

## CONTENTS

|  |    |
|--|----|
| FOREWORD.....  | 7  |
| INTRODUCTION.....  | 9  |
| 1 Scope.....   | 10 |
| 2 Normative references.....                                      | 11 |
| 3 Terms and definitions .....                                    | 12 |
| 4 Abbreviated terms.....   | 12 |
| 5 Logical node classes.....                                      | 17 |
| 5.1 Logical Node groups .....                                    | 17 |
| 5.2 Interpretation of Logical Node tables .....                  | 18 |
| 5.3 System Logical NodesLN Group: L.....                         | 19 |
| 5.3.1 LN relationships.....                                      | 19 |
| 5.3.2 LN: Physical device informationName: LPHD.....             | 20 |
| 5.3.3 LN: Common Logical Node Name: Common LN .....              | 20 |
| 5.3.4 LN: Logical node zeroName: LLN0.....                       | 21 |
| 5.4 Logical Nodes for automatic controlLN Group: A .....         | 22 |
| 5.4.1 Modelling remarks .....                                    | 22 |
| 5.4.2 LN: Neutral current regulatorName: ANCR .....              | 22 |
| 5.4.3 LN: Reactive power controlName: ARCO.....                  | 22 |
| 5.4.4 LN: Automatic tap changer controllerName: ATCC .....       | 23 |
| 5.4.5 LN: Voltage controlName: AVCO.....                         | 24 |
| 5.5 Logical Nodes for controlLN Group: C.....                    | 25 |
| 5.5.1 Modelling remarks .....                                    | 25 |
| 5.5.2 LN: Alarm handlingName: CALH .....                         | 25 |
| 5.5.3 LN: Cooling group controlName: CCGR.....                   | 25 |
| 5.5.4 LN: InterlockingName: CILO.....                            | 26 |
| 5.5.5 LN: Point-on-wave switchingName: CPOW .....                | 26 |
| 5.5.6 LN: Switch controllerName: CSWI.....                       | 27 |
| 5.5.7 LN: Synchronizer controllerName: CSYN.....                 | 27 |
| 5.6 Logical Nodes for functional blocksLN group F.....           | 28 |
| 5.6.1 Modelling remarks .....                                    | 28 |
| 5.6.2 LN: Counter Name: FCNT.....                                | 28 |
| 5.6.3 LN: Curve shape description Name: FCSD.....                | 28 |
| 5.6.4 LN: Generic Filter Name: FFIL .....                        | 29 |
| 5.6.5 LN: Control function output limitation Name: FLIM .....    | 29 |
| 5.6.6 LN: PID regulator NAME: FPID.....                          | 30 |
| 5.6.7 LN: Ramp function Name: FRMP.....                          | 31 |
| 5.6.8 LN: Set-point control function Name: FSPT .....            | 31 |
| 5.6.9 LN: Action at over threshold Name: FXOT .....              | 32 |
| 5.6.10 LN: Action at under threshold Name: FXUT .....            | 32 |
| 5.7 Logical Nodes for generic referencesLN Group: G.....         | 33 |
| 5.7.1 LN: Generic automatic process controlName: GAPC .....      | 33 |
| 5.7.2 LN: Generic process I/OName: GGIO.....                     | 34 |
| 5.7.3 LN: Generic security applicationName: GSAL.....            | 34 |
| 5.8 Logical Nodes for interfacing and archivingLN Group: I ..... | 35 |
| 5.8.1 LN: ArchivingName: IARC .....                              | 35 |
| 5.8.2 LN: Human machine interfaceName: IHMI.....                 | 35 |

|         |  |    |
|---------|--|----|
| 5.8.3   | LN: Safety alarm function Name: ISAF .....                                     | 35 |
| 5.8.4   | LN: Telecontrol interfaceName: ITCI .....                                      | 36 |
| 5.8.5   | LN: Telemonitoring interfaceName: ITMI .....                                   | 36 |
| 5.9     | Logical Nodes for mechanical and non-electric primary equipmentLN group K..... | 36 |
| 5.9.1   | Modelling remarks .....  | 36 |
| 5.9.2   | LN: Fan Name: KFAN .....   | 36 |
| 5.9.3   | LN: Filter Name: KFIL .....  | 37 |
| 5.9.4   | LN: Pump Name: KPMP .....  | 37 |
| 5.9.5   | LN: Tank Name: KTNK.....   | 38 |
| 5.9.6   | LN: Valve control Name: KVLV.....  | 39 |
| 5.10    | Logical Nodes for metering and measurementLN Group: M .....                    | 40 |
| 5.10.1  | Modelling remarks .....  | 40 |
| 5.10.2  | LN: Advanced Measurement unit Name: MADV .....                                 | 40 |
| 5.10.3  | LN: Differential measurementsName: MDIF.....                                   | 41 |
| 5.10.4  | LN: Environmental information Name: MENV.....                                  | 42 |
| 5.10.5  | LN: Flicker Measurement unit NameName: MFLK .....                              | 42 |
| 5.10.6  | LN: Harmonics or interharmonicsName: MHAI.....                                 | 43 |
| 5.10.7  | LN: Non phase related harmonics or interharmonicsName: MHAN.....               | 45 |
| 5.10.8  | LN: Hydrological information Name: MHYD .....                                  | 46 |
| 5.10.9  | LN: DC measurement Name: MMDC .....  | 47 |
| 5.10.10 | LN: Meteorological information Name: MMET .....                                | 47 |
| 5.10.11 | LN: MeteringName: MMTN.....  | 48 |
| 5.10.12 | LN: MeteringName: MMTR.....  | 49 |
| 5.10.13 | LN: Non phase related MeasurementName: MMXN .....                              | 49 |
| 5.10.14 | LN: MeasurementName: MMXU .....  | 49 |
| 5.10.15 | LN: Sequence and imbalanceName: MSQI .....                                     | 50 |
| 5.10.16 | LN: Metering StatisticsName: MSTA.....   | 50 |
| 5.11    | Logical Nodes for protection functionsLN Group: P.....                         | 51 |
| 5.11.1  | Modelling remarks .....  | 51 |
| 5.11.2  | LN: DifferentialName: PDIF .....   | 53 |
| 5.11.3  | LN: Direction comparisonName: PDIR.....  | 53 |
| 5.11.4  | LN: DistanceName: PDIS .....   | 54 |
| 5.11.5  | LN: Directional overpowerName: PDOP .....                                      | 55 |
| 5.11.6  | LN: Directional underpowerName: PDUP.....                                      | 55 |
| 5.11.7  | LN: Rate of change of frequencyName: PFRC .....                                | 55 |
| 5.11.8  | LN: Harmonic restraintName: PHAR.....  | 56 |
| 5.11.9  | LN: Ground detectorName: PHIZ.....   | 56 |
| 5.11.10 | LN: Instantaneous overcurrentName: PIOC .....                                  | 57 |
| 5.11.11 | LN: Motor restart inhibitionName: PMRI .....                                   | 57 |
| 5.11.12 | LN: Motor starting time supervisionName: PMSS.....                             | 58 |
| 5.11.13 | LN: Over power factorName: POPF.....   | 58 |
| 5.11.14 | LN: Phase angle measuringName: PPAM.....                                       | 59 |
| 5.11.15 | LN: Rotor protectionName: PRTR .....   | 59 |
| 5.11.16 | LN: Protection schemeName: PSCH .....  | 59 |
| 5.11.17 | LN: Sensitive directional earthfaultName: PSDE .....                           | 60 |
| 5.11.18 | LN: Transient earth faultName: PTEF .....                                      | 61 |
| 5.11.19 | LN: Thyristor protectionName: PTHF.....  | 61 |
| 5.11.20 | LN: Time overcurrentName: PTOC.....  | 62 |
| 5.11.21 | LN: OverfrequencyName: PTOF .....  | 62 |

- 5.11.22LN: OvervoltageName: PTOV.....63
- 5.11.23LN: Protection trip conditioningName: PTRC .....63
- 5.11.24LN: Thermal overloadName: PTTR.....64
- 5.11.25LN: UndercurrentName: PTUC .....65
- 5.11.26LN: UnderfrequencyName: PTUF .....65
- 5.11.27LN: UndervoltageName: PTUV .....66
- 5.11.28LN: Underpower factorName: PUPF .....66
- 5.11.29LN: Voltage controlled time overcurrentName: PVOC .....67
- 5.11.30LN: Volts per HzName: VVPH .....67
- 5.11.31LN: Zero speed or underspeedName: PZSU.....68
- 5.12 Logical Nodes for power quality eventsLN Group: Q .....68
  - 5.12.1 Modelling Remarks .....68
  - 5.12.2 LN: Voltage VariationName: QVVR.....68
  - 5.12.3 LN: LN: Frequency VariationName: QFVR .....69
  - 5.12.4 LN: LN: Voltage Unbalance VariationName: QVUB .....70
  - 5.12.5 LN: LN: Current Unbalance VariationName: QIUB .....70
  - 5.12.6 LN: LN: Voltage TransientName: QVTR.....71
  - 5.12.7 LN: LN: Current TransientName: QITR.....71
- 5.13 Logical Nodes for protection related functionsLN Group: R.....72
  - 5.13.1 Modelling Remarks .....72
  - 5.13.2 LN: Disturbance recorder channel analogueName: RADR.....72
  - 5.13.3 LN: Disturbance recorder channel binaryName: RBDR .....73
  - 5.13.4 LN: Breaker failureName: RBRF .....73
  - 5.13.5 LN: Directional elementName: RDIR .....74
  - 5.13.6 LN: Disturbance recorder functionName: RDRE .....74
  - 5.13.7 LN: Disturbance record handlingName: RDRS.....75
  - 5.13.8 LN: Fault locatorName: RFLO .....76
  - 5.13.9 LN: Power swing detection/blockingName: RPSB .....76
  - 5.13.10LN: AutoreclosingName: RREC .....77
  - 5.13.11LN: Synchronism-check or synchronisingName: RSYN .....78
  - 5.13.12LN: Teleprotection communication interfacesName: RTPC .....79
- 5.14 Logical Nodes for supervision and monitoringLN Group: S .....80
  - 5.14.1 Modelling remarks .....80
  - 5.14.2 LN: Monitoring and diagnostics for arcsName: SARC .....80
  - 5.14.3 LN: Insulation medium supervision (gas)Name: SIMG .....80
  - 5.14.4 LN: Insulation medium supervision (liquid)Name: SIML.....81
  - 5.14.5 LN: Supervision of Operating Mechanism Name: SOPM .....82
  - 5.14.6 LN: Monitoring and diagnostics for partial dischargesName: SPDC.....83
  - 5.14.7 LN: Circuit Switch Supervision Name: SSWI.....83
  - 5.14.8 LN: Temperature supervisionName: STMP.....84
  - 5.14.9 LN: Vibration supervisionName: SVBR .....85
- 5.15 Logical Nodes for instrument transformers and sensorsLN Group: T .....85
  - 5.15.1 LN: Angle Name: TANG .....85
  - 5.15.2 LN: Axial displacement Name: TAXD .....86
  - 5.15.3 LN: Current transformerName: TCTR .....86
  - 5.15.4 LN: Distance Name: TDST .....87
  - 5.15.5 LN: Liquid flow Name: TFLW.....87
  - 5.15.6 LN: Frequency Name: TFRQ .....87
  - 5.15.7 LN: Humidity Name: THUM .....88

Gelöscht: 68

|   |                |
|---|----------------|
| 5.15.8 LN: LMedia level Name: TLVL.....                                       | 88             |
| 5.15.9 LN: Magnetic field Name: TMGF.....                                     | 88             |
| 5.15.10LN: Movement sensor Name: TMVM.....                                    | 89             |
| 5.15.11LN: Position indicator Name: TPOS.....                                 | 89             |
| 5.15.12LN: Pressure sensorName: TPRS.....                                     | 90             |
| 5.15.13LN: Rotation transmitter Name: TRTN.....                               | 90             |
| 5.15.14LN: Sound pressure sensor Name: TSND.....                              | 90             |
| 5.15.15LN: Temperature sensorName: TTMP.....                                  | 91             |
| 5.15.16LN: Mechanical tension / stress Name: TTNS.....                        | 91             |
| 5.15.17LN: Vibration sensor Name: TVBR.....                                   | 91             |
| 5.15.18LN: Voltage transformerName: TVTR.....                                 | 92             |
| 5.15.19LN: Water acidity Name: TWPH.....                                      | 92             |
| 5.16 Logical Nodes for switchgearLN Group: X.....                             | 93             |
| 5.16.1 LN: Circuit breakerName: XCBR.....                                     | 93             |
| 5.16.2 LN: Circuit switchName: XSWI.....                                      | 93             |
| 5.17 Logical Nodes for power transformersLN Group: Y.....                     | 94             |
| 5.17.1 LN: Earth fault neutralizer (Petersen coil)Name: YEFN.....             | 94             |
| 5.17.2 LN: Tap changerName: YLTC.....   | 95             |
| 5.17.3 LN: Power shuntName: YPSH.....   | 95             |
| 5.17.4 LN: Power transformerName: YPTR.....                                   | 96             |
| 5.18 Logical Nodes for further power system equipmentLN Group: Z.....         | 96             |
| 5.18.1 LN: Auxiliary networkName: ZAXN.....                                   | 96             |
| 5.18.2 LN: BatteryName: ZBAT.....   | 97             |
| 5.18.3 LN: BushingName: ZBSH.....   | 97             |
| 5.18.4 LN: Power cableName: ZCAB.....   | 98             |
| 5.18.5 LN: Capacitor bankName: ZCAP.....                                      | 98             |
| 5.18.6 LN: ConverterName: ZCON.....   | 98             |
| 5.18.7 LN: GeneratorName: ZGEN.....   | 98             |
| 5.18.8 LN: Gas insulated lineName: ZGIL.....                                  | 99             |
| 5.18.9 LN: Power overhead lineName: ZLIN.....                                 | 99             |
| 5.18.10LN: MotorName: ZMOT.....   | 100            |
| 5.18.11LN: ReactorName: ZREA.....   | 100            |
| 5.18.12LN: Neutral resistor Name: ZRES.....                                   | 101            |
| 5.18.13LN: Rotating reactive componentName: ZRRC.....                         | 101            |
| 5.18.14LN: Surge arrestorName: ZSAR.....                                      | 101            |
| 5.18.15LN: Semi-conductor controlled rectifierName: ZSCR.....                 | 101            |
| 5.18.16LN: Synchronous machine Name: ZSMC.....                                | 102            |
| 5.18.17LN: Thyristor controlled frequency converterName: ZTCF.....            | 103            |
| 5.18.18LN: Thyristor controlled reactive componentName: ZTCR.....             | 103            |
| 6 Data name semantics.....  | 105            |
| Annex A (normativ) Interpretation of Mode and Behavior.....                   | <del>133</del> |
| Annex B (normative) Local / Remote concept on station level / NCC level.....  | <del>136</del> |
| Annex C (informative) Obsolete Logical Node Classes.....                      | <del>137</del> |
| C.1 LN: Metering StatisticsName: MSTA.....                                    | <del>137</del> |
| Annex D (informative) Relationship between this standard and IEC 61850-5..... | <del>138</del> |
| Figure 1 – Overview of this standard.....                                     | 11             |
| Figure 2 – LOGICAL NODE Relationships.....                                    | 19             |

Gelöscht: 132

Gelöscht: 135

Gelöscht: 136

Gelöscht: 136

Gelöscht: 137

Table 1 – List of Logical Node Groups ..... 17

Table 2 – Interpretation of Logical Node tables ..... 18

Table 3 – Relation between IEC 61850-5 and IEC 61850-7-4 for automatic control LNs..... 22

Table 4 – Relation between IEC 61850-5 and IEC 61850-7-4 for control LNs ..... 25

Table 19 - Conditional attributes in FPID ..... 31

Table 5 – Relation between IEC 61850-5 and IEC 61850-7-4 for metering and measurement LNs..... 40

Table 6 – Relation between IEC 61850-5 and IEC 61850-7-4 (this standard) for protection LNs..... 51

Table 7 – Relation between IEC 61850-5 and IEC 61850-7-4 for protection related LNs ..... 72

Table 8 – Relation between IEC 61850-5 and IEC 61850-7-4 for supervision and monitoring LNs..... 80

Table 9 – Description of Data ..... 105

Table A.1 – Definition of mode and behavior..... ~~135~~

Table C.1 – Relationship between IEC 61850-5 and this standard for some miscellaneous LNs ..... ~~138~~

Gelöscht: 134

Gelöscht: 137

## INTERNATIONAL ELECTROTECHNICAL COMMISSION

**COMMUNICATION NETWORKS AND SYSTEMS FOR POWER UTILITY  
AUTOMATION –**

**Part 7-400: Basic communication structure – 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.
- 2) The formal decisions or agreements of the 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 National Committees.
- 3) The documents produced have the form of recommendations for international use and are published in the form of standards, technical specifications, technical reports or guides and they are accepted by the National Committees in that sense.
- 4) In order to promote international unification, IEC National Committees undertake to apply IEC International Standards transparently to the maximum extent possible in their national and regional standards. Any divergence between the IEC Standard and the corresponding national or regional standard shall be clearly indicated in the latter.
- 5) The IEC provides no marking procedure to indicate its approval and cannot be rendered responsible for any equipment declared to be in conformity with one of its standards.
- 6) Attention is drawn to the possibility that some of the elements of this International Standard may be the subject of patent rights. The IEC shall not be held responsible for identifying any or all such patent rights.

International Standard IEC 61850-7-4 has been prepared by IEC technical committee 57: Power system control and associated communications.

This CD of Edition2 is based on the following documents:

| IS             | Report on voting |
|----------------|------------------|
| 61850-7-4-2003 |                  |

| CD        | Report on votings |
|-----------|-------------------|
| 57/747/CD |                   |
| 57/781/CD |                   |

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 for power utility automation*:

- Part 1: Introduction and overview
- Part 2: Glossary
- Part 3: General requirements
- Part 4: System and project management
- Part 5: Communication requirements for functions and device models
- Part 6: Configuration description language for communication in electrical substations related to IEDs
- Part 7-1: Basic communication structure – Principles and models
- Part 7-2: Basic communication structure – Abstract communication service interface (ACSI)
- Part 7-3: Basic communication – Common data classes
- Part 7-4: Basic communication structure for power utility automation – Compatible logical node classes and data classes
- Part 7-410: Basic communication structure for hydro power equipment – Compatible logical node classes and data classes
- Part 7-5: Use of logical nodes for applications
- 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
- 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
- Part 10: Conformance testing

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.

## INTRODUCTION

This part of IEC 61850 is part of set of standard definitions (IEC 61850). IEC 61850 defining Communication Networks and Systems for **Power** Utility Automation , and more specially the communication architecture for subsystems like 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 provides in part IEC 61850-7-x a both an **power** utility specific data model and a substation domain specific data model with abstract definitions of data 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 61850-7-300 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 61850-7-200. These common data classes are used in this part to define the compatible data classes.

Gelöscht: 00

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 common logical nodes defined in this part and data they contain, as defined in this basic part, and dedicated logical nodes defined in domain specific parts like for hydro power control systems. Interoperability is easiest if as much as possible of the data are defined as mandatory. Because of different philosophies and technical features, some data especially 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 the next edition of this part.

It should be noted that data with full semantics is only one of the elements required to achieve interoperability. The standardized access to the data is defined in compatible, **power** utility and domain specific services (see IEC 61850-7-200). Since data and services are hosted by devices (IED), a proper device model is needed also. To describe both the device capabilities and the interaction of the devices in the related system, also a configuration language is needed as defined in part 61850-6 by the Substation Configuration description Language (SCL).

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 61850-7-200 and IEC 61850-7-300. Not all features of logical nodes are listed in this part; for example data sets and logs are covered in IEC 61850-7-200.

# COMMUNICATION NETWORKS AND SYSTEMS FOR **POWER** UTILITY AUTOMATION –

## Part 7-4: Basic communication structure – Compatible logical node classes and data 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 contains also the information model of devices and functions related applications in substations. 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 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 Names. Any definition shall be 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. **Part 7-4** does not discuss implementation issues, **but part 7-5 does it.** The relationship between this standard and IEC 61850-5 is outlined in Annex **B**.

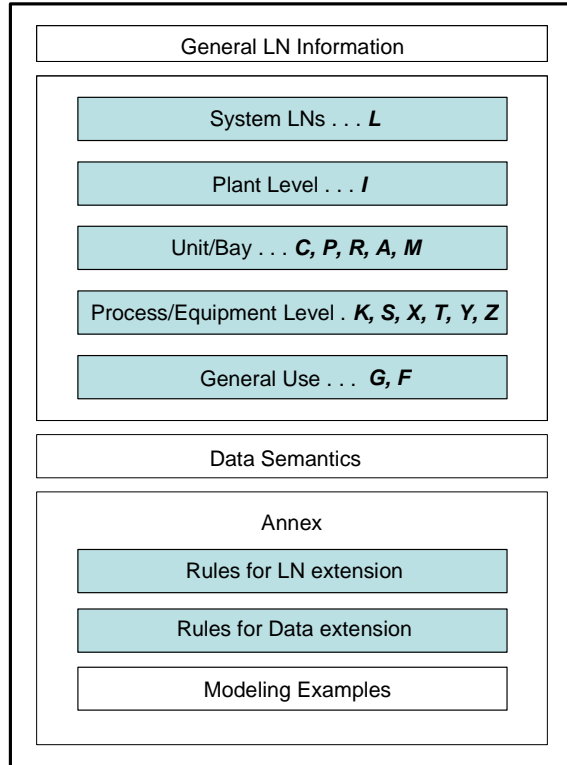
This standard is applicable to describe device models and functions of substation and feeder equipment. The concepts defined in this standard are also applied to describe device models and functions for:

- 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 document. The groups of Logical Nodes defined in this document are shown in Figure 1 ordered according to some semantic meaning like different control levels as plant level, unit level, etc. For convenience, the Logical Nodes are defined below in alphabetical order.

**Gelöscht:** 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.¶

**Gelöscht:** This part



IEC 1102/03

Figure 1 – Overview of this standard

**Kommentar [HD1]:** check if there are more standards to be include

## 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 60270 and/or IEEE 1434 - High-voltage test techniques – Partial discharge measurements](#)

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 61000-4-15, Electromagnetic compatibility \(EMC\) – Part 4: Testing and measurement techniques – Section 15: Flickermeter – Functional and design specifications](#)

[IEC 61000-4-30, Electromagnetic compatibility \(EMC\) – Part 4: Testing and measurement techniques – Section 30: Power quality measurement](#)

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

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)*

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 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".

| <u>Term</u>          | <u>Description</u>                       | <u>Term</u>          | <u>Description</u>   |
|----------------------|--|----------------------|----------------------|
| A                    | Current                                  | Auth                 | Authorisation        |
| <a href="#">a</a>    | <a href="#">Arithmetic</a>               | Auto                 | Automatic            |
| <a href="#">Acs</a>  | <a href="#">Access</a>                   | Aux                  | Auxiliary            |
| <a href="#">Act</a>  | <a href="#">Action</a>                   | Av                   | Average              |
| <a href="#">Abr</a>  | <a href="#">Abrasion</a>                 | Ax                   | Axial                |
| <a href="#">Abs</a>  | <a href="#">absolut</a>                  | B                    | Bushing              |
| ACSI                 | Abstract Communication Service Interface | <a href="#">Base</a> | <a href="#">Base</a> |
| <a href="#">Act</a>  | <a href="#">Action</a>                   | Bat                  | Battery              |
| Acu                  | Acoustic                                 | Beh                  | Behaviour            |
| <a href="#">Adj</a>  | <a href="#">Adjustment</a>               | <a href="#">Bias</a> | <a href="#">Bias</a> |
| Age                  | Ageing                                   | Bin                  | Binary               |
| <a href="#">Air</a>  | <a href="#">Air</a>                      | Blk                  | Block, blocked       |
| <a href="#">Alg</a>  | <a href="#">Algorithm</a>                | Bnd                  | Band                 |
| Alm                  | Alarm                                    | Bo                   | Bottom               |
| Amp                  | Current non phase related                | <a href="#">Bus</a>  | <a href="#">Bus</a>  |
| An                   | Analogue                                 | Cap                  | Capability           |
| Ang                  | Angle                                    | Capac                | Capacitance          |
| <a href="#">App</a>  | <a href="#">Apparent</a>                 | Car                  | Carrier              |
| <a href="#">Arc</a>  | <a href="#">Arc</a>                      | CB                   | Circuit Breaker      |
| <a href="#">Area</a> | <a href="#">Area</a>                     | CDC                  | Common Data Class    |

| <u>Term</u> | <u>Description</u>          | <u>Term</u>  | <u>Description</u>                           |
|-------------|-----------------------------|--------------|--|
| CE          | Cooling Equipment           | Dlt          | Delete                                       |
| <u>Cell</u> | <u>Cell</u>                 | Dmd          | Demand                                       |
| Cf          | Crest factor                | Dn           | Down   |
| <u>Cff</u>  | <u>Coefficient</u>          | DPCSO        | Double point controllable status output      |
| Cfg         | Configuration               | DQ0          | Direct, Quadrature, and zero axis quantities |
| CG          | Core Ground                 | Drag         | Drag hand                                    |
| Ch          | Channel                     | Drv          | Drive  |
| Cha         | Charger                     | DS           | Device State                                 |
| Chg         | Change                      | Dsch         | Discharge                                    |
| Chk         | Check                       | Dur          | Duration                                     |
| Chr         | Characteristic              | <u>Dv</u>    | <u>Deviation</u>                             |
| <u>Circ</u> | <u>Circulating, Circuit</u> | EC           | Earth Coil                                   |
| Clc         | Calculate, calculated       | <u>Echo</u>  | <u>Echo</u>                                  |
| Clk         | Clock, clockwise            | EE           | External Equipment                           |
| <u>Clr</u>  | <u>Clear</u>                | EF           | Earth Fault                                  |
| ClS         | Close                       | <u>Emg</u>   | <u>Emergency</u>                             |
| Cnt         | Counter                     | <u>En</u>    | <u>Energy</u>                                |
| Col         | Coil                        | <u>Ena</u>   | <u>Enabled</u>                               |
| <u>Cons</u> | <u>Constant</u>             | <u>End</u>   | <u>End</u>                                   |
| <u>Con</u>  | <u>Contact</u>              | <u>Env</u>   | <u>Environment</u>                           |
| Cor         | Correction                  | Eq           | Equalization, Equal                          |
| <u>Core</u> | <u>Core</u>                 | <u>Err</u>   | <u>Error</u>                                 |
| Crd         | Coordination                | Ev           | Evaluation                                   |
| <u>Crit</u> | <u>Critical</u>             | <u>Evt</u>   | <u>Event</u>                                 |
| Crv         | Curve                       | Ex           | External                                     |
| <u>Cst</u>  | <u>Constant</u>             | Exc          | Exceeded                                     |
| CT          | Current Transducer          | Excl         | Exclusion                                    |
| Ctl         | Control                     | Exp          | Expired                                      |
| Ctr         | Center                      | Ext          | Excitation                                   |
| <u>Cur</u>  | <u>Current</u>              | FA           | Fault Arc                                    |
| Cyc         | Cycle                       | Fact         | Factor                                       |
| <u>D</u>    | <u>Derivate</u>             | <u>Fail</u>  | <u>Failure</u>                               |
| Dea         | Dead                        | Fan          | Fan  |
| Den         | Density                     | <u>Fil</u>   | <u>Filter, filtration</u>                    |
| Det         | Detected                    | <u>Fld</u>   | <u>Field</u>                                 |
| DExt        | De-excitation               | Flt          | Fault  |
| <u>Dgr</u>  | <u>Degree</u>               | <u>Flush</u> | <u>Flush</u>                                 |
| Diag        | Diagnostics                 | Flw          | Flow   |
| Dif         | Differential, difference    | FPF          | Forward Power Flow                           |
| <u>Dip</u>  | <u>Dip</u>                  | Fu           | Fuse   |
| Dir         | Direction                   | <u>Full</u>  | <u>Full</u>                                  |
| Dis         | Distance                    | Fwd          | Forward                                      |
| <u>Dsp</u>  | <u>Displacement</u>         | Gen          | General                                      |
| DI          | Delay                       |              |  |

Gelöscht: Ena

... [1]

| Term           | Description                                      | Term        | Description   |
|----------------|--|-------------|---|
| Gn             | Generator  | Lin         | Line  |
| Gnd            | Ground   | Liv         | Live  |
| Gr             | Group  | LN          | Logical Node  |
| Grd            | Guard  | Lo          | Low   |
| Gri            | Grid   | LO          | Lockout   |
| H              | Harmonics (phase related)                        | Loc         | Local   |
| H <sub>2</sub> | Hydrogen   | Lod         | Load, loading                                       |
| H2O            | Water  | Lok         | Locked  |
| Ha             | Harmonics (non phase related)                    | <u>Loop</u> | <u>Loop</u>   |
| <u>Health</u>  | <u>Health</u>                                    | Los         | Loss  |
| <u>Heat</u>    | <u>Heater; Heating</u>                           | Lst         | List  |
| Hi             | High, highest                                    | LTC         | Load Tap Changer                                    |
| HP             | Hot point  | m           | Minutes   |
| <u>Hum</u>     | <u>Humidity</u>                                  | M/O/C       | Data Object is Mandatory or Optional or Conditional |
| <u>Hy</u>      | <u>Hydraulics; Hydraulic system</u>              | <u>Made</u> | <u>Made</u>   |
| Hz             | Frequency  | <u>Mag</u>  | <u>Magnetic</u>                                     |
| IEEE           | Institute of Electrical and Electronic Engineers | Max         | Maximum   |
| <u>I</u>       | <u>Integral</u>                                  | <u>Mbr</u>  | <u>Membrane</u>                                     |
| Imb            | Imbalance  | Mem         | Memory  |
| Imp            | Impedance non phase related                      | Min         | Minimum   |
| In             | Input  | Mod         | Mode  |
| Ina            | Inactivity                                       | Mot         | Motor   |
| <u>Ine</u>     | <u>Inertia</u>                                   | ms          | Milliseconds  |
| Incr           | Increment  | <u>Msg</u>  | <u>Message</u>                                      |
| Ind            | Indication                                       | Mst         | Moisture  |
| Inh            | Inhibit  | MT          | Main Tank   |
| Ins            | Insulation                                       | Mth         | Method  |
| Int            | Integer  | <u>Mult</u> | <u>Multiplier</u>                                   |
| <u>Intv</u>    | <u>Interval</u>                                  | <u>Mvm</u>  | <u>Movement, moving</u>                             |
| ISCSO          | Integer status controllable status output        | N           | Neutral   |
| km             | Kilometre  | Nam         | Name  |
| L              | Lower  | Net         | Net sum   |
| LD             | Logical Device                                   | <u>Neut</u> | <u>Neutral</u>                                      |
| LDC            | Line Drop Compensation                           | <u>Nit</u>  | <u>Nitrogen</u>                                     |
| LDCR           | Line Drop Compensation Resistance                | Ng          | Negative  |
| LDCX           | Line Drop Compensation Reactance                 | Nom         | Nominal, Normalising                                |
| LDCZ           | Line Drop Compensation Impedance                 | Num         | Number  |
| <u>Leak</u>    | <u>Leakage</u>                                   | <u>Ns</u>   | <u>Nonsinusoidal</u>                                |
| LED            | Light Emitting Diode                             | Ofs         | Offset  |
| Len            | Length   | <u>Oil</u>  | <u>Oil</u>  |
| Lev            | Level  | <u>Oo</u>   | <u>Out of</u>                                       |
| Lg             | Lag  | Op          | Operate, Operating                                  |
| Lim            | Limit  | Opn         | Open  |

**Kommentar [HD2]:** a message is a reported info, why in a name? F-group

| <u>Term</u>  | <u>Description</u>           | <u>Term</u> | <u>Description</u>                      |
|--------------|------------------------------|-------------|---|
| Out          | Output                       | <u>Red</u>  | <u>Reduction</u>                        |
| Ov           | Over, Override, Overflow     | Ref         | Reference                               |
| <u>Ovl</u>   | <u>Overload</u>              | Rel         | Release                                 |
| <u>P</u>     | <u>Proportional</u>          | Rem         | Remote                                  |
| Pa           | Partial                      | Res         | Residual                                |
| <u>Pap</u>   | <u>Paper</u>                 | Ris         | Resistance                              |
| Par          | Parallel                     | RI          | Relation, relative                      |
| Pct          | Percent, <u>Percentage</u>   | <u>Rmp</u>  | <u>Ramping, Ramp</u>                    |
| Per          | Periodic, Period             | <u>Rms</u>  | Root mean square                        |
| PF           | Power Factor                 | <u>Rnbk</u> | <u>Runback</u>                          |
| Ph           | Phase                        | Rot         | Rotation, Rotor                         |
| Phy          | Physical                     | Rs          | Reset, Resetable                        |
| Pls          | Pulse                        | Rsl         | Result                                  |
| Plt          | Plate                        | Rst         | Restraint, Restriction                  |
| Pmp          | Pump                         | Rsv         | Reserve                                 |
| Po           | Polar                        | Rte         | Rate                                    |
| Pol          | Polarizing                   | Rtg         | Rating                                  |
| Pos          | Position                     | Rv          | Reverse                                 |
| POW          | Point on wave switching      | Rx          | Receive, received                       |
| PP           | Phase to phase               | S1          | Step one                                |
| PPV          | Phase to phase voltage       | S2          | Step two                                |
| <u>Pre</u>   | <u>Pre-</u>                  | Sch         | Scheme                                  |
| Pres         | Pressure                     | SCO         | Supply change over                      |
| Prg          | Progress, in progress        | SCSM        | Specific Communication Service Mapping  |
| Pri          | Primary                      | Sec         | Security                                |
| Pro          | Protection                   | Seq         | Sequence                                |
| <u>Proxy</u> | <u>Proxy</u>                 | Set         | Setting                                 |
| <u>Prt</u>   | <u>Parts; part</u>           | Sh          | Shunt                                   |
| Ps           | Positive                     | Spd         | Speed                                   |
| Pst          | Post                         | SPI         | Single Pole                             |
| Pwr          | Power                        | SPCSO       | Single point controllable status output |
| Qty          | Quantity                     | <u>Spt</u>  | <u>Setpoint</u>                         |
| R            | Raise                        | Src         | Source                                  |
| R0           | Zero sequence resistance     | St          | Status                                  |
| R1           | Positive sequence resistance | Sto         | Storage e.g. activity of storing data   |
| Rat          | Winding ratio                | Stat        | Statistics                              |
| Rcd          | Record, recording            | Stop        | Stop                                    |
| Rch          | Reach                        | Std         | Standard                                |
| Rcl          | Reclaim                      | <u>Stk</u>  | <u>Stroke</u>                           |
| <u>Rct</u>   | <u>Reaction</u>              | Str         | Start                                   |
| Re           | Retry                        | Sup         | Supply                                  |
| React        | Reactance; Reactive          | Svc         | Service                                 |
| Rec          | Reclose                      | Sw          | Switch                                  |
| <u>Rect</u>  | <u>Rectifier</u>             | Swg         | Swing                                   |

**Kommentar [HD3]:** there is already an abbreviation Pa = partial ?

| <u>Term</u>          | <u>Description</u>          | <u>Term</u>           | <u>Description</u>             |
|----------------------|-----------------------------|-----------------------|--------------------------------|
| Syn                  | Synchronisation             | V                     | Voltage                        |
| Tap                  | Tap                         | VA                    | Volt Amperes                   |
| Td                   | Total distortion            | Vac                   | Vacuum                         |
| Tdf                  | Transformer derating factor | Val                   | Value                          |
| <a href="#">Term</a> | <a href="#">Term</a>        | VAr                   | Volt Amperes Reactive          |
| Test                 | Test                        | <a href="#">Vbr</a>   | <a href="#">Vibration</a>      |
| Thd                  | Total Harmonic Distortion   | <a href="#">Viol</a>  | <a href="#">Violation</a>      |
| Thm                  | Thermal                     | Vlv                   | Valve                          |
| TIF                  | Telephone influence factor  | Vol                   | Voltage non phase related      |
|                      | Time                        | <a href="#">Volts</a> | <a href="#">Voltage</a>        |
|                      | Tmh = Time in h             | VT                    | Voltage Transducer             |
|                      | Tmm = Time in min           | W                     | Active Power                   |
|                      | Tms = Time in s             | Wac                   | Watchdog                       |
|                      | Tmms = Time in ms           | Watt                  | Active Power non phase related |
| Tmp                  | Temperature (°C)            | Wei                   | Weak End Infeed                |
| <a href="#">Ink</a>  | <a href="#">Tank</a>        | Wh                    | Watt hours                     |
| To                   | Top                         | Wid                   | Width                          |
| Tot                  | Total                       | Win                   | Window                         |
| TP                   | Three pole                  | Wrm                   | Warm                           |
| Tr                   | Trip                        | <a href="#">Wrn</a>   | <a href="#">Warning</a>        |
| <a href="#">Trip</a> | <a href="#">Trip</a>        | X0                    | Zero sequence reactance        |
| Trg                  | Trigger                     | X1                    | Positive sequence reactance    |
| Ts                   | Total signed                | Z                     | Impedance                      |
| Tu                   | Total unsigned              | Z0                    | Zero sequence impedance        |
| Tx                   | Transmit, transmitted       | Z1                    | Positive sequence impedance    |
| Typ                  | Type                        | Zer                   | Zero                           |
| Un                   | Under                       | Zn                    | Zone                           |
| <a href="#">Up</a>   | <a href="#">Up, upwards</a> | Zro                   | Zero sequence method           |
| Use                  | Data actually in use        |                       |                                |
| <a href="#">Used</a> | <a href="#">Used</a>        |                       |                                |
| <a href="#">v</a>    | <a href="#">Vector</a>      |                       |                                |

## 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), for modelling protection per zone or level one instance per zone or level shall be created also.

**Table 1 – List of Logical Node Groups**

| Group Indicator  | Logical node groups                             |
|--|---|
| A  | Automatic Control                               |
| B  | Reserved  |
| C  | Supervisory control                             |
| D  | <u>Distributed Energy Ressources</u>            |
| E  | Reserved  |
| F  | Functional blocks                               |
| G  | Generic Function References                     |
| H  | Hydro power                                     |
| I  | Interfacing and Archiving                       |
| J  | Reserved  |
| K  | Mechanical and non-electrical primary equipment |
| L  | System Logical Nodes                            |
| M  | Metering and Measurement                        |
| N  | Reserved  |
| O  | Reserved  |
| P  | Protection Functions                            |
| Q  | Power Quality Events Detection Related          |
| R  | Protection Related Functions                    |
| S <sup>a)</sup>  | Supervision and Monitoring                      |
| T <sup>a)</sup>  | Instrument Transformer and Sensors              |
| U  | Reserved  |
| V  | Reserved  |
| W  | Wind power                                      |
| X <sup>a)</sup>  | Switchgear                                      |
| Y <sup>a)</sup>  | Power Transformer and Related Functions         |
| Z <sup>a)</sup>  | Further (power system) Equipment                |
| <sup>a)</sup> 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). |   |

## 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  |
|-------------------|--|
| Data Name         | Name of the Data   |
| Common Data Class | 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.  |
| E                 | <u>This data can be specified by use of number extensions acc. IEC61850-7-1 chapter 14.4</u>   |
| T                 | <p>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.</p> <p><u>For transient data, the falling edge shall not be reported if the transient attribute is set to true in the SCL-ICD file.</u></p> <p><u>It is recommended to report both states (true to false, AND false to true) , i.e. not to set the transient attribute in the SCL-ICD file for those DOs, and that the client filter the transitions that are not "desired".</u></p> |
| M/O/C             | <p>This column defines whether data, data sets, control blocks or services are mandatory (M) or optional (O) or conditional (C) for the instantiation of a specific Logical Node.</p> <p>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.</p> <p>The entry C is an indication that a condition exists for this data object. The condition decides what conditional data objects get mandatory. C may have an index to handle multiple conditions.</p>   |

Kommentar [HD4]: #129

Kommentar [HD5]: #442

The LN type and the LNName attribute are inherited from Logical-Node class (see IEC 61850-7-2). The LN class names are individually given in the Logical Node tables. The LN instance name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2 clause 19.

All 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.

### Data without category (Common Information)

is information independent of the dedicated function represented by the LN class. Mandatory data (M) are common to all LN classes i.e. shall be used for all LN classes dedicated for functions. Optional data (O) may be used for all LN classes dedicated for functions. These dedicated LN classes show if optional data of the Common Logical Node class get mandatory

Gelöscht: Logical Node

Kommentar [HD6]: see #441

### 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 resetable counters. They are typically changed remotely, and are changed during operation much more often 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.

**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**

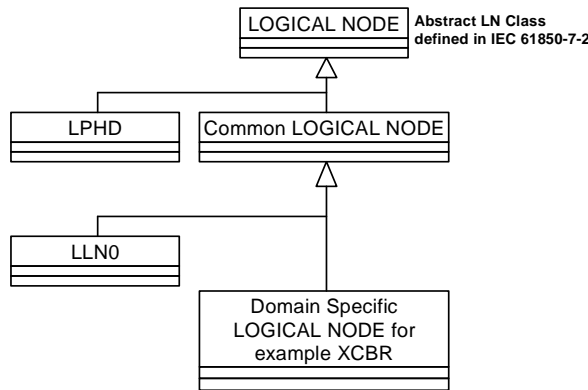
are data which are needed for the function to operate. Since many settings are dependent on the implementation of the function, only a commonly agreed minimum is standardised. They may be changed remotely, but normally not very often.

**5.3 System Logical Nodes LN Group: L**

**5.3.1 LN relationships**

**Kommentar [HD7]: #394**

In this subclause, the system specific information is defined. This includes Common Logical Node Information (for example logical node behavior, 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 the Common Logical Node..



**Figure 2 – LOGICAL NODE Relationships**

**Kommentar [HD8]: #401**

IEC 1103/03

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 (LLNO and domain specific LNs) defined in this document inherit at least the mandatory data of the common logical node (Common LN).

**Kommentar [HD9]: CH06:**  
here we should describe the relationship to 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  |                   |  |   |              |
|---|-------------------|--|---|--------------|
| Data Name   | Common Data Class | Explanation  | T | M/O/C        |
| <b>Data</b>   |                   |  |   |              |
| 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            |
| <b>Settings</b>   |                   |  |   |              |
| <del>TmChgDTm</del>   | <del>TSG</del>    | <del>Time of next change to daylight saving time</del> |   | <del>O</del> |
| <del>TmChgSTm</del>   | <del>TSG</del>    | <del>Time of next change to standard time</del>        |   | <del>O</del> |
| <b>Data Sets (see IEC 61850-7-2)</b>                                  |                   |  |   |              |
| Inherited and specialised from Logical Node class (see IEC 61850-7-2) |                   |  |   |              |
| <b>Control Blocks (see IEC 61850-7-2)</b>                             |                   |  |   |              |
| Inherited and specialised from Logical Node class (see IEC 61850-7-2) |                   |  |   |              |
| <b>Services (see IEC 61850-7-2)</b>                                   |                   |  |   |              |
| Inherited and specialised from Logical Node class (see IEC 61850-7-2) |                   |  |   |              |

Kommentar [HD10]: #442

Kommentar [HD11]: LNNa me is deleted because of #107

Kommentar [HD12]: #263

Kommentar [HD13]: #432

Kommentar [HD14]: #395

**5.3.3 LN: Common Logical Node Name: Common LN**

The Common Logical Node class provides Data which are mandatory or conditional to all dedicated LN classes. It contains also dat which may be used in all dedicated Logical Node classes like input references and data for the statistical calculation methods.

| Common LN class   |                   |  |   |              |
|---|-------------------|--|---|--------------|
| Data Name   | Common Data Class | Explanation  | T | M/O/C        |
| <b>Data</b>   |                   |  |   |              |
| <b>Mandatory and Conditional Logical Node Information (Shall be inherited by ALL LN but LPHD)</b> |                   |  |   |              |
| Mod   | INC               | Mode   |   | C            |
| Beh   | INS               | Behaviour  |   | M            |
| Health  | INS               | Health   |   | C            |
| NamPlt  | LPL               | Name plate   |   | C            |
| <b>Optional Logical Node Information</b>  |                   |  |   |              |
| InRef   | ORG               | General input  |   | O            |
| <del>BlkRef</del>   | <del>ORG</del>    | <del>Blocking reference shows the receiving of blocking signal</del> |   | <del>O</del> |
| <del>Blk</del>  | <del>SPS</del>    | <del>Dynamically blocking of function described by the LN</del>      |   | <del>O</del> |
| ClcExp  | SPS               | Calculation period expired   | T | O            |

Kommentar [HD15]: #395

Gelöscht:

Gelöscht: M

Gelöscht: M

Kommentar [HD16]: for this in 7-1 should be a description of the concept

|   |            |  |          |
|---|------------|--|----------|
| ClcStr  | SPC        | Start calculation at time operTm <u>from the control model</u> (if set) or immediately   | O        |
| ClcMth  | ING        | Calculation Method of statistical data. Allowed values<br>PRES   MIN   MAX   <u>AVG</u>   SDV   <u>TREND</u>   <u>RATE</u>               | O        |
| <u>ClcMod</u>   | <u>ING</u> | <u>Calculation mode. Allowed values:</u><br><u>TOTAL</u>   <u>PERIOD</u>   <u>SLIDING</u>  | <u>O</u> |
| <u>ClcIntvTyp</u>   | <u>ING</u> | <u>Calculation interval typ. Allowed values:</u><br><u>ANYTIME</u>   <u>HOUR</u>   <u>DAY</u>   <u>WEEK</u>   <u>MONTH</u>   <u>YEAR</u> | <u>O</u> |
| ClcPerms  | ING        | If <u>ClcIntvTyp</u> is equal <u>ANYTIME</u> Calculation Period <u>shall be defined</u> in milliseconds                                  | O        |
| ClcSrc  | ORG        | Object Reference to Source logical node  | O        |
| <u>ClcTyp</u>   | <u>ING</u> | <u>Calculation Type</u>  | <u>O</u> |
| GrRef   | <u>ORG</u> | Reference to a higher level Logical Device   | O        |
| <b>Data Sets (see IEC 61850-7-2)</b>                                  |            |  |          |
| Inherited and specialised from Logical Node class (see IEC 61850-7-2) |            |  |          |
| <b>Control Blocks (see IEC 61850-7-2)</b>                             |            |  |          |
| Inherited and specialised from Logical Node class (see IEC 61850-7-2) |            |  |          |
| <b>Services (see IEC 61850-7-2)</b>                                   |            |  |          |
| Inherited and specialised from Logical Node class (see IEC 61850-7-2) |            |  |          |

Condition C: Mod, Health and NamPlt shall be inherited by LLN0 as mandatory and by all other LN as optional.

- All dedicated LN classes shall inherit all Data, Data Sets, Control Blocks and Services from this Common Logical Node class.
- ClcMth is optional but mandatory if ClcMth not= PRES; default is PRES
- The data ClcExp, ClcStr, ClcPerms and ClcSrc shall be included in any logical node that represents statistical data (MIN, MAX, ...).
- The data ClcTyp shall be included in any logical node with mag/ang where any other calculation type is given instead of true RMS. ClcTyp = True RMS is default value.

**5.3.4 LN: Logical node zero Name: LLN0**

This LN shall be used to address common issues for Logical Devices. For example, LLN0 contains common information for the LD like Health, Mode and Beh and NamPlt.

| LLNO class       |                   |   |          |
|------------------|-------------------|---|----------|
| Data Name        | Common Data Class | Explanation                                       | T M/O/ C |
| <b>Data</b>      |                   |   |          |
| LocKey           | SPS               | Local operation for complete logical device       | O        |
| <u>LocSta</u>    | <u>SPC</u>        | <u>Switching authority at station level</u>       | <u>O</u> |
| <u>Loc</u>       | <u>SPS</u>        | <u>Local Control Behavior</u>                     | <u>M</u> |
| OpTmh            | INS               | Operation time                                    | O        |
| <b>Controls</b>  |                   |   |          |
| Diag             | SPC               | Run Diagnostics                                   | O        |
| LEDRs            | SPC               | LED reset   | T O      |
| <b>Settings</b>  |                   |   |          |
| <u>ModSwAuth</u> | <u>ING</u>        | <u>Select mode of authority for local control</u> | <u>O</u> |

**Kommentar [HD17]:** #479

**Kommentar [HD18]:** acc. meeting in Baden, use for synchrophasors

**Gelöscht:** TOTMIN | TOTMAX |

**Kommentar [HD19]:** acc. e-mail KHS (02.01.08)

**Gelöscht:** of statistical data

**Gelöscht:** , shall be

**Kommentar [HD20]:** Seoul and #504

**Gelöscht:** (wether RMS values or other calculation methods is used)

**Gelöscht:** REF

**Gelöscht:** .

**Gelöscht:** <#>.¶  
The data CalcMth shall be included in any logical node that represents analogue or counting information if the calculation method is unequal PRES i.e. that all analogue values (i. e. all common attributes i and f) are present values.

**Gelöscht:** ¶

**Gelöscht:** ¶

**Kommentar [HD21]:** tissue #306 in annex give an example

**Gelöscht:** RemCtlBlk

**Gelöscht:** Remote Control Blocked

**Kommentar [HD22]:** tissue #306

**Gelöscht:** CtlBeh

**Gelöscht:** O

**Kommentar [HD23]:** decisi on in Quebec

## 5.4 Logical Nodes for automatic control LN Group: A

### 5.4.1 Modelling remarks

**Table 3 – Relation between IEC 61850-5 and IEC 61850-7-4 for automatic control LNs**

Gelöscht: 3

| Functionality                    | Defined in IEC 61850-5 by LN | Modelled in IEC 61850-7-4 by LN | Comments   |
|----------------------------------|------------------------------|---------------------------------|--|
| Automatic tap changer controller |                              | ATCC                            | See Table 5  |
| Synchronised switching           | AsySw or CPBC                | CPOW                            | See Table 5  |
| Zero voltage tripping            | AZVT                         | PTUV                            | The start value has to discriminate between live and dead. The delay time has to be reasonably long to discriminate between a transient voltage zero or a permanent switched off line. |

### 5.4.2 LN: Neutral current regulator Name: ANCR

For a description of this LN, see IEC 61850-5.

| ANCR class                |                   |   |   |       |
|---------------------------|-------------------|---|---|-------|
| Data Name                 | Common Data Class | Explanation   | T | M/O/C |
| LNName                    |                   | The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2 clause 19 |   |       |
| <b>Data</b>               |                   |   |   |       |
| LocKey                    | SPS               | Local operation   |   | Q     |
| LocSta                    | SPC               | Remote Control Blocked  |   | O     |
| LocC                      | SPS               | Local Control Behavior  |   | O     |
| OpCntRs                   | INC               | Resetable operation counter   |   | O     |
| <b>Controls</b>           |                   |   |   |       |
| TapChg                    | BSC               | Change Tap Position (stop, higher, lower)   |   | M     |
| RCol                      | SPC               | Raise Plunge Coil Position  |   | O     |
| LCol                      | SPC               | Lower Plunge Coil Position  |   | O     |
| <b>Status Information</b> |                   |   |   |       |
| Auto                      | SPS               | Automatic operation   |   | O     |

Gelöscht: M

Kommentar [HD24]: tissue #306 in annex give an example

Gelöscht: RemCtBlk

Kommentar [HD25]: tissue #306

Gelöscht: CtlBeh

Gelöscht: re

Gelöscht: re

### 5.4.3 LN: Reactive power control Name: ARCO

For a description of this LN, see IEC 61850-5. This LN shall be used for a reactive controller independent of the control method being used.

| ARCO class  |                   |   |   |       |
|-------------|-------------------|---|---|-------|
| Data Name   | Common Data Class | Explanation   | T | M/O/C |
| LNName      |                   | The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2 clause 19 |   |       |
| <b>Data</b> |                   |   |   |       |
| LocKey      | SPS               | Local operation   |   | Q     |
| LocSta      | SPC               | Remote Control Blocked  |   | O     |
| LocC        | SPS               | Local Control Behavior  |   | O     |
| OpCntRs     | INC               | Resetable operation counter   |   | O     |

Gelöscht: M

Kommentar [HD26]: tissue #306 in annex give an example

Gelöscht: RemCtBlk

Kommentar [HD27]: tissue #306

Gelöscht: CtlBeh

| ARCO class                |                   |   |   |       |
|---------------------------|-------------------|---|---|-------|
| Data Name                 | Common Data Class | Explanation                                 | T | M/O/C |
| <b>Controls</b>           |                   |   |   |       |
| TapChg                    | BSC               | Change reactive power (stop, higher, lower) |   | M     |
| <b>Status Information</b> |                   |   |   |       |
| Auto                      | SPS               | Automatic operation                         |   | O     |
| VOvSt                     | SPS               | Voltage override status                     |   | O     |
| NeutAlm                   | SPS               | Neutral alarm is present                    |   | O     |
| DschBlk                   | SPS               | Bank switch close blocked due to discharge  | T | O     |

#### 5.4.4 LN: Automatic tap changer controller Name: ATCC

For a description of this LN, see IEC 61850-5.

| ATCC class                |                   |   |   |                |
|---------------------------|-------------------|---|---|----------------|
| Data Name                 | Common Data Class | Explanation   | T | M/O/C          |
| LNName                    |                   | The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2 clause 19 |   |                |
| <b>Data</b>               |                   |   |   |                |
| LocKey                    | SPS               | Local operation   |   | <del>O</del>   |
| <del>LocSta</del>         | <del>SPC</del>    | <del>Remote Control Blocked</del>   |   | <del>O</del>   |
| <del>Loc</del>            | <del>SPS</del>    | <del>Local Control Behavior</del>   |   | <del>O</del>   |
| OpCntRs                   | INC               | Resetable operation counter   |   | O              |
| <b>Controls</b>           |                   |   |   |                |
| TapChg                    | BSC               | Change Tap Position (stop, higher, lower)   |   | <del>C1</del>  |
| TapPos                    | ISC               | Tap position  |   | <del>C1</del>  |
| <del>BndCtrChg</del>      | <del>BAC</del>    | <del>Band centre change (raise, lower), no status</del>   |   | <del>C2</del>  |
| ParOp                     | DPC               | Parallel/Independent operation  |   | M              |
| LTCBlk                    | SPC               | Block (Inhibit) Automatic Control of LTC  |   | O              |
| LTCDragRs                 | SPC               | Reset LTC Drag Hands  | T | O              |
| VRed1                     | SPC               | Voltage reduction step 1  |   | O              |
| VRed2                     | SPC               | Voltage reduction step 2  |   | O              |
| <b>Measured Values</b>    |                   |   |   |                |
| CtIV                      | MV                | Control Voltage   |   | M              |
| LodA                      | MV                | Load Current (total transformer secondary current)  |   | O              |
| CircA                     | MV                | Circulating Current   |   | O              |
| PhAng                     | MV                | Phase Angle of LodA relative to CtIV at 1.0 power factor, FPF   |   | O              |
| <b>Metered Values</b>     |                   |   |   |                |
| HiCtIV                    | MV                | Highest Control Voltage   |   | O              |
| LoCtIV                    | MV                | Lowest Control Voltage  |   | O              |
| HiDmdA                    | MV                | High current demand (Load Current Demand)   |   | O              |
| <b>Status Information</b> |                   |   |   |                |
| Auto                      | SPS               | Automatic/Manual operation  |   | O              |
| HiTapPos                  | INS               | High tap position   |   | O              |
| LoTapPos                  | INS               | Low tap position  |   | O              |
| <del>TapOpR</del>         | <del>SPS</del>    | <del>Change tap position raise</del>  |   | <del>I O</del> |
| <del>TapOpLo</del>        | <del>SPS</del>    | <del>Change tap position lower</del>  |   | <del>I O</del> |

Gelöscht: M

Kommentar [HD28]: tissue #306 in annex give an example

Gelöscht: RemCtBlk

Kommentar [HD29]: tissue #306

Gelöscht: CtIBeh

| ATCC class      |                   |   |   |       |
|-----------------|-------------------|---|---|-------|
| Data Name       | Common Data Class | Explanation   | T | M/O/C |
| TapOpStop       | SPS               | Change tap position stop  | I | Q     |
| <b>Settings</b> |                   |   |   |       |
| BndCtr          | ASG               | Band center voltage (FPF presumed)  |   | C2    |
| BndWid          | ASG               | Band width voltage (as voltage or percent of nominal voltage, FPF presumed) |   | O     |
| CtIDITmms       | ING               | Control intentional time delay (FPF presumed)                               |   | O     |
| LDCR            | ASG               | Line drop voltage due to line resistance component                          |   | O     |
| LDCX            | ASG               | Line drop voltage due to line reactance component                           |   | O     |
| BlkLV           | ASG               | Control voltage below which auto Lower commands blocked                     |   | O     |
| BlkRV           | ASG               | Control voltage above which auto Raise commands blocked                     |   | O     |
| BlkVLo          | ASG               | Control voltage below which auto Raise commands are blocked.                |   | O     |
| BlkVHi          | ASG               | Control voltage above which auto Lower commands are blocked.                |   | O     |
| RnbkRV          | ASG               | Runback Raise Voltage   |   | O     |
| LimLodA         | ASG               | Limit Load Current (LTC Block Load Current)                                 |   | O     |
| LDC             | SPG               | Line Drop Compensation is R&X or Z model                                    |   | O     |
| TmDIChr         | SPG               | Time delay linear or inverse characteristic                                 |   | O     |
| LDCZ            | ASG               | Line drop voltage due to line total impedance                               |   | O     |
| VRedVal         | ASG               | Reduction of band centre (percent) when voltage step 1 is active            |   | O     |
| TapBlkR         | ING               | Tap position of Load Tap Changer where automatic Raise commands are blocked |   | O     |
| TapBlkL         | ING               | Tap position of Load Tap Changer where automatic Lower commands are blocked |   | O     |

**Kommentar [HD30]:** may be improve description; acc. Baden editor meeting

**Gelöscht:** O

Condition C1: depending on the tap-change method at least one of the two controls TapChg and TapPos shall be used.

Condition C2: xxxxxxxx

#### 5.4.5 LN: Voltage control Name: AVCO

For a description of this LN, see IEC 61850-5. This LN shall be used for a voltage controller independent of the control method beeing used.

| AVCO class                |                   |   |   |       |
|---------------------------|-------------------|---|---|-------|
| Data Name                 | Common Data Class | Explanation   | T | M/O/C |
| LNName                    |                   | The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2 clause 19 |   |       |
| <b>Data</b>               |                   |   |   |       |
| LocKey                    | SPS               | Local operation   |   | Q     |
| LocSta                    | SPC               | Remote Control Blocked  |   | O     |
| Loc                       | SPS               | Local Control Behavior  |   | O     |
| OpCntRs                   | INC               | Resetable operation counter   |   | O     |
| <b>Controls</b>           |                   |   |   |       |
| TapChg                    | BSC               | Change Voltage (stop, higher, lower)  |   | M     |
| <b>Status Information</b> |                   |   |   |       |
| Auto                      | SPS               | Automatic operation   |   | O     |
| BlkEF                     | SPS               | Blocked by earth fault  |   | O     |
| BlkAOv                    | SPS               | Blocked by current limit overflow   |   | O     |

**Gelöscht:** M

**Kommentar [HD31]:** tissue #306 in annex give an example

**Gelöscht:** RemCtBlk

**Kommentar [HD32]:** tissue #306

**Gelöscht:** CtlBeh

| AVCO class      |                   |                                     |   |       |
|-----------------|-------------------|-------------------------------------|---|-------|
| Data Name       | Common Data Class | Explanation                         | T | M/O/C |
| BlkVOv          | SPS               | Blocked by Voltage limit overflow   |   | O     |
| <b>Settings</b> |                   |                                     |   |       |
| LimAOv          | ASG               | Current limit for overflow blocking |   | O     |
| LimVOv          | ASG               | Voltage limit for overflow blocking |   | O     |

## 5.5 Logical Nodes for control LN Group: C

### 5.5.1 Modelling remarks

Table 4 – Relation between IEC 61850-5 and IEC 61850-7-4 for control LNs

| Functionality             | Defined in IEC 61850-5 by LN | Modelled in IEC 61850-7-4 by LN | Comments  |
|---------------------------|------------------------------|---------------------------------|---|
| Transformer incl. cooling | YPTR                         | CCGR                            | Dedicated cooling group control split off from YPTR |
| Tap changer controller    | CTCC                         | ATCC                            | Automatic tap changer controller                    |

Gelöscht: 4

### 5.5.2 LN: Alarm handling Name: CALH

For a description of this LN, see IEC 61850-5. Individual alarms are generated in the corresponding logical nodes, for example metering alarms are found in MMXU or MMTR, etc. CALH allows the creation of group warnings, group indications and group alarms. The individual alarms, which are used to calculate the group indications/alarms/warnings, are subscribed from elsewhere. The calculation is a local issue, usually a logic disjunction.

Gelöscht: .

| CALH class                |                   |   |   |          |
|---------------------------|-------------------|---|---|----------|
| Data Name                 | Common Data Class | Explanation   | T | M/O/C    |
| LNName                    |                   | The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2 clause 19 |   |          |
| <b>Data</b>               |                   |   |   |          |
| <b>Status Information</b> |                   |   |   |          |
| GrAlm                     | SPS               | Group alarm   |   | G        |
| GrWrn                     | SPS               | Group warning   |   | G        |
| <u>GrInd</u>              | <u>SPS</u>        | <u>Group Indication</u>   |   | <u>C</u> |
| AlmLstOv                  | SPS               | Alarm list overflow   |   | O        |

Gelöscht: M

Gelöscht: O

Condition C: At least one data object shall be modelled.

### 5.5.3 LN: Cooling group control Name: CCGR

This LN class shall be used to control the cooling equipment. One instance per cooling group shall be used.

| CCGR class             |                   |   |   |       |
|------------------------|-------------------|---|---|-------|
| Data Name              | Common Data Class | Explanation   | T | M/O/C |
| LNName                 |                   | The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2 clause 19 |   |       |
| <b>Data</b>            |                   |   |   |       |
| EEHealth               | INS               | External equipment health   |   | O     |
| EEName                 | DPL               | External equipment name plate   |   | O     |
| OpTmh                  | INS               | Operation time  |   | O     |
| <b>Measured Values</b> |                   |   |   |       |

| CCGR class                |                   |  |   |       |
|---------------------------|-------------------|--|---|-------|
| Data Name                 | Common Data Class | Explanation  | T | M/O/C |
| EnvTmp                    | MV                | Temperature of environment                         |   | O     |
| OilTmpIn                  | MV                | Oil temperature cooler in                          |   | O     |
| OilTmpOut                 | MV                | Oil temperature cooler out                         |   | O     |
| OilMotA                   | MV                | Oil circulation motor drive current                |   | O     |
| FanFlw                    | MV                | Air flow in fan                                    |   | O     |
| CETmpIn                   | MV                | Temperature of secondary cooling medium in         |   | O     |
| CETmpOut                  | MV                | Temperature of secondary cooling medium out        |   | O     |
| CEPres                    | MV                | Pressure of secondary cooling medium               |   | O     |
| CEFlw                     | MV                | Flow of secondary cooling medium                   |   | O     |
| FanA                      | MV                | Motor drive current fan                            |   | O     |
| <b>Controls</b>           |                   |  |   |       |
| CGRBlk                    | SPC               | Control of automatic / manual operation            |   | O     |
| CECtl                     | SPC               | Control of complete cooling group (pumps and fans) |   | O     |
| PmpCtlGen                 | INC               | Control of all pumps                               |   | O     |
| PmpCtl                    | INC               | Control of a single pump                           |   | O     |
| FanCtlGen                 | INC               | Control of all fans                                |   | O     |
| FanCtl                    | INC               | Control of a single fan                            |   | O     |
| <b>Status Information</b> |                   |  |   |       |
| Auto                      | SPS               | Automatic or manual                                |   | O     |
| FanOvCur                  | SPS               | Fan overcurrent trip                               |   | O     |
| PmpOvCur                  | SPS               | Pump overcurrent trip                              |   | O     |
| PmpAlm                    | SPS               | Loss of pump                                       |   | O     |
| <b>Settings</b>           |                   |  |   |       |
| OilTmpSet                 | ASG               | Set point for oil temperature                      |   | O     |

#### 5.5.4 LN: Interlocking Name: CILO

For a description of this LN, see IEC 61850-5. This LN shall be used to “enable” a switching operation if the interlocking conditions are fulfilled. One instance per switching device is needed. At least all related switchgear positions have to be subscribed. The interlocking algorithm is a local issue.

| CILO class                |                   |   |   |       |
|---------------------------|-------------------|---|---|-------|
| Data Name                 | Common Data Class | Explanation   | T | M/O/C |
| LNNName                   |                   | The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2 clause 19 |   |       |
| <b>Data</b>               |                   |   |   |       |
| <b>Status Information</b> |                   |   |   |       |
| EnaOpn                    | SPS               | Enable Open   |   | M     |
| EnaCls                    | SPS               | Enable Close  |   | M     |

#### 5.5.5 LN: Point-on-wave switching Name: CPOW

For a description of this LN, see IEC 61850-5. This LN shall be used if the circuit breaker is able to perform point-on-wave switching. In this case, the start signal for CPOW is OpOpn or OpCls to be subscribed from CSWI. Then CPOW shall perform its entire dedicated algorithm using data from the allocated TCTR or local and remote TVTR (local issue) and shall then release a “Time Activated Control” (see IEC 61850-7-2) to XCBR. OpOpn and OpCls shall be used if no “Time Activated Control” services is available between CPOW and XCBR. Alternatively, CPOW may be started by a control service acting on data Pos.

| CPOW class                |                   |   |   |       |
|---------------------------|-------------------|---|---|-------|
| Data Name                 | Common Data Class | Explanation   | T | M/O/C |
| LNName                    |                   | The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2 clause 19 |   |       |
| <b>Data</b>               |                   |   |   |       |
| <b>Controls</b>           |                   |   |   |       |
| Pos                       | DPC               | Switch, general   |   | O     |
| <b>Status Information</b> |                   |   |   |       |
| TmExc                     | SPS               | Maximum allowed time exceeded   |   | M     |
| StrPOW                    | SPS               | CPOW started  |   | O     |
| OpOpn                     | ACT               | Open switch   | T | O     |
| OpCls                     | ACT               | Close switch  | T | O     |
| <b>Settings</b>           |                   |   |   |       |
| MaxDITmms                 | ING               | Maximum allowed delay time  |   | O     |

### 5.5.6 LN: Switch controller Name: CSWI

For a description of this LN, see IEC 61850-5. This LN class shall be used to control all switching conditions above process level. CSWI shall subscribe the data POWCap (“point-on-wave switching capability”) from XCBR if applicable. If a switching command (for example Select-before-Operate) arrives and point-on-wave switching capability” is supported by the breaker, the command shall be passed to CPOW. OpOpn and OpCls shall be used if no Control Service is available between CSWI and XCBR (see GSE in IEC 61850-7-2).

| CSWI class                |                   |   |             |              |
|---------------------------|-------------------|---|-------------|--------------|
| Data Name                 | Common Data Class | Explanation   | T           | M/O/C        |
| LNName                    |                   | The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2 clause 19 |             |              |
| <b>Data</b>               |                   |   |             |              |
| LocKey                    | SPS               | Local operation   |             | O            |
| <del>LocSta</del>         | <del>SPC</del>    | <del>Remote Control Blocked</del>   | <del></del> | <del>O</del> |
| Loc                       | SPS               | Local Control Behavior  |             | M            |
| OpCntRs                   | INC               | Resetable operation counter   |             | O            |
| <b>Controls</b>           |                   |   |             |              |
| Pos                       | DPC               | Switch, general   |             | M            |
| PosA                      | DPC               | Switch L1   |             | O            |
| PosB                      | DPC               | Switch L2   |             | O            |
| PosC                      | DPC               | Switch L3   |             | O            |
| <b>Status Information</b> |                   |   |             |              |
| OpOpn                     | ACT               | Operation “Open Switch”   | T           | O            |
| OpCls                     | ACT               | Operation “Close Switch”  | T           | O            |

**Kommentar [HD33]:** tissue #306 in annex give an example

**Gelöscht:** RemCtBlk

**Kommentar [HD34]:** tissue #306

**Gelöscht:** O

### 5.5.7 LN: Synchronizer controller Name: CSYN

For a description of this LN, see IEC 61850-5. This LN class shall be used to control the synchronizing conditions.

**Kommentar [HD35]:** this is a placeholder only

| CSWI class |                   |             |   |       |
|------------|-------------------|-------------|---|-------|
| Data Name  | Common Data Class | Explanation | T | M/O/C |

| CSWI class      |                   |   |   |       |
|-----------------|-------------------|---|---|-------|
| Data Name       | Common Data Class | Explanation   | T | M/O/C |
| LNNName         |                   | The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2 clause 19 |   |       |
| <b>Data</b>     |                   |   |   |       |
| LockKey         | SPS               | Local operation   |   | O     |
| LocSta          | SPC               | Remote Control Blocked  |   | O     |
| Loc             | SPS               | Local Control Behavior  |   | M     |
| OpCntRs         | INC               | Resetable operation counter   |   | O     |
| <b>Controls</b> |                   |   |   |       |
| ????????????    |                   | Here sholud be included data from Hydro-proposal reg. RSYN  |   |       |

## 5.6 Logical Nodes for functional blocks LN group F

### 5.6.1 Modelling remarks

This group of logical nodes represents various types of control function blocks. Logical Node classes of this type do include some form of control algorithm. The LN's will normally be part of a logical device providing overall functionality within the system.

The LN of F-group are never located at the boarder to the process.

The LN classes of the F-group shall be used only if no other LN class from other groups doesn't fit to the semantic and function to be modelled.

### 5.6.2 LN: Counter

Name: FCNT

Logical Node FCNT shall be used to count incoming pulses.

| FCNT class                |                   |   |   |       |
|---------------------------|-------------------|---|---|-------|
| Data Name                 | Common Data Class | Explanation   | T | M/O/C |
| LNNName                   |                   | The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2 clause 19 |   |       |
| <b>Data</b>               |                   |   |   |       |
| EEHealth                  | INS               | External equipment health   |   | O     |
| EENName                   | DPL               | External equipment nameplate  |   | O     |
| <b>Status information</b> |                   |   |   |       |
| Up                        | SPS               | Last count direction upward   |   | O     |
| Dn                        | SPS               | Last count direction downward   |   | O     |
| <b>Metered values</b>     |                   |   |   |       |
| OpCntRs                   | BCR               | Counter   |   | M     |

Gelöscht: Attribute Name

Gelöscht: Attr. Type

Gelöscht: Loc ... [2]

Gelöscht: STS

Gelöscht: STS

Gelöscht: Measured

Gelöscht: Controls ... [3]

### 5.6.3 LN: Curve shape description

Name: FCSD

Logical Node FCSD shall comprise the data classes that represent the curve shaping output positions. The values can be dynamically modified online. The values entered in the table are based on statistical data obtained following a series of index tests.

The Logical Node is used to adapt an incoming value to a specified curve function. For example, it can be used 2-dimensional to adjust nonlinear transmitters to the correct physical values or, by instantiation, used for 3-dimensional surface mapping.

| FCSD class             |                          |   |   |        |
|------------------------|--------------------------|---|---|--------|
| <u>Data Name</u>       | <u>Common Data Class</u> | <u>Explanation</u>  | T | M/O /C |
| LNName                 |                          | The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2 clause 19 |   |        |
| <b>Data</b>            |                          |   |   |        |
| <i>Measured Values</i> |                          |   |   |        |
| Out                    | MV                       | Output  |   | M      |
| <b>Settings</b>        |                          |   |   |        |
| Crv                    | <del>CSG</del>           | Curve shape   |   | M      |

Gelöscht: Attribute Name

Gelöscht: Attr. Type

Kommentar [HD38]: acc. CH-11

Gelöscht: CSD

Gelöscht: Controls ... [4]

5.6.4 LN: Generic Filter

Name: FFIL

Logical Node FFIL shall be used to filter an incoming value. For a more detailed description of the functionality behind FFIL, see Appendix A [in IEC 61850-7-410](#).

| FFIL class                |                          |   |   |          |
|---------------------------|--------------------------|---|---|----------|
| <u>Data Name</u>          | <u>Common Data Class</u> | <u>Explanation</u>  | T | M/O /C   |
| LNName                    |                          | The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2 clause 19 |   |          |
| <b>Data</b>               |                          |   |   |          |
| <i>Measured values</i>    |                          |   |   |          |
| <u>Out</u>                | <u>MV</u>                | <u>Output</u>   |   | <u>M</u> |
| <i>Status information</i> |                          |   |   |          |
| <u>ErrTerm</u>            | <u>SPS</u>               | <u>Error term</u>   |   | <u>Q</u> |
| <b>Settings</b>           |                          |   |   |          |
| FlitTyp                   | ING                      | Filter type:   Low pass   High pass   Bandpass   Bandstop (notch)   |   | M        |
| Kp                        | ASG                      | Proportional Gain   |   | M        |
| Kld                       | ASG                      | K lead  |   | O        |
| Klg                       | ASG                      | K lag   |   | O        |
| T1                        | <del>JNG</del>           | Time 1 [ms]   |   | O        |
| T1ld                      | <del>JNG</del>           | Time 1 (lead) [ms]  |   | O        |
| T2                        | <del>JNG</del>           | Time 2 [ms]   |   | O        |
| T2ld                      | <del>JNG</del>           | Time 2 (lead) [ms]  |   | O        |
| T3                        | <del>JNG</del>           | Time 3 [ms]   |   | O        |

Gelöscht: Attribute Name

Gelöscht: Attr. Type

Kommentar [HD39]: acc. mail from Claes – 03.01.08

Gelöscht: INT

Gelöscht: INT

Gelöscht: INT

Gelöscht: INT

Gelöscht: INT

Gelöscht: Measured v... [5]

5.6.5 LN: Control function output limitation

Name: FLIM

This logical node is used to set temporary or permanent operational limits to an output signal (MV) from a control function. The FLIM Logical Node should not be used to replace FXOT or FXUT.

| FLIM class       |                          |   |   |        |
|------------------|--------------------------|---|---|--------|
| <u>Data Name</u> | <u>Common Data Class</u> | <u>Explanation</u>  | T | M/O /C |
| LNName           |                          | The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2 clause 19 |   |        |
| <b>Data</b>      |                          |   |   |        |

Gelöscht: Attribute Name

Gelöscht: Attr. Type

| Status information |     |   |  |   |
|--------------------|-----|---|--|---|
| HiLim              | SPS | High limit reached (input signal equal to or above limit) |  | O |
| LoLim              | SPS | Low limit reached (input signal equal to or below limit)  |  | O |
| Measured values    |     |   |  |   |
| Out                | MV  | Output signal   |  | M |
| Settings           |     |   |  |   |
| HiLimSpt           | ASG | High limit setpoint                                       |  | M |
| LoLimSpt           | ASG | Minimum limit setpoint                                    |  | O |

Gelöscht: Controls ... [6]

### 5.6.6 LN: PID regulator

NAME: FPID

Logical Node FPID shall comprise the data classes that represent proportional, integral and derivative information for a PID controller. For a more detailed description of the functionality behind FPID, see Appendix A in IEC 61850-7-410.

| FPID class      |                   |   |   |       |
|-----------------|-------------------|---|---|-------|
| Data Name       | Common Data Class | Explanation   | T | M/O/C |
| LNNName         |                   | The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2 clause 19 |   |       |
| Data            |                   |   |   |       |
| Measured Values |                   |   |   |       |
| Out             | MV                | PID output  |   | M     |
| PAct            | MV                | Proportional action   |   | C     |
| IAct            | MV                | Integral action   |   | C     |
| DAct            | MV                | Derivative action   |   | C     |
| P               | MV                | P output  |   | O     |
| I               | MV                | I output  |   | O     |
| D               | MV                | D output  |   | O     |
| ErrTerm         | MV                | Error term  |   | O     |
| Settings        |                   |   |   |       |
| PidAlg          | ING               | P I D PI PD ID PID  |   | M     |
| Kp              | ASG               | Proportional gain   |   | C     |
| Ki              | ASG               | Integral Gain   |   | C     |
| Ti              | INT               | Integral time (ms)  |   | C     |
| Kd              | ASG               | Derivative gain   |   | C     |
| Td              | INT               | Derivative time (ms)  |   | C     |
| Tdf             | INT               | Derivative time filter (ms)   |   | C     |
| Bias            | ASG               | Bias added to Process variable  |   | O     |

Gelöscht: Attribute Name  
Gelöscht: Attr. Type

Kommentar [HD41]: #590

Kommentar [HD42]: #550

Gelöscht: Controls ... [7]

The conditional attributes shown in the first column of table 19 shall be linked with the corresponding PID algorithm selected.

| Data Name | PidAlg<br>(M-Mandatory, Blank-Not Used) |   |   |    |    |    |     |
|-----------|---|---|---|----|----|----|-----|
|           | P                                       | I | D | PI | PD | ID | PID |
| PAct      | M                                       |   |   | M  | M  |    | M   |
| IAct      |   | M |   | M  |    | M  | M   |
| DAct      |   |   | M |    | M  | M  | M   |

Gelöscht: Attribute Name

|    |   |   |   |   |   |   |   |
|----|---|---|---|---|---|---|---|
| Kp | M |   |   | M | M |   | M |
| Ki |   | M |   | M |   | M | M |
| Ti |   | M |   | M |   | M | M |
| Kd |   |   | M |   | M | M | M |
| Td |   |   | M |   | M | M | M |
| Tf |   |   | M |   | M | M | M |

Table 19 - Conditional attributes in FPID

## 5.6.7 LN: Ramp function

Name: FRMP

Logical Node FRMP shall be used as a generic ramp. The LN is required due to the fact the data attributes of the ASG common data class does not contain all of the information required to achieved a full ramping function with divergent up and down trends.

| FRMP class                |                          |   |   |       |
|---------------------------|--------------------------|---|---|-------|
| <u>Data Name</u>          | <u>Common Data Class</u> | <u>Explanation</u>  | T | M/O/C |
| LNNName                   |                          | The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2 clause 19 |   |       |
| <b>Data</b>               |                          |   |   |       |
| <i>Measured Values</i>    |                          |   |   |       |
| Out                       | MV                       | Ramp Output   |   | M     |
| ErrTerm                   | MV                       | Error term  |   | O     |
| <i>Status information</i> |                          |   |   |       |
| AdjMsg                    | INS                      | Adjustment Message  |   | O     |
| <i>Settings</i>           |                          |   |   |       |
| RmpUp                     | ASG                      | Ramping rate on a upward trend  |   | M     |
| RmpDn                     | ASG                      | Ramping rate on a downward trend  |   | M     |
| StepPs                    | ASG                      | Step size when turning from negative to positive direction  |   | O     |
| StepNg                    | ASG                      | Step size when turning from positive to negative direction  |   | O     |

Gelöscht: Attribute Name

Gelöscht: Attr. Type

Kommentar [HD43]: #590

Gelöscht: Controls ... [8]

## 5.6.8 LN: Set-point control function

Name: FSPT

Logical Node FSPT shall be used to provide the common characteristics found in all controller or regulator type Logical Nodes. The LN can be standalone or cascaded with other logical nodes to form a complete controller.

| FSPT class             |                          |   |   |       |
|------------------------|--------------------------|---|---|-------|
| <u>Data Name</u>       | <u>Common Data Class</u> | <u>Explanation</u>  | T | M/O/C |
| LNNName                |                          | The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2 clause 19 |   |       |
| <b>Data</b>            |                          |   |   |       |
| Loc                    | SPS                      | LocalControl Behavior   |   | O     |
| <i>Controls</i>        |                          |   |   |       |
| SptR                   | SPC                      | Setpoint raise  |   | O     |
| SptLo                  | SPC                      | Setpoint lower  |   | O     |
| SptVal                 | APC                      | Setpoint  |   | M     |
| <i>Measured Values</i> |                          |   |   |       |
| SptMem                 | MV                       | Setpoint in memory  |   | M     |

Gelöscht: Attribute Name

Gelöscht: Attr. Type

|                           |     |                              |  |   |
|---------------------------|-----|------------------------------|--|---|
| ErrTerm                   | MV  | Error term                   |  | O |
| Output                    | MV  | Output                       |  | O |
| <b>Status Information</b> |     |                              |  |   |
| Auto                      | SPS | Automatic operation          |  | O |
| SptDvAlm                  | SPS | Deviation alarm              |  | O |
| SptUp                     | SPS | Setpoint going up (raising)  |  | O |
| SptDn                     | SPS | Setpoint going up (Lowering) |  | O |
| SptDir                    | SPS | Setpoint direction           |  | O |
| SptMsg                    | INS | End Message                  |  | O |
| AdjMsg                    | INS | Adjustment Message           |  | O |
| <b>Settings</b>           |     |                              |  |   |
| MaxRst                    | RST | Maximum restriction          |  | O |
| MinRst                    | RST | Minimum restriction          |  | O |
| DvAlm                     | ASG | Deviation Alarm              |  | O |
| DeaB                      | ASG | Deadband                     |  | O |

**Kommentar [HD44]:** #590

**Kommentar [HD45]:** Zug: what CDC RST is that? come from Hydro, should be included in 7-3; could be also a CDC ASG?  
answer: new CDC from 7-410

**Gelöscht:** SptVal ... [9]

**Gelöscht:** d

**Gelöscht:** Controls ... [10]

### 5.6.9 LN: Action at over threshold

**Name:** FXOT

Logical Node FXOT shall be used to set a high-level threshold value to be used in control sequences. If a second level is necessary a second instance can be modelled. FXOT can typically be used whenever a protection, control or alarm function is based on other physical measurements than primary electric data.

**Gelöscht:** It optionally provides a second level signal that can be used provide a two-step action.

| FXOT class                |                   |   |   |       |
|---------------------------|-------------------|---|---|-------|
| Data Name                 | Common Data Class | Explanation   | T | M/O/C |
| LNName                    |                   | The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2 clause 19 |   |       |
| <b>Data</b>               |                   |   |   |       |
| EEHealth                  | INS               | External equipment health   |   | O     |
| EEName                    | DPL               | External equipment nameplate  |   | O     |
| <b>Status information</b> |                   |   |   |       |
| Op                        | ACT               | Level of action reached   | T | M     |
| <b>Settings</b>           |                   |   |   |       |
| StrVal                    | ASG               | Start level set-point   |   | C     |
| OpDITmms                  | ING               | Operate delay time [ms]   |   | O     |
| StrCrv                    | CSD               | Start level curve   |   | C     |
| RsDITmms                  | ING               | Reset operate delay time [ms]   |   | O     |

**Gelöscht:** Attribute Name

**Gelöscht:** Attr. Type

**Gelöscht:** SPS

**Gelöscht:** OpB ... [11]

**Gelöscht:** StrValB ... [12]

**Gelöscht:** Controls ... [13]

Condition: Start level shall be given as a singular point or as a curve.

### 5.6.10 LN: Action at under threshold

**Name:** FXUT

Logical Node FXUT shall be used to set a low-level threshold value to be used in control sequences. If a second level is necessary a second instance can be modelled. FXUT can typically be used whenever a protection, control or alarm function is based on other physical measurements than primary electric data.

**Gelöscht:** It optionally provides a second level signal that can be used provide a two step action.

| FXUT class                |                   |   |   |   |     |
|---------------------------|-------------------|---|---|---|-----|
| Data Name                 | Common Data Class | Explanation   | T | M | O/C |
| LNName                    |                   | The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2 clause 19 |   |   |     |
| <b>Data</b>               |                   |   |   |   |     |
| EEHealth                  | INS               | External equipment health   |   |   | O   |
| EENaMe                    | DPL               | External equipment nameplate  |   |   | O   |
| <b>Status information</b> |                   |   |   |   |     |
| Op                        | ACT               | Level of action reached   | T | M |     |
| <b>Settings</b>           |                   |   |   |   |     |
| StrVal                    | ASG               | Start level set-point   |   |   | C   |
| OpDI Tmms                 | ING               | Operate delay time [ms]   |   |   | O   |
| StrCrv                    | CSD               | Start level curve   |   |   | C   |
| RsDI Tmms                 | ING               | Reset operate delay time [ms]   |   |   | O   |

Gelöscht: Attribute Name

Gelöscht: Attr. Type

Gelöscht: SPS

Gelöscht: OpB ... [14]

Gelöscht: StrValB ... [15]

Kommentar [HD46]: CSD or CSG?

Gelöscht: CRV

Gelöscht: Controls ... [16]

Condition: Start level shall be given as a singular point or as a curve.

## 5.7 Logical Nodes for generic references LN Group: G

### 5.7.1 LN: Generic automatic process control Name: GAPC

Description of this LN see IEC 61850-5. This node shall be used only to model in a generic way the processing/automation of functions that are not predefined by one of the groups A, C, M, P, or R. If needed, all data listed in clause 6 of this document can be used single or multiple for a dedicated application of LN **GAPC**. Data with proper semantic meaning should be preferred. The extensions rules according to Annex A shall be followed.

Gelöscht: GGIO

| GAPC class                |                   |   |   |   |       |
|---------------------------|-------------------|---|---|---|-------|
| Data Name                 | Common Data Class | Explanation   | E | T | M/O/C |
| LNName                    |                   | The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2 clause 19 |   |   |       |
| <b>Data</b>               |                   |   |   |   |       |
| LocKey                    | SPS               | Local operation   |   |   | O     |
| LocSta                    | SPC               | Remote Control Blocked  |   |   | O     |
| Loc                       | SPS               | Local Control Behavior  |   |   | O     |
| OpCntRs                   | INC               | Resetable operation counter   |   |   | O     |
| <b>Controls</b>           |                   |   |   |   |       |
| SPCSO                     | SPC               | Single point controllable status output   | E |   | O     |
| DPCSO                     | DPC               | Double point controllable status output   | E |   | O     |
| ISCSO                     | INC               | Integer status controllable status output   | E |   | O     |
| <b>Status Information</b> |                   |   |   |   |       |
| Auto                      | SPS               | Automatic operation   | E |   | O     |
| Str                       | ACD               | Start   | E |   | O     |
| Op                        | ACT               | Operate   | E | T | O     |
| Alm                       | SPS               | Generic single alarm  | E |   | O     |
| <b>Settings</b>           |                   |   |   |   |       |
| StrVal                    | ASG               | Start Value   | E |   | O     |

Gelöscht: ¶

Kommentar [HD47]: tissue #306 in annex give an example

Gelöscht: RemCtlBlk

Kommentar [HD48]: tissue #306

Gelöscht: LocCtlBeh

**5.7.2 LN: Generic process I/O Name: GGIO**

Description of this LN see IEC 61850-5. This node shall be used only to model in a generic way device processes that are not predefined by the groups S, T, X, Y, or Z. If needed, all data listed in clause 6 of this document can be used single or multiple for a dedicated application of LN GGIO. Data with proper semantic meaning should be preferred. The extensions rules according to Annex A shall be followed.

| GGIO class                 |                   |   |              |   |              |
|----------------------------|-------------------|---|--------------|---|--------------|
| Data Name                  | Common Data Class | Explanation   | E            | T | M/O/C        |
| LNName                     |                   | The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2 clause 19 |              |   |              |
| <b>Data</b>                |                   |   |              |   |              |
| EEHealth                   | INS               | External equipment health (external sensor)   |              |   | O            |
| EEName                     | DPL               | External equipment name plate   |              |   | O            |
| LocKey                     | SPS               | Local operation   |              |   | O            |
| <del>LocSta</del>          | <del>SPC</del>    | <del>Remote Control Blocked</del>   |              |   | <del>O</del> |
| <del>Loc</del>             | <del>SPS</del>    | <del>Local Control Behavior</del>   |              |   | <del>O</del> |
| OpCntRs                    | INC               | Resetable operation counter   |              |   | O            |
| <b>Measured Values</b>     |                   |   |              |   |              |
| AnIn                       | MV                | Analogue input  | E            |   | O            |
| <del>AnOut</del>           | <del>APC</del>    | <del>Controllable analogue output</del>   | <del>E</del> |   | <del>O</del> |
| <b>Controls</b>            |                   |   |              |   |              |
| SPCSO                      | SPC               | Single point controllable status output   | E            |   | O            |
| DPCSO                      | DPC               | Double point controllable status output   | E            |   | O            |
| ISCSO                      | INC               | Integer status controllable status output   | E            |   | O            |
| <b>Metered Information</b> |                   |   |              |   |              |
| <del>CntRs</del>           | <del>BCR</del>    | <del>Counter, resetable</del>   | <del>E</del> |   | <del>O</del> |
| <b>Status Information</b>  |                   |   |              |   |              |
| IntIn                      | INS               | Integer status input  | E            |   | O            |
| Alm                        | SPS               | General single alarm  | E            |   | O            |
| Ind                        | SPS               | General indication (binary input)   | E            |   | O            |

**Kommentar [HD49]:** tissue #306 in annex give an example

**Gelöscht:** RemCtlBlk

**Kommentar [HD50]:** tissue #306

**Gelöscht:** LocCtlBeh

**Kommentar [HD51]:** #467

**5.7.3 LN: Generic security application Name: GSAL**

For a description of this LN, see IEC 61850-7-2. This node shall be used to monitor security violations regarding authorisation, access control, service privileges and inactive associations.

| GSAL class                |                   |   |   |       |  |
|---------------------------|-------------------|---|---|-------|--|
| Data Name                 | Common Data Class | Explanation   | T | M/O/C |  |
| LNName                    |                   | The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2 clause 19 |   |       |  |
| <b>Data</b>               |                   |   |   |       |  |
| OpCntRs                   | INC               | Resetable operation counter.<br>NOTE – An operation in the context of this logical node is a security violation     |   | M     |  |
| <b>Status Information</b> |                   |   |   |       |  |
| AuthFail                  | SEC               | Authorisation failures  |   | M     |  |
| AcsCtlFail                | SEC               | Access control failures detected  |   | M     |  |
| SvcViol                   | SEC               | Service privilege violations  |   | M     |  |

| GSAL class |                   |                          |   |       |
|------------|-------------------|--------------------------|---|-------|
| Data Name  | Common Data Class | Explanation              | T | M/O/C |
| Ina        | SEC               | Inactive associations    |   | M     |
| NumCntRs   | INS               | Number of counter resets |   | O     |

**Kommentar [HD52]:** tissue #208

## 5.8 Logical Nodes for interfacing and archiving LN Group: I

### 5.8.1 LN: Archiving Name: IARC

For a description of this LN, see IEC 61850-5.

| IARC class                |                   |   |   |       |
|---------------------------|-------------------|---|---|-------|
| Data Name                 | Common Data Class | Explanation   | T | M/O/C |
| LNName                    |                   | The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2 clause 19 |   |       |
| <b>Data</b>               |                   |   |   |       |
| <b>Status Information</b> |                   |   |   |       |
| MemOv                     | SPS               | Memory Overflow   |   | M     |
| MemUsed                   | INS               | Memory used in %  |   | O     |
| NumRcd                    | INS               | Actual number of records  |   | O     |
| <b>Settings</b>           |                   |   |   |       |
| MaxNumRcd                 | ING               | Maximum number of records   |   | O     |
| OpMod                     | ING               | Operation mode (Saturation, Overwrite)  |   | O     |
| MemFull                   | ING               | Memory full level   |   | O     |

### 5.8.2 LN: Human machine interface Name: IHMI

For a description of this LN, see IEC 61850-5.

| IHMI class    |                   |   |   |          |
|---------------|-------------------|---|---|----------|
| Data Name     | Common Data Class | Explanation   | T | M/O/C    |
| LNName        |                   | The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2 clause 19 |   |          |
| <b>Data</b>   |                   |   |   |          |
| <u>LocKey</u> | <u>SPS</u>        | <u>Local operation</u>  |   | <u>O</u> |
| <u>LocSta</u> | <u>SPC</u>        | <u>Remote Control Blocked</u>   |   | <u>O</u> |
| <u>Loc</u>    | <u>SPS</u>        | <u>Local Control Behavior</u>   |   | <u>O</u> |

**Kommentar [HD53]:** tissue #306 in annex give an example

**Kommentar [HD54]:** tissue #306

**Kommentar [HD55]:** #478 and from Hydro data model

### 5.8.3 LN: Safety alarm function Name: ISAF

Logical Node ISAF shall be used to represent an alarm push-button or any other device that is used to provide an alarm in case of danger to persons or property.

| ISAF class                |                   |   |   |       |
|---------------------------|-------------------|---|---|-------|
| Data Name                 | Common Data Class | Explanation   | T | M/O/C |
| LNName                    |                   | The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2 clause 19 |   |       |
| <b>Data</b>               |                   |   |   |       |
| <b>Status Information</b> |                   |   |   |       |
| Alm                       | SPS               | Safety alarm ( <u>True</u> =On, <u>False</u> =Off)  | T | M     |

**Gelöscht:** 1

**Gelöscht:** 0

**Gelöscht:** OpCntRs ... [17]

| ISAF class      |                   |                                    |   |          |
|-----------------|-------------------|------------------------------------|---|----------|
| Data Name       | Common Data Class | Explanation                        | T | M/O/C    |
| <b>Controls</b> |                   |                                    |   |          |
| AlmReset        | SPC               | Alarm signal reset                 |   | O        |
| <u>OpCntRs</u>  | <u>INC</u>        | <u>Resetable operation counter</u> |   | <u>O</u> |

### 5.8.4 LN: Telecontrol interface Name: ITCI

For a description of this LN, see IEC 61850-5.

| ITCI class    |                   |   |   |          |
|---------------|-------------------|---|---|----------|
| Data Name     | Common Data Class | Explanation   | T | M/O/C    |
| LNName        |                   | The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2 clause 19 |   |          |
| <b>Data</b>   |                   |   |   |          |
| <u>LocKey</u> | <u>SPS</u>        | <u>Local operation</u>  |   | <u>O</u> |
| <u>LocSta</u> | <u>SPC</u>        | <u>Remote Control Blocked</u>   |   | <u>O</u> |
| <u>Loc</u>    | <u>SPS</u>        | <u>Local Control Behavior</u>   |   | <u>O</u> |

**Kommentar [HD56]:** tissue #306 in annex give an example

**Kommentar [HD57]:** tissue #306

... [18]

### 5.8.5 LN: Telemonitoring interface Name: ITMI

For a description of this LN, see IEC 61850-5.

| ITMI class  |                   |   |   |       |
|-------------|-------------------|---|---|-------|
| Data Name   | Common Data Class | Explanation   | T | M/O/C |
| LNName      |                   | The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2 clause 19 |   |       |
| <b>Data</b> |                   |   |   |       |
|             |                   |   |   |       |

## 5.9 Logical Nodes for mechanical and non-electric primary equipment LN group K

### 5.9.1 Modelling remarks

This group of logical nodes does represent various devices that can be supervised, controlled or operated but that are not primarily of electrical nature. This group includes devices like tanks, valves, fans etc.

### 5.9.2 LN: Fan

**Name: KFAN**

Logical Node KFAN shall be used to represent a fan. It can be seen as an extended nameplate that allows the temporary setting of data.

| KFAN class       |                          |  |   |     |
|------------------|--------------------------|--|---|-----|
| <u>Data Name</u> | <u>Common Data Class</u> | <u>Explanation</u>   | T | M/O |
| LNName           |                          | Shall be inherited from Logical-Node Class (see IEC 61850-7-2) |   |     |
| <b>Data</b>      |                          |  |   |     |
| EEHealth         | INS                      | External equipment health                                      |   | O   |
| EEName           | DPL                      | External equipment nameplate                                   |   | O   |
| OpTmh            | INS                      | Operation time   |   | O   |

**Gelöscht: Attribute Name**

**Gelöscht: Attr. Type**

| Status information |     |  |  |   |
|--------------------|-----|--|--|---|
| ACAIm              | SPS | AC supply failure (fuse or other problem)          |  | O |
| MotPro             | SPS | Motor protection tripped                           |  | O |
| FanBlk             | SPS | The fan is blocked from operation                  |  | O |
| Settings           |     |  |  |   |
| MinOpTmm           | ING | Minimum operation time in minutes                  |  | O |
| MaxOpTmm           | ING | Maximum operation time in minutes                  |  | O |
| Measured values    |     |  |  |   |
| RoiSpd             | MV  | Rotational speed of the fan                        |  | O |
| Controls           |     |  |  |   |
| Operation          | SPC | Operate fan  |  | C |
| RoiSpdSpt          | APC | Speed set-point (in case of speed regulated motor) |  | C |

**Kommentar [HD58]:** here we have the dynam. blocking signal from common LN. can we use it?

**Gelöscht:** ocked

**Kommentar [HD59]:** #554

**Gelöscht:** e

**Gelöscht:** DPC

**Gelöscht:** M

**Kommentar [HD60]:** #555 move to settings , change CDC to ASG

**Gelöscht:** O

**C: Condition: only one data should be applied**

### 5.9.3 LN: Filter

**Name:** KFIL

Logical Node KFIL shall be used to represent a (mechanical) filter. It can be seen as an extended nameplate that allows the temporary setting of data.

| KFIL class         |                          |  |   |     |
|--------------------|--------------------------|--|---|-----|
| <u>Data Name</u>   | <u>Common Data Class</u> | <u>Explanation</u>   | T | M/O |
| LNName             |                          | Shall be inherited from Logical-Node Class (see IEC 61850-7-2) |   |     |
| Data               |                          |  |   |     |
| EEHealth           | INS                      | External equipment health                                      |   | O   |
| EEName             | DPL                      | External equipment nameplate                                   |   | O   |
| OpTmh              | INS                      | Operation time   |   | O   |
| Status information |                          |  |   |     |
| ACAIm              | SPS                      | AC supply failure (fuse or other problem)                      |   | O   |
| MotPro             | SPS                      | Motor protection tripped                                       |   | O   |
| Flush              | SPS                      | Filter flushing  |   | O   |
| FlushCnt           | INC                      | Filter flushing counter (reset-able)                           |   | O   |
| FilAlm             | SPS                      | Filter alarm   |   | O   |
| Settings           |                          |  |   |     |
| DifPresHi          | ASG                      | Alarm level set-point  |   | O   |
| Measured values    |                          |  |   |     |
| DifPresHi          | MV                       | Differential pressure over the filter                          |   | O   |
| Controls           |                          |  |   |     |
| Operation          | SPC                      | Operate filter   |   | O   |

**Gelöscht:** Attribute Name

**Gelöscht:** Attr. Type

**Kommentar [HD61]:** #556

**Gelöscht:** e

**Gelöscht:** D

### 5.9.4 LN: Pump

**Name:** KPMP

Logical Node KPMP shall be used to represent a pump. It can be seen as an extended nameplate that allows the temporary setting of data.

| KPMP class       |                          |                    |   |     |
|------------------|--------------------------|--------------------|---|-----|
| <u>Data Name</u> | <u>Common Data Class</u> | <u>Explanation</u> | T | M/O |

**Gelöscht:** Attribute Name

**Gelöscht:** Attr. Type

|                           |     |  |  |   |
|---------------------------|-----|--|--|---|
| LNName                    |     | Shall be inherited from Logical-Node Class (see IEC 61850-7-2) |  |   |
| <b>Data</b>               |     |  |  |   |
| EEHealth                  | INS | External equipment health                                      |  | O |
| EEName                    | DPL | External equipment nameplate                                   |  | O |
| OpTmh                     | INS | Operation time   |  | O |
| <b>Status information</b> |     |  |  |   |
| ACAlm                     | SPS | AC supply failure (fuse or other problem)                      |  | O |
| MotPro                    | SPS | Motor protection tripped                                       |  | O |
| BkSt                      | SPS | The pump is blocked from operation                             |  | O |
| <b>Settings</b>           |     |  |  |   |
| MinOpTmm                  | ING | Minimum operation time in minutes                              |  | O |
| MaxOpTmm                  | ING | Maximum operation time in minutes                              |  | O |
| <b>Measured values</b>    |     |  |  |   |
| RotSpd                    | MV  | Rotational speed of the pump                                   |  | O |
| <b>Controls</b>           |     |  |  |   |
| Operation                 | SPC | Operate pump   |  | C |
| RotSpdSpt                 | APC | Speed set-point (in case of speed regulated motor)             |  | C |

Kommentar [HD62]: #557

Kommentar [HD63]: #558

Gelöscht: e

Gelöscht: D

Gelöscht: M

Gelöscht: O

C: Condition: only one data should be applied

### 5.9.5 LN: Tank

Name: KTNK

Logical Node KTNK shall be used to represent the physical device of a tank, such as a hydraulic oil tank. The tank can be pressurised or not. If used to represent a tank for pressurised gas, only the pressure MV will be used. If used for an oil sump, only the level MV will be used. For a simple level sensor, the SLVL logical node can be used instead.

| KTNK class                |                   |   |   |     |
|---------------------------|-------------------|---|---|-----|
| Data Name                 | Common Data Class | Explanation   | T | M/O |
| LNName                    |                   | Shall be inherited from Logical-Node Class (see IEC 61850-7-2)    |   |     |
| <b>Data</b>               |                   |   |   |     |
| EEHealth                  | INS               | External equipment health   |   | O   |
| EEName                    | DPL               | External equipment nameplate                                      |   | O   |
| Loc                       | SPS               | Local operation   |   | O   |
| <b>Status information</b> |                   |   |   |     |
| TnkTyp                    | INS               | Type of tank (pressure only, level only, both pressure and level) |   | M   |
| <b>Settings</b>           |                   |   |   |     |
| VlmCap                    | AsG               | Total volume capacity   |   | O   |
| <b>Measured values</b>    |                   |   |   |     |
| Pres                      | MV                | Pressure in the tank  |   | O   |
| LevPct                    | MV                | Level in the tank (as percentage of full tank level)              |   | O   |
| Vlm                       | MV                | Volume of media in tank   |   | O   |
| Tmp                       | MV                | Temperature of the media in the tank                              |   | O   |

Gelöscht: Attribute Name

Gelöscht: Attr. Type

**5.9.6 LN: Valve control****Name: KVLV**

**Kommentar [HD64]:** to discuss: relation between Valve to valve controller

Logical Node KVLV shall be used to represent a valve or gate where the position can be given as a percentage of full open position (optionally the angle 0-90° may be used). In case of dam gates where either open or closed position depends on the water level of the dam, the HGTE LN should be used.

| KVLV class                |                   |  |   |                |
|---------------------------|-------------------|--|---|----------------|
| Data Name                 | Common Data Class | Explanation  | T | M/O            |
| LNName                    |                   | Shall be inherited from Logical-Node Class (see IEC 61850-7-2) |   |                |
| <b>Data</b>               |                   |  |   |                |
| EEHealth                  | INS               | External equipment health                                      |   | O              |
| EEName                    | DPL               | External equipment nameplate                                   |   | O              |
| OpCnt                     | INS               | Operation counter  |   | O              |
| Loc                       | SPS               | Local operation selected                                       |   | M              |
| <b>Status information</b> |                   |  |   |                |
| ClsPos                    | SPS               | Closed end position reached (valve cannot move further)        |   | C <sup>1</sup> |
| OpnPos                    | SPS               | Open end position reached (valve cannot move further)          |   | C <sup>1</sup> |
| Mvm                       | SPS               | Valve is moving  |   | O              |
| Stuck                     | SPS               | Valve is blocked (cannot move from present position)           |   | O              |
| <b>Settings</b>           |                   |  |   |                |
| OpnLim                    | ASG               | Opening limit of valve position (temporary restriction)        |   | O              |
| ClsLim                    | ASG               | Closing limit of valve position (temporary restriction)        |   | O              |
| Incr                      | ASG               | Increment of position change for open / close commands         |   | O              |
| <b>Measured values</b>    |                   |  |   |                |
| PosPc                     | MV                | Valve position given as 0 – 100 %                              |   | C <sup>2</sup> |
| PosDg                     | MV                | Valve position given as 0 – 90 °                               |   | C <sup>2</sup> |
| Flw                       | MV                | Calculated liquid flow through the valve [m <sup>3</sup> / s]  |   | O              |
| <b>Controls</b>           |                   |  |   |                |
| PosSpt                    | APC               | Valve position set-point                                       |   | O              |
| Opn                       | DPC               | Valve to full open position                                    |   | O              |
| Cls                       | DPC               | Valve to full closed position                                  |   | O              |
| PosChg                    | INC               | Change valve position (stop, raise, lower)                     |   | C <sup>2</sup> |
| PosChgIncr                | INC               | Incremental change of position                                 |   | C <sup>2</sup> |
| BlkOpn                    | SPC               | Block opening of the valve                                     |   | O              |
| BlkCls                    | SPC               | Block closing of the valve                                     |   | O              |

**Gelöscht: Attribute Name**

**Gelöscht: Attr. Type**

**Kommentar [HD65]:** give no unit in CDC MV, ergo only one DO without unit; ValvPos ?

**Gelöscht: 6**

**Kommentar [HD66]:** #558 hydro

**Kommentar [HD67]:** Opn sollte als DPC mit Cls kombiniert werden

**Kommentar [HD68]:** #561 hydro

Note: For data attributes with conditions C<sup>1</sup>, one or both may be used, however the use of at least one is mandatory. Data attributes with conditions C<sup>2</sup> are optional, but if used, only one can be selected.

5.10 Logical Nodes for metering and measurement LN Group: M

5.10.1 Modelling remarks

**Table 5 – Relation between IEC 61850-5 and IEC 61850-7-4 for metering and measurement LNs**

| Functionality                | Defined in IEC 61850-5 by LN | Modelled in IEC 61850-7-4 by LN | Comments   |
|------------------------------|------------------------------|---------------------------------|--|
| Measurement                  | MMXU                         | MMXU                            | Three-phase version  |
|                              |                              | MMXN<br>MMDC                    | Non-phase related version (single phase)<br>DC related version |
| Metering (three-phase)       | MMTR                         | MMTR                            | Metering (three-phase values)                                  |
|                              |                              | MMTN                            | Metering (single-phase values)                                 |
|                              |                              | MSTA                            | Metering (statistics) – <i>obsolet, moved to annex</i>         |
| Harmonics and interharmonics | MHAI                         | MHAI                            | Three-phase version  |
|                              |                              | MHAN                            | Non-phase related version (single phase)                       |
| Advanced                     |                              | MADV                            | Advanced measurements for power quality                        |
| Flicker                      |                              | MFLK                            | Flicker measurements for power quality                         |
| Differential measurements    |                              | MDIF                            | Calculated data for differential protection                    |
| Meteorological data          |                              | MMET                            | █  |
| Environmental data           |                              | MENV                            | █  |
| Hydrological measurement     |                              | MHYD                            | █  |

**Gelöscht:** If the values for metering or measurement are provided by an external sensor connected via a 4 to 20 mA link, the live zero alarm is provided by the data external health (EEHealth).¶

**Gelöscht: 5**

**Kommentar [HD69]:** only if there is LN MFLK available

5.10.2 LN: Advanced Measurement unit Name: MADV

This LN shall be used for calculation of currents, voltages, and powers using advanced summation techniques (arithmetic and vector) for three phase quantities, and for proper representation of these quantities in non-sinusoidal and unbalanced conditions according to IEEE standard 1459. The main use is for operative applications.

**Kommentar [HD70]:** no units in MV class

**Kommentar [HD71]:** check all name reg. table 9

| MADV class             |                   |  |         |
|------------------------|-------------------|--|---------|
| Data Name              | Common Data Class | Explanation  | T M/O/C |
| LNName                 |                   | The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2 clause 19. |         |
| <b>Data</b>            |                   |  |         |
| <b>Measured Values</b> |                   |  |         |
| TotVAa                 | MV                | Arithmetic Total Apparent Power (va)   | 0       |
| TotVAv                 | MV                | Vector Total Apparent Power (va)   | 0       |
| TotVAaFund             | MV                | Fundamental Arithmetic Total Apparent Power (va)   | 0       |
| TotVAvFund             | MV                | Fundamental Vector Total Apparent Power (va)   | 0       |
| TPF                    | WYE               | True Power Factor (pu)   | 0       |
| TPFworst               | MV                | Worst Phase True Power Factor (pu)   | 0       |
| AvgTPF                 | MV                | Average True Power Factor (pu)   | 0       |
| TotPFa                 | MV                | Arithmetic Total Power Factor (pu)   | 0       |
| TotPFv                 | MV                | Vector Total Power Factor (pu)   | 0       |
| DspIPF                 | WYE               | Displacement Power Factor (pu), <i>fundamental power factor</i>  | 0       |
| DFworst                | MV                | Worst Phase Displacement Power Factor (pu)   | 0       |
| AvDF                   | MV                | Average Displacement Power Factor (pu)   | 0       |
| TotDFa                 | MV                | Arithmetic Total Displacement Power Factor (pu)  | 0       |

**Kommentar [HD72]:** discuss with KPB and Thierry if there are 2 MV needed, arithmetic and vector? and with Christoph

**Gelöscht: a**

**Gelöscht: F**

**Gelöscht:**



| Data Name              | Common Data Class | Explanation   | T | M/O/C |
|------------------------|-------------------|---|---|-------|
| LNName                 |                   | The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2 clause 19 |   |       |
| <b>Data</b>            |                   |   |   |       |
| <b>Measured Values</b> |                   |   |   |       |
| OpARem                 | WYE               | Operate Current (phasor) of the local current measurement   |   | C     |
| Amp                    | SAV               | Operate Current (Sampled value) of the local current measurement  |   | C     |
| Status                 | INS               | Local status according to predetermined format  |   | O     |
| Status [1..n]          | INT16U            | Local status according to predetermined format  |   | O     |

**Gelöscht:** remote

**Gelöscht:** 1

**Gelöscht:** (Sampled value) phase A

**Kommentar [HD74]:** Mode ? Beh? or what?

**Gelöscht:** Amp2 [19]

Condition C : Either OpARem or Amp shall be used. If possible, number of status should be configurable.

**5.10.4 LN: Environmental information Name: MENV**

Logical Node MENV shall be used for modelling the characteristics of environmental conditions such as emissions, and other key environmental data. In addition, many of the environmental sensors may be located remotely from the instantiated logical node. This logical node may therefore represent a collection of environmental information from many sources. It does however not include basic meteorological and hydrological data. For such information, see MHYD and MMET logical node classes.

| <b>MENV class</b>      |                   |   |   |       |
|------------------------|-------------------|---|---|-------|
| Data Name              | Common Data Class | Explanation   | T | M/O/C |
| LNName                 |                   | The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2 clause 19 |   |       |
| <b>Data</b>            |                   |   |   |       |
| <b>Measured Values</b> |                   |   |   |       |
| CO2                    | MV                | CO <sub>2</sub> emissions   |   | O     |
| CO                     | MV                | CO emissions  |   | O     |
| NOx                    | MV                | NO <sub>x</sub> emissions   |   | O     |
| SOx                    | MV                | SO <sub>x</sub> emissions   |   | O     |
| Dust                   | MV                | Dust particles suspended in air   |   | O     |
| Snd                    | MV                | Sound pressure level  |   | O     |
| O2                     | MV                | Oxygen in combustion gases  |   | O     |
| O3                     | MV                | Ozone in air  |   | O     |
| <b>Settings</b>        |                   |   |   |       |
| DvcOwner               | BOO               | Owner and operator of device  |   | G     |
| CTrade                 | INS               | Involved in carbon trading  |   | O     |
| CCredit                | MV                | Carbon production credit value  |   | O     |
| GreenTag               | INS               | Green tag information   |   | O     |

**Kommentar [HD75]:** #562 hydro: for table 9 use text

**Kommentar [HD76]:** new CDC from 7-410 in CDC DPL included, so this is included in PhyNam of LPHD for each device

**5.10.5 LN: Flicker Measurement unit Name Name: MFLK**

This LN shall be used for calculation of flicker inducing voltage fluctuations according to IEC Standard 61000-4-15. The main use is for operative applications.

**Kommentar [HD77]:** for used CDC in MFLK further discussion may be needed?

| MFLK class             |                   |  |   |       |
|------------------------|-------------------|--|---|-------|
| Data Name              | Common Data Class | Explanation  | I | M/O/C |
| LNNName                |                   | The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2 clause 19. |   |       |
| <b>Data</b>            |                   |  |   |       |
| <b>Measured Values</b> |                   |  |   |       |
| PPPst                  | DEL               | Pst of last complete interval for phase to phase measurements  |   | O     |
| PhPst                  | WYE               | Pst of last complete interval for phase to ground measurements   |   | O     |
| PPPlt                  | DEL               | Plt of last complete interval for phase to phase measurements  |   | O     |
| PhPlt                  | WYE               | Plt of last complete interval for phase to ground measurements   |   | O     |
| PPPiMax                | DEL               | Output 5 – Instantaneous peak P value for phase to phase measurements  |   | O     |
| PhPiMax                | DEL               | Output 5 – Instantaneous peak P value for phase to ground measurements   |   | O     |
| PPPILPF                | DEL               | Output 4 – 1 minute average of Output 5 for phase to phase measurements  |   | O     |
| PhPiLPF                | DEL               | Output 4 – 1 minute average of Output 5 for phase to ground measurements   |   | O     |
| PPPiRoot               | DEL               | Output 3 – Square root of Output 5 for phase to phase measurements   |   | O     |
| PhPiRoot               | DEL               | Output 3 – Square root of Output 5 for phase to ground measurements  |   | O     |
| PPPcbLs                | HST               | Classifier bins of last complete short interval for phase to phase (AB, BC, CA)                                      |   | O     |
| PhPcbLs                | HST               | Classifier bins of last complete short interval for phase to ground (A, B, C)  |   | O     |
| PPPcbLI                | HST               | Classifier bins of last complete long interval for phase to phase (AB, BC, CA)                                       |   | O     |
| PhPcbLI                | HST               | Classifier bins of last complete long interval for phase to ground (A, B, C)   |   | O     |
| PPPdmWave              | HDEL              | Real time demodulated waveform for phase to phase (AB, BC, CA)   |   | O     |
| PhPdmWave              | HWYE              | Real time demodulated waveform for phase to ground (A, B, C)   |   | O     |
| PPPdmSpec              | HDEL              | Real time demodulated waveform spectra for phase to phase (AB, BC, CA)   |   | O     |
| PhPdmSpec              | HWYE              | Real time demodulated waveform spectra for phase to ground (A, B, C)   |   | O     |

### 5.10.6 LN: Harmonics or interharmonics Name: MHA1

For a description of this LN, see IEC 61850-5. This LN shall be used for calculation of harmonics or interharmonics in a three-phase system. ~~Instances either for harmonics (including subharmonics and multiples) or interharmonics are possible depending on the value of the basic settings, i.e.:~~

- ~~frequency  $f$  ("Hz");~~
- ~~evaluation window  $\Delta t$  ("EvTmms").~~

~~The frequency may either be given or calculated by means such as a phase locked loop (only possible for a dominant frequency like the basic power frequency).~~

#### ~~a) Settings for Harmonics, Subharmonics and multiples~~

~~EvTmms = 1/Hz (16 ms for 60 Hz, 20 ms for 50 Hz)~~

~~NumCyc = 1 results in Harmonics only, i.e. in multiples of Hz in a)~~

~~NumCyc > 1 results in addition in Subharmonics and multiples~~

~~Lowest frequency = 1/EvTmms~~

~~Highest frequency = (SmpRte)/2 (see TVTR, TCTR and IEC 61850-7-3)~~

#### ~~b) Settings for Interharmonics~~

**Gelöscht: <#>LN: Flicker Measurement unit Name**

**Name: MFLK¶**

This LN shall be used for calculation of flicker inducing voltage fluctuations according to IEC¶

Standard 61000-4-15. The main use is for operative applications.¶

¶

**MFLK class**

[... [20]

~~EvTmms = 1/Hz (adopted to the lowest interharmonics frequency expected)~~

~~NumCyc = 1 results in Interharmonics, i.e. in multiples of Hz in b)~~

~~NumCyc > 1 normally not used since the lowest frequency is freely adjusted by choice of Hz~~

~~Lowest frequency = 1/EvTmms~~

~~Highest frequency = (SmpRte)/2 (see TVTR, TCTR and IEC 61850-7-3)~~

~~Both harmonics and interharmonics carry power and produce distortions. There are different methods to calculate disturbances. For more information and definitions see IEC 61000-4-7 (1994), IEEE Std 519-1992, and IEEE Std 1459-2000.~~

**Kommentar [HD78]:** shall be moved to part 5, or annex

| MHAI class             |                   |   |   |       |
|------------------------|-------------------|---|---|-------|
| Data Name              | Common Data Class | Explanation   | T | M/O/C |
| LNName                 |                   | The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2 clause 19 |   |       |
| <b>Data</b>            |                   |   |   |       |
| <b>Measured Values</b> |                   |   |   |       |
| Hz                     | MV                | Basic frequency   |   | C     |
| HA                     | HWYE              | Sequence of Harmonics or Interharmonics current   |   | O     |
| HPhV                   | HWYE              | Sequence of Harmonics or Interharmonics phase to ground voltages  |   | O     |
| HPPV                   | HDEL              | Sequence of Harmonics or Interharmonics phase to phase voltages   |   | O     |
| HW                     | HWYE              | Sequence of Harmonics or Interharmonics active power  |   | O     |
| HVAr                   | HWYE              | Sequence of Harmonics or Interharmonics reactive power  |   | O     |
| HVA                    | HWYE              | Sequence of Harmonics or Interharmonics apparent power  |   | O     |
| HRmsA                  | WYE               | Current RMS Harmonic or Interharmonics (un-normalized Total harmonic distortion, Thd)                               |   | O     |
| HRmsPhV                | WYE               | Voltage RMS Harmonic or Interharmonics (un-normalized Thd) for phase to ground                                      |   | O     |
| HRmsPPV                | DEL               | Voltage RMS Harmonic or Interharmonics (un-normalized Thd) for phase to phase                                       |   | O     |
| HTuW                   | WYE               | Total phase Harmonic or Interharmonics active power (no fundamental) unsigned sum                                   |   | O     |
| HTsW                   | WYE               | Total phase Harmonic or Interharmonic active power (no fundamental) signed sum                                      |   | O     |
| HATm                   | WYE               | Current Time product  |   | O     |
| <b>HKf</b>             | WYE               | K Factor  |   | O     |
| HTdf                   | WYE               | Transformer derating factor   |   | O     |
| ThdA                   | WYE               | Current Total Harmonic or Interharmonic Distortion (different methods)  |   | O     |
| ThdOddA                | WYE               | Current Total Harmonic or Interharmonic Distortion (different methods – odd components)                             |   | O     |
| ThdEvnA                | WYE               | Current Total Harmonic or Interharmonic Distortion (different methods – even components)                            |   | O     |
| TddA                   | WYE               | Current Total Demand Distortion per IEEE 519  |   | O     |
| TddOddA                | WYE               | Current Total Demand Distortion per IEEE 519 (odd components)   |   | O     |
| TddEvnA                | WYE               | Current Total Demand Distortion per IEEE 519 (even components)  |   | O     |
| ThdPhV                 | WYE               | Voltage Total Harmonic or Interharmonic Distortion (different methods) for phase to ground                          |   | O     |
| ThdOddPhV              | WYE               | Voltage Total Harmonic or Interharmonic Distortion (different methods) for phase to ground (odd components)         |   | O     |
| ThdEvnPhV              | WYE               | Voltage Total Harmonic or Interharmonic Distortion (different methods) for phase to ground (even components)        |   | O     |
| ThdPPV                 | DEL               | Voltage Total Harmonic or Interharmonic Distortion (different methods) for phase to phase                           |   | O     |

**Gelöscht:** EEHealth ... [21]

| MHAI class      |                   |   |   |       |
|-----------------|-------------------|---|---|-------|
| Data Name       | Common Data Class | Explanation   | T | M/O/C |
| ThdOddPPV       | DEL               | Voltage Total Harmonic or Interharmonic Distortion (different methods) for phase to phase (odd components)  |   | O     |
| ThdEvnPPV       | DEL               | Voltage Total Harmonic or Interharmonic Distortion (different methods) for phase to phase (even components) |   | O     |
| HCfPhV          | WYE               | Voltage crest factors (peak waveform value/sqrt(2)/fundamental) for phase to ground                         |   | O     |
| HCfPPV          | DEL               | Voltage crest factors (peak waveform value/sqrt(2)/fundamental) for phase to phase                          |   | O     |
| HCfA            | WYE               | Current crest factors (peak waveform value/sqrt(2)/fundamental)   |   | O     |
| HTif            | WYE               | Voltage Telephone Influence Factor  |   | O     |
| <b>Settings</b> |                   |   |   |       |
| HzSet           | ASG               | Basic frequency   |   | C     |
| EvTmms          | ASG               | Evaluation time (time window) determines the lowest frequency   |   | O     |
| NumCyc          | ING               | Number of cycles of the basic frequency   |   | O     |
| ThdAVal         | ASG               | ThdA alarm Setting – value entered in %   |   | O     |
| ThdVVal         | ASG               | ThdPhV / ThdPPV alarm Setting – value entered in %  |   | O     |
| ThdATmms        | ING               | ThdA alarm time delay in ms   |   | O     |
| ThdVTmms        | ING               | ThdPhV / ThdPPV alarm time delay in ms  |   | O     |
| NomA            | ASG               | Normalising demand current used in IEEE 519 TDD calculation   |   | O     |

Condition C: Hz and HzSet are exclusive.

### 5.10.7 LN: Non phase related harmonics or interharmonics Name: MHAN

This LN shall be used for calculation of harmonics or interharmonics in a single-phase system, i.e. a single line with no phase relations. Instances either for harmonics (including subharmonics and multiples) or interharmonics are possible depending on the value of the basic settings, i.e.:

- frequency  $f$  ("Hz");
- evaluation window  $\Delta t$  ("EvTmms").

The frequency may either be given or calculated by means such as a phase-locked loop (only possible for a dominant frequency like the basic power frequency). The settings for Harmonics and Interharmonics instances, see MHAI.

| MHAN class             |                   |   |   |       |
|------------------------|-------------------|---|---|-------|
| Data Name              | Common Data Class | Explanation   | T | M/O/C |
| LNName                 |                   | The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2 clause 19 |   |       |
| <b>Data</b>            |                   |   |   |       |
| <b>Measured Values</b> |                   |   |   |       |
| Hz                     | MV                | Basic frequency   |   | C     |
| HaAmp                  | HMV               | Sequence of Harmonics or Interharmonics for current   |   | O     |
| HaVol                  | HMV               | Sequence of Harmonics or Interharmonics for voltages  |   | O     |
| HaWatt                 | HMV               | Sequence of Harmonics or Interharmonics for active power  |   | O     |
| HaVolAmpr              | HMV               | Sequence of Harmonics or Interharmonics for reactive power  |   | O     |
| HaVolAmp               | HMV               | Sequence of Harmonics or Interharmonics for apparent power  |   | O     |
| HaRmsAmp               | MV                | Current RMS Harmonic or Interharmonic (un-normalized Thd)   |   | O     |

Gelöscht: EEHealth ... [22]

| MHAN class      |                   |  |   |       |
|-----------------|-------------------|--|---|-------|
| Data Name       | Common Data Class | Explanation  | T | M/O/C |
| HaRmsVol        | MV                | Voltage RMS Harmonic or Interharmonic (un-normalized Thd)                                |   | 0     |
| HaTuWatt        | MV                | Total Harmonic or Interharmonic active power (no fundamental) unsigned sum               |   | 0     |
| HaTsWatt        | MV                | Total Harmonic or Interharmonic active power (no fundamental) signed sum                 |   | 0     |
| HaAmpTm         | MV                | Current Time product   |   | 0     |
| HaKFact         | MV                | K Factor   |   | 0     |
| HaTdFact        | MV                | Transformer derating factor  |   | 0     |
| ThdAmp          | MV                | Current Total Harmonic or Interharmonic Distortion (different methods)                   |   | 0     |
| ThdOddAmp       | MV                | Current Total Harmonic or Interharmonic Distortion (different methods – odd components)  |   | 0     |
| ThdEvnAmp       | MV                | Current Total Harmonic or Interharmonic Distortion (different methods – even components) |   | 0     |
| TddAmp          | MV                | Current Total Demand Distortion per IEEE 519   |   | 0     |
| TddOddAmp       | MV                | Current Total Demand Distortion per IEEE 519 (odd components)                            |   | 0     |
| TddEvnAmp       | MV                | Current Total Demand Distortion per IEEE 519 (even components)                           |   | 0     |
| ThdVol          | MV                | Voltage Total Harmonic or Interharmonic Distortion (different methods)                   |   | 0     |
| ThdOddVol       | MV                | Voltage Total Harmonic or Interharmonic Distortion (different methods - odd components)  |   | 0     |
| ThdEvnVol       | MV                | Voltage Total Harmonic or Interharmonic Distortion (different methods-even components)   |   | 0     |
| HaCfAmp         | MV                | Current crest factors (peak waveform value/sqrt(2)/fundamental)                          |   | 0     |
| HaCfVol         | MV                | Voltage crest factors (peak waveform value/sqrt(2)/fundamental)                          |   | 0     |
| HaTiFact        | MV                | Voltage Telephone Influence Factor   |   | 0     |
| <b>Settings</b> |                   |  |   |       |
| HzSet           | ASG               | Basic frequency  |   | C     |
| EvTmms          | ASG               | Evaluation time (time window) determines the lowest frequency                            |   | 0     |
| NumCyc          | ING               | Number of cycles of the basic frequency  |   | 0     |
| ThdAVal         | ASG               | ThdA alarm Setting – value entered in %  |   | 0     |
| ThdVVal         | ASG               | ThdV alarm Setting – value entered in %  |   | 0     |
| ThdATmms        | ING               | ThdA alarm time delay in ms  |   | 0     |
| ThdVTmms        | ING               | ThdV alarm time delay in ms  |   | 0     |
| NomA            | ASG               | Normalising demand current used in IEEE 519 TDD calculation                              |   | 0     |

Condition C: Hz and HzSet are exclusive.

**5.10.8 LN: Hydrological information Name: MHYD**

Logical Node MHYD shall comprise the data classes that represent hydrological information such as river, lake, pond, or oceanic water related information.

This logical node may represent a collection of meteorological information from many sources.

| MHYD class |                   |   |   |       |
|------------|-------------------|---|---|-------|
| Data Name  | Common Data Class | Explanation   | T | M/O/C |
| LNName     |                   | The name shall be composed of the class name, the LN-Prefix and LN- |   |       |

| <b>MHYD class</b>      |                          |  |          |              |
|------------------------|--------------------------|--|----------|--------------|
| <b>Data Name</b>       | <b>Common Data Class</b> | <b>Explanation</b>                                       | <b>T</b> | <b>M/O/C</b> |
|                        |                          | Instance-ID according to IEC 61850-7-2 clause 19         |          |              |
| <b>Data</b>            |                          |  |          |              |
| <b>Measured Values</b> |                          |  |          |              |
| FishCnt                | MV                       | Fish counter reading                                     |          | Q            |
| Lev                    | MV                       | Water level [m]  |          | Q            |
| Flw                    | MV                       | River, Stream, Canal Volumetric Flow [m <sup>3</sup> /s] |          | Q            |
| SpdSrfc                | MV                       | Surface speed of water flow [m/s]                        |          | Q            |
| Tmp                    | MV                       | Temperature of water [°C]                                |          | Q            |
| Cndct                  | MV                       | Electrical conductivity of water [S/cm <sup>2</sup> ]    |          | Q            |
| HydPH                  | MV                       | pH of water (0-14)                                       |          | Q            |
| Slnt                   | MV                       | Saline content of water [g/l]                            |          | Q            |

**5.10.9 LN: DC measurement****Name: MMDC**

Logical Node MMDC shall be used to represent measurements in a DC system: current, voltage, power and resistance.

| <b>MMDC class</b>      |                          |   |          |              |
|------------------------|--------------------------|---|----------|--------------|
| <b>Data Name</b>       | <b>Common Data Class</b> | <b>Explanation</b>  | <b>T</b> | <b>M/O/C</b> |
| LNName                 |                          | The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2 clause 19 |          |              |
| <b>Data</b>            |                          |   |          |              |
| <b>Measured Values</b> |                          |   |          |              |
| Watt                   | MV                       | Power   |          | Q            |
| Amp                    | MV                       | Current (DC current)  |          | Q            |
| Vol                    | MV                       | Voltage (DC voltage) between poles  |          | Q            |
| VolPsGnd               | MV                       | Voltage between positive pole and earth   |          | Q            |
| VolNgGnd               | MV                       | Voltage between negative pole and earth   |          | Q            |
| Ris                    | MV                       | Resistance in DC circuit  |          | Q            |
| RisPsGnd               | MV                       | Resistance between positive pole and earth  |          | Q            |
| RisNgGnd               | MV                       | Resistance between negative pole and earth  |          | Q            |

**5.10.10 LN: Meteorological information****Name: MMET**

Logical Node MMET shall comprise the data classes that represent meteorological information.

The data classes as shown in the following table focus on meteorological station information. MMET may in reality represent a collection of meteorological information from many sources, that is, from sensors located at different places. This logical node is a superset of the WMET LN defined in IEC 61400-25-2; information about precipitation and insolation is added.

| <b>MMET class</b>      |                          |   |          |              |
|------------------------|--------------------------|---|----------|--------------|
| <b>Data Name</b>       | <b>Common Data Class</b> | <b>Explanation</b>  | <b>T</b> | <b>M/O/C</b> |
| LNName                 |                          | The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2 clause 19 |          |              |
| <b>Data</b>            |                          |   |          |              |
| <b>Measured Values</b> |                          |   |          |              |

| MMET class |                   |   |   |       |
|------------|-------------------|---|---|-------|
| Data Name  | Common Data Class | Explanation   | T | M/O/C |
| EnvTmp     | MV                | Ambient temperature   |   | Q     |
| WetBltTmp  | MV                | Wet bulb temperature [°C]                                   |   | Q     |
| CloudCvr   | MV                | Cloud cover level   |   | Q     |
| EnvHum     | MV                | Humidity  |   | Q     |
| DewPt      | MV                | Dew point   |   | Q     |
| DifInsol   | MV                | Diffuse insolation [W/m <sup>2</sup> ]                      |   | Q     |
| DirInsol   | MV                | Direct normal insolation [W/m <sup>2</sup> ]                |   | Q     |
| DI Dur     | MV                | Daylight Duration (time elapsed between sunrise and sunset) |   | Q     |
| HorInsol   | MV                | Total Horizontal Insolation [W/m <sup>2</sup> ]             |   | Q     |
| HorWdDir   | MV                | Horizontal Wind direction                                   |   | Q     |
| HorWdSpd   | MV                | Average Horizontal Wind speed [m/s]                         |   | Q     |
| VerWdDir   | MV                | Vertical Wind Direction                                     |   | Q     |
| VerWdSpd   | MV                | Average Vertical Wind speed [m/s]                           |   | Q     |
| WdGustSpd  | MV                | Max Wind gust speed [m/s]                                   |   | Q     |
| EnvPres    | MV                | Barometric pressure   |   | Q     |
| RnFl       | MV                | Rainfall (mm)   |   | Q     |
| SnwDen     | MV                | Density of snowfall (g/cm <sup>3</sup> )                    |   | Q     |
| SnwTmp     | MV                | Temperature of snowfall (°C)                                |   | Q     |
| SnwCvr     | MV                | Snowcover (mm)  |   | Q     |
| SnwFl      | MV                | Snowfall (mm)   |   | Q     |
| SnwEq      | MV                | Water equivalent of snowfall (mm)                           |   | Q     |

**5.10.11 LN: Metering Name: MMTN**

For a description of this LN, see IEC 61850-5. This LN shall be used for calculation of energy in a single-phase system. The main use is for billing purposes.

| MMTN class            |                   |   |   |       |
|-----------------------|-------------------|---|---|-------|
| Data Name             | Common Data Class | Explanation   | T | M/O/C |
| LNName                |                   | The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2 clause 19 |   |       |
| <b>Data</b>           |                   |   |   |       |
| <b>Metered Values</b> |                   |   |   |       |
| TotVAh                | BCR               | Net apparent energy since last reset  |   | Q     |
| TotWh                 | BCR               | Net Real energy since last reset  |   | Q     |
| TotVARh               | BCR               | Net Reactive energy since last reset  |   | Q     |
| SupWh                 | BCR               | Real energy supply (default supply direction: energy flow towards busbar)   |   | Q     |
| SupVARh               | BCR               | Reactive energy supply (default supply direction: energy flow towards busbar)                                       |   | Q     |
| DmdWh                 | BCR               | Real energy demand (default demand direction: energy flow from busbar away)   |   | Q     |
| DmdVARh               | BCR               | Reactive energy demand (default demand direction: energy flow from busbar away)                                     |   | Q     |

**5.10.12 LN: Metering Name: MMTR**

For a description of this LN, see IEC 61850-5. This LN shall be used for calculation of energy in a three-phase system. The main use is for billing purposes.

| MMTR class            |                   |   |   |       |
|-----------------------|-------------------|---|---|-------|
| Data Name             | Common Data Class | Explanation   | T | M/O/C |
| LNName                |                   | The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2 clause 19 |   |       |
| <b>Data</b>           |                   |   |   |       |
| <b>Metered Values</b> |                   |   |   |       |
| TotVAh                | BCR               | Net apparent energy since last reset  |   | O     |
| TotWh                 | BCR               | Net Real energy since last reset  |   | O     |
| TotVARh               | BCR               | Net Reactive energy since last reset  |   | O     |
| SupWh                 | BCR               | Real energy supply (default supply direction: energy flow towards busbar)   |   | O     |
| SupVARh               | BCR               | Reactive energy supply (default supply direction: energy flow towards busbar)                                       |   | O     |
| DmdWh                 | BCR               | Real energy demand (default demand direction: energy flow from busbar away)   |   | O     |
| DmdVARh               | BCR               | Reactive energy demand (default demand direction: energy flow from busbar away)                                     |   | O     |

Gelöscht: EEHealth ... [23]

**5.10.13 LN: Non phase related Measurement Name: MMXN**

This LN shall be used for calculation of currents, voltages, powers and impedances in a single-phase system, i.e. in a system where voltages and currents are not phase-related. The main use is for operative applications.

| MMXN class             |                   |   |   |       |
|------------------------|-------------------|---|---|-------|
| Data Name              | Common Data Class | Explanation   | T | M/O/C |
| LNName                 |                   | The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2 clause 19 |   |       |
| <b>Data</b>            |                   |   |   |       |
| <b>Measured Values</b> |                   |   |   |       |
| Amp                    | MV                | Current I <u>not allocated to a phase</u>   |   | O     |
| Vol                    | MV                | Voltage V <u>not allocated to a phase</u>   |   | O     |
| Watt                   | MV                | Power (P) not allocated to a phase  |   | O     |
| VolAmpr                | MV                | Reactive Power (Q) not allocated to a phase   |   | O     |
| VolAmp                 | MV                | Apparent Power (S) not allocated to a phase   |   | O     |
| PwrFact                | MV                | Power Factor not allocated to a phase   |   | O     |
| Imp                    | CMV               | Impedance   |   | O     |
| Hz                     | MV                | Frequency   |   | O     |

Gelöscht: EEHealth ... [24]

Gelöscht: (rms)

Gelöscht: (rms)

**5.10.14 LN: Measurement Name: MMXU**

For a description of this LN, see IEC 61850-5. This LN shall be used for calculation of currents, voltages, powers and impedances in a three-phase system. The main use is for operative applications.

| MMXU class  |                   |   |   |       |
|-------------|-------------------|---|---|-------|
| Data Name   | Common Data Class | Explanation   | T | M/O/C |
| LNName      |                   | The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2 clause 19 |   |       |
| <b>Data</b> |                   |   |   |       |

Gelöscht: EEHealth ... [25]

| MMXU class             |                   |                                       |   |       |
|------------------------|-------------------|---------------------------------------|---|-------|
| Data Name              | Common Data Class | Explanation                           | T | M/O/C |
| <b>Measured Values</b> |                   |                                       |   |       |
| TotW                   | MV                | Total Active Power (Total P)          |   | 0     |
| TotVAr                 | MV                | Total Reactive Power (Total Q)        |   | 0     |
| TotVA                  | MV                | Total Apparent Power (Total S)        |   | 0     |
| TotPF                  | MV                | Average Power factor (Total PF)       |   | 0     |
| Hz                     | MV                | Frequency                             |   | 0     |
| PPV                    | DEL               | Phase to phase voltages (VL1VL2, ...) |   | 0     |
| PhV                    | WYE               | Phase to ground voltages (VL1ER, ...) |   | 0     |
| A                      | WYE               | Phase currents (IL1, IL2, IL3)        |   | 0     |
| W                      | WYE               | Phase active power (P)                |   | 0     |
| VAr                    | WYE               | Phase reactive power (Q)              |   | 0     |
| VA                     | WYE               | Phase apparent power (S)              |   | 0     |
| PF                     | WYE               | Phase power factor                    |   | 0     |
| Z                      | WYE               | Phase Impedance                       |   | 0     |

**5.10.15 LN: Sequence and imbalance Name: MSQI**

For a description of this LN, see IEC 61850-5.

| MSQI class             |                   |   |   |       |
|------------------------|-------------------|---|---|-------|
| Data Name              | Common Data Class | Explanation   | T | M/O/C |
| LNName                 |                   | The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2 clause 19 |   |       |
| <b>Data</b>            |                   |   |   |       |
| <b>Measured Values</b> |                   |   |   |       |
| SeqA                   | SEQ               | Positive, Negative and Zero Sequence Current  |   | C     |
| SeqV                   | SEQ               | Positive, Negative and Zero Sequence Voltage  |   | C     |
| DQ0Seq                 | SEQ               | DQ0 Sequence  |   | 0     |
| ImbA                   | WYE               | Imbalance current   |   | 0     |
| ImbNgA                 | MV                | Imbalance negative sequence current   |   | 0     |
| ImbNgV                 | MV                | Imbalance negative sequence voltage   |   | 0     |
| ImbPPV                 | DEL               | Imbalance phase-phase voltage   |   | 0     |
| ImbV                   | WYE               | Imbalance voltage   |   | 0     |
| ImbZroA                | MV                | Imbalance zero sequence current   |   | 0     |
| ImbZroV                | MV                | Imbalance zero sequence voltage   |   | 0     |
| MaxImbA                | MV                | Maximum imbalance current   |   | 0     |
| MaxImbPPV              | MV                | Maximum imbalance phase-phase voltage   |   | 0     |
| MaxImbV                | MV                | Maximum imbalance voltage   |   | 0     |

**Gelöscht:** EEHealth ... [26]

**Kommentar [HD79]:** This LN is obsolete and only defined because of backwards compatibility.

**Gelöscht:** The metered values are not always used directly, but as average values, minima and maxima over a given evaluation period. The reporting may be started after the end of this period.¶

**MSTA class** ... [27]

**Gelöscht:** ¶

Condition C: At least one of either data shall be used.

**5.10.16 LN: Metering Statistics Name: MSTA**

**This LN is moved to annex A because of including the calculation methods MAX, MIN, AVG etc it is obsolete.**

## 5.11 Logical Nodes for protection functions LN Group: P

### 5.11.1 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 XCBR shall be a LN PTRC.

**Table 6 – Relation between IEC 61850-5 and IEC 61850-7-4 (this standard)  
for protection LNs**

Gelöscht: 6

| 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<br>Use shown in Annex B.1  |
| Zero speed and underspeed                     | 14                   | PZSU                   | PZSU                      |   |
| Distance                                      | 21                   | PDIS                   | PDIS<br>PSCH              | Use one instance per zone.<br>To build line protection schemes  |
| Volt per Hz                                   | 24                   | PVPH                   | PVPH                      |   |
| (Time) Undervoltage                           | 27                   | PTUV                   | PTUV                      |   |
| Directional power /reverse power              | 32                   | PDPR                   | PDOP<br>or<br>PDUP        | Directional over power<br>Directional under power<br><br>Reverse power modelled by PDOP plus directional mode “reverse” |
| Undercurrent/underpower                       | 37                   | PUCP                   | PTUC<br>PDUP              | Undercurrent<br>Underpower  |
| Loss of field/Underexcitation                 | 40                   | PUEX                   | PDUP                      | Directional under power   |

| Functionality                                 | IEEE C37.2 reference | Defined in IEC 61850-5 | Modelled in IEC 61850-7-4 | Comments  |
|---|----------------------|------------------------|---------------------------|---|
| 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<br>PUPF              | Over power factor<br>Under power factor   |
| Thyristor failure protection                  | 58                   |                        | PTHF                      |   |
| (Time) Overvoltage                            | 59                   | PTOV                   | PTOV                      |   |
| DC-overvoltage                                | 59DC                 | PDOV                   | PTOV                      | Both for DC and AC  |
| Voltage or current balance                    | 60                   | PVCB                   | PTOV<br>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                      |   |
| Frequency                                     | 81                   | PFRQ                   | PTOF<br>PTUF<br>PFRC      | Over frequency<br>Under frequency<br>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<br>PHAR              | Differential transformer<br>Harmonic restraint  |
| Busbar  | 87B                  | PBDF                   | PDIF or<br>PDIR           | Busbar differential or<br>Fault direction comparison  |
| Motor differential                            | 87M                  | PMDF                   | PDIF                      |   |
| Generator differential                        | 87G                  | PGDF                   | PDIF                      |   |
| Motor Startup                                 | 49R, 66<br>48, 51LR  | PMSU                   | PMRI<br>PMSS              | Motor Restart Inhibition<br>Motor Starting Time Supervision   |

**Kommentar [HD80]:** needs to verify!

| Functionality    | IEEE C37.2 reference | Defined in IEC 61850-5 | Modelled in IEC 61850-7-4 | Comments   |
|------------------|----------------------|------------------------|---------------------------|--|
| Rotor protection | 64 / 59AC            |                        | PRTB                      | Field short-circuit protection using the 6th harmonic (300Hz). |

**Kommentar [HD81]:**  
should be verified

### 5.11.2 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                |                   |  |   |       |
|---------------------------|-------------------|--|---|-------|
| Data Name                 | Common Data Class | Explanation  | T | M/O/C |
| LNName                    |                   | The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2 clause 19. |   |       |
| <b>Data</b>               |                   |  |   |       |
| <b>Status Information</b> |                   |  |   |       |
| Str                       | ACD               | Start  |   | O     |
| Op                        | ACT               | Operate  | T | M     |
| TmASt                     | CSD               | Active curve characteristic  |   | O     |
| <b>Controls</b>           |                   |  |   |       |
| OpCntRs                   | INC               | Resettable operation counter   |   | O     |
| <b>Measured Values</b>    |                   |  |   |       |
| DifAClc                   | WYE               | Differential Current   |   | O     |
| RstA                      | WYE               | Restraint Current  |   | O     |
| <b>Settings</b>           |                   |  |   |       |
| 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     |
| TmAChr33                  | CSG               | Multiline curve characteristic definition  |   | C     |

**Kommentar [HD82]:** #108

C: Condition.....

**Kommentar [HD83]:** ask Thierry?

### 5.11.3 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                |                   |   |   |       |
|---------------------------|-------------------|---|---|-------|
| Data Name                 | Common Data Class | Explanation   | T | M/O/C |
| LNName                    |                   | The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2 clause 19 |   |       |
| <b>Data</b>               |                   |   |   |       |
| <b>Status Information</b> |                   |   |   |       |
| 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     |

| PDIR class      |                   |                             |   |       |
|-----------------|-------------------|-----------------------------|---|-------|
| Data Name       | Common Data Class | Explanation                 | T | M/O/C |
| <b>Controls</b> |                   |                             |   |       |
| OpCntRs         | INC               | Resetable operation counter |   | O     |
| <b>Settings</b> |                   |                             |   |       |
| RsDITmms        | ING               | Reset Delay Time            |   | O     |

**5.11.4 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                |                   |   |   |       |
|---------------------------|-------------------|---|---|-------|
| Data Name                 | Common Data Class | Explanation   | T | M/O/C |
| LNName                    |                   | The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2 clause 19 |   |       |
| <b>Data</b>               |                   |   |   |       |
| <b>Status Information</b> |                   |   |   |       |
| Str                       | ACD               | Start   |   | M     |
| Op                        | ACT               | Operate   | T | M     |
| <b>Controls</b>           |                   |   |   |       |
| OpCntRs                   | INC               | Resetable operation counter   |   | O     |
| <b>Settings</b>           |                   |   |   |       |
| 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     |
| 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     |

**5.11.5 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                |                   |   |   |       |
|---------------------------|-------------------|---|---|-------|
| Data Name                 | Common Data Class | Explanation   | T | M/O/C |
| LNName                    |                   | The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2 clause 19 |   |       |
| <b>Data</b>               |                   |   |   |       |
| <b>Status Information</b> |                   |   |   |       |
| Str                       | ACD               | Start   |   | M     |
| Op                        | ACT               | Operate   | T | M     |
| <b>Controls</b>           |                   |   |   |       |
| OpCntRs                   | INC               | Resetable operation counter   |   | O     |
| <b>Settings</b>           |                   |   |   |       |
| DirMod                    | ING               | Directional Mode  |   | O     |
| StrVal                    | ASG               | Start Value   |   | O     |
| OpDITmms                  | ING               | Operate Delay Time  |   | O     |
| RsDITmms                  | ING               | Reset Delay Time  |   | O     |

**5.11.6 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                |                   |   |   |       |
|---------------------------|-------------------|---|---|-------|
| Data Name                 | Common Data Class | Explanation   | T | M/O/C |
| LNName                    |                   | The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2 clause 19 |   |       |
| <b>Data</b>               |                   |   |   |       |
| <b>Status Information</b> |                   |   |   |       |
| Str                       | ACD               | Start   |   | M     |
| Op                        | ACT               | Operate   | T | M     |
| <b>Controls</b>           |                   |   |   |       |
| OpCntRs                   | INC               | Resetable operation counter   |   | O     |
| <b>Settings</b>           |                   |   |   |       |
| StrVal                    | ASG               | Start Value   |   | O     |
| OpDITmms                  | ING               | Operate Delay Time  |   | O     |
| RsDITmms                  | ING               | Reset Delay Time  |   | O     |
| DirMod                    | ING               | Directional Mode  |   | O     |

**5.11.7 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  |                   |   |   |       |
|-------------|-------------------|---|---|-------|
| Data Name   | Common Data Class | Explanation   | T | M/O/C |
| LNName      |                   | The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2 clause 19 |   |       |
| <b>Data</b> |                   |   |   |       |

| PFRC class                |                   |                             |   |       |
|---------------------------|-------------------|-----------------------------|---|-------|
| Data Name                 | Common Data Class | Explanation                 | T | M/O/C |
| <b>Status Information</b> |                   |                             |   |       |
| Str                       | ACD               | Start                       |   | M     |
| Op                        | ACT               | Operate                     | T | M     |
| BlkV                      | SPS               | Blocked because of voltage  |   | O     |
| <b>Controls</b>           |                   |                             |   |       |
| OpCntRs                   | INC               | Resetable operation counter |   | O     |
| <b>Settings</b>           |                   |                             |   |       |
| 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     |

### 5.11.8 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                |                   |   |   |       |
|---------------------------|-------------------|---|---|-------|
| Data Name                 | Common Data Class | Explanation   | T | M/O/C |
| LNName                    |                   | The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2 clause 19 |   |       |
| <b>Data</b>               |                   |   |   |       |
| <b>Status Information</b> |                   |   |   |       |
| Str                       | ACD               | Start (active when restraint is needed)   |   | M     |
| <b>Controls</b>           |                   |   |   |       |
| OpCntRs                   | INC               | Resetable operation counter   |   | O     |
| <b>Settings</b>           |                   |   |   |       |
| 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     |

### 5.11.9 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                |                   |   |   |       |
|---------------------------|-------------------|---|---|-------|
| Data Name                 | Common Data Class | Explanation   | T | M/O/C |
| LNName                    |                   | The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2 clause 19 |   |       |
| <b>Data</b>               |                   |   |   |       |
| <b>Status Information</b> |                   |   |   |       |
| Str                       | ACD               | Start   |   | M     |
| Op                        | ACT               | Operate   | T | M     |

| PHIZ class      |                   |                                    |   |       |
|-----------------|-------------------|------------------------------------|---|-------|
| Data Name       | Common Data Class | Explanation                        | T | M/O/C |
| <b>Controls</b> |                   |                                    |   |       |
| OpCntRs         | INC               | Resetable operation counter        |   | O     |
| <b>Settings</b> |                   |                                    |   |       |
| 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     |

#### 5.11.10 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                |                   |   |   |       |
|---------------------------|-------------------|---|---|-------|
| Data Name                 | Common Data Class | Explanation   | T | M/O/C |
| LNName                    |                   | The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2 clause 19 |   |       |
| <b>Data</b>               |                   |   |   |       |
| <b>Status Information</b> |                   |   |   |       |
| Str                       | ACD               | Start   |   | O     |
| Op                        | ACT               | Operate   | T | M     |
| <b>Controls</b>           |                   |   |   |       |
| OpCntRs                   | INC               | Resetable operation counter   |   | O     |
| <b>Settings</b>           |                   |   |   |       |
| StrVal                    | ASG               | Start Value   |   | O     |

#### 5.11.11 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                |                   |   |   |       |
|---------------------------|-------------------|---|---|-------|
| Data Name                 | Common Data Class | Explanation   | T | M/O/C |
| LNName                    |                   | The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2 clause 19 |   |       |
| <b>Data</b>               |                   |   |   |       |
| <b>Status Information</b> |                   |   |   |       |
| Op                        | ACT               | Operate   | T | O     |
| StrInh                    | SPS               | Restart inhibited   |   | O     |
| StrInhTmm                 | INS               | Restart Inhibition Time   |   | O     |
| <b>Controls</b>           |                   |   |   |       |
| OpCntRs                   | INC               | Resetable operation counter   |   | O     |
| <b>Settings</b>           |                   |   |   |       |
| 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     |

| PMRI class |                   |  |   |       |
|------------|-------------------|--|---|-------|
| Data Name  | Common Data Class | Explanation  | T | M/O/C |
| 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     |

**5.11.12 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                |                   |   |   |       |
|---------------------------|-------------------|---|---|-------|
| Data Name                 | Common Data Class | Explanation   | T | M/O/C |
| LNName                    |                   | The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2 clause 19 |   |       |
| <b>Data</b>               |                   |   |   |       |
| <b>Status Information</b> |                   |   |   |       |
| Str                       | ACD               | Start   |   | O     |
| Op                        | ACT               | Operate   | T | O     |
| <b>Controls</b>           |                   |   |   |       |
| OpCntRs                   | INC               | Resetable operation counter   |   | O     |
| <b>Settings</b>           |                   |   |   |       |
| 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     |

**5.11.13 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                |                   |   |   |       |
|---------------------------|-------------------|---|---|-------|
| Data Name                 | Common Data Class | Explanation   | T | M/O/C |
| LNName                    |                   | The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2 clause 19 |   |       |
| <b>Data</b>               |                   |   |   |       |
| <b>Status Information</b> |                   |   |   |       |
| 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     |
| <b>Controls</b>           |                   |   |   |       |
| OpCntRs                   | INC               | Resetable operation counter   |   | O     |
| <b>Settings</b>           |                   |   |   |       |
| StrVal                    | ASG               | Start Value   |   | O     |
| OpDITmms                  | ING               | Operate Delay Time  |   | O     |
| RsDITmms                  | ING               | Reset Delay Time  |   | O     |

| POPF class |                   |   |   |       |
|------------|-------------------|---|---|-------|
| Data Name  | Common Data Class | Explanation                             | T | M/O/C |
| BlkValA    | ASG               | Block Value (Minimum operating current) |   | O     |
| BlkValV    | ASG               | Block Value (Minimum operating voltage) |   | O     |

#### 5.11.14 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                |                   |   |   |       |
|---------------------------|-------------------|---|---|-------|
| Data Name                 | Common Data Class | Explanation   | T | M/O/C |
| LNName                    |                   | The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2 clause 19 |   |       |
| <b>Data</b>               |                   |   |   |       |
| <b>Status Information</b> |                   |   |   |       |
| Str                       | ACD               | Start   |   | M     |
| Op                        | ACT               | Operate   | T | M     |
| <b>Controls</b>           |                   |   |   |       |
| OpCntRs                   | INC               | Resetable operation counter   |   | O     |
| <b>Settings</b>           |                   |   |   |       |
| StrVal                    | ASG               | Start Value   |   | O     |

#### 5.11.15 LN: Rotor protection Name: PRTR

For a description of this LN, see IEC 61850-5. Logical Node PRTR shall be used to represent a field short-circuit protection using the 6<sup>th</sup> harmonic (300Hz). The protection is normally included in the excitation system.

| PRTR class                |                   |   |   |       |
|---------------------------|-------------------|---|---|-------|
| Data Name                 | Common Data Class | Explanation   | T | M/O/C |
| LNName                    |                   | The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2 clause 19 |   |       |
| <b>Data</b>               |                   |   |   |       |
| <b>Status Information</b> |                   |   |   |       |
| Str                       | ACD               | Start   |   | M     |
| Op                        | ACT               | Operate (trips both field CB and generator CB)  | T | M     |
| <b>Controls</b>           |                   |   |   |       |
| OpCntRs                   | INC               | Resetable operation counter   |   | O     |
| <b>Settings</b>           |                   |   |   |       |
| StrVal                    | ASG               | Start Value   |   | O     |

#### 5.11.16 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.

Editorial remark: This LN will be changed later according to the result of the SS-SS-Task force.

| PSCH class |  |  |  |  |
|------------|--|--|--|--|
|------------|--|--|--|--|

| Data Name                 | Common Data Class | Explanation   | T | M/O/C |
|---------------------------|-------------------|---|---|-------|
| LNName                    |                   | The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2 clause 19             |   |       |
| <b>Data</b>               |                   |   |   |       |
| <b>Status Information</b> |                   |   |   |       |
| OpCntRs                   | INC               | Resetable operation counter   |   | O     |
| TxPrm                     | ACT               | Permissive information to be transmitted to the other side (Teleprotection permissive signal)                                   | I | O     |
| TxBlk                     | ACT               | Blocking information to be transmitted to the other side (Teleprotection blocking signal)                                       | I | O     |
| TxTr                      | ACT               | Direct trip information to be transmitted to the other side   | I | O     |
| RxPrm1                    | ACT               | Activation information RxPrm1 received from the other side(s), for logging purposes (Teleprotection permissive signal received) | I | O     |
| RxBlk1                    | ACT               | Activation information RxBlk1 received from the other side(s), for logging purposes (Teleprotection blocking signal received)   | I | O     |
| RxTr1                     | ACT               | Activation information RxTr1 received from the other side(s), for logging purposes (direct trip signal received)                |   | O     |
| Op                        | ACT               | Operate   | I | M     |
| Echo                      | SPS               | TxPrm is being sent as echo signal (in case of weak infeed)   | I | O     |
| WeiOp                     | SPS               | Indicates operate from weak end infeed function (typically with undervoltage control)   | I | O     |
| BlkSta                    | SPS               | Teleprotection in blocked state   |   | O     |
| <b>Settings</b>           |                   |   |   |       |
| RxSrc1                    | ORG               | Source for activation information RxPrm or RxBlk, must refer to data of type ACT  |   | O     |
| RxSrcTr1                  | ORG               | Source for activation information RxTr, must refer to data of type ACT  |   | O     |
| OpDITmms                  | ING               | Operate Delay Time  |   | O     |
| CrdTmms                   | ING               | Co-ordination timer for blocking scheme   |   | O     |
| DurTmms                   | ING               | Minimum duration of TxPerm in case of operate of PSCH   |   | O     |
| UnBlkMod                  | ING               | Unblock function mode for scheme type   |   | O     |
| UnBlkTmms                 | ING               | Unblocking time (check application??)   |   | O     |
| WeiMod                    | ING               | Mode of weak end infeed function  |   | O     |
| WeiTmms                   | ING               | Co-ordination time for weak end infeed function   |   | O     |

**5.11.17 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                |                   |   |   |       |
|---------------------------|-------------------|---|---|-------|
| Data Name                 | Common Data Class | Explanation   | T | M/O/C |
| LNName                    |                   | The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2 clause 19 |   |       |
| <b>Data</b>               |                   |   |   |       |
| <b>Status Information</b> |                   |   |   |       |
| Str                       | ACD               | Start   |   | M     |
| Op                        | ACT               | Operate   | T | O     |

| PSDE class      |                   |   |   |       |
|-----------------|-------------------|---|---|-------|
| Data Name       | Common Data Class | Explanation   | T | M/O/C |
| <b>Controls</b> |                   |   |   |       |
| OpCntRs         | INC               | Resetable operation counter                           |   | O     |
| <b>Settings</b> |                   |   |   |       |
| 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     |

#### 5.11.18 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                |                   |   |   |       |
|---------------------------|-------------------|---|---|-------|
| Data Name                 | Common Data Class | Explanation   | T | M/O/C |
| LNName                    |                   | The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2 clause 19 |   |       |
| <b>Data</b>               |                   |   |   |       |
| <b>Status Information</b> |                   |   |   |       |
| Str                       | ACD               | Start (Transient earth fault)   |   | C     |
| Op                        | ACT               | Operate (Transient earth fault)   | T | C     |
| <b>Controls</b>           |                   |   |   |       |
| OpCntRs                   | INC               | Resetable operation counter   |   | O     |
| <b>Settings</b>           |                   |   |   |       |
| 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.

#### 5.11.19 LN: Thyristor protection Name: PTHF

Logical Node PTHF shall be used to represent a thyristor (thyristor valve) protection. In a power plant, this protection will typically be included in the excitation system.

| PTHF class                |                   |   |   |       |
|---------------------------|-------------------|---|---|-------|
| Data Name                 | Common Data Class | Explanation   | T | M/O/C |
| LNName                    |                   | The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2 clause 19 |   |       |
| <b>Data</b>               |                   |   |   |       |
| <b>Status Information</b> |                   |   |   |       |
| Str                       | ACD               | Start   |   | M     |
| Op                        | ACT               | Operate (trips both field CB and generator CB)  | T | M     |
| <b>Controls</b>           |                   |   |   |       |
| OpCntRs                   | INC               | Resetable operation counter   |   | O     |
| <b>Settings</b>           |                   |   |   |       |
| StrVal                    | ASG               | Start Value   |   | O     |

**5.11.20 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                |                   |   |   |       |
|---------------------------|-------------------|---|---|-------|
| Data Name                 | Common Data Class | Explanation   | T | M/O/C |
| LNName                    |                   | The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2 clause 19 |   |       |
| <b>Data</b>               |                   |   |   |       |
| <b>Status Information</b> |                   |   |   |       |
| Str                       | ACD               | Start   |   | M     |
| Op                        | ACT               | Operate   | T | M     |
| TmASt                     | CSD               | Active curve characteristic   |   | O     |
| <b>Controls</b>           |                   |   |   |       |
| OpCntRs                   | INC               | Resetable operation counter   |   | O     |
| <b>Settings</b>           |                   |   |   |       |
| TmAChr33                  | CSG               | Multiline curve characteristic definition   |   | C     |
| 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     |

**5.11.21 LN: Overfrequency Name: PTOF**

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

| PTOF class                |                   |   |   |       |
|---------------------------|-------------------|---|---|-------|
| Data Name                 | Common Data Class | Explanation   | T | M/O/C |
| LNName                    |                   | The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2 clause 19 |   |       |
| <b>Data</b>               |                   |   |   |       |
| <b>Status Information</b> |                   |   |   |       |
| Str                       | ACD               | Start   |   | M     |
| Op                        | ACT               | Operate   | T | M     |
| BlkV                      | SPS               | Blocked because of voltage  |   | O     |
| <b>Controls</b>           |                   |   |   |       |
| OpCntRs                   | INC               | Resetable operation counter   |   | O     |
| <b>Settings</b>           |                   |   |   |       |
| StrVal                    | ASG               | Start Value (frequency)   |   | O     |
| BlkVal                    | ASG               | Voltage Block Value   |   | O     |
| OpDITmms                  | ING               | Operate Delay Time  |   | O     |

| PTOF class |                   |                  |   |       |
|------------|-------------------|------------------|---|-------|
| Data Name  | Common Data Class | Explanation      | T | M/O/C |
| RsDITmms   | ING               | Reset Delay Time |   | O     |

### 5.11.22 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                |                     |   |   |                   |
|---------------------------|---------------------|---|---|-------------------|
| Data Name                 | Common Data Class   | Explanation   | T | M/O/C             |
| LNName                    |                     | The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2 clause 19 |   |                   |
| <b>Data</b>               |                     |   |   |                   |
| <b>Status Information</b> |                     |   |   |                   |
| Str                       | ACD                 | Start   |   | M                 |
| Op                        | ACT                 | Operate   | T | O                 |
| TmVSt                     | CSD                 | Active curve characteristic   |   | O                 |
| <b>Controls</b>           |                     |   |   |                   |
| OpCntRs                   | INC                 | Resetable operation counter   |   | O                 |
| <b>Settings</b>           |                     |   |   |                   |
| TmVCrv                    | CURVE               | Operating Curve Type  |   | O                 |
| <a href="#">TmAChr33</a>  | <a href="#">CSG</a> | <a href="#">Multiline curve characteristic definition</a>   |   | <a href="#">C</a> |
| 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                 |

### 5.11.23 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                |                   |   |   |       |
|---------------------------|-------------------|---|---|-------|
| Data Name                 | Common Data Class | Explanation   | T | M/O/C |
| LNName                    |                   | The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2 clause 19 |   |       |
| <b>Data</b>               |                   |   |   |       |
| <b>Status Information</b> |                   |   |   |       |
| 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     |
| <b>Controls</b>           |                   |   |   |       |
| OpCntRs                   | INC               | Resetable operation counter   |   | O     |
| <b>Settings</b>           |                   |   |   |       |
| TrMod                     | ING               | Trip Mode   |   | O     |

| PTRC class |                   |                 |   |       |
|------------|-------------------|-----------------|---|-------|
| Data Name  | Common Data Class | Explanation     | T | M/O/C |
| TrPlsTmms  | ING               | Trip Pulse Time |   | 0     |

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

#### 5.11.24 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                |                   |   |   |       |
|---------------------------|-------------------|---|---|-------|
| Data Name                 | Common Data Class | Explanation   | T | M/O/C |
| LNName                    |                   | The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2 clause 19 |   |       |
| <b>Data</b>               |                   |   |   |       |
| <b>Measured Values</b>    |                   |   |   |       |
| Amp                       | MV                | Current for thermal load model  |   | 0     |
| Tmp                       | MV                | Temperature for thermal load  |   | 0     |
| TmpRI                     | MV                | Relation between temperature and max. temperature   |   | 0     |
| LodRsvAlm                 | MV                | Load reserve to alarm   |   | 0     |
| LodRsvTr                  | MV                | Load reserve to trip  |   | 0     |
| AgeRat                    | MV                | Ageing rate   |   | 0     |
| <b>Status Information</b> |                   |   |   |       |
| Str                       | ACD               | Start   |   | 0     |
| Op                        | ACT               | Operate   | T | M     |
| AlmThm                    | SPS               | Thermal Alarm   |   | 0     |
| TmTmpSt                   | CSD               | Active curve characteristic   |   | 0     |
| TmASt                     | CSD               | Active curve characteristic   |   | 0     |
| BlkThm                    | SPS               | Block closing command for circuit breaker because of thermal condition  |   | 0     |
| <b>Controls</b>           |                   |   |   |       |
| OpCntRs                   | INC               | Resetable operation counter   |   | 0     |
| <b>Settings</b>           |                   |   |   |       |
| TmTmpCrv                  | CURVE             | Characteristic Curve for temperature measurement  |   | 0     |
| TmTmChr33                 | CSG               | Multiline curve characteristic definition   |   | C     |
| TmACrv                    | CURVE             | Characteristic Curve for current measurement /Thermal model   |   | 0     |
| TmAChr33                  | CSG               | Multiline curve characteristic definition   |   | C     |
| TmpMax                    | ASG               | Maximum allowed temperature   |   | 0     |
| StrVal                    | ASG               | Start Value   |   | 0     |
| OpDITmms                  | ING               | Operate Delay Time  |   | 0     |
| MinOpTmms                 | ING               | Minimum Operate Time  |   | 0     |
| MaxOpTmms                 | ING               | Maximum Operate Time  |   | 0     |
| RsDITmms                  | ING               | Reset Delay Time  |   | 0     |
| Constms                   | ING               | Time constant of the thermal model  |   | 0     |
| AlmVal                    | ASG               | Alarm Value   |   | 0     |
| DropoutVal                | ASG               | Value for blocking closing command  |   | 0     |

Kommentar [HD84]: #252

Kommentar [HD85]: acc. comment DE12

**5.11.25 LN: Undercurrent Name: PTUC**

For a description of this LN, see IEC 61850-5 (LN PUCP). This LN shall be used for the undercurrent part of PUCP. The underpower part of LN PUCP is covered by PDUP already. Different instances shall be used for phase and ground.

| PTUC class                |                     |   |   |                   |
|---------------------------|---------------------|---|---|-------------------|
| Data Name                 | Common Data Class   | Explanation   | T | M/O/C             |
| LNName                    |                     | The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2 clause 19 |   |                   |
| <b>Data</b>               |                     |   |   |                   |
| <b>Status Information</b> |                     |   |   |                   |
| Str                       | ACD                 | Start   |   | M                 |
| Op                        | ACT                 | Operate   | T | M                 |
| TmASt                     | CSD                 | Active curve characteristic   |   | O                 |
| <b>Controls</b>           |                     |   |   |                   |
| OpCntRs                   | INC                 | Resettable operation counter  |   | O                 |
| <b>Settings</b>           |                     |   |   |                   |
| TmAcrv                    | CURVE               | Operating Curve Type  |   | O                 |
| <a href="#">TmAChr33</a>  | <a href="#">CSG</a> | <a href="#">Multiline curve characteristic definition</a>   |   | <a href="#">C</a> |
| StrVal                    | ASG                 | Start Value   |   | O                 |
| OpDITmms                  | ING                 | Operate Delay Time  |   | O                 |
| TmMult                    | ASG                 | Time Dial Multiplier  |   | O                 |
| MinOpTmms                 | ING                 | Minimum Operate Time  |   | O                 |
| MaxOpTmms                 | ING                 | Maximum Operate Time  |   | O                 |
| TypRsCrv                  | ING                 | Type of Reset Curve   |   | O                 |
| RsDITmms                  | ING                 | Reset Delay Time  |   | O                 |
| DirMod                    | ING                 | Directional Mode  |   | O                 |

**5.11.26 LN: Underfrequency Name: PTUF**

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

| PTUF class                |                     |   |                   |                   |
|---------------------------|---------------------|---|-------------------|-------------------|
| Data Name                 | Common Data Class   | Explanation   | T                 | M/O/C             |
| <a href="#">LNName</a>    |                     | <a href="#">The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2 clause 19</a> |                   |                   |
| <b>Data</b>               |                     |   |                   |                   |
| <b>Status Information</b> |                     |   |                   |                   |
| <a href="#">Str</a>       | <a href="#">ACD</a> | <a href="#">Start</a>   |                   | <a href="#">M</a> |
| <a href="#">Op</a>        | <a href="#">ACT</a> | <a href="#">Operate</a>   | <a href="#">I</a> | <a href="#">M</a> |
| <a href="#">BlkV</a>      | <a href="#">SPS</a> | <a href="#">Blocked because of voltage</a>  |                   | <a href="#">Q</a> |
| <b>Controls</b>           |                     |   |                   |                   |
| <a href="#">OpCntRs</a>   | <a href="#">INC</a> | <a href="#">Resettable operation counter</a>  |                   | <a href="#">Q</a> |
| <b>Settings</b>           |                     |   |                   |                   |
| <a href="#">StrVal</a>    | <a href="#">ASG</a> | <a href="#">Start Value (frequency)</a>   |                   | <a href="#">Q</a> |
| <a href="#">BlkVal</a>    | <a href="#">ASG</a> | <a href="#">Voltage Block Value</a>   |                   | <a href="#">Q</a> |
| <a href="#">OpDITmms</a>  | <a href="#">ING</a> | <a href="#">Operate Delay Time</a>  |                   | <a href="#">Q</a> |
| <a href="#">RsDITmms</a>  | <a href="#">ING</a> | <a href="#">Reset Delay Time</a>  |                   | <a href="#">Q</a> |

**5.11.27 LN: Undervoltage Name: PTUV**

For a description of this LN, see IEC 61850-5. With an appropriate low operating curve, PTUV functions also as Zero voltage relay.

| PTUV class                |                     |   |   |                   |
|---------------------------|---------------------|---|---|-------------------|
| Data Name                 | Common Data Class   | Explanation   | T | M/O/C             |
| LNName                    |                     | The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2 clause 19 |   |                   |
| <b>Data</b>               |                     |   |   |                   |
| <b>Status Information</b> |                     |   |   |                   |
| Str                       | ACD                 | Start   |   | M                 |
| Op                        | ACT                 | Operate   | T | M                 |
| TmVSt                     | CSD                 | Active curve characteristic   |   | O                 |
| <b>Controls</b>           |                     |   |   |                   |
| OpCntRs                   | INC                 | Resetable operation counter   |   | O                 |
| <b>Settings</b>           |                     |   |   |                   |
| TmVCrv                    | CURVE               | Operating Curve Type  |   | O                 |
| <a href="#">TmVChr33</a>  | <a href="#">CSG</a> | <a href="#">Multiline curve characteristic definition</a>   |   | <a href="#">C</a> |
| 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                 |

**5.11.28 LN: Underpower factor Name: PUPF**

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

| PUPF class                |                   |   |   |       |
|---------------------------|-------------------|---|---|-------|
| Data Name                 | Common Data Class | Explanation   | T | M/O/C |
| LNName                    |                   | The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2 clause 19 |   |       |
| <b>Data</b>               |                   |   |   |       |
| <b>Status Information</b> |                   |   |   |       |
| 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     |
| <b>Controls</b>           |                   |   |   |       |
| OpCntRs                   | INC               | Resetable operation counter   |   | O     |
| <b>Settings</b>           |                   |   |   |       |
| 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     |

**5.11.29 LN: Voltage controlled time overcurrent    Name: PVOC**

For a description of this LN, see IEC 61850-5.

| PVOC class                |                     |   |                   |
|---------------------------|---------------------|---|-------------------|
| Data Name                 | Common Data Class   | Explanation   | T M/O/C           |
| LNName                    |                     | The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2 clause 19 |                   |
| <b>Data</b>               |                     |   |                   |
| <b>Status Information</b> |                     |   |                   |
| Str                       | ACD                 | Start   | M                 |
| Op                        | ACT                 | Operate   | T M               |
| AVSt                      | CSD                 | Active curve characteristic   | O                 |
| TmASt                     | CSD                 | Active curve characteristic   | O                 |
| <b>Controls</b>           |                     |   |                   |
| OpCntRs                   | INC                 | Resetable operation counter   | O                 |
| <b>Settings</b>           |                     |   |                   |
| AVCrv                     | CURVE               | Operating Curve Type (for voltage controlled current curve)   | O                 |
| <a href="#">TmAVChr33</a> | <a href="#">CSG</a> | <a href="#">Multiline curve characteristic definition</a>   | <a href="#">C</a> |
| TmACrv                    | CURVE               | Operating Curve Type (for current)  | O                 |
| <a href="#">TmAChr33</a>  | <a href="#">CSG</a> | <a href="#">Multiline curve characteristic definition</a>   | <a href="#">C</a> |
| 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                 |

**Gelöscht: <#>LN:**  
**Underfrequency    Name:**  
**PTUF¶**  
 For a description of this LN, see IEC 61850-5 (LN PFRQ). This LN shall be used to model the underfrequency part of PFRQ. One instance shall be used per stage.¶  
**PTUF class**    ... [28]

**5.11.30 LN: Volts per Hz    Name: PVPH**

For a description of this LN, see IEC 61850-5. One instance of PVPH shall be used per protection stage.

| PVPH class                 |                     |   |                   |
|----------------------------|---------------------|---|-------------------|
| Data Name                  | Common Data Class   | Explanation   | T M/O/C           |
| LNName                     |                     | The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2 clause 19 |                   |
| <b>Data</b>                |                     |   |                   |
| <b>Status Information</b>  |                     |   |                   |
| Str                        | ACD                 | Start   | M                 |
| Op                         | ACT                 | Operate   | T M               |
| VHzSt                      | CSD                 | Active curve characteristic   | O                 |
| <b>Controls</b>            |                     |   |                   |
| OpCntRs                    | INC                 | Resetable operation counter   | O                 |
| <b>Settings</b>            |                     |   |                   |
| VHzCrv                     | CURVE               | Operating Curve Type  | O                 |
| <a href="#">TmVHzChr33</a> | <a href="#">CSG</a> | <a href="#">Multiline curve characteristic definition</a>   | <a href="#">C</a> |
| StrVal                     | ASG                 | Volts per hertz Start Value   | O                 |

| PVPH class |                   |                      |   |       |
|------------|-------------------|----------------------|---|-------|
| Data Name  | Common Data Class | Explanation          | T | M/O/C |
| OpDITmms   | ING               | Operate Delay Time   |   | O     |
| TypRsCrv   | ING               | Type of Reset Curve  |   | O     |
| RsDITmms   | ING               | Reset Delay Time     |   | O     |
| TmMult     | ASG               | Time Dial Multiplier |   | O     |
| MinOpTmms  | ING               | Minimum Operate Time |   | O     |
| MaxOpTmms  | ING               | Maximum Operate Time |   | O     |

### 5.11.31 LN: Zero speed or underspeed Name: PZSU

For a description of this LN, see IEC 61850-5.

| PZSU class                |                   |   |   |       |
|---------------------------|-------------------|---|---|-------|
| Data Name                 | Common Data Class | Explanation   | T | M/O/C |
| LNName                    |                   | The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2 clause 19 |   |       |
| <b>Data</b>               |                   |   |   |       |
| <b>Status Information</b> |                   |   |   |       |
| Str                       | ACD               | Start   |   | M     |
| Op                        | ACT               | Operate   | T | M     |
| <b>Controls</b>           |                   |   |   |       |
| OpCntRs                   | INC               | Resetable operation counter   |   | O     |
| <b>Settings</b>           |                   |   |   |       |
| StrVal                    | ASG               | Start Value (Speed)   |   | O     |
| OpDITmms                  | ING               | Operate Delay Time  |   | O     |
| RsDITmms                  | ING               | Reset Delay Time  |   | O     |

## 5.12 Logical Nodes for power quality events LN Group: Q

### 5.12.1 Modelling Remarks

This group of logical nodes refers to the modelling of power quality events detection and analysis functions. The models are based on the principles used for modelling protection functions.

There is a one-to-one relationship between the power quality event logical nodes in IEC 61850-5 and the logical node class definitions in this document.

### 5.12.2 LN: Voltage Variation Name: QVVR

Description of this LN see IEC 61850-5.

| QVVR class      |                   |  |   |       |
|-----------------|-------------------|--|---|-------|
| Data Name       | Common Data Class | Explanation  | T | M/O/C |
| LNName          |                   | The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2 clause 19. |   | M     |
| <b>Data</b>     |                   |  |   |       |
| <b>Controls</b> |                   |  |   |       |
| OpCntRs         | INC               | Resetable counter operation  |   | O     |

| <b>Status Information</b> |     |  |   |   |
|---------------------------|-----|--|---|---|
| Str                       | SPS | Start (Voltage Variation Event in progress)  |   | M |
| DipStr                    | SPS | Start (Voltage Dip Event in progress)  |   | O |
| SwlStr                    | SPS | Start (Voltage Swell Event in progress)  |   | O |
| Op                        | SPS | Operate (Event finished but not Reset)   | T | O |
| <b>Measured Values</b>    |     |  |   |   |
| Dur                       | MV  | Voltage Variation Duration of the last completed event                               |   | O |
| Mag                       | MV  | Voltage Variation Magnitude <u>of the last completed event</u>                       |   | O |
| TmLv[k]                   | MV  | Time at/or above/below Level [k]   |   |   |
| Area                      | MV  | Voltage Variation Area   |   | O |
| EvtCnt                    | HST | <u>Event counter histogram</u>   |   | O |
| <b>Settings</b>           |     |  |   |   |
| Phs                       | ING | Monitored phase  |   | O |
| PQStd                     | ING | Power Quality Standard (Enumerated -UNIPED, NRS048, CIGRE C4.07, EPRI, IEEE, Custom) |   | O |
| DipStrVal                 | ASG | Voltage Dip Set Point  |   | M |
| SwlStrVal                 | ASG | Voltage Swell Set Point  |   | M |
| IntStrVal                 | ASG | Voltage Interruption Set Point   |   | O |
| IntDetMth                 | ING | <u>Interruption Detection Method</u>   |   | O |
| LvStrVal[k]               | ASG | <u>Time at/or above/below Voltage Level Set Point</u>                                |   | O |

Gelöscht: OpCnt[i]

Gelöscht: INS

Gelöscht: Operation counter

Gelöscht: d

Kommentar [HD86]: in QFVR CDC CSD

Gelöscht: Mag1[i] ... [29]

### 5.12.3 LN: LN: Frequency Variation Name: QFVR

Description of this LN see IEC 61850-5.

| <b>QFVR class</b>         |                   |  |   |       |
|---------------------------|-------------------|--|---|-------|
| Data Name                 | Common Data Class | Explanation  | T | M/O/C |
| LNNName                   |                   | The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2 clause 19. |   | M     |
| <b>Data</b>               |                   |  |   |       |
| <b>Controls</b>           |                   |  |   |       |
| OpCntRs                   | INC               | Resettable counter operation   |   | O     |
| <b>Status Information</b> |                   |  |   |       |
| Str                       | SPS               | Start (Frequency Variation Event in progress)  |   | M     |
| UnHzStr                   | SPS               | Start (Underfrequency Variation Event in progress)   |   | O     |
| OvHzStr                   | SPS               | Start (Overfrequency Variation Event in progress)  |   | O     |
| Op                        | SPS               | Operate (Event finished but not Reset)   | T | O     |
| <b>Measured Values</b>    |                   |  |   |       |
| Dur                       | MV                | Frequency Variation Duration of the last completed event   |   | O     |
| Mag                       | MV                | Frequency Variation Magnitude <u>of the last completed event</u>   |   | O     |
| RteChg                    | MV                | Rate of change of Frequency Value  |   | O     |
| TmLv                      | MV                | <u>Time at/or above/below Level (can be instantiated)</u>  |   | O     |
| Area                      | MV                | Frequency Variation Area   |   | O     |
| EvtCnt                    | HST               | <u>Event counter histogram</u>   |   | O     |

Gelöscht: CntEvent ... [30]

| <b>Settings</b> |     |  |  |   |
|-----------------|-----|--|--|---|
| Phs             | ING | Monitored phase                                  |  | O |
| UnHzStrVal      | ASG | Underfrequency Set Point                         |  | M |
| OvHzStrVal      | ASG | Overfrequency Set Point                          |  | M |
| LvlStrVal       | CSD | Time at/or above/below Frequency Level Set Point |  | O |

Gelöscht: Mag1 ... [31]

### 5.12.4 LN: LN: Voltage Unbalance Variation Name: QVUB

Description of this LN see IEC 61850-5.

| <b>QVUB class</b>         |                   |  |   |       |
|---------------------------|-------------------|--|---|-------|
| Data Name                 | Common Data Class | Explanation  | T | M/O/C |
| LNNName                   |                   | The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2 clause 19. |   | M     |
| <b>Data</b>               |                   |  |   |       |
| <b>Controls</b>           |                   |  |   |       |
| OpCntRs                   | INC               | Resetable counter operation  |   | O     |
| <b>Status Information</b> |                   |  |   |       |
| Str                       | ACT               | Start  |   | M     |
| Op                        | ACT               | Operate  | T | O     |
| <b>Measured Values</b>    |                   |  |   |       |
| Dur                       | MV                | Voltage Unbalance Variation Duration   |   | O     |
| Mag                       | MV                | Maximum Unbalance Deviation Value  |   | O     |
| EvtCnt                    | HST               | Event counter histogram  |   | O     |
| <b>Settings</b>           |                   |  |   |       |
| UnbDetMth                 | ING               | Unbalance Detection Method   |   | M     |
| StrVal                    | ASG               | Voltage Unbalance Start Value  |   | M     |

Gelöscht: N

Gelöscht: OpCnt[i,j]

Gelöscht: INS

Gelöscht: Operation counter

Gelöscht: d

Gelöscht: LvlStrVal[k] ... [32]

### 5.12.5 LN: LN: Current Unbalance Variation Name: QIUB

Description of this LN see IEC 61850-5.

| <b>QIUB class</b>         |                   |  |   |       |
|---------------------------|-------------------|--|---|-------|
| Data Name                 | Common Data Class | Explanation  | T | M/O/C |
| LNNName                   |                   | The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2 clause 19. |   | M     |
| <b>Data</b>               |                   |  |   |       |
| <b>Controls</b>           |                   |  |   |       |
| OpCntRs                   | INC               | Resetable counter operation  |   | O     |
| <b>Status Information</b> |                   |  |   |       |
| Str                       | ACT               | Start  |   | M     |
| Op                        | ACT               | Operate  | T | O     |
| <b>Measured Values</b>    |                   |  |   |       |
| Dur                       | MV                | Current Unbalance Variation Duration   |   | O     |
| Mag                       | MV                | Maximum Unbalance Deviation Value  |   | O     |

Gelöscht: UN

|                     |            |   |  |          |
|---------------------|------------|---|--|----------|
| <b>EvtCnt</b>       | <b>HST</b> | <b>Event counter histogram</b>                    |  | <b>Q</b> |
| <b>Settings</b>     |            |   |  |          |
| UnbDetMth           | ING        | Unbalance Detection Method                        |  | <b>M</b> |
| StrVal              | ASG        | Current Unbalance Start Value                     |  | M        |
| <b>LvlStrVal[k]</b> | <b>ASG</b> | <b>Time at/or above Unbalance Level Set Point</b> |  | <b>O</b> |

Gelöscht: OpCnt[i,j] ... [33]

Kommentar [HD89]: acc. CH-15

Gelöscht: d

Gelöscht: Mag1[i] ... [34]

### 5.12.6 LN: LN: Voltage Transient Name: QVTR

Description of this LN see IEC 61850-5.

| <b>QVTR class</b>         |                   |  |   |          |
|---------------------------|-------------------|--|---|----------|
| Data Name                 | Common Data Class | Explanation  | T | M/O/C    |
| LNNName                   |                   | The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2 clause 19. |   | M        |
| <b>Data</b>               |                   |  |   |          |
| OpCntRs                   | INC               | Resetable counter operation  |   | O        |
| <b>Status Information</b> |                   |  |   |          |
| Str                       | ACT               | Start  |   | M        |
| Op                        | ACT               | Operate  | T | O        |
| <b>Measured Values</b>    |                   |  |   |          |
| Dur                       | MV                | Transient Duration   |   | O        |
| Mag                       | MV                | Maxmum Voltage Transient Value   |   | O        |
| RteChg                    | MV                | Rate of change of Voltage Transient Value  |   | O        |
| <b>EvtCnt</b>             | <b>HST</b>        | <b>Event counter histogram</b>   |   | <b>O</b> |
| <b>Settings</b>           |                   |  |   |          |
| StrVal                    | ASG               | Voltage Transient Start Value  |   | M        |

Gelöscht: OpCnt[i,j]

Gelöscht: INS

Gelöscht: Operation counter

Gelöscht: [i]

Gelöscht: Mag1[i] ... [35]

### 5.12.7 LN: LN: Current Transient Name: QITR

Description of this LN see IEC 61850-5.

| <b>QITR class</b>         |                   |  |   |       |
|---------------------------|-------------------|--|---|-------|
| Data Name                 | Common Data Class | Explanation  | T | M/O/C |
| LNNName                   |                   | The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2 clause 19. |   | M     |
| <b>Data</b>               |                   |  |   |       |
| OpCntRs                   | INC               | Resetable counter operation  |   | O     |
| <b>Status Information</b> |                   |  |   |       |
| Str                       | ACT               | Start  |   | M     |
| Op                        | ACT               | Operate  | T | O     |
| <b>Measured Values</b>    |                   |  |   |       |
| Dur                       | MV                | Transient Duration   |   | O     |
| Mag                       | MV                | Maxmum Current Transient Value   |   | O     |
| RteChg                    | MV                | Rate of change of Current Transient Value  |   | O     |

Gelöscht: N

|                 |            |                                      |  |          |
|-----------------|------------|--------------------------------------|--|----------|
| <b>EvtCnt</b>   | <b>HST</b> | <b>Event counter histogram</b>       |  | <b>Q</b> |
| <b>Settings</b> |            |                                      |  |          |
| <b>StrVal</b>   | <b>ASG</b> | <b>Current Transient Start Value</b> |  | <b>M</b> |

Gelöscht: OpCnt[i,j] ... [36]

Gelöscht: [i]

Gelöscht: Mag1[i] ... [37]

### 5.13 Logical Nodes for protection related functions LN Group: R

#### 5.13.1 Modelling Remarks

**Table 7 – Relation between IEC 61850-5 and IEC 61850-7-4 for protection related LNs**

Gelöscht: 7

| Functionality                         | IEEE reference | Defined in IEC 61850-5 by LN | Modelled in IEC 61850-7-4 by LN | Comments  |
|---------------------------------------|----------------|------------------------------|---------------------------------|---|
| Carrier or pilot line wire protection | 85             | RCPW                         | PSCH                            | PSCH is used for line protection schemes instead of RCPW              |
| Directional element                   |                |                              | RDIR                            | Directional element for modelling directed protection with Pxyz nodes |
| Disturbance recording (acquisition)   |                | RDRE                         | RDRE<br>RADR<br>RBDR            | Basic functionality<br>Analogue channel<br>Binary channel             |
| Others                                |                | R...                         | R...                            | 1:1 Relationship  |

#### 5.13.2 LN: Disturbance recorder channel analogue Name: RADR

In addition to the channel number, all attributes needed for the COMTRADE file (IEC 60255-24) are provided either by data from the TVTR or TCTR or by attributes of the measured value (samples subscribed from TVTR or TCTR) itself or by data from pseudo channels (calculated values, derived values of power quality devices). The “circuit component” and “phase identification” is provided by the instance identification of the LN RADR. Channels “1” to “n” are created by “1” to “n” instances.

Kommentar [HD90]: #468

| RADR class                |                   |   |   |       |
|---------------------------|-------------------|---|---|-------|
| Data Name                 | Common Data Class | Explanation   | T | M/O/C |
| LNNName                   |                   | The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2 clause 19 |   |       |
| <b>Data</b>               |                   |   |   |       |
| <b>Measured Values</b>    |                   |   |   |       |
| Access via COMTRADE only  |                   | Analogue input channel  |   | M     |
| <b>Status Information</b> |                   |   |   |       |
| ChTrg                     | SPS               | Channel triggered   |   | M     |
| <b>Controls</b>           |                   |   |   |       |
| OpCntRs                   | INC               | Resetable operation counter   |   | O     |
| <b>Settings</b>           |                   |   |   |       |
| ChNum                     | ING               | Channel number  |   | O     |
| TrgMod                    | ING               | Trigger mode (internal trigger, external or both)   |   | O     |
| LevMod                    | ING               | Level Trigger Mode  |   | O     |
| HiTrgLev                  | ASG               | High (positive) trigger level   |   | O     |
| LoTrgLev                  | ASG               | Low (negative) trigger level  |   | O     |
| PreTms                    | ING               | Pre-trigger time  |   | O     |

| RADR class |                   |                   |   |       |
|------------|-------------------|-------------------|---|-------|
| Data Name  | Common Data Class | Explanation       | T | M/O/C |
| PstTmms    | ING               | Post-trigger time |   | O     |

### 5.13.3 LN: Disturbance recorder channel binary Name: RBDR

In addition to the channel number, all attributes needed for the COMTRADE file ([IEC 60255-24](#)) are provided by attributes of the binary input (subscribed from another LN). The "circuit component" and "phase identification" is provided by the instance identification of the LN RBDR. Channels "1" to "n" are created by "1" to "n" instances.

| RBDR class                |                   |   |   |       |
|---------------------------|-------------------|---|---|-------|
| Data Name                 | Common Data Class | Explanation   | T | M/O/C |
| LNName                    |                   | The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2 clause 19 |   |       |
| <b>Data</b>               |                   |   |   |       |
| <b>Status Information</b> |                   |   |   |       |
| Access via COMTRADE only  |                   | Binary input <u>channel</u>   |   | M     |
| ChTrg                     | SPS               | Channel triggered   |   | M     |
| <b>Controls</b>           |                   |   |   |       |
| OpCntRs                   | INC               | Resetable operation counter   |   | O     |
| <b>Settings</b>           |                   |   |   |       |
| ChNum                     | ING               | Channel number  |   | O     |
| TrgMod                    | ING               | Trigger mode (internal trigger, external or both)   |   | O     |
| LevMod                    | ING               | Level Trigger Mode  |   | O     |
| PreTmms                   | ING               | Pre-trigger time  |   | O     |
| PstTmms                   | ING               | Post-trigger time   |   | O     |

**Kommentar [HD91]: #468**  
Add a reference to IEC 60255-24 (after the word COMTRADE) in the description of RADR and RBDR. This standard defines the "Comtrade" format for fault recorder data. Note: It is already included in chapter 2.

### 5.13.4 LN: Breaker failure Name: RBRF

For a description of this LN, see IEC 61850-5.

| RBRF class                |                   |   |   |       |
|---------------------------|-------------------|---|---|-------|
| Data Name                 | Common Data Class | Explanation   | T | M/O/C |
| LNName                    |                   | The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2 clause 19 |   |       |
| <b>Data</b>               |                   |   |   |       |
| <b>Status Information</b> |                   |   |   |       |
| Str                       | ACD               | Start, timer running  |   | O     |
| OpEx                      | ACT               | Breaker failure trip ("external trip")  | T | C     |
| OpIn                      | ACT               | Operate, retrip ("internal trip")   | T | C     |
| <b>Controls</b>           |                   |   |   |       |
| OpCntRs                   | INC               | Resetable operation counter   |   | O     |
| <b>Settings</b>           |                   |   |   |       |
| FailMod                   | ING               | Breaker Failure Detection Mode (current, breaker status, both, other)   |   | O     |
| FailTmms                  | ING               | Breaker Failure Time Delay for bus bar trip   |   | O     |
| SPITrTmms                 | ING               | Single Pole Retrip Time Delay   |   | O     |
| TPITrTmms                 | ING               | Three Pole Retrip Time Delay  |   | O     |

| RBRF class |                   |                        |   |       |
|------------|-------------------|------------------------|---|-------|
| Data Name  | Common Data Class | Explanation            | T | M/O/C |
| DetValA    | ASG               | Current Detector Value |   | O     |
| ReTrMod    | ING               | Retrip Mode            |   | O     |

Condition C: At least one of either data shall be used depending on the applied tripping schema.

### 5.13.5 LN: Directional element Name: RDIR

This LN shall be used to represent all directional Data in a dedicated LN used for directional relay settings. The protection function itself is modelled by the dedicated protection LN. LN RDIR may be used with functions 21, 32 or 67 according to IEEE device function number designation.

| RDIR class                |                   |   |   |       |
|---------------------------|-------------------|---|---|-------|
| Data Name                 | Common Data Class | Explanation   | T | M/O/C |
| LNName                    |                   | The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2 clause 19 |   |       |
| <b>Data</b>               |                   |   |   |       |
| <b>Status Information</b> |                   |   |   |       |
| Dir                       | ACD               | Direction   |   | M     |
| <b>Settings</b>           |                   |   |   |       |
| ChrAng                    | ASG               | Characteristic Angle  |   | O     |
| MinFwdAng                 | ASG               | Minimum Phase Angle in Forward Direction  |   | O     |
| MinRvAng                  | ASG               | Minimum Phase Angle in Reverse Direction  |   | O     |
| MaxFwdAng                 | ASG               | Maximum Phase Angle in Forward Direction  |   | O     |
| MaxRvAng                  | ASG               | Maximum Phase Angle in Reverse Direction  |   | O     |
| BlkValA                   | ASG               | Minimum operating current   |   | O     |
| BlkValV                   | ASG               | Minimum operating voltage   |   | O     |
| PolQty                    | ING               | Polarising Quantity   |   | O     |
| MinPPV                    | ASG               | Min Phase-Phase Voltage   |   | O     |

### 5.13.6 LN: Disturbance recorder function Name: RDRE

For consistent modelling, the disturbance recorder function described as a requirement in IEC 61850-5 is decomposed into one LN class for analogue channels (RADR) and another LN class for binary channels (RBDR). The output refers to the "IEEE Standard Format for Transient Data Exchange (COMTRADE) for Power Systems" (IEC 60255-24). Disturbance recorders are logical devices built up with one instance of LN RADR or LN RBDR per channel. Since the content of Logical Devices (LD) are not standardised, other LNs may be inside the LD "Disturbance recorder" if applicable. All enabled channels are included in the recording, independently of the trigger mode (TrgMod).

| RDRE class      |                   |   |   |       |
|-----------------|-------------------|---|---|-------|
| Data Name       | Common Data Class | Explanation   | T | M/O/C |
| LNName          |                   | The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2 clause 19 |   |       |
| <b>Data</b>     |                   |   |   |       |
| <b>Controls</b> |                   |   |   |       |
| RcdTrg          | SPC               | Trigger recorder  |   | O     |
| MemRs           | SPC               | Reset recorder memory (set the pointer of memory start to the beginning)  | T | O     |

| RDRE class                |                   |  |   |       |
|---------------------------|-------------------|--|---|-------|
| Data Name                 | Common Data Class | Explanation  | T | M/O/C |
| MemClr                    | SPC               | Clear Memory <i>(erase all content of the memory)</i>        | T | O     |
| OpCntRs                   | INC               | Resettable operation counter                                 |   | O     |
| <b>Status Information</b> |                   |  |   |       |
| RcdMade                   | SPS               | Recording made   |   | M     |
| FltNum                    | INS               | Fault Number   |   | M     |
| GriFltNum                 | INS               | Grid Fault Number  |   | O     |
| RcdStr                    | SPS               | Recording started  |   | O     |
| MemUsed                   | INS               | Memory used in %   |   | O     |
| <b>Settings</b>           |                   |  |   |       |
| TrgMod                    | ING               | Trigger mode (internal trigger, external or both)            |   | O     |
| LevMod                    | ING               | Level Trigger Mode   |   | O     |
| PreTmms                   | ING               | Pre-trigger time   |   | O     |
| PstTmms                   | ING               | Post-trigger time  |   | O     |
| MemFull                   | ING               | Memory full level  |   | O     |
| MaxNumRcd                 | ING               | Maximum number of records                                    |   | O     |
| ReTrgMod                  | ING               | Retrigger Mode   |   | O     |
| PerTrgTms                 | ING               | Periodic trigger time in s                                   |   | O     |
| ExclTmms                  | ING               | Exclusion time   |   | O     |
| OpMod                     | ING               | Operation mode (Saturation, Overwrite)                       |   | O     |
| StoRte                    | ING               | Storage rate, i.e. sampling rate of the disturbance recorder |   | O     |
| TrgMod                    | ING               | Trigger mode (internal trigger, external or both)            |   | O     |

**Kommentar [HD92]:** better describe: what is the difference

NOTE 1 The trigger modes (TrgMod) of RDRE, RADR and RBDR are not independent. If the trigger mode of RDRE is external, the trigger modes of RADR and RBDR may be external (no extension of trigger possibilities) or internal (extension of the external trigger mode). If the trigger mode of RDRE is internal, the trigger modes of RADR and RBDR should also be internal because otherwise, no trigger possibility is provided.

NOTE 2 The source of the external trigger is a local issue. It may be a contact or a signal from another logical node.

NOTE 3 The source of the internal trigger is an event detected by the supervision of the channel. It may, for analogue channels, be a limit violation or it may, for binary channels, be a status change. The trigger levels (High/Low) for analogue channels for internal triggering have to be set per channel.

NOTE 4 Since in case of sensors providing the analog data as samples, the sampling rate at the source (TVTR and TCTR) as defined in part 7-3 as Data attribute smpRate may be different from the sampling rate of the recording unit. Therefore, in line with table 4 in part 7-4, the sampling rate of the RDRE is a Data called StoRte meaning Storage rate.

### 5.13.7 LN: Disturbance record handling Name: **RDRS**

For a description of this LN, see IEC 61850-5. This LN shall handle the disturbance records acquired by some local function. This LN is normally located at station level.

**Kommentar [HD93]:** #468 need more explanation of "Analogue input channel" and "Binary Input channel". Also B.4 part should contain a relationship with RDRS in annex

| RDRS class      |                   |   |   |       |
|-----------------|-------------------|---|---|-------|
| Data Name       | Common Data Class | Explanation   | T | M/O/C |
| LNName          |                   | The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2 clause 19 |   |       |
| <b>Data</b>     |                   |   |   |       |
| <b>Controls</b> |                   |   |   |       |
| AutoUpLod       | SPC               | Automatic upload  |   | O     |
| DltRcd          | SPC               | Delete record   |   | O     |

**5.13.8 LN: Fault locator Name: RFLO**

For a description of this LN, see IEC 61850. In case of a fault, the fault location is calculated in  $\Omega$ .

**Kommentar [HD94]:** 952-2006-0109-57-836...pdf - AT7 &8:

**Gelöscht:** To convert it into km, the line parameters (settings) also have to be known.

| RFLO class                |                   |   |   |          |
|---------------------------|-------------------|---|---|----------|
| Data Name                 | Common Data Class | Explanation   | T | M/O/C    |
| LNName                    |                   | The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2 clause 19 |   |          |
| <b>Data</b>               |                   |   |   |          |
| <b>Measured Values</b>    |                   |   |   |          |
| FltZ                      | CMV               | Fault Impedance   |   | M        |
| FltDiskm                  | MV                | Fault Distance  |   | $\Omega$ |
| <b>Status Information</b> |                   |   |   |          |
| FltLoop                   | INS               | Fault Loop  |   | O        |
| <b>Controls</b>           |                   |   |   |          |
| OpCntRs                   | INC               | Resetable operation counter   |   | O        |

**Gelöscht:** in km

**Gelöscht:** M

**5.13.9 LN: Power swing detection/blocking Name: RPSB**

For a description of this LN, see IEC 61850-5. The power swing is characterised by slow periodic changing of measured impedance. Such a moderate impedance change is tolerated, but may result in tripping of the distance protection function. To avoid this unwanted behaviour, tripping of distance protection function shall be blocked in the correlated zone (power swing blocking). For convenience, the instances of RPSB should have the same instance numbers like the PDIS per zone (RPSB1 and PDIS1, etc.). If the generator is out of step (pole slipping), transient changes of impedance (one per slip) are measured. After a small number of slips, (MaxNumSlp) in a dedicated time window (EvTmms), the generator shall be tripped to avoid mechanical damage (out of step tripping). The actual number of slips shall be reset either by the trip or by the end of evaluation time.

| RPSB class                |                   |   |   |       |
|---------------------------|-------------------|---|---|-------|
| Data Name                 | Common Data Class | Explanation   | T | M/O/C |
| LNName                    |                   | The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2 clause 19 |   |       |
| <b>Data</b>               |                   |   |   |       |
| <b>Status Information</b> |                   |   |   |       |
| Str                       | ACD               | Start (Power Swing Detected)  |   | C1    |
| Op                        | ACT               | Operate (Out of step Tripping)  | T | C2    |
| BlkZn                     | SPS               | Blocking of correlated PDIS zone  |   | C1    |
| <b>Controls</b>           |                   |   |   |       |
| OpCntRs                   | INC               | Resetable operation counter   |   | O     |
| <b>Settings</b>           |                   |   |   |       |
| ZeroEna                   | SPG               | Zero Enable   |   | O     |
| NgEna                     | SPG               | Negative Sequence Current Supervision Enabled   |   | O     |
| MaxEna                    | SPG               | Max Current Supervision Enabled   |   | O     |
| SwgVal                    | ASG               | Power Swing Delta   |   | O     |
| SwgRis                    | ASG               | Power Swing Delta R   |   | O     |
| SwgReact                  | ASG               | Power Swing Delta X   |   | O     |
| SwgTmms                   | ING               | Power Swing Time  |   | O     |

| RPSB class |                   |  |   |       |
|------------|-------------------|--|---|-------|
| Data Name  | Common Data Class | Explanation  | T | M/O/C |
| UnBlkTmms  | ING               | Unblocking Time  |   | 0     |
| MaxNumSlp  | ING               | Maximum number of pole slips until tripping (Op, Out of step tripping) |   | 0     |
| EvTmms     | ING               | Evaluation time (time window, Out of step tripping)                    |   | 0     |

Condition C1: Mandatory if RPSB is used for "Power swing blocking"

Condition C2: Mandatory if RPSB is used for "Out of step tripping"

### 5.13.10 LN: Autoreclosing Name: RREC

Description of this LN see IEC 61850-5. The number of Trigger Modes (TrMod *i*) and Reclose Times (RecTmms*i*) is equal to the maximum allowed number of reclose cycles (MaxCyc). The trigger for the activation of RREC can be the start signal of PTRC, or the report "breaker open" of the circuit breaker, or any other signals and combination of signals. If different types of protections are involved in the Autoreclosing process, all relevant data have to be published and subscribed by the allocated protection LNs. An example for the interaction of Protection (Pxyz) and Autoreclosing (RREC) is given in Annex B.

| RREC class                |                   |   |   |          |
|---------------------------|-------------------|---|---|----------|
| Data Name                 | Common Data Class | Explanation   | T | M/O/C    |
| LNName                    |                   | The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2 clause 19.                            |   |          |
| <b>Data</b>               |                   |   |   |          |
| <b>Controls</b>           |                   |   |   |          |
| BlkRec                    | SPC               | Block Reclose   |   | 0        |
| ChkRec                    | SPC               | Check Reclosing   |   | 0        |
| OpCntRs                   | INC               | Resettable operation counter  |   | 0        |
| <b>Status Information</b> |                   |   |   |          |
| Auto                      | SPS               | Automatic Operation (external switch status)  |   | 0        |
| TrBeh                     | INS               | Defines Single or Three Pole Tripping (mostly resulting from combination TrMod and RecCyc) for the next trip to be subscribed by the Protection |   | 0        |
| RecCyc                    | INS               | Actual Reclose Cycle  |   | 0        |
| OpCls                     | ACT               | Operation "close switch" issued to close the XCBR   |   | M        |
| AutoRecSt                 | INS               | Auto Reclosing Status   |   | M        |
| <u>AutoCycSt</u>          | <u>INS</u>        | <u>Auto Reclosing Cycle Status</u>  |   | <u>0</u> |
| <b>Settings</b>           |                   |   |   |          |
| TrMod1                    | <u>SPG</u>        | Indicates if Single Pole Tripping allowed or Three Pole Tripping always requested in the first cycle  |   | 0        |
| TrMod2                    | <u>SPG</u>        | Indicates if Single Pole Tripping allowed or Three Pole Tripping always requested in the second cycle   |   | 0        |
| TrMod3                    | <u>SPG</u>        | Indicates if Single Pole Tripping allowed or Three Pole Tripping always requested in the third cycle  |   | 0        |
| MaxCyc                    | ING               | Maximum number of Reclose cycles  |   | 0        |
| UseCyc                    | ING               | Used actual set maximum number of Reclose cycles  |   | 0        |
| MaxTmms                   | ING               | Maximum time after fault detection during which autoreclosing is permitted  |   | 0        |
| RecTmms1                  | ING               | First Reclose Time  |   | 0        |
| RecTmms2                  | ING               | Second Reclose Time   |   | 0        |
| RecTmms3                  | ING               | Third Reclose Time  |   | 0        |
| PlsTmms                   | ING               | Close Pulse Time  |   | 0        |

**Kommentar [HD95]:** new LN content from KPB

**Kommentar [HD96]:** proposal KPB

**Gelöscht:** ING

**Gelöscht:** ING

**Gelöscht:** ING

| RREC class |                   |  |   |       |
|------------|-------------------|--|---|-------|
| Data Name  | Common Data Class | Explanation  | T | M/O/C |
| ClsTmms    | ING               | Time the breaker has to stay closed for successful autoreclosing |   | O     |
| RclTmms    | ING               | Reclaim Time   |   | O     |

**Kommentar [HD95]:** new LN content from KPB

All settings with an index higher than 1 up to MaxCyc will appear if MaxCyc is higher than 1. **or the number of actual permitted (used) cycles holds:** UseCyc ≤ MaxCyc

**5.13.11 LN: Synchronism-check or synchronising Name: RSYN**

For a description of this LN, see IEC 61850-5. The voltage phasor difference from both sides of an open breaker is calculated and compared with predefined switching conditions (synchroncheck). Included is the case that one side is dead (example: energising a dead line) and the case that the phasor on one side can be actively controlled by “higher” or “lower” (means synchronising).

| RSYN class                |                   |   |   |       |
|---------------------------|-------------------|---|---|-------|
| Data Name                 | Common Data Class | Explanation   | T | M/O/C |
| LNName                    |                   | The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2 clause 19 |   |       |
| <b>Data</b>               |                   |   |   |       |
| <b>Status Information</b> |                   |   |   |       |
| RHz                       | SPS               | Raise Frequency   |   | C     |
| LHz                       | SPS               | Lower Frequency   |   | C     |
| RV                        | SPS               | Raise Voltage   |   | C     |
| LV                        | SPS               | Lower Voltage   |   | C     |
| Rel                       | SPS               | Release   |   | M     |
| VInd                      | SPS               | Voltage Difference Indicator  |   | O     |
| AngInd                    | SPS               | Angle Difference Indicator  |   | O     |
| HzInd                     | SPS               | Frequency Difference Indicator  |   | O     |
| SynPrg                    | SPS               | Synchronising in progress   |   | O     |
| <b>Measured Values</b>    |                   |   |   |       |
| DifVClc                   | MV                | Calculated Difference in Voltage  |   | O     |
| DifHzClc                  | MV                | Calculated Difference in Frequency  |   | O     |
| DifAngClc                 | MV                | Calculated Difference of Phase Angle  |   | O     |
| <b>Settings</b>           |                   |   |   |       |
| DifV                      | ASG               | Difference Voltage  |   | O     |
| DifHz                     | ASG               | Difference Frequency  |   | O     |
| DifAng                    | ASG               | Difference Phase Angle  |   | O     |
| LivDeaMod                 | ING               | Live Dead Mode  |   | O     |
| DeaLinVal                 | ASG               | Dead Line Value   |   | O     |
| LivLinVal                 | ASG               | Live Line Value   |   | O     |
| DeaBusVal                 | ASG               | Dead Bus Value  |   | O     |
| LivBusVal                 | ASG               | Live Bus Value  |   | O     |
| PlsTmms                   | ING               | Close Pulse Time  |   | O     |
| CBTmms                    | ING               | Closing time of breaker   |   | O     |

**Gelöscht:** BkrTmms

Note: Conditional attributes are mandatory in case of synchronising, optional in case of synchronism-check.

5.13.12 LN: **Teleprotection** communication interfaces Name: **RTPC**

The LN RTPC comprises all information for communication channel setting and supervision. RTPC is not intended to generate direct process data. Thus, it does not contain the input and output data to be transmitted and it has no 'operate' data object.

**Kommentar [HD97]:** the name doesn't correspond with the abbreviation

**Gelöscht: C**

**Kommentar [HD98]:** referene to 61850-90-1

| <b>RTPC class</b>         |                          |   |          |              |
|---------------------------|--------------------------|---|----------|--------------|
| <b>Data Name</b>          | <b>Common Data Class</b> | <b>Explanation</b>  | <b>I</b> | <b>M/O/C</b> |
| <u>LNName</u>             |                          | The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2 clause 19   |          |              |
| <b>Data</b>               |                          |   |          |              |
| <b>Measured Values</b>    |                          |   |          |              |
| <u>BerCh</u>              | <u>MV</u>                | Bit Error Rate of the communication channel. Used in case of a digital communication channel  |          | <u>O</u>     |
| <u>FerCh</u>              | <u>MV</u>                | Frame Error Rate of the communication channel. Used in case of a digital communication channel. May be vendor specific  |          | <u>O</u>     |
| <u>LoopTestTm</u>         | <u>MV</u>                | Time measured at last loop test   |          | <u>O</u>     |
| <u>CarrierLevel</u>       | <u>MV</u>                | Power of received signal in case of an analogue communication channel   |          | <u>O</u>     |
| <u>SNR</u>                | <u>MV</u>                | Signal to noise ratio in dB, used in case of analogue communication.  |          | <u>O</u>     |
| <b>Status Information</b> |                          |   |          |              |
| <u>EEHealth</u>           | <u>INS</u>               | Communication channel health  |          | <u>O</u>     |
| <u>GrdRxCmdRx</u>         | <u>SPS</u>               | Alarm situation: Guard received together with the command, may indicate interference on the channel. Used in case of an analogue communication channel.   |          | <u>O</u>     |
| <u>LosOfSignal</u>        | <u>SPS</u>               | Alarm situation: No signal received, indicates a channel problem  |          | <u>O</u>     |
| <u>TxCmdCnt1</u>          | <u>INS</u>               | For diagnostics: Transmitted commands counters (for each command)   |          | <u>O</u>     |
| <u>RxCmdCnt1</u>          | <u>INS</u>               | For diagnostics: Received commands counters (for each command)  |          | <u>O</u>     |
| <u>LosOfSyn</u>           | <u>SPS</u>               | Alarm situation: Loss of synchronism. Indicates that there is no synchronization between the transmitter and the receiver, i.e., no communication is possible. Used in case of a digital communication channel.     |          | <u>O</u>     |
| <b>Settings</b>           |                          |   |          |              |
| <u>NumTxCmd</u>           | <u>ING</u>               | Number of used binary transmit commands   |          | <u>O</u>     |
| <u>NumRxCmd</u>           | <u>ING</u>               | Number of used binary receive commands  |          | <u>O</u>     |
| <u>TpcTxMod1</u>          | <u>ING</u>               | Teleprotection application mode in Transmit direction for each command (Unused, Blocking, Permissive, Direct, Unblocking, Status)   |          | <u>O</u>     |
| <u>TpcRxMod1</u>          | <u>ING</u>               | Teleprotection application mode in Receive direction for each command (Unused, Blocking, Permissive, Direct, Unblocking, Status)  |          | <u>O</u>     |
| <u>SecTmms</u>            | <u>ING</u>               | Pickup security timer on loss of carrier guard signal: if a command is received within SecTmms after the guard has disappeared this command is considered valid, used in case of an analogue communication channel. |          | <u>O</u>     |
| <u>BoostRatiodB</u>       | <u>ING</u>               | Level of increased power during the transmission of a command in dB. Used in case of an analogue communication channel  |          | <u>O</u>     |
| <u>TxPwrPEPdBm</u>        | <u>ING</u>               | Transmit power (peak envelope power) in dBm. Used in case of an analogue communication channel  |          | <u>O</u>     |
| <u>TxCtrHz</u>            | <u>ING</u>               | Transmit center frequency. Used in case of an analogue communication channel  |          | <u>O</u>     |
| <u>RxCtrHz</u>            | <u>ING</u>               | Receive center frequency. Used in case of an analogue communication channel   |          | <u>O</u>     |
| <u>TxBwHz</u>             | <u>ING</u>               | Transmit bandwidth. Used in case of an analogue communication channel   |          | <u>O</u>     |
| <u>RxBwHz</u>             | <u>ING</u>               | Receive bandwidth. Used in case of an analogue communication channel  |          | <u>O</u>     |

Note: EEHealth is used to indicate the state of the communication channel, whereas PhyHealth is used to indicate the state of the (physical) communication device. If RTPC receives a GOOSE message with quality attribute "invalid" or "questionable" or no

GOOSE message at all within Tmax, it will set PhyHealth to "Warning". Other actions are a local issue.

**5.14 Logical Nodes for supervision and monitoring LN Group: S**

**5.14.1 Modelling remarks**

**Table 8 – Relation between IEC 61850-5 and IEC 61850-7-4 for supervision and monitoring LNs**

Gelöscht: 8

| Functionality                             | Defined in IEC 61850-5 by LN | Modelled in IEC 61850-7-4 by LN | Comments  |
|---|------------------------------|---------------------------------|---|
| Insulation medium supervision             | SIMS                         | SIML<br>SIMG                    | Insulation liquid like oil<br>Insulation gas like SF <sub>6</sub> |
| <u>Temperature supervision</u>            |                              | <u>STMP</u>                     |   |
| <u>Vibration supervision</u>              |                              | <u>SVBR</u>                     |   |
| <u>Arc supervision</u>                    |                              | <u>SARC</u>                     |   |
| <u>Partial discharge supervision</u>      |                              | <u>SPDC</u>                     |   |
| <u>Supervision of operating mechanism</u> |                              | <u>SOPM</u>                     |   |
| <u>Circuit Switch Supervision</u>         |                              | <u>SSWI</u>                     |   |

**5.14.2 LN: Monitoring and diagnostics for arcs Name: SARC**

For a description of this LN, see IEC 61850-5.

| SARC class                |                   |   |   |       |
|---------------------------|-------------------|---|---|-------|
| Data Name                 | Common Data Class | Explanation   | T | M/O/C |
| LNName                    |                   | The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2 clause 19 |   |       |
| <b>Data</b>               |                   |   |   |       |
| EEHealth                  | INS               | External equipment health   |   | O     |
| EEName                    | DPL               | External equipment name plate   |   | O     |
| OpCntRs                   | INC               | Resetable Operation Counter (Switch and fault arcs)   |   | O     |
| <b>Status Information</b> |                   |   |   |       |
| FACntRs                   | INC               | Fault arc counter   |   | M     |
| FADet                     | SPS               | Fault arc detected  |   | M     |
| ArcCntRs                  | INC               | Switch arc counter  |   | O     |
| SwArcDet                  | SPS               | Switch arc detected   |   | O     |

Gelöscht: ¶

**5.14.3 LN: Insulation medium supervision (gas) Name: SIMG**

General description of this LN see IEC 61850-5. Insulation medium is gas, e.g. SF<sub>6</sub> in gas isolated devices. If more measurement positions are needed and they are located to the same measuring object, these shall be added by numbered extensions of the data (e.g. Tmp1, Tmp2, .) in the existing LN SIMG. For other measuring objects related to the same IED, a new instance of SIMG may be used. If the new measuring point(s) is/are related to a new IED, in this new IED a new instance of SIMG shall be used.

| SIMG class |
|------------|
|------------|

| Data Name                 | Common Data Class | Explanation   | T | M/O/C    |
|---------------------------|-------------------|---|---|----------|
| LNName                    |                   | The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2 clause 19 |   |          |
| <b>Data</b>               |                   |   |   |          |
| EEHealth                  | INS               | External equipment health   |   | O        |
| EEName                    | DPL               | External equipment name plate   |   | O        |
| <b>Measured Values</b>    |                   |   |   |          |
| Pres                      | MV                | Isolation gas pressure  |   | O        |
| Den                       | MV                | Isolation gas density   |   | O        |
| Tmp                       | MV                | Isolation gas temperature   |   | O        |
| <u>CngIntv</u>            | <u>MV</u>         | <u>Trend of insulation medium, expressed as time to blocking level</u>  |   | <u>O</u> |
| <b>Status Information</b> |                   |   |   |          |
| InsAlm                    | SPS               | Insulation gas critical (refill isolation medium)   |   | M        |
| InsBlk                    | SPS               | Insulation gas not safe (block device operation)  |   | O        |
| InsTr                     | SPS               | Insulation gas dangerous (trip for device isolation)  |   | O        |
| <u>PresAlm</u>            | <u>SPS</u>        | <u>Isolation gas pressure alarm</u>   |   | <u>C</u> |
| <u>DenAlm</u>             | <u>SPS</u>        | <u>Isolation gas density alarm</u>  |   | <u>C</u> |
| <u>TmpAlm</u>             | <u>SPS</u>        | <u>Isolation gas temperature alarm</u>  |   | <u>C</u> |
| InsLevMax                 | SPS               | Insulation gas level maximum (relates to predefined filling value)  |   | O        |
| InsLevMin                 | SPS               | Insulation gas level minimum (relates to predefined filling value)  |   | O        |

**Kommentar [HD99]:** added acc. DE19 and editor meeting in Baden

**Kommentar [HD100]:** added acc. DE19 and editor meeting in Baden

Condition C: depending on the supervised properties of the liquid, at least one status information shall be used.

#### 5.14.4 LN: Insulation medium supervision (liquid) Name: SIML

For a description of this LN, see IEC 61850-5. The insulation medium is a liquid such as oil like that used for example for some transformers and tap changers. If more measurement positions are needed, these shall be added by numbered extensions of the data (for Tmp use Tmp1, Tmp2, ...) in the existing LN SIML. For other measuring objects related to the same IED, a new instance of SIML may be used. If the new measuring point(s) is/are related to a new IED a new instance of SIML shall be used..

| SIML class             |                   |   |   |          |
|------------------------|-------------------|---|---|----------|
| Data Name              | Common Data Class | Explanation   | T | M/O/C    |
| LNName                 |                   | The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2 clause 19 |   |          |
| <b>Data</b>            |                   |   |   |          |
| EEHealth               | INS               | External equipment health   |   | O        |
| EEName                 | DPL               | External equipment name plate   |   | O        |
| <b>Measured Values</b> |                   |   |   |          |
| Tmp                    | MV                | Insulation liquid temperature   |   | O        |
| Lev                    | MV                | Insulation liquid level   |   | O        |
| Pres                   | MV                | Insulation liquid pressure  |   | O        |
| H2O                    | MV                | Relative saturation of moisture in insulating liquid (in %)   |   | O        |
| H2OPap                 | MV                | Relative saturation of moisture in insulating paper (in %)  |   | O        |
| H2OAir                 | MV                | Relative saturation of moisture in air in expansion volume (in %)   |   | O        |
| H2OTmp                 | MV                | Temperature of insulating liquid at point of H2O measurement  |   | O        |
| <u>H2</u>              | <u>MV</u>         | <u>Measurement of Hydrogen (H<sub>2</sub> in ppm)</u>   |   | <u>O</u> |
| <u>N2</u>              | <u>MV</u>         | <u>Measurement of N<sub>2</sub> in ppm</u>  |   | <u>O</u> |
| <u>CO</u>              | <u>MV</u>         | <u>Measurement of CO in ppm</u>   |   | <u>O</u> |

**Gelöscht:** ppm

**Gelöscht:** ppm

**Gelöscht:** ppm

| SIML class                |                   |  |   |       |
|---------------------------|-------------------|--|---|-------|
| Data Name                 | Common Data Class | Explanation  | T | M/O/C |
| CO2                       | MV                | Measurement of CO2 in ppm  |   | O     |
| CH4                       | MV                | Measurement of CH4 in ppm  |   | O     |
| C2H2                      | MV                | Measurement of C2H2 in ppm   |   | O     |
| C2H4                      | MV                | Measurement of C2H4 in ppm   |   | O     |
| C2H6                      | MV                | Measurement of C2H6 in ppm   |   | O     |
| O2                        | MV                | Measurement of O2 in ppm   |   | O     |
| TDCG                      | MV                | Measurement of total dissolved combustable gases (TDCG)                    |   | O     |
| FltGas                    | MV                | Fault gas volume in Buchholz relay   |   | O     |
| <b>Status Information</b> |                   |  |   |       |
| InsAlm                    | SPS               | Insulation liquid critical (refill insulation medium)                      |   | M     |
| InsBlk                    | SPS               | Insulation liquid not safe (block device operation)                        |   | O     |
| InsTr                     | SPS               | Insulation liquid dangerous (trip for device isolation)                    |   | O     |
| TmpAlm                    | SPS               | Insulation liquid temperature alarm  |   | O     |
| GasInsAlm                 | SPS               | Gas in insulation liquid alarm (may be used for Buchholz alarm)            |   | O     |
| GasInsTr                  | SPS               | Gas in insulation liquid trip (may be used for Buchholz trip)              |   | O     |
| GasFlwTr                  | SPS               | Insulation liquid flow trip because of gas (may be used for Buchholz trip) |   | O     |
| InsLevMax                 | SPS               | Insulation liquid level maximum  |   | O     |
| InsLevMin                 | SPS               | Insulation liquid level minimum  |   | O     |
| H2Alm                     | SPS               | H2 alarm   |   | O     |
| MstAlm                    | SPS               | Moisture sensor alarm  |   | O     |

Gelöscht: ppm

Gelöscht: ppm

Gelöscht: ppm

Gelöscht: ppm

Gelöscht: ppm

Gelöscht: ppm

Kommentar [HD101]: #59  
1

Kommentar [HD102]: add ed acc. comment DE19 and editor meeting in Baden

**5.14.5 LN: Supervision of Operating Mechanism Name: SOPM**

This LN is used for supervision of operating mechanism for switches. It is used to asses the condition of the operating mechanism and can be used to indicate a possible malfunction in the future. The LN SOPM is closely related to LN SSWI.

Today different technologies for operating mechanisms are available. Typically operating mechanisms for circuit breakers contain an energy storage to provide the required switching energy within a short time. Examples for todays storage medias are disk springs or compressed gas. To operate the switch the energy is transferred by means of a mechanical or hydraulical linkage. A charger motor is used to compensate energy loses due to leakages or to recharge the storage after a switch operation.

The proposed attributes covers the status of the relevant components as energy storage, hydraulic system and the charger motor. Depending on the used technology some of the attributes are not applicable. This LN can also be used for simple operating mechanism that are directly driven by a motor.

| SOPM class            |                   |   |   |       |
|-----------------------|-------------------|---|---|-------|
| Data Name             | Common Data Class | Explanation   | T | M/O/C |
| LNName                |                   | The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2 clause 19 |   |       |
| <b>Data</b>           |                   |   |   |       |
| EEHealth              | INS               | External equipment health   |   | O     |
| EEName                | DPL               | External equipment name plate   |   | O     |
| <b>Metered values</b> |                   |   |   |       |
| En                    | MV                | Stored energy (eg. stored energy or remaining energy)   |   | O     |

| SOPM class                |                   |  |   |       |
|---------------------------|-------------------|--|---|-------|
| Data Name                 | Common Data Class | Explanation  | T | M/O/C |
| HyPres                    | MV                | Hydraulic pressure                                 |   | Q     |
| HyTmp                     | MV                | Hydraulic temperature                              |   | Q     |
| MotTm                     | MV                | Operating time of the motor                        |   | Q     |
| MotA                      | MV                | Motor current                                      |   | Q     |
| Tmp                       | MV                | Temperature inside the drive cubicle               |   | Q     |
| ChgIntv                   | MV                | Time interval between last two charging operations |   | Q     |
| <b>Status information</b> |                   |  |   |       |
| HyAlm                     | SPS               | Hydraulic Alarm                                    |   | Q     |
| HyBlk                     | SPS               | Block of operation due to hydraulic                |   | Q     |
| EnBlk                     | SPS               | Energy block                                       |   | Q     |
| EnAlm                     | SPS               | Energy alarm                                       |   | Q     |
| MotAlm                    | SPS               | Motor operating time exceeded                      |   | Q     |
| HeatAlm                   | SPS               | Heater alarm                                       |   | Q     |

**Kommentar [HD103]:** further discussion about DO name and description could be needed

#### 5.14.6 LN: Monitoring and diagnostics for partial discharges Name: SPDC

For a description of this LN, see IEC 61850-5. IEC 60270 should be applied.

| SPDC class                |                   |   |   |       |
|---------------------------|-------------------|---|---|-------|
| Data Name                 | Common Data Class | Explanation   | T | M/O/C |
| LNName                    |                   | The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2 clause 19 |   |       |
| <b>Data</b>               |                   |   |   |       |
| EEHealth                  | INS               | External equipment health   |   | O     |
| EEName                    | DPL               | External equipment name plate   |   | O     |
| OpCnt                     | INS               | Operation counter   |   | M     |
| <b>Measured Values</b>    |                   |   |   |       |
| AcuPaDsCh                 | MV                | Acoustic level of partial discharge   |   | C     |
| AppPaDsCh                 | MV                | Apparent charge of partial discharge, peak level (PD)   |   | C     |
| NQS                       | MV                | Average discharge current   |   | C     |
| UHFPaDsCh                 | MV                | UHF level of partial discharge  |   | C     |
| <b>Status Information</b> |                   |   |   |       |
| PaDsChAlm                 | SPS               | Partial discharge alarm   |   | C     |
| <b>Settings</b>           |                   |   |   |       |
| CtrHz                     | ASG               | Center Frequency of measurement unit according to IEC 60270, clause 3.8   |   | Q     |
| Bndwid                    | ASG               | Bandwidth of measurement unit according to IEC 60270, clause 3.8  |   | Q     |

**Gelöscht:** in db

**Gelöscht:** in db

**Kommentar [HD104]:** acc. AT-1 / AT-2

Condition C: depending on the functionality, at least one of the data AcuPaDsCh, UHFPaDch, NQS, AppPaDsCh or PaDsChAlm shall be used.

**Kommentar [HD105]:** added acc. comment DE19 and editor meeting in Baden

#### 5.14.7 LN: Circuit Switch Supervision Name: SSWI

This LN is used for supervision of all switches, as circuit breakers, disconnectors, earthing switches, etc. It is used to assess the condition of the switch and is closely related to LN SOPM. Most attributes are used to supervise the operation timing of the switch and contact movement. Deviations from nominal values can be used to indicate a possible malfunction of the switch in the future. Abrasion of parts gives an indication when to overhaul the switch.

| <b>SSWI class</b>         |                          |   |          |              |
|---------------------------|--------------------------|---|----------|--------------|
| <u>Data Name</u>          | <u>Common Data Class</u> | <u>Explanation</u>  | <u>T</u> | <u>M/O/C</u> |
| LNName                    |                          | The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2 clause 19 |          |              |
| <b>Data</b>               |                          |   |          |              |
| EEHealth                  | INS                      | External equipment health   |          | O            |
| EEName                    | DPL                      | External equipment name plate   |          | O            |
| <b>Measured values</b>    |                          |   |          |              |
| AbrPrt                    | MV                       | Abrasion (in %) of parts subject to wear.   |          | O            |
| AuxSwTmOpn                | MV                       | Auxiliary switches timing Open  |          | O            |
| AuxSwTmCls                | MV                       | Auxiliary switches timing Close   |          | O            |
| RctTmOpn                  | MV                       | Reaction time measurement Open  |          | O            |
| RctTmCls                  | MV                       | Reaction time measurement   |          | O            |
| OpSpdOpn                  | MV                       | Operation speed Open  |          | O            |
| OpSpdCls                  | MV                       | Operation speed Close   |          | O            |
| OpTmOpn                   | MV                       | Operation time Open   |          | O            |
| OpTmCls                   | MV                       | Operation time Close  |          | O            |
| Stk                       | MV                       | Contact Stroke  |          | O            |
| OvStkOpn                  | MV                       | Overstroke Open   |          | O            |
| OvStkCls                  | MV                       | Overstroke Close  |          | O            |
| CoIA                      | MV                       | Coil current  |          | O            |
| Tmp                       | MV                       | Temperature e.g. inside drive mechanism   |          | O            |
| <b>Status Information</b> |                          |   |          |              |
| MechAlm                   | INS                      | Mechanical behaviour alarm  |          | O            |
| OpTmAlm                   | SPS                      | Switch operating time exceeded  |          | O            |
| CoIAlm                    | SPS                      | Coil alarm  |          | O            |
| PhDif                     | SPS                      | Phase discrepancy occurred  |          | O            |

**Kommentar [HD106]:** sum of alarms which are not in other alarms, belongs to the switch itself, not defined exactly

**Kommentar [HD107]:** belongs to Operation time

**Kommentar [HD108]:** belongs to current of coil

**Kommentar [HD109]:** sometimes there is no MV available

### 5.14.8 LN: Temperature supervision Name: STMP

Logical Node STMP shall be used to represent various devices that supervise the temperatures of major plant objects. It provides alarm and trip / shutdown functions. If more than one sensor (LN TTMP) is connected the LN STMP shall be instantiated for each sensor.

| <b>STMP class</b>         |                          |   |          |              |
|---------------------------|--------------------------|---|----------|--------------|
| <u>Data Name</u>          | <u>Common Data Class</u> | <u>Explanation</u>  | <u>T</u> | <u>M/O/C</u> |
| LNName                    |                          | The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2 clause 19 |          |              |
| <b>Data</b>               |                          |   |          |              |
| EEHealth                  | INS                      | External equipment health   |          | O            |
| EEName                    | DPL                      | External equipment nameplate  |          | O            |
| Loc                       | SPS                      | Local operation   |          | O            |
| <b>Measured values</b>    |                          |   |          |              |
| Tmp                       | MV                       | Temperature   |          | O            |
| <b>Status information</b> |                          |   |          |              |

|                 |     |                                   |  |   |
|-----------------|-----|-----------------------------------|--|---|
| Alm             | SPS | Temperature alarm level reached   |  | M |
| Trip            | SPS | Temperature trip level reached    |  | O |
| <b>Settings</b> |     |                                   |  |   |
| TmpAlmSpt       | ASG | Temperature alarm level set-point |  | M |
| TmpTrSpt        | ASG | Temperature trip level set-point  |  | O |

#### 5.14.9 LN: Vibration supervision      Name: SVBR

Logical Node SVBR shall be used to represent various devices that supervise the vibrations in rotating plant objects such as shafts, turbines, generators etc. It provides alarm and trip / shutdown functions. If more than one sensor (LN TVBR) is connected, the LN SVBR shall be instantiated for each sensor

| SVBR class                |                   |   |   |       |
|---------------------------|-------------------|---|---|-------|
| Data Name                 | Common Data Class | Explanation   | T | M/O/C |
| LNName                    |                   | The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2 clause 19 |   |       |
| <b>Data</b>               |                   |   |   |       |
| EEHealth                  | INS               | External equipment health   |   | O     |
| EEName                    | DPL               | External equipment name plate   |   | O     |
| <b>Measured Values</b>    |                   |   |   |       |
| Vbr                       | MV                | Vibration level   |   | O     |
| AxDsp                     | MV                | Total axial displacement  |   | O     |
| <b>Status Information</b> |                   |   |   |       |
| Alm                       | SPS               | Vibration alarm level reached   |   | M     |
| Trip                      | SPS               | Vibration trip level reached  |   | O     |
| <b>Settings</b>           |                   |   |   |       |
| VbrAlmSpt                 | ASG               | Vibration alarm level set-point   |   | M     |
| VbrTrSpt                  | ASG               | Vibration trip level set-point  |   | O     |
| AxDspAlmSpt               | ASG               | Axial displacement alarm level set-point  |   | O     |
| AxDspTrpSpt               | ASG               | Axial displacement trip level set-point   |   | O     |

Gelöscht: [mm/s]

Gelöscht: [mm]

#### 5.15 Logical Nodes for instrument transformers and sensors      LN Group: T

This group of Logical Nodes represents the sensors for all the different values which have to be continuously sampled for monitoring their behavior over time. These samples are used either by dedicated processing Logical Node classes as for Protection (see LN Group P) or by the related Supervision Logical Node classes (see LN group S). The sampling rate defines the time resolution of the resulting figures of the processing Logical Node classes (group P, group S). The modelling of samples are conditional since they are not exposed to communication in any case since T and S nodes may be implemented in the same IED.

Gelöscht:

##### 5.15.1 LN: Angle      Name: TANG

Logical Node TANG shall be used to represent a measurement of an angle between two objects (one of which might be a theoretical vertical or horizontal line). The measurement can be returned optionally as degrees or radians (° or rad). Compare also with the specific gate position indicator (HGPI) of this document.

| TANG class  |                   |   |   |       |
|-------------|-------------------|---|---|-------|
| Data Name   | Common Data Class | Explanation   | T | M/O/C |
| LNName      |                   | The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2 clause 19 |   |       |
| <b>Data</b> |                   |   |   |       |

|                        |     |                               |  |   |
|------------------------|-----|-------------------------------|--|---|
| EEHealth               | INS | External equipment health     |  | O |
| EEName                 | DPL | External equipment name plate |  | O |
| <b>Measured Values</b> |     |                               |  |   |
| AngRadSv               | SAV | Angle given as [Rad]          |  | C |
| AngDgrSv               | SAV | Angle given as [°]            |  | C |
| <b>Settings</b>        |     |                               |  |   |
| SmpRte                 | ING | Sampling rate setting         |  | O |

Condition C: The data is mandatory if the data is transmitted over a communication link and therefore it is visible.

**Kommentar [HD110]:** there could be only one data because definition by unit in SAV; discuss in Canada

**Gelöscht:** r

**Gelöscht:** are

**Gelöscht:** they are

### 5.15.2 LN: Axial displacement Name: TAXD

Logical Node TAXD shall be used to represent an axial displacement value. The axial displacement can, depending on the application, be either longitudinal or transverse to the shaft. This sensor is often used together with vibration sensors as input to a vibration monitoring system.

| TTXD class             |                   |   |   |       |
|------------------------|-------------------|---|---|-------|
| Data Name              | Common Data Class | Explanation   | T | M/O/C |
| LNNName                |                   | The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2 clause 19 |   |       |
| <b>Data</b>            |                   |   |   |       |
| EEHealth               | INS               | External equipment health   |   | O     |
| EEName                 | DPL               | External equipment name plate   |   | O     |
| <b>Measured Values</b> |                   |   |   |       |
| AxDspSv                | SAV               | Total axial displacement  |   | C     |
| <b>Settings</b>        |                   |   |   |       |
| Smplntv                | ING               | Sampling interval   |   | O     |

Condition C: The data is mandatory if the data is transmitted over a communication link and therefore it is visible.

**Gelöscht:** [mm]

**Gelöscht:** are

**Gelöscht:** they are

### 5.15.3 LN: Current transformer Name: TCTR

For a description of this LN, see IEC 61850-5. The current is delivered as sampled values. The sampled values are transmitted as engineering values, i.e. as “true” (corrected) primary current values. Therefore, the transformer ratio and the correction factors are of no interest for the transmitted samples, but for maintenance purposes of an external conventional (magnetic) transducer only. In addition, status information is provided and some other settings are accepted from the LN TCTR.

| TCTR class             |                   |   |   |       |
|------------------------|-------------------|---|---|-------|
| Data Name              | Common Data Class | Explanation   | T | M/O/C |
| LNNName                |                   | The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2 clause 19 |   |       |
| <b>Data</b>            |                   |   |   |       |
| EEHealth               | INS               | External equipment health   |   | O     |
| EEName                 | DPL               | External equipment name plate   |   | O     |
| OpTmh                  | INS               | Operation time  |   | O     |
| <b>Measured Values</b> |                   |   |   |       |
| AmpSv                  | SAV               | Current (Sampled value)   |   | C     |
| <b>Settings</b>        |                   |   |   |       |
| ARtg                   | ASG               | Rated Current   |   | O     |
| HzRtg                  | ASG               | Rated Frequency   |   | O     |
| Rat                    | ASG               | Winding ratio of an external current transformer (transducer) if applicable   |   | O     |
| Cor                    | ASG               | Current phasor magnitude correction of an external current transformer  |   | O     |
| AngCor                 | ASG               | Current phasor angle correction of an external current transformer  |   | O     |

Condition C: The data is mandatory if the data is transmitted over a communication link and therefore it is visible.

**Kommentar [HD111]:** scale factor should be incl.

**Gelöscht:** are

**Gelöscht:** they are

#### 5.15.4 LN: Distance Name: TDST

Logical Node TDST shall be used to represent a measurement of the distance to an object that can move. It is intended to provide a measurement between a fixed location and a movable object.

| TDST class             |                   |   |   |       |
|------------------------|-------------------|---|---|-------|
| Data Name              | Common Data Class | Explanation   | T | M/O/C |
| LNNName                |                   | The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2 clause 19 |   |       |
| <b>Data</b>            |                   |   |   |       |
| EEHealth               | INS               | External equipment health   |   | O     |
| EENName                | DPL               | External equipment name plate   |   | O     |
| <b>Measured Values</b> |                   |   |   |       |
| DisSv                  | SAV               | Distance [m]  |   | C     |
| <b>Settings</b>        |                   |   |   |       |
| SmpRte                 | ING               | Sampling rate setting   |   | O     |

Condition C: The data is mandatory if the data is transmitted over a communication link and therefore it is visible.

Gelöscht: t

Gelöscht: are

Gelöscht: they are

#### 5.15.5 LN: Liquid flow Name: TFLW

Logical Node TFLW shall be used to represent a measurement of media flow rate through the device where it is located.

| TFLW class             |                   |   |   |       |
|------------------------|-------------------|---|---|-------|
| Data Name              | Common Data Class | Explanation   | T | M/O/C |
| LNNName                |                   | The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2 clause 19 |   |       |
| <b>Data</b>            |                   |   |   |       |
| EEHealth               | INS               | External equipment health   |   | O     |
| EENName                | DPL               | External equipment name plate   |   | O     |
| <b>Measured Values</b> |                   |   |   |       |
| FlwSv                  | SAV               | Liquid flow rate [m <sup>3</sup> /s]  |   | C     |
| <b>Settings</b>        |                   |   |   |       |
| SmpRte                 | ING               | Sampling rate setting   |   | O     |

Condition C: The data is mandatory if the data is transmitted over a communication link and therefore it is visible.

Gelöscht: are

Gelöscht: they are

Gelöscht: are

#### 5.15.6 LN: Frequency Name: TFRQ

Logical Node TFRQ shall be used to represent a measurement of frequency. It is intended for any frequency that is not related to electrical ac measurements. It can be used for e.g. sound measurements, vibrations and timing of repeated occurrences. If a pure vibration is to be measured, where the movement rather than the frequency is of interest, the TVBR logical node is recommended.

| TFRQ class  |                   |   |   |       |
|-------------|-------------------|---|---|-------|
| Data Name   | Common Data Class | Explanation   | T | M/O/C |
| LNNName     |                   | The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2 clause 19 |   |       |
| <b>Data</b> |                   |   |   |       |
| EEHealth    | INS               | External equipment health   |   | O     |

|                        |     |   |  |   |
|------------------------|-----|---|--|---|
| EEName                 | DPL | External equipment name plate                   |  | O |
| <b>Measured Values</b> |     |   |  |   |
| HzSv                   | SAV | Frequency [Hz] related to non-electrical values |  | C |
| <b>Settings</b>        |     |   |  |   |
| SmpRte                 | ING | Sampling rate setting                           |  | O |

Condition C: The data is mandatory if the data js transmitted over a communication link and therefore it is visible.

Gelöscht: are

Gelöscht: they are

### 5.15.7 LN: Humidity Name: THUM

Logical Node THUM shall be used to represent a measurement of humidity in the media that is monitored. The result is given in percent of maximum possible humidity.

| THUM class             |                   |   |   |       |
|------------------------|-------------------|---|---|-------|
| Data Name              | Common Data Class | Explanation   | T | M/O/C |
| LNNName                |                   | The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2 clause 19 |   |       |
| <b>Data</b>            |                   |   |   |       |
| EEHealth               | INS               | External equipment health   |   | O     |
| EEName                 | DPL               | External equipment name plate   |   | O     |
| <b>Measured Values</b> |                   |   |   |       |
| HumSv                  | SAV               | Humidity [%]  |   | C     |
| <b>Settings</b>        |                   |   |   |       |
| SmpRte                 | ING               | Sampling rate setting   |   | O     |

Condition C: The data is mandatory if the data js transmitted over a communication link and therefore it is visible.

Gelöscht: dt

Gelöscht: are

Gelöscht: they are

### 5.15.8 LN: LMedia level Name: TLVL

Logical Node TLVL shall be used to represent a measurement of the media level in the container where it is located. The level is expressed as a percentage of full container. For a measurement given as a distance from a base level the HLVL logical node shall be used.

| TLVL class             |                   |   |   |       |
|------------------------|-------------------|---|---|-------|
| Data Name              | Common Data Class | Explanation   | T | M/O/C |
| LNNName                |                   | The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2 clause 19 |   |       |
| <b>Data</b>            |                   |   |   |       |
| EEHealth               | INS               | External equipment health   |   | O     |
| EEName                 | DPL               | External equipment name plate   |   | O     |
| <b>Measured Values</b> |                   |   |   |       |
| LevPctSv               | SAV               | Level [%]   |   | C     |
| <b>Settings</b>        |                   |   |   |       |
| SmpRte                 | ING               | Sampling rate setting   |   | O     |

Condition C: The data is mandatory if the data are transmitted over a communication link and therefore they are visible.

### 5.15.9 LN: Magnetic field Name: TMGF

Logical Node TMGF shall be used to represent a measurement of the magnetic field strength at the place where it is located.

| TMGF class |  |  |  |  |
|------------|--|--|--|--|
|------------|--|--|--|--|

| Data Name              | Common Data Class | Explanation   | T | M/O/C |
|------------------------|-------------------|---|---|-------|
| LNNName                |                   | The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2 clause 19 |   |       |
| <b>Data</b>            |                   |   |   |       |
| EEHealth               | INS               | External equipment health   |   | O     |
| EENName                | DPL               | External equipment name plate   |   | O     |
| <b>Measured Values</b> |                   |   |   |       |
| MagFldSv               | SAV               | Magnetic field strength / flux density [m/s]  |   | C     |
| <b>Settings</b>        |                   |   |   |       |
| SmpRte                 | ING               | Sampling rate setting   |   | O     |

Condition C: The data is mandatory if the data is transmitted over a communication link and therefore it is visible.

Gelöscht: are

Gelöscht: they are

#### 5.15.10 LN: Movement sensor Name: TMVM

Logical Node TPOS shall be used to represent the position of a movable device, actuator or similar. The position is given as a percentage of the full movement of the device being monitored. Compare with TDST that returns the distance in m.

| TMVM class             |                   |   |   |       |
|------------------------|-------------------|---|---|-------|
| Data Name              | Common Data Class | Explanation   | T | M/O/C |
| LNNName                |                   | The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2 clause 19 |   |       |
| <b>Data</b>            |                   |   |   |       |
| EEHealth               | INS               | External equipment health   |   | O     |
| EENName                | DPL               | External equipment name plate   |   | O     |
| <b>Measured Values</b> |                   |   |   |       |
| MvmRteSv               | SAV               | Movement rate [m/s]   |   | C     |
| <b>Settings</b>        |                   |   |   |       |
| SmpRte                 | ING               | Sampling rate setting   |   | O     |

Condition C: The data is mandatory if the data is transmitted over a communication link and therefore it is visible.

Gelöscht: are

Gelöscht: they are

#### 5.15.11 LN: Position indicator Name: TPOS

Logical Node TPOS shall be used to represent the position of a movable device, actuator or similar. The position is given as a percentage of the full movement of the device being monitored. Compare with TDST that returns the distance in m.

| TPOS class             |                   |   |   |       |
|------------------------|-------------------|---|---|-------|
| Data Name              | Common Data Class | Explanation   | T | M/O/C |
| LNNName                |                   | The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2 clause 19 |   |       |
| <b>Data</b>            |                   |   |   |       |
| EEHealth               | INS               | External equipment health   |   | O     |
| EENName                | DPL               | External equipment name plate   |   | O     |
| <b>Measured Values</b> |                   |   |   |       |
| PosPctSv               | SAV               | Position given as percentage of full movement [%]   |   | C     |
| <b>Settings</b>        |                   |   |   |       |
| SmpRte                 | ING               | Sampling rate setting   |   | O     |

Condition C: The data is mandatory if the data is transmitted over a communication link and therefore it is visible.

Gelöscht: are

Gelöscht: they are

**5.15.12 LN: Pressure sensor Name: TPRS**

Logical Node TPRS shall be used to represent the absolute pressure of a medium. The medium might be air, water, oil, steam or any other substance, the pressure of which needs to be supervised.

| TPRS class             |                   |   |   |       |
|------------------------|-------------------|---|---|-------|
| Data Name              | Common Data Class | Explanation   | T | M/O/C |
| LNNName                |                   | The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2 clause 19 |   |       |
| <b>Data</b>            |                   |   |   |       |
| EEHealth               | INS               | External equipment health   |   | O     |
| EENName                | DPL               | External equipment name plate   |   | O     |
| <b>Measured Values</b> |                   |   |   |       |
| PresSv                 | SAV               | Pressure of media [Pa]  |   | C     |
| <b>Settings</b>        |                   |   |   |       |
| SmpRte                 | ING               | Sampling rate setting   |   | O     |

Condition C: The data is mandatory if the data is transmitted over a communication link and therefore it is visible.

Gelöscht: are

Gelöscht: they are

**5.15.13 LN: Rotation transmitter Name: TRTN**

Logical Node TRTN shall be used to represent the rotational speed of a rotating device. Different measurement principles may be used, the presented result is however the same.

| TRTN class             |                   |   |   |       |
|------------------------|-------------------|---|---|-------|
| Data Name              | Common Data Class | Explanation   | T | M/O/C |
| LNNName                |                   | The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2 clause 19 |   |       |
| <b>Data</b>            |                   |   |   |       |
| EEHealth               | INS               | External equipment health   |   | O     |
| EENName                | DPL               | External equipment name plate   |   | O     |
| <b>Measured Values</b> |                   |   |   |       |
| RotSpdSv               | SAV               | Rotational speed [1/s]  |   | C     |
| <b>Settings</b>        |                   |   |   |       |
| SmpRte                 | ING               | Sampling rate setting   |   | O     |

Condition C: The data is mandatory if the data is transmitted over a communication link and therefore it is visible.

Gelöscht: r/s

Gelöscht: are

Gelöscht: they are

**5.15.14 LN: Sound pressure sensor Name: TSND**

Logical Node TSND shall be used to represent the sound pressure level at the location where the sensor is located.

| TSND class             |                   |   |   |       |
|------------------------|-------------------|---|---|-------|
| Data Name              | Common Data Class | Explanation   | T | M/O/C |
| LNNName                |                   | The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2 clause 19 |   |       |
| <b>Data</b>            |                   |   |   |       |
| EEHealth               | INS               | External equipment health   |   | O     |
| EENName                | DPL               | External equipment name plate   |   | O     |
| <b>Measured Values</b> |                   |   |   |       |
| SndSv                  | SAV               | Sound pressure level [B]  |   | C     |

| Settings |     |                       |   |
|----------|-----|-----------------------|---|
| SmpRte   | ING | Sampling rate setting | O |

Condition C: The data is mandatory if the data is transmitted over a communication link and therefore it is visible.

Gelöscht: are

Gelöscht: they are

#### 5.15.15 LN: Temperature sensor Name: TTMP

Logical Node TTMP shall be used to represent a single temperature measurement.

| TTMP class      |                   |   |   |       |
|-----------------|-------------------|---|---|-------|
| Data Name       | Common Data Class | Explanation   | T | M/O/C |
| LNNName         |                   | The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2 clause 19 |   |       |
| Data            |                   |   |   |       |
| EEHealth        | INS               | External equipment health   |   | O     |
| EENName         | DPL               | External equipment name plate   |   | O     |
| Measured Values |                   |   |   |       |
| TmpSv           | SAV               | Temperature [°C]  |   | C     |
| Settings        |                   |   |   |       |
| SmpRte          | ING               | Sampling rate setting   |   | O     |

Condition C: The data is mandatory if the data is transmitted over a communication link and therefore it is visible.

Gelöscht: are

Gelöscht: they are

#### 5.15.16 LN: Mechanical tension / stress Name: TTNS

Logical Node TTNS shall be used to represent a measurement of the mechanical tension in an object.

| TTNS class      |                   |   |   |       |
|-----------------|-------------------|---|---|-------|
| Data Name       | Common Data Class | Explanation   | T | M/O/C |
| LNNName         |                   | The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2 clause 19 |   |       |
| Data            |                   |   |   |       |
| EEHealth        | INS               | External equipment health   |   | O     |
| EENName         | DPL               | External equipment name plate   |   | O     |
| Measured Values |                   |   |   |       |
| Tns             | SAV               | Mechanical stress [N]   |   | C     |
| Settings        |                   |   |   |       |
| SmpRte          | ING               | Sampling rate setting   |   | O     |

Condition C: The data is mandatory if the data is transmitted over a communication link and therefore it is visible.

Gelöscht: are

Gelöscht: they are

#### 5.15.17 LN: Vibration sensor Name: TVBR

Logical Node TVBR shall be used to represent a vibration level value. In case the vibration can be defined as a frequency, the TFRQ logical node could be used instead.

| TVBR class |                   |   |   |       |
|------------|-------------------|---|---|-------|
| Data Name  | Common Data Class | Explanation   | T | M/O/C |
| LNNName    |                   | The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2 clause 19 |   |       |
| Data       |                   |   |   |       |
| EEHealth   | INS               | External equipment health   |   | O     |
| EENName    | DPL               | External equipment name plate   |   | O     |

| <b>Measured Values</b> |     |                       |   |
|------------------------|-----|-----------------------|---|
| VbrSv                  | SAV | Vibration [mm/s]      | C |
| <b>Settings</b>        |     |                       |   |
| SmpInt                 | ING | Sampling rate setting | O |

Condition C: The data is mandatory if the data is transmitted over a communication link and therefore it is visible.

Gelöscht: are

Gelöscht: they are

### 5.15.18 LN: Voltage transformer Name: TVTR

For a description of this LN, see IEC 61850-5. The voltage is delivered as sampled values. The sampled values are transmitted as engineering values, i.e. as "true" (corrected) primary voltage values. Therefore, the transformer ratio and the correction factors are of no interest for the transmitted samples but for maintenance purposes of an external conventional (magnetic) transducer only. In addition, status information is provided and some other settings are accepted from the LN TVTR.

| <b>TVTR class</b>         |                   |   |   |       |
|---------------------------|-------------------|---|---|-------|
| Data Name                 | Common Data Class | Explanation   | T | M/O/C |
| LNNName                   |                   | The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2 clause 19 |   |       |
| <b>Data</b>               |                   |   |   |       |
| EEHealth                  | INS               | External equipment health   |   | O     |
| EENName                   | DPL               | External equipment name plate   |   | O     |
| OpTmh                     | INS               | Operation time  |   | O     |
| <b>Measured Values</b>    |                   |   |   |       |
| VolSv                     | SAV               | Voltage (sampled value)   |   | C     |
| <b>Status Information</b> |                   |   |   |       |
| FuFail                    | SPS               | TVTR fuse failure   |   | O     |
| <b>Settings</b>           |                   |   |   |       |
| VRtg                      | ASG               | Rated Voltage   |   | O     |
| HzRtg                     | ASG               | Rated frequency   |   | O     |
| Rat                       | ASG               | Winding ratio of external voltage transformer (transducer) if applicable  |   | O     |
| Cor                       | ASG               | Voltage phasor magnitude correction of external voltage transformer   |   | O     |
| AngCor                    | ASG               | Voltage phasor angle correction of external voltage transformer   |   | O     |

Condition C: The data is mandatory if the data is transmitted over a communication link and therefore it is visible.

Gelöscht: are

Gelöscht: they are

### 5.15.19 LN: Water acidity Name: TWPH

Logical Node TWPH shall be used to represent a water pH level value.

| <b>TWPH class</b>      |                   |   |   |       |
|------------------------|-------------------|---|---|-------|
| Data Name              | Common Data Class | Explanation   | T | M/O/C |
| LNNName                |                   | The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2 clause 19 |   |       |
| <b>Data</b>            |                   |   |   |       |
| EEHealth               | INS               | External equipment health   |   | O     |
| EENName                | DPL               | External equipment name plate   |   | O     |
| <b>Measured Values</b> |                   |   |   |       |
| H2OPhSv                | SAV               | WaterpH level (0-14)  |   | C     |
| <b>Settings</b>        |                   |   |   |       |

Kommentar [HD112]: könnte jetzt Hyd genannt werden

Gelöscht: ydr

|        |     |                       |  |   |
|--------|-----|-----------------------|--|---|
| SmpRte | ING | Sampling rate setting |  | O |
|--------|-----|-----------------------|--|---|

Condition C: The data is mandatory if the data is transmitted over a communication link and therefore it is visible.

**Gelöscht:** are

**Gelöscht:** they are

## 5.16 Logical Nodes for switchgear LN Group: X

### 5.16.1 LN: Circuit breaker Name: XCBR

This LN is used for modelling switches with short circuit breaking capability. Additional LNs for example SIMS, etc. may be required to complete the logical modelling for the breaker being represented. The closing and opening commands shall be subscribed from CSWI or CPOW if applicable. If no "Time Activated Control" service is available between CSWI or CPOW and XCBR, the opening and closing commands shall be performed with a GSE-message (see IEC 61850-7-2).

| XCBR class                |                   |   |   |              |
|---------------------------|-------------------|---|---|--------------|
| Data Name                 | Common Data Class | Explanation   | T | M/O/C        |
| LNName                    |                   | The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2 clause 19 |   |              |
| <b>Data</b>               |                   |   |   |              |
| LocKey                    | SPS               | Local operation (local means without substation automation communication, hardwired direct control)                 |   | M            |
| <del>LocSta</del>         | <del>SPC</del>    | <del>Remote Control Blocked</del>   |   | <del>O</del> |
| Loc                       | SPS               | Local Control Behavior  |   | M            |
| EEHealth                  | INS               | External equipment health   |   | O            |
| EEName                    | DPL               | External equipment name plate   |   | O            |
| OpCnt                     | INS               | Operation counter   |   | M            |
| <b>Controls</b>           |                   |   |   |              |
| Pos                       | DPC               | Switch position   |   | M            |
| BlkOpn                    | SPC               | Block opening   |   | M            |
| BlkCls                    | SPC               | Block closing   |   | M            |
| ChaMotEna                 | SPC               | Charger motor enabled   |   | O            |
| <b>Metered Values</b>     |                   |   |   |              |
| SumSwARs                  | BCR               | Sum of Switched Amperes, resetable  |   | O            |
| <b>Status Information</b> |                   |   |   |              |
| CBOpCap                   | INS               | Circuit breaker operating capability  |   | <del>O</del> |
| POWCap                    | INS               | Point On Wave switching capability  |   | O            |
| MaxOpCap                  | INS               | Circuit breaker operating capability when fully charged   |   | O            |

**Kommentar [HD113]:** tisse ue #306 in annex give an example

**Gelöscht:** RemCtBlk

**Kommentar [HD114]:** change comes from Amd2, attention important change; the same for XSWI

### 5.16.2 LN: Circuit switch Name: XSWI

This LN is used for modelling switches without short circuit breaking capability, for example disconnectors, air break switches, earthing switches, etc. Additional LNs, SIMS, etc. may be required to complete the logical model for the switch being represented. The closing and opening commands shall be subscribed from CSWI. If no "Time Activated Control" service is available between CSWI or CPOW and XSWI, the opening and closing commands shall be performed with a GSE-message (see IEC 61850-7-2).

| XSWI class  |                   |   |   |       |
|-------------|-------------------|---|---|-------|
| Data Name   | Common Data Class | Explanation   | T | M/O/C |
| LNName      |                   | The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2 clause 19 |   |       |
| <b>Data</b> |                   |   |   |       |
| LocKey      | SPS               | Local operation   |   | M     |

| XSWI class                |                   |  |   |              |
|---------------------------|-------------------|--|---|--------------|
| Data Name                 | Common Data Class | Explanation  | T | M/O/C        |
| <del>LocSta</del>         | SPC               | Remote Control Blocked                                 |   | <del>O</del> |
| Loc                       | SPS               | Local Control Behavior                                 |   | M            |
| EEHealth                  | INS               | External equipment health                              |   | O            |
| EEName                    | DPL               | External equipment name plate                          |   | O            |
| OpCnt                     | INS               | Operation counter                                      |   | M            |
| <b>Controls</b>           |                   |  |   |              |
| Pos                       | DPC               | Switch position  |   | M            |
| BlkOpn                    | SPC               | Block opening  |   | M            |
| BlkCls                    | SPC               | Block closing  |   | M            |
| ChaMotEna                 | SPC               | Charger motor enabled                                  |   | O            |
| <b>Status Information</b> |                   |  |   |              |
| SwTyp                     | INS               | Switch type  |   | M            |
| SwOpCap                   | INS               | Switch operating capability                            |   | O            |
| MaxOpCap                  | INS               | Circuit switch operating capability when fully charged |   | O            |

**Kommentar [HD115]:** tisse ue #306 in annex give an example

**Gelöscht:** RemCtlBlk

### 5.17 Logical Nodes for power transformers LN Group: Y

#### 5.17.1 LN: Earth fault neutralizer (Petersen coil) Name: YEFN

For a description of this LN, see IEC 61850-5.

| YEFN class             |                   |   |   |              |
|------------------------|-------------------|---|---|--------------|
| Data Name              | Common Data Class | Explanation   | T | M/O/C        |
| LNName                 |                   | The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2 clause 19 |   |              |
| <b>Data</b>            |                   |   |   |              |
| LocKey                 | SPS               | Local operation   |   | M            |
| <del>LocSta</del>      | SPC               | Remote Control Blocked  |   | <del>O</del> |
| Loc                    | SPS               | Local Control Behavior  |   | O            |
| EEHealth               | INS               | External equipment health   |   | O            |
| EEName                 | DPL               | External equipment name plate   |   | O            |
| OpTmh                  | INS               | Operation time  |   | O            |
| <b>Measured Values</b> |                   |   |   |              |
| ECA                    | MV                | Earth coil current  |   | M            |
| <b>Controls</b>        |                   |   |   |              |
| ColTapPos              | ISC               | Coil Tap Position   |   | <del>C</del> |
| ColPos                 | APC               | Plunge Core Position  |   | <del>C</del> |

**Kommentar [HD116]:** tisse ue #306 in annex give an example

**Gelöscht:** RemCtlBlk

**Gelöscht:** M

**Kommentar [HD117]:** CH1 7, one of the data are mand.

**Gelöscht:** O

**Gelöscht:** ¶

Condition C: At least one of the data should be mandatory.

**5.17.2 LN: Tap changer Name: YLTC**

For a description of this LN, see IEC 61850-5.

| YLTC class                |                   |   |   |       |
|---------------------------|-------------------|---|---|-------|
| Data Name                 | Common Data Class | Explanation   | T | M/O/C |
| LNName                    |                   | The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2 clause 19 |   |       |
| <b>Data</b>               |                   |   |   |       |
| EEHealth                  | INS               | External equipment health   |   | O     |
| EEName                    | DPL               | External equipment name plate   |   | O     |
| OpCnt                     | INS               | Operation counter   |   | O     |
| <b>Measured Values</b>    |                   |   |   |       |
| Torq                      | MV                | Drive torque  |   | O     |
| MotDrvA                   | MV                | Motor drive current   |   | O     |
| AbrPrt                    | MV                | Abrasion (in %) of parts subject to wear  |   | O     |
| <b>Controls</b>           |                   |   |   |       |
| TapPos                    | ISC               | Change Tap Position to dedicated position   |   | C     |
| TapChg                    | BSC               | Change Tap Position (stop, higher, lower)   |   | C     |
| <b>Status Information</b> |                   |   |   |       |
| EndPosR                   | SPS               | End position raise reached  |   | M     |
| EndPosL                   | SPS               | End position lower reached  |   | M     |
| OilFil                    | SPS               | Oil filtration  |   | O     |
| MotDrvTr                  | SPS               | Motor drive overcurrent trip  |   | O     |
| VacCelAlm                 | SPS               | Circuit status of vacuum cell (ANSI)  |   | O     |
| OilFilTr                  | SPS               | Oil filter unit trip  |   | O     |
| OoStep                    | SPS               | Out of step alarm: supervision of diverter selector switch synchronism  |   | O     |
| LTCCycAlm                 | SPS               | LTC switching cycle incomplete: tap change operation without diverter switch operation                              |   | O     |

**Kommentar [HD118]:** acc. to an expert this DO should be renamed to " ...selector..", mail 30.11.07

Condition C: depending on the tap-change method, at least one of the two controls TapChg and TapPos shall be used.

**5.17.3 LN: Power shunt Name: YPSH**

For a description of this LN, see IEC 61850-5. The LN class power shunt also includes the switch for closing and opening the shunt.

| YPSH class      |                   |   |   |       |
|-----------------|-------------------|---|---|-------|
| Data Name       | Common Data Class | Explanation   | T | M/O/C |
| LNName          |                   | The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2 clause 19 |   |       |
| <b>Data</b>     |                   |   |   |       |
| EEHealth        | INS               | External equipment health   |   | O     |
| EEName          | DPL               | External equipment name plate   |   | O     |
| OpTmh           | INS               | Operation time  |   | O     |
| <b>Controls</b> |                   |   |   |       |
| Pos             | DPC               | Switch position   |   | M     |
| BlkOpn          | SPC               | Block opening   |   | M     |
| BlkCls          | SPC               | Block closing   |   | M     |
| ShOpCap         | INS               | Operating capability  |   | M     |
| ChaMotEna       | SPC               | Charger motor enabled   |   | O     |
| MaxOpCap        | INS               | Power shunt operating capability when fully charged   |   | O     |

**5.17.4 LN: Power transformer Name: YPTR**

For a description of this LN, see IEC 61850-5.

| YPTR class                |                   |   |   |       |
|---------------------------|-------------------|---|---|-------|
| Data Name                 | Common Data Class | Explanation   | T | M/O/C |
| LNName                    |                   | The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2 clause 19 |   |       |
| <b>Data</b>               |                   |   |   |       |
| EEHealth                  | INS               | External equipment health   |   | O     |
| EEName                    | DPL               | External equipment name plate   |   | O     |
| OpTmh                     | INS               | Operation time  |   | O     |
| <b>Measured Values</b>    |                   |   |   |       |
| HPTmp                     | MV                | Winding hotspot temperature (in °C)   |   | O     |
| Age                       | MV                | Aging rate  |   | O     |
| LoadFact                  | MV                | Load factor (apparent power / rated power)  |   | O     |
| MaxPwr                    | MV                | Maximum permissible permanent power (overload) [W]  |   | O     |
| OvITmm                    | MV                | Maximum permissible overload time with cooling unit [min]   |   | O     |
| OvITmmEmg                 | MV                | Maximum permissible overload time without cooling unit (emergency case) [min]                                       |   | O     |
| CoreTmp                   | MV                | Core temperature  |   | O     |
| <b>Status Information</b> |                   |   |   |       |
| HPTmpAlm                  | SPS               | Winding hot point temperature alarm   |   | O     |
| HPTmpOp                   | SPS               | Winding hot point temperature operate   |   | O     |
| HPTmpTr                   | SPS               | Winding hot point temperature trip  | T | O     |
| OANL                      | SPS               | Operation at no load  |   | O     |
| OpOvA                     | SPS               | Operation at overcurrent  |   | O     |
| OpOvV                     | SPS               | Operation at overvoltage  |   | O     |
| OpUnV                     | SPS               | Operation at undervoltage   |   | O     |
| CGAlm                     | SPS               | Core ground alarm   |   | O     |
| MbrAlm                    | SPS               | Leakage supervision alarm of tank conservator membrane  |   | O     |
| <b>Settings</b>           |                   |   |   |       |
| HivRtg                    | ASG               | Rated Voltage (High voltage level)  |   | O     |
| LoVRtg                    | ASG               | Rated Voltage (Low voltage level)   |   | O     |
| PwrRtg                    | ASG               | Rated power   |   | O     |

Gelöscht: EnvTmp [38]

Kommentar [HD120]: CH1 9 and proposal in mail from WW (07.01.08)

Kommentar [HD121]: CH1 9

**5.18 Logical Nodes for further power system equipment LN Group: Z**


**5.18.1 LN: Auxiliary network Name: ZAXN**

For a description of this LN, see IEC 61850-5.

| ZAXN class             |                   |   |   |       |
|------------------------|-------------------|---|---|-------|
| Data Name              | Common Data Class | Explanation   | T | M/O/C |
| LNName                 |                   | The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2 clause 19 |   |       |
| <b>Data</b>            |                   |   |   |       |
| EEHealth               | INS               | External equipment health   |   | O     |
| EEName                 | DPL               | External equipment name plate   |   | O     |
| OpTmh                  | INS               | Operation time  |   | O     |
| <b>Measured Values</b> |                   |   |   |       |
| Vol                    | MV                | Voltage of the auxiliary network  |   | O     |
| Amp                    | MV                | Current of the auxiliary network  |   | O     |

**5.18.2 LN: Battery Name: ZBAT**

For a description of this LN, see IEC 61850-5.

| ZBAT class                |                   |   |   |       |
|---------------------------|-------------------|---|---|-------|
| Data Name                 | Common Data Class | Explanation   | T | M/O/C |
| LNName                    |                   | The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2 clause 19           |   |       |
| <b>Data</b>               |                   |   |   |       |
| EEHealth                  | INS               | External equipment health   |   | O     |
| EEName                    | DPL               | External equipment name plate   |   | O     |
| OpTmh                     | INS               | Operation time  |   | O     |
| <b>Measured Values</b>    |                   |   |   |       |
| Vol                       | MV                | Battery voltage   |   | M     |
| VolChgRte                 | MV                | Rate of battery voltage change  |   | O     |
| Amp                       | MV                | Battery drain current   |   | O     |
| <b>Controls</b>           |                   |   |   |       |
| BatTest                   | SPC               | Start battery test  |   | O     |
| <b>Status Information</b> |                   |   |   |       |
| TestRsl                   | SPS               | Battery Test Results  |   | O     |
| BatHi                     | SPS               | Battery high (voltage or charge  Overcharge) |   | O     |
| BatLo                     | SPS               | Battery low (voltage or charge)   |   | O     |
| <b>Settings</b>           |                   |   |   |       |
| LoBatVal                  | ASG               | Low battery alarm value   |   | O     |
| HiBatVal                  | ASG               | High battery alarm value  |   | O     |

Gelöscht: -

**5.18.3 LN: Bushing Name: ZBSH**

For a description of this LN, see IEC 61850-5.

| ZBSH class             |                   |   |   |       |
|------------------------|-------------------|---|---|-------|
| Data Name              | Common Data Class | Explanation   | T | M/O/C |
| LNName                 |                   | The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2 clause 19 |   |       |
| <b>Data</b>            |                   |   |   |       |
| EEHealth               | INS               | External equipment health   |   | O     |
| EEName                 | DPL               | External equipment name plate   |   | O     |
| OpTmh                  | INS               | Operation time  |   | O     |
| <b>Measured Values</b> |                   |   |   |       |
| React                  | MV                | Relative capacitance of bushing related to the data RefReact  |   | M     |
| AbsReact               | MV                | Online capacitance, absolute value  |   | O     |
| LosFact                | MV                | Loss Factor (tan delta)   |   | O     |
| Vol                    | MV                | Voltage of bushing measuring tap  |   | O     |
| DisplA                 | MV                | Displacement current: apparent current at measuring tap   |   | O     |
| LeakA                  | MV                | Leakage current: active current at measuring tap  |   | O     |
| <b>Settings</b>        |                   |   |   |       |
| RefReact               | ASG               | Reference capacitance for bushing at commissioning  |   | O     |
| RefPF                  | ASG               | Reference power factor for bushing at commissioning   |   | O     |
| RefV                   | ASG               | Reference voltage for bushing at commissioning  |   | O     |

**5.18.4 LN: Power cable Name: ZCAB**

For a description of this LN, see IEC 61850-5.

| ZCAB class  |                   |   |   |       |
|-------------|-------------------|---|---|-------|
| Data Name   | Common Data Class | Explanation   | T | M/O/C |
| LNName      |                   | The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2 clause 19 |   |       |
| <b>Data</b> |                   |   |   |       |
| EEHealth    | INS               | External equipment health   |   | O     |
| EENName     | DPL               | External equipment name plate   |   | O     |
| OpTmh       | INS               | Operation time  |   | O     |

**5.18.5 LN: Capacitor bank Name: ZCAP**

For a description of this LN, see IEC 61850-5.

| ZCAP class                |                   |   |   |       |
|---------------------------|-------------------|---|---|-------|
| Data Name                 | Common Data Class | Explanation   | T | M/O/C |
| LNName                    |                   | The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2 clause 19 |   |       |
| <b>Data</b>               |                   |   |   |       |
| EEHealth                  | INS               | External equipment health   |   | O     |
| EENName                   | DPL               | External equipment name plate   |   | O     |
| OpTmh                     | INS               | Operation time  |   | O     |
| <b>Controls</b>           |                   |   |   |       |
| CapDS                     | SPC               | Capacitor bank device status  |   | M     |
| <b>Status Information</b> |                   |   |   |       |
| DschBlk                   | SPS               | Blocked due to discharge  |   | M     |

**5.18.6 LN: Converter Name: ZCON**

For a description of this LN, see IEC 61850-5.

| ZCON class  |                   |   |   |       |
|-------------|-------------------|---|---|-------|
| Data Name   | Common Data Class | Explanation   | T | M/O/C |
| LNName      |                   | The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2 clause 19 |   |       |
| <b>Data</b> |                   |   |   |       |
| EEHealth    | INS               | External equipment health   |   | O     |
| EENName     | DPL               | External equipment name plate   |   | O     |
| OpTmh       | INS               | Operation time  |   | O     |

**5.18.7 LN: Generator Name: ZGEN**

For a description of this LN, see IEC 61850-5.

| ZGEN class  |                   |   |   |       |
|-------------|-------------------|---|---|-------|
| Data Name   | Common Data Class | Explanation   | T | M/O/C |
| LNName      |                   | The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2 clause 19 |   |       |
| <b>Data</b> |                   |   |   |       |
| EEHealth    | INS               | External equipment health   |   | O     |

| ZGEN class                |                   |  |   |       |
|---------------------------|-------------------|--|---|-------|
| Data Name                 | Common Data Class | Explanation  | T | M/O/C |
| EEName                    | DPL               | External equipment name plate                                    |   | O     |
| OpTmh                     | INS               | Operation time   |   | O     |
| <b>Controls</b>           |                   |  |   |       |
| GnCtl                     | DPC               | Generator control  |   | M     |
| DExt                      | SPC               | De-excitation  |   | M     |
| AuxSCO                    | SPC               | Aux. supply change over  |   | O     |
| StopVlv                   | SPC               | Stop valve   |   | O     |
| ReactPwrR                 | SPC               | Reactive power raise   |   | O     |
| ReactPwrL                 | SPC               | Reactive power lower   |   | O     |
| <b>Measured Values</b>    |                   |  |   |       |
| GnSpd                     | MV                | Generator Speed  |   | O     |
| <b>Status Information</b> |                   |  |   |       |
| GnSt                      | INS               | Generator state (stopped, Starting, Started, Stopping, Disabled) |   | M     |
| OANL                      | SPS               | Operation at no load   |   | M     |
| ClkRot                    | SPS               | Phase rotation clockwise   |   | M     |
| CntClkRot                 | SPS               | Phase rotation counter clockwise                                 |   | M     |
| OpUnExt                   | SPS               | Operation at under-excitation                                    |   | M     |
| OpOvExt                   | SPS               | Operation at over-excitation                                     |   | M     |
| LosOil                    | SPS               | Loss of oil  |   | O     |
| LosVac                    | SPS               | Loss of vacuum   |   | O     |
| PresAlm                   | SPS               | Low pressure alarm   |   | O     |
| <b>Settings</b>           |                   |  |   |       |
| DmdPwr                    | ASG               | Demanded power   |   | O     |
| PwrRtg                    | ASG               | Rated power  |   | O     |
| VRtg                      | ASG               | Rated Voltage  |   | O     |

### 5.18.8 LN: Gas insulated line Name: ZGIL

For a description of this LN, see IEC 61850-5.

| ZGIL class  |                   |   |   |       |
|-------------|-------------------|---|---|-------|
| Data Name   | Common Data Class | Explanation   | T | M/O/C |
| LNName      |                   | The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2 clause 19 |   |       |
| <b>Data</b> |                   |   |   |       |
| EEHealth    | INS               | External equipment health   |   | O     |
| EEName      | DPL               | External equipment name plate   |   | O     |
| OpTmh       | INS               | Operation time  |   | O     |

### 5.18.9 LN: Power overhead line Name: ZLIN

For a description of this LN, see IEC 61850-5. ZLIN represents an overhead line with all physical characteristics.

| ZLIN class  |                   |   |   |       |
|-------------|-------------------|---|---|-------|
| Data Name   | Common Data Class | Explanation   | T | M/O/C |
| LNName      |                   | The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2 clause 19 |   |       |
| <b>Data</b> |                   |   |   |       |

| ZLIN class      |                   |  |   |       |
|-----------------|-------------------|--|---|-------|
| Data Name       | Common Data Class | Explanation                            | T | M/O/C |
| EEHealth        | INS               | External equipment health              |   | O     |
| EEName          | DPL               | External equipment name plate          |   | O     |
| OpTmh           | INS               | Operation time                         |   | O     |
| <b>Settings</b> |                   |  |   |       |
| LinLenkm        | ASG               | Line length in km                      |   | O     |
| R1              | ASG               | Positive-sequence line resistance      |   | O     |
| X1              | ASG               | Positive-sequence line reactance       |   | O     |
| R0              | ASG               | Zero-sequence line resistance          |   | O     |
| X0              | ASG               | Zero-sequence line reactance           |   | O     |
| Z1Mod           | ASG               | Positive-sequence line impedance value |   | O     |
| Z1Ang           | ASG               | Positive-sequence line impedance angle |   | O     |
| Z0Mod           | ASG               | Zero-sequence line impedance value     |   | O     |
| Z0Ang           | ASG               | Zero-sequence line impedance angle     |   | O     |
| Rm0             | ASG               | Mutual resistance                      |   | O     |
| Xm0             | ASG               | Mutual reactance                       |   | O     |
| Zm0Mod          | ASG               | Mutual impedance value                 |   | O     |
| Zm0Ang          | ASG               | Mutual impedance angle                 |   | O     |

**5.18.10 LN: Motor Name: ZMOT**

For a description of this LN, see IEC 61850-5.

| ZMOT class                |                   |   |   |       |
|---------------------------|-------------------|---|---|-------|
| Data Name                 | Common Data Class | Explanation   | T | M/O/C |
| LNName                    |                   | The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2 clause 19 |   |       |
| <b>Data</b>               |                   |   |   |       |
| EEHealth                  | INS               | External equipment health   |   | O     |
| EEName                    | DPL               | External equipment name plate   |   | O     |
| OpTmh                     | INS               | Operation time  |   | O     |
| <b>Controls</b>           |                   |   |   |       |
| DExt                      | SPC               | De-excitation   |   | M     |
| <b>Status Information</b> |                   |   |   |       |
| LosOil                    | SPS               | Loss of oil   |   | O     |
| LosVac                    | SPS               | Loss of vacuum  |   | O     |
| PresAlm                   | SPS               | Low pressure alarm  |   | O     |

**5.18.11 LN: Reactor Name: ZREA**

For a description of this LN, see IEC 61850-5.

| ZREA class  |                   |   |   |       |
|-------------|-------------------|---|---|-------|
| Data Name   | Common Data Class | Explanation   | T | M/O/C |
| LNName      |                   | The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2 clause 19 |   |       |
| <b>Data</b> |                   |   |   |       |
| EEHealth    | INS               | External equipment health   |   | O     |
| EEName      | DPL               | External equipment name plate   |   | O     |

| ZREA class |                   |                |   |       |
|------------|-------------------|----------------|---|-------|
| Data Name  | Common Data Class | Explanation    | T | M/O/C |
| OpTmh      | INS               | Operation time |   | O     |

#### 5.18.12 LN: Neutral resistor Name: ZRES

Logical Node ZRES shall be used to represent a neutral resistor. The resistor is normally not controlled; this LN is a placeholder for rating plate data.

| ZRES class  |                   |   |   |       |
|-------------|-------------------|---|---|-------|
| Data Name   | Common Data Class | Explanation   | T | M/O/C |
| LNName      |                   | The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2 clause 19 |   |       |
| <b>Data</b> |                   |   |   |       |
| EEHealth    | INS               | External equipment health   |   | O     |
| EENName     | DPL               | External equipment name plate   |   | O     |
| OpTmh       | INS               | Operation time  |   | O     |

#### 5.18.13 LN: Rotating reactive component Name: ZRRC

For a description of this LN, see IEC 61850-5.

| ZRRC class  |                   |   |   |       |
|-------------|-------------------|---|---|-------|
| Data Name   | Common Data Class | Explanation   | T | M/O/C |
| LNName      |                   | The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2 clause 19 |   |       |
| <b>Data</b> |                   |   |   |       |
| EEHealth    | INS               | External equipment health   |   | O     |
| EENName     | DPL               | External equipment name plate   |   | O     |
| OpTmh       | INS               | Operation time  |   | O     |

#### 5.18.14 LN: Surge arrestor Name: ZSAR

For a description of this LN, see IEC 61850-5.

| ZSAR class                |                   |   |   |       |
|---------------------------|-------------------|---|---|-------|
| Data Name                 | Common Data Class | Explanation   | T | M/O/C |
| LNName                    |                   | The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2 clause 19 |   |       |
| <b>Data</b>               |                   |   |   |       |
| EEHealth                  | INS               | External equipment health   |   | O     |
| EENName                   | DPL               | External equipment name plate   |   | O     |
| OpCnt                     | INS               | Operation counter   |   | O     |
| <b>Status Information</b> |                   |   |   |       |
| OPSA                      | SPS               | Operation of surge arrestor   | T | M     |

#### 5.18.15 LN: Semi-conductor controlled rectifier Name: ZSCR

Logical Node ZSCR shall be used to represent a controllable rectifier. A typical use is to provide the controllable dc current within an excitation system.

| ZSCR class |  |  |  |  |
|------------|--|--|--|--|
|------------|--|--|--|--|

| Data Name                 | Common Data Class | Explanation   | T | M/O/C |
|---------------------------|-------------------|---|---|-------|
| LNName                    |                   | The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2 clause 19 |   |       |
| <b>Data</b>               |                   |   |   |       |
| EEHealth                  | INS               | External equipment health   |   | O     |
| EEName                    | DPL               | External equipment name plate   |   | O     |
| OpTmh                     | INS               | Operation time  |   | O     |
| <b>Status Information</b> |                   |   |   |       |
| Alm                       | SPS               | Control function alarm  |   | M     |
| <b>Settings</b>           |                   |   |   |       |
| SetA                      | ASG               | Current setting (if operating to a fixed current)   |   | C     |
| SetV                      | ASG               | Voltage setting (if operating to a fixed voltage)   |   | C     |
| <b>Controls</b>           |                   |   |   |       |
| OpModRect                 | ING               | Control mode setting (A, V, W)  |   | C     |
| AmpSpt                    | APC               | Current target set-point  |   | C     |
| VoltSpt                   | APC               | Voltage target set-point  |   | C     |

Condition C: The rectifier can be used to provide a fixed voltage and controllable current, to provide a fixed current and a controllable voltage or have both current and voltage controllable. If either voltage or current is fixed, the set-point shall be given as a setting.

**5.18.16 LN: Synchronous machine Name: ZSMC**

Logical Node ZSMC shall be used to represent any type of synchronous machine. The logical node only includes rating data, all controls and operational status information is found in other logical nodes in this document, compare e.g. the logical node HUNT.

**Kommentar [HD122]:** LN HUNT exists only in Hydro part therefore reference is not correct

| ZSMC class                |                   |   |   |       |
|---------------------------|-------------------|---|---|-------|
| Data Name                 | Common Data Class | Explanation   | T | M/O/C |
| LNName                    |                   | The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2 clause 19 |   |       |
| <b>Data</b>               |                   |   |   |       |
| EEHealth                  | INS               | External equipment health   |   | O     |
| EEName                    | DPL               | External equipment name plate   |   | O     |
| OpTmh                     | INS               | Operation time  |   | O     |
| <b>Measured Values</b>    |                   |   |   |       |
| PwrRtg                    | INS               | Rated apparent power [VA]   |   | M     |
| VRtg                      | INS               | Rated voltage [V]   |   | M     |
| ARtg                      | INS               | Rated stator current [A]  |   | M     |
| SpdRtg                    | INS               | Synchronous machine rated speed [s <sup>-1</sup> ]  |   | M     |
| SpdCrit                   | INS               | Synchronous machine critical speed of the generator [s <sup>-1</sup> ]  |   | O     |
| FldRisTmp                 | INS               | Reference temperature for field resistance [°C]   |   | O     |
| StatRisTmp                | INS               | Reference temperature for stator resistance [°C]  |   | O     |
| <b>Status Information</b> |                   |   |   |       |
| RotDir                    | SPS               | Field rotation direction (TRUE = clockwise)   |   | O     |
| <b>Settings</b>           |                   |   |   |       |
| StatRis                   | ASG               | Stator resistance [Ohm]   |   | O     |
| PFRtg                     | ASG               | Rated power factor  |   | O     |
| Iner                      | ASG               | Synchronous machine moment of inertia J [kgm <sup>2</sup> ]   |   | O     |
| FldAmpRtg                 | ASG               | Rated field current [A]   |   | O     |
| FldAmpRtgO                | ASG               | No-load field current for rated stator voltage [A]  |   | O     |
| FldRis                    | ASG               | Field resistance [Ohm]  |   | O     |

**Gelöscht:** tia

| ZSMC class |                   |   |   |       |
|------------|-------------------|---|---|-------|
| Data Name  | Common Data Class | Explanation   | T | M/O/C |
| Baselmp    | ASG               | Base p.u. impedance [Ohm /phase]  |   | 0     |
| StatLReact | ASG               | Stator leakage reactance [p.u.]   |   | 0     |
| ReactXd    | ASG               | D-axis synchronous reactance Xd [p.u.] (unsaturated)                    |   | 0     |
| ReactXdPr  | ASG               | D-axis transient synchronous reactance Xd' [p.u.] (unsaturated)         |   | 0     |
| ReactXdSe  | ASG               | D-axis Reactance Xd'' [p.u.] (unsaturated)                              |   | 0     |
| ReactXq    | ASG               | Q-axis synchronous reactance Xq [p.u.] (unsaturated)                    |   | 0     |
| ReactXqPr  | ASG               | Q-axis transient reactance Xq' [p.u.] (unsaturated)                     |   | 0     |
| ReactXqSe  | ASG               | Q-axis sub-transient reactance Xq'' [p.u.] (unsaturated)                |   | 0     |
| ReactX0    | ASG               | Zero sequence Reactance X0 [p.u.] (unsaturated)                         |   | 0     |
| ReactX2    | ASG               | Negative sequence Reactance X2 [p.u.] (unsaturated)                     |   | 0     |
| TmCstTdP   | ASG               | D-axis short circuit transient time constant Td' [s] (unsaturated)      |   | 0     |
| TmCstTdS   | ASG               | D-axis short-circuit sub-transient time constant Td''[s] (unsaturated)  |   | 0     |
| TmCstTd0P  | ASG               | D-axis open circuit transient time constant Td0' [s] (unsaturated)      |   | 0     |
| TmCstTd0S  | ASG               | D-axis open circuit sub-transient time constant Td0''[s] (unsaturated)  |   | 0     |
| TmCstTqP   | ASG               | Q-axis short circuit transient time constant Tq' [s] (unsaturated)      |   | 0     |
| TmCstTqS   | ASG               | Q-axis short circuit sub-transient time constant Tq'' [s] (unsaturated) |   | 0     |
| TmCstTq0P  | ASG               | Q-axis open circuit transient time constant Tq0' [s] (unsaturated)      |   | 0     |
| TmCstTq0S  | ASG               | Q-axis open circuit sub-transient time constant Tq0''[s] (unsaturated)  |   | 0     |
| TmCstTa    | ASG               | Armature time constant Ta[s] (unsaturated)                              |   | 0     |
| SatCffS10  | ASG               | Saturation coefficient S1.0   |   | 0     |
| SatCffS12  | ASG               | Saturation coefficient S1.2   |   | 0     |

Kommentar [HD123]:  
#574

### 5.18.17 LN: Thyristor controlled frequency converter Name: ZTCF

For a description of this LN, see IEC 61850-5.

| ZTCF class      |                   |   |   |       |
|-----------------|-------------------|---|---|-------|
| Data Name       | Common Data Class | Explanation   | T | M/O/C |
| LNName          |                   | The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2 clause 19 |   |       |
| <b>Data</b>     |                   |   |   |       |
| EEHealth        | INS               | External equipment health   |   | 0     |
| EEName          | DPL               | External equipment name plate   |   | 0     |
| OpTmh           | INS               | Operation time  |   | 0     |
| <b>Settings</b> |                   |   |   |       |
| PwrHz           | ASG               | Target frequency  |   | 0     |

### 5.18.18 LN: Thyristor controlled reactive component Name: ZTCR

For a description of this LN, see IEC 61850-5.

| ZTCR class |                   |   |   |       |
|------------|-------------------|---|---|-------|
| Data Name  | Common Data Class | Explanation   | T | M/O/C |
| LNName     |                   | The name shall be composed of the class name, the LN-Prefix and LN- |   |       |

| ZTCR class  |                   |  |   |       |
|-------------|-------------------|--|---|-------|
| Data Name   | Common Data Class | Explanation                                      | T | M/O/C |
|             |                   | Instance-ID according to IEC 61850-7-2 clause 19 |   |       |
| <b>Data</b> |                   |  |   |       |
| EEHealth    | INS               | External equipment health                        |   | O     |
| EEName      | DPL               | External equipment name plate                    |   | O     |
| OpTmh       | INS               | Operation time                                   |   | O     |

## 6 Data name semantics

In Table 9, the data used in Clause 5 are described. The meaning of Boolean values are FALSE = 0, TRUE = 1.

**Table 9 – Description of Data**

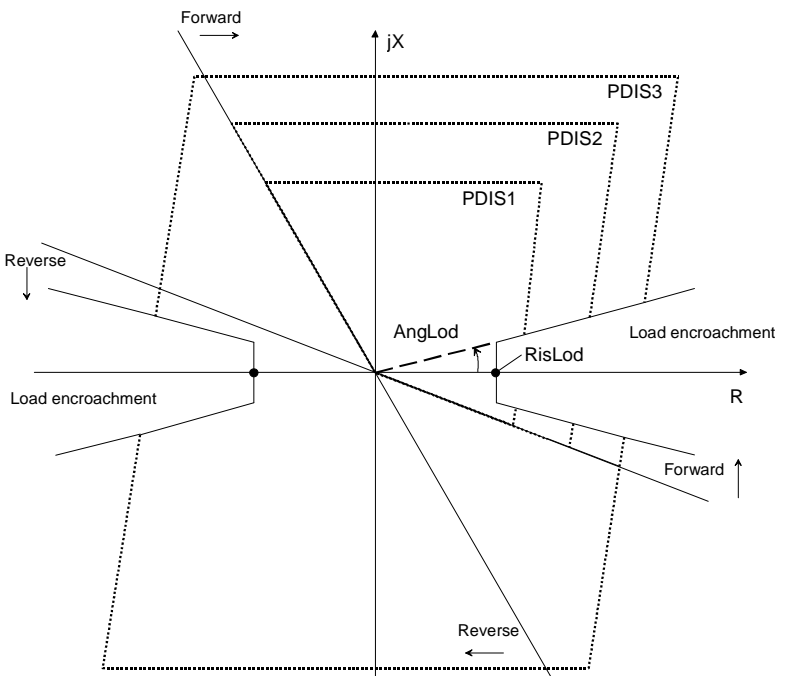
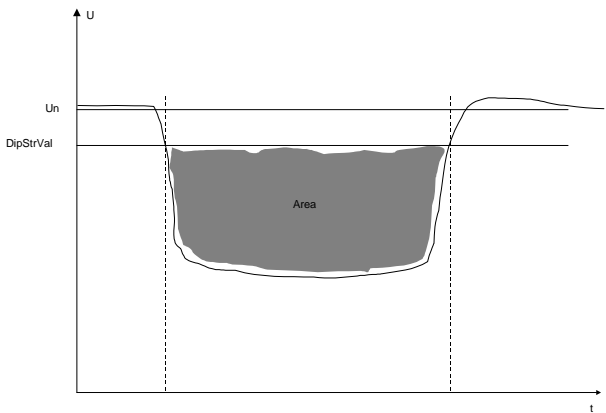
| Data Name     | Semantics  |
|---------------|--|
| A             | Phase currents (IL1, IL2, IL3)   |
| <u>AbrPrt</u> | <u>Calculated or measured wear (e.g. of main contact), expressed in % where 0% corresponds to new condition</u>  |
| AcsCtlFail    | Number of access control failures detected: <u>a</u> data that the client wanted to access exists in the server, but based on the access view of the association with that client, an access to the data was refused.  |
| AcuPaDsch     | Acoustic level of partial discharge in db.   |
| AdjMsg        | Adjustment Message<br>0- <u>Completed</u><br>1- <u>Cancelled</u><br>2- <u>New adjustments</u><br>3- <u>Under way</u>   |
| AgeRat        | Ageing rate, for example of transformer.   |
| Alm           | General single alarm.  |
| AlmLstOv      | TRUE = Indication that the Alarm List has overflowed.  |
| AlmThm        | Thermal Alarm.   |
| AlmVal        | Alarm Value is the pre-set value for a measurand that when reached will result in an alarm.  |
| Amp           | Current of a non-three-phase circuit.  |
| Ang           | Angle between phase voltage and current.   |
| AngCor        | Phase angle correction of a phasor (used for example for instrument transformers/transducers).   |
| AngInd        | This Data indicates the check result of the differences between the angles of the busbar and line voltages. FALSE indicates that the angle difference is below the required limit. The angle difference criteria for the synchronising are fulfilled. TRUE indicates the angle difference exceeds the limit. The synchronising process shall be aborted because the angle criteria are not fulfilled (synchrocheck) or shall be continued with turbine control activities (synchronising). |

Gelöscht: 9

Kommentar [HD124]: #20  
9

Gelöscht: 0

... [39]

| Data Name    | Semantics   |
|--------------|---|
| AngLod       | <p>Angle for load area. The following is an example of the definition of load encroachment used for the Data AngLod and RisLod with polygonal characteristic, applicable also with MHO. PDIS1, PDIS2, and PDIS3 are different instances of the LN PDIS, one for each zone. See also RisGndRch.</p>  <p style="text-align: right;"><i>IEC 1104/03</i></p> |
| AnIn         | Analogue Input used for generic I/O.  |
| <b>AnOut</b> | <b>Controllable analogue output</b>   |
| ArcCntRs     | Arc counter, resettable.  |
| ARtg         | Rated current, intrinsic property of the device, which cannot be set/changed from remote.   |
| AStr         | Current level: if this level is exceeded, the related functions start a dedicated action.   |
| Area         | <p>The total calculated Area of a power quality event (ex. Voltage Sag in Fig.)</p>    |
| AuthFail     | Number of authorisation failures: an association to the client could not be established due to an authorisation failure.  |

**Kommentar [HD125]: #20**  
9

| Data Name                  | Semantics   |                       |       |       |   |             |   |            |   |
|----------------------------|---|-----------------------|-------|-------|---|-------------|---|------------|---|
| Auto                       | This Data is responsible for the enabling or disabling of the output circuit of the automatic controller; automatic (TRUE) = output circuit is enabled, not automatic (FALSE) = output circuit is disabled.   |                       |       |       |   |             |   |            |   |
| AutoRecSt                  | This Data represents whether or not the auto reclosing is ready, in progress, or successful. <table border="1"> <thead> <tr> <th>Auto Reclosing Status</th> <th>Value</th> </tr> </thead> <tbody> <tr> <td>Ready</td> <td>1</td> </tr> <tr> <td>In Progress</td> <td>2</td> </tr> <tr> <td>Successful</td> <td>3</td> </tr> </tbody> </table> | Auto Reclosing Status | Value | Ready | 1 | In Progress | 2 | Successful | 3 |
| Auto Reclosing Status      | Value   |                       |       |       |   |             |   |            |   |
| Ready                      | 1   |                       |       |       |   |             |   |            |   |
| In Progress                | 2   |                       |       |       |   |             |   |            |   |
| Successful                 | 3   |                       |       |       |   |             |   |            |   |
| AutoUpLod                  | TRUE = automatic uploading of the disturbance recorder files.   |                       |       |       |   |             |   |            |   |
| AuxSCO                     | TRUE = Commands change over to operation from the auxiliary power supply.   |                       |       |       |   |             |   |            |   |
| <a href="#">AuxSwTmCls</a> | <a href="#">Timing of the close operation measured by auxiliary switches (usually displayed in ms) Significant changes in timing can point to a malfunction of the mechanical link, e.g. missing lubricant</a>  |                       |       |       |   |             |   |            |   |
| <a href="#">AuxSwTmOpn</a> | <a href="#">Timing of the open operation measured by auxiliary switches (usually displayed in ms). Description see AuxswTmCls</a>   |                       |       |       |   |             |   |            |   |
| AvAmps                     | Average current in a defined evaluation interval (period)   |                       |       |       |   |             |   |            |   |
| AVCrv                      | Characteristic Curve for protection operation of the form: $\gamma = f(x)$ , where $x = V$ (voltage) and $\gamma = A$ (current) The integers representing the different curves are given in the definition of CDC CURVE in IEC 61850-7-3.   |                       |       |       |   |             |   |            |   |
| AvDF                       | Average Displacement Power Factor (pu)  |                       |       |       |   |             |   |            |   |
| avgTPF                     | Average True Power Factor (pu)  |                       |       |       |   |             |   |            |   |
| AVSt                       | Delivers the active curve characteristic.   |                       |       |       |   |             |   |            |   |
| AvVA                       | Average apparent power in a defined evaluation interval (period).   |                       |       |       |   |             |   |            |   |
| AvVAr                      | Average reactive power in a defined evaluation interval (period).   |                       |       |       |   |             |   |            |   |
| AvVolts                    | Average voltage in a defined evaluation interval (period).  |                       |       |       |   |             |   |            |   |
| AvW                        | Average real power in a defined evaluation interval (period).   |                       |       |       |   |             |   |            |   |
| BatHi                      | TRUE = Indicates that battery is in overcharge condition.   |                       |       |       |   |             |   |            |   |
| BatLo                      | TRUE = Indicates that battery voltage has dropped below a pre-set level.  |                       |       |       |   |             |   |            |   |
| BatTest                    | TRUE = Command to start the battery test.   |                       |       |       |   |             |   |            |   |

Gelöscht: g

| Data Name          | Semantics   |                               |                    |                               |                |    |    |    |   |    |         |         |   |    |      |      |   |    |              |              |   |    |     |     |   |         |    |         |   |         |         |         |   |         |      |              |   |         |              |              |   |         |     |     |   |      |    |      |   |      |         |              |   |      |      |      |   |      |              |              |   |      |     |     |   |              |    |              |   |              |         |              |   |              |      |              |   |              |              |              |   |              |     |     |   |     |    |     |   |     |         |     |   |     |      |     |   |     |              |     |   |     |     |     |   |
|--------------------|---|-------------------------------|--------------------|-------------------------------|----------------|----|----|----|---|----|---------|---------|---|----|------|------|---|----|--------------|--------------|---|----|-----|-----|---|---------|----|---------|---|---------|---------|---------|---|---------|------|--------------|---|---------|--------------|--------------|---|---------|-----|-----|---|------|----|------|---|------|---------|--------------|---|------|------|------|---|------|--------------|--------------|---|------|-----|-----|---|--------------|----|--------------|---|--------------|---------|--------------|---|--------------|------|--------------|---|--------------|--------------|--------------|---|--------------|-----|-----|---|-----|----|-----|---|-----|---------|-----|---|-----|------|-----|---|-----|--------------|-----|---|-----|-----|-----|---|
| Beh                | <p>Since the logical device controls all logical nodes that are part of the logical device, the mode of the logical device ("LDMode" = LLN0.Mod) and the mode of a specific logical node ("LNMode" = XXXX.Mod) are related. The behaviour of a logical node is therefore a combination of LLN0.Mod and XXXX.Mod and is described in the "LNBeh" = XXXX.Beh. This Data is read-only and has the same possible values as <b>Mod</b> (Mode). The value is determined according the following table:</p> <table border="1"> <thead> <tr> <th>LNMode<br/>XXXX.Mod</th> <th>LDMode<br/>LLN0.Mod</th> <th>LNBeh (read only)<br/>XXXX.Beh</th> <th>LNBeh<br/>Value</th> </tr> </thead> <tbody> <tr><td>on</td><td>on</td><td>on</td><td>1</td></tr> <tr><td>on</td><td>blocked</td><td>blocked</td><td>2</td></tr> <tr><td>on</td><td>test</td><td>test</td><td>3</td></tr> <tr><td>on</td><td>test-blocked</td><td>test-blocked</td><td>4</td></tr> <tr><td>on</td><td>off</td><td>off</td><td>5</td></tr> <tr><td>blocked</td><td>on</td><td>blocked</td><td>2</td></tr> <tr><td>blocked</td><td>blocked</td><td>blocked</td><td>2</td></tr> <tr><td>blocked</td><td>test</td><td>test-blocked</td><td>4</td></tr> <tr><td>blocked</td><td>test-blocked</td><td>test-blocked</td><td>4</td></tr> <tr><td>blocked</td><td>off</td><td>off</td><td>5</td></tr> <tr><td>test</td><td>on</td><td>test</td><td>3</td></tr> <tr><td>test</td><td>blocked</td><td>test-blocked</td><td>4</td></tr> <tr><td>test</td><td>test</td><td>test</td><td>3</td></tr> <tr><td>test</td><td>test-blocked</td><td>test-blocked</td><td>4</td></tr> <tr><td>test</td><td>off</td><td>off</td><td>5</td></tr> <tr><td>test-blocked</td><td>on</td><td>test-blocked</td><td>4</td></tr> <tr><td>test-blocked</td><td>blocked</td><td>test-blocked</td><td>4</td></tr> <tr><td>test-blocked</td><td>test</td><td>test-blocked</td><td>4</td></tr> <tr><td>test-blocked</td><td>test-blocked</td><td>test-blocked</td><td>4</td></tr> <tr><td>test-blocked</td><td>off</td><td>off</td><td>5</td></tr> <tr><td>off</td><td>on</td><td>off</td><td>5</td></tr> <tr><td>off</td><td>blocked</td><td>off</td><td>5</td></tr> <tr><td>off</td><td>test</td><td>off</td><td>5</td></tr> <tr><td>off</td><td>test-blocked</td><td>off</td><td>5</td></tr> <tr><td>off</td><td>off</td><td>off</td><td>5</td></tr> </tbody> </table> | LNMode<br>XXXX.Mod            | LDMode<br>LLN0.Mod | LNBeh (read only)<br>XXXX.Beh | LNBeh<br>Value | on | on | on | 1 | on | blocked | blocked | 2 | on | test | test | 3 | on | test-blocked | test-blocked | 4 | on | off | off | 5 | blocked | on | blocked | 2 | blocked | blocked | blocked | 2 | blocked | test | test-blocked | 4 | blocked | test-blocked | test-blocked | 4 | blocked | off | off | 5 | test | on | test | 3 | test | blocked | test-blocked | 4 | test | test | test | 3 | test | test-blocked | test-blocked | 4 | test | off | off | 5 | test-blocked | on | test-blocked | 4 | test-blocked | blocked | test-blocked | 4 | test-blocked | test | test-blocked | 4 | test-blocked | test-blocked | test-blocked | 4 | test-blocked | off | off | 5 | off | on | off | 5 | off | blocked | off | 5 | off | test | off | 5 | off | test-blocked | off | 5 | off | off | off | 5 |
| LNMode<br>XXXX.Mod | LDMode<br>LLN0.Mod  | LNBeh (read only)<br>XXXX.Beh | LNBeh<br>Value     |                               |                |    |    |    |   |    |         |         |   |    |      |      |   |    |              |              |   |    |     |     |   |         |    |         |   |         |         |         |   |         |      |              |   |         |              |              |   |         |     |     |   |      |    |      |   |      |         |              |   |      |      |      |   |      |              |              |   |      |     |     |   |              |    |              |   |              |         |              |   |              |      |              |   |              |              |              |   |              |     |     |   |     |    |     |   |     |         |     |   |     |      |     |   |     |              |     |   |     |     |     |   |
| on                 | on  | on                            | 1                  |                               |                |    |    |    |   |    |         |         |   |    |      |      |   |    |              |              |   |    |     |     |   |         |    |         |   |         |         |         |   |         |      |              |   |         |              |              |   |         |     |     |   |      |    |      |   |      |         |              |   |      |      |      |   |      |              |              |   |      |     |     |   |              |    |              |   |              |         |              |   |              |      |              |   |              |              |              |   |              |     |     |   |     |    |     |   |     |         |     |   |     |      |     |   |     |              |     |   |     |     |     |   |
| on                 | blocked   | blocked                       | 2                  |                               |                |    |    |    |   |    |         |         |   |    |      |      |   |    |              |              |   |    |     |     |   |         |    |         |   |         |         |         |   |         |      |              |   |         |              |              |   |         |     |     |   |      |    |      |   |      |         |              |   |      |      |      |   |      |              |              |   |      |     |     |   |              |    |              |   |              |         |              |   |              |      |              |   |              |              |              |   |              |     |     |   |     |    |     |   |     |         |     |   |     |      |     |   |     |              |     |   |     |     |     |   |
| on                 | test  | test                          | 3                  |                               |                |    |    |    |   |    |         |         |   |    |      |      |   |    |              |              |   |    |     |     |   |         |    |         |   |         |         |         |   |         |      |              |   |         |              |              |   |         |     |     |   |      |    |      |   |      |         |              |   |      |      |      |   |      |              |              |   |      |     |     |   |              |    |              |   |              |         |              |   |              |      |              |   |              |              |              |   |              |     |     |   |     |    |     |   |     |         |     |   |     |      |     |   |     |              |     |   |     |     |     |   |
| on                 | test-blocked  | test-blocked                  | 4                  |                               |                |    |    |    |   |    |         |         |   |    |      |      |   |    |              |              |   |    |     |     |   |         |    |         |   |         |         |         |   |         |      |              |   |         |              |              |   |         |     |     |   |      |    |      |   |      |         |              |   |      |      |      |   |      |              |              |   |      |     |     |   |              |    |              |   |              |         |              |   |              |      |              |   |              |              |              |   |              |     |     |   |     |    |     |   |     |         |     |   |     |      |     |   |     |              |     |   |     |     |     |   |
| on                 | off   | off                           | 5                  |                               |                |    |    |    |   |    |         |         |   |    |      |      |   |    |              |              |   |    |     |     |   |         |    |         |   |         |         |         |   |         |      |              |   |         |              |              |   |         |     |     |   |      |    |      |   |      |         |              |   |      |      |      |   |      |              |              |   |      |     |     |   |              |    |              |   |              |         |              |   |              |      |              |   |              |              |              |   |              |     |     |   |     |    |     |   |     |         |     |   |     |      |     |   |     |              |     |   |     |     |     |   |
| blocked            | on  | blocked                       | 2                  |                               |                |    |    |    |   |    |         |         |   |    |      |      |   |    |              |              |   |    |     |     |   |         |    |         |   |         |         |         |   |         |      |              |   |         |              |              |   |         |     |     |   |      |    |      |   |      |         |              |   |      |      |      |   |      |              |              |   |      |     |     |   |              |    |              |   |              |         |              |   |              |      |              |   |              |              |              |   |              |     |     |   |     |    |     |   |     |         |     |   |     |      |     |   |     |              |     |   |     |     |     |   |
| blocked            | blocked   | blocked                       | 2                  |                               |                |    |    |    |   |    |         |         |   |    |      |      |   |    |              |              |   |    |     |     |   |         |    |         |   |         |         |         |   |         |      |              |   |         |              |              |   |         |     |     |   |      |    |      |   |      |         |              |   |      |      |      |   |      |              |              |   |      |     |     |   |              |    |              |   |              |         |              |   |              |      |              |   |              |              |              |   |              |     |     |   |     |    |     |   |     |         |     |   |     |      |     |   |     |              |     |   |     |     |     |   |
| blocked            | test  | test-blocked                  | 4                  |                               |                |    |    |    |   |    |         |         |   |    |      |      |   |    |              |              |   |    |     |     |   |         |    |         |   |         |         |         |   |         |      |              |   |         |              |              |   |         |     |     |   |      |    |      |   |      |         |              |   |      |      |      |   |      |              |              |   |      |     |     |   |              |    |              |   |              |         |              |   |              |      |              |   |              |              |              |   |              |     |     |   |     |    |     |   |     |         |     |   |     |      |     |   |     |              |     |   |     |     |     |   |
| blocked            | test-blocked  | test-blocked                  | 4                  |                               |                |    |    |    |   |    |         |         |   |    |      |      |   |    |              |              |   |    |     |     |   |         |    |         |   |         |         |         |   |         |      |              |   |         |              |              |   |         |     |     |   |      |    |      |   |      |         |              |   |      |      |      |   |      |              |              |   |      |     |     |   |              |    |              |   |              |         |              |   |              |      |              |   |              |              |              |   |              |     |     |   |     |    |     |   |     |         |     |   |     |      |     |   |     |              |     |   |     |     |     |   |
| blocked            | off   | off                           | 5                  |                               |                |    |    |    |   |    |         |         |   |    |      |      |   |    |              |              |   |    |     |     |   |         |    |         |   |         |         |         |   |         |      |              |   |         |              |              |   |         |     |     |   |      |    |      |   |      |         |              |   |      |      |      |   |      |              |              |   |      |     |     |   |              |    |              |   |              |         |              |   |              |      |              |   |              |              |              |   |              |     |     |   |     |    |     |   |     |         |     |   |     |      |     |   |     |              |     |   |     |     |     |   |
| test               | on  | test                          | 3                  |                               |                |    |    |    |   |    |         |         |   |    |      |      |   |    |              |              |   |    |     |     |   |         |    |         |   |         |         |         |   |         |      |              |   |         |              |              |   |         |     |     |   |      |    |      |   |      |         |              |   |      |      |      |   |      |              |              |   |      |     |     |   |              |    |              |   |              |         |              |   |              |      |              |   |              |              |              |   |              |     |     |   |     |    |     |   |     |         |     |   |     |      |     |   |     |              |     |   |     |     |     |   |
| test               | blocked   | test-blocked                  | 4                  |                               |                |    |    |    |   |    |         |         |   |    |      |      |   |    |              |              |   |    |     |     |   |         |    |         |   |         |         |         |   |         |      |              |   |         |              |              |   |         |     |     |   |      |    |      |   |      |         |              |   |      |      |      |   |      |              |              |   |      |     |     |   |              |    |              |   |              |         |              |   |              |      |              |   |              |              |              |   |              |     |     |   |     |    |     |   |     |         |     |   |     |      |     |   |     |              |     |   |     |     |     |   |
| test               | test  | test                          | 3                  |                               |                |    |    |    |   |    |         |         |   |    |      |      |   |    |              |              |   |    |     |     |   |         |    |         |   |         |         |         |   |         |      |              |   |         |              |              |   |         |     |     |   |      |    |      |   |      |         |              |   |      |      |      |   |      |              |              |   |      |     |     |   |              |    |              |   |              |         |              |   |              |      |              |   |              |              |              |   |              |     |     |   |     |    |     |   |     |         |     |   |     |      |     |   |     |              |     |   |     |     |     |   |
| test               | test-blocked  | test-blocked                  | 4                  |                               |                |    |    |    |   |    |         |         |   |    |      |      |   |    |              |              |   |    |     |     |   |         |    |         |   |         |         |         |   |         |      |              |   |         |              |              |   |         |     |     |   |      |    |      |   |      |         |              |   |      |      |      |   |      |              |              |   |      |     |     |   |              |    |              |   |              |         |              |   |              |      |              |   |              |              |              |   |              |     |     |   |     |    |     |   |     |         |     |   |     |      |     |   |     |              |     |   |     |     |     |   |
| test               | off   | off                           | 5                  |                               |                |    |    |    |   |    |         |         |   |    |      |      |   |    |              |              |   |    |     |     |   |         |    |         |   |         |         |         |   |         |      |              |   |         |              |              |   |         |     |     |   |      |    |      |   |      |         |              |   |      |      |      |   |      |              |              |   |      |     |     |   |              |    |              |   |              |         |              |   |              |      |              |   |              |              |              |   |              |     |     |   |     |    |     |   |     |         |     |   |     |      |     |   |     |              |     |   |     |     |     |   |
| test-blocked       | on  | test-blocked                  | 4                  |                               |                |    |    |    |   |    |         |         |   |    |      |      |   |    |              |              |   |    |     |     |   |         |    |         |   |         |         |         |   |         |      |              |   |         |              |              |   |         |     |     |   |      |    |      |   |      |         |              |   |      |      |      |   |      |              |              |   |      |     |     |   |              |    |              |   |              |         |              |   |              |      |              |   |              |              |              |   |              |     |     |   |     |    |     |   |     |         |     |   |     |      |     |   |     |              |     |   |     |     |     |   |
| test-blocked       | blocked   | test-blocked                  | 4                  |                               |                |    |    |    |   |    |         |         |   |    |      |      |   |    |              |              |   |    |     |     |   |         |    |         |   |         |         |         |   |         |      |              |   |         |              |              |   |         |     |     |   |      |    |      |   |      |         |              |   |      |      |      |   |      |              |              |   |      |     |     |   |              |    |              |   |              |         |              |   |              |      |              |   |              |              |              |   |              |     |     |   |     |    |     |   |     |         |     |   |     |      |     |   |     |              |     |   |     |     |     |   |
| test-blocked       | test  | test-blocked                  | 4                  |                               |                |    |    |    |   |    |         |         |   |    |      |      |   |    |              |              |   |    |     |     |   |         |    |         |   |         |         |         |   |         |      |              |   |         |              |              |   |         |     |     |   |      |    |      |   |      |         |              |   |      |      |      |   |      |              |              |   |      |     |     |   |              |    |              |   |              |         |              |   |              |      |              |   |              |              |              |   |              |     |     |   |     |    |     |   |     |         |     |   |     |      |     |   |     |              |     |   |     |     |     |   |
| test-blocked       | test-blocked  | test-blocked                  | 4                  |                               |                |    |    |    |   |    |         |         |   |    |      |      |   |    |              |              |   |    |     |     |   |         |    |         |   |         |         |         |   |         |      |              |   |         |              |              |   |         |     |     |   |      |    |      |   |      |         |              |   |      |      |      |   |      |              |              |   |      |     |     |   |              |    |              |   |              |         |              |   |              |      |              |   |              |              |              |   |              |     |     |   |     |    |     |   |     |         |     |   |     |      |     |   |     |              |     |   |     |     |     |   |
| test-blocked       | off   | off                           | 5                  |                               |                |    |    |    |   |    |         |         |   |    |      |      |   |    |              |              |   |    |     |     |   |         |    |         |   |         |         |         |   |         |      |              |   |         |              |              |   |         |     |     |   |      |    |      |   |      |         |              |   |      |      |      |   |      |              |              |   |      |     |     |   |              |    |              |   |              |         |              |   |              |      |              |   |              |              |              |   |              |     |     |   |     |    |     |   |     |         |     |   |     |      |     |   |     |              |     |   |     |     |     |   |
| off                | on  | off                           | 5                  |                               |                |    |    |    |   |    |         |         |   |    |      |      |   |    |              |              |   |    |     |     |   |         |    |         |   |         |         |         |   |         |      |              |   |         |              |              |   |         |     |     |   |      |    |      |   |      |         |              |   |      |      |      |   |      |              |              |   |      |     |     |   |              |    |              |   |              |         |              |   |              |      |              |   |              |              |              |   |              |     |     |   |     |    |     |   |     |         |     |   |     |      |     |   |     |              |     |   |     |     |     |   |
| off                | blocked   | off                           | 5                  |                               |                |    |    |    |   |    |         |         |   |    |      |      |   |    |              |              |   |    |     |     |   |         |    |         |   |         |         |         |   |         |      |              |   |         |              |              |   |         |     |     |   |      |    |      |   |      |         |              |   |      |      |      |   |      |              |              |   |      |     |     |   |              |    |              |   |              |         |              |   |              |      |              |   |              |              |              |   |              |     |     |   |     |    |     |   |     |         |     |   |     |      |     |   |     |              |     |   |     |     |     |   |
| off                | test  | off                           | 5                  |                               |                |    |    |    |   |    |         |         |   |    |      |      |   |    |              |              |   |    |     |     |   |         |    |         |   |         |         |         |   |         |      |              |   |         |              |              |   |         |     |     |   |      |    |      |   |      |         |              |   |      |      |      |   |      |              |              |   |      |     |     |   |              |    |              |   |              |         |              |   |              |      |              |   |              |              |              |   |              |     |     |   |     |    |     |   |     |         |     |   |     |      |     |   |     |              |     |   |     |     |     |   |
| off                | test-blocked  | off                           | 5                  |                               |                |    |    |    |   |    |         |         |   |    |      |      |   |    |              |              |   |    |     |     |   |         |    |         |   |         |         |         |   |         |      |              |   |         |              |              |   |         |     |     |   |      |    |      |   |      |         |              |   |      |      |      |   |      |              |              |   |      |     |     |   |              |    |              |   |              |         |              |   |              |      |              |   |              |              |              |   |              |     |     |   |     |    |     |   |     |         |     |   |     |      |     |   |     |              |     |   |     |     |     |   |
| off                | off   | off                           | 5                  |                               |                |    |    |    |   |    |         |         |   |    |      |      |   |    |              |              |   |    |     |     |   |         |    |         |   |         |         |         |   |         |      |              |   |         |              |              |   |         |     |     |   |      |    |      |   |      |         |              |   |      |      |      |   |      |              |              |   |      |     |     |   |              |    |              |   |              |         |              |   |              |      |              |   |              |              |              |   |              |     |     |   |     |    |     |   |     |         |     |   |     |      |     |   |     |              |     |   |     |     |     |   |
| BerCh              | <u>Bit Error Rate of the communication channel. Used in case of a digital communication channel</u>   |                               |                    |                               |                |    |    |    |   |    |         |         |   |    |      |      |   |    |              |              |   |    |     |     |   |         |    |         |   |         |         |         |   |         |      |              |   |         |              |              |   |         |     |     |   |      |    |      |   |      |         |              |   |      |      |      |   |      |              |              |   |      |     |     |   |              |    |              |   |              |         |              |   |              |      |              |   |              |              |              |   |              |     |     |   |     |    |     |   |     |         |     |   |     |      |     |   |     |              |     |   |     |     |     |   |
| BinIn              | Binary input array used for generic I/O, and represents a set of binary inputs.   |                               |                    |                               |                |    |    |    |   |    |         |         |   |    |      |      |   |    |              |              |   |    |     |     |   |         |    |         |   |         |         |         |   |         |      |              |   |         |              |              |   |         |     |     |   |      |    |      |   |      |         |              |   |      |      |      |   |      |              |              |   |      |     |     |   |              |    |              |   |              |         |              |   |              |      |              |   |              |              |              |   |              |     |     |   |     |    |     |   |     |         |     |   |     |      |     |   |     |              |     |   |     |     |     |   |
| BkrTmms            | Closing time of breaker including other delays until the operation of the breaker. This is a property of the breaker that is subject to ageing.   |                               |                    |                               |                |    |    |    |   |    |         |         |   |    |      |      |   |    |              |              |   |    |     |     |   |         |    |         |   |         |         |         |   |         |      |              |   |         |              |              |   |         |     |     |   |      |    |      |   |      |         |              |   |      |      |      |   |      |              |              |   |      |     |     |   |              |    |              |   |              |         |              |   |              |      |              |   |              |              |              |   |              |     |     |   |     |    |     |   |     |         |     |   |     |      |     |   |     |              |     |   |     |     |     |   |
| Blk                | <u>Dynamically blocking of function described by the LN</u>   |                               |                    |                               |                |    |    |    |   |    |         |         |   |    |      |      |   |    |              |              |   |    |     |     |   |         |    |         |   |         |         |         |   |         |      |              |   |         |              |              |   |         |     |     |   |      |    |      |   |      |         |              |   |      |      |      |   |      |              |              |   |      |     |     |   |              |    |              |   |              |         |              |   |              |      |              |   |              |              |              |   |              |     |     |   |     |    |     |   |     |         |     |   |     |      |     |   |     |              |     |   |     |     |     |   |
| BlkA               | TRUE = Operation is blocked by current reasons.   |                               |                    |                               |                |    |    |    |   |    |         |         |   |    |      |      |   |    |              |              |   |    |     |     |   |         |    |         |   |         |         |         |   |         |      |              |   |         |              |              |   |         |     |     |   |      |    |      |   |      |         |              |   |      |      |      |   |      |              |              |   |      |     |     |   |              |    |              |   |              |         |              |   |              |      |              |   |              |              |              |   |              |     |     |   |     |    |     |   |     |         |     |   |     |      |     |   |     |              |     |   |     |     |     |   |
| BlkAOv             | TRUE = Switch operation is blocked by current limit overflow.   |                               |                    |                               |                |    |    |    |   |    |         |         |   |    |      |      |   |    |              |              |   |    |     |     |   |         |    |         |   |         |         |         |   |         |      |              |   |         |              |              |   |         |     |     |   |      |    |      |   |      |         |              |   |      |      |      |   |      |              |              |   |      |     |     |   |              |    |              |   |              |         |              |   |              |      |              |   |              |              |              |   |              |     |     |   |     |    |     |   |     |         |     |   |     |      |     |   |     |              |     |   |     |     |     |   |
| BlkCIs             | This Data is used to block <u>close operation</u> (for example, for XCBR, XSWI, YPSH) from another logical node such as a protection node or from a local/remote switch. An example may be the low isolation gas density. Block closing is not reflected in operating capability. TRUE = block operation <u>close circuit breaker</u> .   |                               |                    |                               |                |    |    |    |   |    |         |         |   |    |      |      |   |    |              |              |   |    |     |     |   |         |    |         |   |         |         |         |   |         |      |              |   |         |              |              |   |         |     |     |   |      |    |      |   |      |         |              |   |      |      |      |   |      |              |              |   |      |     |     |   |              |    |              |   |              |         |              |   |              |      |              |   |              |              |              |   |              |     |     |   |     |    |     |   |     |         |     |   |     |      |     |   |     |              |     |   |     |     |     |   |
| BlkEF              | TRUE = Switch activity blocked due to earth fault.  |                               |                    |                               |                |    |    |    |   |    |         |         |   |    |      |      |   |    |              |              |   |    |     |     |   |         |    |         |   |         |         |         |   |         |      |              |   |         |              |              |   |         |     |     |   |      |    |      |   |      |         |              |   |      |      |      |   |      |              |              |   |      |     |     |   |              |    |              |   |              |         |              |   |              |      |              |   |              |              |              |   |              |     |     |   |     |    |     |   |     |         |     |   |     |      |     |   |     |              |     |   |     |     |     |   |
| BlkLV              | Control voltage below which auto Lower commands blocked.  |                               |                    |                               |                |    |    |    |   |    |         |         |   |    |      |      |   |    |              |              |   |    |     |     |   |         |    |         |   |         |         |         |   |         |      |              |   |         |              |              |   |         |     |     |   |      |    |      |   |      |         |              |   |      |      |      |   |      |              |              |   |      |     |     |   |              |    |              |   |              |         |              |   |              |      |              |   |              |              |              |   |              |     |     |   |     |    |     |   |     |         |     |   |     |      |     |   |     |              |     |   |     |     |     |   |
| BlkOpn             | This Data is used to block <u>open operation</u> (for example to XCBR, XSWI, YPSH) from another logical node such as a protection node or from a local/remote switch. An example may be the blocking of the buscoupler also for trips during busbar transfer. Block opening is not reflected in operating capability. TRUE = block operation <u>open circuit breaker</u> .  |                               |                    |                               |                |    |    |    |   |    |         |         |   |    |      |      |   |    |              |              |   |    |     |     |   |         |    |         |   |         |         |         |   |         |      |              |   |         |              |              |   |         |     |     |   |      |    |      |   |      |         |              |   |      |      |      |   |      |              |              |   |      |     |     |   |              |    |              |   |              |         |              |   |              |      |              |   |              |              |              |   |              |     |     |   |     |    |     |   |     |         |     |   |     |      |     |   |     |              |     |   |     |     |     |   |
| BlkRec             | Block Reclosing.  |                               |                    |                               |                |    |    |    |   |    |         |         |   |    |      |      |   |    |              |              |   |    |     |     |   |         |    |         |   |         |         |         |   |         |      |              |   |         |              |              |   |         |     |     |   |      |    |      |   |      |         |              |   |      |      |      |   |      |              |              |   |      |     |     |   |              |    |              |   |              |         |              |   |              |      |              |   |              |              |              |   |              |     |     |   |     |    |     |   |     |         |     |   |     |      |     |   |     |              |     |   |     |     |     |   |
| BlkRef             | <u>Blockng reference shows if there is received a signal that blocks the function</u>   |                               |                    |                               |                |    |    |    |   |    |         |         |   |    |      |      |   |    |              |              |   |    |     |     |   |         |    |         |   |         |         |         |   |         |      |              |   |         |              |              |   |         |     |     |   |      |    |      |   |      |         |              |   |      |      |      |   |      |              |              |   |      |     |     |   |              |    |              |   |              |         |              |   |              |      |              |   |              |              |              |   |              |     |     |   |     |    |     |   |     |         |     |   |     |      |     |   |     |              |     |   |     |     |     |   |
| BlkRV              | Control voltage above which auto Raise commands blocked.  |                               |                    |                               |                |    |    |    |   |    |         |         |   |    |      |      |   |    |              |              |   |    |     |     |   |         |    |         |   |         |         |         |   |         |      |              |   |         |              |              |   |         |     |     |   |      |    |      |   |      |         |              |   |      |      |      |   |      |              |              |   |      |     |     |   |              |    |              |   |              |         |              |   |              |      |              |   |              |              |              |   |              |     |     |   |     |    |     |   |     |         |     |   |     |      |     |   |     |              |     |   |     |     |     |   |
| BlkSta             | <u>Teleprotection in block state</u>  |                               |                    |                               |                |    |    |    |   |    |         |         |   |    |      |      |   |    |              |              |   |    |     |     |   |         |    |         |   |         |         |         |   |         |      |              |   |         |              |              |   |         |     |     |   |      |    |      |   |      |         |              |   |      |      |      |   |      |              |              |   |      |     |     |   |              |    |              |   |              |         |              |   |              |      |              |   |              |              |              |   |              |     |     |   |     |    |     |   |     |         |     |   |     |      |     |   |     |              |     |   |     |     |     |   |
| BlkThm             | <u>Block closing command for circuit breaker because of thermal condition. If the temperature of protected equipments is still higher than a setting.</u>   |                               |                    |                               |                |    |    |    |   |    |         |         |   |    |      |      |   |    |              |              |   |    |     |     |   |         |    |         |   |         |         |         |   |         |      |              |   |         |              |              |   |         |     |     |   |      |    |      |   |      |         |              |   |      |      |      |   |      |              |              |   |      |     |     |   |              |    |              |   |              |         |              |   |              |      |              |   |              |              |              |   |              |     |     |   |     |    |     |   |     |         |     |   |     |      |     |   |     |              |     |   |     |     |     |   |
| BlkV               | TRUE = Operation is blocked for voltage reasons.  |                               |                    |                               |                |    |    |    |   |    |         |         |   |    |      |      |   |    |              |              |   |    |     |     |   |         |    |         |   |         |         |         |   |         |      |              |   |         |              |              |   |         |     |     |   |      |    |      |   |      |         |              |   |      |      |      |   |      |              |              |   |      |     |     |   |              |    |              |   |              |         |              |   |              |      |              |   |              |              |              |   |              |     |     |   |     |    |     |   |     |         |     |   |     |      |     |   |     |              |     |   |     |     |     |   |

**Kommentar [HD126]:** change all table formats, no included tables allowed

Gelöscht: '  
Gelöscht: '  
Gelöscht: '

Gelöscht: '  
Gelöscht: '  
Gelöscht: '  
Gelöscht: '

| Data Name                    | Semantics  |                              |       |      |   |      |   |              |   |                     |   |                             |   |
|------------------------------|--|------------------------------|-------|------|---|------|---|--------------|---|---------------------|---|-----------------------------|---|
| BlkVal                       | When the measurements exceed (or drop below, in the case of a dropout function) this value, the function operation is blocked.   |                              |       |      |   |      |   |              |   |                     |   |                             |   |
| BlkValA                      | Block Value (Minimum operating current).   |                              |       |      |   |      |   |              |   |                     |   |                             |   |
| BlkValV                      | Block Value (Minimum operating voltage).   |                              |       |      |   |      |   |              |   |                     |   |                             |   |
| BlkVLo                       | Control voltage below which auto Raise commands are blocked. If the control voltage is under the limit of BlkVLo (e.g. because that part of the network is switched off) the ATCC issues no Raise commands until the control voltage exceeds the limit of BlkVLo.  |                              |       |      |   |      |   |              |   |                     |   |                             |   |
| BlkVHi                       | Control voltage above which auto Lower commands are blocked. If the control voltage is over the limit of BlkVHi the ATCC issues no Lower commands until the control voltage exceeds the limit of BlkVHi.   |                              |       |      |   |      |   |              |   |                     |   |                             |   |
| BlkVOv                       | TRUE = Switch operation is blocked by voltage limit overflow.  |                              |       |      |   |      |   |              |   |                     |   |                             |   |
| BlkZn                        | This Data is used by the power swing protection to block operation of protection for a specific protection zone i.e. the related instance of PDIS.<br>TRUE = blocked, FALSE = not blocked.   |                              |       |      |   |      |   |              |   |                     |   |                             |   |
| BndCtr                       | Centre of control bandwidth, forward power flow presumed.  |                              |       |      |   |      |   |              |   |                     |   |                             |   |
| <b>BndCtrChg</b>             | <b>Band centre change (raise, lower), no status</b>  |                              |       |      |   |      |   |              |   |                     |   |                             |   |
| BndWid                       | Band width, i.e. the defined range of control voltage given either as voltage value or percentage of the nominal voltage. Forward power flow is presumed if applicable.  |                              |       |      |   |      |   |              |   |                     |   |                             |   |
| CapDS                        | TRUE = Capacitor bank is on line, or close. FALSE = Capacitor bank off line or open.   |                              |       |      |   |      |   |              |   |                     |   |                             |   |
| CarRx                        | Carrier has been received after initiation of unblock logic.   |                              |       |      |   |      |   |              |   |                     |   |                             |   |
| CBOpCap                      | This is an enumeration representing the physical capabilities of the breaker to operate. It reflects the switching energy as well as additional blocking due to some local problems.<br>CBOpCap is always less or equal to MaxOpCap.<br><table border="1"> <thead> <tr> <th>Breaker Operating Capability</th> <th>Value</th> </tr> </thead> <tbody> <tr> <td>None</td> <td>1</td> </tr> <tr> <td>Open</td> <td>2</td> </tr> <tr> <td>Close – Open</td> <td>3</td> </tr> <tr> <td>Open – Close – Open</td> <td>4</td> </tr> <tr> <td>Close – Open – Close – Open</td> <td>5</td> </tr> </tbody> </table> <p>More values (6...n) describe higher Operating Capabilities. A new value, i.e. a new line in the table must start alternating with <del>Close</del> and <del>Open</del> and must end always with "Open".</p> | Breaker Operating Capability | Value | None | 1 | Open | 2 | Close – Open | 3 | Open – Close – Open | 4 | Close – Open – Close – Open | 5 |
| Breaker Operating Capability | Value  |                              |       |      |   |      |   |              |   |                     |   |                             |   |
| None                         | 1  |                              |       |      |   |      |   |              |   |                     |   |                             |   |
| Open                         | 2  |                              |       |      |   |      |   |              |   |                     |   |                             |   |
| Close – Open                 | 3  |                              |       |      |   |      |   |              |   |                     |   |                             |   |
| Open – Close – Open          | 4  |                              |       |      |   |      |   |              |   |                     |   |                             |   |
| Close – Open – Close – Open  | 5  |                              |       |      |   |      |   |              |   |                     |   |                             |   |
| CECtl                        | Control of complete cooling group (pumps and fans).  |                              |       |      |   |      |   |              |   |                     |   |                             |   |
| CETmpIn                      | Temperature of the <del>behaviour</del> cooling medium in a cooling equipment (input). Typically used for the water temperature for water cooled power transformers (OFWF or ODWF).  |                              |       |      |   |      |   |              |   |                     |   |                             |   |
| CETmpOut                     | Temperature of the <del>behaviour</del> cooling medium in a cooling equipment (output). Typically used for the water temperature for water cooled power transformers (OFWF or ODWF).   |                              |       |      |   |      |   |              |   |                     |   |                             |   |
| CEPres                       | Pressure of the <del>behaviour</del> cooling medium in a cooling equipment. Typically used for the water pressure for water cooled power transformers (OFWF or ODWF).  |                              |       |      |   |      |   |              |   |                     |   |                             |   |
| CEFlw                        | Flow of the <del>behaviour</del> cooling medium in a cooling equipment. Typically used for the water flow for water cooled power transformers (OFWF or ODWF).  |                              |       |      |   |      |   |              |   |                     |   |                             |   |
| CGAlm                        | TRUE = Core Ground Alarm indicates that the insulation has broken down.  |                              |       |      |   |      |   |              |   |                     |   |                             |   |
| CGRBlk                       | Control of automatic / manual operation. TRUE = Automatic control of cooling equipment blocked (inhibited)   |                              |       |      |   |      |   |              |   |                     |   |                             |   |
| ChaMotEna                    | This Data is used to enable the charger motor; used to prevent overload of the power supply after a busbar trip. TRUE = enable charger motor, FALSE = disable charger motor.   |                              |       |      |   |      |   |              |   |                     |   |                             |   |
| <b>ChgIntv</b>               | <b>Leakage rate of energy storage, expressed as time between two charging operations (usually displayed in hours)</b>  |                              |       |      |   |      |   |              |   |                     |   |                             |   |
| ChkRec                       | Determines if the reclosing is with (TRUE) or without (FALSE) synch-check.   |                              |       |      |   |      |   |              |   |                     |   |                             |   |
| ChNum                        | Channel number being monitored (for example for COMTRADE).   |                              |       |      |   |      |   |              |   |                     |   |                             |   |

Gelöscht: "

Gelöscht: "

Gelöscht: "

Gelöscht: "

Gelöscht: secondary

Gelöscht: secondary

Gelöscht: secondary

Gelöscht: secondary

| Data Name         | Semantics  |
|-------------------|--|
| ChrAng            | The angle by which the current is displaced from the polarising quantity in order to obtain maximum sensitivity.   |
| ChTrg             | Channel triggered. TRUE = channel started recording, FALSE = <del>behavior not started recording.</del>  |
| CircA             | Measured circulating current, which circulates between transformers operated in parallel (one component of transformer secondary current in a paralleling installation).   |
| ClcExp            | Indicates that the calculation period of a statistical logical node has expired.<br>This DATA shall be mandatory for all logical nodes that are intended to represent statistical data, indicated by the common data classes, e.g., CDC MV, CMV, WYE, etc. |
| <u>ClcIntvTyp</u> | Sliding period with possible values ANYTIME, HOUR, DAY, WEEK, MONTH, YEAR. The sliding period is defined in milliseconds in case of ANYTIME by setting ClcPerms.   |

Gelöscht: channel

| Data Name | Semantics  |       |             |      |  |     |   |     |   |        |   |        |   |     |   |     |  |       |   |      |  |
|-----------|--|-------|-------------|------|--|-----|---|-----|---|--------|---|--------|---|-----|---|-----|--|-------|---|------|--|
| CicMth    | <p>The calculation method specifies how the Data Attributes that represent analogue values have been calculated. The calculation method shall be the same for all data of a given logical node instance. The possible values shall be :</p> <table border="1"> <thead> <tr> <th>value</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>PRES</td> <td>Indicates that all analogue values (i. e. all common attributes i and f) are present <u>or, more precisely, actual</u> values.</td> </tr> <tr> <td>MIN</td> <td>Indicates that all analogue values (i. e. all common attributes i and f) are <b>minimum</b> values calculated during the corresponding calculation period <b>CclPerms</b>.</td> </tr> <tr> <td>MAX</td> <td>Indicates that all analogue values (i. e. all common attributes i and f) are <b>maximum</b> values calculated during the corresponding calculation period <b>CclPerms</b>.</td> </tr> <tr> <td>TOTMIN</td> <td>Indicates that all analogue values (i. e. all common attributes i and f) are <b>total minimum</b> values calculated since the start of the system</td> </tr> <tr> <td>TOTMAX</td> <td>Indicates that all analogue values (i. e. all common attributes i and f) are <b>total maximum</b> values calculated since the start of the system</td> </tr> <tr> <td>AVG</td> <td>Indicates that all analogue values (i. e. all common attributes i and f) are <b>average</b> values calculated during the corresponding calculation period <b>CclPerms</b>.</td> </tr> <tr> <td>SDV</td> <td>Indicates that all analogue values (i. e. all common attributes i and f) are <b>standard deviation</b> values calculated during the corresponding calculation period <b>CclPerms</b>.</td> </tr> <tr> <td>TREND</td> <td>Indicates that all analogue values (i. e. all common attributes i and f) are <u>long term changes over time calculated with the corresponding calculation period CclPerms</u></td> </tr> <tr> <td>RATE</td> <td>Indicates that all analogue values (i. e. all common attributes i and f) are <u>actual changes over time calculated with the actual value and value before</u></td> </tr> </tbody> </table> <p>This DATA shall be mandatory for all logical nodes that are intended to represent statistical data, indicated by the common data classes, e.g., CDC MV, CMV, WYE, etc.</p> <p>NOTE 1 – If different calculation periods are required for the data of a logical node, then different logical nodes could be instantiated – with different calculation periods.</p> <p>NOTE 2 – The calculation algorithm and number of samples used for the calculation is an implementation issue.</p> | value | Description | PRES | Indicates that all analogue values (i. e. all common attributes i and f) are present <u>or, more precisely, actual</u> values. | MIN | Indicates that all analogue values (i. e. all common attributes i and f) are <b>minimum</b> values calculated during the corresponding calculation period <b>CclPerms</b> . | MAX | Indicates that all analogue values (i. e. all common attributes i and f) are <b>maximum</b> values calculated during the corresponding calculation period <b>CclPerms</b> . | TOTMIN | Indicates that all analogue values (i. e. all common attributes i and f) are <b>total minimum</b> values calculated since the start of the system | TOTMAX | Indicates that all analogue values (i. e. all common attributes i and f) are <b>total maximum</b> values calculated since the start of the system | AVG | Indicates that all analogue values (i. e. all common attributes i and f) are <b>average</b> values calculated during the corresponding calculation period <b>CclPerms</b> . | SDV | Indicates that all analogue values (i. e. all common attributes i and f) are <b>standard deviation</b> values calculated during the corresponding calculation period <b>CclPerms</b> . | TREND | Indicates that all analogue values (i. e. all common attributes i and f) are <u>long term changes over time calculated with the corresponding calculation period CclPerms</u> | RATE | Indicates that all analogue values (i. e. all common attributes i and f) are <u>actual changes over time calculated with the actual value and value before</u> |
| value     | Description  |       |             |      |  |     |   |     |   |        |   |        |   |     |   |     |  |       |   |      |  |
| PRES      | Indicates that all analogue values (i. e. all common attributes i and f) are present <u>or, more precisely, actual</u> values.   |       |             |      |  |     |   |     |   |        |   |        |   |     |   |     |  |       |   |      |  |
| MIN       | Indicates that all analogue values (i. e. all common attributes i and f) are <b>minimum</b> values calculated during the corresponding calculation period <b>CclPerms</b> .  |       |             |      |  |     |   |     |   |        |   |        |   |     |   |     |  |       |   |      |  |
| MAX       | Indicates that all analogue values (i. e. all common attributes i and f) are <b>maximum</b> values calculated during the corresponding calculation period <b>CclPerms</b> .  |       |             |      |  |     |   |     |   |        |   |        |   |     |   |     |  |       |   |      |  |
| TOTMIN    | Indicates that all analogue values (i. e. all common attributes i and f) are <b>total minimum</b> values calculated since the start of the system  |       |             |      |  |     |   |     |   |        |   |        |   |     |   |     |  |       |   |      |  |
| TOTMAX    | Indicates that all analogue values (i. e. all common attributes i and f) are <b>total maximum</b> values calculated since the start of the system  |       |             |      |  |     |   |     |   |        |   |        |   |     |   |     |  |       |   |      |  |
| AVG       | Indicates that all analogue values (i. e. all common attributes i and f) are <b>average</b> values calculated during the corresponding calculation period <b>CclPerms</b> .  |       |             |      |  |     |   |     |   |        |   |        |   |     |   |     |  |       |   |      |  |
| SDV       | Indicates that all analogue values (i. e. all common attributes i and f) are <b>standard deviation</b> values calculated during the corresponding calculation period <b>CclPerms</b> .   |       |             |      |  |     |   |     |   |        |   |        |   |     |   |     |  |       |   |      |  |
| TREND     | Indicates that all analogue values (i. e. all common attributes i and f) are <u>long term changes over time calculated with the corresponding calculation period CclPerms</u>  |       |             |      |  |     |   |     |   |        |   |        |   |     |   |     |  |       |   |      |  |
| RATE      | Indicates that all analogue values (i. e. all common attributes i and f) are <u>actual changes over time calculated with the actual value and value before</u>   |       |             |      |  |     |   |     |   |        |   |        |   |     |   |     |  |       |   |      |  |
| CicMod    | <p><u>Calculation mode</u></p> <p><u>Possible values are:</u></p> <p><u>TOTAL</u> _____ <u>the total time from the first start of the device/application until the current time</u></p> <p><u>PERIOD</u> _____ <u>the periodical time cycle</u></p> <p><u>SLIDING</u> _____ <u>sliding window from now predefined window backwards</u></p>   |       |             |      |  |     |   |     |   |        |   |        |   |     |   |     |  |       |   |      |  |
| CicPerms  | <p>The calculation period of a statistical logical node. The period shall always be in Milliseconds [ms]. This DATA shall be mandatory for all logical nodes that are intended to represent statistical data, indicated by the common data classes, e.g., CDC MV, CMV, WYE, etc.</p> <p>NOTE 3 – The calculation algorithm and number of samples used for the calculation is an implementation issue.</p>  |       |             |      |  |     |   |     |   |        |   |        |   |     |   |     |  |       |   |      |  |
| CicSrc    | <p>The reference to the logical node whose analogue data attributes are used to calculate the value contained in this logical node instance. This DATA shall be mandatory for all logical nodes that are intended to represent statistical data, indicated by the common data classes, e.g., CDC MV, CMV, WYE, etc.</p>  |       |             |      |  |     |   |     |   |        |   |        |   |     |   |     |  |       |   |      |  |
| CicStr    | <p>Starts the calculation of statistical data. Either at once, or if available and set at operTm of the control model. This DATA shall be mandatory for all logical nodes that are intended to represent statistical data, indicated by the common data classes, e.g., CDC MV, CMV, WYE, etc.</p>  |       |             |      |  |     |   |     |   |        |   |        |   |     |   |     |  |       |   |      |  |

Gelöscht: CicStr [40]

Kommentar [HD127]: mail from KHS /02.01.08

Kommentar [HD128]: need more description #479


Gelöscht: I

Gelöscht: tbd

Kommentar [HD129]: contribution from KPB

Gelöscht: tbd

Kommentar [HD130]: improve description ?

| ClcTyp   | This enumerated data specifies the calculation type of all mags available in the LN.   |                  |       |   |   |                               |   |  |
|--|--|------------------|-------|---|---|-------------------------------|---|--|
|  | <table border="1"> <thead> <tr> <th>Calculation Type</th> <th>Value</th> </tr> </thead> <tbody> <tr> <td>True RMS (unfiltered signal, i.e. includes all harmonics of the signal)</td> <td>1</td> </tr> <tr> <td>Peak amplitude of fundamental</td> <td>2</td> </tr> <tr> <td>RMS fundamental, i.e. peak fundamental / (sqrt(2))</td> <td>3</td> </tr> </tbody> </table> <p>For vectors:<br/>                     1) if ClcTyp = True RMS → no ang shall be available (default)<br/>                     2) if CLcTyp = Peak fundamental or RMS fundamental → ang is optional</p> | Calculation Type | Value | True RMS (unfiltered signal, i.e. includes all harmonics of the signal) | 1 | Peak amplitude of fundamental | 2 | RMS fundamental, i.e. peak fundamental / (sqrt(2)) |
| Calculation Type   | Value  |                  |       |   |   |                               |   |  |
| True RMS (unfiltered signal, i.e. includes all harmonics of the signal)            | 1  |                  |       |   |   |                               |   |  |
| Peak amplitude of fundamental  | 2  |                  |       |   |   |                               |   |  |
| RMS fundamental, i.e. peak fundamental / (sqrt(2))                                 | 3  |                  |       |   |   |                               |   |  |
| ClkRot   | TRUE = indication that phase rotation is clockwise (forward).  |                  |       |   |   |                               |   |  |
| CntClkRot  | TRUE = indication that phase rotation is counter clockwise (reverse).  |                  |       |   |   |                               |   |  |
| <u>CntRs</u>   | <u>Generic counter (resetable)</u>   |                  |       |   |   |                               |   |  |
| <u>CoIA</u>  | <u>Current in opening or closing coil during last operation (usually displayed in A)</u>   |                  |       |   |   |                               |   |  |
| <u>ColAlm</u>  | <u>TRUE = Supervision has detected an abnormal state of the coils</u>  |                  |       |   |   |                               |   |  |
| ColPos   | Represents the continuous adjustment of a coil (plunge core position) such as a Petersen Coil.   |                  |       |   |   |                               |   |  |
| ColTapPos  | Represents the discrete adjustment of a coil such as a Petersen Coil.  |                  |       |   |   |                               |   |  |
| ConstTms   | Time constant, for example for a thermal model.  |                  |       |   |   |                               |   |  |
| Cor  | Magnitude correction of a phasor (used for example for instrument transformers/transducers).   |                  |       |   |   |                               |   |  |
| CrdTmms  | Delay time in ms to wait on additional input if other actions are called for.  |                  |       |   |   |                               |   |  |
|  | <u>Curve from F-LN</u>   |                  |       |   |   |                               |   |  |
| CtlDITmms  | Control delay time before operating after reaching control point forward power flow presumed.  |                  |       |   |   |                               |   |  |
| CtlV   | Voltage on secondary of transformer as used for voltage control.   |                  |       |   |   |                               |   |  |
| DeaBusVal  | Voltage setting used to detect a Dead Bus bar, for example for auto reclosing.   |                  |       |   |   |                               |   |  |
| DeaLinVal  | Voltage setting used to detect a Dead Line, for example for auto reclosing.  |                  |       |   |   |                               |   |  |
| Den  | Density of insulating medium.  |                  |       |   |   |                               |   |  |
| DenAlm   | Density alarm because of an abnormal condition (FALSE = Normal, TRUE = alert)  |                  |       |   |   |                               |   |  |
| DetValA  | Used to detect that the breaker has opened when the current is below that setting.   |                  |       |   |   |                               |   |  |
| DExt   | TRUE = Command to de-excite the machine.   |                  |       |   |   |                               |   |  |
| DF   | Displacement Power Factor (pu)<br>$P_{F1} = \frac{P_1}{S_1} = \cos \theta_1$   |                  |       |   |   |                               |   |  |
| Diag   | TRUE = Diagnostic is running, FALSE = Diagnostic is not running.   |                  |       |   |   |                               |   |  |
| DipStrVal  | When the voltage in at least one phase goes below the Voltage Dip Set Point it will start the voltage variation function and the timer that will measure the duration of the voltage variation power quality event. The event ends when all monitored phase voltages return above the threshold.   |                  |       |   |   |                               |   |  |
| DFworst  | Worst Phase Displacement Power Factor (pu)   |                  |       |   |   |                               |   |  |
| DifAClc  | Differential Current.  |                  |       |   |   |                               |   |  |
| DifAng   | Setting for the phase angle difference between two measured values by a synch-check LN.  |                  |       |   |   |                               |   |  |
| DifAngClc  | Calculated value for the phase angle difference between two measured values by a LN synch-check.   |                  |       |   |   |                               |   |  |
| DifHz  | Setting for the frequency difference between two measured values by a synch-check LN.  |                  |       |   |   |                               |   |  |
| DifHzClc   | Calculated value for the frequency difference between two measured values by a LN synch-check.   |                  |       |   |   |                               |   |  |
| DifV   | Setting for the voltage difference between two measured values by a synch-check LN.  |                  |       |   |   |                               |   |  |
| DifVClc  | Calculated value for the voltage difference between two measured values by a LN synch-check.   |                  |       |   |   |                               |   |  |
| Dir  | The direction of a fault or power flow.  |                  |       |   |   |                               |   |  |

| DirMod          | This Data is used to enable operation when the following directional conditions are met: <table border="1"> <thead> <tr> <th>Direction Mode</th> <th>Value</th> </tr> </thead> <tbody> <tr> <td>Non Directional</td> <td>1</td> </tr> <tr> <td>Forward</td> <td>2</td> </tr> <tr> <td>Reverse</td> <td>3</td> </tr> </tbody> </table> | Direction Mode | Value | Non Directional | 1 | Forward | 2 | Reverse | 3 |
|-----------------|---|----------------|-------|-----------------|---|---------|---|---------|---|
| Direction Mode  | Value   |                |       |                 |   |         |   |         |   |
| Non Directional | 1   |                |       |                 |   |         |   |         |   |
| Forward         | 2   |                |       |                 |   |         |   |         |   |
| Reverse         | 3   |                |       |                 |   |         |   |         |   |
| DltRcd          | TRUE = delete the selected record.  |                |       |                 |   |         |   |         |   |
| DmdPwr          | Demanded Power.   |                |       |                 |   |         |   |         |   |
| DmdVARh         | Reactive energy demand (default demand direction: energy flow from busbar away).  |                |       |                 |   |         |   |         |   |
| DmdWh           | Real energy demand (default demand direction: energy flow from busbar away).  |                |       |                 |   |         |   |         |   |
| <u>Dn</u>       | <u>Last count direction downward</u>  |                |       |                 |   |         |   |         |   |
| DPSCO           | Generic double point control.   |                |       |                 |   |         |   |         |   |
| DQ0Seq          | Direct, quadrature, and zero axis quantity.   |                |       |                 |   |         |   |         |   |
| DschBlk         | TRUE = indicates that switch close action for capacitor bank is blocked due to the discharge state of the bank.   |                |       |                 |   |         |   |         |   |
| Dur             | The total measured or calculated Duration of power quality event, i. e. the time from the start until the end of a voltage dip (sag), swell, interruption or other event  |                |       |                 |   |         |   |         |   |
| DurTmms         | Minimum duration of carrier signal sent by a communication based scheme in ms.  |                |       |                 |   |         |   |         |   |
| ECA             | This is the measured current through a Petersen Coil in neutral compensated networks.   |                |       |                 |   |         |   |         |   |
| Echo            | Echo signal from weak end infeed function.  |                |       |                 |   |         |   |         |   |
| EEHealth        | This information reflects the state of external equipment, for example circuit breaker controlled by the logical node XCBR. The values are the same as for the Health.  |                |       |                 |   |         |   |         |   |
| EEName          | This information reflects the name plate of external equipment, for example the circuit breaker XCBR controlled by the logical node CSWI.   |                |       |                 |   |         |   |         |   |
| <u>En</u>       | <u>Energy available in the drive mechanism expressed in %, where 100 % corresponds to rated value and 0% to lowest block value</u>  |                |       |                 |   |         |   |         |   |
| <u>EnAlm</u>    | <u>TRUE = Supervision has detected an abnormal condition in the energy storing system e.g. loss of N2 or equivalent</u>   |                |       |                 |   |         |   |         |   |
| EnaCls          | The interlocking function itself determines the status of this data and thus permits the closing of the device when TRUE. The control service checks this value before he controls "Close/On" a switch.   |                |       |                 |   |         |   |         |   |
| EnaOpn          | The interlocking function itself determines the status of this data and thus permits the opening of the device when TRUE. The control service checks this value before he controls "Open/Off" a switch.   |                |       |                 |   |         |   |         |   |
| <u>EnBlk</u>    | <u>TRUE = Energy is too low for operation</u>   |                |       |                 |   |         |   |         |   |
| EndPosL         | TRUE = Load tap changer is in the maximum lower position.   |                |       |                 |   |         |   |         |   |
| EndPosR         | TRUE = Load tap changer is in the maximum raise position.   |                |       |                 |   |         |   |         |   |
| EnvTmp          | Temperature of environment.   |                |       |                 |   |         |   |         |   |
| EqTmm           | Temperature Equalisation Time (min). For the duration of EqTmm, the thermal memory will be kept, i.e. the thermal memory is frozen. This time is active after the motor is switched off.  |                |       |                 |   |         |   |         |   |
| <u>ErrTerm</u>  | <u>From F-LN</u>  |                |       |                 |   |         |   |         |   |
| <u>EvtCnt</u>   | <u>Event counter – counts the number of times that a power quality event detected by the logical node occurred</u>  |                |       |                 |   |         |   |         |   |
| EvTmms          | Evaluation time in ms (time window) determines the lowest frequency.  |                |       |                 |   |         |   |         |   |
| ExclTmms        | Exclusion time in ms that consecutive triggers from the same source are ignored.  |                |       |                 |   |         |   |         |   |
| FACntRs         | Fault arc counter, resetable.   |                |       |                 |   |         |   |         |   |
| FADet           | TRUE = Alarm that fault arc has been detected.  |                |       |                 |   |         |   |         |   |
| Fail            | TRUE = indicates a breaker has failed to operate and a breaker failure has occurred.  |                |       |                 |   |         |   |         |   |

**Kommentar [HD131]:** question to Claes: could we use abb. Lo (lower)? all places in F-LN

**Gelöscht:** Dur1[1] ... [41]

| FailMod                         | Circuit Breaker failure detection mode.<br><table border="1"> <thead> <tr> <th>Detection Mode</th> <th>Value</th> </tr> </thead> <tbody> <tr> <td>Current</td> <td>1</td> </tr> <tr> <td>Breaker Status</td> <td>2</td> </tr> <tr> <td>Both Current and Breaker Status</td> <td>3</td> </tr> <tr> <td>Other</td> <td>4</td> </tr> </tbody> </table>  | Detection Mode | Value | Current           | 1 | Breaker Status    | 2 | Both Current and Breaker Status | 3 | Other              | 4 |                    |   |                    |   |        |   |
|---------------------------------|--|----------------|-------|-------------------|---|-------------------|---|---------------------------------|---|--------------------|---|--------------------|---|--------------------|---|--------|---|
| Detection Mode                  | Value  |                |       |                   |   |                   |   |                                 |   |                    |   |                    |   |                    |   |        |   |
| Current                         | 1  |                |       |                   |   |                   |   |                                 |   |                    |   |                    |   |                    |   |        |   |
| Breaker Status                  | 2  |                |       |                   |   |                   |   |                                 |   |                    |   |                    |   |                    |   |        |   |
| Both Current and Breaker Status | 3  |                |       |                   |   |                   |   |                                 |   |                    |   |                    |   |                    |   |        |   |
| Other                           | 4  |                |       |                   |   |                   |   |                                 |   |                    |   |                    |   |                    |   |        |   |
| FailTmms                        | The time delay in ms until the Breaker Failure function will issue the trip to an alternate device.  |                |       |                   |   |                   |   |                                 |   |                    |   |                    |   |                    |   |        |   |
| FanA                            | Motor drive current of a fan in A.   |                |       |                   |   |                   |   |                                 |   |                    |   |                    |   |                    |   |        |   |
| FanBlk                          | <a href="#">Fan is blocked for operation</a>   |                |       |                   |   |                   |   |                                 |   |                    |   |                    |   |                    |   |        |   |
| FanCtlGen<br>FanCtl             | FanCtlGen – Control of all fans<br>FanCtl – Control of a single fan<br><table border="1"> <thead> <tr> <th>Fan Control</th> <th>Value</th> </tr> </thead> <tbody> <tr> <td>Inactive</td> <td>1</td> </tr> <tr> <td>Stage 1</td> <td>2</td> </tr> <tr> <td>Stage 2</td> <td>3</td> </tr> <tr> <td>Stage 3</td> <td>4</td> </tr> </tbody> </table> <p>More stages may be added with numbers greater than 4.</p>  | Fan Control    | Value | Inactive          | 1 | Stage 1           | 2 | Stage 2                         | 3 | Stage 3            | 4 |                    |   |                    |   |        |   |
| Fan Control                     | Value  |                |       |                   |   |                   |   |                                 |   |                    |   |                    |   |                    |   |        |   |
| Inactive                        | 1  |                |       |                   |   |                   |   |                                 |   |                    |   |                    |   |                    |   |        |   |
| Stage 1                         | 2  |                |       |                   |   |                   |   |                                 |   |                    |   |                    |   |                    |   |        |   |
| Stage 2                         | 3  |                |       |                   |   |                   |   |                                 |   |                    |   |                    |   |                    |   |        |   |
| Stage 3                         | 4  |                |       |                   |   |                   |   |                                 |   |                    |   |                    |   |                    |   |        |   |
| FanFlw                          | Air flow in fan.   |                |       |                   |   |                   |   |                                 |   |                    |   |                    |   |                    |   |        |   |
| FanOvCur                        | Fan overcurrent trip.  |                |       |                   |   |                   |   |                                 |   |                    |   |                    |   |                    |   |        |   |
| FltTyp                          | <a href="#">Filter type Low pass; High pass, Band pass, Band stop (notch)</a>  |                |       |                   |   |                   |   |                                 |   |                    |   |                    |   |                    |   |        |   |
| FltDiskm                        | The distance to a fault in km.   |                |       |                   |   |                   |   |                                 |   |                    |   |                    |   |                    |   |        |   |
| FltLoop                         | <table border="1"> <thead> <tr> <th>Fault Loop</th> <th>Value</th> </tr> </thead> <tbody> <tr> <td>Phase A to Ground</td> <td>1</td> </tr> <tr> <td>Phase B to Ground</td> <td>2</td> </tr> <tr> <td>Phase C to Ground</td> <td>3</td> </tr> <tr> <td>Phase A to Phase B</td> <td>4</td> </tr> <tr> <td>Phase B to Phase C</td> <td>5</td> </tr> <tr> <td>Phase C to Phase A</td> <td>6</td> </tr> <tr> <td>Others</td> <td>7</td> </tr> </tbody> </table> | Fault Loop     | Value | Phase A to Ground | 1 | Phase B to Ground | 2 | Phase C to Ground               | 3 | Phase A to Phase B | 4 | Phase B to Phase C | 5 | Phase C to Phase A | 6 | Others | 7 |
| Fault Loop                      | Value  |                |       |                   |   |                   |   |                                 |   |                    |   |                    |   |                    |   |        |   |
| Phase A to Ground               | 1  |                |       |                   |   |                   |   |                                 |   |                    |   |                    |   |                    |   |        |   |
| Phase B to Ground               | 2  |                |       |                   |   |                   |   |                                 |   |                    |   |                    |   |                    |   |        |   |
| Phase C to Ground               | 3  |                |       |                   |   |                   |   |                                 |   |                    |   |                    |   |                    |   |        |   |
| Phase A to Phase B              | 4  |                |       |                   |   |                   |   |                                 |   |                    |   |                    |   |                    |   |        |   |
| Phase B to Phase C              | 5  |                |       |                   |   |                   |   |                                 |   |                    |   |                    |   |                    |   |        |   |
| Phase C to Phase A              | 6  |                |       |                   |   |                   |   |                                 |   |                    |   |                    |   |                    |   |        |   |
| Others                          | 7  |                |       |                   |   |                   |   |                                 |   |                    |   |                    |   |                    |   |        |   |
| FltNum                          | Fault Number (number allocation is local issue).   |                |       |                   |   |                   |   |                                 |   |                    |   |                    |   |                    |   |        |   |
| FltZ                            | Fault impedance  |                |       |                   |   |                   |   |                                 |   |                    |   |                    |   |                    |   |        |   |
| FuFail                          | TRUE = indicates that the TVTR fuse has opened/failed.   |                |       |                   |   |                   |   |                                 |   |                    |   |                    |   |                    |   |        |   |
| GasFlwTr                        | Insulation liquid (for example oil) flow trip because of gas (maybe used for Buchholz trip).   |                |       |                   |   |                   |   |                                 |   |                    |   |                    |   |                    |   |        |   |
| GasInsAlm                       | Gas in insulation liquid (for example oil) alarm because of an abnormal condition (FALSE = Normal, TRUE = alert, maybe used for Buchholz trip).  |                |       |                   |   |                   |   |                                 |   |                    |   |                    |   |                    |   |        |   |
| GasInsTr                        | Gas in insulation liquid trip because of a dangerous condition (maybe used for Buchholz trip).   |                |       |                   |   |                   |   |                                 |   |                    |   |                    |   |                    |   |        |   |
| GnCtl                           | Generator Control.   |                |       |                   |   |                   |   |                                 |   |                    |   |                    |   |                    |   |        |   |
| GndDIMod                        | Operate Time Delay for Single Phase Ground Mode. TRUE = on, FALSE = off.   |                |       |                   |   |                   |   |                                 |   |                    |   |                    |   |                    |   |        |   |
| GndDITmms                       | Operate Time Delay for single-phase ground faults in ms.   |                |       |                   |   |                   |   |                                 |   |                    |   |                    |   |                    |   |        |   |
| GndStr                          | When the ground measurements exceed (or drop below, in the case of a dropout function) this value, the operation of the related function is initiated.   |                |       |                   |   |                   |   |                                 |   |                    |   |                    |   |                    |   |        |   |
| GnSpd                           | Generator Speed.   |                |       |                   |   |                   |   |                                 |   |                    |   |                    |   |                    |   |        |   |

| GnSt                   | Generator State.<br><table border="1"> <thead> <tr> <th><i>Generator State</i></th> <th><i>Value</i></th> </tr> </thead> <tbody> <tr> <td>Stopped</td> <td>1</td> </tr> <tr> <td>Stopping</td> <td>2</td> </tr> <tr> <td>Started</td> <td>3</td> </tr> <tr> <td>Starting</td> <td>4</td> </tr> <tr> <td>Disabled</td> <td>5</td> </tr> </tbody> </table> | <i>Generator State</i> | <i>Value</i> | Stopped | 1 | Stopping | 2 | Started | 3 | Starting | 4 | Disabled | 5 |
|------------------------|--|------------------------|--------------|---------|---|----------|---|---------|---|----------|---|----------|---|
| <i>Generator State</i> | <i>Value</i>   |                        |              |         |   |          |   |         |   |          |   |          |   |
| Stopped                | 1  |                        |              |         |   |          |   |         |   |          |   |          |   |
| Stopping               | 2  |                        |              |         |   |          |   |         |   |          |   |          |   |
| Started                | 3  |                        |              |         |   |          |   |         |   |          |   |          |   |
| Starting               | 4  |                        |              |         |   |          |   |         |   |          |   |          |   |
| Disabled               | 5  |                        |              |         |   |          |   |         |   |          |   |          |   |
| GrAlm                  | This Data summarises different alarms, assigned via configuration. TRUE = Indicates a Group Alarm.   |                        |              |         |   |          |   |         |   |          |   |          |   |
| <u>GrInd</u>           | <u>Group indication</u>  |                        |              |         |   |          |   |         |   |          |   |          |   |
| GrRef                  | Reference to a higher-level object. The Mod of this Logical Device influences the Beh of the LN same as the same level LN Device (see Beh in Table 6). This Beh of the LN may be modified by the same level Logical Device. Same holds also for the data sets and the settings of control blocks.  |                        |              |         |   |          |   |         |   |          |   |          |   |
| GrdRx                  | If TRUE: receipt of a guard signal from the carrier set interface.   |                        |              |         |   |          |   |         |   |          |   |          |   |
| GriFltNum              | Grid Fault Number is used for identification of disturbance records of a common fault (number allocation is local issue).  |                        |              |         |   |          |   |         |   |          |   |          |   |
| GrWrn                  | This Data summarises different warnings, assigned via configuration TRUE = Indicates a Group Warning.  |                        |              |         |   |          |   |         |   |          |   |          |   |
| H2                     | Measurement of Hydrogen (H <sub>2</sub> in ppm). Combustible gas measurement in oil indicating the amount of deterioration of the insulation system.   |                        |              |         |   |          |   |         |   |          |   |          |   |
| H2Alm                  | H2 alarm for gas composition (FALSE = Normal, TRUE = alert).   |                        |              |         |   |          |   |         |   |          |   |          |   |
| H2O                    | Relative saturation of moisture in oil (in %). Note that this a measurement used in conjunction with H2OTmp.   |                        |              |         |   |          |   |         |   |          |   |          |   |
| H2OTmp                 | Temperature of oil at point of measurement of relative saturation of moisture in oil (in °C). Note that this is a measurement used in conjunction with H2O.  |                        |              |         |   |          |   |         |   |          |   |          |   |
| HA                     | Phase related sequence of Harmonics or Interharmonics current for A, B C, N, Net, Res.   |                        |              |         |   |          |   |         |   |          |   |          |   |
| HaAmp                  | Non phase related sequence of Harmonics or Interharmonics current.   |                        |              |         |   |          |   |         |   |          |   |          |   |
| HaAmpTm                | Non phase related Current Time product.  |                        |              |         |   |          |   |         |   |          |   |          |   |
| HaCfAmp                | Non phase related current crest factors (peak waveform value/sqrt(2)/fundamental).   |                        |              |         |   |          |   |         |   |          |   |          |   |
| HaCfVol                | Non phase related voltage crest factors (peak waveform value/sqrt(2)/fundamental).   |                        |              |         |   |          |   |         |   |          |   |          |   |
| HaKFact                | Non phase related K Factor.  |                        |              |         |   |          |   |         |   |          |   |          |   |
| HaRmsAmp               | Non phase related current RMS Harmonic or Interharmonic (un-normalized Thd).   |                        |              |         |   |          |   |         |   |          |   |          |   |
| HaRmsVol               | Non phase related voltage RMS Harmonic or Interharmonic (un-normalized Thd).   |                        |              |         |   |          |   |         |   |          |   |          |   |
| HaRst                  | Number of the harmonic that is being monitored for restraint.  |                        |              |         |   |          |   |         |   |          |   |          |   |
| HaTdFact               | Non phase related Transformer derating factor.   |                        |              |         |   |          |   |         |   |          |   |          |   |
| HaTiFact               | Non phase related voltage Telephone Influence Factor, Method 1, 2, 3, ...  |                        |              |         |   |          |   |         |   |          |   |          |   |
| HATm                   | Phase related Current Time product.  |                        |              |         |   |          |   |         |   |          |   |          |   |
| HaTsWatt               | Non phase related total harmonic or interharmonic active power (no fundamental) signed sum.  |                        |              |         |   |          |   |         |   |          |   |          |   |
| HaTuWatt               | Non phase related total harmonic or interharmonic active power (no fundamental) unsigned sum.  |                        |              |         |   |          |   |         |   |          |   |          |   |
| HaVol                  | Non phase related sequence of Harmonics or Interharmonics voltage.   |                        |              |         |   |          |   |         |   |          |   |          |   |
| HaVolAmp               | Non phase related sequence of Harmonics or Interharmonics apparent power.  |                        |              |         |   |          |   |         |   |          |   |          |   |
| HaVolAmpr              | Non phase related sequence of Harmonics or Interharmonics reactive power.  |                        |              |         |   |          |   |         |   |          |   |          |   |
| HaWatt                 | Non phase related sequence of Harmonics or Interharmonics active power.  |                        |              |         |   |          |   |         |   |          |   |          |   |
| HCfA                   | Phase related current crest factors (peak waveform value/sqrt(2)/fundamental).   |                        |              |         |   |          |   |         |   |          |   |          |   |
| HCfPhV                 | Phase to ground voltage crest factors (peak waveform value/sqrt(2)/fundamental).   |                        |              |         |   |          |   |         |   |          |   |          |   |
| HCfPPV                 | Phase to phase voltage crest factors (peak waveform value/sqrt(2)/fundamental).  |                        |              |         |   |          |   |         |   |          |   |          |   |

| Health  | <p>This information reflects the state of the logical node related HW and SW. More detailed information related to the source of the problem may be provided by specific Data. For LLNO, this Data reflects the worst value of "Health" of the logical nodes that are part of the logical device associated with LLNO.</p> <table border="1"> <thead> <tr> <th>Health State</th> <th>Value</th> </tr> </thead> <tbody> <tr> <td>Ok ("green") – no problems, normal operation</td> <td>1</td> </tr> <tr> <td>Warning ("yellow") – minor problems, but in safe operation mode</td> <td>2</td> </tr> <tr> <td>Alarm ("red") – severe problem, no operation possible</td> <td>3</td> </tr> </tbody> </table> <p>Health states 1 ("green") and 3 ("red") are unambiguous by definition. The detailed meaning of Health state 2 ("yellow") is a local issue depending from the dedicated function/device.</p> | Health State | Value | Ok ("green") – no problems, normal operation | 1 | Warning ("yellow") – minor problems, but in safe operation mode | 2 | Alarm ("red") – severe problem, no operation possible | 3 |
|---|---|--------------|-------|--|---|---|---|---|---|
| Health State  | Value   |              |       |  |   |   |   |   |   |
| Ok ("green") – no problems, normal operation                    | 1   |              |       |  |   |   |   |   |   |
| Warning ("yellow") – minor problems, but in safe operation mode | 2   |              |       |  |   |   |   |   |   |
| Alarm ("red") – severe problem, no operation possible           | 3   |              |       |  |   |   |   |   |   |
| <b>HeatAlm</b>  | <b>TRUE = Supervision has detected an abnormal state of the Heater</b>  |              |       |  |   |   |   |   |   |
| HiBatVal  | High battery alarm value.   |              |       |  |   |   |   |   |   |
| HiCtIV  | Highest control voltage since last reset.   |              |       |  |   |   |   |   |   |
| HiDmdA  | Highest current demand since last reset.  |              |       |  |   |   |   |   |   |
| <b>HiLimSpt</b>   | <b>High limit setpoint</b>  |              |       |  |   |   |   |   |   |
| HiSet   | High operate value, percentage of the nominal current.  |              |       |  |   |   |   |   |   |
| HiTapPos  | Highest tap position since last reset.  |              |       |  |   |   |   |   |   |
| HiTrgLev  | High (positive) trigger level.  |              |       |  |   |   |   |   |   |
| HiVRtg  | Rated Voltage (high voltage level).   |              |       |  |   |   |   |   |   |
| HKf   | Phase related K Factor for A, B, C.   |              |       |  |   |   |   |   |   |
| HPhV  | Sequence of Harmonics or Interharmonics for phase to ground voltages AN, BN, CN, NG.  |              |       |  |   |   |   |   |   |
| HPPV  | Sequence of Harmonics or Interharmonics for phase to phase voltage AB, BC, CA.  |              |       |  |   |   |   |   |   |
| HPTmp   | Winding hotspot temperature (in °C).  |              |       |  |   |   |   |   |   |
| HPTmpAlm  | Hot Point Temperature alarm (FALSE = Normal, TRUE = High).  |              |       |  |   |   |   |   |   |
| <b>HPTmpOp</b>  | <b>Winding hot point temperature operate (could be used to trip a XCBR via a LN PTRC)  </b>   |              |       |  |   |   |   |   |   |
| HPTmpTr   | TRUE = indicates that a trip has occurred due to winding hot point temperature.   |              |       |  |   |   |   |   |   |
| HRmsA   | Phase related Current RMS Harmonic or Interharmonics (un-normalized Total harmonic distortion, Thd) for A, B, C, N.   |              |       |  |   |   |   |   |   |
| HRmsPhV   | Phase to ground voltage RMS Harmonic or Interharmonic (un-normalized Thd) for AN, BN, CN, NG.   |              |       |  |   |   |   |   |   |
| HRmsPPV   | Phase to phase voltage RMS Harmonic or Interharmonic (un-normalized Thd) for AB, BC, CA.  |              |       |  |   |   |   |   |   |
| HTdf  | Phase related Transformer derating factor for A, B, C.  |              |       |  |   |   |   |   |   |
| HTif  | Phase related voltage Telephone Influence Factor, Method 1, 2, 3, ...   |              |       |  |   |   |   |   |   |
| HTsW  | Phase related total phase harmonic or interharmonic active power (no fundamental) signed sum for A, B, C.   |              |       |  |   |   |   |   |   |
| HTuW  | Phase related total phase harmonic or interharmonic active power (no fundamental) unsigned sum for A, B, C.   |              |       |  |   |   |   |   |   |
| HVA   | Phase related sequence of Harmonics or Interharmonics apparent power for A, B, C.   |              |       |  |   |   |   |   |   |
| HVAR  | Phase related sequence of Harmonics or Interharmonics reactive power for A, B, C.   |              |       |  |   |   |   |   |   |
| HVStr   | When the third harmonic phase voltage measurement exceeds this value, the PHIZ protection control operation is initiated.   |              |       |  |   |   |   |   |   |
| HW  | Phase related sequence of Harmonics or Interharmonics active power for A, B, C.   |              |       |  |   |   |   |   |   |
| <b>HyPres</b>   | <b>Actual pressure of the energy transferring medium in %, where 100 % corresponds to rated value and 0 % to block value</b>  |              |       |  |   |   |   |   |   |
| <b>HyTmp</b>  | <b>Actual temperature of the energy transferring medium (usually displayed in °C)</b>   |              |       |  |   |   |   |   |   |
| Hz  | The frequency of a power system in Hz.  |              |       |  |   |   |   |   |   |

**Kommentar [HD132]:** proposal in mail from WW (07.01.08)

| HzInd   | This Data indicates the check result of the differences between the frequencies of the busbar and line voltages. FALSE indicates that the frequency difference is below the required limit. The frequency difference criteria for the synchronising are fulfilled. TRUE indicates the frequency difference exceeds the limit. The synchronising process shall be aborted because the frequency criteria are not fulfilled (synchrocheck) or shall be continued with turbine control activities (synchronising).  |  |              |         |   |                     |   |   |   |   |   |   |   |                               |   |                                  |   |   |   |
|---|--|--|--------------|---------|---|---------------------|---|---|---|---|---|---|---|-------------------------------|---|----------------------------------|---|---|---|
| HzRtg   | Rated frequency, intrinsic property of the device, which cannot be set/changed from remote.  |  |              |         |   |                     |   |   |   |   |   |   |   |                               |   |                                  |   |   |   |
| HzSet   | Setting of a frequency.  |  |              |         |   |                     |   |   |   |   |   |   |   |                               |   |                                  |   |   |   |
| IhA   | Phase related sequence of Interharmonics Current for A, B, C, N, Net, Res.   |  |              |         |   |                     |   |   |   |   |   |   |   |                               |   |                                  |   |   |   |
| IhAmp   | Non phase related sequence of Interharmonics Current.  |  |              |         |   |                     |   |   |   |   |   |   |   |                               |   |                                  |   |   |   |
| IhPhV   | Sequence of Interharmonics for phase to ground voltages AN, BN, CN, NG.  |  |              |         |   |                     |   |   |   |   |   |   |   |                               |   |                                  |   |   |   |
| IhPPV   | Sequence of Interharmonics for phase to phase voltage AB, BC, CA.  |  |              |         |   |                     |   |   |   |   |   |   |   |                               |   |                                  |   |   |   |
| IhVA  | Phase related sequence of Interharmonics apparent power for A, B, C.   |  |              |         |   |                     |   |   |   |   |   |   |   |                               |   |                                  |   |   |   |
| IhVAr   | Phase related sequence of Interharmonics reactive power for A, B, C.   |  |              |         |   |                     |   |   |   |   |   |   |   |                               |   |                                  |   |   |   |
| IhVol   | Non phase related sequence of Interharmonics voltage.  |  |              |         |   |                     |   |   |   |   |   |   |   |                               |   |                                  |   |   |   |
| IhVolAmp  | Non phase related sequence of Interharmonics apparent power.   |  |              |         |   |                     |   |   |   |   |   |   |   |                               |   |                                  |   |   |   |
| IhVolAmpr   | Non phase related sequence of Interharmonics reactive power.   |  |              |         |   |                     |   |   |   |   |   |   |   |                               |   |                                  |   |   |   |
| IhW   | Phase related sequence of Interharmonics active power for A, B, C.   |  |              |         |   |                     |   |   |   |   |   |   |   |                               |   |                                  |   |   |   |
| IhWatt  | Non phase related sequence of Interharmonics active power.   |  |              |         |   |                     |   |   |   |   |   |   |   |                               |   |                                  |   |   |   |
| ImbA  | Deviation from the average phase current.<br>$\text{ImbA.phsX} =  I_x - I_{\text{ave}}  \text{ with } I_{\text{ave}} = (1/3) \times (I_A + I_B + I_C)$   |  |              |         |   |                     |   |   |   |   |   |   |   |                               |   |                                  |   |   |   |
| ImbNgA  | Current Imbalance Negative Sequence Method. $\text{ImbNgA} = I_2 / I_1$  |  |              |         |   |                     |   |   |   |   |   |   |   |                               |   |                                  |   |   |   |
| ImbNgV  | Voltage Imbalance Negative Sequence Method. $\text{ImbNgV} = V_2 / V_1$  |  |              |         |   |                     |   |   |   |   |   |   |   |                               |   |                                  |   |   |   |
| ImbPPV  | Deviation from the average phase-to-phase voltage.<br>$\text{ImbPPV.phsXY} =  V_{XY} - \text{PPV}_{\text{ave}}  \text{ with } \text{PPV}_{\text{ave}} = (1/3) \times (V_{ab} + V_{bc} + V_{ca}).$  |  |              |         |   |                     |   |   |   |   |   |   |   |                               |   |                                  |   |   |   |
| ImbV  | Deviation from the average phase-to-neutral voltage.<br>$\text{ImbV.phsX} =  V_x - V_{\text{ave}}  \text{ with } V_{\text{ave}} = (1/3) \times (V_{an} + V_{bn} + V_{cn}).$  |  |              |         |   |                     |   |   |   |   |   |   |   |                               |   |                                  |   |   |   |
| ImbZroA   | Current Imbalance Zero Sequence Method. $\text{ImbZroA} = I_0 / I_1$   |  |              |         |   |                     |   |   |   |   |   |   |   |                               |   |                                  |   |   |   |
| ImbZroV   | Voltage Imbalance Zero Sequence Method. $\text{ImbZroV} = V_0 / V_1$   |  |              |         |   |                     |   |   |   |   |   |   |   |                               |   |                                  |   |   |   |
| Ina   | Number of associations terminated due to inactivity.   |  |              |         |   |                     |   |   |   |   |   |   |   |                               |   |                                  |   |   |   |
| Ind   | General indication.  |  |              |         |   |                     |   |   |   |   |   |   |   |                               |   |                                  |   |   |   |
| Inet  | Net Current $I_a + I_b + I_c + I_n$ (amps)   |  |              |         |   |                     |   |   |   |   |   |   |   |                               |   |                                  |   |   |   |
| IntDetMth   | <p>Voltage Interruption Detection Method is the method used to detect the interruption condition based on measured or calculated voltages, currents or the status of the breaker auxiliary contacts.</p> <table border="1"> <thead> <tr> <th><u>Voltage Interruption Detection Method</u></th> <th><u>Value</u></th> </tr> </thead> <tbody> <tr> <td>Voltage</td> <td>1</td> </tr> <tr> <td>Voltage and Current</td> <td>2</td> </tr> <tr> <td>Voltage and Normally Open Breaker Contact</td> <td>3</td> </tr> <tr> <td>Voltage and Normally Closed Breaker Contact</td> <td>4</td> </tr> <tr> <td>Voltage and both Normally Open and Normally Closed Breaker Contacts</td> <td>5</td> </tr> <tr> <td>Normally Open Breaker Contact</td> <td>6</td> </tr> <tr> <td>Normally Closed Breaker Contacts</td> <td>7</td> </tr> <tr> <td>Both Normally Open and Normally Closed Breaker Contacts</td> <td>8</td> </tr> </tbody> </table> | <u>Voltage Interruption Detection Method</u> | <u>Value</u> | Voltage | 1 | Voltage and Current | 2 | Voltage and Normally Open Breaker Contact | 3 | Voltage and Normally Closed Breaker Contact | 4 | Voltage and both Normally Open and Normally Closed Breaker Contacts | 5 | Normally Open Breaker Contact | 6 | Normally Closed Breaker Contacts | 7 | Both Normally Open and Normally Closed Breaker Contacts | 8 |
| <u>Voltage Interruption Detection Method</u>                        | <u>Value</u>   |  |              |         |   |                     |   |   |   |   |   |   |   |                               |   |                                  |   |   |   |
| Voltage   | 1  |  |              |         |   |                     |   |   |   |   |   |   |   |                               |   |                                  |   |   |   |
| Voltage and Current   | 2  |  |              |         |   |                     |   |   |   |   |   |   |   |                               |   |                                  |   |   |   |
| Voltage and Normally Open Breaker Contact                           | 3  |  |              |         |   |                     |   |   |   |   |   |   |   |                               |   |                                  |   |   |   |
| Voltage and Normally Closed Breaker Contact                         | 4  |  |              |         |   |                     |   |   |   |   |   |   |   |                               |   |                                  |   |   |   |
| Voltage and both Normally Open and Normally Closed Breaker Contacts | 5  |  |              |         |   |                     |   |   |   |   |   |   |   |                               |   |                                  |   |   |   |
| Normally Open Breaker Contact                                       | 6  |  |              |         |   |                     |   |   |   |   |   |   |   |                               |   |                                  |   |   |   |
| Normally Closed Breaker Contacts                                    | 7  |  |              |         |   |                     |   |   |   |   |   |   |   |                               |   |                                  |   |   |   |
| Both Normally Open and Normally Closed Breaker Contacts             | 8  |  |              |         |   |                     |   |   |   |   |   |   |   |                               |   |                                  |   |   |   |
| InhTmm  | Time Setting for Restart Inhibition (min). Once the StrInh is activated, the motor should not be allowed to start until this time has elapsed.   |  |              |         |   |                     |   |   |   |   |   |   |   |                               |   |                                  |   |   |   |
| InOv  | This Data indicates that a buffer overflow occurred for the input buffer and that all messages could not be received properly. Important service requests may be lost (TRUE) in the communication. Appropriate actions shall be taken.   |  |              |         |   |                     |   |   |   |   |   |   |   |                               |   |                                  |   |   |   |
| InRef   | Reference to the object what is binded to this input   |  |              |         |   |                     |   |   |   |   |   |   |   |                               |   |                                  |   |   |   |

Gelöscht: d

Kommentar [HD133]: #21  
6

| InsAlm                | TRUE = provides an alarm after a pre-set limit is reached, for example low insulation level. Setting of the limits is a local issue and depends on the supervised media property. An appropriate action may be to refill the insulation medium.  |                       |       |                    |   |                     |   |      |   |       |   |
|-----------------------|--|-----------------------|-------|--------------------|---|---------------------|---|------|---|-------|---|
| InsBlk                | TRUE = block the operation of the isolated device when the level is reached where operation is not safe anymore. Setting of the limits is a local issue and depends on the supervised media property.  |                       |       |                    |   |                     |   |      |   |       |   |
| InsLevMax             | TRUE = Insulation medium level has reached predetermined maximum level, mainly used for the filling process.   |                       |       |                    |   |                     |   |      |   |       |   |
| InsLevMin             | TRUE = Insulation medium level has dropped to a predetermined minimum level, mainly used for the filling process.  |                       |       |                    |   |                     |   |      |   |       |   |
| InsTr                 | TRUE = the isolation of the device is not guaranteed anymore. The device has to switch off from the power system, i.e. it has to be isolated by tripping the surrounding breakers. Setting of the limits is a local issue and depends on the supervised media property.  |                       |       |                    |   |                     |   |      |   |       |   |
| IntStrVal             | The Voltage Interruption set point. When the measured voltage goes below this value  |                       |       |                    |   |                     |   |      |   |       |   |
| IntIn                 | Integer status input used for generic I/O.   |                       |       |                    |   |                     |   |      |   |       |   |
| Ires                  | Residual Current Ia + Ib + Ic (amps)   |                       |       |                    |   |                     |   |      |   |       |   |
| ISCSO                 | Generic integer control output.  |                       |       |                    |   |                     |   |      |   |       |   |
| K0Fact                | K0 is Zero Sequence Compensation Factor = $(Z0 - Z1)/3Z1$ where Z0 is Zero Sequence Impedance, and Z1 is Positive Sequence Impedance.  |                       |       |                    |   |                     |   |      |   |       |   |
| K0FactAng             | Residual Compensation Factor Angle for K0.   |                       |       |                    |   |                     |   |      |   |       |   |
| <u>Kld</u>            | <u>K lead</u>  |                       |       |                    |   |                     |   |      |   |       |   |
| <u>Klg</u>            | <u>K lag</u>   |                       |       |                    |   |                     |   |      |   |       |   |
| <u>Kp</u>             | <u>Proportional gain</u>   |                       |       |                    |   |                     |   |      |   |       |   |
| LCoI                  | Lower Plunge Coil Position.  |                       |       |                    |   |                     |   |      |   |       |   |
| LDC                   | Line Drop Compensation. LDC is R&X or Z model TRUE = R&X, FALSE = Z.   |                       |       |                    |   |                     |   |      |   |       |   |
| LDCR                  | Line drop voltage due to line resistance component (FPF presumed) at rated current.  |                       |       |                    |   |                     |   |      |   |       |   |
| LDCX                  | Line drop voltage due to line reactance component (FPF presumed) at rated current.   |                       |       |                    |   |                     |   |      |   |       |   |
| LDCZ                  | Line drop voltage due to line total impedance (FPF presumed) at rated current.   |                       |       |                    |   |                     |   |      |   |       |   |
| LEDRs                 | Resets all light emitting diodes, true causes reset to occur.  |                       |       |                    |   |                     |   |      |   |       |   |
| Lev                   | Level of insulating medium.  |                       |       |                    |   |                     |   |      |   |       |   |
| LevMod                | Internal Trigger Mode for disturbance recording.<br><table border="1" style="margin-left: 20px;"> <thead> <tr> <th>Internal Trigger Mode</th> <th>Value</th> </tr> </thead> <tbody> <tr> <td>Positive or Rising</td> <td>1</td> </tr> <tr> <td>Negative or Falling</td> <td>2</td> </tr> <tr> <td>Both</td> <td>3</td> </tr> <tr> <td>Other</td> <td>4</td> </tr> </tbody> </table> <p>The disturbance recorder trigger mode is defined by <b>TrgMod</b>. <b>LevMod</b> exists both for the disturbance recorder as a whole (RDRE) and for each of its individual channels (RADR, RBDR). The interaction of both is determined by the individual disturbance recorder.</p> | Internal Trigger Mode | Value | Positive or Rising | 1 | Negative or Falling | 2 | Both | 3 | Other | 4 |
| Internal Trigger Mode | Value  |                       |       |                    |   |                     |   |      |   |       |   |
| Positive or Rising    | 1  |                       |       |                    |   |                     |   |      |   |       |   |
| Negative or Falling   | 2  |                       |       |                    |   |                     |   |      |   |       |   |
| Both                  | 3  |                       |       |                    |   |                     |   |      |   |       |   |
| Other                 | 4  |                       |       |                    |   |                     |   |      |   |       |   |
| LHz                   | TRUE = Lower frequency, FALSE = no action.   |                       |       |                    |   |                     |   |      |   |       |   |
| LimAOv                | Current limit for overflow blocking.   |                       |       |                    |   |                     |   |      |   |       |   |
| LimLodA               | The Data LodA current (percent) above which automatic commands suspended.  |                       |       |                    |   |                     |   |      |   |       |   |
| LimVOv                | Voltage limit for overflow blocking.   |                       |       |                    |   |                     |   |      |   |       |   |
| LinAng                | Line angle is the feeder/line impedance angle.   |                       |       |                    |   |                     |   |      |   |       |   |
| LinCapac              | Capacitance of the line.   |                       |       |                    |   |                     |   |      |   |       |   |
| LinLenKm              | The length of the line in km.  |                       |       |                    |   |                     |   |      |   |       |   |
| LivBusVal             | Voltage setting used to detect Live Bus, for example for auto reclosing.   |                       |       |                    |   |                     |   |      |   |       |   |

Gelöscht: re

Kommentar [HD134]: example in annex necessary? like mod/beh?

| LivDeaMod | Live Dead Mode of operation under which switching may be carried out.   |                |       |                     |   |                     |   |                     |   |   |   |   |   |   |   |   |   |
|-----------|---|----------------|-------|---------------------|---|---------------------|---|---------------------|---|---|---|---|---|---|---|---|---|
|           | <table border="1"> <thead> <tr> <th>Live Dead Mode</th> <th>Value</th> </tr> </thead> <tbody> <tr> <td>Dead Line, Dead Bus</td> <td>1</td> </tr> <tr> <td>Live Line, Dead Bus</td> <td>2</td> </tr> <tr> <td>Dead Line, Live Bus</td> <td>3</td> </tr> <tr> <td>Dead Line, Dead Bus OR<br/>Live Line, Dead Bus</td> <td>4</td> </tr> <tr> <td>Dead Line, Dead Bus OR<br/>Dead Line, Live Bus</td> <td>5</td> </tr> <tr> <td>Live Line, Dead Bus OR<br/>Dead Line, Live Bus</td> <td>6</td> </tr> <tr> <td>Dead Line, Dead Bus OR<br/>Live Line, Dead Bus OR<br/>Dead Line, Live Bus</td> <td>7</td> </tr> </tbody> </table> | Live Dead Mode | Value | Dead Line, Dead Bus | 1 | Live Line, Dead Bus | 2 | Dead Line, Live Bus | 3 | Dead Line, Dead Bus OR<br>Live Line, Dead Bus | 4 | Dead Line, Dead Bus OR<br>Dead Line, Live Bus | 5 | Live Line, Dead Bus OR<br>Dead Line, Live Bus | 6 | Dead Line, Dead Bus OR<br>Live Line, Dead Bus OR<br>Dead Line, Live Bus | 7 |
|           | Live Dead Mode  | Value          |       |                     |   |                     |   |                     |   |   |   |   |   |   |   |   |   |
|           | Dead Line, Dead Bus   | 1              |       |                     |   |                     |   |                     |   |   |   |   |   |   |   |   |   |
|           | Live Line, Dead Bus   | 2              |       |                     |   |                     |   |                     |   |   |   |   |   |   |   |   |   |
|           | Dead Line, Live Bus   | 3              |       |                     |   |                     |   |                     |   |   |   |   |   |   |   |   |   |
|           | Dead Line, Dead Bus OR<br>Live Line, Dead Bus   | 4              |       |                     |   |                     |   |                     |   |   |   |   |   |   |   |   |   |
|           | Dead Line, Dead Bus OR<br>Dead Line, Live Bus   | 5              |       |                     |   |                     |   |                     |   |   |   |   |   |   |   |   |   |
|           | Live Line, Dead Bus OR<br>Dead Line, Live Bus   | 6              |       |                     |   |                     |   |                     |   |   |   |   |   |   |   |   |   |
|           | Dead Line, Dead Bus OR<br>Live Line, Dead Bus OR<br>Dead Line, Live Bus   | 7              |       |                     |   |                     |   |                     |   |   |   |   |   |   |   |   |   |
| LivLinVal | Voltage setting used to detect Live Line, for example for auto reclosing.   |                |       |                     |   |                     |   |                     |   |   |   |   |   |   |   |   |   |
| LoBatVal  | Low battery alarm value.  |                |       |                     |   |                     |   |                     |   |   |   |   |   |   |   |   |   |
| LockKey   | This changeover is always done locally with a physical key or toggle switch. The physical key or toggle switch may have a set of contacts from which the position can be read. This Data indicates the switchover between local and remote operation; local = TRUE, remote = FALSE.   |                |       |                     |   |                     |   |                     |   |   |   |   |   |   |   |   |   |
| Loc       | This data describes the control behavior of the related LN. (FALSE =not allowed at this level, TRUE = allowed at this level). The relationship between LocSta, ModSwAuth is given in annex xx.  |                |       |                     |   |                     |   |                     |   |   |   |   |   |   |   |   |   |
| LoCtIV    | Lowest Control Voltage since last reset.  |                |       |                     |   |                     |   |                     |   |   |   |   |   |   |   |   |   |
| LocSta    | Control authority at station level (see Loc). Switch between station and higher level.  |                |       |                     |   |                     |   |                     |   |   |   |   |   |   |   |   |   |
| LodA      | Load side current of transformer.   |                |       |                     |   |                     |   |                     |   |   |   |   |   |   |   |   |   |
| LodRsvAlm | Load reserve to alarm.  |                |       |                     |   |                     |   |                     |   |   |   |   |   |   |   |   |   |
| LodRsvTr  | Load reserve to trip.   |                |       |                     |   |                     |   |                     |   |   |   |   |   |   |   |   |   |
| LokRotTms | Locked Rotor Time (s). This time is the permissible locked rotor time during start-up.  |                |       |                     |   |                     |   |                     |   |   |   |   |   |   |   |   |   |
| LoSet     | Low operate value, percentage of the nominal current.   |                |       |                     |   |                     |   |                     |   |   |   |   |   |   |   |   |   |
| LosFact   | Loss Factor (tan delta)   |                |       |                     |   |                     |   |                     |   |   |   |   |   |   |   |   |   |
| LosOfGrd  | Loss of guard.  |                |       |                     |   |                     |   |                     |   |   |   |   |   |   |   |   |   |
| LosOil    | TRUE = indicates that a loss of oil has been detected.  |                |       |                     |   |                     |   |                     |   |   |   |   |   |   |   |   |   |
| LosVac    | TRUE = indicates when vacuum drops below a predetermined level.   |                |       |                     |   |                     |   |                     |   |   |   |   |   |   |   |   |   |
| LoTapPos  | Lowest tap position since last reset.   |                |       |                     |   |                     |   |                     |   |   |   |   |   |   |   |   |   |
| LoTrgLev  | Low (negative) trigger level.   |                |       |                     |   |                     |   |                     |   |   |   |   |   |   |   |   |   |
| LoVRtg    | Rated Voltage (low voltage level).  |                |       |                     |   |                     |   |                     |   |   |   |   |   |   |   |   |   |
| LTCBlk    | TRUE = Automatic control of LTC blocked (inhibited).  |                |       |                     |   |                     |   |                     |   |   |   |   |   |   |   |   |   |
| LTCDragRs | TRUE = Reset LTC Drag Hands (high and low positions to present position).   |                |       |                     |   |                     |   |                     |   |   |   |   |   |   |   |   |   |
| LV        | TRUE = Lower voltage, FALSE = no action.  |                |       |                     |   |                     |   |                     |   |   |   |   |   |   |   |   |   |
| Mag       | The measured global maximum or minimum value of the system parameter reached during the event. This is the parameter that defines the power quality event, for example the minimum voltage during a voltage dip or the maximum frequency during an overfrequency variation.<br><br>Figure in Am1  |                |       |                     |   |                     |   |                     |   |   |   |   |   |   |   |   |   |
| MaxAmps   | Maximum current in a defined evaluation interval (period).  |                |       |                     |   |                     |   |                     |   |   |   |   |   |   |   |   |   |
| MaxCyc    | Maximum number of allowed cycles for any cyclic process, e.g. used for the Autorecloser   |                |       |                     |   |                     |   |                     |   |   |   |   |   |   |   |   |   |
| MaxDITmms | Operation instant difference (between intended and performed operation).  |                |       |                     |   |                     |   |                     |   |   |   |   |   |   |   |   |   |
| MaxEna    | Monitoring of current exceeding a set value is enabled (TRUE) in order to detect a fault condition during power swing in the system.  |                |       |                     |   |                     |   |                     |   |   |   |   |   |   |   |   |   |

**Gelöscht:** At bay level 'local' means operation from the bay unit and 'remote' means operation from a station unit. At process level, 'local' means operation direct on the process device, for example on a circuit breaker and 'remote' means operation from a bay unit. If in a Logical Device the Loc of LLN0 is in contradiction to the Loc of any contained LN, "local" is always dominant.

**Gelöscht:** behavior  
**Kommentar [HD135]:** missing table for relationship between Loc and LockKey

**Gelöscht:** It is a result of both the LockKey and the RemCtIBlk according to the following table:

... [42]

|           |   |
|-----------|---|
| MaxFwdAng | Maximum phase angle in forward direction.   |
| MaxImbA   | Maximum deviation from the average current.<br>Max(Idev_a,Idev_b,Idev_c)  |
| MaxImbPPV | Maximum deviation from the average phase-to-phase voltage.<br>MaxImbPPV = Max(PPVdev_a,PPVdev_b,PPVdev_c)   |
| MaxImbV   | Maximum deviation from the average phase-to-neutral voltage.<br>MaxImbV = Max(Vdev_a,Vdev_b,Vdev_c)   |
| MaxNumRcd | Maximum number of records that can be recorded.   |
| MaxNumStr | Setting for the maximum number of starts. This Data is also used for the permissible number of cold starts. For example, the motor manufacturer may state that three starts at the maximum are allowed within 1 h. These parameters are intended for this. So MaxNumStr is set to 3 and MaxStrTmm is set to 60 (min). |
| MaxOpCap  | This Data shall provide the information of the operation capability available when the switch mechanism is fully charged. The Maximum Operating Capability gives the information about the maximum of CBOpCap.  |
| MaxOpTmms | The Data maximum operating time in ms for the LN is used for co-ordinating action of the related function.  |
| MaxRvAng  | Maximum phase angle in reverse direction.   |
| MaxStrTmm | The time period in which the maximum number of starts is allowed.   |
| MaxTmms   | Maximum allowed time in ms to be used for any application if needed   |
| MaxVA     | Maximum apparent power in a defined evaluation interval (period).   |
| MaxVAr    | Maximum reactive power in a defined evaluation interval (period).   |
| MaxVolts  | Maximum voltage in a defined evaluation interval (period).  |
| MaxW      | Maximum real power in a defined evaluation interval (period).   |
| MaxWrmStr | Permissible number of warm starts, in most cases cold starts – 1.   |
| MechAlm   | Supervision has detected an abnormal condition of the mechanical chain, derived e.g. from travel curve or operating times. The values are the same as for the Health.   |
| MemClr    | TRUE = Clear Memory.  |
| MemFull   | This Data is the percentage at which to indicate memory is full.  |
| MemOv     | TRUE = Memory overflow has occurred.  |
| MemRs     | TRUE = resetting the memory in the recorder.  |
| MemUsed   | Percentage of storage memory in use.  |
| MinAmps   | Minimum current in a defined evaluation interval (period).  |
| MinFwdAng | Minimum phase angle in forward direction.   |
| MinOpTmms | The Data minimum operating time in ms for the LN is used for co-ordinating with older electromechanical relays.   |
| MinPPV    | Minimum phase to phase Voltage.   |
| MinRvAng  | Minimum phase angle in reverse direction.   |
| MinVA     | Minimum apparent power in a defined evaluation interval (period).   |
| MinVAr    | Minimum reactive power in a defined evaluation interval (period).   |
| MinVolts  | Minimum voltage in a defined evaluation interval (period).  |
| MinW      | Minimum real power in a defined evaluation interval (period).   |
| Mod       | Controllable dat to change the behavior of the LN.  |
| ModSwAuth | Mode of local authority. Relationship is given in annex xx.   |
| MotA      | Motor current (usually displayed in A)  |
| MotAlm    | TRUE = Motor operating time exceeded  |
| MotDrvA   | Motor drive current.  |
| MotStr    | I-Motor Startup Threshold. This value identifies a motor starting condition.  |

| Mode             |
|------------------|
| ON (enabled)     |
| BLOCKED          |
| TEST             |
| TEST/BLOCKE      |
| OFF (disabled)   |
| Function active  |
| Outputs (to pro  |
| GOOSE output     |
| GOOSE input      |
| SV stream out    |
| SV stream in     |
| Reporting (to cl |
| Controls (from c |
| Participating in |
| Functional (pro  |
| Configuration (c |
| (Normal state)   |

**Gelöscht:**

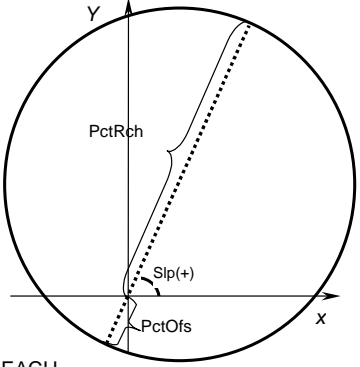
¶ with the exception of Mod/Beh change¶  
 with the exception of Mod/Beh change¶  
 in test mode provided by manufacturer¶  
 quality of DO flagged as test and test bit set in GOOSE header if the LLN0.Mod of GsCB is Test¶  
 interpretation of quality/Beh depending on LN implementation¶  
 only if the test bit is set in the control service¶  
 If required, the quality of the reported DO is set to invalid when its associated Beh is off¶  
 quality of DO flagged as test and test bit set in SV header if the LLN0.Mod of SVCB is Test¶  
 quality of DO flagged as test

|          |  |
|----------|--|
| MotTm    | Motor operating time of the last charging operation (usually displayed in s)   |
| MstAlm   | Moisture sensor alarm (FALSE = Normal, TRUE = High Moisture).  |
| NamPlt   | This is the name plate of the logical node.  |
| NeutAlm  | TRUE = Neutral Alarm is present.   |
| NgEna    | Monitoring of Negative sequence current is enabled (TRUE) in order to detect an unbalanced fault condition during power swing in the system. |
| NomA     | Normalising demand current used in IEEE 519 TDD calculation.   |
| NsN      | non-active power (vars)  |
| NsSn     | Non-fundamental apparent power   |
| NsSh     | harmonic apparent power  |
| NsDpi    | current distortion power   |
| NsDpv    | voltage distortion power   |
| NsDph    | harmonic distortion power  |
| NsSnS1   | Sn / S1 ratio - harmonic pollution   |
| NsIeh    | 3 phase effective harmonic current   |
| NsVeh    | 3 phase effective harmonic voltage   |
| NsSeh    | 3 phase effective harmonic apparent power  |
| NsDpei   | 3 phase effective current distortion power   |
| NsDpev   | 3 phase effective voltage distortion power   |
| NsDpeh   | 3 phase effective harmonic distortion power  |
| NsSen    | 3 phase effective non-fundamental apparent power   |
| NsSenSe1 | Sen / Se1 ratio - harmonic pollution   |
| NsS1     | fundamental apparent power (va)  |
| NsP1     | fundamental real power (watts)   |
| NsSn     | non-active apparent power (vars)   |
| NsIe     | 3 phase effective current (amps)   |
| NsVe     | 3 phase effective voltage (volts)  |
| NsSe     | 3 phase effective apparent power (va)  |
| NsIe1Ve1 | 3 phase effective fundamental current (amps)   |
| NsSe1    | 3 phase effective fundamental voltage (volts)  |
| NsTotN   | 3 phase effective fundamental apparent power (va)  |
| NsPFe    | 3 phase total non-active power (vars)  |
| NsS1p    | 3 phase effective power factor (pu)  |
| NsS1u    | positive sequence fundamental apparent power (va)  |
| NsP1p    | fundamental unbalanced apparent power (va)   |
| NsQ1p    | positive sequence fundamental apparent power (va)  |
| NsPF1p   | positive sequence fundamental reactive power (var)   |
| NsS1uS1p | positive sequence fundamental power factor (pu)  |
| NumCntRs | Number of times a counter is reset.  |
| NumCyc   | Number of cycles of the basic frequency.   |
| NumPwrUp | The number of power up operations of the physical device since the last reset.   |
| NumRcd   | Actual number of records.  |
| OANL     | TRUE = Provides indication that power system devices is operating with no load.  |
| Ofs      | Offset, for Analogue Values, the offset from zero of the Analogue Value.   |

**Kommentar [HD136]:** see #591

| OilFil         | TRUE = Oil filtration is operational/running.   |                |       |            |   |           |   |
|----------------|---|----------------|-------|------------|---|-----------|---|
| OilMotA        | Oil circulation motor drive current.  |                |       |            |   |           |   |
| OilTmpIn       | Oil temperature cooler in.  |                |       |            |   |           |   |
| OilTmpOut      | Oil temperature cooler out.   |                |       |            |   |           |   |
| OilTmpSet      | Set point for oil temperature.  |                |       |            |   |           |   |
| OoStep         | <u>Out of step alarm: supervision of diverter selector switch synchronism</u>   |                |       |            |   |           |   |
| Op             | Operate (Common Data Classes ACT) indicates the trip decision of a protection function (LN). The trip itself is issued by PTRC.   |                |       |            |   |           |   |
| OpARem         | The remote operating current (phasor) used by the differential protection function.   |                |       |            |   |           |   |
| OpCls          | Operation Close Switch. OpCls shall be used if no control service is available between CSWI and XCBR and the GOOSE is used instead.   |                |       |            |   |           |   |
| OpCnt          | This Data represents a count of operations that is not resettable. In general, this type of counter is included in the following LNs: XCBR, XSWI, and YLTC. The counter shall not be reset from remote but maybe from local.  |                |       |            |   |           |   |
| OpCntRs        | This Data represents a resettable LN operations counter. The use of the INC Common Data Class, permits setting the counter to something other than "0".   |                |       |            |   |           |   |
| OpDITmms       | Time delay in ms before operating once operate conditions have been met.  |                |       |            |   |           |   |
| OpEx           | Trip of a breaker failure function to a circuit breaker other than the faulty one to switch off the grid fault ("external trip").   |                |       |            |   |           |   |
| OpIn           | Retrip of a breaker failure function after a trip of a protection function was not successful ("internal trip").  |                |       |            |   |           |   |
| OpMod          | This Data is used to defined the operation mode of mass storages<br><table border="1" style="margin-left: 20px;"> <thead> <tr> <th>Direction Mode</th> <th>Value</th> </tr> </thead> <tbody> <tr> <td>Saturation</td> <td>1</td> </tr> <tr> <td>Overwrite</td> <td>2</td> </tr> </tbody> </table> | Direction Mode | Value | Saturation | 1 | Overwrite | 2 |
| Direction Mode | Value   |                |       |            |   |           |   |
| Saturation     | 1   |                |       |            |   |           |   |
| Overwrite      | 2   |                |       |            |   |           |   |
| OpOpn          | Operation open Switch. OpOpn shall be used if no control service is available between CSWI and XCBR and the GOOSE is used instead   |                |       |            |   |           |   |
| OpOvA          | TRUE = Device is operating under an overcurrent condition.  |                |       |            |   |           |   |
| OpOvExt        | TRUE = Device operating in an over excited condition.   |                |       |            |   |           |   |
| OpOvV          | TRUE = Device is operating under an overvoltage condition.  |                |       |            |   |           |   |
| OPSA           | TRUE = Surge arrestor operation detected.   |                |       |            |   |           |   |
| OpSpdCls       | <u>Operation speed of main contact during close operation (usually displayed in m/s)</u>  |                |       |            |   |           |   |
| OpSpdOpn       | <u>Operation speed of main contact during open operation (usually displayed in m/s)</u>   |                |       |            |   |           |   |
| OpTmAlm        | <u>TRUE = Switch operating time exceeded</u>  |                |       |            |   |           |   |
| OpTmCls        | <u>Operation timing of main contact during close operation (usually displayed in ms)</u>  |                |       |            |   |           |   |
| OpTmh          | This Data indicates the Operation time in h of a physical device since start of the operation. Details are LN specific.   |                |       |            |   |           |   |
| OpTmOpn        | <u>Operation timing of main contact during open operation (usually displayed in ms)</u>   |                |       |            |   |           |   |
| OpUnExt        | TRUE = Device operated in an under-excited condition.   |                |       |            |   |           |   |
| OpUnV          | TRUE = Device operating in an under voltage condition.  |                |       |            |   |           |   |
| OutOv          | This Data indicates that a buffer overflow occurred for the output buffer and important annunciation's may be lost (TRUE) for the communication. A general interrogation is recommended or an integrity scan is started automatically.  |                |       |            |   |           |   |
| OvStkCls       | <u>The movement of the main contact during a close operation, which is over the end position (usually displayed in mm)</u>  |                |       |            |   |           |   |
| OvStkOpn       | <u>The movement of the main contact during a open operation, which is over the end position (usually displayed in mm)</u>   |                |       |            |   |           |   |
| PaDschAlm      | TRUE = Partial Discharge has reached pre-set alarm level.   |                |       |            |   |           |   |
| ParOp          | Transformers are operating in parallel.   |                |       |            |   |           |   |

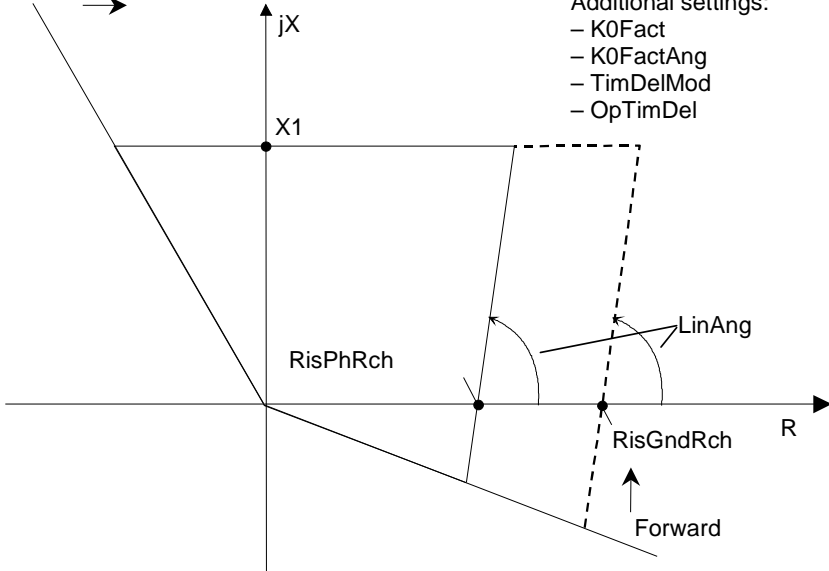
**Kommentar [HD137]:** acc. to an expert this DO should be renamed to" ...selector..", mail 30.11.07

| PctOfs              | <p>Distance characteristic offset in percent of the line length.</p>  <p style="text-align: right;">IEC 1105/03</p>   |              |       |          |   |         |   |         |   |         |   |
|---------------------|--|--------------|-------|----------|---|---------|---|---------|---|---------|---|
| PctRch              | Distance characteristic reach in percent of the line length; see curve in PctOfs.  |              |       |          |   |         |   |         |   |         |   |
| PerTrgTms           | Periodic trigger time in s.  |              |       |          |   |         |   |         |   |         |   |
| PF                  | Phase to ground power factor for Phases 1, 2, and 3, including Angle.  |              |       |          |   |         |   |         |   |         |   |
| PhA                 | Phase current in amperes for Phases 1, 2, and 3, including Angle.  |              |       |          |   |         |   |         |   |         |   |
| PhAng               | Phase angle of LodA relative to CtIV at 1.0 power factor, assuming forward power flow.   |              |       |          |   |         |   |         |   |         |   |
| PhDif               | Used for single-pole-operated CB. If an operation command can not be completed for all three poles, the circuit breaker will be switched into a save position (TRUE = phase discrepancy occurred)  |              |       |          |   |         |   |         |   |         |   |
| PhDMod              | Operate Time Delay Multiphase Mode. TRUE = on, FALSE = off   |              |       |          |   |         |   |         |   |         |   |
| PhDITmms            | Operate Time Delay for Multiphase Faults in ms.  |              |       |          |   |         |   |         |   |         |   |
| PhGndVal            | Phase to ground is the Undervoltage level for WEI (weak end infeed) condition for a phase to ground measurement.   |              |       |          |   |         |   |         |   |         |   |
| PhStop              | Phase Stop Value.  |              |       |          |   |         |   |         |   |         |   |
| PhStr               | When the phase measurements exceed (or drop below, in the case of a dropout function) this value, the operation of the related function is initiated.  |              |       |          |   |         |   |         |   |         |   |
| PhV                 | Phase to ground voltages for Phases 1, 2, and 3, including Angle.  |              |       |          |   |         |   |         |   |         |   |
| PhVA                | Phase to ground apparent power for Phases 1, 2, and 3, including Angle.  |              |       |          |   |         |   |         |   |         |   |
| PhVAr               | Phase to ground reactive for Phases 1, 2, and 3, including Angle.  |              |       |          |   |         |   |         |   |         |   |
| PhW                 | Phase to ground active power for Phases 1, 2, and 3, including Angle.  |              |       |          |   |         |   |         |   |         |   |
| PhyHealth           | See Health in Common Logical Node Information.   |              |       |          |   |         |   |         |   |         |   |
| PhyNam              | This is the name plate of the physical device.   |              |       |          |   |         |   |         |   |         |   |
| PlsTmms             | Defines the length of the breaker closing pulse from the reclosing LN.   |              |       |          |   |         |   |         |   |         |   |
| PmpAlm              | Loss of pump is indicated.   |              |       |          |   |         |   |         |   |         |   |
| PmpCtlGen<br>PmpCtl | <p>PmpCtlGen – Control of all pumps.<br/>PmpCtl – Control of a single pump.</p> <table border="1"> <thead> <tr> <th>Pump Control</th> <th>Value</th> </tr> </thead> <tbody> <tr> <td>Inactive</td> <td>1</td> </tr> <tr> <td>Stage 1</td> <td>2</td> </tr> <tr> <td>Stage 2</td> <td>3</td> </tr> <tr> <td>Stage 3</td> <td>4</td> </tr> </tbody> </table> <p>More stages may be added with numbers greater than 4</p> | Pump Control | Value | Inactive | 1 | Stage 1 | 2 | Stage 2 | 3 | Stage 3 | 4 |
| Pump Control        | Value  |              |       |          |   |         |   |         |   |         |   |
| Inactive            | 1  |              |       |          |   |         |   |         |   |         |   |
| Stage 1             | 2  |              |       |          |   |         |   |         |   |         |   |
| Stage 2             | 3  |              |       |          |   |         |   |         |   |         |   |
| Stage 3             | 4  |              |       |          |   |         |   |         |   |         |   |
| PmpOvCur            | Pump overcurrent trip.   |              |       |          |   |         |   |         |   |         |   |

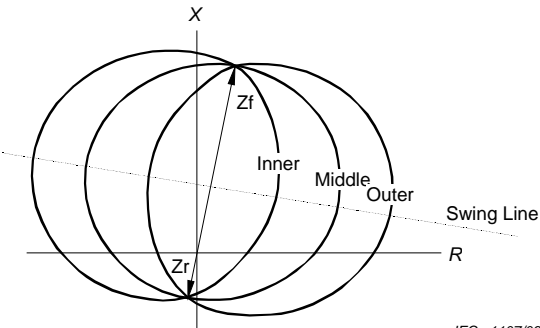
| PoQty                                      | <p>This Data indicates the reference quantity used to determine fault direction.</p> <table border="1"> <thead> <tr> <th><b>Polarizing Quantity</b></th> <th><b>Value</b></th> </tr> </thead> <tbody> <tr> <td>None</td> <td>1</td> </tr> <tr> <td>Zero sequence current</td> <td>2</td> </tr> <tr> <td>Zero sequence voltage</td> <td>3</td> </tr> <tr> <td>Negative sequence voltage</td> <td>4</td> </tr> <tr> <td>Phase to Phase Voltages (Cross Polarising)</td> <td>5</td> </tr> <tr> <td>Phase to Ground Voltages</td> <td>6</td> </tr> </tbody> </table>  | <b>Polarizing Quantity</b>      | <b>Value</b> | None | 1 | Zero sequence current | 2 | Zero sequence voltage | 3 | Negative sequence voltage | 4 | Phase to Phase Voltages (Cross Polarising) | 5 | Phase to Ground Voltages | 6 |
|--|---|---------------------------------|--------------|------|---|-----------------------|---|-----------------------|---|---------------------------|---|--|---|--------------------------|---|
| <b>Polarizing Quantity</b>                 | <b>Value</b>  |                                 |              |      |   |                       |   |                       |   |                           |   |  |   |                          |   |
| None                                       | 1   |                                 |              |      |   |                       |   |                       |   |                           |   |  |   |                          |   |
| Zero sequence current                      | 2   |                                 |              |      |   |                       |   |                       |   |                           |   |  |   |                          |   |
| Zero sequence voltage                      | 3   |                                 |              |      |   |                       |   |                       |   |                           |   |  |   |                          |   |
| Negative sequence voltage                  | 4   |                                 |              |      |   |                       |   |                       |   |                           |   |  |   |                          |   |
| Phase to Phase Voltages (Cross Polarising) | 5   |                                 |              |      |   |                       |   |                       |   |                           |   |  |   |                          |   |
| Phase to Ground Voltages                   | 6   |                                 |              |      |   |                       |   |                       |   |                           |   |  |   |                          |   |
| PoRch                                      | Polar Reach is the diameter of the Mho diagram, see PctRch.   |                                 |              |      |   |                       |   |                       |   |                           |   |  |   |                          |   |
| Pos  | <p>This Data is accessed when performing a switch command or to verify the switch status or position. When this Data is also used for a hand-operated switch, the (optional) CtlVal attribute in IEC 61850-7-3 does not exist.</p> <p>Possible states for position are:</p> <ul style="list-style-type: none"> <li>0- <a href="#">intermediate state</a></li> <li>1- <a href="#">off</a></li> <li>2- <a href="#">on</a></li> <li>3- <a href="#">bad state</a></li> </ul> <p><a href="#">The state 3(bad state) can only happen, when SAS is out of order)</a></p> |                                 |              |      |   |                       |   |                       |   |                           |   |  |   |                          |   |
| PosA                                       | This Data shall be used for switching, where single phase A may be operated separately.   |                                 |              |      |   |                       |   |                       |   |                           |   |  |   |                          |   |
| PosB                                       | This Data shall be used for switching, where single phase B may be operated separately.   |                                 |              |      |   |                       |   |                       |   |                           |   |  |   |                          |   |
| PosC                                       | This Data shall be used for switching, where single phase C may be operated separately.   |                                 |              |      |   |                       |   |                       |   |                           |   |  |   |                          |   |
| POWCap                                     | <p>Point On Wave switching capability.</p> <table border="1"> <thead> <tr> <th><b>POW Switching Capability</b></th> <th><b>Value</b></th> </tr> </thead> <tbody> <tr> <td>None</td> <td>1</td> </tr> <tr> <td>Close</td> <td>2</td> </tr> <tr> <td>Open</td> <td>3</td> </tr> <tr> <td>Close and Open</td> <td>4</td> </tr> </tbody> </table>   | <b>POW Switching Capability</b> | <b>Value</b> | None | 1 | Close                 | 2 | Open                  | 3 | Close and Open            | 4 |  |   |                          |   |
| <b>POW Switching Capability</b>            | <b>Value</b>  |                                 |              |      |   |                       |   |                       |   |                           |   |  |   |                          |   |
| None                                       | 1   |                                 |              |      |   |                       |   |                       |   |                           |   |  |   |                          |   |
| Close                                      | 2   |                                 |              |      |   |                       |   |                       |   |                           |   |  |   |                          |   |
| Open                                       | 3   |                                 |              |      |   |                       |   |                       |   |                           |   |  |   |                          |   |
| Close and Open                             | 4   |                                 |              |      |   |                       |   |                       |   |                           |   |  |   |                          |   |
| PPV  | Phase to phase voltages.  |                                 |              |      |   |                       |   |                       |   |                           |   |  |   |                          |   |
| PPVVal                                     | Undervoltage level for WEI conditions for a phase-phase measurement.  |                                 |              |      |   |                       |   |                       |   |                           |   |  |   |                          |   |
| Pres                                       | Pressure in a specific volume.  |                                 |              |      |   |                       |   |                       |   |                           |   |  |   |                          |   |
| PresAlm                                    | Pressure alarm because of an abnormal condition (FALSE = Normal, TRUE = alert)  |                                 |              |      |   |                       |   |                       |   |                           |   |  |   |                          |   |
| PresTr                                     | Pressure trip because of an abnormal condition (FALSE = Normal, TRUE = alert).  |                                 |              |      |   |                       |   |                       |   |                           |   |  |   |                          |   |
| PreTmms                                    | This is the time prior to trigger for which data is recorded when a trigger occurs.   |                                 |              |      |   |                       |   |                       |   |                           |   |  |   |                          |   |
| ProRx                                      | TRUE = indicates that the protection function has received the information about a fault in forward direction from the other end of the line.   |                                 |              |      |   |                       |   |                       |   |                           |   |  |   |                          |   |
| ProTx                                      | TRUE = indicates that the protection function has detected a fault in forward direction and has transmitted this information to the other end of the line.  |                                 |              |      |   |                       |   |                       |   |                           |   |  |   |                          |   |
| Proxy                                      | TRUE indicates that the LN (LPHD) is a proxy. This means that the LD embedding this LN is representing another physical device.   |                                 |              |      |   |                       |   |                       |   |                           |   |  |   |                          |   |
| PstTmms                                    | This is the time following the trigger that the data capture is recorded.   |                                 |              |      |   |                       |   |                       |   |                           |   |  |   |                          |   |
| PwrDn                                      | A device power down has been detected if PwrDn is TRUE.   |                                 |              |      |   |                       |   |                       |   |                           |   |  |   |                          |   |
| PwrFact                                    | Power factor not allocated to a phase.  |                                 |              |      |   |                       |   |                       |   |                           |   |  |   |                          |   |
| PwrRtg                                     | Rated Power.  |                                 |              |      |   |                       |   |                       |   |                           |   |  |   |                          |   |
| PwrSupAlm                                  | Alarm from power supply allocated to the Physical Device if PwrSupAlm is TRUE. May be an external contact. It refers always to the local power supply of the IED modelled by LPHD and not to the health (EEHealth) of the complete external supply system   |                                 |              |      |   |                       |   |                       |   |                           |   |  |   |                          |   |
| PwrUp                                      | A device power up has been detected if PwrUp is TRUE.   |                                 |              |      |   |                       |   |                       |   |                           |   |  |   |                          |   |
| R0   | Zero sequence line resistance.  |                                 |              |      |   |                       |   |                       |   |                           |   |  |   |                          |   |
| R1   | Positive sequence line resistance.  |                                 |              |      |   |                       |   |                       |   |                           |   |  |   |                          |   |
| Rat  | Winding ratio of an instrument transformer/transducer   |                                 |              |      |   |                       |   |                       |   |                           |   |  |   |                          |   |

| RcdMade                               | TRUE = Disturbance recording complete.   |                |       |                           |   |                             |   |                    |   |                           |   |                                       |   |              |   |
|---------------------------------------|--|----------------|-------|---------------------------|---|-----------------------------|---|--------------------|---|---------------------------|---|---------------------------------------|---|--------------|---|
| RcdMod                                | This Data defines whether the recording will stop when the memory is full or saturated, or overwrite existing values. <table border="1"> <thead> <tr> <th>Recording Mode</th> <th>Value</th> </tr> </thead> <tbody> <tr> <td>Overwrite existing values</td> <td>1</td> </tr> <tr> <td>Stop when full or saturated</td> <td>2</td> </tr> </tbody> </table>  | Recording Mode | Value | Overwrite existing values | 1 | Stop when full or saturated | 2 |                    |   |                           |   |                                       |   |              |   |
| Recording Mode                        | Value  |                |       |                           |   |                             |   |                    |   |                           |   |                                       |   |              |   |
| Overwrite existing values             | 1  |                |       |                           |   |                             |   |                    |   |                           |   |                                       |   |              |   |
| Stop when full or saturated           | 2  |                |       |                           |   |                             |   |                    |   |                           |   |                                       |   |              |   |
| RcdStr                                | TRUE = Disturbance recording processes started.  |                |       |                           |   |                             |   |                    |   |                           |   |                                       |   |              |   |
| RcdTrg                                | External command to trigger recorder (TRUE).   |                |       |                           |   |                             |   |                    |   |                           |   |                                       |   |              |   |
| RclTmms                               | Recloser reclaim time (after successful reclose) in ms.  |                |       |                           |   |                             |   |                    |   |                           |   |                                       |   |              |   |
| RCol                                  | Raise Plunge Coil Position.  |                |       |                           |   |                             |   |                    |   |                           |   |                                       |   |              |   |
| RctTmCls                              | Time difference between activation to first position change for a close operation (usually displayed in ms)  |                |       |                           |   |                             |   |                    |   |                           |   |                                       |   |              |   |
| RctTmOpn                              | Time difference between activation to first position change for a open operation (usually displayed in ms)   |                |       |                           |   |                             |   |                    |   |                           |   |                                       |   |              |   |
| React                                 | Relative capacitance of bushing related to reference capacitance for bushing at commissioning  |                |       |                           |   |                             |   |                    |   |                           |   |                                       |   |              |   |
| ReactPwrL                             | TRUE = Lower reactive power, FALSE = no action.  |                |       |                           |   |                             |   |                    |   |                           |   |                                       |   |              |   |
| ReactPwrR                             | TRUE = Raise reactive power, FALSE = no action.  |                |       |                           |   |                             |   |                    |   |                           |   |                                       |   |              |   |
| RecTmms                               | Reclose delay time (shot) in milliseconds. Multiple instances allow to set the Reclose delay time per cycle or step.   |                |       |                           |   |                             |   |                    |   |                           |   |                                       |   |              |   |
| RecCyc                                | Number of the actual reclose cycle (1 to n, typically n=3). Default value 0 if no Autoreclosing is going on.   |                |       |                           |   |                             |   |                    |   |                           |   |                                       |   |              |   |
| RefPF                                 | Reference power factor for bushing at commissioning.   |                |       |                           |   |                             |   |                    |   |                           |   |                                       |   |              |   |
| RefReact                              | Reference capacitance for bushing at commissioning.  |                |       |                           |   |                             |   |                    |   |                           |   |                                       |   |              |   |
| RefV                                  | Reference voltage for bushing at commissioning.  |                |       |                           |   |                             |   |                    |   |                           |   |                                       |   |              |   |
| Rel                                   | This Data indicates that all criteria are fulfilled and the switching/operation action is released to proceed if value is TRUE, and blocked if FALSE.  |                |       |                           |   |                             |   |                    |   |                           |   |                                       |   |              |   |
| ReTrgMod                              | If the mode is true, the recorder will start a new recording if it is retriggered while still collecting samples on previous recording (during post fault time). If false, the recorder ignores the retrigger.   |                |       |                           |   |                             |   |                    |   |                           |   |                                       |   |              |   |
| ReTrMod                               | Retrip Mode <table border="1"> <thead> <tr> <th>Retrip Mode</th> <th>Value</th> </tr> </thead> <tbody> <tr> <td>Off</td> <td>1</td> </tr> <tr> <td>Without Check</td> <td>2</td> </tr> <tr> <td>With Current Check</td> <td>3</td> </tr> <tr> <td>With Breaker Status Check</td> <td>4</td> </tr> <tr> <td>With Current and Breaker Status Check</td> <td>5</td> </tr> <tr> <td>Other Checks</td> <td>6</td> </tr> </tbody> </table> | Retrip Mode    | Value | Off                       | 1 | Without Check               | 2 | With Current Check | 3 | With Breaker Status Check | 4 | With Current and Breaker Status Check | 5 | Other Checks | 6 |
| Retrip Mode                           | Value  |                |       |                           |   |                             |   |                    |   |                           |   |                                       |   |              |   |
| Off                                   | 1  |                |       |                           |   |                             |   |                    |   |                           |   |                                       |   |              |   |
| Without Check                         | 2  |                |       |                           |   |                             |   |                    |   |                           |   |                                       |   |              |   |
| With Current Check                    | 3  |                |       |                           |   |                             |   |                    |   |                           |   |                                       |   |              |   |
| With Breaker Status Check             | 4  |                |       |                           |   |                             |   |                    |   |                           |   |                                       |   |              |   |
| With Current and Breaker Status Check | 5  |                |       |                           |   |                             |   |                    |   |                           |   |                                       |   |              |   |
| Other Checks                          | 6  |                |       |                           |   |                             |   |                    |   |                           |   |                                       |   |              |   |
| RHz                                   | TRUE = Raise frequency, FALSE = no action  |                |       |                           |   |                             |   |                    |   |                           |   |                                       |   |              |   |

Gelöscht: re

| <p>RisGndRch</p>                               | <p>Resistive reach of the quadrilateral ground distance element shown as the difference between the left and right resistive blinders in the diagram below. See also AngLod.</p> <p>DirMod = forward<br/>(from LN RDIR)</p>  <p>Additional settings:<br/>         - K0Fact<br/>         - K0FactAng<br/>         - TimDelMod<br/>         - OpTimDel</p> <p>IEC 1106/03</p>  |                |       |      |   |                          |   |                          |   |  |   |                   |   |  |   |       |   |
|--|--|----------------|-------|------|---|--------------------------|---|--------------------------|---|--|---|-------------------|---|--|---|-------|---|
| <p>RisLod</p>                                  | <p>Resistive reach for load area...see AngLod for an example of the definition of load encroachment used for the Data AngLod and RisLod with polygonal characteristic, applicable also with MHO.</p>   |                |       |      |   |                          |   |                          |   |  |   |                   |   |  |   |       |   |
| <p>RisPhRch</p>                                | <p>Resistive reach of quadrilateral phase distance element; see RisGndRch.</p>   |                |       |      |   |                          |   |                          |   |  |   |                   |   |  |   |       |   |
| <p>Rm0</p>                                     | <p>Mutual resistance coupling from parallel line.</p>  |                |       |      |   |                          |   |                          |   |  |   |                   |   |  |   |       |   |
| <p>RmpDn</p>                                   | <p><a href="#">Ramping rate on a downward trend</a></p>  |                |       |      |   |                          |   |                          |   |  |   |                   |   |  |   |       |   |
| <p>RmpUp</p>                                   | <p><a href="#">Ramping rate on a upward trend</a></p>  |                |       |      |   |                          |   |                          |   |  |   |                   |   |  |   |       |   |
| <p>RnbkRV</p>                                  | <p>Runback Raise Voltage is the control voltage above which auto Lower command issued.</p>   |                |       |      |   |                          |   |                          |   |  |   |                   |   |  |   |       |   |
| <p>RotSpd</p>                                  | <p><a href="#">Rotational speed usually in 1/s</a></p>   |                |       |      |   |                          |   |                          |   |  |   |                   |   |  |   |       |   |
| <p>RsDITmms</p>                                | <p>Time delay in ms before reset once reset conditions have been met.</p>  |                |       |      |   |                          |   |                          |   |  |   |                   |   |  |   |       |   |
| <p>RsStat</p>                                  | <p>This Data resets device statistics of this LN.</p>  |                |       |      |   |                          |   |                          |   |  |   |                   |   |  |   |       |   |
| <p>RstA</p>                                    | <p>Restraint Current</p>   |                |       |      |   |                          |   |                          |   |  |   |                   |   |  |   |       |   |
| <p>RstMod</p>                                  | <p>Identifies the Restraint Mode for the Differential LN.</p> <table border="1"> <thead> <tr> <th>Restraint Mode</th> <th>Value</th> </tr> </thead> <tbody> <tr> <td>None</td> <td>1</td> </tr> <tr> <td>2<sup>nd</sup> Harmonic</td> <td>2</td> </tr> <tr> <td>5<sup>th</sup> Harmonic</td> <td>3</td> </tr> <tr> <td>2<sup>nd</sup> &amp; 5<sup>th</sup> Harmonic</td> <td>4</td> </tr> <tr> <td>Waveform analysis</td> <td>5</td> </tr> <tr> <td>2<sup>nd</sup> Harmonic and waveform analysis</td> <td>6</td> </tr> <tr> <td>Other</td> <td>7</td> </tr> </tbody> </table> | Restraint Mode | Value | None | 1 | 2 <sup>nd</sup> Harmonic | 2 | 5 <sup>th</sup> Harmonic | 3 | 2 <sup>nd</sup> & 5 <sup>th</sup> Harmonic | 4 | Waveform analysis | 5 | 2 <sup>nd</sup> Harmonic and waveform analysis | 6 | Other | 7 |
| Restraint Mode                                 | Value  |                |       |      |   |                          |   |                          |   |  |   |                   |   |  |   |       |   |
| None   | 1  |                |       |      |   |                          |   |                          |   |  |   |                   |   |  |   |       |   |
| 2 <sup>nd</sup> Harmonic                       | 2  |                |       |      |   |                          |   |                          |   |  |   |                   |   |  |   |       |   |
| 5 <sup>th</sup> Harmonic                       | 3  |                |       |      |   |                          |   |                          |   |  |   |                   |   |  |   |       |   |
| 2 <sup>nd</sup> & 5 <sup>th</sup> Harmonic     | 4  |                |       |      |   |                          |   |                          |   |  |   |                   |   |  |   |       |   |
| Waveform analysis                              | 5  |                |       |      |   |                          |   |                          |   |  |   |                   |   |  |   |       |   |
| 2 <sup>nd</sup> Harmonic and waveform analysis | 6  |                |       |      |   |                          |   |                          |   |  |   |                   |   |  |   |       |   |
| Other  | 7  |                |       |      |   |                          |   |                          |   |  |   |                   |   |  |   |       |   |
| <p>RV</p>                                      | <p>TRUE = Raise voltage, FALSE = no action</p>   |                |       |      |   |                          |   |                          |   |  |   |                   |   |  |   |       |   |
| <p>RvABlk</p>                                  | <p>Block signal from current reversal function.</p>  |                |       |      |   |                          |   |                          |   |  |   |                   |   |  |   |       |   |

| RvAMod                            | <p>This Data is the current reversal function mode.</p> <table border="1"> <thead> <tr> <th><b>Current Reversals Mode</b></th> <th><b>Value</b></th> </tr> </thead> <tbody> <tr> <td>Off</td> <td>1</td> </tr> <tr> <td>On</td> <td>2</td> </tr> </tbody> </table>   | <b>Current Reversals Mode</b>     | <b>Value</b>   | Off  | 1                    | On        | 2                                    |                        |   |                       |  |          |   |   |                    |   |                        |   |                               |   |                             |   |                                  |   |  |   |                                       |   |  |   |  |   |                |
|-----------------------------------|--|-----------------------------------|----------------|------|----------------------|-----------|--------------------------------------|------------------------|---|-----------------------|--|----------|---|---|--------------------|---|------------------------|---|-------------------------------|---|-----------------------------|---|----------------------------------|---|--|---|---------------------------------------|---|--|---|--|---|----------------|
| <b>Current Reversals Mode</b>     | <b>Value</b>   |                                   |                |      |                      |           |                                      |                        |   |                       |  |          |   |   |                    |   |                        |   |                               |   |                             |   |                                  |   |  |   |                                       |   |  |   |  |   |                |
| Off                               | 1  |                                   |                |      |                      |           |                                      |                        |   |                       |  |          |   |   |                    |   |                        |   |                               |   |                             |   |                                  |   |  |   |                                       |   |  |   |  |   |                |
| On                                | 2  |                                   |                |      |                      |           |                                      |                        |   |                       |  |          |   |   |                    |   |                        |   |                               |   |                             |   |                                  |   |  |   |                                       |   |  |   |  |   |                |
| RvATmms                           | Pickup time in ms for current reversal logic.  |                                   |                |      |                      |           |                                      |                        |   |                       |  |          |   |   |                    |   |                        |   |                               |   |                             |   |                                  |   |  |   |                                       |   |  |   |  |   |                |
| RvRSTmms                          | After the reverse fault has disappeared, the current reversal output still will be active for this time.   |                                   |                |      |                      |           |                                      |                        |   |                       |  |          |   |   |                    |   |                        |   |                               |   |                             |   |                                  |   |  |   |                                       |   |  |   |  |   |                |
| SchTyp                            | <p>This Data indicates the scheme type for line protection.</p> <table border="1"> <thead> <tr> <th><b>Scheme Type</b></th> <th><b>Value</b></th> </tr> </thead> <tbody> <tr> <td>None</td> <td>1</td> </tr> <tr> <td>Intertrip</td> <td>2</td> </tr> <tr> <td>Permissive Under Reach</td> <td>3</td> </tr> <tr> <td>Permissive Over Reach</td> <td>4</td> </tr> <tr> <td>Blocking</td> <td>5</td> </tr> </tbody> </table>   | <b>Scheme Type</b>                | <b>Value</b>   | None | 1                    | Intertrip | 2                                    | Permissive Under Reach | 3   | Permissive Over Reach | 4  | Blocking | 5   |   |                    |   |                        |   |                               |   |                             |   |                                  |   |  |   |                                       |   |  |   |  |   |                |
| <b>Scheme Type</b>                | <b>Value</b>   |                                   |                |      |                      |           |                                      |                        |   |                       |  |          |   |   |                    |   |                        |   |                               |   |                             |   |                                  |   |  |   |                                       |   |  |   |  |   |                |
| None                              | 1  |                                   |                |      |                      |           |                                      |                        |   |                       |  |          |   |   |                    |   |                        |   |                               |   |                             |   |                                  |   |  |   |                                       |   |  |   |  |   |                |
| Intertrip                         | 2  |                                   |                |      |                      |           |                                      |                        |   |                       |  |          |   |   |                    |   |                        |   |                               |   |                             |   |                                  |   |  |   |                                       |   |  |   |  |   |                |
| Permissive Under Reach            | 3  |                                   |                |      |                      |           |                                      |                        |   |                       |  |          |   |   |                    |   |                        |   |                               |   |                             |   |                                  |   |  |   |                                       |   |  |   |  |   |                |
| Permissive Over Reach             | 4  |                                   |                |      |                      |           |                                      |                        |   |                       |  |          |   |   |                    |   |                        |   |                               |   |                             |   |                                  |   |  |   |                                       |   |  |   |  |   |                |
| Blocking                          | 5  |                                   |                |      |                      |           |                                      |                        |   |                       |  |          |   |   |                    |   |                        |   |                               |   |                             |   |                                  |   |  |   |                                       |   |  |   |  |   |                |
| SecTmms                           | Pickup security timer on loss of carrier guard signal in ms.   |                                   |                |      |                      |           |                                      |                        |   |                       |  |          |   |   |                    |   |                        |   |                               |   |                             |   |                                  |   |  |   |                                       |   |  |   |  |   |                |
| SeqA                              | The absolute measured values of positive, negative and zero sequence current.  |                                   |                |      |                      |           |                                      |                        |   |                       |  |          |   |   |                    |   |                        |   |                               |   |                             |   |                                  |   |  |   |                                       |   |  |   |  |   |                |
| SeqV                              | The absolute measured values of positive, negative and zero sequence voltage.  |                                   |                |      |                      |           |                                      |                        |   |                       |  |          |   |   |                    |   |                        |   |                               |   |                             |   |                                  |   |  |   |                                       |   |  |   |  |   |                |
| SetA                              | Current setting for a limit in motor start-up (for example counting operate condition or thermal stress). This setting is used in motor start-up protection.   |                                   |                |      |                      |           |                                      |                        |   |                       |  |          |   |   |                    |   |                        |   |                               |   |                             |   |                                  |   |  |   |                                       |   |  |   |  |   |                |
| SetTms                            | Time Setting for a limit in motor start-up (for example counting operate condition or thermal stress). This setting is used in motor start-up protection.  |                                   |                |      |                      |           |                                      |                        |   |                       |  |          |   |   |                    |   |                        |   |                               |   |                             |   |                                  |   |  |   |                                       |   |  |   |  |   |                |
| ShOpCap                           | <p>This is an enumeration representing the operating capabilities of the power shunt.</p> <table border="1"> <thead> <tr> <th><b>Shunt Operating Capability</b></th> <th><b>Value</b></th> </tr> </thead> <tbody> <tr> <td>None</td> <td>1</td> </tr> <tr> <td>Open</td> <td>2</td> </tr> <tr> <td>Close</td> <td>3</td> </tr> <tr> <td>Open and Close</td> <td>4</td> </tr> </tbody> </table>   | <b>Shunt Operating Capability</b> | <b>Value</b>   | None | 1                    | Open      | 2                                    | Close                  | 3   | Open and Close        | 4  |          |   |   |                    |   |                        |   |                               |   |                             |   |                                  |   |  |   |                                       |   |  |   |  |   |                |
| <b>Shunt Operating Capability</b> | <b>Value</b>   |                                   |                |      |                      |           |                                      |                        |   |                       |  |          |   |   |                    |   |                        |   |                               |   |                             |   |                                  |   |  |   |                                       |   |  |   |  |   |                |
| None                              | 1  |                                   |                |      |                      |           |                                      |                        |   |                       |  |          |   |   |                    |   |                        |   |                               |   |                             |   |                                  |   |  |   |                                       |   |  |   |  |   |                |
| Open                              | 2  |                                   |                |      |                      |           |                                      |                        |   |                       |  |          |   |   |                    |   |                        |   |                               |   |                             |   |                                  |   |  |   |                                       |   |  |   |  |   |                |
| Close                             | 3  |                                   |                |      |                      |           |                                      |                        |   |                       |  |          |   |   |                    |   |                        |   |                               |   |                             |   |                                  |   |  |   |                                       |   |  |   |  |   |                |
| Open and Close                    | 4  |                                   |                |      |                      |           |                                      |                        |   |                       |  |          |   |   |                    |   |                        |   |                               |   |                             |   |                                  |   |  |   |                                       |   |  |   |  |   |                |
| SPCSO                             | Generic single point controllable status output.   |                                   |                |      |                      |           |                                      |                        |   |                       |  |          |   |   |                    |   |                        |   |                               |   |                             |   |                                  |   |  |   |                                       |   |  |   |  |   |                |
| SPITrTmms                         | Single pole delay time in ms before the Breaker Failure tries to retrip the failed breaker.  |                                   |                |      |                      |           |                                      |                        |   |                       |  |          |   |   |                    |   |                        |   |                               |   |                             |   |                                  |   |  |   |                                       |   |  |   |  |   |                |
| SptMsg                            | <p>End message</p> <table border="1"> <tbody> <tr> <td>0</td> <td>Ended normally</td> </tr> <tr> <td>1</td> <td>Ended with overshoot</td> </tr> <tr> <td>2</td> <td>Cancelled: measurement was deviating</td> </tr> <tr> <td>3</td> <td>Cancelled: loss of communication with dispatch centre</td> </tr> <tr> <td>4</td> <td>Cancelled: loss of communication with local area network</td> </tr> <tr> <td>5</td> <td>Cancelled: loss of communication with the local interface</td> </tr> <tr> <td>6</td> <td>Cancelled: timeout</td> </tr> <tr> <td>7</td> <td>Cancelled: voluntarily</td> </tr> <tr> <td>8</td> <td>Cancelled: noisy environments</td> </tr> <tr> <td>9</td> <td>Cancelled: material failure</td> </tr> <tr> <td>A</td> <td>Cancelled: new set-point request</td> </tr> <tr> <td>B</td> <td>Cancelled: improper environment (blockage)</td> </tr> <tr> <td>C</td> <td>Cancelled: stability time was reached</td> </tr> <tr> <td>D</td> <td>Cancelled: immobilisation time was reached</td> </tr> <tr> <td>E</td> <td>Cancelled: equipment was in the wrong mode</td> </tr> <tr> <td>F</td> <td>Unknown causes</td> </tr> </tbody> </table> | 0                                 | Ended normally | 1    | Ended with overshoot | 2         | Cancelled: measurement was deviating | 3                      | Cancelled: loss of communication with dispatch centre | 4                     | Cancelled: loss of communication with local area network | 5        | Cancelled: loss of communication with the local interface | 6 | Cancelled: timeout | 7 | Cancelled: voluntarily | 8 | Cancelled: noisy environments | 9 | Cancelled: material failure | A | Cancelled: new set-point request | B | Cancelled: improper environment (blockage) | C | Cancelled: stability time was reached | D | Cancelled: immobilisation time was reached | E | Cancelled: equipment was in the wrong mode | F | Unknown causes |
| 0                                 | Ended normally   |                                   |                |      |                      |           |                                      |                        |   |                       |  |          |   |   |                    |   |                        |   |                               |   |                             |   |                                  |   |  |   |                                       |   |  |   |  |   |                |
| 1                                 | Ended with overshoot   |                                   |                |      |                      |           |                                      |                        |   |                       |  |          |   |   |                    |   |                        |   |                               |   |                             |   |                                  |   |  |   |                                       |   |  |   |  |   |                |
| 2                                 | Cancelled: measurement was deviating   |                                   |                |      |                      |           |                                      |                        |   |                       |  |          |   |   |                    |   |                        |   |                               |   |                             |   |                                  |   |  |   |                                       |   |  |   |  |   |                |
| 3                                 | Cancelled: loss of communication with dispatch centre  |                                   |                |      |                      |           |                                      |                        |   |                       |  |          |   |   |                    |   |                        |   |                               |   |                             |   |                                  |   |  |   |                                       |   |  |   |  |   |                |
| 4                                 | Cancelled: loss of communication with local area network   |                                   |                |      |                      |           |                                      |                        |   |                       |  |          |   |   |                    |   |                        |   |                               |   |                             |   |                                  |   |  |   |                                       |   |  |   |  |   |                |
| 5                                 | Cancelled: loss of communication with the local interface  |                                   |                |      |                      |           |                                      |                        |   |                       |  |          |   |   |                    |   |                        |   |                               |   |                             |   |                                  |   |  |   |                                       |   |  |   |  |   |                |
| 6                                 | Cancelled: timeout   |                                   |                |      |                      |           |                                      |                        |   |                       |  |          |   |   |                    |   |                        |   |                               |   |                             |   |                                  |   |  |   |                                       |   |  |   |  |   |                |
| 7                                 | Cancelled: voluntarily   |                                   |                |      |                      |           |                                      |                        |   |                       |  |          |   |   |                    |   |                        |   |                               |   |                             |   |                                  |   |  |   |                                       |   |  |   |  |   |                |
| 8                                 | Cancelled: noisy environments  |                                   |                |      |                      |           |                                      |                        |   |                       |  |          |   |   |                    |   |                        |   |                               |   |                             |   |                                  |   |  |   |                                       |   |  |   |  |   |                |
| 9                                 | Cancelled: material failure  |                                   |                |      |                      |           |                                      |                        |   |                       |  |          |   |   |                    |   |                        |   |                               |   |                             |   |                                  |   |  |   |                                       |   |  |   |  |   |                |
| A                                 | Cancelled: new set-point request   |                                   |                |      |                      |           |                                      |                        |   |                       |  |          |   |   |                    |   |                        |   |                               |   |                             |   |                                  |   |  |   |                                       |   |  |   |  |   |                |
| B                                 | Cancelled: improper environment (blockage)   |                                   |                |      |                      |           |                                      |                        |   |                       |  |          |   |   |                    |   |                        |   |                               |   |                             |   |                                  |   |  |   |                                       |   |  |   |  |   |                |
| C                                 | Cancelled: stability time was reached  |                                   |                |      |                      |           |                                      |                        |   |                       |  |          |   |   |                    |   |                        |   |                               |   |                             |   |                                  |   |  |   |                                       |   |  |   |  |   |                |
| D                                 | Cancelled: immobilisation time was reached   |                                   |                |      |                      |           |                                      |                        |   |                       |  |          |   |   |                    |   |                        |   |                               |   |                             |   |                                  |   |  |   |                                       |   |  |   |  |   |                |
| E                                 | Cancelled: equipment was in the wrong mode   |                                   |                |      |                      |           |                                      |                        |   |                       |  |          |   |   |                    |   |                        |   |                               |   |                             |   |                                  |   |  |   |                                       |   |  |   |  |   |                |
| F                                 | Unknown causes   |                                   |                |      |                      |           |                                      |                        |   |                       |  |          |   |   |                    |   |                        |   |                               |   |                             |   |                                  |   |  |   |                                       |   |  |   |  |   |                |

| StepNg                      | Step size when turning from negative to positive deirection  |                             |       |      |   |      |   |       |   |                |   |
|-----------------------------|--|-----------------------------|-------|------|---|------|---|-------|---|----------------|---|
| StepPs                      | Step size when turning from negative to positive deirection  |                             |       |      |   |      |   |       |   |                |   |
| Stk                         | Stroke of the last operation defined as distance between start and end position of the main contact or at the place of travel measurement (usually displayed in mm)  |                             |       |      |   |      |   |       |   |                |   |
| StopVlv                     | This Data is responsible for control and indication of the valve that stops the generator driving forces, for example fluid flow. TRUE = valve close(d)  |                             |       |      |   |      |   |       |   |                |   |
| StoRte                      | Storage rate (often called sampling rate) of the disturbance recorder in samples per Millisecond (ms)  |                             |       |      |   |      |   |       |   |                |   |
| Str                         | Start (Common Data Classes ACD) indicates the detection of a fault or an unacceptable condition. Str may contain phase and directional information.  |                             |       |      |   |      |   |       |   |                |   |
| StrInh                      | Status Information Restart inhibited. After a limit is reached (for example maximum number of starts or permissible temperature), restart inhibit is activated.  |                             |       |      |   |      |   |       |   |                |   |
| StrInhTmm                   | Time Setting for Restart Inhibition. Once the StrInh is activated, the motor should not be allowed to start until this time has elapsed.   |                             |       |      |   |      |   |       |   |                |   |
| StrPOW                      | TRUE = Start CPOW (for example by select) – Request by CSWI or RREC.   |                             |       |      |   |      |   |       |   |                |   |
| StrVal                      | Level of the supervised value, which starts a dedicated action of the related function.  |                             |       |      |   |      |   |       |   |                |   |
| SumSwARs                    | Sum of switched amperes, resetable. This Data indicates the sum or integration of all switched currents since the last reset of the counter for example after maintenance of the contacts, the nozzle and other aging parts.   |                             |       |      |   |      |   |       |   |                |   |
| SupVARh                     | Reactive energy supply (default supply direction: energy flow towards busbar).   |                             |       |      |   |      |   |       |   |                |   |
| SupWh                       | Real energy supply (default supply direction: energy flow towards busbar).   |                             |       |      |   |      |   |       |   |                |   |
| SvcViol                     | Service violation: the data that the client wanted to access exists in the access view for the association with that client, but the requested service is not allowed.   |                             |       |      |   |      |   |       |   |                |   |
| SwArcDet                    | TRUE = Alarm that switch arc has been detected.  |                             |       |      |   |      |   |       |   |                |   |
| SwgReact                    | Value of the power swing reactance band, see figure under SwgVal.  |                             |       |      |   |      |   |       |   |                |   |
| SwgRis                      | Value of the power swing resistance band, see figure under SwgVal.   |                             |       |      |   |      |   |       |   |                |   |
| SwgTmms                     | Power swing detection time in ms.  |                             |       |      |   |      |   |       |   |                |   |
| SwgVal                      | Value of the power swing band.<br>  |                             |       |      |   |      |   |       |   |                |   |
| SwOpCap                     | This is an enumeration representing the physical capabilities of the switch to operate. It includes additional blocking due to some local problems.<br><table border="1"> <thead> <tr> <th>Switch Operating Capability</th> <th>Value</th> </tr> </thead> <tbody> <tr> <td>None</td> <td>1</td> </tr> <tr> <td>Open</td> <td>2</td> </tr> <tr> <td>Close</td> <td>3</td> </tr> <tr> <td>Open and Close</td> <td>4</td> </tr> </tbody> </table> | Switch Operating Capability | Value | None | 1 | Open | 2 | Close | 3 | Open and Close | 4 |
| Switch Operating Capability | Value  |                             |       |      |   |      |   |       |   |                |   |
| None                        | 1  |                             |       |      |   |      |   |       |   |                |   |
| Open                        | 2  |                             |       |      |   |      |   |       |   |                |   |
| Close                       | 3  |                             |       |      |   |      |   |       |   |                |   |
| Open and Close              | 4  |                             |       |      |   |      |   |       |   |                |   |

Kommentar [HD138]: #20  
9

| SwTyp                      | <table border="1"> <thead> <tr> <th>Switch Type</th> <th>Value</th> </tr> </thead> <tbody> <tr> <td>Load Break</td> <td>1</td> </tr> <tr> <td>Disconnecter</td> <td>2</td> </tr> <tr> <td>Earthing Switch</td> <td>3</td> </tr> <tr> <td>High Speed Earthing Switch</td> <td>4</td> </tr> </tbody> </table> | Switch Type | Value | Load Break | 1 | Disconnecter | 2 | Earthing Switch | 3 | High Speed Earthing Switch | 4 |
|----------------------------|---|-------------|-------|------------|---|--------------|---|-----------------|---|----------------------------|---|
| Switch Type                | Value   |             |       |            |   |              |   |                 |   |                            |   |
| Load Break                 | 1   |             |       |            |   |              |   |                 |   |                            |   |
| Disconnecter               | 2   |             |       |            |   |              |   |                 |   |                            |   |
| Earthing Switch            | 3   |             |       |            |   |              |   |                 |   |                            |   |
| High Speed Earthing Switch | 4   |             |       |            |   |              |   |                 |   |                            |   |
| SynPrg                     | Synchronizing in progress.  |             |       |            |   |              |   |                 |   |                            |   |
| TapBlkL                    | Tap position of Load Tap Changer where automatic Lower commands blocked.  |             |       |            |   |              |   |                 |   |                            |   |
| TapBlkR                    | Tap position of Load Tap Changer where automatic Raise commands blocked.  |             |       |            |   |              |   |                 |   |                            |   |
| TapChg                     | This Data represents the control of a process to raise or lower a single step or tap.   |             |       |            |   |              |   |                 |   |                            |   |
| TapOpR                     | <u>Change tap position raise (shall be used if no control service is available and the GOOSE is used instead)</u>   |             |       |            |   |              |   |                 |   |                            |   |
| TapOpLo                    | <u>Change tap position lower (shall be used if no control service is available and the GOOSE is used instead)</u>   |             |       |            |   |              |   |                 |   |                            |   |
| TapOpStop                  | <u>Change tap position stop (shall be used if no control service is available and the GOOSE is used instead)</u>  |             |       |            |   |              |   |                 |   |                            |   |
| TapPos                     | Represents the discrete adjustment of a transformer such as used in a load tap changer to a specified tap position.   |             |       |            |   |              |   |                 |   |                            |   |
| TddA                       | Current Total Demand Distortion (according to IEEE 519, phase related).   |             |       |            |   |              |   |                 |   |                            |   |
| TddAmp                     | Current Total Demand Distortion (according to IEEE 519, non-phase related).   |             |       |            |   |              |   |                 |   |                            |   |
| TddEvnA                    | Current Total Demand Distortion (according to IEEE 519, even components, phase related).  |             |       |            |   |              |   |                 |   |                            |   |
| TddEvnAmp                  | Current Total Demand Distortion (according to IEEE 519, even components, non-phase related).  |             |       |            |   |              |   |                 |   |                            |   |
| TddOddA                    | Current Total Demand Distortion (according to IEEE 519, odd components, phase related).   |             |       |            |   |              |   |                 |   |                            |   |
| TddOddAmp                  | Current Total Demand Distortion (according to IEEE 519, odd components, non-phase related).   |             |       |            |   |              |   |                 |   |                            |   |
| TestRsl                    | Test Results value is TRUE if passed and FALSE if failed.   |             |       |            |   |              |   |                 |   |                            |   |
| ThdA                       | Current Total Harmonic or Interharmonic Distortion (different methods, phase related).  |             |       |            |   |              |   |                 |   |                            |   |
| ThdAmp                     | Current Total Harmonic or Interharmonic Distortion (different methods, non-phase related).  |             |       |            |   |              |   |                 |   |                            |   |
| ThdATmms                   | Total harmonic or interharmonic distortion current alarm delay time in ms after the ThdAVal has been exceeded.  |             |       |            |   |              |   |                 |   |                            |   |
| ThdAVal                    | Total harmonic or interharmonic distortion amperes alarm setting – value entered in %. Thd values above this threshold cause an alarm.  |             |       |            |   |              |   |                 |   |                            |   |
| ThdEvnA                    | Current Total Harmonic or Interharmonic Distortion (even components, phase related).  |             |       |            |   |              |   |                 |   |                            |   |
| ThdEvnAmp                  | Current Total Harmonic or Interharmonic Distortion (different methods, even components, non-phase related).   |             |       |            |   |              |   |                 |   |                            |   |
| ThdEvnPhV                  | Phase to ground voltage Total Harmonic or Interharmonic Distortion (different methods, even components, phase related).   |             |       |            |   |              |   |                 |   |                            |   |
| ThdEvnPPV                  | Phase to phase voltage Total Harmonic or Interharmonic Distortion (different methods, even components, phase related).  |             |       |            |   |              |   |                 |   |                            |   |
| ThdEvnVol                  | Phase voltage Total Harmonic or Interharmonic Distortion (different methods, even components, non-phase related).   |             |       |            |   |              |   |                 |   |                            |   |
| ThdOddA                    | Current Total Harmonic or Interharmonic Distortion (different methods, odd components, phase related).  |             |       |            |   |              |   |                 |   |                            |   |
| ThdOddAmp                  | Current Total Harmonic or Interharmonic Distortion (different methods, odd components, non-phase related).  |             |       |            |   |              |   |                 |   |                            |   |
| ThdOddPhV                  | Phase to ground voltage Total Harmonic or Interharmonic Distortion (different methods, odd components, phase related).  |             |       |            |   |              |   |                 |   |                            |   |
| ThdOddPPV                  | Phase to phase voltage Total Harmonic or Interharmonic Distortion (different methods, odd components, phase related).   |             |       |            |   |              |   |                 |   |                            |   |
| ThdOddVol                  | Phase to ground voltage Total Harmonic or Interharmonic Distortion (different methods, odd components, non-phase related).  |             |       |            |   |              |   |                 |   |                            |   |

| ThdPhV                 | Phase to ground voltage Total Harmonic or Interharmonic Distortion (different methods, phase related).   |             |       |        |      |                        |       |
|------------------------|--|-------------|-------|--------|------|------------------------|-------|
| ThdPPV                 | Phase to phase voltage Total Harmonic or Interharmonic Distortion (different methods, phase related).  |             |       |        |      |                        |       |
| ThdVol                 | Voltage Total Harmonic or Interharmonic Distortion (different methods, non-phase related).   |             |       |        |      |                        |       |
| ThdVTmms               | Total harmonic or Interharmonic distortion voltage alarm time delay in ms after the ThdVVal has been exceeded.   |             |       |        |      |                        |       |
| ThdVVal                | Total harmonic or Interharmonic distortion alarm setting – value entered in %. Thd values above this threshold cause an alarm.   |             |       |        |      |                        |       |
| TmACrv                 | Characteristic Curve for protection operation of the form: $y = f(x)$ , where $x = A$ (current) and $y = Tm$ (time). The integers representing the different curves are given in the definition of CDC CURVE in IEC 61850-7-3.   |             |       |        |      |                        |       |
| TmASt                  | Delivers the active curve characteristic.  |             |       |        |      |                        |       |
| TmChgDTm               | Time of next change to daylight saving time  |             |       |        |      |                        |       |
| TmChgSTm               | Time of next change to standard time   |             |       |        |      |                        |       |
| TmDlChr                | Time delay linear or inverse characteristic.<br><table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>Timer Delay</th> <th>Value</th> </tr> </thead> <tbody> <tr> <td>Linear</td> <td>TRUE</td> </tr> <tr> <td>Inverse characteristic</td> <td>FALSE</td> </tr> </tbody> </table> | Timer Delay | Value | Linear | TRUE | Inverse characteristic | FALSE |
| Timer Delay            | Value  |             |       |        |      |                        |       |
| Linear                 | TRUE   |             |       |        |      |                        |       |
| Inverse characteristic | FALSE  |             |       |        |      |                        |       |
| TmDlMod                | Operate Time Delay Mode. TRUE = on, FALSE = off  |             |       |        |      |                        |       |
| TmExc                  | TRUE = Maximum allowed time exceeded (LN CPOW).  |             |       |        |      |                        |       |
| TmMult                 | This Data is the time dial multiplier or Time Dial Setting mainly used for protection.   |             |       |        |      |                        |       |
| Tmp                    | The temperature of a specified component or in a specified volume.   |             |       |        |      |                        |       |
| TmpAlm                 | Temperature alarm because of an abnormal condition (FALSE = Normal, TRUE = alert).   |             |       |        |      |                        |       |
| TmpMax                 | Maximum temperature.   |             |       |        |      |                        |       |
| TmpRI                  | Relation between temperature and maximum temperature.  |             |       |        |      |                        |       |
| TmTmpCrv               | Characteristic Curve for protection operation of the form: $y = f(x)$ , where $x = Tmp$ (Temperature) and $y = Tm$ (time). The integers representing the different curves are given in the definition of CDC CURVE in IEC 61850-7-3.   |             |       |        |      |                        |       |
| TmTmpSt                | Delivers the active curve characteristic.  |             |       |        |      |                        |       |
| TmVCrv                 | Characteristic Curve for protection operation of the form: $y = f(x)$ , where $x = V$ (voltage) and $y = Tm$ (time). The integers representing the different curves are given in the definition of CDC CURVE in IEC 61850-7-3.   |             |       |        |      |                        |       |
| TmVSt                  | Delivers the active curve characteristic.  |             |       |        |      |                        |       |
| Torq                   | Drive torque.  |             |       |        |      |                        |       |
| TotPF                  | Average power factor for a three-phase circuit.  |             |       |        |      |                        |       |
| TotVA                  | Total apparent power in a three-phase circuit.   |             |       |        |      |                        |       |
| TotVAh                 | Net Apparent energy since last rest.   |             |       |        |      |                        |       |
| TotVAR                 | Total reactive power in a three-phase circuit.   |             |       |        |      |                        |       |
| TotVARh                | Net Reactive energy since last reset.  |             |       |        |      |                        |       |
| TotW                   | Total real power in a three phase circuit.   |             |       |        |      |                        |       |
| TotWh                  | Net Real energy since last reset.  |             |       |        |      |                        |       |
| TPTrTmms               | Three-pole delay time in ms before the Breaker Failure tries to retrip the failed breaker.   |             |       |        |      |                        |       |
| Tr                     | Trip is the command to open the breaker when issued in case of fault by PTRC.  |             |       |        |      |                        |       |

| TrBeh                                 | Indicates for the next Trip if Single Pole Tripping is allowed or Three Pole Tripping requested.<br><table border="1"> <thead> <tr> <th>Trigger Behavior</th> <th>Value</th> </tr> </thead> <tbody> <tr> <td>Single Pole Tripping</td> <td>1</td> </tr> <tr> <td>Undefined</td> <td>2</td> </tr> <tr> <td>Three Pole Tripping</td> <td>3</td> </tr> </tbody> </table>   | Trigger Behavior           | Value | Single Pole Tripping | 1 | Undefined                   | 2 | Three Pole Tripping                   | 3 |                                   |   |                          |   |        |   |
|---------------------------------------|---|----------------------------|-------|----------------------|---|-----------------------------|---|---------------------------------------|---|-----------------------------------|---|--------------------------|---|--------|---|
| Trigger Behavior                      | Value   |                            |       |                      |   |                             |   |                                       |   |                                   |   |                          |   |        |   |
| Single Pole Tripping                  | 1   |                            |       |                      |   |                             |   |                                       |   |                                   |   |                          |   |        |   |
| Undefined                             | 2   |                            |       |                      |   |                             |   |                                       |   |                                   |   |                          |   |        |   |
| Three Pole Tripping                   | 3   |                            |       |                      |   |                             |   |                                       |   |                                   |   |                          |   |        |   |
| TrgMod                                | Disturbance recorder trigger mode. The source of the External trigger is a local issue.<br><table border="1"> <thead> <tr> <th>Trigger Mode</th> <th>Value</th> </tr> </thead> <tbody> <tr> <td>Internal</td> <td>1</td> </tr> <tr> <td>External</td> <td>2</td> </tr> <tr> <td>Both</td> <td>3</td> </tr> </tbody> </table>  | Trigger Mode               | Value | Internal             | 1 | External                    | 2 | Both                                  | 3 |                                   |   |                          |   |        |   |
| Trigger Mode                          | Value   |                            |       |                      |   |                             |   |                                       |   |                                   |   |                          |   |        |   |
| Internal                              | 1   |                            |       |                      |   |                             |   |                                       |   |                                   |   |                          |   |        |   |
| External                              | 2   |                            |       |                      |   |                             |   |                                       |   |                                   |   |                          |   |        |   |
| Both                                  | 3   |                            |       |                      |   |                             |   |                                       |   |                                   |   |                          |   |        |   |
| TrMod                                 | This data represents type of trip function; 3ph means only 3phase tripping possible, 1 or 3ph means PTRC with 1 and 3 phase tripping possibility and first trip depending on fault type. Specific means for example PTRC with 1 and 2ph and 3ph tripping possibility and first trip depending on fault type.<br><table border="1"> <thead> <tr> <th>Trip Mode</th> <th>Value</th> </tr> </thead> <tbody> <tr> <td>3 phase tripping</td> <td>1</td> </tr> <tr> <td>1 or 3 phase tripping</td> <td>2</td> </tr> <tr> <td>specific</td> <td>3</td> </tr> </tbody> </table>   | Trip Mode                  | Value | 3 phase tripping     | 1 | 1 or 3 phase tripping       | 2 | specific                              | 3 |                                   |   |                          |   |        |   |
| Trip Mode                             | Value   |                            |       |                      |   |                             |   |                                       |   |                                   |   |                          |   |        |   |
| 3 phase tripping                      | 1   |                            |       |                      |   |                             |   |                                       |   |                                   |   |                          |   |        |   |
| 1 or 3 phase tripping                 | 2   |                            |       |                      |   |                             |   |                                       |   |                                   |   |                          |   |        |   |
| specific                              | 3   |                            |       |                      |   |                             |   |                                       |   |                                   |   |                          |   |        |   |
| TrMod                                 | Setting for single-pole or three-pole tripping to be used for protection if applicable. Multiple instances allow to set the Trip Mode per cycle or step.<br><table border="1"> <thead> <tr> <th>Trip Mode</th> <th>Value</th> </tr> </thead> <tbody> <tr> <td>Single Pole Tripping</td> <td>1</td> </tr> <tr> <td>Undefined</td> <td>2</td> </tr> <tr> <td>Three Pole Tripping</td> <td>3</td> </tr> </tbody> </table>  | Trip Mode                  | Value | Single Pole Tripping | 1 | Undefined                   | 2 | Three Pole Tripping                   | 3 |                                   |   |                          |   |        |   |
| Trip Mode                             | Value   |                            |       |                      |   |                             |   |                                       |   |                                   |   |                          |   |        |   |
| Single Pole Tripping                  | 1   |                            |       |                      |   |                             |   |                                       |   |                                   |   |                          |   |        |   |
| Undefined                             | 2   |                            |       |                      |   |                             |   |                                       |   |                                   |   |                          |   |        |   |
| Three Pole Tripping                   | 3   |                            |       |                      |   |                             |   |                                       |   |                                   |   |                          |   |        |   |
| TrPlsTmms                             | Trip pulse time is the minimum pulse time for breaker operation.  |                            |       |                      |   |                             |   |                                       |   |                                   |   |                          |   |        |   |
| TypRsCrv                              | This is the type of the reset curve that is used to co-ordinate the reset with electromechanical relays that do not reset instantaneously.<br><table border="1"> <thead> <tr> <th>Reset Curve</th> <th>Value</th> </tr> </thead> <tbody> <tr> <td>None</td> <td>1</td> </tr> <tr> <td>Definite Time Delayed Reset</td> <td>2</td> </tr> <tr> <td>Inverse Reset</td> <td>3</td> </tr> </tbody> </table>  | Reset Curve                | Value | None                 | 1 | Definite Time Delayed Reset | 2 | Inverse Reset                         | 3 |                                   |   |                          |   |        |   |
| Reset Curve                           | Value   |                            |       |                      |   |                             |   |                                       |   |                                   |   |                          |   |        |   |
| None                                  | 1   |                            |       |                      |   |                             |   |                                       |   |                                   |   |                          |   |        |   |
| Definite Time Delayed Reset           | 2   |                            |       |                      |   |                             |   |                                       |   |                                   |   |                          |   |        |   |
| Inverse Reset                         | 3   |                            |       |                      |   |                             |   |                                       |   |                                   |   |                          |   |        |   |
| UnbDetMth                             | <u>Unbalance Detection Method is the method used to detect the unbalanced condition based on measured or calculated phase or sequence components of the monitored by the logical node system parameters.</u><br><table border="1"> <thead> <tr> <th>Unbalance Detection Method</th> <th>Value</th> </tr> </thead> <tbody> <tr> <td>Negative Sequence</td> <td>1</td> </tr> <tr> <td>Zero Sequence</td> <td>2</td> </tr> <tr> <td>Negative Sequence / Positive Sequence</td> <td>3</td> </tr> <tr> <td>Zero Sequence / Positive Sequence</td> <td>4</td> </tr> <tr> <td>Phase vectors comparison</td> <td>5</td> </tr> <tr> <td>Others</td> <td>6</td> </tr> </tbody> </table> | Unbalance Detection Method | Value | Negative Sequence    | 1 | Zero Sequence               | 2 | Negative Sequence / Positive Sequence | 3 | Zero Sequence / Positive Sequence | 4 | Phase vectors comparison | 5 | Others | 6 |
| Unbalance Detection Method            | Value   |                            |       |                      |   |                             |   |                                       |   |                                   |   |                          |   |        |   |
| Negative Sequence                     | 1   |                            |       |                      |   |                             |   |                                       |   |                                   |   |                          |   |        |   |
| Zero Sequence                         | 2   |                            |       |                      |   |                             |   |                                       |   |                                   |   |                          |   |        |   |
| Negative Sequence / Positive Sequence | 3   |                            |       |                      |   |                             |   |                                       |   |                                   |   |                          |   |        |   |
| Zero Sequence / Positive Sequence     | 4   |                            |       |                      |   |                             |   |                                       |   |                                   |   |                          |   |        |   |
| Phase vectors comparison              | 5   |                            |       |                      |   |                             |   |                                       |   |                                   |   |                          |   |        |   |
| Others                                | 6   |                            |       |                      |   |                             |   |                                       |   |                                   |   |                          |   |        |   |
| UnBlkMod                              | This Data is the unblock function mode.<br><table border="1"> <thead> <tr> <th>Unblock Function Mode</th> <th>Value</th> </tr> </thead> <tbody> <tr> <td>Off</td> <td>1</td> </tr> <tr> <td>Permanent</td> <td>2</td> </tr> <tr> <td>Time Window</td> <td>3</td> </tr> </tbody> </table>  | Unblock Function Mode      | Value | Off                  | 1 | Permanent                   | 2 | Time Window                           | 3 |                                   |   |                          |   |        |   |
| Unblock Function Mode                 | Value   |                            |       |                      |   |                             |   |                                       |   |                                   |   |                          |   |        |   |
| Off                                   | 1   |                            |       |                      |   |                             |   |                                       |   |                                   |   |                          |   |        |   |
| Permanent                             | 2   |                            |       |                      |   |                             |   |                                       |   |                                   |   |                          |   |        |   |
| Time Window                           | 3   |                            |       |                      |   |                             |   |                                       |   |                                   |   |                          |   |        |   |
| UnBlkTmms                             | Unblocking Time.  |                            |       |                      |   |                             |   |                                       |   |                                   |   |                          |   |        |   |
| Up                                    | <u>Last count direction upward</u>  |                            |       |                      |   |                             |   |                                       |   |                                   |   |                          |   |        |   |
| UseCyc                                | Actual set maximum number of cycles for any cyclic process, e.g. used for the Autorecloser  |                            |       |                      |   |                             |   |                                       |   |                                   |   |                          |   |        |   |
| VA                                    | Phase apparent power  |                            |       |                      |   |                             |   |                                       |   |                                   |   |                          |   |        |   |
| VAr                                   | Phase reactive power (Q)  |                            |       |                      |   |                             |   |                                       |   |                                   |   |                          |   |        |   |

**Kommentar [HD139]:** to decide if the description for TrMod should be kept in addition to TrMod1...  
01Feb: we deleted TrMod1, but didn't decide about TrMod  
TrMod1 came from Ad2  
TrMod came from 7-4 ed1

**Kommentar [HD140]:** in RREC

Gelöscht: ¶

Gelöscht:

| VHzCrv               | Characteristic Curve for protection operation of the form: $y = f(x)$ , where $x = \text{Hz}$ (frequency) and $y = \text{V}$ (voltage) The integers representing the different curves are given in the definition of CDC CURVE in IEC 61850-7-3.  |                      |       |     |   |         |   |      |   |                |   |
|----------------------|---|----------------------|-------|-----|---|---------|---|------|---|----------------|---|
| VHzSt                | Delivers the active curve characteristic.   |                      |       |     |   |         |   |      |   |                |   |
| VInd                 | This Data indicates the check result of the differences between the absolute values of the busbar and line voltages. FALSE indicates that the voltage difference is below the required limit. The voltage difference criteria for the synchronising are fulfilled. TRUE indicates that the voltage difference exceeds the limit. The synchronising process shall be aborted because the voltage band criteria are not fulfilled (synchrocheck) or shall be continued with generator control activities (synchronising). |                      |       |     |   |         |   |      |   |                |   |
| Vol                  | Voltage non phase related.  |                      |       |     |   |         |   |      |   |                |   |
| VolAmp               | Apparent power measurement of a non-three-phase circuit.  |                      |       |     |   |         |   |      |   |                |   |
| VolAmpr              | Volt-amperes reactive of a non-three-phase circuit.   |                      |       |     |   |         |   |      |   |                |   |
| VolChgRte            | Rate of voltage change (change over time).  |                      |       |     |   |         |   |      |   |                |   |
| VOvSt                | TRUE = Indicates voltage override control status.   |                      |       |     |   |         |   |      |   |                |   |
| VRed                 | TRUE = Voltage reduction is active to reduce load side voltage below the normal setting.  |                      |       |     |   |         |   |      |   |                |   |
| VRedVal              | Reduction of band centre (percent) when voltage step $x$ is active.   |                      |       |     |   |         |   |      |   |                |   |
| VRtg                 | Rated Voltage, intrinsic property of the device, which cannot be set/changed from remote.   |                      |       |     |   |         |   |      |   |                |   |
| VStr                 | Value of the voltage that must be reached that a dedicated action is started of the related function.   |                      |       |     |   |         |   |      |   |                |   |
| W                    | Phase active power (P)  |                      |       |     |   |         |   |      |   |                |   |
| WacTrg               | The number of times the watchdog circuit has reset the device since the counter reset.  |                      |       |     |   |         |   |      |   |                |   |
| Watt                 | Real power in a non-three-phase circuit.  |                      |       |     |   |         |   |      |   |                |   |
| WeiMod               | <p>This Data is the weak end infeed function mode.</p> <p>NOTE Normal are values 1, 3 and 4.</p> <table border="1" style="margin-left: 40px;"> <thead> <tr> <th>Weak End Infeed Mode</th> <th>Value</th> </tr> </thead> <tbody> <tr> <td>Off</td> <td>1</td> </tr> <tr> <td>Operate</td> <td>2</td> </tr> <tr> <td>Echo</td> <td>3</td> </tr> <tr> <td>Echo &amp; Operate</td> <td>4</td> </tr> </tbody> </table>   | Weak End Infeed Mode | Value | Off | 1 | Operate | 2 | Echo | 3 | Echo & Operate | 4 |
| Weak End Infeed Mode | Value   |                      |       |     |   |         |   |      |   |                |   |
| Off                  | 1   |                      |       |     |   |         |   |      |   |                |   |
| Operate              | 2   |                      |       |     |   |         |   |      |   |                |   |
| Echo                 | 3   |                      |       |     |   |         |   |      |   |                |   |
| Echo & Operate       | 4   |                      |       |     |   |         |   |      |   |                |   |
| WeiOp                | Operate signal from week end infeed function.   |                      |       |     |   |         |   |      |   |                |   |
| WeiTmms              | Co-ordination time for weak end feed function in ms.  |                      |       |     |   |         |   |      |   |                |   |
| WrmStr               | The number of warm starts made by the physical/logical device since the last reset.   |                      |       |     |   |         |   |      |   |                |   |
| X0                   | Zero sequence line reactance.   |                      |       |     |   |         |   |      |   |                |   |
| X1                   | Positive sequence line (reach) reactance.   |                      |       |     |   |         |   |      |   |                |   |
| Xm0                  | Mutual reactance coupling from parallel line.   |                      |       |     |   |         |   |      |   |                |   |
| Z                    | Line impedance of all phases in a three-phase system (ZL1, ZL2, LZ3)  |                      |       |     |   |         |   |      |   |                |   |
| Z0Ang                | Zero sequence source angle, near end (A).   |                      |       |     |   |         |   |      |   |                |   |
| Z0Mod                | Zero sequence source module, remote end (B).  |                      |       |     |   |         |   |      |   |                |   |
| Z1Ang                | Positive sequence line angle.   |                      |       |     |   |         |   |      |   |                |   |
| Z1Mod                | Positive sequence line Mod.   |                      |       |     |   |         |   |      |   |                |   |
| ZeroEna              | Zero Sequence Current Supervision Enabled (TRUE).   |                      |       |     |   |         |   |      |   |                |   |
| Zm0Ang               | Mutual impedance coupling from parallel line Angle.   |                      |       |     |   |         |   |      |   |                |   |
| Zm0Mod               | Mutual impedance coupling from parallel line Module.  |                      |       |     |   |         |   |      |   |                |   |

**Kommentar [HD141]:** 836-US2: give Explanation:

**Kommentar [HD142]:** the former annex A "extension rules" and annex B "modelling examples" are moved to part 7-1 and 7-5

## Annex A (normativ)

### Interpretation of Mode and Behavior

Switching between the modes (MOD.stVal) should only happen as a result of an operator command to the data **Mod**, what is always visible and controllable (CDC INC). With the exception of the Mod=OFF, all data in all other modes are visible.

|              |   |
|--------------|---|
| ON           | The application represented by the LN works.<br>All communication services work and get updated values.   |
| ON-Blocked   | The application represented by the LN works.<br>No output data (digital by relays or analog setting) will be issued to the process<br>All communication services work but get <b>no updated values (values are frozen).</b><br><b>But the last value of the frozen data could be interrogated or polled.</b>                                    |
| TEST         | The application represented by the LN works.<br>All communication services work and get updated values.<br>Data will be transmitted with quality "test".<br>Control commands with quality test will be accepted only by LNs in TEST or TEST-Blocked mode.   |
| TEST-Blocked | The application represented by the LN works.<br>No output data (digital by relays or analog setting) will be issued to the process<br>All communication services work and get updated values.<br>Data will be transmitted with quality "test".<br>Control commands with quality test will be accepted only by LNs in TEST or TEST-Blocked mode. |
| OFF          | The application represented by the LN doesn't work.<br>No process output is possible. No control command should be acknowledged (negative response).<br>Only the data Mod should be controllable.   |

The communication services **for data Mod** doesn't care about the status of the behavior of the LN.

Table A.1 gives an overview over the definition of mode and behavior.

In the lower lines is given the functional processing of the LNs in different behavior states. "Processed as normal" in behavior "TEST" means that the application should react in the manner what is foreseen for TEST.

**Table A.1 – Definition of mode and behavior**

**Kommentar [HD143]:** acc. meetings in Quebec and Baden

| MODE/BEHAVIOR  | ON                                 | ON-Blocked                             | TEST                          | TEST-Blocked                                    | OFF                                |
|--|------------------------------------|--|-------------------------------|---|------------------------------------|
| Function behind LN   | ON                                 | ON                                     | ON                            | ON  | OFF*                               |
| Output to the Process (Switchgear) via a non-IEC 61850 link e.g wire (typical for X...,Y..., and GGIO LNs)   | YES                                | NO                                     | YES                           | NO  | NO                                 |
| Output of FC ST, MX (issued independently from Beh)  | value is relevant<br>q is relevant | value is frozen<br>q = operatorBlocked | value is relevant<br>q = test | value is relevant<br>q = test +operator-Blocked | value is irrelevant<br>q = invalid |
| Response to (Normal) Command from Client (a <sup>+</sup> positive / a <sup>-</sup> negative acknowledgement) | a <sup>+</sup><br>pos. ack.        | a <sup>-</sup><br>neg. ack.            | a <sup>-</sup><br>neg. ack.   | a <sup>-</sup><br>neg. ack.                     | a <sup>-</sup><br>neg. ack.        |
| Response to TEST Command from Client (a <sup>+</sup> positive / a <sup>-</sup> negative acknowledgement)     | a <sup>-</sup><br>neg. ack.        | a <sup>-</sup><br>neg. ack.            | a <sup>+</sup><br>pos. ack.   | a <sup>+</sup><br>pos. ack.                     | a <sup>-</sup><br>neg. ack.        |
| Non-IEC 61850 binary (relay, contact) inputs and analog (instrument transformer) inputs                      | Processed as normal                | Processed as normal                    | Processed as normal           | Processed as normal                             | Not Processed                      |
| Incoming Data with q=normal  | Processed as normal                | Processed as normal                    | Processed as normal           | Processed as normal                             | Not Processed                      |
| Incoming Data with q=operatorBlocked   | Processed as blocked               | Processed as blocked                   | Processed as blocked          | Processed as blocked                            | Not Processed                      |
| Incoming Data with q=test  | Processed as invalid               | Processed as invalid                   | Processed as normal           | Processed as normal                             | Not Processed                      |
| Incoming Data with q=test+operatorBlocked  | Processed as invalid               | Processed as invalid                   | Processed as blocked          | Processed as blocked                            | Not Processed                      |
| Incoming Data with q=invalid   | Processed as invalid               | Processed as invalid                   | Processed as invalid          | Processed as invalid                            | Not Processed                      |

**Annex B  
(normative)**

**Local / Remote concept on station level / NCC level**

| Switch                | Bay control                 |                        |                 | Manual Command      | Command from    |         |        |
|-----------------------|-----------------------------|------------------------|-----------------|---------------------|-----------------|---------|--------|
|                       |                             |                        |                 |                     | Bay             | Station | NCC    |
|                       | Mode of switching authority | Local control behavior |                 | at switch (process) | orCat           |         |        |
| XCBR.<br>XSWI.<br>Loc | LLNO.<br>ModSwAuth          | CSWI.<br>Loc           | CSWI.<br>LocSta |                     | Local Ctl (Bay) | Station | Remote |
| T                     | OO                          | n.a.                   | n.a.            | AA                  | NA              | NA      | NA     |
| F                     | OO                          | T                      | n.a.            | AA                  | AA              | NA      | NA     |
| F                     | OO                          | F                      | T               | AA                  | NA              | AA      | NA     |
| F                     | OO                          | F                      | F               | AA                  | NA              | NA      | AA     |
| T                     | MO                          | n.a.                   | n.a.            | AA                  | NA              | NA      | NA     |
| F                     | MO                          | T                      | n.a.            | AA                  | AA              | NA      | NA     |
| F                     | MO                          | F                      | T               | AA                  | AA              | AA      | NA     |
| F                     | MO                          | F                      | F               | AA                  | AA              | AA      | AA     |

**Loc status (behavior of the LN reg. switching authority)**

T = TRUE      command only allowed at this level (or below)  
 F = FALSE     command not allowed at this level  
 n.a.            not applicable i.e. the position of this .Loc is of no importance

**Command**

AA = ALLOWED                      command allowed  
 NA = NOT ALLOWED                command not allowed  
 NA\* = NOT ALLOWED                command not allowed with exceptions

OO = Only one switching Originator allowed (default, if no this data is not defined)  
 MO = More than one switching Originator at the same time allowed (station and bay level)

**Conclusions:**

The local control switch is always allowed to be switched

## Annex C (informative)

### Obsolete Logical Node Classes

In annex C, the logical nodes are listed that are obsolete because of technical progress in edition 2. They will be kept in the standard for backwards compatibility.

Gelöscht: A

#### C.1 LN: Metering Statistics      Name: MSTA

The metered values are not always used directly, but as average values, minima and maxima over a given evaluation period. The reporting may be started after the end of this period.

**Kommentar [HD144]:** This LN is obsolete and only defined because of backwards compatibility.

| MSTA class            |                   |   |   |       |
|-----------------------|-------------------|---|---|-------|
| Data Name             | Common Data Class | Explanation   | T | M/O/C |
| LNName                |                   | The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2 clause 19 |   |       |
| <b>Data</b>           |                   |   |   |       |
| <b>Metered Values</b> |                   |   |   |       |
| AvAmps                | MV                | Average current   |   | 0     |
| MaxAmps               | MV                | Maximum current   |   | 0     |
| MinAmps               | MV                | Minimum current   |   | 0     |
| AvVolts               | MV                | Average voltage   |   | 0     |
| MaxVolts              | MV                | Maximum voltage   |   | 0     |
| MinVolts              | MV                | Minimum voltage   |   | 0     |
| AvVA                  | MV                | Average apparent power  |   | 0     |
| MaxVA                 | MV                | Maximum apparent power  |   | 0     |
| MinVA                 | MV                | Minimum apparent power  |   | 0     |
| AvW                   | MV                | Average real power  |   | 0     |
| MaxW                  | MV                | Maximum real power  |   | 0     |
| MinW                  | MV                | Minimum real power  |   | 0     |
| AvVAr                 | MV                | Average reactive power  |   | 0     |
| MaxVAr                | MV                | Maximum reactive power  |   | 0     |
| MinVAr                | MV                | Minimum reactive power  |   | 0     |
| <b>Controls</b>       |                   |   |   |       |
| EvStr                 | SPC               | Start of evaluation interval  |   | 0     |
| <b>Settings</b>       |                   |   |   |       |
| EvTmms                | ASG               | Evaluation time (time window) for averages, etc.  |   | 0     |

**Annex D  
(informative)**

**Relationship between this standard and IEC 61850-5**

The Logical Nodes listed in IEC 61850-5 define requirements; the Logical Nodes listed in this part define the modelling. Some requirements of the LNs from IEC 61850-5 are modelled by LNs not explicitly in this standard. Its functionality is provided by the services or by the communication stack. Some system support functions are too dependent on implementation to be standardised in this part. In Table C.1 examples are listed.

**Table C.1 – Relationship between IEC 61850-5 and this standard  
for some miscellaneous LNs**

| Functionality      | Defined in IEC 61850-5 by LN | Modelled in IEC 61850-7-4 by LN | Comments   |
|--------------------|------------------------------|---------------------------------|--|
| Time master        | STIM                         | Not applicable                  | Dedicated function providing time from some external source to the system  |
| System supervision | SSYS                         | Not applicable                  | Implementation dependent function provided by the system. Some minimum supervision is provided by the system logical nodes (group L) |
| Test generator     | GTES                         | Not applicable                  | Dedicated function outside the system. For testing see IEC 61850-10  |

**Seite 13: [1] Gelöscht Henry Dawidczak 11/30/2007 8:59:00 AM**

Ena Enabled

**Seite 28: [2] Gelöscht Henry Dawidczak 12/20/2007 4:27:00 PM**

|     |     |                 |  |   |
|-----|-----|-----------------|--|---|
| Loc | SPS | Local operation |  | M |
|-----|-----|-----------------|--|---|

**Seite 28: [3] Gelöscht Henry Dawidczak 12/20/2007 4:24:00 PM**

|                 |     |                                |  |   |
|-----------------|-----|--------------------------------|--|---|
| <b>Controls</b> |     |                                |  |   |
| Blk             | SPC | Block operation[HD1]           |  | O |
| CntRs           | SPC | The counter is reset to 0[HD2] |  | O |

**Seite 29: [4] Gelöscht Henry Dawidczak 12/18/2007 10:08:00 AM**

|                 |     |                 |  |   |
|-----------------|-----|-----------------|--|---|
| <b>Controls</b> |     |                 |  |   |
| Blk             | SPC | Block operation |  | O |

**Seite 29: [5] Gelöscht Henry Dawidczak 12/18/2007 10:11:00 AM**

|                        |     |                 |  |   |
|------------------------|-----|-----------------|--|---|
| <b>Measured values</b> |     |                 |  |   |
| Out                    | MV  | Output          |  | M |
| ErrTerm[HD3]           | MV  | Error term      |  | O |
| <b>Control</b>         |     |                 |  |   |
| Blk                    | SPC | Block operation |  | O |

**Seite 30: [6] Gelöscht Henry Dawidczak 12/18/2007 10:09:00 AM**

|                 |     |                 |  |   |
|-----------------|-----|-----------------|--|---|
| <b>Controls</b> |     |                 |  |   |
| Blk             | SPC | Block operation |  | O |

**Seite 30: [7] Gelöscht Henry Dawidczak 12/18/2007 10:09:00 AM**

|                 |     |                 |  |   |
|-----------------|-----|-----------------|--|---|
| <b>Controls</b> |     |                 |  |   |
| Blk             | SPC | Block operation |  | O |

**Seite 31: [8] Gelöscht Henry Dawidczak 12/18/2007 10:09:00 AM**

|                 |     |                 |  |   |
|-----------------|-----|-----------------|--|---|
| <b>Controls</b> |     |                 |  |   |
| Blk             | SPC | Block operation |  | O |

**Seite 32: [9] Gelöscht Henry Dawidczak 12/21/2007 1:01:00 PM**

|        |     |          |  |   |
|--------|-----|----------|--|---|
| SptVal | APC | Setpoint |  | O |
|--------|-----|----------|--|---|

**Seite 32: [10] Gelöscht Henry Dawidczak 12/18/2007 10:09:00 AM**

|                 |     |                 |  |   |
|-----------------|-----|-----------------|--|---|
| <b>Controls</b> |     |                 |  |   |
| Blk             | SPC | Block operation |  | O |

**Seite 32: [11] Gelöscht Henry Dawidczak 12/21/2007 1:07:00 PM**

|     |     |                                |   |   |
|-----|-----|--------------------------------|---|---|
| OpB | SPS | Second level of action reached | T | O |
|-----|-----|--------------------------------|---|---|

**Seite 32: [12] Gelöscht Henry Dawidczak 12/21/2007 1:07:00 PM**

|         |     |                                 |  |   |
|---------|-----|---------------------------------|--|---|
| StrValB | ASG | Second level of action setpoint |  | C |
|---------|-----|---------------------------------|--|---|

**Seite 32: [13] Gelöscht Henry Dawidczak 12/18/2007 10:09:00 AM**

|                 |     |                 |  |   |
|-----------------|-----|-----------------|--|---|
| <b>Controls</b> |     |                 |  |   |
| Blk             | SPC | Block operation |  | O |

|                                |     |                                |                              |
|--------------------------------|-----|--------------------------------|------------------------------|
| <b>Seite 33: [14] Gelöscht</b> |     | <b>Henry Dawidczak</b>         | <b>12/21/2007 1:07:00 PM</b> |
| OpB                            | SPS | Second level of action reached | T O                          |

|                                |     |                                 |                              |
|--------------------------------|-----|---------------------------------|------------------------------|
| <b>Seite 33: [15] Gelöscht</b> |     | <b>Henry Dawidczak</b>          | <b>12/21/2007 1:07:00 PM</b> |
| StrValB                        | ASG | Second level of action setpoint | O                            |

|                                |     |                        |                               |
|--------------------------------|-----|------------------------|-------------------------------|
| <b>Seite 33: [16] Gelöscht</b> |     | <b>Henry Dawidczak</b> | <b>12/18/2007 10:12:00 AM</b> |
| <b>Controls</b>                |     |                        |                               |
| Blk                            | SPC | Block operation        | O                             |

|                                   |     |                             |                              |
|-----------------------------------|-----|-----------------------------|------------------------------|
| <b>Seite 35: [17] Gelöscht</b>    |     | <b>Henry Dawidczak</b>      | <b>12/21/2007 1:13:00 PM</b> |
| OpCntRs                           | INC | Resetable operation counter | O                            |
| <b>Status InformationControls</b> |     |                             |                              |

|                                |  |                        |                              |
|--------------------------------|--|------------------------|------------------------------|
| <b>Seite 36: [18] Gelöscht</b> |  | <b>Henry Dawidczak</b> | <b>12/21/2007 1:14:00 PM</b> |
|                                |  |                        |                              |

|                                |     |                                 |                            |
|--------------------------------|-----|---------------------------------|----------------------------|
| <b>Seite 42: [19] Gelöscht</b> |     | <b>Henry Dawidczak</b>          | <b>1/9/2008 5:03:00 PM</b> |
| Amp2                           | SAV | Current (Sampled value) phase B | C                          |
| Amp3                           | SAV | Current (Sampled value) phase C | C                          |

|                                |  |                        |                              |
|--------------------------------|--|------------------------|------------------------------|
| <b>Seite 43: [20] Gelöscht</b> |  | <b>Henry Dawidczak</b> | <b>12/18/2007 3:45:00 PM</b> |
|--------------------------------|--|------------------------|------------------------------|

**LN: Flicker Measurement unit Name Name: MFLK**

This LN shall be used for calculation of flicker inducing voltage fluctuations according to IEC Standard 61000-4-15. The main use is for operative applications.

| <b>MFLK class</b>      |                          |  |          |              |
|------------------------|--------------------------|--|----------|--------------|
| <b>Data Name</b>       | <b>Common Data Class</b> | <b>Explanation</b>   | <b>T</b> | <b>M/O/C</b> |
| LNNName                |                          | The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2 clause 19. |          |              |
| <b>Data</b>            |                          |  |          |              |
| <b>Measured Values</b> |                          |  |          |              |
| Pst                    | DELTA                    | Pst of last complete interval  |          | O            |
| Plt                    | DELTA                    | Plt of last complete interval  |          | O            |
| PltSlide               | DELTA                    | Sliding window Plt up to last complete Pst interval  |          | O            |
| PiMax                  | DELTA                    | Output 5 – Instantaneous peak P value  |          | O            |
| PiLPF                  | DELTA                    | Output 4 – 1 minute average of Output 5  |          | O            |
| PiRoot                 | DELTA                    | Output 3 – Square root of Output 5   |          | O            |
| PcbLsA                 | HST                      | Classifier bins of last complete short interval Phase A (or AB)  |          | O            |
| PcbLsB                 | HST                      | Classifier bins of last complete short interval Phase B (or BC)  |          | O            |
| PcbLsC                 | HST                      | Classifier bins of last complete short interval Phase C (or CA)  |          | O            |
| PcbLIA                 | HST                      | Classifier bins of last complete long interval Phase A (or AB)   |          | O            |
| PcbLIB                 | HST                      | Classifier bins of last complete long interval Phase B (or BC)   |          | O            |
| PcbLIC                 | HST                      | Classifier bins of last complete long interval Phase C (or CA)   |          | O            |
| PdmWaveA               | FLKDMOD                  | Real time demodulated waveform Phase A (or AB)   |          | O            |
| PdmWaveB               | FLKDMOD                  | Real time demodulated waveform Phase B (or BC)   |          | O            |

|          |         |  |  |   |
|----------|---------|--|--|---|
| PdmWaveC | FLKDMOD | Real time demodulated waveform Phase C (or CA)         |  | O |
| PdmSpecA | FLKSPEC | Real time demodulated waveform spectra Phase A (or AB) |  | O |
| PdmSpecB | FLKSPEC | Real time demodulated waveform spectra Phase B (or BC) |  | O |
| PdmSpecC | FLKSPEC | Real time demodulated waveform spectra Phase C (or CA) |  | O |

Note: DELTA class used for multi-phase measurements for WYE or DELTA connections since neutral is not measured for flicker.

FLKDMOD – Array of N measured values containing demodulated waveform where N is vendor dependent and discoverable

FLKSPEC – Array of N measured values containing demodulated spectra – M Hz resolution where N and M are discoverable

FLKPROB – Array of N counts representing classifier bins where N is discoverable

|                                |     |   |                            |
|--------------------------------|-----|---|----------------------------|
| <b>Seite 44: [21] Gelöscht</b> |     | <b>Henry Dawidczak</b>                      | <b>8/7/2007 9:37:00 AM</b> |
| EEHealth                       | INS | External equipment health (external sensor) | O                          |
| EENAME                         | DPL | External equipment name plate               | O                          |

|                                |     |   |                            |
|--------------------------------|-----|---|----------------------------|
| <b>Seite 45: [22] Gelöscht</b> |     | <b>Henry Dawidczak</b>                      | <b>8/7/2007 9:37:00 AM</b> |
| EEHealth                       | INS | External equipment health (external sensor) | O                          |
| EENAME                         | DPL | External equipment name plate               | O                          |

|                                |     |   |                            |
|--------------------------------|-----|---|----------------------------|
| <b>Seite 49: [23] Gelöscht</b> |     | <b>Henry Dawidczak</b>                      | <b>8/7/2007 9:37:00 AM</b> |
| EEHealth                       | INS | External equipment health (external sensor) | O                          |
| EENAME                         | DPL | External equipment name plate               | O                          |

|                                |     |   |                            |
|--------------------------------|-----|---|----------------------------|
| <b>Seite 49: [24] Gelöscht</b> |     | <b>Henry Dawidczak</b>                      | <b>8/7/2007 9:38:00 AM</b> |
| EEHealth                       | INS | External equipment health (external sensor) | O                          |
| EENAME                         | DPL | External equipment name plate               | O                          |

|                                |     |   |                            |
|--------------------------------|-----|---|----------------------------|
| <b>Seite 49: [25] Gelöscht</b> |     | <b>Henry Dawidczak</b>                      | <b>8/7/2007 9:38:00 AM</b> |
| EEHealth                       | INS | External equipment health (external sensor) | O                          |

|                                |     |   |                            |
|--------------------------------|-----|---|----------------------------|
| <b>Seite 50: [26] Gelöscht</b> |     | <b>Henry Dawidczak</b>                      | <b>8/7/2007 9:38:00 AM</b> |
| EEHealth                       | INS | External equipment health (external sensor) | O                          |
| EENAME                         | DPL | External equipment name plate               | O                          |

|                                |  |                        |                             |
|--------------------------------|--|------------------------|-----------------------------|
| <b>Seite 50: [27] Gelöscht</b> |  | <b>Henry Dawidczak</b> | <b>1/15/2008 1:56:00 PM</b> |
|--------------------------------|--|------------------------|-----------------------------|

The metered values are not always used directly, but as average values, minima and maxima over a given evaluation period. The reporting may be started after the end of this period[HD4].

| MSTA class  |                   |   |   |       |
|-------------|-------------------|---|---|-------|
| Data Name   | Common Data Class | Explanation   | T | M/O/C |
| LNName      |                   | The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2 clause 19 |   |       |
| <b>Data</b> |                   |   |   |       |
| EEHealth    | INS               | External equipment health (external sensor)   |   | O     |
| EENAME      | DPL               | External equipment name plate   |   | O     |

| MSTA class            |                   |  |   |       |
|-----------------------|-------------------|--|---|-------|
| Data Name             | Common Data Class | Explanation                                      | T | M/O/C |
| <b>Metered Values</b> |                   |  |   |       |
| AvAmps                | MV                | Average current                                  |   | O     |
| MaxAmps               | MV                | Maximum current                                  |   | O     |
| MinAmps               | MV                | Minimum current                                  |   | O     |
| AvVolts               | MV                | Average voltage                                  |   | O     |
| MaxVolts              | MV                | Maximum voltage                                  |   | O     |
| MinVolts              | MV                | Minimum voltage                                  |   | O     |
| AvVA                  | MV                | Average apparent power                           |   | O     |
| MaxVA                 | MV                | Maximum apparent power                           |   | O     |
| MinVA                 | MV                | Minimum apparent power                           |   | O     |
| AvW                   | MV                | Average real power                               |   | O     |
| MaxW                  | MV                | Maximum real power                               |   | O     |
| MinW                  | MV                | Minimum real power                               |   | O     |
| AvVAr                 | MV                | Average reactive power                           |   | O     |
| MaxVAr                | MV                | Maximum reactive power                           |   | O     |
| MinVAr                | MV                | Minimum reactive power                           |   | O     |
| <b>Controls</b>       |                   |  |   |       |
| EvStr                 | SPC               | Start of evaluation interval                     |   | O     |
| <b>Settings</b>       |                   |  |   |       |
| EvTmms                | ASG               | Evaluation time (time window) for averages, etc. |   | O     |

Seite 67: [28] Gelöscht

Henry Dawidczak

12/18/2007 10:49:00 AM

**LN: Underfrequency Name: PTUF**

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

| PTUF class                |                   |   |   |       |
|---------------------------|-------------------|---|---|-------|
| Data Name                 | Common Data Class | Explanation   | T | M/O/C |
| LNNName                   |                   | The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2 clause 19 |   |       |
| <b>Data</b>               |                   |   |   |       |
| <b>Status Information</b> |                   |   |   |       |
| Str                       | ACD               | Start   |   | M     |
| Op                        | ACT               | Operate   | T | M     |
| BlkV                      | SPS               | Blocked because of voltage  |   | O     |
| <b>Controls</b>           |                   |   |   |       |
| OpCntRs                   | INC               | Resetable operation counter   |   | O     |
| <b>Settings</b>           |                   |   |   |       |
| StrVal                    | ASG               | Start Value (frequency)   |   | O     |
| BlkVal                    | ASG               | Voltage Block Value   |   | O     |
| OpDITmms                  | ING               | Operate Delay Time  |   | O     |

| PTUF class |                   |                  |         |
|------------|-------------------|------------------|---------|
| Data Name  | Common Data Class | Explanation      | T M/O/C |
| RsDITmms   | ING               | Reset Delay Time | 0       |

**Seite 69: [29] Gelöscht Henry Dawidczak 12/18/2007 3:47:00 PM**

|         |     |   |   |
|---------|-----|---|---|
| Mag1[i] | ASG | Voltage Variation Event Magnitude Range Point 1     | 0 |
| Mag2[i] | ASG | Voltage Variation Event Magnitude Range Point 2     | 0 |
| Dur1[i] | ASG | Voltage Variation Event Duration Range Point 1 [ms] | 0 |
| Dur2[i] | ASG | Voltage Variation Event Duration Range Point 2 [ms] | 0 |

**Seite 69: [30] Gelöscht Henry Dawidczak 12/18/2007 3:55:00 PM**

|          |      |                   |   |
|----------|------|-------------------|---|
| CntEvent | BCPR | Operation counter | 0 |
|----------|------|-------------------|---|

**Seite 70: [31] Gelöscht Henry Dawidczak 12/18/2007 4:01:00 PM**

|      |     |   |   |
|------|-----|---|---|
| Mag1 | CSD | Frequency Variation Event Magnitude Range Point 1     | 0 |
| Mag2 | CSD | Frequency Variation Event Magnitude Range Point 2     | 0 |
| Dur1 | CSD | Frequency Variation Event Duration Range Point 1 [ms] | 0 |
| Dur2 | CSD | Frequency Variation Event Duration Range Point 2 [ms] | 0 |

**Seite 70: [32] Gelöscht Henry Dawidczak 1/14/2008 3:23:00 PM**

|             |     |   |            |
|-------------|-----|---|------------|
| LvlStVal[k] | ASG | Time at/or above Unbalance Level Set Point            | 0<br>[HD5] |
| Mag1[i]     | ASG | Unbalance Variation Event Magnitude Range Point 1     | 0          |
| Mag2[i]     | ASG | Unbalance Variation Event Magnitude Range Point 2     | 0          |
| Dur1[i]     | ASG | Unbalance Variation Event Duration Range Point 1 [ms] | 0          |
| Dur2[i]     | ASG | Unbalance Variation Event Duration Range Point 2 [ms] | 0<br>[HD6] |

**Seite 71: [33] Gelöscht Henry Dawidczak 12/18/2007 3:59:00 PM**

|            |     |                   |   |
|------------|-----|-------------------|---|
| OpCnt[i,j] | INS | Operation counter | 0 |
|------------|-----|-------------------|---|

**Seite 71: [34] Gelöscht Henry Dawidczak 12/18/2007 4:00:00 PM**

|         |     |   |   |
|---------|-----|---|---|
| Mag1[i] | ASG | Unbalance Variation Event Magnitude Range Point 1     | 0 |
| Mag2[i] | ASG | Unbalance Variation Event Magnitude Range Point 2     | 0 |
| Dur1[i] | ASG | Unbalance Variation Event Duration Range Point 1 [ms] | 0 |
| Dur2[i] | ASG | Unbalance Variation Event Duration Range Point 2 [ms] | 0 |

**Seite 71: [35] Gelöscht Henry Dawidczak 12/18/2007 3:59:00 PM**

|         |     |   |   |
|---------|-----|---|---|
| Mag1[i] | ASG | Transient Event Magnitude Range Point 1     | 0 |
| Mag2[i] | ASG | Transient Event Magnitude Range Point 2     | 0 |
| Dur1[i] | ASG | Transient Event Duration Range Point 1 [ms] | 0 |
| Dur2[i] | ASG | Transient Event Duration Range Point 2 [ms] | 0 |

**Seite 72: [36] Gelöscht Henry Dawidczak 12/18/2007 3:59:00 PM**

|            |     |                   |   |
|------------|-----|-------------------|---|
| OpCnt[i,j] | INS | Operation counter | 0 |
|------------|-----|-------------------|---|

**Seite 72: [37] Gelöscht Henry Dawidczak 12/18/2007 3:59:00 PM**

|         |     |   |   |
|---------|-----|---|---|
| Mag1[i] | ASG | Transient Event Magnitude Range Point 1 | 0 |
|---------|-----|---|---|

|         |     |   |  |   |
|---------|-----|---|--|---|
| Mag2[i] | ASG | Transient Event Magnitude Range Point 2     |  | O |
| Dur1[i] | ASG | Transient Event Duration Range Point 1 [ms] |  | O |
| Dur2[i] | ASG | Transient Event Duration Range Point 1 [ms] |  | O |

**Seite 96: [38] Gelöscht Henry Dawidczak 1/21/2008 3:27:00 PM**

|         |    |   |            |
|---------|----|---|------------|
| EnvTmp  | MV | Temperature of environment at the location of the power transformer (may be different to the location of the cooling equipment, see CCGR.EnvTmp). | O          |
| EnvHum  | MV | Humidity of environment   | O          |
| EnvPres | MV | Pressure of environment   | O<br>[HD7] |

**Seite 105: [39] Gelöscht Henry Dawidczak 12/21/2007 4:15:00 PM**

|   |                 |
|---|-----------------|
| 0 | Completed       |
| 1 | Cancelled       |
| 2 | New adjustments |
| 3 | Under way       |

**Seite 111: [40] Gelöscht Henry Dawidczak 1/21/2008 2:27:00 PM**

|        |   |
|--------|---|
| ClcStr | Starts the calculation of statistical data. Either at once, or if available and set at operTm of the control model.<br><br>This DATA shall be mandatory for all logical nodes that are intended to represent statistical data, indicated by the common data classes, e.g., CDC MV, CMV, WYE, etc. |
|--------|---|

**Seite 113: [41] Gelöscht Henry Dawidczak 1/14/2008 3:17:00 PM**

|         |   |
|---------|---|
| Dur1[1] | Defines the first Duration set point [ms] for the Event Range used to detect a power quality event  |
| Dur2[1] | Defines the second Duration set point [ms] for the Event Range used to detect a power quality event |

**Seite 119: [42] Gelöscht Henry Dawidczak 2/14/2008 10:00:00 AM**

|  |  |
|--|--|
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |