literals of RotationalDirectionKind	445
Table 249 – Literals of RotorThermalStateKind	445
Table 250 – Literals of SOFEnablingModeKind	445
Table 251 – Literals of SOFOperationModeKind	446
Table 252 – Literals of STotalCalcMethodKind	446
Table 253 – Literals of ScheduleEnablingErrorKind	446
Table 254 – Literals of ScheduleStateKind	447
Table 255 – Literals of SetpointEndKind	447
Table 256 – Literals of StageControlKind	448
Table 257 – Literals of StrWeekDayKind	448
Table 258 – Literals of SwitchFunctionKind	448
Table 259 – Literals of SwitchingCapabilityKind	449
Table 260 – Literals of SynchOperationModeKind	449
Table 261 – Literals of TankFillKind	449
Table 262 – Literals of TransientPerformanceClassKind	450
Table 263 – Literals of TpcAppModeKind	450
Table 264 – Literals of TriggerSourceKind	450
Table 265 – Literals of TripBehaviourKind	451
Table 266 – Literals of TripModeKind	451
Table 267 – Literals of TuningKind	451
Table 268 – Literals of UnbalanceDetectionKind	452
Table 269 – Literals of UnblockModeKind	452
Table 270 – Literals of VoltInterruptDetectionKind	452
Table 271 – Literals of WeakEndInfeedModeKind	453
Table A.1 – Values of mode and behaviour	454
Table A.2 – Definition of mode and behaviour	456

Table B.1 – Relationship between Loc/Rem data objects and control authority	458
Table I.1 – Conditions for presence of elements within a context	473
Table K.1 – Expected behavior of a schedule	482
Table K.2 – Structure of a schedule	483
Table K.3 – Impact of Mode (Mod) on the schedule status and on the controllable entity	489

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

- 1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of 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, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). 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. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
- 2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.
- 3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
- 4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
- 5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
- 6) All users should ensure that they have the latest edition of this publication.
- 7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
- 8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
- 9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

This consolidated version of the official IEC Standard and its amendment has been prepared for user convenience.

IEC 61850-7-4 edition 2.1 contains the second edition (2010-03) [documents 57/1045/FDIS and 57/1051/RVD] and its amendment 1 (2020-02) [documents 57/2102A/FDIS and 57/2133/RVD].

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 the 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 of IEC 61850 refers to Logical Nodes and Data Objects and IEC 61850-7-3 to the Data Attributes.

Therefore, the amendment complements and updates the second edition of this part of IEC 61850, which was published in 2010. It constitutes editorial revisions for consistency 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 parts of IEC 61850 such as IEC 61850-7-4, on which the amendment is based, are generated automatically from the UML version. This allows publishing, voting and reading the various parts of IEC 61850-7 as in the past.

This amendment includes the following changes with respect to IEC 61850-7-4:2010:

- provides clarifications and corrections to the second edition of IEC 61850-7-4, based on the tissues = {671, 672, 674, 675, 676, 677, 679, 680, 682, 683, 685, 686, 689, 693, 694, 695, 696, 712, 713, 714, 715, 716, 724, 725, 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, 1261, 1269, 1273, 1278, 1282, 1292, 1294, 1310, 1316, 1330, 1331, 1333, 1339, 1347, 1348, 1364, 1368, 1375, 1380, 1390, 1404, 1411, 1420, 1423, 1425, 1426, 1456, 1568};
- adds to each functional LN group a parent abstract Logical node where the functional nodes are children from (full object oriented model). Since all abstract LNs are 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 subclauses (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 for the following reasons:

- To 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 IEC 61850-7-4:2007(revision A – 5.1 and 5.2).
- To include abstract logical nodes. These abstract logical nodes have been described in 6.2.
- The specification of logical nodes begins with 6.3 (was in IEC 61850-7-4:2007 (revision A – 5.3). In consequence all clauses in IEC 61850-7-4:2007 (revision A beginning with 5.3 count one number higher (beginning with 6.3) than they were in IEC 61850-7-4 (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 IEC 61850-7-4 separately.

Annex J and Annex K have been added.

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 for power utility automation*, can be found on the IEC website.

This IEC standard includes Code Components i.e. components that are intended to be directly processed by a computer. Such content is any text found between the markers <CODE BEGINS> and <CODE ENDS>, or otherwise is clearly labeled in this standard as a Code Component. In the current version of this document, such indication is made at the beginning of each concerned top-level clauses

The purchase of this IEC standard carries a copyright license for the purchaser to sell software containing Code Components from this standard directly to end users and to end users via distributors, subject to IEC software licensing conditions, which can be found at: <http://www.iec.ch/CCv1>.

If any updates are required to the published code component that needs to apply immediately and can not wait for an amendment (i.e. fixing a major problem), a new release of the Code Component will be issued and distributed through the IEC WebSite. Any new release of the Code Component related to this part will supersede any previously published Code Component including the one published within the current document.

This publication contains attached nsd files which compose the Code Component of this part. These files are intended to be used as a complement and do not form an integral part of this standard.

The committee has decided that the contents of the base publication and its amendment 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.

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 specifically 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 and may be found in IEC 61850-8 and in IEC 61850-9.

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 many 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 IEC 61850-7-4:2010. 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 of IEC 61850-7.

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

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.

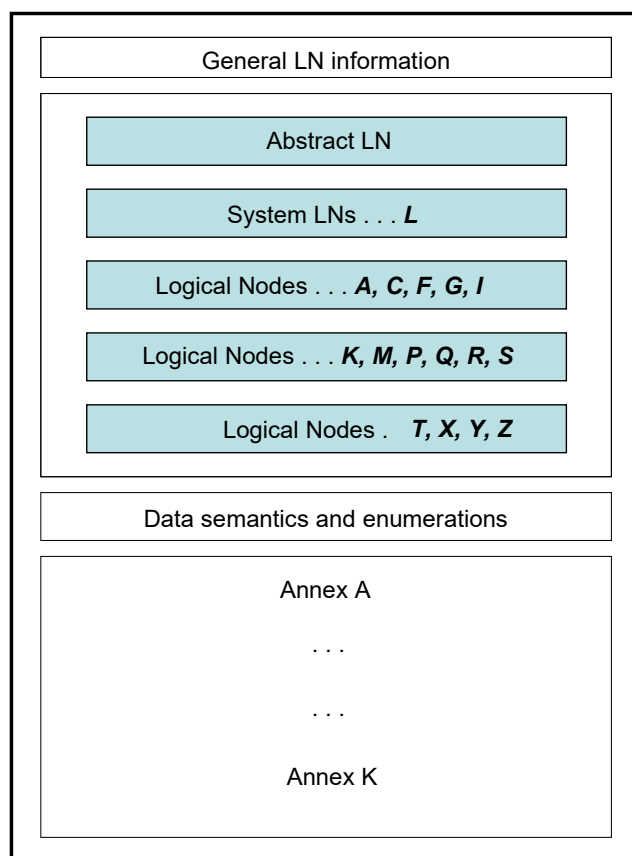
To avoid private, incompatible extensions, this part specifies normative naming rules for multiple instances and private, compatible extensions of logical node (LN) classes and data object names. Any definition is based on IEC 61850 or on referenced well identified public documents.

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 distributed energy resources,
- information exchange for metering,
- information exchanged for hydro power plants, or
- 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.



IEC 1102/03

Figure 1 – Overview of this standard

1.2 Namespace name and version

This new subclause is mandatory for any IEC 61850 namespace (as defined by IEC 61850-7-1:2011).

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

- Namespace Version: 2007
- Namespace Revision: B
- Namespace name: “IEC 61850-7-4:B”
- Namespace release: 3
- Namespace release date: 2019-10-31

IEC 61850-7-4 depends on IEC 61850-7-3:2007B latest release.

The table below provides an overview of all published versions of this namespace.

Edition	Publication date	Webstore	Namespace
Edition 1.0	2003-05	IEC 61850-7-4:2003	IEC 61850-7-4:2003
Edition 2.0	2010-03	IEC 61850-7-4:2010	IEC 61850-7-4:2007
Amendment 1 of Edition 2.0	2020-02	IEC 61850-7-4:2010/AMD1:2020	IEC 61850-7-4:2007B
Edition 2.1	2020-02	IEC 61850-7-4:2010+AMD1:2020 CSV	IEC 61850-7-4:2007B

1.3 Code Component distribution

The Code Component will be available in light and full version:

- Full version will contain definition of the whole LNs defined in this standard with the documentation associated and access will be restricted to purchaser of this part
- Light version will not contain the documentation but will contain the whole definition of the LNs as per full version, and this light version will be freely accessible on the IEC website for download, but the usage remains under the licensing conditions.

The link for downloading the light version of this code component is:

http://www.iec.ch/tc57/supportdocuments/IEC_61850-7-4.NSD.2007B3.light.zip

The Code Components for IEC 61850 data models (like LN definition in this IEC standard) are available as the file format NSD defined by standard IEC 61850-7-7.

The Code Component included in this IEC standard are potentially subject to maintenance works and user shall select the latest release in the repository located at:
<http://www.iec.ch/tc57/supportdocuments>

The latest version/release of the document will be found by selecting the file IEC_61850-7-4.NSD.{VersionStateInfo}.light.zip with the filed VersionStateInfo of the highest value.

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

The IECManifest contains different sections giving information on:

- The copyright notice
- The identification of the code component
- The publication related to the code component
- The list of the electronic files which compose the code component
- An optional list of history files to track changes during the evolution process of the code component

The life cycle of a code component is not restricted to the life cycle of the related publication. The publication life cycle goes through two stages, Version (corresponding to an edition) and Revision (corresponding to an amendment). A third publication stage (Release) allow publication of Code Component without need to publish an amendment.

This is useful when InterOp Tissues need to be fixed. Then a new release of the Code Component will be released, which supersedes the previous release, and distributed through the IEC TC57 web site.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60255-24:2013 / IEEE Std C37.111-2013, *Measuring relays and protection equipment - Part 24: Common format for transient data exchange (COMTRADE) for power systems*

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

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

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

IEC 61850-7-2:2020, *Communication networks and systems for power utility automation - Part 7-2: Basic information and communication structure - Abstract communication service interface (ACSI)*

IEC 61850-7-3:2020, *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*

IEC/IEEE 60255-118-1:2018, *Measuring relays and protection equipment – Part 118-1: Synchrophasor for power systems – Measurements*

IEC/IEEE 61850-9-3:2016, *Communication networks and systems for power utility automation – Part 9-3: Precision time protocol profile for power utility automation*

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*