



GE VERNOVA

# MiCOM P40 Agile

## P141

MICS

Model Implementation Conformance Statement - IEC 61850 Edition 2

Software Version: 91

Publication Reference: P141-MC2-EN-91-4





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# 1 MODEL IMPLEMENTATION CONFORMANCE STATEMENT (MICS)

## 1.1 INTRODUCTION

This specification is the Model Implementation Conformance Statement (MICS) and presents the top-level IEC 61850 data model that has been implemented. The definitions of all used Logical Nodes and their associated Common Data Classes, components and associated enumerated values are also included for completeness.

The reader is expected to be conversant with the terminology presented within the IEC 61850 part 7 series of specifications.

## 1.2 OBJECTIVE

To provide comprehensive details of the standard data object model elements supported by the device. The MICS is conformant to the devices associated ICD (Substation Configuration Language) file, according to part 6 of the IEC 61850 standards. The layout of the presented tables within this document are conformant to the part 7 series of the IEC 61850 standard specifications with the following exceptions:

- The "Trigger Options" field is not presented
- The "M/O" field is not present as the definitions are as deployed within the model
- An additional column "X" is used to signify GE Vernova custom attributes

## 1.3 LOGICAL DEVICE DEFINITIONS

The MiCOM relay implements an IEC 61850 server that can contain one or more Logical Devices. Each Logical Device contains a data model built from instances of specific Logical Nodes and must consist of at least an instance of the LPHD Logical Node (which is responsible for providing physical device information) and an instance of the LLN0 Logical Node (for addressing common issues across the Logical Device).

The IEC 61850 data model is contained within the Logical Devices detailed in the table below. All MiCOM devices will name the supported Logical Devices consistently to ensure that data model variables with the same purpose will have the same name within each MiCOM server.

| Logical Device | Comment/Usage                            |
|----------------|--|
| CtlCB          | CB Control                               |
| CtlCBFail      | CB Fail Control Domain for CB            |
| CtlSw          | Switch Control                           |
| Measurements   | P141 Measurements Domain                 |
| Protection     | P141 Protection Domain                   |
| ProtEfd        | Derived Earth Fault Protection           |
| ProtEfm        | Measured Earth Fault Protection          |
| ProtFrq        | Frequency Protection                     |
| ProtNegSeq     | Negative Sequence Protection             |
| ProtNgv        | Negative Sequence Overvoltage Protection |
| ProtNvd        | Residual Voltage Protection              |
| ProtOvCur      | Overcurrent Protection Elements          |
| ProtOvThm      | Over Thermal Protection                  |
| ProtPwr        | Directional Power Protection Domain      |
| ProtRteChgFrq  | Frequency Change Ratio Protection        |
| ProtSef        | Sensitive Earth Fault Protection         |
| ProtVtp        | Time-voltage Protection                  |
| Records        | P141 Records Domain                      |
| SwControl      | Commands and controls for Switch         |
| System         | P141 System Domain                       |

### 1.3.1 IEC 61850 LOGICAL DEVICE DATA MODEL

The IEC 61850 Logical Device top-level data model consists of instances of Logical Nodes. The data model name for a Logical Node instance is constructed from an optional prefix (known as the wrapper), the Logical Node name, and an instance ID (or suffix).

The presented data model is in an alphabetically sorted order, rather than a logical order, because this is the natural order of the data when presented by a native MMS browser. (Higher level browsers can of course impart any ordering that they desire).

| LD           | LN Instance | LN Type                       | Description                                 |
|--------------|-------------|-------------------------------|---|
| CtlCB        | CBCILO1     | CILO_INTERLOCK                | Circuit Breaker Interlocking for CB         |
|              | CBCSWI1     | CSWI_BASIC                    | Switch Controller for CB                    |
|              | CBPTRC1     | PTRC_GLOBAL                   | Protection trip for CB Control              |
|              | CBXCBR1     | XCBR_BASIC                    | Circuit Breaker Monitoring (Pole 1)         |
|              | LLN0        | LLN0_STANDARD                 | Logical Device for CB Control               |
| CtlCBFail    | CbfPTRC13   | PTRC_INDIVID_NO_SEG           | Protection trip for CB Fail                 |
|              | CbfRBRF1    | RBRF_EXTTRIP                  | CB Fail 1                                   |
|              | CbfRBRF2    | RBRF_EXTTRIP                  | CB Fail 2                                   |
|              | LLN0        | LLN0_STANDARD_WITH_CTRLMOD    | Logical Device for CB Fail Control          |
| CtlSw        | LLN0        | LLN0_STANDARD                 | Switch Control Logical Device               |
|              | SwCILO1     | CILO_INTERLOCK                | XSWI1 Interlocking                          |
|              | SwCILO2     | CILO_INTERLOCK                | XSWI2 Interlocking                          |
|              | SwCILO3     | CILO_INTERLOCK                | XSWI3 Interlocking                          |
|              | SwCILO4     | CILO_INTERLOCK                | XSWI4 Interlocking                          |
|              | SwCILO5     | CILO_INTERLOCK                | XSWI5 Interlocking                          |
|              | SwCILO6     | CILO_INTERLOCK                | XSWI6 Interlocking                          |
|              | SwCILO7     | CILO_INTERLOCK                | XSWI7 Interlocking                          |
|              | SwCILO8     | CILO_INTERLOCK                | XSWI8 Interlocking                          |
|              | SwCSWI1     | CSWI_BASIC                    | Control Switch 1                            |
|              | SwCSWI2     | CSWI_BASIC                    | Control Switch 2                            |
|              | SwCSWI3     | CSWI_BASIC                    | Control Switch 3                            |
|              | SwCSWI4     | CSWI_BASIC                    | Control Switch 4                            |
|              | SwCSWI5     | CSWI_BASIC                    | Control Switch 5                            |
|              | SwCSWI6     | CSWI_BASIC                    | Control Switch 6                            |
|              | SwCSWI7     | CSWI_BASIC                    | Control Switch 7                            |
|              | SwCSWI8     | CSWI_BASIC                    | Control Switch 8                            |
|              | SwXSWI1     | XSWI_BASIC                    | Switch Monitoring and Control               |
|              | SwXSWI2     | XSWI_BASIC                    | Switch Monitoring and Control               |
|              | SwXSWI3     | XSWI_BASIC                    | Switch Monitoring and Control               |
|              | SwXSWI4     | XSWI_BASIC                    | Switch Monitoring and Control               |
|              | SwXSWI5     | XSWI_BASIC                    | Switch Monitoring and Control               |
|              | SwXSWI6     | XSWI_BASIC                    | Switch Monitoring and Control               |
|              | SwXSWI7     | XSWI_BASIC                    | Switch Monitoring and Control               |
| SwXSWI8      | XSWI_BASIC  | Switch Monitoring and Control |   |
| Measurements | LLN0        | LLN0_STANDARD_MEA             | Measurements Logical Device                 |
|              | LPHD1       | LPHD_STANDARD                 | Physical Device Information                 |
|              | PriAvgMMXU1 | MMXU_METER_AV                 | Primary Average Value of Fixed Measurements |

| LD         | LN Instance | LN Type                    | Description   |
|------------|-------------|----------------------------|---|
|            | PriAvgMMXU2 | MMXU_METER_AV              | Primary Average Value of Rolled Measurements          |
|            | PriFitMLFR1 | MLFR_FAULT                 | Measurements during the Latest Fault Record           |
|            | PriFouMMXU1 | MMXU_FOURIER_P140_EXT      | Primary Fourier Measurements                          |
|            | PriMaxMMXU1 | MMXU_METER_MAX             | Primary Maximum Value of Measurement                  |
|            | PriMMTR1    | MMTR_PRIV                  | Primary based metering quantities                     |
|            | PriMSQI1    | MSQI_ALL                   | Primary Sequence Measurements                         |
|            | PriRmsMMXU1 | MMXU_RMS_P140              | Primary RMS Measurements                              |
|            | SecAvgMMXU1 | MMXU_METER_AV              | Secondary Average Value of Fixed Measurements         |
|            | SecAvgMMXU2 | MMXU_METER_AV              | Secondary Average Value of Rolled Measurements        |
|            | SecFouMMXU1 | MMXU_FOURIER_P140          | Secondary Fourier Measurements                        |
|            | SecMaxMMXU1 | MMXU_METER_MAX             | Secondary Maximum Value of Measurement                |
|            | SecMMTR1    | MMTR_PRIV                  | Secondary based metering quantities                   |
|            | SecMSQI1    | MSQI_ALL                   | Secondary Sequence Measurements                       |
|            | SecRmsMMXU1 | MMXU_RMS_P140              | Secondary RMS Measurements                            |
| Protection |             |                            |   |
|            | LLN0        | LLN0_STANDARD              | Protection Logical Device with Standard Template      |
|            | LPHD1       | LPHD_STANDARD              | Physical Device Information                           |
| ProtEfd    |             |                            |   |
|            | EfdPTOC1    | PTOC_NEU                   | IN2> 1 Earth Fault (Derived)                          |
|            | EfdPTOC2    | PTOC_NEU                   | IN2> 2 Earth Fault (Derived)                          |
|            | EfdPTOC3    | PTOC_NEU                   | IN2> 3 Earth Fault (Derived)                          |
|            | EfdPTOC4    | PTOC_NEU                   | IN2> 4 Earth Fault (Derived)                          |
|            | EfdPTRC3    | PTRC_INDIVID_NO_SEG        | Protection trip for Earth Fault (Derived) protection  |
|            | LLN0        | LLN0_STANDARD_WITH_CTRLMOD | Logical Device for Efd Protection                     |
| ProtEfm    |             |                            |   |
|            | EfmPTOC1    | PTOC_NEU                   | IN1> 1 Earth Fault (Measured)                         |
|            | EfmPTOC2    | PTOC_NEU                   | IN1> 2 Earth Fault (Measured)                         |
|            | EfmPTOC3    | PTOC_NEU                   | IN1> 3 Earth Fault (Measured)                         |
|            | EfmPTOC4    | PTOC_NEU                   | IN1> 4 Earth Fault (Measured)                         |
|            | EfmPTRC4    | PTRC_INDIVID_NO_SEG        | Protection trip for Earth Fault (Measured) protection |
|            | LLN0        | LLN0_STANDARD_WITH_CTRLMOD | Logical Device for Efm Protection                     |
| ProtFrq    |             |                            |   |
|            | FrqPTOF1    | PTOF_NO_SEG                | F> 1 Overfrequency                                    |
|            | FrqPTOF2    | PTOF_NO_SEG                | F> 2 Overfrequency                                    |
|            | FrqPTRC10   | PTRC_INDIVID_NO_SEG        | Protection trip for Frequency Protection              |
|            | FrqPTUF1    | PTUF_NO_SEG                | F< 1 Underfrequency                                   |
|            | FrqPTUF2    | PTUF_NO_SEG                | F< 2 Underfrequency                                   |
|            | FrqPTUF3    | PTUF_NO_SEG                | F< 3 Underfrequency                                   |
|            | FrqPTUF4    | PTUF_NO_SEG                | F< 4 Underfrequency                                   |
|            | LLN0        | LLN0_STANDARD_WITH_CTRLMOD | Logical Device for Frequency Protection               |
| ProtNegSeq |             |                            |   |
|            | LLN0        | LLN0_STANDARD_WITH_CTRLMOD | Logical Device for Negative Sequence Protection       |
|            | NgcPTOC1    | PTOC_NO_SEG                | I2> 1 Negative Sequence                               |

| LD            | LN Instance | LN Type                    | Description  |
|---------------|-------------|----------------------------|--|
|               | NgcPTOC2    | PTOC_NO_SEG                | I2> 2 Negative Sequence                              |
|               | NgcPTOC3    | PTOC_NO_SEG                | I2> 3 Negative Sequence                              |
|               | NgcPTOC4    | PTOC_NO_SEG                | I2> 4 Negative Sequence                              |
|               | NgcPTRC5    | PTRC_INDIVID_NO_SEG        | Protection trip for Negative Sequence Protection     |
| ProtNgv       |             |                            |  |
|               | LLN0        | LLN0_STANDARD_WITH_CTRLMOD | Logical Device for Ngv Protection                    |
|               | NgvPTOV1    | PTOV_NO_SEG                | V2> 1 Negative Sequence                              |
|               | VtpNgvPTRC9 | PTRC_INDIVID_NO_SEG        | Protection trip for Ngv protection                   |
| ProtNvd       |             |                            |  |
|               | LLN0        | LLN0_STANDARD_WITH_CTRLMOD | Logical Device for Nvd Protection                    |
|               | VtpResPTOV1 | PTOV_NEU                   | VN> 1 Residual Overvoltage                           |
|               | VtpResPTOV2 | PTOV_NEU                   | VN> 2 Residual Overvoltage                           |
|               | VtpResPTOV3 | PTOV_NEU                   | VN> 3 Residual Overvoltage                           |
|               | VtpResPTOV4 | PTOV_NEU                   | VN> 4 Residual Overvoltage                           |
|               | VtpResPTRC8 | PTRC_INDIVID_NO_SEG        | Protection trip for Nvd protection                   |
| ProtOvCur     |             |                            |  |
|               | LLN0        | LLN0_STANDARD_WITH_CTRLMOD | Logical Device for Overcurrent Protection            |
|               | OcpPTOC1    | PTOC_SEG                   | I> 1 Overcurrent                                     |
|               | OcpPTOC2    | PTOC_SEG                   | I> 2 Overcurrent                                     |
|               | OcpPTOC3    | PTOC_SEG                   | I> 3 Overcurrent                                     |
|               | OcpPTOC4    | PTOC_SEG                   | I> 4 Overcurrent                                     |
|               | OcpPTOC5    | PTOC_SEG                   | I> 5 Overcurrent                                     |
|               | OcpPTOC6    | PTOC_SEG                   | I> 6 Overcurrent                                     |
|               | OcpPTRC2    | PTRC_INDIVID_NO_SEG        | Protection trip for Overcurrent Protection           |
| ProtOvThm     |             |                            |  |
|               | LLN0        | LLN0_STANDARD_WITH_CTRLMOD | Logical Device for Thermal Overload Protection       |
|               | ThmPTRC12   | PTRC_INDIVID_NO_SEG        | Thermal Overload                                     |
|               | ThmPTTR1    | PTTR_NO_SEG                | Thermal Overload                                     |
| ProtPwr       |             |                            |  |
|               | LLN0        | LLN0_STANDARD_WITH_CTRLMOD | Logic device for directional power protection        |
|               | PdpPDOP1    | PDOP_BASIC                 | Directional overpower stage 1                        |
|               | PdpPDOP2    | PDOP_BASIC                 | Directional overpower stage 2                        |
|               | PdpPDUP1    | PDUP_BASIC                 | Directional underpower stage 1                       |
|               | PdpPDUP2    | PDUP_BASIC                 | Directional underpower stage 2                       |
|               | PdpPTRC15   | PTRC_INDIVID_NO_SEG        | Protection trip for directional power                |
| ProtRteChgFrq |             |                            |  |
|               | DfpPFRC1    | PFRC_NO_SEG                | df/dt> 1 Frequency Rate of Change                    |
|               | DfpPFRC2    | PFRC_NO_SEG                | df/dt> 2 Frequency Rate of Change                    |
|               | DfpPFRC3    | PFRC_NO_SEG                | df/dt> 3 Frequency Rate of Change                    |
|               | DfpPFRC4    | PFRC_NO_SEG                | df/dt> 4 Frequency Rate of Change                    |
|               | DfpPFRC5    | PFRC_NO_SEG                | df/dt> 5 Frequency Rate of Change                    |
|               | DfpPFRC6    | PFRC_NO_SEG                | df/dt> 6 Frequency Rate of Change                    |
|               | DfpPFRC7    | PFRC_NO_SEG                | df/dt> 7 Frequency Rate of Change                    |
|               | DfpPFRC8    | PFRC_NO_SEG                | df/dt> 8 Frequency Rate of Change                    |
|               | DfpPFRC9    | PFRC_NO_SEG                | df/dt> 9 Frequency Rate of Change                    |
|               | DfpPTRC11   | PTRC_INDIVID_NO_SEG        | Protection trip for Frequency Rate Change Protection |

| LD        | LN Instance | LN Type                    | Description   |
|-----------|-------------|----------------------------|---|
|           | LLN0        | LLN0_STANDARD_WITH_CTRLMOD | Logical Device for Frequency Rate Change Protection     |
| ProtSef   |             |                            |   |
|           | LLN0        | LLN0_STANDARD_WITH_CTRLMOD | Logical Device for SEF Protection                       |
|           | SenEffPSDE1 | PSDE_NEU                   | ISEF> 1 Sensitive Earth Fault                           |
|           | SenEffPSDE2 | PSDE_NEU                   | ISEF> 2 Sensitive Earth Fault                           |
|           | SenEffPSDE3 | PSDE_NEU                   | ISEF> 3 Sensitive Earth Fault                           |
|           | SenEffPSDE4 | PSDE_NEU                   | ISEF> 4 Sensitive Earth Fault                           |
|           | SenEffPTRC6 | PTRC_INDIVID_NO_SEG        | Protection trip for Sensitive Earth Fault Protection    |
|           | SenRefPDIF1 | PDIF_NEU                   | IREF> 1 Restricted Earth Fault                          |
| ProtVtp   |             |                            |   |
|           | LLN0        | LLN0_STANDARD_WITH_CTRLMOD | Logical Device for Vtp Protection                       |
|           | VtpPhsPTOV1 | PTOV_SEG                   | V> 1 Overvoltage  |
|           | VtpPhsPTOV2 | PTOV_SEG                   | V> 2 Overvoltage  |
|           | VtpPhsPTOV3 | PTOV_SEG                   | V> 3 Overvoltage  |
|           | VtpPhsPTOV4 | PTOV_SEG                   | V> 4 Overvoltage  |
|           | VtpPhsPTOV5 | PTOV_SEG                   | V> 5 Overvoltage  |
|           | VtpPhsPTOV6 | PTOV_SEG                   | V> 6 Overvoltage  |
|           | VtpPhsPTRC7 | PTRC_INDIVID_NO_SEG        | Protection trip for Vtp Protection                      |
|           | VtpPhsPTUV1 | PTUV_SEG                   | V< 1 Undervoltage                                       |
|           | VtpPhsPTUV2 | PTUV_SEG                   | V< 1 Undervoltage                                       |
|           | VtpPhsPTUV3 | PTUV_SEG                   | V< 1 Undervoltage                                       |
|           | VtpPhsPTUV4 | PTUV_SEG                   | V< 1 Undervoltage                                       |
| Records   |             |                            |   |
|           | LLN0        | LLN0_STANDARD              | Records Logical Device                                  |
|           | LPHD1       | LPHD_STANDARD              | Physical Device Information                             |
|           | RDRE1       | RDRE_BASIC                 | Disturbance Recorder                                    |
|           | RFLO1       | RFLO_BASIC                 | Fault Locator   |
| SwControl |             |                            |   |
|           | LLN0        | LLN0_STANDARD              | Switch Control Logical Device                           |
|           | LPHD1       | LPHD_STANDARD              | Px40 Physical Device Information                        |
| System    |             |                            |   |
|           | AlmGGIO1    | GGIO_ALM_96                | Alarms  |
|           | GosGGIO1    | GGIO_IND_128               | GOOSE Input Signals                                     |
|           | GosGGIO2    | GGIO_IND_32                | GOOSE Output Signals                                    |
|           | LedGGIO1    | GGIO_IND_8                 | Red LED Signals   |
|           | LGOS1       | LGOS_SYSTEM                | Monitoring of GOOSE Messages for External Publisher 1   |
|           | LGOS10      | LGOS_SYSTEM                | Monitoring of GOOSE Messages for External Publisher 10  |
|           | LGOS100     | LGOS_SYSTEM                | Monitoring of GOOSE Messages for External Publisher 100 |
|           | LGOS101     | LGOS_SYSTEM                | Monitoring of GOOSE Messages for External Publisher 101 |
|           | LGOS102     | LGOS_SYSTEM                | Monitoring of GOOSE Messages for External Publisher 102 |
|           | LGOS103     | LGOS_SYSTEM                | Monitoring of GOOSE Messages for External Publisher 103 |
|           | LGOS104     | LGOS_SYSTEM                | Monitoring of GOOSE Messages for External Publisher 104 |
|           | LGOS105     | LGOS_SYSTEM                | Monitoring of GOOSE Messages for External Publisher 105 |

| LD | LN Instance | LN Type     | Description   |
|----|-------------|-------------|---|
|    | LGOS106     | LGOS_SYSTEM | Monitoring of GOOSE Messages for External Publisher 106 |
|    | LGOS107     | LGOS_SYSTEM | Monitoring of GOOSE Messages for External Publisher 107 |
|    | LGOS108     | LGOS_SYSTEM | Monitoring of GOOSE Messages for External Publisher 108 |
|    | LGOS109     | LGOS_SYSTEM | Monitoring of GOOSE Messages for External Publisher 109 |
|    | LGOS11      | LGOS_SYSTEM | Monitoring of GOOSE Messages for External Publisher 11  |
|    | LGOS110     | LGOS_SYSTEM | Monitoring of GOOSE Messages for External Publisher 110 |
|    | LGOS111     | LGOS_SYSTEM | Monitoring of GOOSE Messages for External Publisher 111 |
|    | LGOS112     | LGOS_SYSTEM | Monitoring of GOOSE Messages for External Publisher 112 |
|    | LGOS113     | LGOS_SYSTEM | Monitoring of GOOSE Messages for External Publisher 113 |
|    | LGOS114     | LGOS_SYSTEM | Monitoring of GOOSE Messages for External Publisher 114 |
|    | LGOS115     | LGOS_SYSTEM | Monitoring of GOOSE Messages for External Publisher 115 |
|    | LGOS116     | LGOS_SYSTEM | Monitoring of GOOSE Messages for External Publisher 116 |
|    | LGOS117     | LGOS_SYSTEM | Monitoring of GOOSE Messages for External Publisher 117 |
|    | LGOS118     | LGOS_SYSTEM | Monitoring of GOOSE Messages for External Publisher 118 |
|    | LGOS119     | LGOS_SYSTEM | Monitoring of GOOSE Messages for External Publisher 119 |
|    | LGOS12      | LGOS_SYSTEM | Monitoring of GOOSE Messages for External Publisher 12  |
|    | LGOS120     | LGOS_SYSTEM | Monitoring of GOOSE Messages for External Publisher 120 |
|    | LGOS121     | LGOS_SYSTEM | Monitoring of GOOSE Messages for External Publisher 121 |
|    | LGOS122     | LGOS_SYSTEM | Monitoring of GOOSE Messages for External Publisher 122 |
|    | LGOS123     | LGOS_SYSTEM | Monitoring of GOOSE Messages for External Publisher 123 |
|    | LGOS124     | LGOS_SYSTEM | Monitoring of GOOSE Messages for External Publisher 124 |
|    | LGOS125     | LGOS_SYSTEM | Monitoring of GOOSE Messages for External Publisher 125 |
|    | LGOS126     | LGOS_SYSTEM | Monitoring of GOOSE Messages for External Publisher 126 |
|    | LGOS127     | LGOS_SYSTEM | Monitoring of GOOSE Messages for External Publisher 127 |
|    | LGOS128     | LGOS_SYSTEM | Monitoring of GOOSE Messages for External Publisher 128 |
|    | LGOS13      | LGOS_SYSTEM | Monitoring of GOOSE Messages for External Publisher 13  |
|    | LGOS14      | LGOS_SYSTEM | Monitoring of GOOSE Messages for External Publisher 14  |
|    | LGOS15      | LGOS_SYSTEM | Monitoring of GOOSE Messages for External Publisher 15  |

| LD | LN Instance | LN Type     | Description  |
|----|-------------|-------------|--|
|    | LGOS16      | LGOS_SYSTEM | Monitoring of GOOSE Messages for External Publisher 16 |
|    | LGOS17      | LGOS_SYSTEM | Monitoring of GOOSE Messages for External Publisher 17 |
|    | LGOS18      | LGOS_SYSTEM | Monitoring of GOOSE Messages for External Publisher 18 |
|    | LGOS19      | LGOS_SYSTEM | Monitoring of GOOSE Messages for External Publisher 19 |
|    | LGOS2       | LGOS_SYSTEM | Monitoring of GOOSE Messages for External Publisher 2  |
|    | LGOS20      | LGOS_SYSTEM | Monitoring of GOOSE Messages for External Publisher 20 |
|    | LGOS21      | LGOS_SYSTEM | Monitoring of GOOSE Messages for External Publisher 21 |
|    | LGOS22      | LGOS_SYSTEM | Monitoring of GOOSE Messages for External Publisher 22 |
|    | LGOS23      | LGOS_SYSTEM | Monitoring of GOOSE Messages for External Publisher 23 |
|    | LGOS24      | LGOS_SYSTEM | Monitoring of GOOSE Messages for External Publisher 24 |
|    | LGOS25      | LGOS_SYSTEM | Monitoring of GOOSE Messages for External Publisher 25 |
|    | LGOS26      | LGOS_SYSTEM | Monitoring of GOOSE Messages for External Publisher 26 |
|    | LGOS27      | LGOS_SYSTEM | Monitoring of GOOSE Messages for External Publisher 27 |
|    | LGOS28      | LGOS_SYSTEM | Monitoring of GOOSE Messages for External Publisher 28 |
|    | LGOS29      | LGOS_SYSTEM | Monitoring of GOOSE Messages for External Publisher 29 |
|    | LGOS3       | LGOS_SYSTEM | Monitoring of GOOSE Messages for External Publisher 3  |
|    | LGOS30      | LGOS_SYSTEM | Monitoring of GOOSE Messages for External Publisher 30 |
|    | LGOS31      | LGOS_SYSTEM | Monitoring of GOOSE Messages for External Publisher 31 |
|    | LGOS32      | LGOS_SYSTEM | Monitoring of GOOSE Messages for External Publisher 32 |
|    | LGOS33      | LGOS_SYSTEM | Monitoring of GOOSE Messages for External Publisher 33 |
|    | LGOS34      | LGOS_SYSTEM | Monitoring of GOOSE Messages for External Publisher 34 |
|    | LGOS35      | LGOS_SYSTEM | Monitoring of GOOSE Messages for External Publisher 35 |
|    | LGOS36      | LGOS_SYSTEM | Monitoring of GOOSE Messages for External Publisher 36 |
|    | LGOS37      | LGOS_SYSTEM | Monitoring of GOOSE Messages for External Publisher 37 |
|    | LGOS38      | LGOS_SYSTEM | Monitoring of GOOSE Messages for External Publisher 38 |
|    | LGOS39      | LGOS_SYSTEM | Monitoring of GOOSE Messages for External Publisher 39 |
|    | LGOS4       | LGOS_SYSTEM | Monitoring of GOOSE Messages for External Publisher 4  |
|    | LGOS40      | LGOS_SYSTEM | Monitoring of GOOSE Messages for External Publisher 40 |

| LD | LN Instance | LN Type     | Description  |
|----|-------------|-------------|--|
|    | LGOS41      | LGOS_SYSTEM | Monitoring of GOOSE Messages for External Publisher 41 |
|    | LGOS42      | LGOS_SYSTEM | Monitoring of GOOSE Messages for External Publisher 42 |
|    | LGOS43      | LGOS_SYSTEM | Monitoring of GOOSE Messages for External Publisher 43 |
|    | LGOS44      | LGOS_SYSTEM | Monitoring of GOOSE Messages for External Publisher 44 |
|    | LGOS45      | LGOS_SYSTEM | Monitoring of GOOSE Messages for External Publisher 45 |
|    | LGOS46      | LGOS_SYSTEM | Monitoring of GOOSE Messages for External Publisher 46 |
|    | LGOS47      | LGOS_SYSTEM | Monitoring of GOOSE Messages for External Publisher 47 |
|    | LGOS48      | LGOS_SYSTEM | Monitoring of GOOSE Messages for External Publisher 48 |
|    | LGOS49      | LGOS_SYSTEM | Monitoring of GOOSE Messages for External Publisher 49 |
|    | LGOS5       | LGOS_SYSTEM | Monitoring of GOOSE Messages for External Publisher 5  |
|    | LGOS50      | LGOS_SYSTEM | Monitoring of GOOSE Messages for External Publisher 50 |
|    | LGOS51      | LGOS_SYSTEM | Monitoring of GOOSE Messages for External Publisher 51 |
|    | LGOS52      | LGOS_SYSTEM | Monitoring of GOOSE Messages for External Publisher 52 |
|    | LGOS53      | LGOS_SYSTEM | Monitoring of GOOSE Messages for External Publisher 53 |
|    | LGOS54      | LGOS_SYSTEM | Monitoring of GOOSE Messages for External Publisher 54 |
|    | LGOS55      | LGOS_SYSTEM | Monitoring of GOOSE Messages for External Publisher 55 |
|    | LGOS56      | LGOS_SYSTEM | Monitoring of GOOSE Messages for External Publisher 56 |
|    | LGOS57      | LGOS_SYSTEM | Monitoring of GOOSE Messages for External Publisher 57 |
|    | LGOS58      | LGOS_SYSTEM | Monitoring of GOOSE Messages for External Publisher 58 |
|    | LGOS59      | LGOS_SYSTEM | Monitoring of GOOSE Messages for External Publisher 59 |
|    | LGOS6       | LGOS_SYSTEM | Monitoring of GOOSE Messages for External Publisher 6  |
|    | LGOS60      | LGOS_SYSTEM | Monitoring of GOOSE Messages for External Publisher 60 |
|    | LGOS61      | LGOS_SYSTEM | Monitoring of GOOSE Messages for External Publisher 61 |
|    | LGOS62      | LGOS_SYSTEM | Monitoring of GOOSE Messages for External Publisher 62 |
|    | LGOS63      | LGOS_SYSTEM | Monitoring of GOOSE Messages for External Publisher 63 |
|    | LGOS64      | LGOS_SYSTEM | Monitoring of GOOSE Messages for External Publisher 64 |
|    | LGOS65      | LGOS_SYSTEM | Monitoring of GOOSE Messages for External Publisher 65 |
|    | LGOS66      | LGOS_SYSTEM | Monitoring of GOOSE Messages for External Publisher 66 |

| LD | LN Instance | LN Type     | Description  |
|----|-------------|-------------|--|
|    | LGOS67      | LGOS_SYSTEM | Monitoring of GOOSE Messages for External Publisher 67 |
|    | LGOS68      | LGOS_SYSTEM | Monitoring of GOOSE Messages for External Publisher 68 |
|    | LGOS69      | LGOS_SYSTEM | Monitoring of GOOSE Messages for External Publisher 69 |
|    | LGOS7       | LGOS_SYSTEM | Monitoring of GOOSE Messages for External Publisher 7  |
|    | LGOS70      | LGOS_SYSTEM | Monitoring of GOOSE Messages for External Publisher 70 |
|    | LGOS71      | LGOS_SYSTEM | Monitoring of GOOSE Messages for External Publisher 71 |
|    | LGOS72      | LGOS_SYSTEM | Monitoring of GOOSE Messages for External Publisher 72 |
|    | LGOS73      | LGOS_SYSTEM | Monitoring of GOOSE Messages for External Publisher 73 |
|    | LGOS74      | LGOS_SYSTEM | Monitoring of GOOSE Messages for External Publisher 74 |
|    | LGOS75      | LGOS_SYSTEM | Monitoring of GOOSE Messages for External Publisher 75 |
|    | LGOS76      | LGOS_SYSTEM | Monitoring of GOOSE Messages for External Publisher 76 |
|    | LGOS77      | LGOS_SYSTEM | Monitoring of GOOSE Messages for External Publisher 77 |
|    | LGOS78      | LGOS_SYSTEM | Monitoring of GOOSE Messages for External Publisher 78 |
|    | LGOS79      | LGOS_SYSTEM | Monitoring of GOOSE Messages for External Publisher 79 |
|    | LGOS8       | LGOS_SYSTEM | Monitoring of GOOSE Messages for External Publisher 8  |
|    | LGOS80      | LGOS_SYSTEM | Monitoring of GOOSE Messages for External Publisher 80 |
|    | LGOS81      | LGOS_SYSTEM | Monitoring of GOOSE Messages for External Publisher 81 |
|    | LGOS82      | LGOS_SYSTEM | Monitoring of GOOSE Messages for External Publisher 82 |
|    | LGOS83      | LGOS_SYSTEM | Monitoring of GOOSE Messages for External Publisher 83 |
|    | LGOS84      | LGOS_SYSTEM | Monitoring of GOOSE Messages for External Publisher 84 |
|    | LGOS85      | LGOS_SYSTEM | Monitoring of GOOSE Messages for External Publisher 85 |
|    | LGOS86      | LGOS_SYSTEM | Monitoring of GOOSE Messages for External Publisher 86 |
|    | LGOS87      | LGOS_SYSTEM | Monitoring of GOOSE Messages for External Publisher 87 |
|    | LGOS88      | LGOS_SYSTEM | Monitoring of GOOSE Messages for External Publisher 88 |
|    | LGOS89      | LGOS_SYSTEM | Monitoring of GOOSE Messages for External Publisher 89 |
|    | LGOS9       | LGOS_SYSTEM | Monitoring of GOOSE Messages for External Publisher 9  |
|    | LGOS90      | LGOS_SYSTEM | Monitoring of GOOSE Messages for External Publisher 90 |
|    | LGOS91      | LGOS_SYSTEM | Monitoring of GOOSE Messages for External Publisher 91 |

| LD | LN Instance | LN Type          | Description  |
|----|-------------|------------------|--|
|    | LGOS92      | LGOS_SYSTEM      | Monitoring of GOOSE Messages for External Publisher 92                                       |
|    | LGOS93      | LGOS_SYSTEM      | Monitoring of GOOSE Messages for External Publisher 93                                       |
|    | LGOS94      | LGOS_SYSTEM      | Monitoring of GOOSE Messages for External Publisher 94                                       |
|    | LGOS95      | LGOS_SYSTEM      | Monitoring of GOOSE Messages for External Publisher 95                                       |
|    | LGOS96      | LGOS_SYSTEM      | Monitoring of GOOSE Messages for External Publisher 96                                       |
|    | LGOS97      | LGOS_SYSTEM      | Monitoring of GOOSE Messages for External Publisher 97                                       |
|    | LGOS98      | LGOS_SYSTEM      | Monitoring of GOOSE Messages for External Publisher 98                                       |
|    | LGOS99      | LGOS_SYSTEM      | Monitoring of GOOSE Messages for External Publisher 99                                       |
|    | LLN0        | LLN0_SYSTEM      | System Logical Device  |
|    | LPHD1       | LPHD_SYSTEM      | Physical Device Information  |
|    | NP2LCCH1    | LCCH_SYSTEM      | Physical communication channel supervision for NP2 (stationbus port and its redundant port). |
|    | OptGGIO1    | GGIO_IND_8       | Opto Inputs  |
|    | OrdRunGGIO1 | GGIO_IND_64      | Uniqueness of control "Order Running" indications for Control operations                     |
|    | PloGGIO1    | GGIO_IND_32_CTRL | Controllable Inputs  |
|    | RlyGGIO1    | GGIO_IND_8       | P141 8 relay contacts  |
|    | TVTR1       | TVTR_SYSTEM      | Voltage transformer monitor  |

## 1.4 LOGICAL NODE DEFINITIONS

The definition tables for each of the Logical Nodes in the top-level data model are presented in the following sub-sections.

The following table presents a summary of the Logical Node templates used across the Logical Devices within the overall IEC 61850 product data model:

| LN Type                    | (LN Class) | Description   | Name Space          |
|----------------------------|------------|---|---------------------|
| CILO_INTERLOCK             | (CILO)     | Control Interlocking  | IEC 61850-7-4:2007A |
| CSWI_BASIC                 | (CSWI)     | Switch controller   | IEC 61850-7-4:2007A |
| GGIO_ALM_96                | (GGIO)     | Generic Process I/O (w.r.t 96 Alarm Elements)                               | IEC 61850-7-4:2007A |
| GGIO_IND_128               | (GGIO)     | Generic process I/O (w.r.t 128 Indication Elements)                         | IEC 61850-7-4:2007A |
| GGIO_IND_32                | (GGIO)     | Generic Process I/O (w.r.t 32 Indication Elements)                          | IEC 61850-7-4:2007A |
| GGIO_IND_32_CTRL           | (GGIO)     | Generic process I/O (w.r.t 32 Indications Ctrl i/p)                         | IEC 61850-7-4:2007A |
| GGIO_IND_64                | (GGIO)     | Generic Process I/O (w.r.t 64 Indication Elements)                          | IEC 61850-7-4:2007A |
| GGIO_IND_8                 | (GGIO)     | Generic Process I/O (w.r.t 8 Indication Elements)                           | IEC 61850-7-4:2007A |
| LCCH_SYSTEM                | (LCCH)     | Physical communication channel supervision                                  | IEC 61850-7-4:2007A |
| LGOS_SYSTEM                | (LGOS)     | Monitoring of GOOSE messages  | IEC 61850-7-4:2007A |
| LLN0_STANDARD              | (LLN0)     | General Logical Node 0  | IEC 61850-7-4:2007A |
| LLN0_SYSTEM                | (LLN0)     | System Logical Node 0   | IEC 61850-7-4:2007A |
| LLN0_STANDARD_MEA          | (LLN0)     | Measurements Logical Node 0   | IEC 61850-7-4:2007A |
| LLN0_STANDARD_WITH_CTRLMOD | (LLN0)     | Logical Node 0  | IEC 61850-7-4:2007A |
| LPHD_STANDARD              | (LPHD)     | Px40 Physical Device Information  | IEC 61850-7-4:2007A |
| LPHD_SYSTEM                | (LPHD)     | Physical device information   | IEC 61850-7-4:2007A |
| MLFR_FAULT                 | (MLFR)     | Measurements of Fault Record  | MiCOM-Px40:2013A    |
| MMTR_PRIV                  | (MMTR)     | Metering  | IEC 61850-7-4:2007A |
| MMXU_RMS_P140              | (MMXU)     | Standard measurements (w.r.t RMS Values - P140)                             | IEC 61850-7-4:2007A |
| MMXU_FOURIER_P140          | (MMXU)     | Standard measurements   | IEC 61850-7-4:2007A |
| MMXU_FOURIER_P140_EXT      | (MMXU)     | Standard measurements including df/dt                                       | IEC 61850-7-4:2007A |
| MMXU_METER_AV              | (MMXU)     | Metering Statistics (w.r.t Current, Real + Reactive Power - Average values) | IEC 61850-7-4:2007A |
| MMXU_METER_MAX             | (MMXU)     | Standard measurements (w.r.t Current, Real + Reactive Power - Max values)   | IEC 61850-7-4:2007A |
| MSQI_ALL                   | (MSQI)     | Sequence and imbalance (w.r.t Pos, Neg, Zero)                               | IEC 61850-7-4:2007A |

| LN Type             | (LN Class) | Description   | Name Space          |
|---------------------|------------|---|---------------------|
| PDIF_NEU            | (PDIF)     | Differential (w.r.t Neutral)                                    | IEC 61850-7-4:2007A |
| PDOP_BASIC          | (PDOP)     | Overpower protection  | IEC 61850-7-4:2007A |
| PDUP_BASIC          | (PDUP)     | Underpower protection   | IEC 61850-7-4:2007A |
| PFRC_NO_SEG         | (PFRC)     | Rate of change of frequency (w.r.t No Phase Segregation)        | IEC 61850-7-4:2007A |
| PSDE_NEU            | (PSDE)     | Sensitive directional earth fault                               | IEC 61850-7-4:2007A |
| PTOC_NEU            | (PTOC)     | Timed Overcurrent (w.r.t Neutral)                               | IEC 61850-7-4:2007A |
| PTOC_NO_SEG         | (PTOC)     | Timed Overcurrent (w.r.t No Phase Segregation)                  | IEC 61850-7-4:2007A |
| PTOC_SEG            | (PTOC)     | Timed Overcurrent (w.r.t Phase Segregation)                     | IEC 61850-7-4:2007A |
| PTOF_NO_SEG         | (PTOF)     | Overfrequency (w.r.t No Phase Segregation)                      | IEC 61850-7-4:2007A |
| PTOV_NO_SEG         | (PTOV)     | Overvoltage (w.r.t Phase Segregation)                           | IEC 61850-7-4:2007A |
| PTOV_SEG            | (PTOV)     | Overvoltage (w.r.t Phase Segregation)                           | IEC 61850-7-4:2007A |
| PTOV_NEU            | (PTOV)     | Overvoltage (w.r.t Neutral)                                     | IEC 61850-7-4:2007A |
| PTRC_INDIVID_NO_SEG | (PTRC)     | Protection trip conditioning                                    | IEC 61850-7-4:2007A |
| PTRC_GLOBAL         | (PTRC)     | Protection trip conditioning                                    | IEC 61850-7-4:2007A |
| PTTR_NO_SEG         | (PTTR)     | Thermal overload (w.r.t No Phase Segregation)                   | IEC 61850-7-4:2007A |
| PTUF_NO_SEG         | (PTUF)     | Underfrequency (w.r.t No Phase Segregation)                     | IEC 61850-7-4:2007A |
| PTUV_SEG            | (PTUV)     | Undervoltage (w.r.t Phase Segregation)                          | IEC 61850-7-4:2007A |
| RBRF_EXTTRIP        | (RBRF)     | Breaker Failure (w.r.t External Tripping)                       | IEC 61850-7-4:2007A |
| RDRE_BASIC          | (RDRE)     | Disturbance Recorder function (w.r.t Mandatory Attributes only) | IEC 61850-7-4:2007A |
| RFLO_BASIC          | (RFLO)     | Fault Locator (w.r.t Mandatory Attributes only)                 | IEC 61850-7-4:2007A |
| TVTR_SYSTEM         | (TVTR)     | Voltage transformer   | IEC 61850-7-4:2007A |
| XCBR_BASIC          | (XCBR)     | Circuit Breaker (w.r.t Mandatory Attributes Only)               | IEC 61850-7-4:2007A |
| XSWI_BASIC          | (XSWI)     | Circuit Switch (w.r.t Switch Status and Control)                | IEC 61850-7-4:2007A |

### 1.4.1 LOGICAL NODE: CILO\_INTERLOCK

Description: Control Interlocking

LN Class: CILO

| Attribute | Attr. Type           | Explanation           | T | X |
|-----------|----------------------|-----------------------|---|---|
| NamPlt    | LPL_LN               | Name Plate            |   |   |
| Beh       | ENS_BEH_THREE_STATUS | Behaviour             |   |   |
| Health    | ENS_HEALTH           | Health                |   |   |
| Mod       | ENC_MOD_THREE_STATUS | Mode                  |   |   |
| EnaOpn    | SPS_WD               | Enable OPEN Commands  |   |   |
| EnaCls    | SPS_WD               | Enable CLOSE Commands |   |   |

### 1.4.2 LOGICAL NODE: CSWI\_BASIC

Description: Switch controller

LN Class: CSWI

| Attribute | Attr. Type           | Explanation                  | T | X |
|-----------|----------------------|------------------------------|---|---|
| NamPlt    | LPL_LN               | Name Plate                   |   |   |
| Beh       | ENS_BEH_THREE_STATUS | Behaviour                    |   |   |
| Health    | ENS_HEALTH           | Health                       |   |   |
| Mod       | ENC_MOD_THREE_STATUS | Mode                         |   |   |
| Loc       | SPS_WD               | Local control behaviour      |   |   |
| OpOpn     | ACT_NO_SEG           | Operation "open switch"      | T |   |
| OpCls     | ACT_NO_SEG           | Operation "close switch"     | T |   |
| OpCntRs   | INC_MOD_STD          | Resettable operation counter |   |   |
| Pos       | DPC_CONTROL          | Switch, general              |   |   |

### 1.4.3 LOGICAL NODE: GGIO\_ALM\_96

Description: Generic process I/O (w.r.t 96 Alarm Elements)

LN Class: GGIO

| Attribute | Attr. Type           | Explanation          | T | X |
|-----------|----------------------|----------------------|---|---|
| NamPlt    | LPL_LN               | Name Plate           |   |   |
| Beh       | ENS_BEH_THREE_STATUS | Behaviour            |   |   |
| Health    | ENS_HEALTH           | Health               |   |   |
| Mod       | ENC_MOD_THREE_STATUS | Mode                 |   |   |
| Alm01     | SPS_D                | General single alarm |   |   |
| Alm02     | SPS_D                | General single alarm |   |   |
| Alm03     | SPS_D                | General single alarm |   |   |
| Alm04     | SPS_D                | General single alarm |   |   |
| Alm05     | SPS_D                | General single alarm |   |   |
| Alm06     | SPS_D                | General single alarm |   |   |
| Alm07     | SPS_D                | General single alarm |   |   |
| Alm08     | SPS_D                | General single alarm |   |   |
| Alm09     | SPS_D                | General single alarm |   |   |
| Alm10     | SPS_D                | General single alarm |   |   |
| Alm11     | SPS_D                | General single alarm |   |   |
| Alm12     | SPS_D                | General single alarm |   |   |
| Alm13     | SPS_D                | General single alarm |   |   |
| Alm14     | SPS_D                | General single alarm |   |   |
| Alm15     | SPS_D                | General single alarm |   |   |

| Attribute | Attr. Type | Explanation          | T | X |
|-----------|------------|----------------------|---|---|
| Alm16     | SPS_D      | General single alarm |   |   |
| Alm17     | SPS_D      | General single alarm |   |   |
| Alm18     | SPS_D      | General single alarm |   |   |
| Alm19     | SPS_D      | General single alarm |   |   |
| Alm20     | SPS_D      | General single alarm |   |   |
| Alm21     | SPS_D      | General single alarm |   |   |
| Alm22     | SPS_D      | General single alarm |   |   |
| Alm23     | SPS_D      | General single alarm |   |   |
| Alm24     | SPS_D      | General single alarm |   |   |
| Alm25     | SPS_D      | General single alarm |   |   |
| Alm26     | SPS_D      | General single alarm |   |   |
| Alm27     | SPS_D      | General single alarm |   |   |
| Alm28     | SPS_D      | General single alarm |   |   |
| Alm29     | SPS_D      | General single alarm |   |   |
| Alm30     | SPS_D      | General single alarm |   |   |
| Alm31     | SPS_D      | General single alarm |   |   |
| Alm32     | SPS_D      | General single alarm |   |   |
| Alm33     | SPS_D      | General single alarm |   |   |
| Alm34     | SPS_D      | General single alarm |   |   |
| Alm35     | SPS_D      | General single alarm |   |   |
| Alm36     | SPS_D      | General single alarm |   |   |
| Alm37     | SPS_D      | General single alarm |   |   |
| Alm38     | SPS_D      | General single alarm |   |   |
| Alm39     | SPS_D      | General single alarm |   |   |
| Alm40     | SPS_D      | General single alarm |   |   |
| Alm41     | SPS_D      | General single alarm |   |   |
| Alm42     | SPS_D      | General single alarm |   |   |
| Alm43     | SPS_D      | General single alarm |   |   |
| Alm44     | SPS_D      | General single alarm |   |   |
| Alm45     | SPS_D      | General single alarm |   |   |
| Alm46     | SPS_D      | General single alarm |   |   |
| Alm47     | SPS_D      | General single alarm |   |   |
| Alm48     | SPS_D      | General single alarm |   |   |
| Alm49     | SPS_D      | General single alarm |   |   |
| Alm50     | SPS_D      | General single alarm |   |   |
| Alm51     | SPS_D      | General single alarm |   |   |
| Alm52     | SPS_D      | General single alarm |   |   |
| Alm53     | SPS_D      | General single alarm |   |   |
| Alm54     | SPS_D      | General single alarm |   |   |
| Alm55     | SPS_D      | General single alarm |   |   |
| Alm56     | SPS_D      | General single alarm |   |   |
| Alm57     | SPS_D      | General single alarm |   |   |
| Alm58     | SPS_D      | General single alarm |   |   |
| Alm59     | SPS_D      | General single alarm |   |   |
| Alm60     | SPS_D      | General single alarm |   |   |
| Alm61     | SPS_D      | General single alarm |   |   |
| Alm62     | SPS_D      | General single alarm |   |   |
| Alm63     | SPS_D      | General single alarm |   |   |
| Alm64     | SPS_D      | General single alarm |   |   |
| Alm65     | SPS_D      | General single alarm |   |   |
| Alm66     | SPS_D      | General single alarm |   |   |

| Attribute | Attr. Type | Explanation          | T | X |
|-----------|------------|----------------------|---|---|
| Alm67     | SPS_D      | General single alarm |   |   |
| Alm68     | SPS_D      | General single alarm |   |   |
| Alm69     | SPS_D      | General single alarm |   |   |
| Alm70     | SPS_D      | General single alarm |   |   |
| Alm71     | SPS_D      | General single alarm |   |   |
| Alm72     | SPS_D      | General single alarm |   |   |
| Alm73     | SPS_D      | General single alarm |   |   |
| Alm74     | SPS_D      | General single alarm |   |   |
| Alm75     | SPS_D      | General single alarm |   |   |
| Alm76     | SPS_D      | General single alarm |   |   |
| Alm77     | SPS_D      | General single alarm |   |   |
| Alm78     | SPS_D      | General single alarm |   |   |
| Alm79     | SPS_D      | General single alarm |   |   |
| Alm80     | SPS_D      | General single alarm |   |   |
| Alm81     | SPS_D      | General single alarm |   |   |
| Alm82     | SPS_D      | General single alarm |   |   |
| Alm83     | SPS_D      | General single alarm |   |   |
| Alm84     | SPS_D      | General single alarm |   |   |
| Alm85     | SPS_D      | General single alarm |   |   |
| Alm86     | SPS_D      | General single alarm |   |   |
| Alm87     | SPS_D      | General single alarm |   |   |
| Alm88     | SPS_D      | General single alarm |   |   |
| Alm89     | SPS_D      | General single alarm |   |   |
| Alm90     | SPS_D      | General single alarm |   |   |
| Alm91     | SPS_D      | General single alarm |   |   |
| Alm92     | SPS_D      | General single alarm |   |   |
| Alm93     | SPS_D      | General single alarm |   |   |
| Alm94     | SPS_D      | General single alarm |   |   |
| Alm95     | SPS_D      | General single alarm |   |   |
| Alm96     | SPS_D      | General single alarm |   |   |

#### 1.4.4 LOGICAL NODE: GGIO\_IND\_128

Description: Generic Process I/O (w.r.t 128 Indication Elements)

LN Class: GGIO

| Attribute | Attr. Type           | Explanation                       | T | X |
|-----------|----------------------|-----------------------------------|---|---|
| NamPit    | LPL_LN               | Name Plate                        |   |   |
| Beh       | ENS_BEH_THREE_STATUS | Behaviour                         |   |   |
| Health    | ENS_HEALTH           | Health                            |   |   |
| Ind001    | SPS_D                | General indication (binary input) |   |   |
| Mod       | ENC_MOD_THREE_STATUS | Mode                              |   |   |
| Ind002    | SPS_D                | General indication (binary input) |   |   |
| Ind003    | SPS_D                | General indication (binary input) |   |   |
| Ind004    | SPS_D                | General indication (binary input) |   |   |
| Ind005    | SPS_D                | General indication (binary input) |   |   |
| Ind006    | SPS_D                | General indication (binary input) |   |   |
| Ind007    | SPS_D                | General indication (binary input) |   |   |
| Ind008    | SPS_D                | General indication (binary input) |   |   |
| Ind009    | SPS_D                | General indication (binary input) |   |   |
| Ind010    | SPS_D                | General indication (binary input) |   |   |

| Attribute | Attr. Type | Explanation                       | T | X |
|-----------|------------|-----------------------------------|---|---|
| Ind011    | SPS_D      | General indication (binary input) |   |   |
| Ind012    | SPS_D      | General indication (binary input) |   |   |
| Ind013    | SPS_D      | General indication (binary input) |   |   |
| Ind014    | SPS_D      | General indication (binary input) |   |   |
| Ind015    | SPS_D      | General indication (binary input) |   |   |
| Ind016    | SPS_D      | General indication (binary input) |   |   |
| Ind017    | SPS_D      | General indication (binary input) |   |   |
| Ind018    | SPS_D      | General indication (binary input) |   |   |
| Ind019    | SPS_D      | General indication (binary input) |   |   |
| Ind020    | SPS_D      | General indication (binary input) |   |   |
| Ind021    | SPS_D      | General indication (binary input) |   |   |
| Ind022    | SPS_D      | General indication (binary input) |   |   |
| Ind023    | SPS_D      | General indication (binary input) |   |   |
| Ind024    | SPS_D      | General indication (binary input) |   |   |
| Ind025    | SPS_D      | General indication (binary input) |   |   |
| Ind026    | SPS_D      | General indication (binary input) |   |   |
| Ind027    | SPS_D      | General indication (binary input) |   |   |
| Ind028    | SPS_D      | General indication (binary input) |   |   |
| Ind029    | SPS_D      | General indication (binary input) |   |   |
| Ind030    | SPS_D      | General indication (binary input) |   |   |
| Ind031    | SPS_D      | General indication (binary input) |   |   |
| Ind032    | SPS_D      | General indication (binary input) |   |   |
| Ind033    | SPS_D      | General indication (binary input) |   |   |
| Ind034    | SPS_D      | General indication (binary input) |   |   |
| Ind035    | SPS_D      | General indication (binary input) |   |   |
| Ind036    | SPS_D      | General indication (binary input) |   |   |
| Ind037    | SPS_D      | General indication (binary input) |   |   |
| Ind038    | SPS_D      | General indication (binary input) |   |   |
| Ind039    | SPS_D      | General indication (binary input) |   |   |
| Ind040    | SPS_D      | General indication (binary input) |   |   |
| Ind041    | SPS_D      | General indication (binary input) |   |   |
| Ind042    | SPS_D      | General indication (binary input) |   |   |
| Ind043    | SPS_D      | General indication (binary input) |   |   |
| Ind044    | SPS_D      | General indication (binary input) |   |   |
| Ind045    | SPS_D      | General indication (binary input) |   |   |
| Ind046    | SPS_D      | General indication (binary input) |   |   |
| Ind047    | SPS_D      | General indication (binary input) |   |   |
| Ind048    | SPS_D      | General indication (binary input) |   |   |
| Ind049    | SPS_D      | General indication (binary input) |   |   |
| Ind050    | SPS_D      | General indication (binary input) |   |   |
| Ind051    | SPS_D      | General indication (binary input) |   |   |
| Ind052    | SPS_D      | General indication (binary input) |   |   |
| Ind053    | SPS_D      | General indication (binary input) |   |   |
| Ind054    | SPS_D      | General indication (binary input) |   |   |
| Ind055    | SPS_D      | General indication (binary input) |   |   |
| Ind056    | SPS_D      | General indication (binary input) |   |   |
| Ind057    | SPS_D      | General indication (binary input) |   |   |
| Ind058    | SPS_D      | General indication (binary input) |   |   |
| Ind059    | SPS_D      | General indication (binary input) |   |   |
| Ind060    | SPS_D      | General indication (binary input) |   |   |
| Ind061    | SPS_D      | General indication (binary input) |   |   |

| Attribute | Attr. Type | Explanation                       | T | X |
|-----------|------------|-----------------------------------|---|---|
| Ind062    | SPS_D      | General indication (binary input) |   |   |
| Ind063    | SPS_D      | General indication (binary input) |   |   |
| Ind064    | SPS_D      | General indication (binary input) |   |   |
| Ind065    | SPS_D      | General indication (binary input) |   |   |
| Ind066    | SPS_D      | General indication (binary input) |   |   |
| Ind067    | SPS_D      | General indication (binary input) |   |   |
| Ind068    | SPS_D      | General indication (binary input) |   |   |
| Ind069    | SPS_D      | General indication (binary input) |   |   |
| Ind070    | SPS_D      | General indication (binary input) |   |   |
| Ind071    | SPS_D      | General indication (binary input) |   |   |
| Ind072    | SPS_D      | General indication (binary input) |   |   |
| Ind073    | SPS_D      | General indication (binary input) |   |   |
| Ind074    | SPS_D      | General indication (binary input) |   |   |
| Ind075    | SPS_D      | General indication (binary input) |   |   |
| Ind076    | SPS_D      | General indication (binary input) |   |   |
| Ind077    | SPS_D      | General indication (binary input) |   |   |
| Ind078    | SPS_D      | General indication (binary input) |   |   |
| Ind079    | SPS_D      | General indication (binary input) |   |   |
| Ind080    | SPS_D      | General indication (binary input) |   |   |
| Ind081    | SPS_D      | General indication (binary input) |   |   |
| Ind082    | SPS_D      | General indication (binary input) |   |   |
| Ind083    | SPS_D      | General indication (binary input) |   |   |
| Ind084    | SPS_D      | General indication (binary input) |   |   |
| Ind085    | SPS_D      | General indication (binary input) |   |   |
| Ind086    | SPS_D      | General indication (binary input) |   |   |
| Ind087    | SPS_D      | General indication (binary input) |   |   |
| Ind088    | SPS_D      | General indication (binary input) |   |   |
| Ind089    | SPS_D      | General indication (binary input) |   |   |
| Ind090    | SPS_D      | General indication (binary input) |   |   |
| Ind091    | SPS_D      | General indication (binary input) |   |   |
| Ind092    | SPS_D      | General indication (binary input) |   |   |
| Ind093    | SPS_D      | General indication (binary input) |   |   |
| Ind094    | SPS_D      | General indication (binary input) |   |   |
| Ind095    | SPS_D      | General indication (binary input) |   |   |
| Ind096    | SPS_D      | General indication (binary input) |   |   |
| Ind097    | SPS_D      | General indication (binary input) |   |   |
| Ind098    | SPS_D      | General indication (binary input) |   |   |
| Ind099    | SPS_D      | General indication (binary input) |   |   |
| Ind100    | SPS_D      | General indication (binary input) |   |   |
| Ind101    | SPS_D      | General indication (binary input) |   |   |
| Ind102    | SPS_D      | General indication (binary input) |   |   |
| Ind103    | SPS_D      | General indication (binary input) |   |   |
| Ind104    | SPS_D      | General indication (binary input) |   |   |
| Ind105    | SPS_D      | General indication (binary input) |   |   |
| Ind106    | SPS_D      | General indication (binary input) |   |   |
| Ind107    | SPS_D      | General indication (binary input) |   |   |
| Ind108    | SPS_D      | General indication (binary input) |   |   |
| Ind109    | SPS_D      | General indication (binary input) |   |   |
| Ind110    | SPS_D      | General indication (binary input) |   |   |
| Ind111    | SPS_D      | General indication (binary input) |   |   |
| Ind112    | SPS_D      | General indication (binary input) |   |   |

| Attribute | Attr. Type | Explanation                       | T | X |
|-----------|------------|-----------------------------------|---|---|
| Ind113    | SPS_D      | General indication (binary input) |   |   |
| Ind114    | SPS_D      | General indication (binary input) |   |   |
| Ind115    | SPS_D      | General indication (binary input) |   |   |
| Ind116    | SPS_D      | General indication (binary input) |   |   |
| Ind117    | SPS_D      | General indication (binary input) |   |   |
| Ind118    | SPS_D      | General indication (binary input) |   |   |
| Ind119    | SPS_D      | General indication (binary input) |   |   |
| Ind120    | SPS_D      | General indication (binary input) |   |   |
| Ind121    | SPS_D      | General indication (binary input) |   |   |
| Ind122    | SPS_D      | General indication (binary input) |   |   |
| Ind123    | SPS_D      | General indication (binary input) |   |   |
| Ind124    | SPS_D      | General indication (binary input) |   |   |
| Ind125    | SPS_D      | General indication (binary input) |   |   |
| Ind126    | SPS_D      | General indication (binary input) |   |   |
| Ind127    | SPS_D      | General indication (binary input) |   |   |
| Ind128    | SPS_D      | General indication (binary input) |   |   |

#### 1.4.5 LOGICAL NODE: GGIO\_IND\_32

Description: Generic Process I/O (w.r.t 32 Indication Elements)

LN Class: GGIO

| Attribute | Attr. Type           | Explanation                       | T | X |
|-----------|----------------------|-----------------------------------|---|---|
| NamPlt    | LPL_LN               | Name Plate                        |   |   |
| Beh       | ENS_BEH_THREE_STATUS | Behaviour                         |   |   |
| Health    | ENS_HEALTH           | Health                            |   |   |
| Ind01     | SPS_D                | General indication (binary input) |   |   |
| Mod       | ENC_MOD_THREE_STATUS | Mode                              |   |   |
| Ind02     | SPS_D                | General indication (binary input) |   |   |
| Ind03     | SPS_D                | General indication (binary input) |   |   |
| Ind04     | SPS_D                | General indication (binary input) |   |   |
| Ind05     | SPS_D                | General indication (binary input) |   |   |
| Ind06     | SPS_D                | General indication (binary input) |   |   |
| Ind07     | SPS_D                | General indication (binary input) |   |   |
| Ind08     | SPS_D                | General indication (binary input) |   |   |
| Ind09     | SPS_D                | General indication (binary input) |   |   |
| Ind10     | SPS_D                | General indication (binary input) |   |   |
| Ind11     | SPS_D                | General indication (binary input) |   |   |
| Ind12     | SPS_D                | General indication (binary input) |   |   |
| Ind13     | SPS_D                | General indication (binary input) |   |   |
| Ind14     | SPS_D                | General indication (binary input) |   |   |
| Ind15     | SPS_D                | General indication (binary input) |   |   |
| Ind16     | SPS_D                | General indication (binary input) |   |   |
| Ind17     | SPS_D                | General indication (binary input) |   |   |
| Ind18     | SPS_D                | General indication (binary input) |   |   |
| Ind19     | SPS_D                | General indication (binary input) |   |   |
| Ind20     | SPS_D                | General indication (binary input) |   |   |
| Ind21     | SPS_D                | General indication (binary input) |   |   |
| Ind22     | SPS_D                | General indication (binary input) |   |   |
| Ind23     | SPS_D                | General indication (binary input) |   |   |
| Ind24     | SPS_D                | General indication (binary input) |   |   |

| Attribute | Attr. Type | Explanation                       | T | X |
|-----------|------------|-----------------------------------|---|---|
| Ind25     | SPS_D      | General indication (binary input) |   |   |
| Ind26     | SPS_D      | General indication (binary input) |   |   |
| Ind27     | SPS_D      | General indication (binary input) |   |   |
| Ind28     | SPS_D      | General indication (binary input) |   |   |
| Ind29     | SPS_D      | General indication (binary input) |   |   |
| Ind30     | SPS_D      | General indication (binary input) |   |   |
| Ind31     | SPS_D      | General indication (binary input) |   |   |
| Ind32     | SPS_D      | General indication (binary input) |   |   |

#### 1.4.6 LOGICAL NODE: GGIO\_IND\_32\_CTRL

Description: Generic Process I/O (w.r.t 32 Indications Ctrl i/p)

LN Class: GGIO

| Attribute | Attr. Type           | Explanation                             | T | X |
|-----------|----------------------|---|---|---|
| NamPlt    | LPL_LN               | Name Plate                              |   |   |
| Beh       | ENS_BEH_THREE_STATUS | Behaviour                               |   |   |
| Health    | ENS_HEALTH           | Health                                  |   |   |
| SPCSO01   | SPC_CONTROL          | Single point controllable status output |   |   |
| Mod       | ENC_MOD_THREE_STATUS | Mode                                    |   |   |
| SPCSO02   | SPC_CONTROL          | Single point controllable status output |   |   |
| SPCSO03   | SPC_CONTROL          | Single point controllable status output |   |   |
| SPCSO04   | SPC_CONTROL          | Single point controllable status output |   |   |
| SPCSO05   | SPC_CONTROL          | Single point controllable status output |   |   |
| SPCSO06   | SPC_CONTROL          | Single point controllable status output |   |   |
| SPCSO07   | SPC_CONTROL          | Single point controllable status output |   |   |
| SPCSO08   | SPC_CONTROL          | Single point controllable status output |   |   |
| SPCSO09   | SPC_CONTROL          | Single point controllable status output |   |   |
| SPCSO10   | SPC_CONTROL          | Single point controllable status output |   |   |
| SPCSO11   | SPC_CONTROL          | Single point controllable status output |   |   |
| SPCSO12   | SPC_CONTROL          | Single point controllable status output |   |   |
| SPCSO13   | SPC_CONTROL          | Single point controllable status output |   |   |
| SPCSO14   | SPC_CONTROL          | Single point controllable status output |   |   |
| SPCSO15   | SPC_CONTROL          | Single point controllable status output |   |   |
| SPCSO16   | SPC_CONTROL          | Single point controllable status output |   |   |
| SPCSO17   | SPC_CONTROL          | Single point controllable status output |   |   |
| SPCSO18   | SPC_CONTROL          | Single point controllable status output |   |   |
| SPCSO19   | SPC_CONTROL          | Single point controllable status output |   |   |
| SPCSO20   | SPC_CONTROL          | Single point controllable status output |   |   |
| SPCSO21   | SPC_CONTROL          | Single point controllable status output |   |   |
| SPCSO22   | SPC_CONTROL          | Single point controllable status output |   |   |
| SPCSO23   | SPC_CONTROL          | Single point controllable status output |   |   |
| SPCSO24   | SPC_CONTROL          | Single point controllable status output |   |   |
| SPCSO25   | SPC_CONTROL          | Single point controllable status output |   |   |
| SPCSO26   | SPC_CONTROL          | Single point controllable status output |   |   |
| SPCSO27   | SPC_CONTROL          | Single point controllable status output |   |   |
| SPCSO28   | SPC_CONTROL          | Single point controllable status output |   |   |
| SPCSO29   | SPC_CONTROL          | Single point controllable status output |   |   |
| SPCSO30   | SPC_CONTROL          | Single point controllable status output |   |   |
| SPCSO31   | SPC_CONTROL          | Single point controllable status output |   |   |
| SPCSO32   | SPC_CONTROL          | Single point controllable status output |   |   |

### 1.4.7 LOGICAL NODE: GGIO\_IND\_64

Description: Generic Process I/O (w.r.t 64 Indication Elements)

LN Class: GGIO

| Attribute | Attr. Type           | Explanation                       | T | X |
|-----------|----------------------|-----------------------------------|---|---|
| NamPlt    | LPL_LN               | Name Plate                        |   |   |
| Beh       | ENS_BEH_THREE_STATUS | Behaviour                         |   |   |
| Health    | ENS_HEALTH           | Health                            |   |   |
| Mod       | ENC_MOD_THREE_STATUS | Mode                              |   |   |
| Ind01     | SPS_D                | General indication (binary input) |   |   |
| Ind02     | SPS_D                | General indication (binary input) |   |   |
| Ind03     | SPS_D                | General indication (binary input) |   |   |
| Ind04     | SPS_D                | General indication (binary input) |   |   |
| Ind05     | SPS_D                | General indication (binary input) |   |   |
| Ind06     | SPS_D                | General indication (binary input) |   |   |
| Ind07     | SPS_D                | General indication (binary input) |   |   |
| Ind08     | SPS_D                | General indication (binary input) |   |   |
| Ind09     | SPS_D                | General indication (binary input) |   |   |
| Ind10     | SPS_D                | General indication (binary input) |   |   |
| Ind11     | SPS_D                | General indication (binary input) |   |   |
| Ind12     | SPS_D                | General indication (binary input) |   |   |
| Ind13     | SPS_D                | General indication (binary input) |   |   |
| Ind14     | SPS_D                | General indication (binary input) |   |   |
| Ind15     | SPS_D                | General indication (binary input) |   |   |
| Ind16     | SPS_D                | General indication (binary input) |   |   |
| Ind17     | SPS_D                | General indication (binary input) |   |   |
| Ind18     | SPS_D                | General indication (binary input) |   |   |
| Ind19     | SPS_D                | General indication (binary input) |   |   |
| Ind20     | SPS_D                | General indication (binary input) |   |   |
| Ind21     | SPS_D                | General indication (binary input) |   |   |
| Ind22     | SPS_D                | General indication (binary input) |   |   |
| Ind23     | SPS_D                | General indication (binary input) |   |   |
| Ind24     | SPS_D                | General indication (binary input) |   |   |
| Ind25     | SPS_D                | General indication (binary input) |   |   |
| Ind26     | SPS_D                | General indication (binary input) |   |   |
| Ind27     | SPS_D                | General indication (binary input) |   |   |
| Ind28     | SPS_D                | General indication (binary input) |   |   |
| Ind29     | SPS_D                | General indication (binary input) |   |   |
| Ind30     | SPS_D                | General indication (binary input) |   |   |
| Ind31     | SPS_D                | General indication (binary input) |   |   |
| Ind32     | SPS_D                | General indication (binary input) |   |   |
| Ind33     | SPS_D                | General indication (binary input) |   |   |
| Ind34     | SPS_D                | General indication (binary input) |   |   |
| Ind35     | SPS_D                | General indication (binary input) |   |   |
| Ind36     | SPS_D                | General indication (binary input) |   |   |
| Ind37     | SPS_D                | General indication (binary input) |   |   |
| Ind38     | SPS_D                | General indication (binary input) |   |   |
| Ind39     | SPS_D                | General indication (binary input) |   |   |
| Ind40     | SPS_D                | General indication (binary input) |   |   |
| Ind41     | SPS_D                | General indication (binary input) |   |   |
| Ind42     | SPS_D                | General indication (binary input) |   |   |

| Attribute | Attr. Type | Explanation                       | T | X |
|-----------|------------|-----------------------------------|---|---|
| Ind43     | SPS_D      | General indication (binary input) |   |   |
| Ind44     | SPS_D      | General indication (binary input) |   |   |
| Ind45     | SPS_D      | General indication (binary input) |   |   |
| Ind46     | SPS_D      | General indication (binary input) |   |   |
| Ind47     | SPS_D      | General indication (binary input) |   |   |
| Ind48     | SPS_D      | General indication (binary input) |   |   |
| Ind49     | SPS_D      | General indication (binary input) |   |   |
| Ind50     | SPS_D      | General indication (binary input) |   |   |
| Ind51     | SPS_D      | General indication (binary input) |   |   |
| Ind52     | SPS_D      | General indication (binary input) |   |   |
| Ind53     | SPS_D      | General indication (binary input) |   |   |
| Ind54     | SPS_D      | General indication (binary input) |   |   |
| Ind55     | SPS_D      | General indication (binary input) |   |   |
| Ind56     | SPS_D      | General indication (binary input) |   |   |
| Ind57     | SPS_D      | General indication (binary input) |   |   |
| Ind58     | SPS_D      | General indication (binary input) |   |   |
| Ind59     | SPS_D      | General indication (binary input) |   |   |
| Ind60     | SPS_D      | General indication (binary input) |   |   |
| Ind61     | SPS_D      | General indication (binary input) |   |   |
| Ind62     | SPS_D      | General indication (binary input) |   |   |
| Ind63     | SPS_D      | General indication (binary input) |   |   |
| Ind64     | SPS_D      | General indication (binary input) |   |   |

#### 1.4.8 LOGICAL NODE: GGIO\_IND\_8

Description: Generic process I/O (w.r.t 8 Indication Elements)

LN Class: GGIO

| Attribute | Attr. Type           | Explanation                       | T | X |
|-----------|----------------------|-----------------------------------|---|---|
| NamPlt    | LPL_LN               | Name Plate                        |   |   |
| Beh       | ENS_BEH_THREE_STATUS | Behaviour                         |   |   |
| Health    | ENS_HEALTH           | Health                            |   |   |
| Ind1      | SPS_D                | General indication (binary input) |   |   |
| Mod       | ENC_MOD_THREE_STATUS | Mode                              |   |   |
| Ind2      | SPS_D                | General indication (binary input) |   |   |
| Ind3      | SPS_D                | General indication (binary input) |   |   |
| Ind4      | SPS_D                | General indication (binary input) |   |   |
| Ind5      | SPS_D                | General indication (binary input) |   |   |
| Ind6      | SPS_D                | General indication (binary input) |   |   |
| Ind7      | SPS_D                | General indication (binary input) |   |   |
| Ind8      | SPS_D                | General indication (binary input) |   |   |

#### 1.4.9 LOGICAL NODE: LCCH\_SYSTEM

Description: Physical communication channel supervision

LN Class: LCCH

| Attribute | Attr. Type           | Explanation | T | X |
|-----------|----------------------|-------------|---|---|
| NamPlt    | LPL_LN               | Name Plate  |   |   |
| Beh       | ENS_BEH_THREE_STATUS | Behaviour   |   |   |
| Health    | ENS_HEALTH           | Health      |   |   |
| Mod       | ENC_MOD_THREE_STATUS | Mode        |   |   |

| Attribute | Attr. Type | Explanation  | T | X |
|-----------|------------|--|---|---|
| ChLiv     | SPS_D      | Physical channel status: true, if channel receives telegrams within a specified time interval. |   |   |
| RedChLiv  | SPS_D      | Physical channel status of redundant channel.  |   |   |

#### 1.4.10 LOGICAL NODE: LGOS\_SYSTEM

Description: Monitoring of GOOSE messages

LN Class: LGOS

| Attribute | Attr. Type           | Explanation   | T | X |
|-----------|----------------------|---|---|---|
| NamPlt    | LPL_LN               | Name Plate  |   |   |
| Beh       | ENS_BEH_THREE_STATUS | Behaviour   |   |   |
| Health    | ENS_HEALTH           | Health  |   |   |
| Mod       | ENC_MOD_THREE_STATUS | Mode  |   |   |
| SimSt     | SPS_WD               | Status showing that really Sim messages are received and accepted |   |   |
| St        | SPS_WD               | Status of the subscription (True = active, False = not active)    |   |   |
| GoCRef    | ORG_SRC_REF          | Reference to the subscribed GOOSE control block                   |   |   |
| OoSEqGo   | SPS_WD_PRIV          | Out of Order GOOSE indication                                     |   | X |

#### 1.4.11 LOGICAL NODE: LLN0\_STANDARD

Description: General Logical Node 0

LN Class: LLN0

| Attribute | Attr. Type           | Explanation                                | T | X |
|-----------|----------------------|--|---|---|
| NamPlt    | LPL_LLN0             | Name Plate                                 |   |   |
| Beh       | ENS_BEH_THREE_STATUS | Behaviour                                  |   |   |
| Health    | ENS_HEALTH           | Health                                     |   |   |
| Mod       | ENC_MOD_THREE_STATUS | Mode                                       |   |   |
| GrRef     | ORG_SRC_REF          | Reference to a higher level logical device |   |   |

#### 1.4.12 LOGICAL NODE: LLN0\_STANDARD\_MEA

Description: Measurements Logical Node 0

LN Class: LLN0

| Attribute | Attr. Type           | Explanation                                | T | X |
|-----------|----------------------|--|---|---|
| NamPlt    | LPL_LLN0_MEA         | Name Plate                                 |   |   |
| Beh       | ENS_BEH_THREE_STATUS | Behaviour                                  |   |   |
| Health    | ENS_HEALTH           | Health                                     |   |   |
| Mod       | ENC_MOD_THREE_STATUS | Mode                                       |   |   |
| GrRef     | ORG_SRC_REF          | Reference to a higher level logical device |   |   |

**1.4.13 LOGICAL NODE: LLN0\_STANDARD\_WITH\_CTRLMOD**

Description: Logical Node 0

LN Class: LLN0

| Attribute | Attr. Type          | Explanation                                | T | X |
|-----------|---------------------|--|---|---|
| NamPlt    | LPL_LLN0            | Name Plate                                 |   |   |
| Beh       | ENS_BEH_FOUR_STATUS | Behaviour                                  |   |   |
| Health    | ENS_HEALTH          | Health                                     |   |   |
| Mod       | ENC_CTRL_LD_MOD_2   | Mode                                       |   |   |
| GrRef     | ORG_SRC_REF         | Reference to a higher level logical device |   |   |

**1.4.14 LOGICAL NODE: LLN0\_SYSTEM**

Description: System Logical Node 0

LN Class: LLN0

| Attribute | Attr. Type           | Explanation   | T | X |
|-----------|----------------------|---|---|---|
| NamPlt    | LPL_LLN0             | Name Plate  |   |   |
| Beh       | ENS_BEH_THREE_STATUS | Behaviour   |   |   |
| Health    | ENS_HEALTH           | Health  |   |   |
| Mod       | ENC_CTRL_LD_MOD      | Mode  |   |   |
| LEDRs     | SPC_CONTROL          | LED reset   | T |   |
| OrdRun    | SPS_WD_PRIV          | Indicate IED is operating a Control Object                  |   | X |
| SyncSt    | SPS_WD_PRIV          | Indicate time synchronisation in the IED is active/inactive |   | X |

**1.4.15 LOGICAL NODE: LPHD\_STANDARD**

Description: Px40 Physical Device Information

LN Class: LPHD

| Attribute | Attr. Type   | Explanation                     | T | X |
|-----------|--------------|---------------------------------|---|---|
| PhyNam    | DPL_STANDARD | Physical device name plate      |   |   |
| PhyHealth | ENS_HEALTH   | Physical device health          |   |   |
| Proxy     | SPS_D        | Indicates if this LN is a proxy |   |   |
| PwrUp     | SPS_D        | Power up detected               |   |   |

**1.4.16 LOGICAL NODE: LPHD\_SYSTEM**

Description: Physical Device Information

LN Class: LPHD

| Attribute | Attr. Type   | Explanation                             | T | X |
|-----------|--------------|---|---|---|
| PhyNam    | DPL_STANDARD | Physical device name plate              |   |   |
| PhyHealth | ENS_HEALTH   | Physical device health                  |   |   |
| Proxy     | SPS_D        | Indicates if this LN is a proxy         |   |   |
| PwrUp     | SPS_D        | Power up detected                       |   |   |
| Sim       | SPC_CONTROL  | Receive simulated GOOSE or simulated SV |   |   |

**1.4.17 LOGICAL NODE: MLFR\_FAULT**

Description: Measurements of Fault Record

LN Class: MLFR

| Attribute | Attr. Type              | Explanation                            | T | X |
|-----------|-------------------------|--|---|---|
| NamPIt    | LPL_LN_PRIV             | Name Plate                             |   |   |
| Beh       | ENS_BEH_THREE_STATUS_DN | Behaviour                              |   |   |
| Health    | ENS_HEALTH_DN           | Health                                 |   |   |
| Mod       | ENC_MOD_THREE_STATUS_DN | Mode                                   |   |   |
| AFIt      | WYE_SEG_PRIV            | Fault current                          |   | X |
| CBOpTim   | MV_FLOAT_PRIV           | CB operate Time                        |   | X |
| FltDur    | MV_FLOAT_PRIV           | Fault duration                         |   | X |
| PhVFlt    | WYE_SEG_PRIV            | Fault voltage                          |   | X |
| RlyTrTim  | MV_FLOAT_PRIV           | Relay trip time                        |   | X |
| IrefDiff  | MV_FLOAT_PRIV           | Iref differential current during fault |   | X |
| IrefBias  | MV_FLOAT_PRIV           | Iref bias current during fault         |   | X |
| Hz        | MV_FLOAT_PRIV           | System Frequency                       |   | X |
| Vn        | MV_FLOAT_PRIV           | VN Derived VN Measure                  |   | X |
| Imax      | WYE_SEG_PRIV            | Ia,Ib,Ic max                           |   | X |

**1.4.18 LOGICAL NODE: MMTR\_PRIV**

Description: Metering

LN Class: MMTR

| Attribute | Attr. Type           | Explanation  | T | X |
|-----------|----------------------|--|---|---|
| NamPIt    | LPL_LN               | Name Plate   |   |   |
| Beh       | ENS_BEH_THREE_STATUS | Behaviour  |   |   |
| Health    | ENS_HEALTH           | Health   |   |   |
| Mod       | ENC_MOD_THREE_STATUS | Mode   |   |   |
| TotWh     | BCR_PRIV             | Net real energy since last reset                     |   |   |
| TotVArh   | BCR_PRIV             | Net reactive energy since last reset                 |   |   |
| SupWh     | BCR_PRIV             | Real energy supply (Energy flow towards bus bar)     |   |   |
| SupVArh   | BCR_PRIV             | Reactive energy supply (Energy flow towards bus bar) |   |   |
| DmdWh     | BCR_PRIV             | Real energy demand (Energy flow from bus bar)        |   |   |
| DmdVArh   | BCR_PRIV             | Reactive energy demand (Energy flow from bus bar)    |   |   |
| MTRRs     | SPC_CTRL_PRIV_NS     | Reset Energy Meters                                  |   | X |

**1.4.19 LOGICAL NODE: MMXU\_FOURIER\_P140**

Description: Standard measurements

LN Class: MMXU

| Attribute | Attr. Type           | Explanation                    | T | X |
|-----------|----------------------|--------------------------------|---|---|
| NamPIt    | LPL_LN               | Name Plate                     |   |   |
| Beh       | ENS_BEH_THREE_STATUS | Behaviour                      |   |   |
| Health    | ENS_HEALTH           | Health                         |   |   |
| Mod       | ENC_MOD_THREE_STATUS | Mode                           |   |   |
| TotW      | MV_FLOAT             | Total active power (Total P)   |   |   |
| TotVAr    | MV_FLOAT             | Total reactive power (Total Q) |   |   |

| Attribute | Attr. Type         | Explanation                         | T | X |
|-----------|--------------------|-------------------------------------|---|---|
| TotVA     | MV_FLOAT           | Total apparent power (Total S)      |   |   |
| TotPF     | MV_FLOAT           | Average power factor (Total PF)     |   |   |
| Hz        | MV_FLOAT           | Frequency                           |   |   |
| PPV       | DEL_SEG_ANG        | Phase to Phase voltages             |   |   |
| PhV       | WYE_SEG_RES_D      | Phase to Ground voltages            |   |   |
| A         | WYE_SEG_RES_D      | Phase currents (Fourier Magnitudes) |   |   |
| NeutA1    | WYE_RES_ANG_D_PRIV | Phase currents (IN Measured)        |   | X |
| NeutA2    | WYE_RES_ANG_D_PRIV | Phase currents (IN Measured)        |   | X |
| W         | WYE_SEG            | Phase active power (P)              |   |   |
| VAr       | WYE_SEG            | Phase reactive power (Q)            |   |   |
| VA        | WYE_SEG            | Phase apparent power (S)            |   |   |
| PF        | WYE_SEG            | Phase power factor                  |   |   |

#### 1.4.20 LOGICAL NODE: MMXU\_FOURIER\_P140\_EXT

Description: Standard measurements including df/dt

LN Class: MMXU

| Attribute | Attr. Type           | Explanation                         | T | X |
|-----------|----------------------|-------------------------------------|---|---|
| NamPlt    | LPL_LN               | Name Plate                          |   |   |
| Beh       | ENS_BEH_THREE_STATUS | Behaviour                           |   |   |
| Health    | ENS_HEALTH           | Health                              |   |   |
| Mod       | ENC_MOD_THREE_STATUS | Mode                                |   |   |
| TotW      | MV_FLOAT             | Total active power (Total P)        |   |   |
| TotVAr    | MV_FLOAT             | Total reactive power (Total Q)      |   |   |
| TotVA     | MV_FLOAT             | Total apparent power (Total S)      |   |   |
| TotPF     | MV_FLOAT             | Average power factor (Total PF)     |   |   |
| Hz        | MV_FLOAT             | Frequency                           |   |   |
| PPV       | DEL_SEG_ANG          | Phase to Phase voltages             |   |   |
| PhV       | WYE_SEG_RES_D        | Phase to Ground voltages            |   |   |
| A         | WYE_SEG_RES_D        | Phase currents (Fourier Magnitudes) |   |   |
| NeutA1    | WYE_RES_ANG_D_PRIV   | Phase currents (IN Measured)        |   | X |
| NeutA2    | WYE_RES_ANG_D_PRIV   | Phase currents (ISEF Magnitude)     |   | X |
| W         | WYE_SEG              | Phase active power (P)              |   |   |
| VAr       | WYE_SEG              | Phase reactive power (Q)            |   |   |
| VA        | WYE_SEG              | Phase apparent power (S)            |   |   |
| PF        | WYE_SEG              | Phase power factor                  |   |   |
| DfDt      | MV_FLOAT_PRIV        | The measurement for Df/Dt           |   | X |

#### 1.4.21 LOGICAL NODE: MMXU\_METER\_AV

Description: Metering Statistics (w.r.t Current, Real + Reactive Power - Average values)

LN Class: MMXU

| Attribute | Attr. Type           | Explanation                                    | T | X |
|-----------|----------------------|--|---|---|
| NamPlt    | LPL_LN               | Name Plate                                     |   |   |
| Beh       | ENS_BEH_THREE_STATUS | Behaviour                                      |   |   |
| Health    | ENS_HEALTH           | Health   |   |   |
| Mod       | ENC_MOD_THREE_STATUS | Mode   |   |   |
| ClcExp    | SPS_WD               | Calculation period expired                     | T |   |
| ClcMth    | ENG_SET_WD_CLCMTH    | Calculation method of statistical data objects |   |   |

| Attribute  | Attr. Type            | Explanation   | T | X |
|------------|-----------------------|---|---|---|
| CicMod     | ENG_SET_WD_CLCMOD     | Calculation mode  |   |   |
| CicIntvTyp | ENG_SET_WD_CLCINTVTYP | Calculation interval type   |   |   |
| CicIntvPer | ING_SET_WD            | number of units to consider, to calculate the calculation interval duration |   |   |
| AvWPhs     | MV_FLOAT_D            | Arithmetic average of the magnitude of active power of the 3 phases         |   |   |
| AvVArPhs   | MV_FLOAT_D            | Arithmetic average of the magnitude of reactive power of the 3 phases       |   |   |
| AvAPhsA    | MV_FLOAT_D_PRIV       | Arithmetic average of the magnitude of Ia current                           |   | X |
| AvAPhsB    | MV_FLOAT_D_PRIV       | Arithmetic average of the magnitude of Ib current                           |   | X |
| AvAPhsC    | MV_FLOAT_D_PRIV       | Arithmetic average of the magnitude of Ic current                           |   | X |

#### 1.4.22 LOGICAL NODE: MMXU\_METER\_MAX

Description: Standard measurements (w.r.t Current, Real + Reactive Power - Max values)

LN Class: MMXU

| Attribute | Attr. Type           | Explanation   | T | X |
|-----------|----------------------|---|---|---|
| NamPit    | LPL_LN               | Name Plate  |   |   |
| Beh       | ENS_BEH_THREE_STATUS | Behaviour   |   |   |
| Health    | ENS_HEALTH           | Health  |   |   |
| Mod       | ENC_MOD_THREE_STATUS | Mode  |   |   |
| CicExp    | SPS_WD               | Calculation period expired                          | T |   |
| CicMth    | ENG_SET_WD_CLCMTH    | Calculation method of statistical data objects      |   |   |
| CicMod    | ENG_SET_WD_CLCMOD    | Calculation mode                                    |   |   |
| MaxWPhs   | MV_FLOAT_D           | Maximum magnitude of active power of the 3 phases   |   |   |
| MaxVArPhs | MV_FLOAT_D           | Maximum magnitude of reactive power of the 3 phases |   |   |
| MaxAPhsA  | MV_FLOAT_D_PRIV      | Maximum magnitude of Ia current                     |   | X |
| MaxAPhsB  | MV_FLOAT_D_PRIV      | Maximum magnitude of Ib current                     |   | X |
| MaxAPhsC  | MV_FLOAT_D_PRIV      | Maximum magnitude of Ic current                     |   | X |

#### 1.4.23 LOGICAL NODE: MMXU\_RMS\_P140

Description: Standard Measurements (w.r.t RMS Values - P140)

LN Class: MMXU

| Attribute | Attr. Type           | Explanation              | T | X |
|-----------|----------------------|--------------------------|---|---|
| NamPit    | LPL_LN               | Name Plate               |   |   |
| Beh       | ENS_BEH_THREE_STATUS | Behaviour                |   |   |
| Health    | ENS_HEALTH           | Health                   |   |   |
| Mod       | ENC_MOD_THREE_STATUS | Mode                     |   |   |
| PhV       | WYE_SEG_D            | Phase to Ground voltages |   |   |
| A         | WYE_SEG_D            | Phase currents           |   |   |

**1.4.24 LOGICAL NODE: MSQI\_ALL**

Description: Sequence and imbalance (w.r.t Pos, Neg, Zero)

LN Class: MSQI

| Attribute | Attr. Type           | Explanation                                  | T | X |
|-----------|----------------------|--|---|---|
| NamPlt    | LPL_LN               | Name Plate                                   |   |   |
| Beh       | ENS_BEH_THREE_STATUS | Behaviour                                    |   |   |
| Health    | ENS_HEALTH           | Health                                       |   |   |
| Mod       | ENC_MOD_THREE_STATUS | Mode   |   |   |
| SeqA      | SEQ_MAG_ANG          | Positive, Negative and Zero sequence current |   |   |
| SeqV      | SEQ_MAG_ANG          | Positive, Negative and Zero sequence voltage |   |   |
| ImbNgA    | MV_FLOAT             | Imbalance negative sequence current          |   |   |

**1.4.25 LOGICAL NODE: PDFIF\_NEU**

Description: Differential (w.r.t Neutral)

LN Class: PDFIF

| Attribute | Attr. Type           | Explanation          | T | X |
|-----------|----------------------|----------------------|---|---|
| NamPlt    | LPL_LN               | Name Plate           |   |   |
| Beh       | ENS_BEH_THREE_STATUS | Behaviour            |   |   |
| Health    | ENS_HEALTH           | Health               |   |   |
| Mod       | ENC_MOD_THREE_STATUS | Mode                 |   |   |
| Op        | ACT_NEU              | Operate              | T |   |
| DifACIc   | WYE_INET             | Differential current |   |   |
| RstA      | WYE_INET             | Restraint current    |   |   |

**1.4.26 LOGICAL NODE: PDOP\_BASIC**

Description: Overpower protection

LN Class: PDOP

| Attribute | Attr. Type          | Explanation | T | X |
|-----------|---------------------|-------------|---|---|
| NamPlt    | LPL_LN              | Name Plate  |   |   |
| Beh       | ENS_BEH_FOUR_STATUS | Behaviour   |   |   |
| Health    | ENS_HEALTH          | Health      |   |   |
| Mod       | ENC_MOD_TWO_STATUS  | Mode        |   |   |
| Str       | ACD_SEG             | Start       |   |   |
| Op        | ACT_SEG             | Operate     | T |   |

**1.4.27 LOGICAL NODE: PDUP\_BASIC**

Description: Underpower protection

LN Class: PDUP

| Attribute | Attr. Type          | Explanation | T | X |
|-----------|---------------------|-------------|---|---|
| NamPlt    | LPL_LN              | Name Plate  |   |   |
| Beh       | ENS_BEH_FOUR_STATUS | Behaviour   |   |   |
| Health    | ENS_HEALTH          | Health      |   |   |
| Mod       | ENC_MOD_TWO_STATUS  | Mode        |   |   |
| Str       | ACD_SEG             | Start       |   |   |
| Op        | ACT_SEG             | Operate     | T |   |

**1.4.28 LOGICAL NODE: PFRC\_NO\_SEG**

Description: Rate of change of frequency (w.r.t No Phase Segregation)

LN Class: PFRC

| Attribute | Attr. Type           | Explanation | T | X |
|-----------|----------------------|-------------|---|---|
| NamPlt    | LPL_LN               | Name Plate  |   |   |
| Beh       | ENS_BEH_THREE_STATUS | Behaviour   |   |   |
| Health    | ENS_HEALTH           | Health      |   |   |
| Mod       | ENC_MOD_THREE_STATUS | Mode        |   |   |
| Str       | ACD_NO_SEG           | Start       |   |   |
| Op        | ACT_NO_SEG           | Operate     | T |   |

**1.4.29 LOGICAL NODE: PSDE\_NEU**

Description: Sensitive directional earthfault

LN Class: PSDE

| Attribute | Attr. Type          | Explanation | T | X |
|-----------|---------------------|-------------|---|---|
| NamPlt    | LPL_LN              | Name Plate  |   |   |
| Beh       | ENS_BEH_FOUR_STATUS | Behaviour   |   |   |
| Health    | ENS_HEALTH          | Health      |   |   |
| Mod       | ENC_MOD_TWO_STATUS  | Mode        |   |   |
| Str       | ACD_NEU             | Start       |   |   |
| Op        | ACT_NEU             | Operate     | T |   |

**1.4.30 LOGICAL NODE: PTOC\_NEU**

Description: Timed Overcurrent (w.r.t Neutral)

LN Class: PTOC

| Attribute | Attr. Type           | Explanation | T | X |
|-----------|----------------------|-------------|---|---|
| NamPlt    | LPL_LN               | Name Plate  |   |   |
| Beh       | ENS_BEH_THREE_STATUS | Behaviour   |   |   |
| Health    | ENS_HEALTH           | Health      |   |   |
| Mod       | ENC_MOD_THREE_STATUS | Mode        |   |   |
| Str       | ACD_NEU              | Start       |   |   |
| Op        | ACT_NEU              | Operate     | T |   |

**1.4.31 LOGICAL NODE: PTOC\_NO\_SEG**

Description: Timed Overcurrent (w.r.t No Phase Segregation)

LN Class: PTOC

| Attribute | Attr. Type           | Explanation | T | X |
|-----------|----------------------|-------------|---|---|
| NamPlt    | LPL_LN               | Name Plate  |   |   |
| Beh       | ENS_BEH_THREE_STATUS | Behaviour   |   |   |
| Health    | ENS_HEALTH           | Health      |   |   |
| Mod       | ENC_MOD_THREE_STATUS | Mode        |   |   |
| Str       | ACD_NO_SEG           | Start       |   |   |
| Op        | ACT_NO_SEG           | Operate     | T |   |

**1.4.32 LOGICAL NODE: PTOC\_SEG**

Description: Timed Overcurrent (w.r.t Phase Segregation)

LN Class: PTOC

| Attribute | Attr. Type           | Explanation | T | X |
|-----------|----------------------|-------------|---|---|
| NamPlt    | LPL_LN               | Name Plate  |   |   |
| Beh       | ENS_BEH_THREE_STATUS | Behaviour   |   |   |
| Health    | ENS_HEALTH           | Health      |   |   |
| Mod       | ENC_MOD_THREE_STATUS | Mode        |   |   |
| Str       | ACD_SEG              | Start       |   |   |
| Op        | ACT_SEG              | Operate     | T |   |

**1.4.33 LOGICAL NODE: PTOF\_NO\_SEG**

Description: Overfrequency (w.r.t No Phase Segregation)

LN Class: PTOF

| Attribute | Attr. Type           | Explanation | T | X |
|-----------|----------------------|-------------|---|---|
| NamPlt    | LPL_LN               | Name Plate  |   |   |
| Beh       | ENS_BEH_THREE_STATUS | Behaviour   |   |   |
| Health    | ENS_HEALTH           | Health      |   |   |
| Mod       | ENC_MOD_THREE_STATUS | Mode        |   |   |
| Str       | ACD_NO_SEG           | Start       |   |   |
| Op        | ACT_NO_SEG           | Operate     | T |   |

**1.4.34 LOGICAL NODE: PTOV\_NEU**

Description: Overvoltage (w.r.t Neutral)

LN Class: PTOV

| Attribute | Attr. Type           | Explanation | T | X |
|-----------|----------------------|-------------|---|---|
| NamPlt    | LPL_LN               | Name Plate  |   |   |
| Beh       | ENS_BEH_THREE_STATUS | Behaviour   |   |   |
| Health    | ENS_HEALTH           | Health      |   |   |
| Mod       | ENC_MOD_THREE_STATUS | Mode        |   |   |
| Str       | ACD_NEU              | Start       |   |   |
| Op        | ACT_NEU              | Operate     | T |   |

**1.4.35 LOGICAL NODE: PTOV\_NO\_SEG**

Description: Overvoltage (w.r.t No Phase Segregation)

LN Class: PTOV

| Attribute | Attr. Type           | Explanation | T | X |
|-----------|----------------------|-------------|---|---|
| NamPlt    | LPL_LN               | Name Plate  |   |   |
| Beh       | ENS_BEH_THREE_STATUS | Behaviour   |   |   |
| Health    | ENS_HEALTH           | Health      |   |   |
| Mod       | ENC_MOD_THREE_STATUS | Mode        |   |   |
| Str       | ACD_NO_SEG           | Start       |   |   |
| Op        | ACT_NO_SEG           | Operate     | T |   |

**1.4.36 LOGICAL NODE: PTOV\_SEG**

Description: Overvoltage (w.r.t Phase Segregation)

LN Class: PTOV

| Attribute | Attr. Type           | Explanation | T | X |
|-----------|----------------------|-------------|---|---|
| NamPlt    | LPL_LN               | Name Plate  |   |   |
| Beh       | ENS_BEH_THREE_STATUS | Behaviour   |   |   |
| Health    | ENS_HEALTH           | Health      |   |   |
| Mod       | ENC_MOD_THREE_STATUS | Mode        |   |   |
| Str       | ACD_SEG              | Start       |   |   |
| Op        | ACT_SEG              | Operate     | T |   |

**1.4.37 LOGICAL NODE: PTRC\_GLOBAL**

Description: Protection trip conditioning

LN Class: PTRC

| Attribute | Attr. Type           | Explanation  | T | X |
|-----------|----------------------|--|---|---|
| NamPlt    | LPL_LN               | Name Plate   |   |   |
| Beh       | ENS_BEH_THREE_STATUS | Behaviour  |   |   |
| Health    | ENS_HEALTH           | Health   |   |   |
| Mod       | ENC_MOD_THREE_STATUS | Mode   |   |   |
| Tr        | ACT_NO_SEG           | Trip   |   |   |
| Op        | ACT_NO_SEG           | Operate (combination of subscribed Op from protection functions) |   |   |
| Str       | ACD_NO_SEG           | Sum of all starts of all connected Logical Nodes                 |   |   |

**1.4.38 LOGICAL NODE: PTRC\_INDIVID\_NO\_SEG**

Description: Protection trip conditioning

LN Class: PTRC

| Attribute | Attr. Type           | Explanation  | T | X |
|-----------|----------------------|--|---|---|
| NamPlt    | LPL_LN               | Name Plate   |   |   |
| Beh       | ENS_BEH_THREE_STATUS | Behaviour  |   |   |
| Health    | ENS_HEALTH           | Health   |   |   |
| Mod       | ENC_MOD_THREE_STATUS | Mode   |   |   |
| Op        | ACT_NO_SEG           | Operate (combination of subscribed Op from protection functions) |   |   |
| Str       | ACD_NO_SEG           | Sum of all starts of all connected Logical Nodes                 |   |   |

**1.4.39 LOGICAL NODE: PTTR\_NO\_SEG**

Description: Thermal overload (w.r.t No Phase Segregation)

LN Class: PTTR

| Attribute | Attr. Type           | Explanation                    | T | X |
|-----------|----------------------|--------------------------------|---|---|
| NamPlt    | LPL_LN               | Name Plate                     |   |   |
| Beh       | ENS_BEH_THREE_STATUS | Behaviour                      |   |   |
| Health    | ENS_HEALTH           | Health                         |   |   |
| Mod       | ENC_MOD_THREE_STATUS | Mode                           |   |   |
| Amp       | MV_FLOAT             | Current for thermal load model |   |   |

| Attribute | Attr. Type      | Explanation  | T | X |
|-----------|-----------------|--|---|---|
| TmpRI     | MV_FLOAT        | Relation between temperature and maximum temperature |   |   |
| Op        | ACT_NO_SEG      | Operate  | T |   |
| MTRRs     | SPC_CTRL_PRV_NS | Reset Thermal State                                  |   | X |
| AlmThm    | SPS_WD          | Thermal alarm  |   |   |

#### 1.4.40 LOGICAL NODE: PTUF\_NO\_SEG

Description: Underfrequency (w.r.t No Phase Segregation)

LN Class: PTUF

| Attribute | Attr. Type           | Explanation | T | X |
|-----------|----------------------|-------------|---|---|
| NamPlt    | LPL_LN               | Name Plate  |   |   |
| Beh       | ENS_BEH_THREE_STATUS | Behaviour   |   |   |
| Health    | ENS_HEALTH           | Health      |   |   |
| Mod       | ENC_MOD_THREE_STATUS | Mode        |   |   |
| Str       | ACD_NO_SEG           | Start       |   |   |
| Op        | ACT_NO_SEG           | Operate     | T |   |

#### 1.4.41 LOGICAL NODE: PTUV\_SEG

Description: Undervoltage (w.r.t Phase Segregation)

LN Class: PTUV

| Attribute | Attr. Type           | Explanation | T | X |
|-----------|----------------------|-------------|---|---|
| NamPlt    | LPL_LN               | Name Plate  |   |   |
| Beh       | ENS_BEH_THREE_STATUS | Behaviour   |   |   |
| Health    | ENS_HEALTH           | Health      |   |   |
| Mod       | ENC_MOD_THREE_STATUS | Mode        |   |   |
| Str       | ACD_SEG              | Start       |   |   |
| Op        | ACT_SEG              | Operate     | T |   |

#### 1.4.42 LOGICAL NODE: RBRF\_EXTTRIP

Description: Breaker Failure (w.r.t External Tripping)

LN Class: RBRF

| Attribute | Attr. Type           | Explanation                            | T | X |
|-----------|----------------------|--|---|---|
| NamPlt    | LPL_LN               | Name Plate                             |   |   |
| Beh       | ENS_BEH_THREE_STATUS | Behaviour                              |   |   |
| Health    | ENS_HEALTH           | Health                                 |   |   |
| Mod       | ENC_MOD_THREE_STATUS | Mode                                   |   |   |
| OpEx      | ACT_NO_SEG           | Breaker failure trip ("External trip") | T |   |

#### 1.4.43 LOGICAL NODE: RDRE\_BASIC

Description: Disturbance Recorder function (w.r.t Mandatory Attributes only)

LN Class: RDRE

| Attribute | Attr. Type           | Explanation | T | X |
|-----------|----------------------|-------------|---|---|
| NamPlt    | LPL_LN               | Name Plate  |   |   |
| Beh       | ENS_BEH_THREE_STATUS | Behaviour   |   |   |
| Health    | ENS_HEALTH           | Health      |   |   |
| Mod       | ENC_MOD_THREE_STATUS | Mode        |   |   |

| Attribute | Attr. Type | Explanation    | T | X |
|-----------|------------|----------------|---|---|
| RcdMade   | SPS_WD     | Recording made |   |   |
| FitNum    | INS_BASIC  | Fault number   |   |   |

#### 1.4.44 LOGICAL NODE: RFLO\_BASIC

Description: Fault Locator (w.r.t Mandatory Attributes only)

LN Class: RFLO

| Attribute | Attr. Type           | Explanation          | T | X |
|-----------|----------------------|----------------------|---|---|
| NamPit    | LPL_LN               | Name Plate           |   |   |
| Beh       | ENS_BEH_THREE_STATUS | Behaviour            |   |   |
| Health    | ENS_HEALTH           | Health               |   |   |
| Mod       | ENC_MOD_THREE_STATUS | Mode                 |   |   |
| FitZ      | CMV_MAG_FLOAT        | Fault impedance      |   |   |
| FitDiskm  | MV_FLOAT             | Fault distance in km |   |   |

#### 1.4.45 LOGICAL NODE: TVTR\_SYSTEM

Description: Voltage transformer

LN Class: TVTR

| Attribute | Attr. Type           | Explanation                   | T | X |
|-----------|----------------------|-------------------------------|---|---|
| NamPit    | LPL_LN               | Name Plate                    |   |   |
| Beh       | ENS_BEH_THREE_STATUS | Behaviour                     |   |   |
| Health    | ENS_HEALTH           | Health                        |   |   |
| Mod       | ENC_MOD_THREE_STATUS | Mode                          |   |   |
| EEHealth  | ENS_HEALTH           | External equipment health     |   |   |
| EEName    | DPL_PRIV             | External equipment name plate |   |   |
| FuFail    | SPS_WD               | TVTR fuse failure             |   |   |

#### 1.4.46 LOGICAL NODE: XCBR\_BASIC

Description: Circuit Breaker (w.r.t Mandatory Attributes Only)

LN Class: XCBR

| Attribute | Attr. Type           | Explanation                         | T | X |
|-----------|----------------------|-------------------------------------|---|---|
| NamPit    | LPL_LN               | Name Plate                          |   |   |
| Beh       | ENS_BEH_THREE_STATUS | Behaviour                           |   |   |
| Health    | ENS_HEALTH           | Health                              |   |   |
| EEHealth  | ENS_HEALTH           | External equipment health           |   |   |
| Mod       | ENC_MOD_THREE_STATUS | Mode                                |   |   |
| Loc       | SPS_WD               | Local operation                     |   |   |
| OpCnt     | INS_BASIC            | Operation counter                   |   |   |
| CBOpCap   | ENS_CBCAP            | Circuit Breaker operating capacity  |   |   |
| SumSwARs  | BCR_PRIV             | Sum of switched amperes, resettable |   |   |
| Pos       | DPC_STATUS           | Switch position                     |   |   |
| BlkOpn    | SPC_STATUS           | Block opening                       |   |   |
| BlkCls    | SPC_STATUS           | Block closing                       |   |   |

#### 1.4.47 LOGICAL NODE: XSWI\_BASIC

Description: Circuit Switch (w.r.t Switch Status and Control)

LN Class: XSWI

| Attribute | Attr. Type           | Explanation                 | T | X |
|-----------|----------------------|-----------------------------|---|---|
| NamPlt    | LPL_LN               | Name Plate                  |   |   |
| Beh       | ENS_BEH_THREE_STATUS | Behaviour                   |   |   |
| Health    | ENS_HEALTH           | Health                      |   |   |
| Mod       | ENC_MOD_THREE_STATUS | Mode                        |   |   |
| Loc       | SPS_WD               | Local operation             |   |   |
| EEHealth  | ENS_HEALTH           | External equipment health   |   |   |
| OpCnt     | INS_BASIC            | Operation counter           |   |   |
| Pos       | DPC_STATUS           | Switch position             |   |   |
| BlkOpn    | SPC_STATUS           | Block opening               |   |   |
| BlkCls    | SPC_STATUS           | Block closing               |   |   |
| SwTyp     | ENS_SWI_TYPE         | Switch type                 |   |   |
| SwOpCap   | ENS_CBCAP            | Switch operating capability |   |   |

### 1.5 COMMON DATA CLASS DEFINITIONS

The definition tables for each of the Common Data Classes used in the Logical Node definitions are presented in the following sub-sections.

From an application point-of-view the data attributes of a Common Data Class are classified according to their specific use. The characterization of data attributes, and the services that they support/provide, will be through the use of 'Functional Constraints'. The Functional Constraints are specified by the table below:

| FC Name | Semantic                          | Source Definition |
|---------|-----------------------------------|-------------------|
| BL      | Blocking                          | IEC61850-7-2-2010 |
| BR      | Buffered reports                  | IEC61850-7-2      |
| CF      | Configuration                     | IEC61850-7-2      |
| CO      | Control                           | IEC61850-7-2      |
| DC      | Description                       | IEC61850-7-2      |
| EX      | Extended Definition               | IEC61850-7-2      |
| GO      | GOOSE Control                     | IEC61850-7-2      |
| GS      | GSSE Control (UCA2 GOOSE)         | IEC61850-7-2      |
| LG      | Logging                           | IEC61850-7-2      |
| MS      | Multicast sampled value control   | IEC61850-7-2      |
| MX      | Measurands (Analogue values)      | IEC61850-7-2      |
| OR      | Operate received                  | IEC61850-7-2-2010 |
| RP      | Unbuffered reports                | IEC61850-7-2      |
| SE      | Setting Group Editable            | IEC61850-7-2      |
| SG      | Setting Group                     | IEC61850-7-2      |
| SP      | Set Point                         | IEC61850-7-2      |
| SR      | Service response                  | IEC61850-7-2-2010 |
| ST      | Status Information                | IEC61850-7-2      |
| SV      | Substitution Values               | IEC61850-7-2      |
| US      | Unicast sampled value control     | IEC61850-7-2      |
| XX      | Data attribute service parameters | IEC61850-7-2      |

### 1.5.1 COMMON DATA CLASS: ACD\_NEU

Description: Directional Protection Activation Information (w.r.t Neutral)

CDC Class: ACD

| Attribute  | Type                            | FC | Enumeration             | Comment  | X |
|------------|---------------------------------|----|-------------------------|--|---|
| general    | BOOLEAN                         | ST |                         | Trip or start has happened   |   |
| dirGeneral | ENUMERATED8<br>(MMS Type: INT8) | ST | dir                     | General direction (unknown, forward, backward or both)                     |   |
| neut       | BOOLEAN                         | ST |                         | Trip or start event with earth current has happened                        |   |
| dirNeut    | ENUMERATED8<br>(MMS Type: INT8) | ST | PhaseFaultDirectionKind | Earth current direction (unknown, forward or backward)                     |   |
| q          | Quality                         | ST |                         | Quality of the protection activation information                           |   |
| t          | TimeStamp                       | ST |                         | Timestamp of the last change in state of protection activation information |   |

### 1.5.2 COMMON DATA CLASS: ACD\_NO\_SEG

Description: Directional Protection Activation Information (w.r.t No Phase Segregation)

CDC Class: ACD

| Attribute  | Type                            | FC | Enumeration | Comment  | X |
|------------|---------------------------------|----|-------------|--|---|
| general    | BOOLEAN                         | ST |             | Trip or start has happened   |   |
| dirGeneral | ENUMERATED8<br>(MMS Type: INT8) | ST | dir         | General direction (unknown, forward, backward or both)                     |   |
| q          | Quality                         | ST |             | Quality of the protection activation information                           |   |
| t          | TimeStamp                       | ST |             | Timestamp of the last change in state of protection activation information |   |

### 1.5.3 COMMON DATA CLASS: ACD\_SEG

Description: Directional Protection Activation Information (w.r.t Phase Segregation)

CDC Class: ACD

| Attribute  | Type                            | FC | Enumeration             | Comment  | X |
|------------|---------------------------------|----|-------------------------|--|---|
| general    | BOOLEAN                         | ST |                         | Trip or start has happened   |   |
| dirGeneral | ENUMERATED8<br>(MMS Type: INT8) | ST | dir                     | General direction (unknown, forward, backward or both)                     |   |
| phsA       | BOOLEAN                         | ST |                         | Trip or start event of Phase A has happened                                |   |
| dirPhsA    | ENUMERATED8<br>(MMS Type: INT8) | ST | PhaseFaultDirectionKind | Phase A direction (unknown, forward or backward)                           |   |
| phsB       | BOOLEAN                         | ST |                         | Trip or start event of Phase B has happened                                |   |
| dirPhsB    | ENUMERATED8<br>(MMS Type: INT8) | ST | PhaseFaultDirectionKind | Phase B direction (unknown, forward or backward)                           |   |
| phsC       | BOOLEAN                         | ST |                         | Trip or start event of Phase C has happened                                |   |
| dirPhsC    | ENUMERATED8<br>(MMS Type: INT8) | ST | PhaseFaultDirectionKind | Phase C direction (unknown, forward or backward)                           |   |
| q          | Quality                         | ST |                         | Quality of the protection activation information                           |   |
| t          | TimeStamp                       | ST |                         | Timestamp of the last change in state of protection activation information |   |

#### 1.5.4 COMMON DATA CLASS: ACT\_NEU

Description: Protection Activation Information (w.r.t Neutral)

CDC Class: ACT

| Attribute | Type      | FC | Enumeration | Comment  | X |
|-----------|-----------|----|-------------|--|---|
| general   | BOOLEAN   | ST |             | Trip or start has happened   |   |
| neut      | BOOLEAN   | ST |             | Trip or start event with earth current has happened                        |   |
| q         | Quality   | ST |             | Quality of the protection activation information                           |   |
| t         | TimeStamp | ST |             | Timestamp of the last change in state of protection activation information |   |

#### 1.5.5 COMMON DATA CLASS: ACT\_NO\_SEG

Description: Protection Activation Information (w.r.t No Phase Segregation)

CDC Class: ACT

| Attribute | Type      | FC | Enumeration | Comment  | X |
|-----------|-----------|----|-------------|--|---|
| general   | BOOLEAN   | ST |             | Trip or start has happened   |   |
| q         | Quality   | ST |             | Quality of the protection activation information                           |   |
| t         | TimeStamp | ST |             | Timestamp of the last change in state of protection activation information |   |

#### 1.5.6 COMMON DATA CLASS: ACT\_SEG

Description: Protection Activation Information (w.r.t Phase Segregation)

CDC Class: ACT

| Attribute | Type      | FC | Enumeration | Comment  | X |
|-----------|-----------|----|-------------|--|---|
| general   | BOOLEAN   | ST |             | Trip or start has happened   |   |
| phsA      | BOOLEAN   | ST |             | Trip or start event of Phase A has happened                                |   |
| phsB      | BOOLEAN   | ST |             | Trip or start event of Phase B has happened                                |   |
| phsC      | BOOLEAN   | ST |             | Trip or start event of Phase C has happened                                |   |
| q         | Quality   | ST |             | Quality of the protection activation information                           |   |
| t         | TimeStamp | ST |             | Timestamp of the last change in state of protection activation information |   |

#### 1.5.7 COMMON DATA CLASS: BCR\_PRIV

Description: Binary Counter Reading

CDC Class: BCR

| Attribute | Type      | FC | Enumeration | Comment   | X |
|-----------|-----------|----|-------------|---|---|
| actVal    | INT64     | ST |             | Binary counter status represented as an integer                       |   |
| q         | Quality   | ST |             | Quality of counter value  |   |
| t         | TimeStamp | ST |             | Time of last counter change   |   |
| pulsQty   | FLOAT32   | CF |             | Magnitude of the counted value 'per count' (value = actVal x pulsQty) |   |

### 1.5.8 COMMON DATA CLASS: CMV\_MAG\_ANG\_FLOAT

Description: Complex Measured value (w.r.t Floating Point Magnitude and Angle)

CDC Class: CMV

| Attribute | Type                        | FC | Enumeration | Comment  | X |
|-----------|-----------------------------|----|-------------|--|---|
| cVal      | Vector_MagnitudeAngle_Float | MX |             | Deadbanded complex measured vector. Updated to the current value of instCVal when the value has changed according to the configuration parameter db. |   |
| q         | Quality                     | MX |             | Quality of the measurement value   |   |
| t         | TimeStamp                   | MX |             | Time deadbanded magnitude last exceeded its db configuration parameter   |   |
| units     | Unit_Multiplier             | CF |             | Unit of the attribute representing the data  |   |
| db        | INT32U                      | CF |             | Measurement deadband   |   |
| rangeC    | RangeConfig_Deadband        | CF |             | Measurement range configuration attributes   |   |

### 1.5.9 COMMON DATA CLASS: CMV\_MAG\_FLOAT

Description: Complex Measured value (w.r.t Floating Point Magnitude)

CDC Class: CMV

| Attribute | Type                   | FC | Enumeration | Comment  | X |
|-----------|------------------------|----|-------------|--|---|
| cVal      | Vector_Magnitude_Float | MX |             | Deadbanded complex measured vector. Updated to the current value of instCVal when the value has changed according to the configuration parameter db. |   |
| q         | Quality                | MX |             | Quality of the measurement value   |   |
| t         | TimeStamp              | MX |             | Time deadbanded magnitude last exceeded its db configuration parameter   |   |
| units     | Unit_Multiplier        | CF |             | Unit of the attribute representing the data  |   |
| db        | INT32U                 | CF |             | Measurement deadband   |   |
| rangeC    | RangeConfig_Deadband   | CF |             | Measurement range configuration attributes   |   |

### 1.5.10 COMMON DATA CLASS: DEL\_SEG\_ANG

Description: Phase to phase measurements for a 3-Phase system (w.r.t Phase Segregation + Angle)

CDC Class: DEL

| Attribute | Type              | FC | Enumeration | Comment                                   | X |
|-----------|-------------------|----|-------------|---|---|
| phsAB     | CMV_MAG_ANG_FLOAT | -- |             | Measurement values for Phase A to Phase B |   |
| phsBC     | CMV_MAG_ANG_FLOAT | -- |             | Measurement values for Phase B to Phase C |   |
| phsCA     | CMV_MAG_ANG_FLOAT | -- |             | Measurement values for Phase C to Phase A |   |

### 1.5.11 COMMON DATA CLASS: DPC\_CTRL

Description: Controllable Double Point (for CSWI.pos)

CDC Class: DPC

| Attribute | Type                             | FC | Enumeration | Comment   | X |
|-----------|----------------------------------|----|-------------|---|---|
| ctlVal    | BOOLEAN                          | CO |             | Control value (Off - FALSE, On - TRUE)                              |   |
| origin    | Originator                       | ST |             | Originator of the last change of the controllable data              |   |
| stVal     | CODED_ENUM<br>(MMS Type: _BSTR2) | ST | Dbpos       | Status value of the data (Intermediate state, Off, On or Bad-state) |   |
| q         | Quality                          | ST |             | Quality of the status value   |   |
| t         | TimeStamp                        | ST |             | Timestamp of the last change in state of status value               |   |
| ctlModel  | ENUMERATED8<br>(MMS Type: INT8)  | CF | ctlModel    | Control model (Corresponding to the behaviour of the data)          |   |

| Attribute  | Type   | FC | Enumeration | Comment  | X |
|------------|--------|----|-------------|--|---|
| sboTimeout | INT32U | CF |             | Select Before Operate timeout period (in milliseconds) |   |

### 1.5.12 COMMON DATA CLASS: DPC\_STATUS

Description: Controllable Double Point (w.r.t Status Only)

CDC Class: DPC

| Attribute | Type                             | FC | Enumeration | Comment   | X |
|-----------|----------------------------------|----|-------------|---|---|
| stVal     | CODED_ENUM<br>(MMS Type: _BSTR2) | ST | Dbpos       | Status value of the data (Intermediate state, Off, On or Bad-state) |   |
| q         | Quality                          | ST |             | Quality of the status value   |   |
| t         | TimeStamp                        | ST |             | Timestamp of the last change in state of status value               |   |
| ctlModel  | ENUMERATED8<br>(MMS Type: INT8)  | CF | ctlModel    | Control model (Corresponding to the behaviour of the data)          |   |

### 1.5.13 COMMON DATA CLASS: DPL\_PRIV

Description: Device name plate

CDC Class: DPL

| Attribute | Type              | FC | Enumeration | Comment            | X |
|-----------|-------------------|----|-------------|--------------------|---|
| vendor    | VISIBLE_STRING255 | DC |             | Name of the vendor |   |

### 1.5.14 COMMON DATA CLASS: DPL\_STANDARD

Description: Standard Device Name Plate

CDC Class: DPL

| Attribute | Type              | FC | Enumeration | Comment                     | X |
|-----------|-------------------|----|-------------|-----------------------------|---|
| vendor    | VISIBLE_STRING255 | DC |             | Name of the vendor          |   |
| hwRev     | VISIBLE_STRING255 | DC |             | Hardware revision           |   |
| swRev     | VISIBLE_STRING255 | DC |             | Software revision           |   |
| serNum    | VISIBLE_STRING255 | DC |             | Serial Number               |   |
| model     | VISIBLE_STRING255 | DC |             | Model Number                |   |
| location  | VISIBLE_STRING255 | DC |             | Physical location of device |   |

### 1.5.15 COMMON DATA CLASS: ENC\_CTRL\_LD\_MOD

Description: Controllable enumerated status

CDC Class: ENC

| Attribute  | Type                             | FC | Enumeration | Comment  | X |
|------------|----------------------------------|----|-------------|--|---|
| ctlVal     | ENUMERATED32<br>(MMS Type: INT8) | CO | Mod_3       | Control value  |   |
| origin     | Originator                       | ST |             | Originator of the last change of the controllable data     |   |
| stVal      | ENUMERATED32<br>(MMS Type: INT8) | ST | Mod_3       | Status value of the data                                   |   |
| q          | Quality                          | ST |             | Quality of the status value                                |   |
| t          | TimeStamp                        | ST |             | Timestamp of the last change in state of status value      |   |
| ctlModel   | ENUMERATED8<br>(MMS Type: INT8)  | CF | ctlModel    | Control model (Corresponding to the behaviour of the data) |   |
| sboTimeout | INT32U                           | CF |             | Select Before Operate timeout period (in milliseconds)     |   |
| d          | VISIBLE_STRING255                | DC |             | Description of the status element                          |   |

### 1.5.16 COMMON DATA CLASS: ENC\_CTRL\_LD\_MOD\_2

Description: Controllable enumerated status (includes three status, used for child LD.LLN0)

CDC Class: ENC

| Attribute  | Type                             | FC | Enumeration | Comment  | X |
|------------|----------------------------------|----|-------------|--|---|
| ctlVal     | ENUMERATED32<br>(MMS Type: INT8) | CO | Mod_2       | Control value  |   |
| origin     | Originator                       | ST |             | Originator of the last change of the controllable data     |   |
| stVal      | ENUMERATED32<br>(MMS Type: INT8) | ST | Mod_2       | Status value of the data                                   |   |
| q          | Quality                          | ST |             | Quality of the status value                                |   |
| t          | TimeStamp                        | ST |             | Timestamp of the last change in state of status value      |   |
| ctlModel   | ENUMERATED8<br>(MMS Type: INT8)  | CF | ctlModel    | Control model (Corresponding to the behaviour of the data) |   |
| sboTimeout | INT32U                           | CF |             | Select Before Operate timeout period (in milliseconds)     |   |
| d          | VISIBLE_STRING255                | DC |             | Description of the status element                          |   |

### 1.5.17 COMMON DATA CLASS: ENC\_MOD\_THREE\_STATUS

Description: Controllable enumerated mode status (with 3 status)

CDC Class: ENC

| Attribute | Type                             | FC | Enumeration | Comment  | X |
|-----------|----------------------------------|----|-------------|--|---|
| stVal     | ENUMERATED32<br>(MMS Type: INT8) | ST | Mod_3       | Status value of the data                                   |   |
| q         | Quality                          | ST |             | Quality of the status value                                |   |
| t         | TimeStamp                        | ST |             | Timestamp of the last change in state of status value      |   |
| ctlModel  | ENUMERATED8<br>(MMS Type: INT8)  | CF | ctlModel    | Control model (Corresponding to the behaviour of the data) |   |

### 1.5.18 COMMON DATA CLASS: ENC\_MOD\_THREE\_STATUS\_DN

Description: Controllable enumerated status (with 3 status and dataNs used for the Mod in the extended LN)

CDC Class: ENC

| Attribute | Type                             | FC | Enumeration | Comment  | X |
|-----------|----------------------------------|----|-------------|--|---|
| stVal     | ENUMERATED32<br>(MMS Type: INT8) | ST | Mod_3       | Status value of the data                                   |   |
| q         | Quality                          | ST |             | Quality of the status value                                |   |
| t         | TimeStamp                        | ST |             | Timestamp of the last change in state of status value      |   |
| ctlModel  | ENUMERATED8<br>(MMS Type: INT8)  | CF | ctlModel    | Control model (Corresponding to the behaviour of the data) |   |
| dataNs    | VISIBLE_STRING255                | EX |             | Data name space  |   |

### 1.5.19 COMMON DATA CLASS: ENC\_MOD\_TWO\_STATUS

Description: Controllable enumerated status

CDC Class: ENC

| Attribute | Type                             | FC | Enumeration | Comment  | X |
|-----------|----------------------------------|----|-------------|--|---|
| stVal     | ENUMERATED32<br>(MMS Type: INT8) | ST | Mod_2       | Status value of the mode used for LN which have two status |   |
| q         | Quality                          | ST |             | Quality of the status value                                |   |
| t         | TimeStamp                        | ST |             | Timestamp of the last change in state of status value      |   |
| stVal     | ENUMERATED32<br>(MMS Type: INT8) | ST | Mod_2       | Status value of the mode used for LN which have two status |   |
| q         | Quality                          | ST |             | Quality of the status value                                |   |

| Attribute | Type                            | FC | Enumeration | Comment  | X |
|-----------|---------------------------------|----|-------------|--|---|
| t         | TimeStamp                       | ST |             | Timestamp of the last change in state of status value      |   |
| ctlModel  | ENUMERATED8<br>(MMS Type: INT8) | CF | ctlModel    | Control model (Corresponding to the behaviour of the data) |   |

### 1.5.20 COMMON DATA CLASS: ENG\_SET\_WD\_CLCINTVTYP

Description: Enumerated status setting (for ClcIntvTyp)

CDC Class: ENG

| Attribute | Type                            | FC | Enumeration | Comment       | X |
|-----------|---------------------------------|----|-------------|---------------|---|
| setVal    | ENUMERATED8<br>(MMS Type: INT8) | SP | ClcIntvTyp  | Setting value |   |

### 1.5.21 COMMON DATA CLASS: ENG\_SET\_WD\_CLCMOD

Description: Enumerated status setting (for ClcMod)

CDC Class: ENG

| Attribute | Type                            | FC | Enumeration | Comment       | X |
|-----------|---------------------------------|----|-------------|---------------|---|
| setVal    | ENUMERATED8<br>(MMS Type: INT8) | SP | ClcMod      | Setting value |   |

### 1.5.22 COMMON DATA CLASS: ENG\_SET\_WD\_CLCMTH

Description: Enumerated status setting (for ClcMth)

CDC Class: ENG

| Attribute | Type                            | FC | Enumeration | Comment       | X |
|-----------|---------------------------------|----|-------------|---------------|---|
| setVal    | ENUMERATED8<br>(MMS Type: INT8) | SP | ClcMth      | Setting value |   |

### 1.5.23 COMMON DATA CLASS: ENS\_BEH\_FOUR\_STATUS

Description: Enumerated behaviour status (with 4 status)

CDC Class: ENS

| Attribute | Type                            | FC | Enumeration | Comment                               | X |
|-----------|---------------------------------|----|-------------|---------------------------------------|---|
| stVal     | ENUMERATED8<br>(MMS Type: INT8) | ST | Beh_4       | The element status                    |   |
| q         | Quality                         | ST |             | The quality of the status value       |   |
| t         | TimeStamp                       | ST |             | Timestamp of the last change in state |   |

### 1.5.24 COMMON DATA CLASS: ENS\_BEH\_THREE\_STATUS

Description: Enumerated behaviour status (with 3 status)

CDC Class: ENS

| Attribute | Type                            | FC | Enumeration | Comment                               | X |
|-----------|---------------------------------|----|-------------|---------------------------------------|---|
| stVal     | ENUMERATED8<br>(MMS Type: INT8) | ST | Beh_3       | The element status                    |   |
| q         | Quality                         | ST |             | The quality of the status value       |   |
| t         | TimeStamp                       | ST |             | Timestamp of the last change in state |   |

**1.5.25 COMMON DATA CLASS: ENS\_BEH\_THREE\_STATUS\_DN**

Description: Enumerated status (with 3 status and dataNs)

CDC Class: ENS

| Attribute | Type                            | FC | Enumeration | Comment                               | X |
|-----------|---------------------------------|----|-------------|---------------------------------------|---|
| stVal     | ENUMERATED8<br>(MMS Type: INT8) | ST | Beh_3       | The element status                    |   |
| q         | Quality                         | ST |             | The quality of the status value       |   |
| t         | TimeStamp                       | ST |             | Timestamp of the last change in state |   |
| dataNs    | VISIBLE_STRING255               | EX |             | Data name space                       |   |

**1.5.26 COMMON DATA CLASS: ENS\_CBCAP**

Description: Enumerated status (w.r.t CB operating capability)

CDC Class: ENS

| Attribute | Type                            | FC | Enumeration | Comment                               | X |
|-----------|---------------------------------|----|-------------|---------------------------------------|---|
| stVal     | ENUMERATED8<br>(MMS Type: INT8) | ST | CBOpCap     | The element status                    |   |
| q         | Quality                         | ST |             | The quality of the status value       |   |
| t         | TimeStamp                       | ST |             | Timestamp of the last change in state |   |

**1.5.27 COMMON DATA CLASS: ENS\_HEALTH**

Description: Enumerated status

CDC Class: ENS

| Attribute | Type                            | FC | Enumeration | Comment                               | X |
|-----------|---------------------------------|----|-------------|---------------------------------------|---|
| stVal     | ENUMERATED8<br>(MMS Type: INT8) | ST | Health      | The element status                    |   |
| q         | Quality                         | ST |             | The quality of the status value       |   |
| t         | TimeStamp                       | ST |             | Timestamp of the last change in state |   |

**1.5.28 COMMON DATA CLASS: ENS\_HEALTH\_DN**

Description: Enumerated status (with dataNs)

CDC Class: ENS

| Attribute | Type                            | FC | Enumeration | Comment                               | X |
|-----------|---------------------------------|----|-------------|---------------------------------------|---|
| stVal     | ENUMERATED8<br>(MMS Type: INT8) | ST | Health      | The element status                    |   |
| q         | Quality                         | ST |             | The quality of the status value       |   |
| t         | TimeStamp                       | ST |             | Timestamp of the last change in state |   |
| dataNs    | VISIBLE_STRING255               | EX |             | Data name space                       |   |

**1.5.29 COMMON DATA CLASS: ENS\_SWI\_TYPE**

Description: Enumerated status

CDC Class: ENS

| Attribute | Type                            | FC | Enumeration | Comment                               | X |
|-----------|---------------------------------|----|-------------|---------------------------------------|---|
| stVal     | ENUMERATED8<br>(MMS Type: INT8) | ST | SwType      | The element status                    |   |
| q         | Quality                         | ST |             | The quality of the status value       |   |
| t         | TimeStamp                       | ST |             | Timestamp of the last change in state |   |

**1.5.30 COMMON DATA CLASS: INC\_MOD**

Description: Controllable Integer Status (w.r.t Mode)

CDC Class: INC

| Attribute | Type                            | FC | Enumeration | Comment  | X |
|-----------|---------------------------------|----|-------------|--|---|
| stVal     | INT32<br>(MMS Type: INT8)       | ST | Mod         | Status value of the data                                   |   |
| q         | Quality                         | ST |             | Quality of the status value                                |   |
| t         | TimeStamp                       | ST |             | Timestamp of the last change in state of status value      |   |
| ctlModel  | ENUMERATED8<br>(MMS Type: INT8) | CF | ctlModel    | Control model (Corresponding to the behaviour of the data) |   |

**1.5.31 COMMON DATA CLASS: INC\_MOD\_STD**

Description: Controllable Integer Status

CDC Class: INC

| Attribute | Type                            | FC | Enumeration | Comment  | X |
|-----------|---------------------------------|----|-------------|--|---|
| stVal     | INT32                           | ST |             | Status value of the data                                   |   |
| q         | Quality                         | ST |             | Quality of the status value                                |   |
| t         | TimeStamp                       | ST |             | Timestamp of the last change in state of status value      |   |
| ctlModel  | ENUMERATED8<br>(MMS Type: INT8) | CF | ctlModel    | Control model (Corresponding to the behaviour of the data) |   |

**1.5.32 COMMON DATA CLASS: ING\_SET\_WD**

Description: Integer Status Setting

CDC Class: ING

| Attribute | Type  | FC | Enumeration | Comment       | X |
|-----------|-------|----|-------------|---------------|---|
| setVal    | INT32 | SP |             | Setting value |   |

**1.5.33 COMMON DATA CLASS: INS\_BASIC**

Description: Integer Status (w.r.t Mandatory Options Only)

CDC Class: INS

| Attribute | Type      | FC | Enumeration | Comment                               | X |
|-----------|-----------|----|-------------|---------------------------------------|---|
| stVal     | INT32     | ST |             | The element status                    |   |
| q         | Quality   | ST |             | The quality of the status value       |   |
| t         | TimeStamp | ST |             | Timestamp of the last change in state |   |

**1.5.34 COMMON DATA CLASS: INS\_BEH**

Description: Integer Status (w.r.t Behaviour)

CDC Class: INS

| Attribute | Type                      | FC | Enumeration | Comment                               | X |
|-----------|---------------------------|----|-------------|---------------------------------------|---|
| stVal     | INT32<br>(MMS Type: INT8) | ST | Beh         | The element status                    |   |
| q         | Quality                   | ST |             | The quality of the status value       |   |
| t         | TimeStamp                 | ST |             | Timestamp of the last change in state |   |

**1.5.35 COMMON DATA CLASS: INS\_CBCAP**

Description: Integer Status (w.r.t Circuit Breaker Operating)

CDC Class: INS

| Attribute | Type                      | FC | Enumeration | Comment                               | X |
|-----------|---------------------------|----|-------------|---------------------------------------|---|
| stVal     | INT32<br>(MMS Type: INT8) | ST | CBOpCap     | The element status                    |   |
| q         | Quality                   | ST |             | The quality of the status value       |   |
| t         | TimeStamp                 | ST |             | Timestamp of the last change in state |   |

**1.5.36 COMMON DATA CLASS: LPL\_LLNO**

Description: Logical Node 0 Name Plate

CDC Class: LPL

| Attribute | Type              | FC | Enumeration | Comment  | X |
|-----------|-------------------|----|-------------|--|---|
| vendor    | VISIBLE_STRING255 | DC |             | Name of the vendor   |   |
| swRev     | VISIBLE_STRING255 | DC |             | Software revision  |   |
| d         | VISIBLE_STRING255 | DC |             | Description  |   |
| configRev | VISIBLE_STRING255 | DC |             | Uniquely identifies the configuration of a local device instance |   |
| IdNs      | VISIBLE_STRING255 | EX |             | Logical Device name space  |   |

**1.5.37 COMMON DATA CLASS: LPL\_LLNO\_MEA**

Description: Measurements Logical Node 0 name plate

CDC Class: LPL

| Attribute | Type              | FC | Enumeration | Comment  | X |
|-----------|-------------------|----|-------------|--|---|
| vendor    | VISIBLE_STRING255 | DC |             | Name of the vendor   |   |
| swRev     | VISIBLE_STRING255 | DC |             | Software revision  |   |
| configRev | VISIBLE_STRING255 | DC |             | Uniquely identifies the configuration of a local device instance |   |
| IdNs      | VISIBLE_STRING255 | EX |             | Logical Device name space  |   |

**1.5.38 COMMON DATA CLASS: LPL\_LN**

Description: Standard Logical Node Name Plate

CDC Class: LPL

| Attribute | Type              | FC | Enumeration | Comment            | X |
|-----------|-------------------|----|-------------|--------------------|---|
| vendor    | VISIBLE_STRING255 | DC |             | Name of the vendor |   |
| swRev     | VISIBLE_STRING255 | DC |             | Software revision  |   |
| d         | VISIBLE_STRING255 | DC |             | Description        |   |

**1.5.39 COMMON DATA CLASS: LPL\_LN\_PRIV**

Description: Logical Node Name Plate

CDC Class: LPL

| Attribute | Type              | FC | Enumeration | Comment                 | X |
|-----------|-------------------|----|-------------|-------------------------|---|
| vendor    | VISIBLE_STRING255 | DC |             | Name of the vendor      |   |
| swRev     | VISIBLE_STRING255 | DC |             | Software revision       |   |
| d         | VISIBLE_STRING255 | DC |             | Description             |   |
| InNs      | VISIBLE_STRING255 | EX |             | Logical Node name space |   |

| Attribute | Type              | FC | Enumeration | Comment         | X |
|-----------|-------------------|----|-------------|-----------------|---|
| dataNs    | VISIBLE_STRING255 | EX |             | Data name space |   |

#### 1.5.40 COMMON DATA CLASS: MV\_FLOAT

Description: Measured value (w.r.t Floating Point value)

CDC Class: MV

| Attribute | Type                 | FC | Enumeration | Comment  | X |
|-----------|----------------------|----|-------------|--|---|
| mag       | AnalogueValue_Float  | MX |             | Deadbanded magnitude of the instantaneous value of a measured value or harmonic value. Updated to the current value of instMag when the value has changed according to the configuration parameter db. |   |
| q         | Quality              | MX |             | Quality of the measurement value   |   |
| t         | TimeStamp            | MX |             | Time deadbanded magnitude last exceeded its db configuration parameter   |   |
| units     | Unit_Multiplier      | CF |             | Unit of the attribute representing the data  |   |
| db        | INT32U               | CF |             | Measurement deadband   |   |
| rangeC    | RangeConfig_Deadband | CF |             | Measurement range configuration attributes   |   |

#### 1.5.41 COMMON DATA CLASS: MV\_FLOAT\_D

Description: Measured value (w.r.t Floating Point Value with Description)

CDC Class: MV

| Attribute | Type                 | FC | Enumeration | Comment  | X |
|-----------|----------------------|----|-------------|--|---|
| mag       | AnalogueValue_Float  | MX |             | Deadbanded magnitude of the instantaneous value of a measured value or harmonic value. Updated to the current value of instMag when the value has changed according to the configuration parameter db. |   |
| q         | Quality              | MX |             | Quality of the measurement value   |   |
| t         | TimeStamp            | MX |             | Time deadbanded magnitude last exceeded its db configuration parameter   |   |
| units     | Unit_Multiplier      | CF |             | Unit of the attribute representing the data  |   |
| db        | INT32U               | CF |             | Measurement deadband   |   |
| rangeC    | RangeConfig_Deadband | CF |             | Measurement range configuration attributes   |   |
| d         | VISIBLE_STRING255    | DC |             | Description of the status element  |   |

#### 1.5.42 COMMON DATA CLASS: MV\_FLOAT\_D\_PRIV

Description: Measured value

CDC Class: MV

| Attribute | Type                 | FC | Enumeration | Comment  | X |
|-----------|----------------------|----|-------------|--|---|
| mag       | AnalogueValue_Float  | MX |             | Deadbanded magnitude of the instantaneous value of a measured value or harmonic value. Updated to the current value of instMag when the value has changed according to the configuration parameter db. |   |
| q         | Quality              | MX |             | Quality of the measurement value   |   |
| t         | TimeStamp            | MX |             | Time deadbanded magnitude last exceeded its db configuration parameter   |   |
| units     | Unit                 | CF |             | Unit of the attribute representing the data  |   |
| db        | INT32U               | CF |             | Measurement deadband   |   |
| rangeC    | RangeConfig_Deadband | CF |             | Measurement range configuration attributes   |   |
| d         | VISIBLE_STRING255    | DC |             | Description of the status element  |   |
| dataNs    | VISIBLE_STRING255    | EX |             | Data name space  |   |

**1.5.43 COMMON DATA CLASS: MV\_FLOAT\_PRIV**

Description: Measured value (used for extended DO)

CDC Class: MV

| Attribute | Type                 | FC | Enumeration | Comment  | X |
|-----------|----------------------|----|-------------|--|---|
| mag       | AnalogueValue_Float  | MX |             | Deadbanded magnitude of the instantaneous value of a measured value or harmonic value. Updated to the current value of instMag when the value has changed according to the configuration parameter db. |   |
| q         | Quality              | MX |             | Quality of the measurement value   |   |
| t         | TimeStamp            | MX |             | Time deadbanded magnitude last exceeded its db configuration parameter   |   |
| units     | Unit_Multiplier      | CF |             | Unit of the attribute representing the data  |   |
| db        | INT32U               | CF |             | Measurement deadband   |   |
| rangeC    | RangeConfig_Deadband | CF |             | Measurement range configuration attributes   |   |
| dataNs    | VISIBLE_STRING255    | EX |             | Data name space  |   |

**1.5.44 COMMON DATA CLASS: ORG\_SRC\_REF**

Description: Object reference settings

CDC Class: ORG

| Attribute | Type            | FC | Enumeration | Comment                                   | X |
|-----------|-----------------|----|-------------|---|---|
| setSrcRef | ObjectReference | SP |             | The value of the object reference setting |   |

**1.5.45 COMMON DATA CLASS: SEQ\_MAG\_ANG**

Description: Sequence components of a measurement value (w.r.t Magnitudes + Angles)

CDC Class: SEQ

| Attribute | Type                            | FC | Enumeration | Comment  | X |
|-----------|---------------------------------|----|-------------|--|---|
| c1        | CMV_MAG_ANG_FLOAT               | -- |             | Sequence component 1 (For semantic meaning see seqT)               |   |
| c2        | CMV_MAG_ANG_FLOAT               | -- |             | Sequence component 2 (For semantic meaning see seqT)               |   |
| c3        | CMV_MAG_ANG_FLOAT               | -- |             | Sequence component 3 (For semantic meaning see seqT)               |   |
| seqT      | ENUMERATED8<br>(MMS Type: INT8) | MX | seqT        | Sequence quantity measurement type (Pos-Neg-Zero or Dir-Quad-Zero) |   |

**1.5.46 COMMON DATA CLASS: SPC\_CONTROL**

Description: Controllable Single Point

CDC Class: SPC

| Attribute  | Type                            | FC | Enumeration | Comment  | X |
|------------|---------------------------------|----|-------------|--|---|
| ctlVal     | BOOLEAN                         | CO |             | Control value (Off - FALSE, On - TRUE)                     |   |
| origin     | Originator                      | ST |             | Originator of the last change of the controllable data     |   |
| stVal      | BOOLEAN                         | ST |             | Status value of the data                                   |   |
| q          | Quality                         | ST |             | Quality of the status value                                |   |
| t          | TimeStamp                       | ST |             | Timestamp of the last change in state of status value      |   |
| ctlModel   | ENUMERATED8<br>(MMS Type: INT8) | CF | ctlModel    | Control model (Corresponding to the behaviour of the data) |   |
| sboTimeout | INT32U                          | CF |             | Select Before Operate timeout period (in milliseconds)     |   |

**1.5.47 COMMON DATA CLASS: SPC\_CTRL\_PRIV\_NS**

Description: Controllable Single Point (Name Space)

CDC Class: SPC

| Attribute  | Type                            | FC | Enumeration | Comment  | X |
|------------|---------------------------------|----|-------------|--|---|
| ctlVal     | BOOLEAN                         | CO |             | Control value (Off - FALSE, On - TRUE)                     |   |
| origin     | Originator                      | ST |             | Originator of the last change of the controllable data     |   |
| stVal      | BOOLEAN                         | ST |             | Status value of the data                                   |   |
| q          | Quality                         | ST |             | Quality of the status value                                |   |
| t          | TimeStamp                       | ST |             | Timestamp of the last change in state of status value      |   |
| ctlModel   | ENUMERATED8<br>(MMS Type: INT8) | CF | ctlModel    | Control model (Corresponding to the behaviour of the data) |   |
| sboTimeout | INT32U                          | CF |             | Select Before Operate timeout period (in milliseconds)     |   |
| dataNs     | VISIBLE_STRING255               | EX |             | Data name space  |   |

**1.5.48 COMMON DATA CLASS: SPC\_STATUS**

Description: Controllable Single Point (w.r.t Status Only)

CDC Class: SPC

| Attribute | Type                            | FC | Enumeration | Comment  | X |
|-----------|---------------------------------|----|-------------|--|---|
| stVal     | BOOLEAN                         | ST |             | Status value of the data                                   |   |
| q         | Quality                         | ST |             | Quality of the status value                                |   |
| t         | TimeStamp                       | ST |             | Timestamp of the last change in state of status value      |   |
| ctlModel  | ENUMERATED8<br>(MMS Type: INT8) | CF | ctlModel    | Control model (Corresponding to the behaviour of the data) |   |

**1.5.49 COMMON DATA CLASS: SPS\_D**

Description: Standard Single Point Status (with Description)

CDC Class: SPS

| Attribute | Type              | FC | Enumeration | Comment                               | X |
|-----------|-------------------|----|-------------|---------------------------------------|---|
| stVal     | BOOLEAN           | ST |             | The element status (TRUE or FALSE)    |   |
| q         | Quality           | ST |             | The quality of the status value       |   |
| t         | TimeStamp         | ST |             | Timestamp of the last change in state |   |
| d         | VISIBLE_STRING255 | DC |             | Description of the status element     |   |

**1.5.50 COMMON DATA CLASS: SPS\_WD**

Description: Single Point Status (without Description)

CDC Class: SPS

| Attribute | Type      | FC | Enumeration | Comment                               | X |
|-----------|-----------|----|-------------|---------------------------------------|---|
| stVal     | BOOLEAN   | ST |             | The element status (TRUE or FALSE)    |   |
| q         | Quality   | ST |             | The quality of the status value       |   |
| t         | TimeStamp | ST |             | Timestamp of the last change in state |   |

**1.5.51 COMMON DATA CLASS: SPS\_WD\_PRIV**

Description: Single Point Status (without Description with Name Space)

CDC Class: SPS

| Attribute | Type              | FC | Enumeration | Comment                               | X |
|-----------|-------------------|----|-------------|---------------------------------------|---|
| stVal     | BOOLEAN           | ST |             | The element status (TRUE or FALSE)    |   |
| q         | Quality           | ST |             | The quality of the status value       |   |
| t         | TimeStamp         | ST |             | Timestamp of the last change in state |   |
| dataNs    | VISIBLE_STRING255 | EX |             | Data name space                       |   |

**1.5.52 COMMON DATA CLASS: WYE\_INET**

Description: Phase to ground measurements for a 3-Phase system (w.r.t Net Current)

CDC Class: WYE

| Attribute | Type          | FC | Enumeration | Comment   | X |
|-----------|---------------|----|-------------|---|---|
| net       | CMV_MAG_FLOAT | -- |             | Measurement values for the net (sum of all phases) system current |   |

**1.5.53 COMMON DATA CLASS: WYE\_RES\_ANG\_D\_PRIV**

Description: Phase to ground measurements for a 3-Phase system

CDC Class: WYE

| Attribute | Type              | FC | Enumeration | Comment  | X |
|-----------|-------------------|----|-------------|--|---|
| res       | CMV_MAG_ANG_FLOAT | -- |             | Measurement values for the residual system current |   |
| d         | VISIBLE_STRING255 | DC |             | Description of the status element                  |   |
| dataNs    | VISIBLE_STRING255 | EX |             | Data name space                                    |   |

**1.5.54 COMMON DATA CLASS: WYE\_SEG**

Description: Phase to ground measurements for a 3-Phase system (w.r.t Phase Segregation)

CDC Class: WYE

| Attribute | Type          | FC | Enumeration | Comment                        | X |
|-----------|---------------|----|-------------|--------------------------------|---|
| phsA      | CMV_MAG_FLOAT | -- |             | Measurement values for Phase A |   |
| phsB      | CMV_MAG_FLOAT | -- |             | Measurement values for Phase B |   |
| phsC      | CMV_MAG_FLOAT | -- |             | Measurement values for Phase C |   |

**1.5.55 COMMON DATA CLASS: WYE\_SEG\_D**

Description: Phase to ground measurements for a 3-Phase system (w.r.t Phase Segregation + Description)

CDC Class: WYE

| Attribute | Type              | FC | Enumeration | Comment                           | X |
|-----------|-------------------|----|-------------|-----------------------------------|---|
| phsA      | CMV_MAG_FLOAT     | -- |             | Measurement values for Phase A    |   |
| phsB      | CMV_MAG_FLOAT     | -- |             | Measurement values for Phase B    |   |
| phsC      | CMV_MAG_FLOAT     | -- |             | Measurement values for Phase C    |   |
| d         | VISIBLE_STRING255 | DC |             | Description of the status element |   |

### 1.5.56 COMMON DATA CLASS: WYE\_SEG\_PRIV

Description: Phase to ground measurements for a 3-Phase system

CDC Class: WYE

| Attribute | Type              | FC | Enumeration | Comment                        | X |
|-----------|-------------------|----|-------------|--------------------------------|---|
| phsA      | CMV_MAG_FLOAT     | -- |             | Measurement values for Phase A |   |
| phsB      | CMV_MAG_FLOAT     | -- |             | Measurement values for Phase B |   |
| phsC      | CMV_MAG_FLOAT     | -- |             | Measurement values for Phase C |   |
| dataNs    | VISIBLE_STRING255 | EX |             | Data name space                |   |

### 1.5.57 COMMON DATA CLASS: WYE\_SEG\_RES\_D

Description: Phase to ground measurements for a 3-Phase system (w.r.t Phase Segregation + Residual + Description)

CDC Class: WYE

| Attribute | Type              | FC | Enumeration | Comment                              | X |
|-----------|-------------------|----|-------------|--------------------------------------|---|
| phsA      | CMV_MAG_ANG_FLOAT | -- |             | Measurement values for Phase A       |   |
| phsB      | CMV_MAG_ANG_FLOAT | -- |             | Measurement values for Phase B       |   |
| phsC      | CMV_MAG_ANG_FLOAT | -- |             | Measurement values for Phase C       |   |
| neut      | CMV_MAG_ANG_FLOAT | -- |             | Measurement values for neutral input |   |
| d         | VISIBLE_STRING255 | DC |             | Description of the status element    |   |

## 1.6 COMMON DATA ATTRIBUTE TYPE DEFINITIONS

Common data attribute types, known herein as components, are defined for use in the Common Data Classes defined in the sections above.

### 1.6.1 COMPONENT: ANALOGUEVALUE\_FLOAT

Comment: General analogue value (w.r.t Floating Point value)

Parent Type: AnalogueValue

| Attribute | Type    | Enumeration | Comment              | X |
|-----------|---------|-------------|----------------------|---|
| f         | FLOAT32 |             | Floating point value |   |

### 1.6.2 COMPONENT: ORIGINATOR

Comment: Originator of the last change of data attribute representing the value of a controllable data object

Parent Type:

| Attribute | Type                            | Enumeration | Comment   | X |
|-----------|---------------------------------|-------------|---|---|
| orCat     | ENUMERATED8<br>(MMS Type: INT8) | orCategory  | Originator category (Not-supported, bay-control, station-control, remote-control, automatic-bay, automatic-station, automatic-remote, maintenance or process) |   |
| orIdent   | OCTET_STRING64                  |             | Originator identification (Null value indicates unknown or not reported)  |   |

### 1.6.3 COMPONENT: RANGECONFIG\_DEADBAND

Comment: Measurement range configuration

Parent Type: RangeConfig

| Attribute | Type                | Enumeration | Comment  | X |
|-----------|---------------------|-------------|--|---|
| min       | AnalogueValue_Float |             | Minimum process measurement for which values of i and f are considered within limits |   |
| hhLim     | AnalogueValue_Float |             | High High range limit  |   |
| hLim      | AnalogueValue_Float |             | High range limit   |   |
| lLim      | AnalogueValue_Float |             | Low range limit  |   |
| max       | AnalogueValue_Float |             | Maximum process measurement for which values of i and f are considered within limits |   |
| llLim     | AnalogueValue_Float |             | Low Low range limit  |   |

### 1.6.4 COMPONENT: UNIT

Comment: SI Unit definitions

Parent Type:

| Attribute  | Type                            | Enumeration | Comment   | X |
|------------|---------------------------------|-------------|---|---|
| multiplier | ENUMERATED8<br>(MMS Type: INT8) | multiplier  | Multiplier value, the default of which is 0 (i.e. multiplier = 1) |   |
| SIUnit     | ENUMERATED8<br>(MMS Type: INT8) | SIUnit      | SI Unit   |   |

### 1.6.5 COMPONENT: UNIT\_MULTIPLIER

Comment: SI Unit definitions

Parent Type: Unit

| Attribute  | Type                            | Enumeration | Comment   | X |
|------------|---------------------------------|-------------|---|---|
| multiplier | ENUMERATED8<br>(MMS Type: INT8) | multiplier  | Multiplier value, the default of which is 0 (i.e. multiplier = 1) |   |
| SIUnit     | ENUMERATED8<br>(MMS Type: INT8) | SIUnit      | SI Unit   |   |

### 1.6.6 COMPONENT: VECTOR\_MAGNITUDE\_FLOAT

Comment: Complex vector (w.r.t Floating Point Magnitude value)

Parent Type: Vector

| Attribute | Type                | Enumeration | Comment                            | X |
|-----------|---------------------|-------------|------------------------------------|---|
| mag       | AnalogueValue_Float |             | The magnitude of the complex value |   |

### 1.6.7 COMPONENT: VECTOR\_MAGNITUDEANGLE\_FLOAT

Comment: Complex vector (w.r.t Floating Point Magnitude and Angle values)

Parent Type: Vector

| Attribute | Type                | Enumeration | Comment  | X |
|-----------|---------------------|-------------|--|---|
| mag       | AnalogueValue_Float |             | The magnitude of the complex value                   |   |
| ang       | AnalogueValue_Float |             | The angle of the complex value (the unit is degrees) |   |

## 1.7 ENUMERATED TYPE DEFINITIONS

The following sub-sections specify the enumerations that are associated to some Common Data Class attributes. The definition of the enumerations are according to IEC 61850-7-3 and IEC 61850-7-4 unless otherwise stated.

### 1.7.1 ENUMERATED TYPE: ADDCAUSE

Description: AddCause

| Ordinal | Semantic                       |
|---------|--------------------------------|
| 0       | Unknown                        |
| 1       | Not-supported                  |
| 2       | Blocked-by-switching-hierarchy |
| 3       | Select-failed                  |
| 4       | Invalid-position               |
| 5       | Position-reached               |
| 6       | Parameter-change-in-execution  |
| 7       | Step-limit                     |
| 8       | Blocked-by-Mode                |
| 9       | Blocked-by-process             |
| 10      | Blocked-by-interlocking        |
| 11      | Blocked-by-synchrocheck        |
| 12      | Command-already-in-execution   |
| 13      | Blocked-by-health              |
| 14      | 1-of-n-control                 |
| 15      | Abortion-by-cancel             |
| 16      | Time-limit-over                |
| 17      | Abortion-by-trip               |
| 18      | Object-not-selected            |
| 19      | Object-already-selected        |
| 20      | No-access-authority            |
| 21      | Ended-with-overshoot           |
| 22      | Abortion-due-to-deviation      |
| 23      | Abortion-by-communication-loss |
| 24      | Blocked-by-command             |
| 25      | None                           |
| 26      | Inconsistent-parameters        |
| 27      | Locked-by-other-client         |

### 1.7.2 ENUMERATED TYPE: BEH

Description: Behaviour

| Ordinal | Semantic     |
|---------|--------------|
| 1       | on           |
| 2       | blocked      |
| 3       | test         |
| 4       | test/blocked |
| 5       | off          |
| 10      | Unsuccessful |
| 11      | Aborted      |

### 1.7.3 ENUMERATED TYPE: BEH\_3

Description: Behaviour including 3 states

| Ordinal | Semantic     |
|---------|--------------|
| 1       | on           |
| 3       | test         |
| 4       | test/blocked |

### 1.7.4 ENUMERATED TYPE: BEH\_4

Description: Behaviour including 4 states

| Ordinal | Semantic     |
|---------|--------------|
| 1       | on           |
| 3       | test         |
| 4       | test/blocked |
| 5       | off          |

### 1.7.5 ENUMERATED TYPE: CBOPCAP

Description: Enumeration for CB operation

| Ordinal | Semantic                   |
|---------|----------------------------|
| 1       | None                       |
| 2       | Open                       |
| 3       | Close-Open                 |
| 4       | Open-Close-Open            |
| 5       | Close-Open-Close-Open      |
| 6       | Open-Close-Open-Close-Open |
| 7       | more                       |

### 1.7.6 ENUMERATED TYPE: CLCINTVTYP

Description: Calculation interval type

| Ordinal | Semantic  |
|---------|-----------|
| 1       | MS        |
| 2       | PER_CYCLE |
| 3       | CYCLE     |
| 4       | DAY       |
| 5       | WEEK      |
| 6       | MONTH     |
| 7       | YEAR      |
| 8       | EXTERNAL  |

### 1.7.7 ENUMERATED TYPE: CLCMOD

Description: Calculation mode

| Ordinal | Semantic |
|---------|----------|
| 1       | TOTAL    |
| 2       | PERIOD   |
| 3       | SLIDING  |

### 1.7.8 ENUMERATED TYPE: CLCMTH

Description: Calculation method of statistical data objects

| Ordinal | Semantic         |
|---------|------------------|
| 1       | UNSPECIFIED      |
| 2       | TRUE_RMS         |
| 3       | PEAK_FUNDAMENTAL |
| 4       | RMS_FUNDAMENTAL  |
| 5       | MIN              |
| 6       | MAX              |
| 7       | AVG              |
| 8       | SDV              |
| 9       | PREDICTION       |
| 10      | RATE             |

### 1.7.9 ENUMERATED TYPE: CTLMODEL

Description: Control Model

| Ordinal | Semantic                      |
|---------|-------------------------------|
| 0       | status-only                   |
| 1       | direct-with-normal-security   |
| 2       | sbo-with-normal-security      |
| 3       | direct-with-enhanced-security |
| 4       | sbo-with-enhanced-security    |

### 1.7.10 ENUMERATED TYPE: DBPOS

Description: Circuit Breaker position

| Ordinal | Semantic     |
|---------|--------------|
| 0       | intermediate |
| 1       | off          |
| 2       | on           |
| 3       | bad          |

### 1.7.11 ENUMERATED TYPE: DIR

Description: Direction

| Ordinal | Semantic |
|---------|----------|
| 0       | unknown  |
| 1       | forward  |
| 2       | backward |
| 3       | both     |

### 1.7.12 ENUMERATED TYPE: HEALTH

Description: Health

| Ordinal | Semantic |
|---------|----------|
| 1       | Ok       |
| 2       | Warning  |
| 3       | Alarm    |

**1.7.13 ENUMERATED TYPE: MOD**

Description: Mode

| Ordinal | Semantic     |
|---------|--------------|
| 1       | on           |
| 2       | blocked      |
| 3       | test         |
| 4       | test/blocked |
| 5       | off          |

**1.7.14 ENUMERATED TYPE: MOD\_2**

Description: Mode including 2 states

| Ordinal | Semantic |
|---------|----------|
| 1       | on       |
| 5       | off      |

**1.7.15 ENUMERATED TYPE: MOD\_3**

Description: Mode including 3 states

| Ordinal | Semantic     |
|---------|--------------|
| 1       | on           |
| 3       | test         |
| 4       | test/blocked |

**1.7.16 ENUMERATED TYPE: MULTIPLIER**

Description: Exponents of the multiplier value in base 10

| Ordinal | Semantic |
|---------|----------|
| -24     | y        |
| -21     | z        |
| -18     | a        |
| -15     | f        |
| -12     | p        |
| -9      | n        |
| -6      | μ        |
| -3      | m        |
| -2      | c        |
| -1      | d        |
| 0       |          |
| 1       | da       |
| 2       | h        |
| 3       | k        |
| 6       | M        |
| 9       | G        |
| 12      | T        |
| 15      | P        |
| 18      | E        |
| 21      | Z        |
| 24      | Y        |

**1.7.17 ENUMERATED TYPE: ORCATEGORY**

Description: orCategory

| Ordinal | Semantic          |
|---------|-------------------|
| 0       | not-supported     |
| 1       | bay-control       |
| 2       | station-control   |
| 3       | remote-control    |
| 4       | automatic-bay     |
| 5       | automatic-station |
| 6       | automatic-remote  |
| 7       | maintenance       |
| 8       | process           |

**1.7.18 ENUMERATED TYPE: PHASEFAULTDIRECTIONKIND**

Description: Phase Fault Direction kind without 'both'

| Ordinal | Semantic |
|---------|----------|
| 0       | unknown  |
| 1       | forward  |
| 2       | backward |

**1.7.19 ENUMERATED TYPE: SEQT**

Description: Sequence Measurement Type

| Ordinal | Semantic      |
|---------|---------------|
| 0       | pos-neg-zero  |
| 1       | dir-quad-zero |

**1.7.20 ENUMERATED TYPE: SIUNIT**

Description: SI Units derived from ISO/IEC 1000

| Ordinal | Semantic |
|---------|----------|
| -16     | years    |
| -15     | months   |
| -14     | weeks    |
| -13     | V/s      |
| -12     | mins     |
| -11     | hours    |
| -10     | days     |
| -9      | °F       |
| -8      | ratio    |
| -7      | miles    |
| -6      | inches   |
| -5      | feet     |
| -4      | df/dt    |
| -3      | hz/s     |
| -2      | %        |
| -1      | pu       |
| 1       |          |
| 2       | m        |
| 3       | kg       |

| Ordinal | Semantic          |
|---------|-------------------|
| 4       | s                 |
| 5       | A                 |
| 6       | K                 |
| 7       | mol               |
| 8       | cd                |
| 9       | deg               |
| 10      | rad               |
| 11      | sr                |
| 21      | Gy                |
| 22      | Bq                |
| 23      | °C                |
| 24      | Sv                |
| 25      | F                 |
| 26      | C                 |
| 27      | S                 |
| 28      | H                 |
| 29      | V                 |
| 30      | ohm               |
| 31      | J                 |
| 32      | N                 |
| 33      | Hz                |
| 34      | lx                |
| 35      | Lm                |
| 36      | Wb                |
| 37      | T                 |
| 38      | W                 |
| 39      | Pa                |
| 41      | m <sup>2</sup>    |
| 42      | m <sup>3</sup>    |
| 43      | m/s               |
| 44      | m/s <sup>2</sup>  |
| 45      | m <sup>3</sup> /s |
| 46      | m/m <sup>3</sup>  |
| 47      | M                 |
| 48      | kg/m <sup>3</sup> |
| 49      | m <sup>2</sup> /s |
| 50      | W/m K             |
| 51      | J/K               |
| 52      | ppm               |
| 53      | 1/s               |
| 54      | rad/s             |
| 61      | VA                |
| 62      | Watts             |
| 63      | VAr               |
| 64      | phi               |
| 65      | cos(phi)          |
| 66      | Vs                |
| 67      | V <sup>2</sup>    |
| 68      | As                |
| 69      | A <sup>2</sup>    |
| 70      | A <sup>2</sup> t  |

| Ordinal | Semantic         |
|---------|------------------|
| 71      | VAh              |
| 72      | Wh               |
| 73      | VArh             |
| 74      | V/Hz             |
| 75      | Hz/s             |
| 76      | char             |
| 77      | char/s           |
| 78      | kgm <sup>2</sup> |
| 79      | dB               |
| 80      | J/Wh             |
| 81      | W/s              |
| 82      | l/s              |
| 83      | dBm              |
| 84      | h                |
| 85      | min              |

### 1.7.21 ENUMERATED TYPE: SWTYPE

Description: Switch Type

| Ordinal | Semantic                   |
|---------|----------------------------|
| 1       | Load Break                 |
| 2       | Disconnecter               |
| 3       | Earthing Switch            |
| 4       | High Speed Earthing Switch |

## 1.8 MMS DATA-TYPE CONVERSIONS

The following table shows the relationships between the Part 7 and Part 8-1 data types. The definitions presented above use Part 7 data types, however these are subject to 'translation' when exposed over an MMS (Part 8-1) interface:

| Part 7 Type  | MMS Type   | Part 7 Description                  |
|--------------|------------|-------------------------------------|
| BOOLEAN      | Bool       | Logical TRUE/FALSE value            |
| BSTR16       | Bstring16  | Bit-string -16 bits                 |
| BVstring13   | BVstring13 | Variable bit string (up to 13 bits) |
| Check        | BVstring2  | Control Object check flags          |
| CODED_ENUM   | Byte       | Coded enumeration                   |
| CODED_ENUM2  | Byte       | Coded enumeration (2)               |
| EntryTime    | Btime6     | 8.1 Section 8.1.3.7                 |
| ENUMERATED16 | Short      | 16 bit enumerated value             |
| ENUMERATED32 | Long       | 32 bit enumerated value             |
| ENUMERATED8  | Byte       | 8 bit enumerated value              |
| FLOAT32      | Float      | 32 bit floating point value         |
| FLOAT64      | Double     | 64 bit floating point value         |
| INT128       | Int64      | 128 bit signed integer value        |
| INT16        | Short      | 16 bit signed integer value         |
| INT16U       | Ushort     | 16 bit unsigned integer value       |
| INT24U       | Ulong      | 24 bit unsigned integer value       |
| INT32        | Long       | 32 bit signed integer value         |
| INT32U       | Ulong      | 32 bit unsigned integer value       |
| INT64        | Int64      | 64 bit signed integer value         |
| INT8         | Byte       | 8 bit signed integer value          |

| Part 7 Type       | MMS Type       | Part 7 Description                                   |
|-------------------|----------------|--|
| INT8U             | Ubyte          | 8 bit unsigned integer value                         |
| ObjectReference   | Vstring129     | Object Reference(129 character string)               |
| OCTET_STRING6     | Ostring6       | 6 character string (8 bits per character)            |
| OCTET_STRING64    | OVstring64     | 64 character string (8 bits per character)           |
| OCTET_STRING8     | OVstring8      | 8 character string (8 bits per character)            |
| Quality           | BVstring13     | IEC61850 Quality                                     |
| TimeStamp         | Utctime        | IEC61850 Time stamp                                  |
| UNICODE_STRING255 | UTF8Vstring255 | 255 character string (16 bits per unicode character) |
| UTC_TM            | Utctime        | UTC Timestamp  |
| VISIBLE_STRING129 | Vstring129     | 129 character string                                 |
| VISIBLE_STRING255 | Vstring255     | 255 character string                                 |
| VISIBLE_STRING64  | Vstring64      | 64 character string                                  |
| VISIBLE_STRING65  | Vstring65      | 65 character string                                  |
| VISIBLE_STRING97  | Vstring97      | 97 character string                                  |





# GE VERNOVA