

Feeder Terminal

REF 542plus

IEC61850 Conformance Statement for REF 542plus

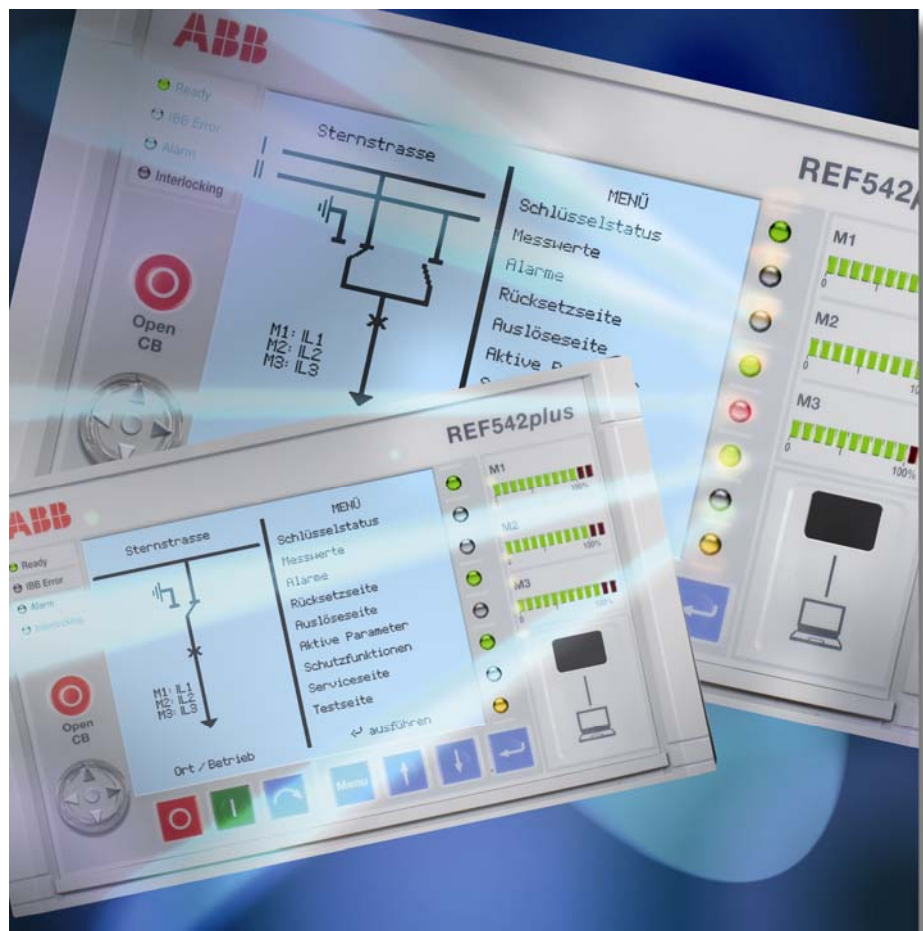


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1 About this document

1.1 Read it first!

Before attempting any operation with the REF 542plus *Ethernet Board*, read first the document.

This document is addressed to anyone who needs to interact with REF 542plus and IEC61850 interface.

1.2 Document information

Revision History

| Revision | Date | Note |
|-----------------|-------------|--|
| 1VCD600508 C | 20 Apr 2007 | Corrections based on KEMA remarks |
| 1MRS756361 A | 11 May 2007 | Changes in layout. ID-number changed from 1VCD600508 to 1MRS756361 |
| 1MRS756361 B | 17 Nov 2008 | Extension due to Release 2.6 |
| 1MRS756361 C | 21 Sep 2009 | Extension due to Release 2.6 SP1 |

Applicability

This manual is applicable to IEC 61850 interface version ETH V1F.07

2 Safety Information

There are safety warnings and notes in the following text. They are in a different format to distinguish them from normal text.

Safety warning

The safety warnings should always be observed. Non-observance can result in death, personal injury or substantial damages to property. Guarantee claims might not be accepted when safety warnings are not respected. They look like below:



Do not make any changes to the REF 542plus configuration unless you are familiar with the REF 542plus and its Operating Tool. This might result in disoperation and loss of warranty.

Note

A note contains additional information worth noting in the specific context, and looks like below:



The selection of this control mode requires caution, because operations are allowed both from the HMI and remotely.

3 Abbreviations, Definitions and Conventions

3.1 Abbreviations

| | |
|-------|---|
| HMI | H uman M achine I nterface |
| RHMI | the same as HMI |
| LCD | L iquid C rystal D isplay |
| SLD | S ingle L ine D iagram |
| LED | L ight E mitting D iode |
| GPS | G lobal P ositioning S ystem |
| SCADA | S upervision, C ontrol and D ata A cquisition |
| CT | C urrent T ransformer |
| VT | V oltage T ransformer |
| SI | S ensor I nterface |
| FUPLA | FUnctional Programming Language. The graphical language to program the REF 542plus. |
| Y | Y es |
| N | N o |

3.2 Definitions

| | |
|--------------------|---|
| Operational State: | the unit is active and it is protecting and controlling the switchgear. |
| Stand-alone: | the unit is not connected to a Scada system. |
| M/m: | mandatory support. The item shall be implemented. |
| C/c: | conditional support. The item shall be implemented if the stated condition exists. |
| O/o: | optional support. The implementation may decide to implement the item. |
| x: | excluded: The implementation shall not implement this item. |
| i: | out-of-scope: The implementation of the item is not within the scope of this product. |
| F/S: | Functional Standard. Should be applied. |
| Base: | Shall be applied in any application claiming conformance to this standard. |

3.3 Conventions

Actual situation with comments, e.g. “*Supported*”, “*Partly supported (foobar is unavailable)*”, “*1ms*” are filled on either Comments column, in “Value/range” column, or device column in *italics*. Possible existing text from standard can be preserved in parenthesis.

4 Reference Documents

| Ref | Document id | Rev | Document title |
|-----|--|-----|--|
| [1] | 61850-8-1 First edition 2004-05 | | Communication networks and systems in substations Part 8-1: Specific communication service mapping (SCSM) – Map-pings to MMS (ISO/IEC 9506 Part 1 and Part 2) and to ISO/IEC 8802-3 |
| [2] | 61850-10 First edition 2005-05 | | Communication networks and systems in substations – Part 10: Conformance testing |
| [3] | IEC61850-7-2 First edition 2003-05 | | Communication networks and systems in substations – Part 7-2: Basic communication structure for substation and feeder equipment – Abstract communication service interface (ACSI) |
| [4] | IEC61850-6 First edition 2004-03 | | Communication networks and systems in substations - Part 6: Configuration description language for communi- cation in electrical substations related to IEDs |
| [5] | IEC61850-7-3 First edition 2003-05 | | Communication networks and systems in substations – Part 7-3: Basic communication structure for substation and feeder equipment – Common data classes |
| [6] | IEC61850-7-4 First Edition 2003-05 | | Communication networks and systems in substations – Part 7-4: |

5 Introduction

This document defines the compliance to IEC61850 in terms of service, modeling and engineering interfaces. Also, exceptions and local adaptations are described.

The conformance statements and documents are referred as PICS (Protocol Implementation Conformance Statement), MICS (Model Implementation Conformance Statement) and local adaptations to be published are described in PIXIT (Protocol Implementation eXtra Information for Testing). ACSI conformance statement describes the abstract services interfaces, which are normally mapped to certain SCSM and therefore indirectly stated in PICS.

The purpose of the information in this document is to give a user, to a system integrator a detailed explanation of IEC61850 capabilities of a product.

5.1 Scope of this statement

The scope of this document is one product/software module. This is identified as follows:

Product family / name:

Product designation: REF 542plus Ethernet Board

Product version: see document revision history1.00

Role(s) in two-party association (TP, c/s): server

Role(s) in multicast association (MC, GOOSE, GSSE): none

Notes, exceptions: MMS conformance statement is not filled

6 ACSI conformance statement

6.1 General

These tables are according to 7-2. [3]

6.2 ACSI basic conformance statement

Table 6-1– Basic conformance statement

| | | Client/ Subscriber | Server/ Publisher | Value/Comments |
|---|---|-----------------------|----------------------|----------------------|
| Client-Server roles | | | | |
| B11 | Server side (of TWO-PARTY-APPLICATION-ASSOCIATION) | — | c1 | <i>Supported</i> |
| B12 | Client side of (TWO-PARTY-APPLICATION-ASSOCIATION) | c1 | — | <i>Not Supported</i> |
| SCSMs supported | | | | |
| B21 | SCSM: IEC 61850-8-1 used | | | <i>Supported</i> |
| B22 | SCSM: IEC 61850-9-1 used | | | <i>Not Supported</i> |
| B23 | SCSM: IEC 61850-9-2 used | | | <i>Not Supported</i> |
| B24 | SCSM: other | | | |
| Generic substation event model (GSE) | | | | |
| B31 | Publisher side | — | O | <i>Not Supported</i> |
| B32 | Subscriber side | O | — | <i>Not Supported</i> |
| Transmission of sampled value model (SVC) | | | | |
| B41 | Publisher side | — | O | <i>Not Supported</i> |
| B42 | Subscriber side | O | — | <i>Not Supported</i> |
| C1 – shall be 'M' if support for LOGICAL-DEVICE model has been declared. | | | | |

6.3 ACSI models conformance statement

Table 6-2– ACSI models conformance statement

| | | Client/ Subscriber | Server/ Publisher | Value/Comments |
|--------------------------------------|----------------------------------|-----------------------|----------------------|----------------------|
| If Server side (B1) supported | | | | |
| M1 | Logical device | c2 | c2 | <i>Supported</i> |
| M2 | Logical node | c3 | c3 | <i>Supported</i> |
| M3 | Data | c4 | c4 | <i>Supported</i> |
| M4 | Data set | c5 | c5 | <i>Supported</i> |
| M5 | Substitution | O | O | <i>Not Supported</i> |
| M6 | Setting group control | O | O | <i>Not Supported</i> |
| | Reporting | | | |
| M7 | Buffered report control | O | O | <i>Supported</i> |
| M7-1 | Sequence-number | | | |
| M7-2 | report-time-stamp | | | |
| M7-3 | reason-for-inclusion | | | |
| M7-4 | data-set-name | | | |
| M7-5 | data-reference | | | |
| M7-6 | buffer-overflow | | | |
| M7-7 | EntryID | | | |
| M7-8 | BufTim | | | |
| M7-9 | IntgPd | | | |
| M7-10 | GI | | | |
| M8 | Unbuffered report control | M | M | <i>Supported</i> |
| M8-1 | sequence-number | | | |
| M8-2 | report-time-stamp | | | |
| M8-3 | reason-for-inclusion | | | |
| M8-4 | data-set-name | | | |
| M8-5 | data-reference | | | |
| M8-6 | BufTim | | | |
| M8-7 | IntgPd | | | |
| M8-8 | GI | | | |
| | Logging | O | O | <i>Not Supported</i> |
| M9 | Log control | O | O | <i>Not Supported</i> |
| M9-1 | IntgPd | | | |
| M10 | Log | O | O | <i>Not Supported</i> |
| M11 | Control | M | M | <i>Supported</i> |
| If GSE (B31/32) is supported | | | | |
| | GOOSE | O | O | <i>Not Supported</i> |
| M12-1 | EntryID | | | |
| M12-2 | DataRefInc | | | |
| M13 | GSSE | O | O | <i>Not Supported</i> |

| | | Client/ Subscriber | Server/ Publisher | Value/Comments |
|---|----------------------|-----------------------|----------------------|---|
| If SVC (41/42) is supported | | | | |
| M14 | Multicast SVC | O | O | <i>Not Supported</i> |
| M15 | Unicast SVC | O | O | <i>Not Supported</i> |
| M16 | Time | M | M | <i>Supported</i> (Time source with required accuracy shall be available) |
| M17 | File Transfer | O | O | <i>Supported</i> |
| c1 – shall be 'M' if support for LOGICAL-DEVICE model has been declared. c2 – shall be 'M' if support for LOGICAL-NODE model has been declared c3 – shall be 'M' if support for DATA model has been declared c4 – shall be 'M' if support for DATA-SET , Substitution, Report, Log Control, or Time model has been declared c5 – shall be 'M' if support for Report, GSE, or SMV models has been declared | | | | |

6.4 ACSI service conformance statement

The ACSI service conformance statement shall be as defined in Table 2-3 (depending on the statements in Table 2-2).

Table 6-3 – ACSI service Conformance statement

| | Services | AA: TP/MC | Client (C) | Server (S) | Comments |
|--------------------------------|---------------------------|--------------|---------------|---------------|------------------|
| Server | | | | | |
| S1 | ServerDirectory | TP | | M | <i>Supported</i> |
| Application association | | | | | |
| S2 | Associate | | M | M | <i>Supported</i> |
| S3 | Abort | | M | M | <i>Supported</i> |
| S4 | Release | | M | M | <i>Supported</i> |
| Logical device | | | | | |
| S5 | GetLogicalDeviceDirectory | TP | M | M | <i>Supported</i> |
| Logical node | | | | | |
| S6 | LogicalNodeDirectory | TP | M | M | <i>Supported</i> |
| S7 | GetAllDataValues | TP | O | M | <i>Supported</i> |
| Data | | | | | |
| S8 | GetDataValues | TP | M | M | <i>Supported</i> |
| S9 | SetDataValues | TP | O | O | <i>Supported</i> |
| S10 | GetDataDirectory | TP | O | M | <i>Supported</i> |
| S11 | GetDataDefinition | TP | O | M | <i>Supported</i> |

| | Services | AA: TP/MC | Client (C) | Server (S) | Comments |
|-----------------|---------------------|--------------|---------------|---------------|----------------------|
| Data set | | | | | |
| S12 | GetDataSetValues | TP | O | M | <i>Supported</i> |
| S13 | SetDataSetValues | TP | O | O | <i>Not Supported</i> |
| S14 | CreateDataSet | TP | O | O | <i>Not Supported</i> |
| S15 | DeleteDataSet | TP | O | O | <i>Not Supported</i> |
| S16 | GetDataSetDirectory | TP | O | O | <i>Supported</i> |

| Substitution | | | | | |
|---------------------|---------------|----|---|---|----------------------|
| S17 | SetDataValues | TP | M | M | <i>Not Supported</i> |

| Setting group control | | | | | |
|------------------------------|---------------------|----|---|---|----------------------|
| S18 | SelectActiveSG | TP | O | O | <i>Not Supported</i> |
| S19 | SelectEditSG | TP | O | O | <i>Not Supported</i> |
| S20 | SetSGValues | TP | O | O | <i>Not Supported</i> |
| S21 | ConfirmEditSGValues | TP | O | O | <i>Not Supported</i> |
| S22 | GetSGValues | TP | O | O | <i>Not Supported</i> |
| S23 | GetSGCBValues | TP | O | O | <i>Not Supported</i> |

| Reporting | | | | | |
|--|--------------------|----|----|----|----------------------|
| Buffered report control block (BRCB) | | | | | |
| S24 | Report | TP | c6 | c6 | |
| S24-1 | data-change (dchg) | | | | <i>Supported</i> |
| S24-2 | qchg-change (qchg) | | | | <i>Supported</i> |
| S24-3 | data-update (dupd) | | | | <i>Not Supported</i> |
| S25 | GetBRCBValues | TP | c6 | c6 | <i>Supported</i> |
| S26 | SetBRCBValues | TP | c6 | c6 | <i>Supported</i> |
| Unbuffered report control block (URCB) | | | | | |
| S27 | Report | TP | c6 | c6 | |
| S27-1 | data-change (dchg) | | | | <i>Supported</i> |
| S27-2 | qchg-change (qchg) | | | | <i>Supported</i> |
| S27-3 | data-update (dup) | | | | <i>Not Supported</i> |
| S28 | GetURCBValues | TP | c6 | c6 | <i>Supported</i> |
| S29 | SetURCBValues | TP | c6 | c6 | <i>Supported</i> |
| c6 – shall declare support for at least one (BRCB or URCB) | | | | | |

| Logging | | | | | |
|---|--------------------|----|----|---|----------------------|
| Log control block | | | | | |
| S30 | GetLCBValues | TP | M | M | <i>Not Supported</i> |
| S31 | SetLCBValues | TP | O | M | <i>Not Supported</i> |
| Log | | | | | |
| S32 | QueryLogByTime | TP | c7 | M | <i>Not Supported</i> |
| S33 | QueryLogByEntry | TP | c7 | M | <i>Not Supported</i> |
| S34 | GetLogStatusValues | TP | M | M | <i>Not Supported</i> |
| c7 – shall declare support for at least one (QueryLogByTime or QueryLogByEntry) | | | | | |

| | Services | AA: TP/MC | Client (C) | Server (S) | Comments |
|--|-----------------------|--------------|---------------|---------------|----------------------|
| Generic substation event model (GSE) | | | | | |
| GOOSE-CONTROL-BLOCK | | | | | |
| S35 | SendGOOSEMessage | MC | c8 | c8 | <i>Not Supported</i> |
| S36 | GetReference | TP | O | c9 | <i>Not Supported</i> |
| S37 | GetGOOSEElementNumber | TP | O | c9 | <i>Not Supported</i> |
| S38 | GetGoCBValues | TP | O | O | <i>Not Supported</i> |
| S39 | SetGoCBValues | TP | O | O | <i>Not Supported</i> |
| GSSE-CONTROL-BLOCK | | | | | |
| S40 | SendGSSEMessage | MC | c8 | c8 | <i>Not Supported</i> |
| S41 | GetReference | TP | O | c9 | <i>Not Supported</i> |
| S42 | GetGSSEElementNumber | TP | O | c9 | <i>Not Supported</i> |
| S43 | GetGsCBValues | TP | O | O | <i>Not Supported</i> |
| S44 | SetGsCBValues | TP | O | O | <i>Not Supported</i> |
| c8 – shall declare support for at least one (SendGOOSEMessage or SendGSSEMessage) c9 – shall declare support if TP association is available | | | | | |

| Transmission of sampled value model (SVC) | | | | | |
|---|----------------|----|-----|-----|----------------------|
| Multicast SVC | | | | | |
| S45 | SendMSVMessage | MC | c10 | c10 | <i>Not Supported</i> |
| S46 | GetMSVCBValues | TP | O | O | <i>Not Supported</i> |
| S47 | SetMSVCBValues | TP | O | O | <i>Not Supported</i> |
| Unicast SVC | | | | | |
| S48 | SendUSVMessage | TP | c10 | c10 | <i>Not Supported</i> |
| S49 | GetUSVCBValues | TP | O | O | <i>Not Supported</i> |
| S50 | SetUSVCBValues | TP | O | O | <i>Not Supported</i> |
| c10 – shall declare support for at least one (SendMSVMessage or SendUSVMessage) | | | | | |

| Control | | | | | |
|----------------|-----------------------|----|---|---|----------------------|
| S51 | Select | | M | O | <i>Not Supported</i> |
| S52 | SelectWithValue | TP | M | O | <i>Supported</i> |
| S53 | Cancel | TP | O | O | <i>Supported</i> |
| S54 | Operate | TP | M | M | <i>Supported</i> |
| S55 | Command-Termination | TP | M | O | <i>Supported</i> |
| S56 | TimeActivated-Operate | TP | O | O | <i>Not Supported</i> |

| File transfer | | | | | |
|----------------------|------------------------|----|---|---|------------------|
| S57 | GetFile | TP | O | M | <i>Supported</i> |
| S58 | SetFile | TP | O | O | <i>Supported</i> |
| S59 | DeleteFile | TP | O | O | <i>Supported</i> |
| S60 | GetFileAttributeValues | TP | O | M | <i>Supported</i> |

| | Services | AA: TP/MC | Client (C) | Server (S) | Comments |
|-------------|-----------------------------------|--------------|---------------|--------------------|---|
| Time | | | | | |
| T1 | Time resolution of internal clock | | | 2^{-10} (1ms) | (nearest negative power of 2 in seconds) |
| T2 | Time accuracy of internal clock | | | | T0 |
| | | | | | T1, <i>Supported</i> |
| | | | | | T2 |
| | | | | | T3 |
| | | | | | T4 |
| | | | | | T5 |
| T3 | supported TimeStamp resolution | - | | 2^{-10} (1ms) | (nearest negative power of 2 in seconds according to IEC61850-7-2, paragraph 5.5.3.7.3.3) |

7 MICS - Model conformance statement

7.1 General

A Model Implementation Conformance Statement or MICS shall be provided detailing the standard data object model elements supported by the system or device. The MICS is implemented in the file ICD (IED capability description) according to IEC 61850-6.

However, since the nature of configurable devices and systems, the ICD file might not reveal all the details the supported or used Common Data Attribute Classes and Common Data Classes with the attributes are listed here. See [5]

7.2 Common Data Attribute Classes

7.2.1 Quality

Table 7-1– Quality

| Quality Type Definition | | | | |
|-------------------------|----------------|--|-------|-----------------------|
| Attribute Name | Attribute Type | Value / Value Range | M/O/C | REF-Eth61850 comments |
| | PACKED LIST | | | |
| Validity | CODED ENUM | good invalid reserved questionable | M | <i>Supported</i> |
| detailQual | PACKED LIST | | M | <i>Supported</i> |
| | Overflow | BOOLEAN | M | <i>Defaulted</i> |
| | outOfRange | BOOLEAN | M | <i>Supported</i> |
| | badReference | BOOLEAN | M | <i>Defaulted</i> |
| | Oscillatory | BOOLEAN | M | <i>Defaulted</i> |
| | Failure | BOOLEAN | M | <i>Defaulted</i> |
| | oldData | BOOLEAN | M | <i>Supported</i> |
| | Inconsistent | BOOLEAN | M | <i>Defaulted</i> |
| | Inaccurate | BOOLEAN | M | <i>Defaulted</i> |
| Source | CODED ENUM | process substituted DEFAULT process | M | <i>Supported</i> |
| Test | BOOLEAN | DEFAULT FALSE | M | <i>Defaulted</i> |
| operatorBlocked | BOOLEAN | DEFAULT FALSE | M | <i>Defaulted</i> |

NOTE – The DEFAULT value shall be applied, if the functionality of the related attribute is not supported. The mapping may specify to exclude the attribute from the message, if it is not supported or if the DEFAULT value applies.

7.2.2 Analogue value

Table 7-2– Analogue value

| AnalogueValue Type Definition | | | | |
|-------------------------------|----------------|----------------------|-------|-----------------------|
| Attribute Name | Attribute Type | Value / Value Range | M/O/C | REF-Eth61850 comments |
| I | INT32 | integer value | GC_1 | <i>Not supported</i> |
| F | FLOAT32 | floating point value | GC_1 | <i>Supported</i> |

7.2.3 Range configuration

Table 7-3– Range Configuration

| RangeConfig Type Definition | | | | |
|-----------------------------|----------------|---------------------|-------|-----------------------|
| Attribute Name | Attribute Type | Value / Value Range | M/O/C | REF-Eth61850 comments |
| hhLim | AnalogueValue | | M | <i>Not supported</i> |
| hLim | AnalogueValue | | M | <i>Not supported</i> |
| lLim | AnalogueValue | | M | <i>Not supported</i> |
| llLim | AnalogueValue | | M | <i>Not supported</i> |
| Min | AnalogueValue | | M | <i>Not supported</i> |
| Max | AnalogueValue | | M | <i>Not supported</i> |

7.2.4 Step position with transient indication

Table 7-4– Step position with transient indication

| ValWithTrans Type Definition | | | | |
|------------------------------|----------------|---------------------|-------|-----------------------|
| Attribute Name | Attribute Type | Value / Value Range | M/O/C | REF-Eth61850 comments |
| posVal | INT8 | -64 ... 63 | M | <i>Not supported</i> |
| transInd | BOOLEAN | | O | <i>Not supported</i> |

7.2.5 Originator

Table 7-5– Originator

| Originator Type Definition | | | | |
|----------------------------|----------------|---|-------|-----------------------|
| Attribute Name | Attribute Type | Value / Value Range | M/O/C | REF-Eth61850 comments |
| orCat | ENUMERATED | not-supported bay-control station-control remote-control automatic-bay automatic-station automatic-remote maintenance process | M | <i>Supported</i> |
| orIdent | OCTET STRING64 | | M | <i>Supported</i> |

Table 7-6– Values for orCat

| Value | Explanation |
|-------------------|---|
| bay-control | Control operation issued from an operator using a client located at bay level |
| station-control | Control operation issued from an operator using a client located at station level |
| remote-control | Control operation from a remote operator outside the substation (e.g. network control center) |
| automatic-bay | Control operation issued from an automatic function at bay level |
| automatic-station | Control operation issued from an automatic function at station level |
| automatic-remote | Control operation issued from a automatic function outside of the substation |
| maintenance | Control operation issued from a maintenance / service tool |
| Process | Status change occurred without control action (e.g. external trip of a circuit breaker or failure inside the breaker) |

7.2.6 Unit definition

Table 7-7– Unit

| Unit Type Definition | | | | |
|----------------------|----------------|-------------------------------|-------|-----------------------|
| Attribute Name | Attribute Type | Value / Value Range | M/O/C | REF-Eth61850 comments |
| SIUnit | ENUMERATED | According to table in Annex A | M | <i>Not supported</i> |
| Multiplier | ENUMERATED | According to table in Annex A | O | <i>Not supported</i> |

7.2.7 Vector definition

Table 7-8– Vector

| Vector Type Definition | | | | |
|------------------------|----------------|---------------------|-------|-----------------------|
| Attribute Name | Attribute Type | Value / Value Range | M/O/C | REF-Eth61850 comments |
| Mag | AnalogueValue | | M | <i>Supported</i> |
| Ang | AnalogueValue | | O | <i>Not supported</i> |

7.2.8 CtxInt

Context specific Integer. The type depends of the DO usage. Enum type is used with Mod, Beh and Health Data Objects. Otherwise Int32. Others????

7.3 Common Data Classes

NOTE – Different variants of the CDC type exist based on the connectivity packet short address information (sAddr). Underlined information indicates the basic type. E.g. ACT uses general or phase attributes.

7.3.1 Single point status (SPS)

Table 9 – Single point status common data class definition

| SPS class | | | | | | |
|---------------------|---|----|-------|---------------------|------------|-----------------------|
| Attribute Name | Attribute Type | FC | TrgOp | Value / Value Range | M/O/C | REF-Eth61850 comments |
| DataName | Inherited from Data Class (see IEC 61850-7-2) | | | | | <i>Supported</i> |
| DataAttribute | | | | | | |
| <i>Status</i> | | | | | | |
| stVal | BOOLEAN | ST | dchg | TRUE FALSE | M | <i>Supported</i> |
| q | Quality | ST | qchg | | M | <i>Supported</i> |
| t | TimeStamp | ST | | | M | <i>Supported</i> |
| <i>Substitution</i> | | | | | | |
| subEna | BOOLEAN | SV | | | PICS_SUBST | <i>Not supported</i> |
| subVal | BOOLEAN | SV | | TRUE FALSE | PICS_SUBST | <i>Not supported</i> |
| subQ | Quality | SV | | | PICS_SUBST | <i>Not supported</i> |
| subID | VISIBLE STRING64 | SV | | | PICS_SUBST | <i>Not supported</i> |

| <i>configuration, description and extension</i> | | | | | | |
|---|-------------------|----|--|------|------------|----------------------|
| d | VISIBLE STRING255 | DC | | Text | O | <i>Supported</i> |
| dU | UNICODE STRING255 | DC | | | O | <i>Not Supported</i> |
| cdcNs | VISIBLE STRING255 | EX | | | AC_DLNDA_M | <i>Not supported</i> |
| cdcName | VISIBLE STRING255 | EX | | | AC_DLNDA_M | <i>Not supported</i> |
| dataNs | VISIBLE STRING255 | EX | | | AC_DLN_M | <i>Not supported</i> |

7.3.2 Double point status (DPS)

Table 10 – Double point status common data class specification

| DPS class | | | | | | |
|---|---|----|-------|---|------------|-----------------------|
| Attribute Name | Attribute Type | FC | TrgOp | Value / Value Range | M/O/C | REF-Eth61850 comments |
| DataName | Inherited from Data Class (see IEC 61850-7-2) | | | | | <i>Supported</i> |
| DataAttribute | | | | | | |
| <i>status</i> | | | | | | |
| stVal | CODED ENUM | ST | dchg | intermediate-state off on bad-state | M | <i>Supported</i> |
| q | Quality | ST | qchg | | M | <i>Supported</i> |
| t | TimeStamp | ST | | | M | <i>Supported</i> |
| <i>substitution</i> | | | | | | |
| subEna | BOOLEAN | SV | | | PICS_SUBST | <i>Not supported</i> |
| subVal | CODED ENUM | SV | | intermediate-state off on bad-state | PICS_SUBST | <i>Not supported</i> |
| subQ | Quality | SV | | | PICS_SUBST | <i>Not supported</i> |
| subID | VISIBLE STRING64 | SV | | | PICS_SUBST | <i>Not supported</i> |
| <i>configuration, description and extension</i> | | | | | | |
| d | VISIBLE STRING255 | DC | | Text | O | <i>Supported</i> |
| dU | UNICODE STRING255 | DC | | | O | <i>Not Supported</i> |
| cdcNs | VISIBLE STRING255 | EX | | | AC_DLNDA_M | <i>Not supported</i> |
| cdcName | VISIBLE STRING255 | EX | | | AC_DLNDA_M | <i>Not supported</i> |
| dataNs | VISIBLE STRING255 | EX | | | AC_DLN_M | <i>Not supported</i> |

7.3.3 Integer status (INS)

Table 11 – Integer status common data class specification

| INS class | | | | | | |
|----------------------|---|----|-------|---------------------|------------|-----------------------|
| Attribute Name | Attribute Type | FC | TrgOp | Value / Value Range | M/O/C | REF-Eth61850 comments |
| DataName | Inherited from Data Class (see IEC 61850-7-2) | | | | | <i>Supported</i> |
| DataAttribute | | | | | | |
| <i>status</i> | | | | | | |
| stVal | CtxInt | ST | dchg | | M | <i>Supported</i> |
| q | Quality | ST | qchg | | M | <i>Supported</i> |
| t | TimeStamp | ST | | | M | <i>Supported</i> |
| <i>substitution</i> | | | | | | |
| subEna | BOOLEAN | SV | | | PICS_SUBST | <i>Not supported</i> |
| subVal | INT32 | SV | | | PICS_SUBST | <i>Not supported</i> |
| subQ | Quality | SV | | | PICS_SUBST | <i>Not supported</i> |
| subID | VISIBLE STRING64 | SV | | | PICS_SUBST | <i>Not supported</i> |

| <i>configuration, description and extension</i> | | | | | | |
|---|-------------------|----|--|------|------------|----------------------|
| d | VISIBLE STRING255 | DC | | Text | O | <u>Supported</u> |
| dU | UNICODE STRING255 | DC | | | O | <u>Not Supported</u> |
| CdcNs | VISIBLE STRING255 | EX | | | AC_DLNDA_M | <u>Not supported</u> |
| cdcName | VISIBLE STRING255 | EX | | | AC_DLNDA_M | <u>Not supported</u> |
| DataNs | VISIBLE STRING255 | EX | | | AC_DLN_M | <u>Not supported</u> |

Protection activation information (ACT)

Table 12 – Protection activation information common data class specification

| ACT class | | | | | | |
|---|---|----|-------|---------------------|------------|-----------------------|
| Attribute Name | Attribute Type | FC | TrgOp | Value / Value Range | M/O/C | REF-Eth61850 comments |
| DataName | Inherited from Data Class (see IEC 61850-7-2) | | | | | <u>Supported</u> |
| DataAttribute | | | | | | |
| <i>Status</i> | | | | | | |
| general | BOOLEAN | ST | dchg | | M | <u>Supported</u> |
| phsA | BOOLEAN | ST | dchg | | O | <u>Supported</u> |
| phsB | BOOLEAN | ST | dchg | | O | <u>Supported</u> |
| phsC | BOOLEAN | ST | dchg | | O | <u>Supported</u> |
| neut | BOOLEAN | ST | dchg | | O | <u>Supported</u> |
| q | Quality | ST | qchg | | M | <u>Supported</u> |
| t | TimeStamp | ST | | | M | <u>Supported</u> |
| <i>configuration, description and extension</i> | | | | | | |
| operTim | TimeStamp | CF | | | O | <u>Not supported</u> |
| d | VISIBLE STRING255 | DC | | Text | O | <u>Supported</u> |
| dU | UNICODE STRING255 | DC | | | O | <u>Not Supported</u> |
| cdcNs | VISIBLE STRING255 | EX | | | AC_DLNDA_M | <u>Not supported</u> |
| cdcName | VISIBLE STRING255 | EX | | | AC_DLNDA_M | <u>Not supported</u> |
| dataNs | VISIBLE STRING255 | EX | | | AC_DLN_M | <u>Not supported</u> |

NOTE – Different variants of the type exist based on the connectivity packet short address information (sAddr). Underlined information indicates the basic type.

7.3.4 Directional protection activation information (ACD)

Table 13 – Directional protection activation information common data class specification

| ACD class | | | | | | |
|----------------------|---|----|-------|-------------------------------------|----------|-----------------------|
| Attribute Name | Attribute Type | FC | TrgOp | Value / Value Range | M/O/C | REF-Eth61850 comments |
| DataName | Inherited from Data Class (see IEC 61850-7-2) | | | | | <u>Supported</u> |
| DataAttribute | | | | | | |
| <i>Status</i> | | | | | | |
| general | BOOLEAN | ST | dchg | | M | <u>Supported</u> |
| dirGeneral | ENUMERATED | ST | dchg | unknown forward backward both | M | <u>Supported</u> |
| PhsA | BOOLEAN | ST | dchg | | GC_2 (1) | <u>Supported</u> |
| dirPhsA | ENUMERATED | ST | dchg | unknown forward backward | GC_2 (1) | <u>Supported</u> |
| PhsB | BOOLEAN | ST | dchg | | GC_2 (2) | <u>Supported</u> |
| dirPhsB | ENUMERATED | ST | dchg | unknown forward backward | GC_2 (2) | <u>Supported</u> |
| PhsC | BOOLEAN | ST | dchg | | GC_2 (3) | <u>Supported</u> |

| | | | | | | |
|---|-------------------|----|------|------------------------------|------------|----------------------|
| dirPhsC | ENUMERATED | ST | dchg | unknown forward backward | GC_2 (3) | <u>Supported</u> |
| Neut | BOOLEAN | ST | dchg | | GC_2 (4) | <u>Supported</u> |
| dirNeut | ENUMERATED | ST | dchg | unknown forward backward | GC_2 (4) | <u>Supported</u> |
| q | Quality | ST | qchg | | M | <u>Supported</u> |
| t | TimeStamp | ST | | | M | <u>Supported</u> |
| <i>configuration, description and extension</i> | | | | | | |
| d | VISIBLE STRING255 | DC | | Text | O | <u>Supported</u> |
| dU | UNICODE STRING255 | DC | | | O | <u>Not Supported</u> |
| cdcNs | VISIBLE STRING255 | EX | | | AC_DLNDA_M | <u>Not supported</u> |
| cdcName | VISIBLE STRING255 | EX | | | AC_DLNDA_M | <u>Not supported</u> |
| dataNs | VISIBLE STRING255 | EX | | | AC_DLN_M | <u>Not supported</u> |

NOTE – Different variants of the type exist based on the connectivity packet short address information (sAddr). Underlined information indicates the basic type.

7.3.5 Binary counter reading (BCR)

Table 14 – Binary counter reading common data class specification

| BCR class | | | | | | |
|---|---|----|-------|---------------------|------------|-----------------------|
| Attribute Name | Attribute Type | FC | TrgOp | Value / Value Range | M/O/C | REF-Eth61850 comments |
| DataName | Inherited from Data Class (see IEC 61850-7-2) | | | | | <u>Not supported</u> |
| DataAttribute | | | | | | |
| <i>status</i> | | | | | | |
| actVal | INT128 | ST | dchg | | M | <u>Not supported</u> |
| frVal | INT128 | ST | dupd | | GC_2 (1) | <u>Not supported</u> |
| frTim | TimeStamp | ST | dupd | | GC_2 (1) | <u>Not supported</u> |
| q | Quality | ST | qchg | | M | <u>Not supported</u> |
| t | TimeStamp | ST | | | M | <u>Not supported</u> |
| <i>configuration, description and extension</i> | | | | | | |
| units | Unit | CF | | | O | <u>Not supported</u> |
| pulsQty | FLOAT32 | CF | | | M | <u>Not supported</u> |
| frEna | BOOLEAN | CF | | | GC_2 (1) | <u>Not supported</u> |
| strTim | TimeStamp | CF | | | GC_2 (1) | <u>Not supported</u> |
| frPd | INT32 | CF | | | GC_2 (1) | <u>Not supported</u> |
| frRs | BOOLEAN | CF | | | GC_2 (1) | <u>Not supported</u> |
| d | VISIBLE STRING255 | DC | | | O | <u>Not supported</u> |
| dU | UNICODE STRING255 | DC | | | O | <u>Not supported</u> |
| cdcNs | VISIBLE STRING255 | EX | | | AC_DLNDA_M | <u>Not supported</u> |
| cdcName | VISIBLE STRING255 | EX | | | AC_DLNDA_M | <u>Not supported</u> |
| dataNs | VISIBLE STRING255 | EX | | | AC_DLN_M | <u>Not supported</u> |

7.3.6 Measured value (MV)

Table 15 – Measured value

| MV class | | | | | | |
|------------------------|---|----|-------|---|-------|-----------------------|
| Attribute Name | Attribute Type | FC | TrgOp | Value / Value Range | M/O/C | REF-Eth61850 comments |
| DataName | Inherited from Data Class (see IEC 61850-7-2) | | | | | <u>Supported</u> |
| DataAttribute | | | | | | |
| <i>measured values</i> | | | | | | |
| instMag | AnalogueValue | MX | | | O | <u>Not supported</u> |
| mag | AnalogueValue | MX | dchg | | M | <u>Supported</u> |
| range | ENUMERATED | MX | dchg | normal high low high-high low-low ... | O | <u>Supported</u> |
| q | Quality | MX | qchg | | M | <u>Supported</u> |
| t | TimeStamp | MX | | | M | <u>Supported</u> |

| <i>substitution</i> | | | | | | |
|---|-------------------|----|--|---------------|------------|-----------------------------|
| subEna | BOOLEAN | SV | | | PICS_SUBST | <i>Not supported</i> |
| subMag | AnalogueValue | SV | | | PICS_SUBST | <i>Not supported</i> |
| subQ | Quality | SV | | | PICS_SUBST | <i>Not supported</i> |
| subID | VISIBLE STRING64 | SV | | | PICS_SUBST | <i>Not supported</i> |
| <i>configuration, description and extension</i> | | | | | | |
| units | Unit | CF | | | O | <i>Not supported</i> |
| db | INT32U | CF | | 0 ... 100'000 | O | <i>Not supported</i> |
| zeroDb | INT32U | CF | | 0 ... 100'000 | O | <i>Not supported</i> |
| sVC | ScaledValueConfig | CF | | | AC_SCAV | <i>Not supported</i> |
| rangeC | RangeConfig | CF | | | GC_CON | <i>Supported</i> |
| smpRate | INT32U | CF | | | O | <i>Not supported</i> |
| d | VISIBLE STRING255 | DC | | Text | O | <u><i>Supported</i></u> |
| dU | UNICODE STRING255 | DC | | | O | <u><i>Not Supported</i></u> |
| cdcNs | VISIBLE STRING255 | EX | | | AC_DLNDA_M | <i>Not supported</i> |
| cdcName | VISIBLE STRING255 | EX | | | AC_DLNDA_M | <i>Not supported</i> |
| dataNs | VISIBLE STRING255 | EX | | | AC_DLN_M | <i>Not supported</i> |

NOTE – Different variants of the type exist based on the connectivity packet short address information (sAddr). Underlined information indicates the basic type.

7.3.7 Complex measured value (CMV)

Table 16 – Complex measured value

| CMV class | | | | | | |
|---|---|----|-------|---|------------|-------------------------|
| Attribute Name | Attribute Type | FC | TrgOp | Value / Value Range | M/O/C | REF-Eth61850 comments |
| DataName | Inherited from Data Class (see IEC 61850-7-2) | | | | | <i>Supported</i> |
| DataAttribute | | | | | | |
| <i>measured values</i> | | | | | | |
| instCVal | Vector | MX | | | O | <i>Not supported</i> |
| cVal | Vector | MX | dchg | | M | <u><i>Supported</i></u> |
| range | ENUMERATED | MX | dchg | normal high low high-high low-low ... | O | <i>Supported</i> |
| q | Quality | MX | qchg | | M | <u><i>Supported</i></u> |
| t | TimeStamp | MX | | | M | <u><i>Supported</i></u> |
| <i>substitution</i> | | | | | | |
| subEna | BOOLEAN | SV | | | PICS_SUBST | <i>Not supported</i> |
| subCVal | Vector | SV | | | PICS_SUBST | <i>Not supported</i> |
| subQ | Quality | SV | | | PICS_SUBST | <i>Not supported</i> |
| subID | VISIBLE STRING64 | SV | | | PICS_SUBST | <i>Not supported</i> |
| <i>configuration, description and extension</i> | | | | | | |
| units | Unit | CF | | | O | <i>Not supported</i> |
| db | INT32U | CF | | 0 ... 100'000 | O | <i>Not supported</i> |
| zeroDb | INT32U | CF | | 0 ... 100'000 | O | <i>Not supported</i> |
| rangeC | RangeConfig | CF | | | GC_CON | <i>Supported</i> |
| magSVC | ScaledValueConfig | CF | | | AC_SCAV | <i>Not supported</i> |
| angSVC | ScaledValueConfig | CF | | | AC_SCAV | <i>Not supported</i> |
| angRef | ENUMERATED | CF | | V A other ... | O | <i>Not supported</i> |
| smpRate | INT32U | CF | | | O | <i>Not supported</i> |

| | | | | | | |
|---------|-------------------|----|--|------|------------|----------------------|
| d | VISIBLE STRING255 | DC | | Text | O | <u>Supported</u> |
| dU | UNICODE STRING255 | DC | | | O | <u>Not Supported</u> |
| cdcNs | VISIBLE STRING255 | EX | | | AC_DLNDA_M | <u>Not supported</u> |
| cdcName | VISIBLE STRING255 | EX | | | AC_DLNDA_M | <u>Not supported</u> |
| dataNs | VISIBLE STRING255 | EX | | | AC_DLN_M | <u>Not supported</u> |

NOTE – Different variants of the type exist based on the connectivity packet short address information (sAddr). Underlined information indicates the basic type.

7.3.8 Phase to ground related measured values of a three phase system (WYE)

Table 17 – WYE

| WYE class | | | | | | |
|---|---|----|-------|---|------------|-----------------------|
| Attribute Name | Attribute Type | FC | TrgOp | Value / Value Range | M/O/C | REF-Eth61850 comments |
| DataName | Inherited from Data Class (see IEC 61850-7-2) | | | | | <u>Supported</u> |
| Data | | | | | | |
| phsA | CMV | | | | GC_1 | <u>Supported</u> |
| phsB | CMV | | | | GC_1 | <u>Supported</u> |
| phsC | CMV | | | | GC_1 | <u>Supported</u> |
| neut | CMV | | | | GC_1 | <u>Supported</u> |
| net | CMV | | | | GC_1 | <u>Not supported</u> |
| res | CMV | | | | GC_1 | <u>Not supported</u> |
| DataAttribute | | | | | | |
| <i>configuration, description and extension</i> | | | | | | |
| angRef | ENUMERATED | CF | | Va Vb Vc Aa Ab Ac Vab Vbc Vca Vother Aother | O | <u>Not supported</u> |
| d | VISIBLE STRING255 | DC | | Text | O | <u>Supported</u> |
| dU | UNICODE STRING255 | DC | | | O | <u>Not Supported</u> |
| cdcNs | VISIBLE STRING255 | EX | | | AC_DLNDA_M | <u>Not supported</u> |
| cdcName | VISIBLE STRING255 | EX | | | AC_DLNDA_M | <u>Not supported</u> |
| dataNs | VISIBLE STRING255 | EX | | | AC_DLN_M | <u>Not supported</u> |

NOTE – Different variants of type exist based on the CMV type variant

7.3.9 Delta (DEL)

Table 18 – Delta

| DEL class | | | | | | |
|----------------|---|----|-------|---------------------|-------|-----------------------|
| Attribute Name | Attribute Type | FC | TrgOp | Value / Value Range | M/O/C | REF-Eth61850 comments |
| DataName | Inherited from Data Class (see IEC 61850-7-2) | | | | | <u>Supported</u> |
| Data | | | | | | |
| phsAB | CMV | | | | GC_1 | <u>Supported</u> |
| phsBC | CMV | | | | GC_1 | <u>Supported</u> |
| phsCA | CMV | | | | GC_1 | <u>Supported</u> |

| DataAttribute | | | | | | |
|---|-------------------|----|--|--|------------|----------------------|
| <i>configuration, description and extension</i> | | | | | | |
| AngRef | ENUMERATED | CF | | Va Vb Vc Aa Ab Ac Vab Vbc Vca Vother Aother | O | <i>Not supported</i> |
| D | VISIBLE STRING255 | DC | | Text | O | <u>Supported</u> |
| dU | UNICODE STRING255 | DC | | | O | <u>Not Supported</u> |
| cdcNs | VISIBLE STRING255 | EX | | | AC_DLNDA_M | <i>Not supported</i> |
| cdcName | VISIBLE STRING255 | EX | | | AC_DLNDA_M | <i>Not supported</i> |
| dataNs | VISIBLE STRING255 | EX | | | AC_DLN_M | <i>Not supported</i> |

NOTE – Different variants of type exist based on the CMV type variant

7.3.10 Controllable single point (SPC)

Table 19 – Controllable single point

| SPC class | | | | | | |
|---|---|-----------|-------|---|------------|-----------------------|
| Attribute Name | Attribute Type | FC | TrgOp | Value / Value Range | M/O/C | REF-Eth61850 comments |
| DataName | Inherited from Data Class (see IEC 61850-7-2) | | | | | <i>Supported</i> |
| DataAttribute | | | | | | |
| <i>control and status</i> | | | | | | |
| ctlVal | BOOLEAN | CO | | off (FALSE) on (TRUE) | AC_CO_M | <i>Supported</i> |
| operTim | TimeStamp | CO | | | AC_CO_O | <i>Not supported</i> |
| Origin | Originator | CO, ST | | | AC_CO_O | <i>Not supported</i> |
| ctlNum | INT8U | CO, ST | | 0..255 | AC_CO_O | <i>Not supported</i> |
| stVal | BOOLEAN | ST | dchg | FALSE TRUE | AC_ST | <u>Supported</u> |
| Q | Quality | ST | qchg | | AC_ST | <u>Supported</u> |
| T | TimeStamp | ST | | | AC_ST | <u>Supported</u> |
| stSeld | BOOLEAN | ST | dchg | | AC_CO_O | <i>Not supported</i> |
| <i>Substitution</i> | | | | | | |
| subEna | BOOLEAN | SV | | | PICS_SUBST | <i>Not supported</i> |
| subVal | BOOLEAN | SV | | FALSE TRUE | PICS_SUBST | <i>Not supported</i> |
| subQ | Quality | SV | | | PICS_SUBST | <i>Not supported</i> |
| subID | VISIBLE STRING64 | SV | | | PICS_SUBST | <i>Not supported</i> |
| <i>configuration, description and extension</i> | | | | | | |
| pulseConfig | PulseConfig | CF | | | AC_CO_O | <i>Not supported</i> |
| ctlModel | ENUMERATED | CF | | status-only direct-with-normal-security sbo-with-normal-security direct-with-enhanced-security sbo-with-enhanced-security | M | <u>Supported</u> |
| sboTimeout | INT32U | CF | | | AC_CO_O | <i>Not supported</i> |
| sboClass | ENUMERATED | CF | | operate-once operate-many | AC_CO_O | <i>Not supported</i> |
| d | VISIBLE STRING255 | DC | | Text | O | <u>Supported</u> |
| dU | UNICODE STRING255 | DC | | | O | <u>Not Supported</u> |
| cdcNs | VISIBLE STRING255 | EX | | | AC_DLNDA_M | <i>Not supported</i> |
| cdcName | VISIBLE STRING255 | EX | | | AC_DLNDA_M | <i>Not supported</i> |
| dataNs | VISIBLE STRING255 | EX | | | AC_DLN_M | <u>Supported</u> |

NOTE – Different variants of the type exist based on the control model (ctlModel) and connectivity packet short address information (sAddr). Underlined information indicates the basic type.

7.3.11 Controllable double point (DPC)

Table 20 – Controllable double point

| DPC class | | | | | | |
|---|---|-----------|-------|---|------------|-----------------------|
| Attribute Name | Attribute Type | FC | TrgOp | Value / Value Range | M/O/C | REF-Eth61850 comments |
| DataName | Inherited from Data Class (see IEC 61850-7-2) | | | | | <u>Supported</u> |
| DataAttribute | | | | | | |
| <i>control and status</i> | | | | | | |
| ctIVal | BOOLEAN | CO | | off (FALSE) on (TRUE) | AC_CO_M | <u>Supported</u> |
| operTim | TimeStamp | CO | | | AC_CO_O | <i>Not supported</i> |
| origin | Originator | CO, ST | | | AC_CO_O | <i>Not supported</i> |
| ctINum | INT8U | CO, ST | | 0..255 | AC_CO_O | <i>Not supported</i> |
| stVal | CODED ENUM | ST | dchg | intermediate-state off on bad-state | M | <u>Supported</u> |
| q | Quality | ST | qchg | | M | <u>Supported</u> |
| t | TimeStamp | ST | | | M | <u>Supported</u> |
| stSeld | BOOLEAN | ST | dchg | | AC_CO_O | <u>Supported</u> |
| <i>substitution</i> | | | | | | |
| subEna | BOOLEAN | SV | | | PICS_SUBST | <i>Not supported</i> |
| subVal | CODED ENUM | SV | | intermediate-state off on bad-state | PICS_SUBST | <i>Not supported</i> |
| subQ | Quality | SV | | | PICS_SUBST | <i>Not supported</i> |
| subID | VISIBLE STRING64 | SV | | | PICS_SUBST | <i>Not supported</i> |
| <i>configuration, description and extension</i> | | | | | | |
| pulseConfig | PulseConfig | CF | | | AC_CO_O | <i>Not supported</i> |
| ctIModel | ENUMERATED | CF | | status-only direct-with-normal-security sbo-with-normal-security direct-with-enhanced-security sbo-with-enhanced-security | M | <u>Supported</u> |
| sboTimeout | INT32U | CF | | | AC_CO_O | <i>Not supported</i> |
| sboClass | ENUMERATED | CF | | operate-once operate-many | AC_CO_O | <i>Not supported</i> |
| d | VISIBLE STRING255 | DC | | Text | O | <u>Supported</u> |
| dU | UNICODE STRING255 | DC | | | O | <u>Not Supported</u> |
| cdcNs | VISIBLE STRING255 | EX | | | AC_DLNDA_M | <i>Not supported</i> |
| cdcName | VISIBLE STRING255 | EX | | | AC_DLNDA_M | <i>Not supported</i> |
| dataNs | VISIBLE STRING255 | EX | | | AC_DLN_M | <i>Not supported</i> |

NOTE 1 – Different variants of the type exist based on the control model (ctIModel) and connectivity packet short address information. Underlined information indicates the basic type.

7.3.12 Controllable integer status (INC)

Table 21 – Controllable integer status

| INC class | | | | | | |
|---|---|-----------|-------|---|------------|-----------------------|
| Attribute Name | Attribute Type | FC | TrgOp | Value / Value Range | M/O/C | REF-Eth61850 comments |
| DataName | Inherited from Data Class (see IEC 61850-7-2) | | | | | Supported |
| DataAttribute | | | | | | |
| <i>control and status</i> | | | | | | |
| ctlVal | CtxInt | CO | | | AC_CO_M | Supported |
| operTim | TimeStamp | CO | | | AC_CO_O | Not supported |
| origin | Originator | CO, ST | | | AC_CO_O | Not supported |
| ctlNum | INT8U | CO, ST | | 0..255 | AC_CO_O | Not supported |
| stVal | CtxInt | ST | dchg | | M | <u>Supported</u> |
| q | Quality | ST | qchg | | M | <u>Supported</u> |
| t | TimeStamp | ST | | | M | <u>Supported</u> |
| stSeld | BOOLEAN | ST | dchg | | AC_CO_O | Not supported |
| <i>Substitution</i> | | | | | | |
| subEna | BOOLEAN | SV | | | PICS_SUBST | Not supported |
| subVal | INT32 | SV | | | PICS_SUBST | Not supported |
| subQ | Quality | SV | | | PICS_SUBST | Not supported |
| subID | VISIBLE STRING64 | SV | | | PICS_SUBST | Not supported |
| <i>configuration, description and extension</i> | | | | | | |
| ctlModel | ENUMERATED | CF | | status-only direct-with-normal-security sbo-with-normal-security direct-with-enhanced-security sbo-with-enhanced-security | M | <u>Supported</u> |
| sboTimeout | INT32U | CF | | | AC_CO_O | Not supported |
| sboClass | ENUMERATED | CF | | operate-once operate-many | AC_CO_O | Not supported |
| minVal | INT32 | CF | | | O | Not supported |
| maxVal | INT32 | CF | | | O | Not supported |
| stepSize | INT32U | CF | | 1 ... (maxVal – minVal) | O | Not supported |
| d | VISIBLE STRING255 | DC | | Text | O | <u>Supported</u> |
| dU | UNICODE STRING255 | DC | | | O | <u>Not Supported</u> |
| cdcNs | VISIBLE STRING255 | EX | | | AC_DLNDA_M | (Supported) See NOTE. |
| cdcName | VISIBLE STRING255 | EX | | | AC_DLNDA_M | Not supported |
| dataNs | VISIBLE STRING255 | EX | | | AC_DLN_M | Supported |

NOTE – Different variants of the type exist based on the control model (ctlModel) and connectivity packet short address information (sAddr). Underlined information indicates the basic type.

NOTE – cdcNs only used for the LD0.Mod diagnostics. It is not possible to change it.

7.3.13 Binary controlled step position information (BSC)

Table 22 – Binary controlled step position information

| BSC class | | | | | | |
|---|---|-----------|-------|---|------------|-----------------------|
| Attribute Name | Attribute Type | FC | TrgOp | Value / Value Range | M/O/C | REF-Eth61850 comments |
| DataName | Inherited from Data Class (see IEC 61850-7-2) | | | | | <i>Not supported</i> |
| DataAttribute | | | | | | |
| <i>control and status</i> | | | | | | |
| ctIVal | CODED ENUM | CO | | stop lower higher reserved | AC_CO_M | <i>Not supported</i> |
| operTim | TimeStamp | CO | | | AC_CO_O | <i>Not supported</i> |
| origin | Originator | CO, ST | | | AC_CO_O | <i>Not supported</i> |
| ctINum | INT8U | CO, ST | | 0..255 | AC_CO_O | <i>Not supported</i> |
| valWTr | ValWithTrans | ST | dchg | | AC_ST | <i>Not supported</i> |
| q | Quality | ST | qchg | | AC_ST | <i>Not supported</i> |
| t | TimeStamp | ST | | | AC_ST | <i>Not supported</i> |
| stSeld | BOOLEAN | ST | dchg | | AC_CO_O | <i>Not supported</i> |
| <i>substitution</i> | | | | | | |
| subEna | BOOLEAN | SV | | | PICS_SUBST | <i>Not supported</i> |
| subVal | ValWithTrans | SV | | | PICS_SUBST | <i>Not supported</i> |
| subQ | Quality | SV | | | PICS_SUBST | <i>Not supported</i> |
| subID | VISIBLE STRING64 | SV | | | PICS_SUBST | <i>Not supported</i> |
| <i>configuration, description and extension</i> | | | | | | |
| persistent | BOOLEAN | CF | | | M | <i>Not supported</i> |
| ctIModel | ENUMERATED | CF | | status-only direct-with-normal-security sbo-with-normal-security direct-with-enhanced-security sbo-with-enhanced-security | M | <i>Not supported</i> |
| sboTimeout | INT32U | CF | | | AC_CO_O | <i>Not supported</i> |
| sboClass | ENUMERATED | CF | | operate-once operate-many | AC_CO_O | <i>Not supported</i> |
| minVal | INT8 | CF | | | O | <i>Not supported</i> |
| maxVal | INT8 | CF | | | O | <i>Not supported</i> |
| stepSize | INT8U | CF | | 1 ... (maxVal – minVal) | O | <i>Not supported</i> |
| d | VISIBLE STRING255 | DC | | Text | O | <i>Not supported</i> |
| dU | UNICODE STRING255 | DC | | | O | <i>Not supported</i> |
| cdcNs | VISIBLE STRING255 | EX | | | AC_DLNDA_M | <i>Not supported</i> |
| cdcName | VISIBLE STRING255 | EX | | | AC_DLNDA_M | <i>Not supported</i> |
| dataNs | VISIBLE STRING255 | EX | | | AC_DLN_M | <i>Not supported</i> |

NOTE – Different variants of the type exist based on the control model (ctIModel) and connectivity packet short address information. Underlined information indicates the basic type.

7.3.14 Integer controlled step position information (ISC)

Table 23 – Integer controlled step position information

| ISC class | | | | | | |
|---|---|-----------|-------|---|------------|-----------------------|
| Attribute Name | Attribute Type | FC | TrgOp | Value / Value Range | M/O/C | REF-Eth61850 comments |
| DataName | Inherited from Data Class (see IEC 61850-7-2) | | | | | Not supported |
| DataAttribute | | | | | | |
| <i>control and status</i> | | | | | | |
| ctIVal | INT8 | CO | | -64 ... 63 | AC_CO_M | Not supported |
| operTim | TimeStamp | CO | | | AC_CO_O | Not supported |
| origin | Originator | CO, ST | | | AC_CO_O | Not supported |
| ctINum | INT8U | CO, ST | | 0..255 | AC_CO_O | Not supported |
| valWTr | ValWithTrans | ST | dchg | | AC_ST | Not supported |
| q | Quality | ST | qchg | | AC_ST | Not supported |
| t | TimeStamp | ST | | | AC_ST | Not supported |
| stSeld | BOOLEAN | ST | dchg | | AC_CO_O | Not supported |
| <i>substitution</i> | | | | | | |
| subEna | BOOLEAN | SV | | | PICS_SUBST | Not supported |
| subVal | ValWithTrans | SV | | | PICS_SUBST | Not supported |
| subQ | Quality | SV | | | PICS_SUBST | Not supported |
| subID | VISIBLE STRING64 | SV | | | PICS_SUBST | Not supported |
| <i>configuration, description and extension</i> | | | | | | |
| ctIModel | ENUMERATED | CF | | status-only direct-with-normal-security sbo-with-normal-security direct-with-enhanced-security sbo-with-enhanced-security | M | Not supported |
| sboTimeout | INT32U | CF | | | AC_CO_O | Not supported |
| sboClass | ENUMERATED | CF | | operate-once operate-many | AC_CO_O | Not supported |
| minVal | INT8 | CF | | | O | Not supported |
| maxVal | INT8 | CF | | | O | Not supported |
| stepSize | INT8U | CF | | 1 ... (maxVal – minVal) | O | Not supported |
| d | VISIBLE STRING255 | DC | | Text | O | Not supported |
| dU | UNICODE STRING255 | DC | | | O | Not supported |
| cdcNs | VISIBLE STRING255 | EX | | | AC_DLNDA_M | Not supported |
| cdcName | VISIBLE STRING255 | EX | | | AC_DLNDA_M | Not supported |
| dataNs | VISIBLE STRING255 | EX | | | AC_DLN_M | Not supported |

NOTE – Status-only only supported for the ctIModel.

7.3.15 Device name plate (DPL)

Table 24 – Device name plate common data class specification

| DPL class | | | | | | |
|---|---|----|-------|---------------------|------------|-----------------------|
| Attribute Name | Attribute Type | FC | TrgOp | Value / Value Range | M/O/C | REF-Eth61850 comments |
| DataName | Inherited from Data Class (see IEC 61850-7-2) | | | | | Supported |
| DataAttribute | | | | | | |
| <i>configuration, description and extension</i> | | | | | | |
| vendor | VISIBLE STRING255 | DC | | | M | Supported |
| hwRev | VISIBLE STRING255 | DC | | | O | Supported |
| swRev | VISIBLE STRING255 | DC | | | O | Supported |
| serNum | VISIBLE STRING255 | DC | | | O | Supported |
| model | VISIBLE STRING255 | DC | | | O | Not supported |
| location | VISIBLE STRING255 | DC | | | O | Supported |
| cdcNs | VISIBLE STRING255 | EX | | | AC_DLNDA_M | Not supported |
| cdcName | VISIBLE STRING255 | EX | | | AC_DLNDA_M | Not supported |
| dataNs | VISIBLE STRING255 | EX | | | AC_DLN_M | Not supported |

7.3.16 Logical node name plate (LPL).

Table 25 – Logical node name plate common data class specification

| LPL class | | | | | | |
|---|---|----|-------|--|------------|-----------------------|
| Attribute Name | Attribute Type | FC | TrgOp | Value / Value Range | M/O/C | REF-Eth61850 comments |
| DataName | Inherited from Data Class (see IEC 61850-7-2) | | | | | Supported |
| DataAttribute | | | | | | |
| <i>configuration, description and extension</i> | | | | | | |
| vendor | VISIBLE STRING255 | DC | | | M | Supported |
| swRev | VISIBLE STRING255 | DC | | | M | Supported |
| d | VISIBLE STRING255 | DC | | | M | Supported |
| dU | UNICODE STRING255 | DC | | | O | Not Supported |
| configRev | VISIBLE STRING255 | DC | | | AC_LNO_M | Supported |
| ldNs | VISIBLE STRING255 | EX | | shall be included in LLNO only; e.g. "IEC61850-7-4:2002" | AC_LNO_M | Supported |
| lnNs | VISIBLE STRING255 | EX | | | AC_DLD_M | Supported |
| cdcNs | VISIBLE STRING255 | EX | | | AC_DLNDA_M | Not supported |
| cdcName | VISIBLE STRING255 | EX | | | AC_DLNDA_M | Not supported |
| dataNs | VISIBLE STRING255 | EX | | | AC_DLN_M | Not supported |

NOTE – For lnNs the value (val) needs to be set after specific short address (sAddr)

7.4 Common Data Classes Device Extensions

7.4.1 Redundancy Supervision Status (RSS).

Table 26 Redundancy Supervision Status common data class specification

| RSS class | | | | | | |
|---|---|----|-------|---------------------|------------|-----------------------|
| Attribute Name | Attribute Type | FC | TrgOp | Value / Value Range | M/O/C | REF-Eth61850 comments |
| DataName | Inherited from Data Class (see IEC 61850-7-2) | | | | | Supported |
| DataAttribute | | | | | | |
| <i>configuration, description and extension</i> | | | | | | |
| stValA | BOOLEAN | ST | dchg | | M | Supported |
| stValB | BOOLEAN | ST | dchg | | M | Supported |
| q | Quality | ST | qchg | | M | Supported |
| t | TimeStamp | ST | | | M | Supported |
| errRateA | INT32U | ST | | | M | Supported |
| ErrRateB | INT32U | ST | | | M | Supported |
| addr | VISIBLE STRING255 | CF | | | M | Supported |
| d | VISIBLE STRING255 | DC | | | M | Supported |
| dU | UNICODE STRING255 | DC | | | O | Not Supported |
| configRev | VISIBLE STRING255 | DC | | | AC_LN0_M | Supported |
| InNs | VISIBLE STRING255 | EX | | | AC_DLD_M | Supported |
| cdcNs | VISIBLE STRING255 | EX | | | AC_DLNDA_M | Supported |
| cdcName | VISIBLE STRING255 | EX | | | AC_DLNDA_M | Supported |
| dataNs | VISIBLE STRING255 | EX | | | AC_DLN_M | Supported |

7.4.2 Data Attribute Semantic

Table 27 Semantics of data attributes

| Data attribute name | Semantics |
|---------------------|---|
| StValA | TRUE FALSE: channel A link is up and at least 1 frame is received in the last 10 seconds. |
| StValB | TRUE FALSE: channel B link is up and at least 1 frame is received in the last 10 seconds. |
| ErrRateA | Error rate in channel A, errors per 1000 telegrams. Valid only for PRP. |
| ErrRateB | Error rate in channel B, errors per 1000 telegrams. Valid only for PRP. |
| addr | IP address of supervised source, or empty |

7.5 Logical Node conformance statement

The following table shows logical node classes that are supported:

| Logical Node | Supported |
|---|-----------|
| Logical Nodes for management functions LN Group: L | |
| LN: Physical device information Name: LPHD | X |
| LN: Logical node zero Name: LLN0 | X |

| Logical Node | Supported |
|---|-----------|
| Logical Nodes for protection functions LN Group: P | |
| LN: Differential Name: PDIF | X |
| LN: Direction comparison Name: PDIR | |
| LN: Distance Name: PDIS | |
| LN: Directional overpower Name: PDOP | X |
| LN: Directional underpower Name: PDUP | X |
| LN: Rate of change of frequency Name: PFRC | |
| LN: Harmonic restraint Name: PHAR | X |
| LN: Ground detector Name: PHIZ | |
| LN: Instantaneous overcurrent Name: PIOC | X |
| LN: Motor restart inhibition Name: PMRI | X |
| LN: Motor starting time supervision Name: PMSS | X |
| LN: Over power factor Name: POPF | |
| LN: Phase angle measuring Name: PPAM | |
| LN: Protection scheme Name: PSCH | |
| LN: Sensitive directional earthfault Name: PSDE | X |
| LN: Transient earth fault Name: PTEF | |
| LN: Time overcurrent Name: PTOC | X |
| LN: Over frequency Name: PTOF | |
| LN: Overvoltage Name: PTOV | X |
| LN: Protection trip conditioning Name: PTRC | X |
| LN: Thermal overload Name: PTTR | X |
| LN: Undercurrent Name: PTUC | |
| LN: Undervoltage Name: PTUV | X |
| LN: Under power factor Name: PUPF | |
| LN: Under frequency Name: PTUF | X |
| LN: Voltage controlled time overcurrent Name: PVOC | |
| LN: Volts per Hz Name: PVPH | |
| LN: Zero speed or underspeed Name: PZSU | |

| Logical Node | Supported |
|---|-----------|
| Logical Nodes for protection related functions LN Group: R | |
| LN: Disturbance recorder function Name: RDRE | |
| LN: Disturbance recorder channel analogue Name: RADR | |
| LN: Disturbance recorder channel binary Name: RBDR | |
| LN: Disturbance record handling Name: RDRS | |
| LN: Breaker failure Name: RBRF | |
| LN: Directional element Name: RDIR | |
| LN: Fault locator Name: RFLO | |
| LN: Power swing detection/blocking Name: RPSB | |
| LN: Autoreclosing Name: RREC | X |
| LN: Synchronism-check or synchronising Name: RSYN | X |
| Logical Nodes for control LN Group: C | |
| LN: Alarm handling Name: CALH | |
| LN: Cooling Group Control Name: CCGR | |
| LN: Interlocking Name: CILO | X |
| LN: Point-on-wave switching Name: CPOW | |
| LN: Switch controller Name: CSWI | X |
| Logical nodes for generic references LN Group: G | |
| LN: Generic automatic process control Name: GAPC | |
| LN: Generic process I/O Name: GGIO | X |
| LN: Generic security application Name: GSAL | |
| Logical Nodes for interfacing and archiving LN Group: I | |
| LN: Archiving Name: IARC | |
| LN: Human machine interface Name: IHMI | |
| LN: Telecontrol interface Name: ITCI | |
| LN: Telemonitoring interface Name: ITMI | |
| Logical Nodes for automatic control LN Group: A | |
| LN: Neutral current regulator Name: ANCR | |
| LN: Reactive power control Name: ARCO | |
| LN: Automatic tap changer controller Name: ATCC | |
| LN: Voltage control Name: AVCO | |
| Logical Nodes for metering and measurement LN Group: M | |
| LN: Differential measurements Name: MDIF | |
| LN: Harmonics or interharmonics Name: MHAI | |
| LN: Non phase related harmonics or interharmonics Name: MHAN | |
| LN: Metering Name: MMTR | |
| LN: Non phase related Measurement Name: MMXN | |
| LN: Measurement Name: MMXU | X |
| LN: Sequence & imbalance Name: MSQI | |
| LN: Metering Statistics Name: MSTA | |

| Logical Node | Supported |
|---|-----------|
| Logical Nodes for sensors and monitoring LN Group: S | |
| LN: Monitoring and diagnostics for arcs Name: SARC | |
| LN: Insulation medium supervision (gas) Name: SIMG | X |
| LN: Insulation medium supervision (liquid) Name: SIML | |
| LN: Monitoring and diagnostics for partial discharges Name: SPDC | |
| Logical Nodes for switchgear LN Group: X | |
| LN: Circuit breaker Name: XCBR | X |
| LN: Circuit switch Name: XSWI | X |
| Logical Nodes for instrument transformers LN Group: T | |
| LN: Current transformer Name: TCTR | |
| LN: Voltage transformer Name: TVTR | |
| Logical Nodes for power transformers LN Group: Y | |
| LN: Earth fault neutralizer (Petersen coil) Name: YEFN | |
| LN: Tap changer Name: YLTC | |
| LN: Power shunt Name: YPSH | |
| LN: Power transformer Name: YPTR | |
| Logical Nodes for Further Power System Equipment LN Group: Z | |
| LN: Auxiliary network Name: ZAXN | |
| LN: Battery Name: ZBAT | |
| LN: Bushing Name: ZBSH | |
| LN: Power cable Name: ZCAB | |
| LN: Capacitor bank Name: ZCAP | |
| LN: Converter Name: ZCON | |
| LN: Generator Name: ZGEN | |
| LN: Gas insulated line Name: ZGIL | |
| LN: Power overhead line Name: ZLIN | |
| LN: Motor Name: ZMOT | |
| LN: Reactor Name: ZREA | |
| LN: Rotating reactive component Name: ZRRC | |
| LN: Surge arrester Name: ZSAR | |
| LN: Thyristor controlled frequency converter Name: ZTCF | |
| LN: Thyristor controlled reactive component Name: ZTCR | |

Table 28 Supported logical node classes

7.6 System Logical Nodes LN Group: L

System Logical Nodes LN Group: L

7.6.1 LN: Physical device information Name: LPHD

| LPHD class | | | | |
|-------------------|------------|---|-------|------------------|
| Attribute Name | Attr. Type | Explanation | M / O | REF-Eth61850 |
| LNNName | | Shall be inherited from Logical-Node Class (see7-2). | | |
| Data | | | | |
| PhyName | DPL | Physical device name plate | M | Y |
| PhyHealth | INS | Physical device health | M | Y |
| OutOv | SPS | Output communications buffer overflow | O | N |
| Proxy | SPS | Indicates if this LN is a proxy | M | Y |
| InOv | SPS | Input communications buffer overflow | O | Y |
| NumPwrUp | INS | Number of Power ups | O | N |
| WrmStr | INS | Number of Warm Starts | O | N |
| WacTrg | INS | Number of watchdog device resets detected | O | N |
| PwrUp | SPS | Power Up detected | O | N |
| PwrDn | SPS | Power Down detected | O | N |
| PwrSupAlm | SPS | External power supply alarm | O | N |
| RsStat | SPC | Reset device statistics | O | N |
| Device Extensions | | | | |
| SrcSt | RSS | Status values of Ethernet communication port 1 and port 2 | | Y ⁽¹⁾ |

(1) only present for LD0.LPHD

7.6.2 Common Logical Node

| Common Logical Node class | | | | |
|---|------------|---|-------|--------------|
| Attribute Name | Attr. Type | Explanation | M / O | REF-ETH61850 |
| LNNName | | Shall be inherited from Logical-Node Class (see-7-2). | | |
| Data | | | | |
| <i>Mandatory Logical Node Information (Shall be inherited by ALL LN but LPHD)</i> | | | | |
| Mod | INC | Mode | M | Y |
| Beh | INS | Behaviour | M | Y |
| Health | INS | Health | M | Y |
| NamPlt | LPL | Name Plate | M | Y |
| <i>Optional Logical Node Information</i> | | | | |
| Loc | SPS | Local operation | O | N |
| EEHealth | INS | External equipment health | O | N |
| EEName | DPL | External equipment name plate | O | N |
| OpCntRs | INC | Operation counter resetable | O | N |
| OpCnt | INS | Operation counter | O | N |
| OpTmh | INS | Operation time | O | N |

7.6.3 LN: Logical node zero

Name: LLN0

| LLN0 class | | | | |
|---|------------|---|-------|------------------|
| Attribute Name | Attr. Type | Explanation | M / O | REF-ETH61850 |
| LNNName | | Shall be inherited from Logical-Node Class (see-7-2). | | |
| Data | | | | |
| <i>Common Logical Node Information</i> | | | | |
| LN shall inherit all Mandatory Data from Common Logical Node Class. | | | M | Y |
| Loc | SPS | Local operation for complete logical device | O | Y ⁽¹⁾ |
| OpTmh | INS | Operation time | O | N |
| <i>Controls</i> | | | | |
| Diag | SPC | Run Diagnostics | O | N |
| LEDRs | SPC | LED reset | O | Y ⁽¹⁾ |

(1) only present for LD1.LLN0

7.7 Logical Nodes for protection functions LN Group: P

The relationship between this IEC61850 and the REF542plus functions is done by the SPA channel number. The SPA channel number is taken for the Logical Node instance (inst) number. All SPA register with no relationship to the LN Group P are present under a GGIO with the same Logical Node instance (inst) number similar to the P LN.

For example SPA channel number = **52** (Overcurrent definite time, high set) will be found in the IEC61850 world as:

DTH PTOC **52** and
DTHOI GGIO **52**.

7.7.1 LN: Differential Name: PDIF

| PDIF class | | | | |
|--|------------|---|-------|------------------|
| Attribute Name | Attr. Type | Explanation | M / O | REF-ETH61850 |
| LNNName | | Shall be inherited from Logical-Node Class (see IEC 61850-7-2). | | |
| Data | | | | |
| Common Logical Node Information | | | | |
| LN shall inherit all Mandatory Data from Common Logical Node Class | | | M | Y |
| OpCntRs | INC | Resetable operation counter operate general | O | Y |
| Status Information | | | | |
| Str | ACD | Start | O | Y ⁽²⁾ |
| Op | ACT | Operate | M | Y |
| TmASSt | CSD | Active curve characteristic | O | N |
| Measured Values | | | | |
| DifACIc | WYE | Differential Current | O | N |
| RstA | WYE | Restraint Current | O | N |
| Settings | | | | |
| LinCapac | ASG | Line capacitance (for load currents) | O | N |
| LoSet | ING | Low operate value, percentage of the nominal current | O | N |
| HiSet | ING | High operate value, percentage of the nominal current | O | N |
| MinOpTmms | ING | Minimum Operate Time | O | N |
| MaxOpTmms | ING | Maximum Operate Time | O | N |
| RstMod | ING | Restraint Mode | O | N |
| RsDITmms | ING | Reset Delay Time | O | N |
| TmACrv | CURVE | Operating Curve Type | O | N |
| Device Extensions | | | | |
| BlkOpn | SPC | Block opening | M | Y ⁽¹⁾ |
| OpCntRsStr | INC | Resetable start counter general | O | Y ⁽²⁾ |

Used for the following protection functions:

| | | |
|-----------------------|------------------------------------|------------------------------------|
| SPA channel number 79 | Differential protection | this function supports (1) |
| SPA channel number 95 | Restricted differential protection | this function supports (1) and (2) |

7.7.2 LN: Directional overpower Name: PDOP

| PDOP class | | | | |
|---|------------|---|-------|------------------|
| Attribute Name | Attr. Type | Explanation | M / O | REF-ETH61850 |
| LNNName | | Shall be inherited from Logical-Node Class (see IEC 61850-7-2). | | |
| Data | | | | |
| Common Logical Node Information | | | | |
| LN shall inherit all Mandatory Data from Common Logical Node Class. | | | M | Y |
| OpCntRs | INC | Resetable operation counter operate general | O | Y |
| Status Information | | | | |
| Str | ACD | Start | M | Y |
| Op | ACT | Operate | M | Y |
| Settings | | | | |
| DirMod | ING | Directional Mode | O | N |
| StrVal | ASG | Start Value | O | N |
| OpDITmms | ING | Operate Delay Time | O | N |
| RsDITmms | ING | Reset Delay Time | O | N |
| Device Extensions | | | | |
| BlkOpn | SPC | Block opening | M | Y ⁽¹⁾ |
| OpCntRsStr | INC | Resetable start counter general | O | Y ⁽¹⁾ |

Used for the following protection functions:

SPA channel number 76 Directional power protection this function supports (1)

7.7.3 LN: Directional underpower Name: PDUP

| PDUP class | | | | |
|---|------------|---|-------|------------------|
| Attribute Name | Attr. Type | | M / O | REF-ETH61850 |
| LNNName | | Shall be inherited from Logical-Node Class (see-7-2). | | |
| Data | | | | |
| Common Logical Node Information | | | | |
| LN shall inherit all Mandatory Data from Common Logical Node Class. | | | M | Y |
| OpCntRs | INC | Resetable operation counter operate general | O | Y |
| Status Information | | | | |
| Str | ACD | Start | M | Y |
| Op | ACT | Operate | M | Y |
| Settings | | | | |
| StrVal | ASG | Start Value | M | N |
| OpDITmms | ING | Operate Delay Time | O | N |
| RsDITmms | ING | Reset Delay Time | O | N |
| DirMod | ING | Directional Mode | O | N |
| Device Extensions | | | | |
| BlkOpn | SPC | Block opening | M | Y ⁽¹⁾ |
| OpCntRsStr | INC | Resetable start counter general | O | Y ⁽¹⁾ |

Used for the following protection functions:
SPA channel number 77 Low load protection this function supports (1)

7.7.4 LN: Instantaneous overcurrent Name: PIOC

| PIOC class | | | | |
|---|------------|---|-------|------------------|
| Attribute Name | Attr. Type | Explanation | M / O | REF-ETH61850 |
| LNNName | | Shall be inherited from Logical-Node Class (see-7-2). | | |
| Data | | | | |
| Common Logical Node Information | | | | |
| LN shall inherit all Mandatory Data from Common Logical Node Class. | | | M | Y |
| OpCntRs | INC | Resetable operation counter operate general | O | Y |
| Status Information | | | | |
| Str | ACD | Start | O | Y |
| Op | ACT | Operate | M | Y |
| Settings | | | | |
| StrVal | ASG | Start Value | O | N |
| Device Extensions | | | | |
| BlkOpn | SPC | Block opening | M | Y ⁽¹⁾ |
| OpCntRsA | INC | Resetable start counter phase A | O | Y ⁽²⁾ |
| OpCntRsB | INC | Resetable start counter phase B | O | Y ⁽²⁾ |
| OpCntRsC | INC | Resetable start counter phase C | O | Y ⁽²⁾ |
| OpCntRsStr | INC | Resetable start counter general | O | Y ⁽¹⁾ |

Used for the following protection functions:

SPA channel number 50 Inrush blocking
SPA channel number 51 Overcurrent instantaneous

this function supports (1) and (2)

this function supports (1) and (2)

7.7.5 LN: Motor restart inhibition

Name: PMRI

| PMRI class | | | | |
|---|------------|---|-------|------------------|
| Attribute Name | Attr. Type | Explanation | M / O | REF- Eth61850 |
| LNNName | | Shall be inherited from Logical-Node Class (see IEC 61850-7-2). | | |
| Data | | | | |
| <i>Common Logical Node Information</i> | | | | |
| LN shall inherit all Mandatory Data from Common Logical Node Class. | | | M | Y |
| OpCntRs | INC | Resetable operation counter operate general | O | Y |
| <i>Status Information</i> | | | | |
| Op | ACT | Operate | O | Y |
| StrInh | SPS | Restart inhibited | O | N |
| StrInhTmm | INS | Restart Inhibition Time | O | N |
| <i>Settings</i> | | | | |
| SetA | ASG | Current setting for motor start-up | O | N |
| SetTms | ING | Time Setting for motor start-up | O | N |
| MaxNumStr | ING | Maximum number of starts (also for cold starts) | O | N |
| MaxWrmStr | ING | Maximum Warm Starts, permissible number of warm starts | O | N |
| MaxStrTmm | ING | Time period for the maximum number of starts | O | N |
| EqTmm | ING | Temperature Equalisation Time | O | N |
| InhTmm | ING | Restart Inhibit Time | O | N |
| <i>Device Extensions</i> | | | | |
| BlkOpn | SPC | Block opening | M | Y |

Used for the following protection functions:

SPA channel number 87 Number of Starts

7.7.6 LN: Motor starting time supervision Name: PMSS

| PMSS class | | | | |
|--|------------|---|-------|------------------|
| Attribute Name | Attr. Type | Explanation | M / O | REF- Eth61850 |
| LNNName | | Shall be inherited from Logical-Node Class (see IEC 61850-7-2). | | |
| Data | | | | |
| <i>Common Logical Node Information</i> | | | | |
| | | LN shall inherit all Mandatory Data from Common Logical Node Class. | M | Y |
| OpCntRs | INC | Resetable operation counter operate general | O | Y |
| <i>Status Information</i> | | | | |
| Str | ACD | Start | O | Y |
| Op | ACT | Operate | O | Y |
| <i>Settings</i> | | | | |
| SetA | ASG | Current setting for motor start-up | O | N |
| SetTms | ING | Time Setting for motor start-up | O | N |
| MotStr | ASG | I Motor Startup, (current pickup value of motor starting) | O | N |
| LokRotTms | ING | Lock Rotor Time, permissible locked rotor time | O | N |
| <i>Device Extensions</i> | | | | |
| BlkOpn | SPC | Block opening | M | Y ⁽¹⁾ |
| OpCntRsA | INC | Resetable start counter phase A | O | Y ⁽²⁾ |
| OpCntRsB | INC | Resetable start counter phase B | O | Y ⁽²⁾ |
| OpCntRsC | INC | Resetable start counter phase C | O | Y ⁽²⁾ |
| OpCntRsStr | INC | Resetable start counter general | O | Y ⁽¹⁾ |

Used for the following protection functions:

| | | |
|-----------------------|--------------------------|------------------------------------|
| SPA channel number 80 | Motorstart protection | this function supports (1) |
| SPA channel number 86 | Blocked rotor protection | this function supports (1) and (2) |

7.7.7 LN: Sensitive directional earthfault Name: PSDE

| PSDE class | | | | |
|---|------------|---|-------|------------------|
| Attribute Name | Attr. Type | Explanation | M / O | REF- Eth61850 |
| LNNName | | Shall be inherited from Logical-Node Class (see IEC 61850-7-2). | | |
| Data | | | | |
| <i>Common Logical Node Information</i> | | | | |
| LN shall inherit all Mandatory Data from Common Logical Node Class. | | | M | Y |
| OpCntRs | INC | Resetable operation counter operate general | O | Y |
| <i>Status Information</i> | | | | |
| Str | ACD | Start | M | Y |
| Op | ACT | Operate | O | Y |
| <i>Settings</i> | | | | |
| Ang | ASG | Angle between voltage (U0) and current (I0) | O | N |
| GndStr | ASG | Ground Start Value (3U0) | O | N |
| GndOp | ASG | Ground Operate Value (3I0) | O | N |
| StrDITmms | ING | Start Delay Time | O | N |
| OpDITmms | ING | Operate Delay Time | O | N |
| DirMod | ING | Directional Mode | O | N |
| <i>Device Extensions</i> | | | | |
| BlkOpn | SPC | Block opening | M | Y ⁽¹⁾ |
| OpCntRsStr | INC | Resetable start counter general | O | Y ⁽¹⁾ |

Used for the following protection functions:

SPA channel number 88 Sensitive Earthfault directional this function supports (1)

7.7.8 LN: Time overcurrent Name: PTOC

| PTOC class | | | | |
|---|------------|---|-------|------------------|
| Attribute Name | Attr. Type | Explanation | M / O | REF- Eth61850 |
| LNName | | Shall be inherited from Logical-Node Class (see-7-2). | | |
| Data | | | | |
| Common Logical Node Information | | | | |
| LN shall inherit all Mandatory Data from Common Logical Node Class. | | | M | Y |
| OpCntRs | INC | Resetable operation counter operate general | O | Y |
| Status Information | | | | |
| Str | ACD | Start | M | Y |
| Op | ACT | Operate | M | Y |
| TmASt | CSD | Active curve characteristic | O | N |
| Settings | | | | |
| TmAcrv | CURVE | Operating Curve Type | O | N |
| StrVal | ASG | Start Value | O | N |
| TmMult | ASG | Time Dial Multiplier | O | N |
| MinOpTmms | ING | Minimum Operate Time | O | N |
| MaxOpTmms | ING | Maximum Operate Time | O | N |
| OpDITmms | ING | Operate Delay Time | O | N |
| TypRsCrv | ING | Type of Reset Curve | O | N |
| RsDITmms | ING | Reset Delay Time | O | N |
| DirMod | ING | Directional Mode | O | N |
| Device Extensions | | | | |
| BlkOpn | SPC | Block opening | M | Y ⁽¹⁾ |
| OpCntRsA | INC | Resetable start counter phase A | O | Y ⁽²⁾ |
| OpCntRsB | INC | Resetable start counter phase B | O | Y ⁽²⁾ |
| OpCntRsC | INC | Resetable start counter phase C | O | Y ⁽²⁾ |
| OpCntRsStr | INC | Resetable start counter general | O | Y ⁽¹⁾ |
| OpCntRsN | INC | Resetable start counter neut | O | Y ⁽³⁾ |

Used for the following protection functions:

| | | |
|----------------------------|---------------------------------------|------------------------------------|
| SPA channel number 52 | Overcurrent definite time, high set | this function supports (1) and (2) |
| SPA channel number 53 | Overcurrent definite time, low set | this function supports (1) and (2) |
| SPA channel number 54 | Overcurrent directional, high set | this function supports (1) and (2) |
| SPA channel number 55 | Overcurrent directional, low set | this function supports (1) and (2) |
| SPA channel number 56 | Overcurrent IDMT normally inverse | this function supports (1) and (2) |
| SPA channel number 57 | Overcurrent IDMT Very inverse | this function supports (1) and (2) |
| SPA channel number 58 | Overcurrent IDMT Extremely inverse | this function supports (1) and (2) |
| SPA channel number 59 | Overcurrent IDMT Long-time inverse | this function supports (1) and (2) |
| SPA channel number 66 | Earthfault non-directional, high set | this function supports (1) |
| SPA channel number 67 | Earthfault non-directional, low set | this function supports (1) |
| SPA channel number 68 | Earthfault IDMT Normal Inverse | this function supports (1) |
| SPA channel number 69 | Earthfault IDMT Very Inverse | this function supports (1) |
| SPA channel number 70 | Earthfault IDMT Extremely Inverse | this function supports (1) |
| SPA channel number 71 | Earthfault IDMT Long time Inverse | this function supports (1) |
| SPA channel number 72 | Earthfault directional, high set | this function supports (1) |
| SPA channel number 73 | Earthfault directional, low set | this function supports (1) |
| SPA channel number 75 | Asymmetrical load (Unbalanced load I) | this function supports (1) |
| SPA channel number 190-199 | Earthfault directional sector | this function supports (1) |
| SPA channel number 200-207 | Earthfault directional sector | this function supports (1) and (2) |
| SPA channel number 210-217 | Overcurrent directional | this function supports (1) and (2) |

SPA channel number 220-227 Earthfault non-directional
SPA channel number 230-237 Earthfault directional

this function supports (1) and (3)
this function supports (1) and (3)

7.7.9 LN: Overvoltage Name: PTOV

| PTOV class | | | | |
|---|------------|---|-------|------------------|
| Attribute Name | Attr. Type | Explanation | M / O | REF- Eth61850 |
| LNNName | | Shall be inherited from Logical-Node Class (see-7-2). | | |
| Data | | | | |
| Common Logical Node Information | | | | |
| LN shall inherit all Mandatory Data from Common Logical Node Class. | | | M | Y |
| OpCntRs | INC | Resetable operation counter operate general | O | Y |
| Status Information | | | | |
| Str | ACD | Start | M | Y |
| Op | ACT | Operate | O | Y |
| TmVSt | CSD | Active curve characteristic | O | N |
| Settings | | | | |
| TmVCrv | CURVE | Operating Curve Type | O | N |
| StrVal | ASG | Start Value | O | N |
| TmMult | ASG | Time Dial Multiplier | O | N |
| MinOpTmms | ING | Minimum Operate Time | O | N |
| MaxOpTmms | ING | Maximum Operate Time | O | N |
| OpDlTmms | ING | Operate Delay Time | O | N |
| RsDlTmms | ING | Reset Delay Time | O | N |
| Device Extensions | | | | |
| BlkOpn | SPC | Block opening | M | Y ⁽¹⁾ |
| OpCntRsA | INC | Resetable start counter phase A | O | Y ⁽²⁾ |
| OpCntRsB | INC | Resetable start counter phase B | O | Y ⁽²⁾ |
| OpCntRsC | INC | Resetable start counter phase C | O | Y ⁽²⁾ |
| OpCntRsStr | INC | Resetable start counter general | O | Y ⁽¹⁾ |

Used for the following protection functions:

| | | |
|-----------------------|---|------------------------------------|
| SPA channel number 60 | Overvoltage instantaneous | this function supports (1) and (2) |
| SPA channel number 61 | Overvoltage definite time, high set | this function supports (1) and (2) |
| SPA channel number 62 | Overvoltage definite time, low set | this function supports (1) and (2) |
| SPA channel number 82 | Residual overvoltage definite time high | this function supports (1) |
| SPA channel number 83 | Residual overvoltage definite time low | this function supports (1) |
| SPA channel number 89 | Switching Resonance | this function supports (1) and (2) |
| SPA channel number 93 | High Harmonic | this function supports (1) and (2) |

7.7.10 LN: Protection trip conditioning

Name: PTRC

| PTRC class | | | | |
|---|-------------------|--|--------------|--------------------------|
| Attribute Name | Attr. Type | Explanation | M / O | REF- Eth61850 |
| LNNName | | Shall be inherited from Logical-Node Class (see-7-2). | | |
| Data | | | | |
| Common Logical Node Information | | | | |
| LN shall inherit all Mandatory Data from Common Logical Node Class. | | | M | Y |
| OpCntRs | INC | Resetable operation counter trip | O | Y |
| Status Information | | | | |
| Tr | ACT | Trip | C | Y |
| Op | ACT | Operate (combination of subscribed Op from protection functions) | C | N |
| Str | ACD | Sum of all starts of all connected Logical Nodes | O | Y |
| Settings | | | | |
| TrMod | ING | Trip Mode | O | N |
| TrPlsTmms | ING | Trip Pulse Time | O | N |
| Device Extensions | | | | |
| BlkOpn | SPC | Block opening | M | Y ⁽¹⁾ |
| OpCntRsStr | INC | Resetable start counter general | O | Y ⁽¹⁾ |

Used for the following protection functions:
SPA channel number 260 PTRC General

this function supports (1)

7.7.11 LN: Thermal overload Name: PTTR

| PTTR class | | | | |
|---|------------|---|-------|------------------|
| Attribute Name | Attr. Type | Explanation | M / O | REF- Eth61850 |
| LNNName | | Shall be inherited from Logical-Node Class (see-7-2). | | |
| Data | | | | |
| Common Logical Node Information | | | | |
| LN shall inherit all Mandatory Data from Common Logical Node Class. | | | M | Y |
| OpCntRs | INC | Resetable operation counter operate general | O | Y |
| Measured Values | | | | |
| Amp | MV | Current for thermal load model | O | N |
| Tmp | MV | Temperature for thermal load | O | N |
| TmpRl | MV | Relation between temperature and max. temperature | O | N |
| LodRsvAlm | MV | Load reserve to alarm | O | N |
| LodRsvTr | MV | Load reserve to trip | O | N |
| AgeRat | MV | Ageing rate | O | N |
| Status Information | | | | |
| Str | ACD | Start | O | N |
| Op | ACT | Operate | M | Y |
| AlmThm | ACT | Thermal Alarm | O | Y |
| TmTmpSt | CSD | Active curve characteristic | O | N |
| TmASt | CSD | Active curve characteristic | O | N |
| Settings | | | | |
| TmTmpCrv | CURVE | Characteristic Curve for temperature measurement | O | N |
| TmACrv | CURVE | Characteristic Curve for current measurement /Thermal model | O | N |
| TmpMax | ASG | Maximum allowed temperature | O | N |
| StrVal | ASG | Start Value | O | N |
| OpDlTmms | ING | Operate Delay Time | O | N |
| MinOpTmms | ING | Minimum Operate Time | O | N |
| MaxOpTmms | ING | Maximum Operate Time | O | N |
| RsDlTmms | ING | Reset Delay Time | O | N |
| ConsTms | ING | Time constant of the thermal model | O | N |
| AlmVal | ASG | Alarm Value | O | N |
| Device Extensions | | | | |
| BlkOpn | SPC | Block opening | M | Y ⁽¹⁾ |
| OpCntRsThm | INC | Resetable Thermal Alarm counter | O | Y ⁽¹⁾ |

Used for the following protection functions:

SPA channel number 74 Thermal Overload

this function supports (1)

7.7.12 LN: Undervoltage Name: PTUV

| PTUV class | | | | |
|---|------------|---|-------|------------------|
| Attribute Name | Attr. Type | Explanation | M / O | REF- Eth61850 |
| LNNName | | Shall be inherited from Logical-Node Class (see-7-2). | | |
| Data | | | | |
| Common Logical Node Information | | | | |
| LN shall inherit all Mandatory Data from Common Logical Node Class. | | | M | Y |
| OpCntRs | INC | Resetable operation counter operate general | O | Y |
| Status Information | | | | |
| Str | ACD | Start | M | Y |
| Op | ACT | Operate | M | Y |
| TmVSt | CSD | Active curve characteristic | O | N |
| Settings | | | | |
| TmVCrv | CURVE | Operating Curve Type | O | N |
| StrVal | ASG | Start Value | O | N |
| TmMult | ASG | Time Dial Multiplier | O | N |
| MinOpTmms | ING | Minimum Operate Time | O | N |
| MaxOpTmms | ING | Maximum Operate Time | O | N |
| OpDITmms | ING | Operate Delay Time | O | N |
| RsDITmms | ING | Reset Delay Time | O | N |
| Device Extensions | | | | |
| BlkOpn | SPC | Block opening | M | Y ⁽¹⁾ |
| OpCntRsA | INC | Resetable start counter phase A | O | Y ⁽²⁾ |
| OpCntRsB | INC | Resetable start counter phase B | O | Y ⁽²⁾ |
| OpCntRsC | INC | Resetable start counter phase C | O | Y ⁽²⁾ |
| OpCntRsStr | INC | Resetable start counter general | O | Y ⁽¹⁾ |

Used for the following protection functions:

| | | |
|----------------------------|--------------------------------------|------------------------------------|
| SPA channel number 63 | Undervoltage instantaneous | this function supports (1) and (2) |
| SPA channel number 64 | Undervoltage definite time, high set | this function supports (1) and (2) |
| SPA channel number 65 | Undervoltage definite time, low set | this function supports (1) and (2) |
| SPA channel number 150-155 | Frequency protection | this function supports (1) |
| SPA channel number 160-165 | Frequency protection | this function supports (1) |

7.7.13 LN: Undervoltage Name: PTUF

| PTUF class | | | | |
|---|------------|---|-------|------------------|
| Attribute Name | Attr. Type | Explanation | M / O | REF- Eth61850 |
| LNNName | | Shall be inherited from Logical-Node Class (see-7-2). | | |
| Data | | | | |
| Common Logical Node Information | | | | |
| LN shall inherit all Mandatory Data from Common Logical Node Class. | | | M | Y |
| OpCntRs | INC | Resetable operation counter operate general | O | Y |
| Status Information | | | | |
| Str | ACD | Start | M | Y |
| Op | ACT | Operate | M | Y |
| BlkV | SPS | Blocked because of voltage | O | N |
| Settings | | | | |
| StrVal | CURVE | Start Value (frequency) | O | N |
| BlkVal | ASG | Voltage Block Value | O | N |
| OpDITmms | ING | Operate Delay Time | O | N |
| RsDITmms | ING | Reset Delay Time | O | N |
| Device Extensions | | | | |
| BlkOpn | SPC | Block opening | M | Y ⁽¹⁾ |
| OpCntRsA | INC | Resetable start counter phase A | O | Y ⁽²⁾ |
| OpCntRsB | INC | Resetable start counter phase B | O | Y ⁽²⁾ |
| OpCntRsC | INC | Resetable start counter phase C | O | Y ⁽²⁾ |
| OpCntRsStr | INC | Resetable start counter general | O | Y ⁽¹⁾ |

Used for the following protection functions:

| | | |
|-----------------------|--------------------------------------|------------------------------------|
| SPA channel number 63 | Undervoltage instantaneous | this function supports (1) and (2) |
| SPA channel number 64 | Undervoltage definite time, high set | this function supports (1) and (2) |
| SPA channel number 65 | Undervoltage definite time, low set | this function supports (1) and (2) |

7.8 Logical Nodes for protection related functions LN Group: R

The relationship between this IEC61850 and the REF542plus functions is done by the SPA channel number. The SPA channel number is taken for the Logical Node instance (inst) number. All SPA register with no relationship to the LN Group R are present under a GGIO with the same Logical Node instance (inst) number similar to the R LN.

7.8.1 LN: Autoreclosing Name: RREC

| RREC class | | | | |
|---|------------|---|-----|------------------|
| Attribute Name | Attr. Type | Explanation | M/O | REF- IEC61850 |
| LNNName | | Shall be inherited from Logical-Node Class (see-7-2). | | |
| Data | | | | |
| Common Logical Node Information | | | | |
| LN shall inherit all Mandatory Data from Common Logical Node Class. | | | M | Y |
| OpCntRs | INC | Resetable operation counter operate general | O | Y |
| Controls | | | | |
| BlkRec | SPC | Block Reclosing | O | N |
| ChkRec | SPC | Check Reclosing | O | N |
| Status Information | | | | |
| Auto | SPS | Automatic Operation (external switch status) | O | N |
| Op | ACT | Operate (used here to provide close to XCBR) | M | Y |
| AutoRecSt | INS | Auto Reclosing Status | M | Y |
| Settings | | | | |
| Rec1Tmms | ING | First Reclose Time | O | N |
| Rec2Tmms | ING | Second Reclose Time | O | N |
| Rec3Tmms | ING | Third Reclose Time | O | N |
| PlsTmms | ING | Close Pulse Time | O | N |
| RclTmms | ING | Reclaim Time | O | N |
| Device Extensions | | | | |
| BlkCls | SPC | Block closing | M | Y ⁽¹⁾ |

Used for the following protection functions:

SPA channel number 250 Autoreclose 2 (AR2)

this function supports (1)

7.8.2 LN: Synchronism-check or synchronising Name: RSYN

| RSYN class | | | | |
|---|-------------------|---|--------------|--------------------------|
| Attribute Name | Attr. Type | Explanation | M / O | REF- Eth61850 |
| LNNName | | Shall be inherited from Logical-Node Class (see-7-2). | | |
| Data | | | | |
| Common Logical Node Information | | | | |
| LN shall inherit all Mandatory Data from Common Logical Node Class. | | | M | Y |
| Controls | | | | |
| RHz | SPC | Raise Frequency | O | N |
| LHz | SPC | Lower Frequency | O | N |
| RV | SPC | Raise Voltage | O | N |
| LV | SPC | Lower Voltage | O | N |
| Status Information | | | | |
| Rel | SPS | Release | M | Y |
| VInd | SPS | Voltage Difference Indicator | O | N |
| AngInd | SPS | Angle Difference Indicator | O | N |
| HzInd | SPS | Frequency Difference Indicator | O | N |
| SynPrg | SPS | Synchronising in progress | O | Y |
| Measured values | | | | |
| DifVClc | MV | Calculated Difference in Voltage | O | N |
| DifHzClc | MV | Calculated Difference in Frequency | O | N |
| DifAngClc | MV | Calculated Difference of Phase Angle | O | N |
| Settings | | | | |
| DifV | ASG | Difference Voltage | O | N |
| DifHz | ASG | Difference Frequency | O | N |
| DifAng | ASG | Difference Phase Angle | O | N |
| LivDeaMod | ING | Live Dead Mode | O | N |
| DeaLinVal | ASG | Dead Line Value | O | N |
| LivLinVal | ASG | Live Line Value | O | N |
| DeaBusVal | ASG | Dead Bus Value | O | N |
| LivBusVal | ASG | Live Bus Value | O | N |
| PlsTmms | ING | Close Pulse Time | O | N |
| BkrTmms | ING | Closing time of breaker | O | N |
| Device Extensions | | | | |
| BlkClIs | SPC | Block closing | M | Y ⁽¹⁾ |

Used for the following protection functions:

SPA channel number 85

Synchro Check

this function supports (1)

7.9 Logical Nodes for control LN Group: C

The relationship between this IEC61850 and the REF542plus functions is done by the SPA channel number. The SPA channel number is taken for the Logical Node instance (inst) number.

The supported REF542plus functions for this Logical Node Group are:

- Switching object 2-2
for the primary devices circuit breaker, disconnecter and earthing switch.
- Switching object 2-2-H Bridge
for the primary devices disconnecter.
- Switching object 4-4-H Bridge
for the primary devices disconnecter and earthing switch

The CILO Logical Node is only present, when the primary switch is configured as electrical controllable.

7.9.1 LN: Interlocking Name: CILO

| CILO class | | | | |
|---|------------|---|-------|------------------|
| Attribute Name | Attr. Type | Explanation | M / O | REF- Eth61850 |
| LNNName | | Shall be inherited from Logical-Node Class (see-7-2). | | |
| Data | | | | |
| Common Logical Node Information | | | | |
| LN shall inherit all Mandatory Data from Common Logical Node Class. | | | M | Y |
| Status information | | | | |
| EnaOpn | SPS | Enable Open | M | Y |
| EnaCls | SPS | Enable Close | M | Y |

The following table gives an overview of the possible configuration variants. The presents of the items are dependent on the configuration in the tools, REF542plus configuration and SCL.

| IEC reference | SPA reference | SPA description |
|---------------|--------------------|--|
| EnaOpn | 5/49 or 111/129117 | Open Interlocked (position independant) used for primary devices controlled with: an Switching object 2-2 or an Switching object 2-2-H and an Switching object 4-4-H ES part |
| EnaOpn | 5/49 or 111/129119 | Open Interlocked (position independant) used for primary devices controlled with: an Switching object 4-4-H DC part |
| EnaCls | 5/49 or 111/129118 | Close Interlocked (position independant) used for primary devices controlled with: an Switching object 2-2 or an Switching object 2-2-H and an Switching object 4-4-H ES part |
| EnaCls | 5/49 or 111/129120 | Close Interlocked (position independant) used for primary devices controlled with: an Switching object 4-4-H DC part |

7.9.2 LN: Switch controller Name: CSWI

| CSWI class | | | | |
|---|------------|---|-------|------------------|
| Attribute Name | Attr. Type | Explanation | M / O | REF- Eth61850 |
| LNName | | Shall be inherited from Logical-Node Class (see-7-2). | | |
| Data | | | | |
| Common Logical Node Information | | | | |
| LN shall inherit all Mandatory Data from Common Logical Node Class. | | | M | Y |
| Loc | SPS | Local operation | O | Y |
| OpCntRs | INC | Resetable operation counter | O | N |
| Controls | | | | |
| Pos | DPC | Switch, general | M | Y |
| PosA | DPC | Switch L1 | O | N |
| PosB | DPC | Switch L2 | O | N |
| PosC | DPC | Switch L3 | O | N |
| OpOpn | ACT | Operation "Open Switch" | O | N |
| OpCls | ACT | Operation "Close Switch" | O | N |

The following table gives an overview of the possible configuration variants. The presents of the items are dependent on the configuration in the tools, REF542plus configuration and SCL.

| IEC reference | SPA reference | SPA description |
|---------------|--|---|
| Loc | 0V10 | Remote Control Status |
| Pos.SBOW | 5/49 or 111/129 V14 (on) V13 (off) | Position Indication CB, DC or ES controlled with: an Switching object 2-2 |
| Pos.SBOW | 5/49 or 111/129 V26 (on) V25 (off) | Position Indication DC controlled with: an Switching object 2-2-H and an Switching object 4-4-H |
| Pos.SBOW | 5/49 or 111/129 V36 (on) V35 (off) | Position Indication ES controlled with: an Switching object 4-4-H |
| Pos.Oper | 5/49 or 111/129 V10 (on) V11 (off) | Position Indication CB, DC or ES controlled with: an Switching object 2-2 |
| Pos.Oper | 5/49 or 111/129 V22 (on) V23 (off) | Position Indication DC controlled with: an Switching object 2-2-H and an Switching object 4-4-H |
| Pos.Oper | 5/49 or 111/129 V32 (on) V33 (off) | Position Indication ES controlled with: an Switching object 4-4-H |
| Pos.Cancel | 5/49 or 111/129V12 | Position Indication CB, DC or ES controlled with: an Switching object 2-2 |
| Pos.Cancel | 5/49 or 111/129V24 | Position Indication DC controlled with: an Switching object 2-2-H and an Switching object 4-4-H |
| Pos.Cancel | 5/49 or 111/129V34 | Position Indication ES controlled with: an Switching object 4-4-H |
| Pos.stVal | 5/49 or 111/129I1 | Position Indication CB, DC or ES controlled with: an Switching object 2-2 |

| IEC reference | SPA reference | SPA description |
|---------------|--------------------|---|
| Pos.stVal | 5/49 or 111/129I11 | Position Indication DC controlled with: an Switching object 2-2-H and an Switching object 4-4-H |
| Pos.stVal | 5/49 or 111/129I12 | Position Indication ES controlled with: an Switching object 4-4-H |
| Pos.stSeld | 5/49 or 111/129V1 | Position Indication CB, DC or ES controlled with: an Switching object 2-2 and an Switching object 4-4-H DC part |
| Pos.stSeld | 5/49 or 111/129V9 | Position Indication DC controlled with: an Switching object 2-2-H |
| Pos.stSeld | 5/49 or 111/129V19 | Position Indication ES controlled with: an Switching object 4-4-H |

7.10 Logical Nodes for generic references LN Group: G

The supported REF542plus functions for this Logical Node Group are:

- All protection functions have additional information on an GGIO. The GGIO instance number is the SPA channel number of the protection function.
- For IntIn the 16-Bit Read object could be used.
- For Alm, Ind and the status part of the SPCSO the switching object 0-1 and the binary read object could be used.
- For SPCSO control part the switching object 1-0 and the binary write object could be used.
- The Direct Read-Write object could be used for a SPCSO.
- For ISCSO the 16-Bit Read object could be used for the status and the 16-Bit Write object could be used for the control.
- AnIn is used to map SPA analog Values, which are not listed in the MMXU Logical Node.

The configuration of the GGIO's has to be done in the SCL tool.

7.10.1 LN: Generic process I/O Name: GGIO

| GGIO class | | | | |
|---|------------|---|-------|------------------|
| Attribute Name | Attr. Type | Explanation | M / O | REF- Eth61850 |
| LNNName | | Shall be inherited from Logical-Node Class (see-7-2). | | |
| Data | | | | |
| Common Logical Node Information | | | | |
| LN shall inherit all Mandatory Data from Common Logical Node Class. | | | M | Y |
| EEHealth | INS | External equipment health (external sensor) | O | N |
| EEName | DPL | External equipment name plate | O | N |
| Loc | SPS | Local operation | O | Y |
| OpCntRs | INC | Resetable operation counter | O | Y |
| Measured values | | | | |
| AnIn | MV | Analogue input | O | Y |
| Controls | | | | |
| SPCSO | SPC | Single point controllable status output | O | Y |
| DPCSO | DPC | Double point controllable status output | O | N |
| ISCSO | INC | Integer status controllable status output | O | Y |
| Status Information | | | | |
| IntIn | INS | Integer status input | O | Y |
| Alm | SPS | General single alarm | O | Y |
| Ind | SPS | General indication (binary input) | O | Y |

The following table gives an overview of the possible configuration variants. The presents of the items are dependent on the configuration in the tools, REF542plus configuration and SCL.

The prefix and the instance number of the GGIO and the number extension of the attributes could be configured by the user in the SCL tool. In the table the ? character is used for replacement.

| IEC reference | SPA reference | SPA description |
|---|--|--|
| LD1.????GGIO???.Alm?? | 9811/32 | Object: Binary Read |
| LD1.????GGIO???.Alm?? | 5/49 or 111/12714 | Switching object 0-1 |
| LD1.????GGIO???.Ind?? | 9811/32 | Object: Binary Read |
| LD1.????GGIO???.Ind?? | 5/49 or 111/12714 | Switching object 0-1 |
| LD1.????GGIO???.IntIn?? | 9911/64 | Object: 16-Bit Read |
| LD1.????GGIO???.SPCSO???.Oper | 98O1/32 | Object: Binary Write |
| LD1.????GGIO???.SPCSO???.Oper | 5/49 or 111/127O4 | Switching object 1-0 |
| LD1.????GGIO???.SPCSO???.Oper LD1.????GGIO???.SPCSO???.stVal | 101O1/99 and 10111/99 | Object: Direct-Read-Write |
| LD1.????GGIO???.SPCSO???.Oper LD1.????GGIO???.SPCSO???.stVal | 98O1/32 and 9811/32 | Object: Binary Write and Object: Binary Read |
| LD1.????GGIO???.SPCSO???.Oper LD1.????GGIO???.SPCSO???.stVal | 98O1/32 and 5/49 or 111/12714 | Object: Binary Write and Switching object 0-1 |
| LD1.????GGIO???.SPCSO???.Oper LD1.????GGIO???.SPCSO???.stVal | 5/49 or 111/127O4 and 9811/32 | Switching object 1-0 and Object: Binary Read |
| LD1.????GGIO???.SPCSO???.Oper LD1.????GGIO???.SPCSO???.stVal | 5/49 or 111/127O4 and 5/49 or 111/12714 | Switching object 1-0 and Switching object 0-1 |
| LD1.????GGIO???.ISCSO???.Oper | 99O1/64 | Object: 16-Bit Write |
| LD1.????GGIO???.ISCSO???.Oper LD1.????GGIO???.ISCSO???.stVal | 99O1/64 and 9911/64 | Object: 16-Bit Write and Object: 16-Bit Read |

The following table gives an overview of the additional supported measurements. The presents of the measurements are dependent on the configuration in the tools, REF542plus configuration and SCL.

| IEC reference | SPA reference | SPA description |
|----------------------|---------------|--|
| LD1.UIGGIO1.AnIn1006 | 111006 | Demand current L1 |
| LD1.UIGGIO1.AnIn1007 | 111007 | Demand current L2 |
| LD1.UIGGIO1.AnIn1008 | 111008 | Demand current L3 |
| LD1.UIGGIO1.AnIn1009 | 111009 | Maximal demand current L1 |
| LD1.UIGGIO1.AnIn1010 | 111010 | Maximal demand current L2 |
| LD1.UIGGIO1.AnIn1011 | 111011 | Maximal demand current L3 |
| LD1.UIGGIO1.SPCSO102 | 101 O 102 | Reset maximum bar (Maximal demand current L1, L2, L3) |
| LD1.UIGGIO1.AnIn1020 | 111020 | Max voltage U1_2 |
| LD1.UIGGIO1.AnIn1021 | 111021 | Max voltage U2_3 |
| LD1.UIGGIO1.AnIn1022 | 111022 | Max voltage U3_1 |
| LD1.UIGGIO1.AnIn1023 | 111023 | Min voltage U1_2 |
| LD1.UIGGIO1.AnIn1024 | 111024 | Min voltage U2_3 |
| LD1.UIGGIO1.AnIn1025 | 111025 | Min voltage U3_1 |
| LD1.UIGGIO1.SPCSO121 | 101 O 121 | Reset min/max voltages network 1 |
| LD1.UIGGIO1.AnIn1026 | 111026 | Voltage THD U1_N |

| IEC reference | SPA reference | SPA description |
|----------------------|---------------|---|
| LD1.UIGGIO1.AnIn1027 | 111027 | Voltage THD U2_N |
| LD1.UIGGIO1.AnIn1028 | 111028 | Voltage THD U3_N |
| LD1.UIGGIO1.AnIn1029 | 111029 | Residual Voltage THD U0 (Sensor) |
| LD1.UIGGIO1.AnIn1030 | 111030 | Voltage THD U1_2 |
| LD1.UIGGIO1.AnIn1031 | 111031 | Voltage THD U2_3 |
| LD1.UIGGIO1.AnIn1032 | 111032 | Voltage THD U3_1 |
| LD1.UIGGIO1.AnIn1033 | 111033 | NPS Current |
| LD1.UIGGIO1.AnIn1034 | 111034 | NPS Voltage |
| LD1.UIGGIO1.AnIn1035 | 111035 | PPS Current |
| LD1.UIGGIO1.AnIn1036 | 111036 | PPS Voltage |
| LD1.UIGGIO1.AnIn87 | 1187 | Real Energy |
| LD1.UIGGIO1.AnIn88 | 1188 | Reactive Energy |
| LD1.UIGGIO1.AnIn175 | 11175 | Forward Real Energy (positive) |
| LD1.UIGGIO1.AnIn176 | 11176 | Backward Real Energy (negative) |
| LD1.UIGGIO1.AnIn177 | 11177 | Forward Reactive Energy (positive) |
| LD1.UIGGIO1.AnIn178 | 11178 | Backward Reactive Energy (negative) |
| LD1.UIGGIO1.SPCSO103 | 101 O 103 | Reset energy (measurements and value in energy pulse counter FUPLA object) |
| | | |
| LD1.UIGGIO2.AnIn1106 | 111106 | Demand current L1 |
| LD1.UIGGIO2.AnIn1107 | 111107 | Demand current L2 |
| LD1.UIGGIO2.AnIn1108 | 111108 | Demand current L3 |
| LD1.UIGGIO2.AnIn1109 | 111109 | Maximal demand current L1 |
| LD1.UIGGIO2.AnIn1110 | 111110 | Maximal demand current L2 |
| LD1.UIGGIO2.AnIn1111 | 111111 | Maximal demand current L3 |
| LD1.UIGGIO2.SPCSO102 | 101 O 102 | Reset maximum bar (Maximal demand current L1, L2, L3) |
| LD1.UIGGIO2.AnIn1120 | 111120 | Max voltage U1_2 |
| LD1.UIGGIO2.AnIn1121 | 111121 | Max voltage U2_3 |
| LD1.UIGGIO2.AnIn1122 | 111122 | Max voltage U3_1 |
| LD1.UIGGIO2.AnIn1123 | 111123 | Min voltage U1_2 |
| LD1.UIGGIO2.AnIn1124 | 111124 | Min voltage U2_3 |
| LD1.UIGGIO2.AnIn1125 | 111125 | Min voltage U3_1 |
| LD1.UIGGIO2.SPCSO122 | 101 O 122 | Reset min/max voltages network 2 |
| LD1.UIGGIO2.AnIn1126 | 111126 | Voltage THD U1_N |
| LD1.UIGGIO2.AnIn1127 | 111127 | Voltage THD U2_N |
| LD1.UIGGIO2.AnIn1128 | 111128 | Voltage THD U3_N |
| LD1.UIGGIO2.AnIn1129 | 111129 | Residual Voltage THD U0 (Sensor) |
| LD1.UIGGIO2.AnIn1130 | 111130 | Voltage THD U1_2 |
| LD1.UIGGIO2.AnIn1131 | 111131 | Voltage THD U2_3 |
| LD1.UIGGIO2.AnIn1132 | 111132 | Voltage THD U3_1 |
| LD1.UIGGIO2.AnIn1133 | 111133 | NPS Current |

| IEC reference | SPA reference | SPA description |
|----------------------|---------------|--|
| LD1.UIGGIO2.AnIn1134 | 111134 | NPS Voltage |
| LD1.UIGGIO2.AnIn1135 | 111135 | PPS Current |
| LD1.UIGGIO2.AnIn1136 | 111136 | PPS Voltage |
| LD1.UIGGIO2.AnIn87 | 1187 | Real Energy |
| LD1.UIGGIO2.AnIn88 | 1188 | Reactive Energy |
| LD1.UIGGIO2.AnIn175 | 11175 | Forward Real Energy (positive) |
| LD1.UIGGIO2.AnIn176 | 11176 | Backward Real Energy (negative) |
| LD1.UIGGIO2.AnIn177 | 11177 | Forward Reactive Energy (positive) |
| LD1.UIGGIO2.AnIn178 | 11178 | Backward Reactive Energy (negative) |
| LD1.UIGGIO2.SPCSO103 | 101 O 103 | Reset energy (measurements and value in energy pulse counter FUPLA object) |

7.11 Logical Nodes for metering and measurements LN Group: M

7.11.1 LN: Measurement Name: MMXU

The measurements of this Logical Node could be present on two MMXU's.

The instance number is related to the configured net 1 or 2.

Measurements which doesn't fit into this Logical Node are present under an GGIO Logical Node.

| MMXU class | | | | |
|---|------------|---|-------|------------------|
| Attribute Name | Attr. Type | Explanation | M / O | REF- Eth61850 |
| LNNName | | Shall be inherited from Logical-Node Class (see-7-2). | | |
| Data | | | | |
| Common Logical Node Information | | | | |
| LN shall inherit all Mandatory Data from Common Logical Node Class. | | | M | Y |
| EEHealth | INS | External equipment health (external sensor) | O | N |
| Measured values | | | | |
| TotW | MV | Total Active Power (Total P) | O | Y |
| TotVAr | MV | Total Reactive Power (Total Q) | O | Y |
| TotVA | MV | Total Apparent Power (Total S) | O | Y |
| TotPF | MV | Average Power factor (Total PF) | O | Y |
| Hz | MV | Frequency | O | Y |
| PPV | DEL | Phase to phase voltages (VL1VL2, ...) | O | Y |
| PhV | WYE | Phase to ground voltages (VL1ER, ...) | O | Y |
| A | WYE | Phase currents (IL1, IL2, IL3) | O | Y |
| W | WYE | Phase active power (P) | O | N |
| VAr | WYE | Phase reactive power (Q) | O | N |
| VA | WYE | Phase apparent power (S) | O | N |
| PF | WYE | Phase power factor | O | N |
| Z | WYE | Phase Impedance | O | N |

The following table gives an overview of the supported measurements. The presents of the measurements are dependent on the configuration in the tools, REF542plus configuration and SCL.

| IEC reference | SPA reference | SPA description |
|-----------------------|---------------|-----------------------|
| LD1.UIMMXU1.TotW | 1183 | Active power (P) |
| LD1.UIMMXU1.TotVar | 1184 | Reactive power (Q) |
| LD1.UIMMXU1.TotVA | 1185 | Apparent power (S) |
| LD1.UIMMXU1.TotPF | 1182 | Power factor cos(phi) |
| LD1.UIMMXU1.Hz | 111037 | Frequency |
| LD1.UIMMXU1.PPV.PhsAB | 111017 | Voltage U1_2 |
| LD1.UIMMXU1.PPV.PhsBC | 111018 | Voltage U2_3 |
| LD1.UIMMXU1.PPV.PhsCA | 111019 | Voltage U3_1 |

| IEC reference | SPA reference | SPA description |
|-----------------------|---------------------|---|
| LD1.UIMMXU1.PhV.phsA | 111012 | Voltage U1_N |
| LD1.UIMMXU1.PhV.phsB | 111013 | Voltage U2_N |
| LD1.UIMMXU1.PhV.phsC | 111014 | Voltage U3_N |
| LD1.UIMMXU1.PhV.neut | 111015 or 111016 | Residual Voltage U0 (Sensor) or Residual Voltage U0 (Calculated) |
| LD1.UIMMXU1.A.phsA | 111001 | Current L1 |
| LD1.UIMMXU1.A.phsB | 111002 | Current L2 |
| LD1.UIMMXU1.A.phsC | 111003 | Current L3 |
| LD1.UIMMXU1.A.neut | 111004 or 111005 | Earth Current L0 (Sensor) or Earth Current L0 (Calculated) |
| LD1.UIMMXU2.TotW | 1183 | Active power (P) |
| LD1.UIMMXU2.TotVar | 1184 | Reactive power (Q) |
| LD1.UIMMXU2.TotVA | 1185 | Apparent power (S) |
| LD1.UIMMXU2.TotPF | 1182 | Power factor cos(phi) |
| LD1.UIMMXU2.Hz | 111137 | Frequency |
| LD1.UIMMXU2.PPV.PhsAB | 111117 | Voltage U1_2 |
| LD1.UIMMXU2.PPV.PhsBC | 111118 | Voltage U2_3 |
| LD1.UIMMXU2.PPV.PhsCA | 111119 | Voltage U3_1 |
| LD1.UIMMXU2.PhV.phsA | 111112 | Voltage U1_N |
| LD1.UIMMXU2.PhV.phsB | 111113 | Voltage U2_N |
| LD1.UIMMXU2.PhV.phsC | 111114 | Voltage U3_N |
| LD1.UIMMXU2.PhV.neut | 111115 or 111116 | Residual Voltage U0 (Sensor) or Residual Voltage U0 (Calculated) |
| LD1.UIMMXU2.A.phsA | 111101 | Current L1 |
| LD1.UIMMXU2.A.phsB | 111102 | Current L2 |
| LD1.UIMMXU2.A.phsC | 111103 | Current L3 |
| LD1.UIMMXU2.A.neut | 111104 or 111105 | Earth Current L0 (Sensor) or Earth Current L0 (Calculated) |

7.12 Logical Nodes for switchgear LN Group: S

7.12.1 LN: Insulation medium supervision (gas) Name: SIMG

| SIMG class | | | | |
|---|------------|--|-------|------------------|
| Attribute Name | Attr. Type | Explanation | M / O | REF- Eth61850 |
| LNNName | | Shall be inherited from Logical-Node Class (see -7-2). | | |
| Data | | | | |
| Common Logical Node Information | | | | |
| LN shall inherit all Mandatory Data from Common Logical Node Class. | | | M | Y |
| EEHealth | INS | External equipment health | O | Y |
| EEName | DPL | External equipment name plate | O | N |
| Measured values | | | | |
| Pres | MV | Isolation gas pressure | O | Y |
| Den | MV | Isolation gas density | O | Y |
| Tmp | MV | Isolation gas temperature | O | Y |
| Status Information | | | | |
| InsAlm | SPS | Insulation gas critical (refill isolation medium) | M | Y |
| InsBlk | SPS | Insulation gas not safe (block device operation) | O | Y |
| InsTr | SPS | Insulation gas dangerous (trip for device isolation) | O | Y |
| PresAlm | SPS | Isolation gas pressure alarm | C | N |
| DenAlm | SPS | Isolation gas density alarm | C | N |
| TmpAlm | SPS | Isolation gas temperature alarm | C | N |
| InsLevMax | SPS | Insulation gas level maximum (relates to predefined filling value) | O | N |
| InsLevMin | SPS | Insulation gas level minimum (relates to predefined filling value) | O | N |
| Device Extensions | | | | |
| PresAv | MV | Isolation gas average pressure | O | Y |

Condition C: depending on the supervised properties of the insulation gas, at least one statusinformation shall be used.

7.13 Logical Nodes for switchgear LN Group: X

The relationship between this IEC61850 and the REF542plus functions is done by the SPA channel number. The SPA channel number is taken for the Logical Node instance (inst) number.

The supported REF542plus functions for this Logical Node Group are:

- 2-2 Object
for the primary devices circuit breaker, disconnecter and earthing switch.
- 2-2-H bridge object
for the primary devices disconnecter.
- 4-4-H bridge object
for the primary devices disconnecter and earthing switch

7.13.1 LN: Circuit breaker Name: XCBR

| XCBR class | | | | |
|---|------------|---|-------|------------------|
| Attribute Name | Attr. Type | Explanation | M / O | REF- Eth61850 |
| LNNName | | Shall be inherited from Logical-Node Class (see -7-2). | | |
| Data | | | | |
| Common Logical Node Information | | | | |
| LN shall inherit all Mandatory Data from Common Logical Node Class. | | | M | Y |
| Loc | SPS | Local operation (local means without substation automation communication, hardwired direct control) | M | Y |
| EEHealth | INS | External equipment health | O | N |
| EEName | DPL | External equipment name plate | O | N |
| OpCnt | INS | Operation counter | M | Y |
| Controls | | | | |
| Pos | DPC | Switch position | M | Y |
| BlkOpn | SPC | Block opening | M | Y |
| BlkCls | SPC | Block closing | M | Y |
| ChaMotEna | SPC | Charger motor enabled | O | N |
| Metered Values | | | | |
| SumSwARs | BCR | Sum of Switched Amperes, resetable | O | N |
| Status Information | | | | |
| CBOPCap | INS | Circuit breaker operating capability | M | Y |
| POWCap | INS | Point On Wave switching capability | O | N |
| MaxOpCap | INS | Circuit breaker operating capability when fully charged | O | Y |
| Device Extensions | | | | |
| OpnColFlt | SPS | Open Coil Fault The information from the coil supervision will be here present. | O | Y |
| ClsColFlt | SPS | Close Coil Fault The information from the coil supervision will be here present. | O | Y |

The following table gives an overview of the possible configuration variants. The presents of the items are dependent on the configuration in the tools, REF542plus configuration and SCL.

| IEC reference | SPA reference | SPA description |
|---------------|---|---|
| Loc | 0V10 | Remote Control Status |
| OpCnt | 5/49 or 111/129V100 | Number of cycles of switching object CB controlled with: an Switching object 2-2 |
| Pos.stVal | 5/49 or 111/129I1 | Position Indication CB controlled with: an Switching object 2-2 |
| BlkOpn | 5/49 or 111/129I14 | Device Operation Blocked controlled with: an Switching object 2-2 |
| BlkCls | 5/49 or 111/129I14 | Device Operation Blocked controlled with: an Switching object 2-2 |
| CBOpCap | No register | Fix Open-Close-Open |
| MaxOpCap | No register | Fix Open-Close-Open |
| OpnColFlt | 9811/32 or 5/49 or 111/127I4 or 0V103/108 | Object: Binary Read or Switching object 0-1 or Coil continuity binary output 1 or 2, I/O card 1,2 or 3 |
| ClsColFlt | 9811/32 or 5/49 or 111/127I4 or 0V103/108 | Object: Binary Read or Switching object 0-1 or Coil continuity binary output 1 or 2, I/O card 1,2 or 3 |

7.13.2 LN: Circuit switch Name: XSWI

| XSWI class | | | | |
|---|------------|--|-------|------------------|
| Attribute Name | Attr. Type | Explanation | M / O | REF- Eth61850 |
| LNName | | Shall be inherited from Logical-Node Class (see-7-2). | | |
| Data | | | | |
| Common Logical Node Information | | | | |
| LN shall inherit all Mandatory Data from Common Logical Node Class. | | | M | Y |
| Loc | SPS | Local operation | M | Y |
| EEHealth | INS | External equipment health | O | N |
| EEName | DPL | External equipment name plate | O | N |
| OpCnt | INS | Operation counter | M | Y |
| Controls | | | | |
| Pos | DPC | Switch position | M | Y |
| BlkOpn | SPC | Block opening | M | Y |
| BlkCls | SPC | Block closing | M | Y |
| ChaMotEna | SPC | Charger motor enabled | O | N |
| Status Information | | | | |
| SwTyp | INS | Switch type | M | Y |
| SwOpCap | INS | Switch operating capability | M | Y |
| MaxOpCap | INS | Circuit switch operating capability when fully charged | O | Y |

The following table gives an overview of the possible configuration variants. The presents of the items are dependent on the configuration in the tools, REF542plus configuration and SCL.

| IEC reference | SPA reference | SPA description |
|---------------|---|---|
| Loc | 0V10 | Remote Control Status |
| OpCnt | 5/49 or 111/129V100 5/49 or 111/129V104 5/49 or 111/129V105 | Number of cycles of switching object controlled with: an Switching object 2-2 DC,ES an Switching object 2-2-H or 4-4-H DC an Switching object 4-4-H ES |
| Pos.stVal | 5/49 or 111/129I1 5/49 or 111/129I11 5/49 or 111/129I12 | Position Indication controlled with: an Switching object 2-2 DC,ES an Switching object 2-2-H or 4-4-H DC an Switching object 4-4-H ES |
| BlkOpn | 5/49 or 111/129I14 | Device Operation Blocked valid for all Switching objects |
| BlkCls | 5/49 or 111/129I14 | Device Operation Blocked valid for all Switching objects |
| SwTyp | No register | Fix Disconnertor or Earthing Switch |
| SwOpCap | No register | Fix Open and Close |
| MaxOpCap | No register | Fix Open and Close |

8 SCL conformance statement

Defines several degrees of conformance for which implementations may declare support of the substation configuration language. [1]

Table 8-1 – SCL conformance degrees

| | SCL Conformance | Client-CR | | | Server-CR | | |
|-------|---|-----------|-----|-------------|-----------|-----|--|
| | | Base | F/S | Value/Range | Base | F/S | Value/Range |
| SCL.1 | SCL File for Implementation Available (offline) | | | | m | m | <i>Supported, CID file import</i> |
| SCL.2 | SCL File available from implementation online | O | o | | o | o | <i>Supported, CID file export, available on FTP online</i> |
| SCL.3 | SCL implementation reconfiguration supported online | O | o | | o | o | <i>Supported, see NOTE</i> |

NOTE. The CID file is used to configure the device. Notice that you have to preserve the Communication Engineering Tool's (CET) private sections to configure a device again. CET knows product limitations and it is recommended to configure a device only with CET.

Implementations claiming conformance to SCL.2 or SCL.3 may support the ACSI services defined in Table 4-2

Table 8-2 – Supported ACSI services for SCL.2 and SCL.3

| | SCL Conformance | Client-CR | | | Server-CR | | |
|--|-----------------------------|-----------|-----|-------------|-----------|-----|----------------------|
| | | Base | F/S | Value/Range | Base | F/S | Value/Range |
| ACSI Services | | | | | | | <i>Not supported</i> |
| | GetFileAttributeValues | O | o | | o | m | <i>Not supported</i> |
| | GetFile | O | c2 | | o | c2 | <i>Not supported</i> |
| | SetFile | O | c3 | | o | c3 | <i>Not supported</i> |
| | DeleteFile | O | o | | o | c3 | <i>Not supported</i> |
| | GetDataValues | O | c1 | | o | c1 | <i>Not supported</i> |
| | SetDataValues | O | c2 | | o | c2 | <i>Not supported</i> |
| | | | | | | | <i>Not supported</i> |
| | SCL Control Block | l | i | | o | c3 | <i>Not supported</i> |
| | SCL File Structure | l | m | | i | m | <i>Not supported</i> |
| | Remote Creation of SCL File | l | o | | i | o | <i>Not supported</i> |
| c1 – shall be 'm' if support for SCL.2 or SCL.3 is declared. c2 – shall be 'm' if support for SCL.2 is declared. c3 – shall be 'm' if support for SCL.3 is declared. | | | | | | | |

The additional MMS services of Table D.3 shall be supported if support for SCL.2 or SCL.3 is declared.

Table 8-3 – Additional MMS services for SCL.2 and SCL.3

| | SCL Conformance | Client-CR | | | Server-CR | | |
|--|---------------------|-----------|-----|-------------|-----------|-----|----------------------|
| | | Base | F/S | Value/Range | Base | F/S | Value/Range |
| MMS Services | | | | | | | |
| | GetCapabilityList | O | i | | o | i | <i>Not supported</i> |
| | GetDomainAttributes | O | o | | o | m | <i>Not supported</i> |
| | LoadDomain | O | c1 | | o | c1 | <i>Not supported</i> |
| | StoreDomain | O | c2 | | o | c2 | <i>Not supported</i> |
| C1 – shall be 'm' if support SCL.3 is declared. | | | | | | | |
| c2 – shall be 'm' if support for remote creation of a SCL is declared. | | | | | | | |

8.1 SCL control block

The SCL control block shall have a functional constraint of "SC". This control block shall occur in LLN0 only.

The SCL control block shall be a structured MMS TypeDefinition that contains the ordered NamedComponents defined in Table D.4.

Table 8-4 – Definition of SCL control block

| IEC 61850-8-1 Component Name | MMS TypeDescription | r/w | m/o | Comments | DUT |
|------------------------------|----------------------------------|--------|--------|--|----------------------|
| validate | VISIBLE-STRING size of 64 octets | r w | m o | shall be 'm' if support for remote activation of a SCL is declared. | <i>Not supported</i> |
| valState | Unsigned Integer – 8 bits | r | m | (0) – NOT-VALIDATED (1) – VALIDATION-ERROR (2) – VALIDATED (3) – VALIDATION-IN-PROGRESS (4) – NOT-SUPPORTED (5) – VALIDATE-FILE-PRESENT | <i>Not supported</i> |
| activate | VISIBLE-STRING size of 64 octets | r w | m o | shall be 'm' if support for remote activation of a SCL is declared. | <i>Not supported</i> |

9 PICS – Protocol conformance statement

9.1 Profile conformance

Table 9-1 and Table 9-2 define the basic conformance statement.

Table 9-1 – PICS for A-Profile support

| | | Client | | Server | | Value/Comment |
|--|--------------------------------|--------|--|--------|--|----------------------|
| | | F/S | | F/S | | |
| A1 | Client/Server A-Profile | c1 | | c1 | | <i>Supported</i> |
| A2 | GOOSE/GSE Management A-Profile | c2 | | c2 | | <i>Not supported</i> |
| A3 | GSSE A-Profile | c3 | | c3 | | <i>Not supported</i> |
| A4 | TimeSync A-Profile | c4 | | c4 | | <i>Supported</i> |
| <p>c1 – shall be 'm' if support for any service specified for Client/S are declared within the ACSI basic conformance statement.</p> <p>c2 – shall be 'm' if support for any service specified for GOOSE/GSE Management are declared within the ACSI basic conformance statement.</p> <p>c3 – shall be 'm' if support for any service specified for GSSE A-Profile are declared within the ACSI basic conformance statement</p> <p>c4 – support for at least one other A-Profile shall be declared (e.g. in A1-A3) in order to claim conformance to IEC 61850-8-1.</p> | | | | | | |

Table 9-2 – PICS for T-Profile support

| | | Client | | Server | | Value/Comment |
|--|---------------------|--------|--|--------|--|----------------------|
| | | F/S | | F/S | | |
| T1 | TCP/IP T-Profile | c1 | | c1 | | <i>Supported</i> |
| T2 | OSI T-Profile | c2 | | c2 | | <i>Not supported</i> |
| T3 | GOOSE/GSE T-Profile | c3 | | c3 | | <i>Not supported</i> |
| T4 | GSSE T-Profile | c4 | | c4 | | <i>Not supported</i> |
| T5 | TimeSync T-Profile | o | | o | | <i>Supported</i> |
| <p>c1 – shall be 'm' if support for A1 is declared. Otherwise, shall be "i"</p> <p>c2 – shall be "o" if support for A1 is declared. Otherwise, shall be "i".</p> <p>c3 – shall be 'm' if support for A2 is declared. Otherwise, shall be "i".</p> <p>c4 – shall be 'm' if support for A3 is declared. Otherwise, shall be "i".</p> | | | | | | |

9.2 MMS Conformance

MMS conformance guaranteed by MMS stack vendor, ie. Sisco Inc..

All needed services supporting the ACSI services stated to be supported in paragraph 2. are supported by the MMS stack used.

10 PIXIT

In this chapter, the essentials for device communication configuration and integration are described. PIXIT is given as a separate document.

11 Appendix B: Index of Tables

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