# Model Implementation Conformance Statement for the IEC 61850 interface in SEL-787

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# INDEX

# 1. Introduction

This model implementation conformance statement is applicable for SEL-787 firmware R100:

This MICS document specifies the modelling extensions compared to IEC 61850 edition 1. For the exact details on the standardized model please compare the ICD substation configuration file: “0787-4 004.ICD”, version R100.

Clause 2 contains the list of implemented logical nodes.
Clause 3 describes the new and extended logical nodes.
Clause 4 describes the new and extended common data classes.

# 2. Logical Node List

The following table contains the list of logical nodes implemented in the device:

| |
|---|
| **C**: **Supervisory Control** |
| **CSWI** (Switch Controller) |
| **G**: **Generic Function References** |
| **GGIO** (Generic Process I/O) |
| **L**: **System Logical Nodes** |
| **LLN0** (Logical Node Zero) |
| **LPHD** (Physical Device Information) |
| **M**: **Metering and Measurement** |
| **MDST** (Demand Metering Statistics) |
| **MHAI** (Harmonics or Interharmonics) |
| **MMXU** (Measurement) |
| **MSQI** (Sequence and Imbalance ) |
| **MSTA** (Metering Statistics) |
| **MTHR** (Thermal Metering) |
| **P**: **Protection Functions** |
| **PDIF** (Differential) |
| **PDOP** (Directional Overpower) |
| **PDUP** (Directional Underpower) |
| **PHAR** (Harmonic Restraint) |
| **PIOC** (Instantaneous Overcurrent) |
| **POPF** (Over Power Factor) |
| **PTOC** (Time Overcurrent) |
| **PTOF** (Overfrequency) |
| **PTOV** (Overvoltage) |
| **PTRC** (Protection Trip Conditioning) |

| |
|---|
| **PTUV** (Undervoltage) |
| **PVPH** (Volts per Hz) |
| **R**: **Protection Related Functions** |
| **RBRF** (Breaker Failure) |
| **S**: **Sensors, Monitoring** |
| **SCBR** (Circuit Breaker Supervision) |
| **X**: **Switchgear** |
| **XCBR** (Circuit Breaker) |
| **Z**: **Further (power system) Equipment** |
| **ZBAT** (Battery) |

# 3. Logical Node Extensions

The following tables use:

M: Data is mandatory in the IEC–61850–7–4.

O: Data is optional in the IEC–61850–7–4 and is used in the device.

E: Data is an extension to the IEC–61850–7–4.

## 3.1 New Logical Nodes

New logical nodes have the lnNs attribute in the Name plate. The value of LnNs is a reference to the MICS document.

### 3.1.1 MDST: Demand Metering Statistics

This LN shall be used for calculation of demand currents and energy in a three-phase system.

| **MDST Class** | | | | |
|---|---|---|---|---|
| Attribute Name | Attribute Type | Explanation | M/O/E | Remarks |
| LNName | | Shall be inherited from Logical Node Class. | | |
| **Data** | | | | |
| Mod | INC | Mode | M | |
| Beh | INS | Behavior | M | |
| Health | INS | Health | M | |
| NamPlt | LPL | Name plate | M | |
| PosVArh | MV | Reactive energy demand (energy flow out of bus) | E | |
| DmdWh | MV | Real energy demand (energy flow out of bus) | E | |

| | | | | |
|---|---|---|---|---|
| NegVArh | MV | Reactive energy supply (energy flow into bus) | E | |

### 3.1.2 MTHR: Thermal Metering

This LN shall be used to acquire values from RTDs and to calculate thermal capacity. This is mainly used for Thermal Monitoring.

| **MTHR Class** | | | | |
|---|---|---|---|---|
| Attribute Name | Attribute Type | Explanation | M/O/E | Remarks |
| LNName | | Shall be inherited from Logical Node Class. | | |
| **Data** | | | | |
| Mod | INC | Mode | M | |
| Beh | INS | Behavior | M | |
| Health | INS | Health | M | |
| EEHealth | INS | External equipment health | E | |
| NamPlt | LPL | Name plate | M | |
| MaxWdgTmp | MV | Maximum winding temperature | E | |
| MaxBrgTmp | MV | Maximum bearing temperature | E | |
| MaxAmbTmp | MV | RTD percent thermal capacity used | E | |
| MaxOthTmp | MV | Maximum other temperature | E | |
| Tmp | MV | Temperature | E | |

### 3.1.3 SCBR: Circuit Breaker Supervision

| SCBR Class | | | | |
|---|---|---|---|---|
| Attribute Name | Attribute Type | Explanation | M/O/E | Remarks |
| LNName | | Shall be inherited from Logical Node Class. | | |
| **Data** | | | | |
| Mod | INC | Mode | M | |
| Beh | INS | Behavior | M | |
| Health | INS | Health | M | |
| NamPlt | LPL | Name plate | M | |
| ColOpn | SPS | Open command of trip coil | E | |
| AbrPrt | MV | Abrasion (in percent) of parts subject to wear | E | |

## 3.2 Extended Logical Nodes

The following logical nodes have been extended with extra data. All extra data has been highlighted in the tables and marked as "E" (Extended), these data contain the dataNs attribute.

### 3.2.1 GGIO: Generic Process I/O

For a description of this LN, see IEC 61850-5. This node shall be used to model in a generic way device processes that are not predefined by the groups S, T, X, Y, or Z.

| GGIO Class | | | | |
|---|---|---|---|---|
| Attribute Name | Attribute Type | Explanation | M/O/E | Remarks |
| LNName | | Shall be inherited from Logical Node Class. | | |
| **Data** | | | | |

| | | | | |
|---|---|---|---|---|
| Mod | INC | Mode | M | |
| Beh | INS | Behavior | M | |
| Health | INS | Health | M | |
| NamPlt | LPL | Name Plate | M | |
| AnIn | MV | Analogue input | O | |
| SPCSO | SPC | Single point controllable status output | O | |
| Ind | SPS | General indication (binary input) | O | |
| Ra | MV | Remote Analog | E | |

### 3.2.2 MMXU: Measurement

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

| **MMXU Class** | | | | |
|---|---|---|---|---|
| Attribute Name | Attribute Type | Explanation | M/O/E | Remarks |
| LNName | | Shall be inherited from Logical Node Class. | | |
| **Data** | | | | |
| Mod | INC | Mode | M | |
| Beh | INS | Behavior | M | |
| Health | INS | Health | M | |
| NamPlt | LPL | Name Plate | M | |
| TotW | MV | Total Active Power (Total P) | O | |
| TotVAr | MV | Total Reactive Power (Total Q) | O | |

| | | | | |
|---|---|---|---|---|
| TotVA | MV | Total Apparent Power (Total S) | O | |
| TotPF | MV | Average Power Factor (Total PF) | O | |
| Hz | MV | Frequency | O | |
| PPV | DEL | Phase to ground voltages (VL1VL2, ...) | O | |
| PhV | WYE | Phase to ground voltages (VL1ER, ...) | O | |
| A | WYE | Phase currents (IL1, IL2, IL3) | O | |
| VSyn | CMV | Synchronous voltage | E | |
| Vhz | MV | Synchronous frequency | E | |

### 3.2.3 MSTA: Metering Statistics

| **MSTA Class** | | | | |
|---|---|---|---|---|
| Attribute Name | Attribute Type | Explanation | M/O/E | Remarks |
| LNName | | Shall be inherited from Logical Node Class. | | |
| **Data** | | | | |
| Mod | INC | Mode | M | |
| Beh | INS | Behavior | M | |
| Health | INS | Health | M | |
| NamPlt | LPL | Name Plate | M | |
| MaxAmps | MV | Maximum current | O | |
| MinAmps | MV | Minimum current | O | |
| MaxVA | MV | Maximum apparent power | O | |

| | | | | |
|---|---|---|---|---|
| MinVA | MV | Minimum apparent power | O | |
| MaxW | MV | Maximum real power | O | |
| MinW | MV | Minimum real power | O | |
| MaxVAr | MV | Maximum reactive power | O | |
| MinVAr | MV | Minimum reactive power | O | |
| MaxA | WYE | Maximum current | E | |
| MinA | WYE | Minimum current | E | |
| MaxPhV | WYE | Maximum phase voltage | E | |
| MinPhV | WYE | Minimum phase voltage | E | |
| MinP2PV | DEL | Minimum Phase to Phase Voltages | E | |
| MaxP2PV | DEL | Maximum Phase to Phase Voltages | E | |

### 3.2.4 XCBR: Circuit Breaker

This LN is used for modeling switches with short circuit breaking capability. Additional LNs, for example SIMS, may be required to complete the logical modelling for the breaker being represented. The closing and opening commands shall be subscribed from CSWI or CPOW if applicable. If no services with real-time capability are available between CSWI or CPOW and XCBR, the opening anc closing commands are performed with a GSE-message.

| **XCBR Class** | | | | |
|---|---|---|---|---|
| Attribute Name | Attribute Type | Explanation | M/O/E | Remarks |
| LNName | | Shall be inherited from Logical Node Class. | | |
| **Data** | | | | |
| Mod | INC | Mode | M | |

| | | | | |
|---|---|---|---|---|
| Beh | INS | Behavior | M | |
| Health | INS | Health | M | |
| NamPlt | LPL | Name Plate | M | |
| Loc | SPS | Local operation | M | |
| OpCnt | INS | Operation counter | M | |
| Pos | DPC | Switch position | M | |
| BlkOpn | SPC | Block opening | M | |
| BlkCls | SPC | Block closing | M | |
| CBOpCap | INS | Circuit breaker operating capability | M | |
| OpCntEx | INS | Operation counter—external | E | |

# 4. Common Data Class Extensions

The following common data classes have been extended with extra data. All extra data has been highlighted in the tables and marked as "E" (Extended). Comments:

M: Data is mandatory in the IEC–61850–7–3.

O: Data is optional in the IEC–61850–7–3 and is used in the device.

E: Data is an extension to the IEC–61850–7–3.

## 4.1 Extended Common Data Classes

The following common data classes have been extended with extra data. All extra data has been highlighted in the tables and marked as "E" (Extended).

### 4.1.1 WYE: Phase-to-Ground Related Measured Values of a Three Phase System

| **WYE Class** | | | | | | |
|---|---|---|---|---|---|---|
| Attribute Name | Attribute Type | FC | TrgOp | Value/Value Range | M/O/E | Remarks |
| phsA | CMV | | | | O | |
| phsB | CMV | | | | O | |
| phsC | CMV | | | | O | |
| neut | CMV | | | | O | |
| nseq | CMV | | | | E | |
| res | CMV | | | | O | |
| cdcNs | VisString255 | EX | | | O | |
| cdcName | VisString255 | EX | | | O | |
| dataNs | VisString255 | EX | | | O | |