Prior to meeting in Bregenz, 2005-09

CD IEC 61850-7-4, Amendment 2

Communication networks and systems in substations

Part 7-4: Basic communication structure for substations and feeder equipment - Compatible logical node classes and data classes

Amendment 2: Clarifications, corrections and extensions for statistical data

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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COMMUNICATION NETWORKS AND SYSTEMS IN SUBSTATIONS

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Amendment 2: Clarifications, corrections and extensions for statistical data

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This CD of the Amendment to International Standard IEC 61850-7-4 has been prepared by the working group 10 of IEC technical committee 57.

This document contains amendments to Parts 7-4 of the standard series IEC 61850, a set of specifications for communication networks and systems in substations.

At time of publication of this part, the following parts were part of IEC 61850:

IEC 61850-1: Communication networks and systems in substations – Part 1: Introduction and overview

IEC 61850-2: Communication networks and systems in substations – Part 2: Glossary

IEC 61850-3: Communication networks and systems in substations – Part 3: General requirements

IEC 61850-4: Communication networks and systems in substations – Part 4: System and project management

IEC 61850-5: Communication networks and systems in substations – Part 5: Communication requirements for functions and device models

IEC 61850-6: Communication networks and systems in substations – Part 6: Substation automation system configuration language

IEC 61850-7-1: Communication networks and systems in substations – Part 7-1: Basic communication structure for substation and feeder equipment – Principles and models

IEC 61850-7-2: Communication networks and systems in substations – Part 7-2: Basic communication structure for substation and feeder equipment – Abstract communication service interface (ACSI)

IEC 61850-7-3: Communication networks and systems in substations – Part 7-3: Basic communication structure for substation and feeder equipment – Common data classes

IEC 61850-7-4: Communication networks and systems in substations – Part 7-4: Basic communication structure for substation and feeder equipment – Compatible logical node classes and data classes

IEC 61850-8-1: Communication networks and systems in substations – Part 8-1: Specific communication service mapping (SCSM) – Mapping to MMS(ISO/IEC 9506 Part 1 and Part 2)

IEC 61850-9-1: Communication networks and systems in substations – Part 9-1: Specific communication service mapping (SCSM) – Serial unidirectional multidrop point to point link

IEC 61850-9-2: Communication networks and systems in substations – Part 9-2: Specific communication service mapping (SCSM) – Mapping on a IEEE 802.3 based process bus

IEC 61850-10: Communication networks and systems in substations – Part 10: Conformance Testing

INTRODUCTION

This document is an amendment to the standard IEC 61850-7-4

— provides clarifications and corrections to the published edition 1 of IEC 61850-7-4.

ABOUT THIS VERSION:

This version covers the green TISSUES 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79 with 133, 80, 82, 83, 84, 85,86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 97, 98, 99, 100, 101, 102, 104, 105, 106, 133 with 79, 134, and 174 as of August 14, 2005 and some other editorial corrections. In addition, it covers the extensions for statistical data.

Green TISSUES with no acceptance confirmed by the voting mean no amendment of the standard and, therefore, are not listed here.

NORMATIVE REFERENCES

IEC 61850-7-4:2003 Communication networks and systems in substations – Part 7-4: Basic communication structure for substation and feeder equipment – Compatible logical node classes and data classes

COMMUNICATION NETWORKS AND SYSTEMS IN SUBSTATIONS

Part 7-4: Basic communication structure for substations and feeder equipment - Compatible logical node classes and data classes

Amendment 2: Clarifications, corrections and extensions for statistical data

4 Abreviated terms

Change 'Ms'(millisecond) to 'ms' resulting in

ms	Milliseconds

Add the following entry

Sto	Storage e.g. activity of storing data

5 Logical Node classes

5.2 Interpretation of Logical Node tables

Change from (repetitions)

All Attribute Names (Data Names) are listed alphabetically in Clause **Fehler! Verweisquelle konnte nicht gefunden werden.**. The data in the Logical Nodes Classes are grouped into various categories (as described below) for the convenience of the reader. This grouping may result in some overlapping.

All Attribute Names (Data Names) are listed alphabetically in Clause 6. Despite some overlapping, the data in the Logical Nodes Classes are for the convenience of the reader grouped into some categories explained in the following.

to

All Attribute Names (Data Names) are listed alphabetically in Clause 6. Despite some overlapping, the data in the Logical Nodes Classes are grouped for the convenience of the reader into some of the following categories.

4.11 System Logical Nodes LN Group: L

5.2.1 General

114..13 LN: Physical device information Name: LPHD

114..14 Common Logical Node

The compatible logical nodes classes defined in this document are specialisations of this common logical node class.

The Common Logical Node class has to cover the methods for statistical calculation methods. Therefore, the following table has to be updated as shown below.

Common Logical Node class				
Attribute Name	**Attr. Type**	**Explanation**	**T**	**M/O**
LNName		Shall be inherited from Logical-Node Class (see IEC 61850-7-2).		

Data				
Mandatory Logical Node Information (Shall be inherited by ALL LN but LPHD)				
Mod	INC	Mode		M
Beh	INS	Behaviour		M
Health	INS	Health		M
NamPlt	LPL	Name plate		M
Optional Logical Node Information				
Loc	SPS	Local operation		O
EEHealth	INS	External equipment health		O
EEName	DPL	External equipment name plate		O
OpCntRs	INC	Operation counter resetable		O
OpCnt	INS	Operation counter		O
OpTmh	INS	Operation time		O
CalcExp	SPS	Calculation period expired	T	O
CalcStr	SPC	Start calculation at time operTm (if set) or immediately		O
CalcMthd	ING	Calcualtion Method of statistical data. Allowed values PRES | MIN | MAX |TOTMIN | TOTMAX |AVG | SDV |		O
CalcPd	ING	Calculation Period of statistical data, shall be in seconds		O
CalcSrc	ORG	Object Reference to Source logical node		O
Data Sets (see IEC 61850-7-2)				
Inherited and specialised from Logical Node class (see IEC 61850-7-2).				
Control Blocks (see IEC 61850-7-2)				
Inherited and specialised from Logical Node class (see IEC 61850-7-2).				
Services (see IEC 61850-7-2)				
Inherited and specialised from Logical Node class (see IEC 61850-7-2).				

A specialisation of this Common Logical Node class shall inherit all Data, Data Sets, Control Blocks and Services that are mandatory. For the optional data there are three choices for specialisations:

— not to inherit these items

— inherit these items and leave them to be optional

— inherit these items and define them to be mandatory

Add the following text

The data CalcMthd shall be included in any logical node that represents analogue or counting information if the calculation method is unequal PRES. The data CalcExp, CalcStr, CalcPd and CalcSrc shall be included in any logical node that represents statistical data (MIN, MAX, ...).

114..15 LN: Logical node zero Name: LLN0

Modify (extend) the explanation of LLN0 after this headline as follows

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

5.4 Logical Nodes for protection functions LN Group: P

5.4.19 LN: Over frequency Name: PTOF

Change in the description before the table "… to model the overcurrent part ..." to to model the over-frequency part ..." resulting in

Description of this LN, see IEC 61850-5 (LN PFRQ). This LN shall be used to model the over frequency part of PFRQ. One instance shall be used per stage.

5.5 Logical Nodes for protection related functions LN Group: R

5.5.2 LN: Disturbance recorder function Name: RDRE

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

RDRE class				
Attribute Name	**Attr. Type**	**Explanation**	**T**	**M/O**
...	...	...		...
Settings				
StoRte	ING	Storage rate, i.e. sampling rate of the disturbance recorder		M
TrgMod	ING	Trigger mode (internal trigger, external or both)		M
...	...	...		...

5.5.8 LN: Fault locator Name: RFLO

Settings: Change LinLenKm to LinLenkm resulting in

LinLenkm	ASG	Line length in km		O

5.5.10 LN: Autoreclosing Name: RREC

The description and definition of LN class RREC has been completely updated. It shall have the following definition.

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

RREC class				
Attribute Name	**Attr. Type**	**Explanation**	**T**	**M/O**
LNName		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
OpCntRs	INC	Resetable operation counter		O
Controls				
BlkRec	SPC	Block Reclose		O
ChkRec	SPC	Check Reclosing		O

RREC class				
Attribute Name	**Attr. Type**	**Explanation**	**T**	**M/O**
Status Information				
Auto	SPS	Automatic Operation (external switch status)		O
TrBeh	INS	Defines Single or Three Pole Tripping (mostly resulting from combination TrMod and RecCyc) for the next trip to be subscribed by the Protection		O
RecCyc	INS	Actual Reclose Cycle		O
OpCls	ACT	Operation"close switch" issued to close the XCBR		M
AutoRecSt	INS	Auto Reclosing Status		M
Settings				
TrMod1	ING	Indicates if Single Pole Tripping allowed or Three Pole Tripping always requested in the first cycle		O
TrMod2	ING	Indicates if Single Pole Tripping allowed or Three Pole Tripping always requested in the second cycle		O
TrMod3	ING	Indicates if Single Pole Tripping allowed or Three Pole Tripping always requested in the third cycle		O
MaxCyc	ING	Maximum number of Reclose cycles		O
MaxTmms	ING	Maximum time after fault detection during which autoreclosing is permitted		O
RecTmms1	ING	First Reclose Time		O
RecTmms2	ING	Second Reclose Time		O
RecTmms3	ING	Third Reclose Time		O
PlsTmms	ING	Close Pulse Time		O
RclTmms	ING	Reclaim Time		O

All settings with an index higher than 1 up to MaxCyc will appear if MaxCyc is higher than 1.

5.6 Logical Nodes for control LN Group: C

Extend the data of CPOW by a Data headline Controls and add Pos (CDC DPC) to allow CPOW start directly by a control service alternatively to the subscription of OpOpn or OpCls from CSWI. Complement the text in front of the table by a last sentence..

5.6.5 LN: Point-on-wave switching Name: CPOW

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

CPOW class				
Attribute Name	**Attr. Type**	**Explanation**	**T**	**M/O**
LNName		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
Controls				
Pos	DPC	Switch, general		O
Status Information				
TmExc	SPS	Maximum allowed time exceeded		M
StrPOW	SPS	CPOW started		O
OpOpn	ACT	Open switch	T	O
OpCls	ACT	Close switch	T	O
Settings				
MaxDlTmms	ING	Maximum allowed delay time		M

114..16 LN: Switch controller Name: CSWI

Since Data OpOpen and OpClose are used for Control but not being controllable, they have been decided to be moved to Status information

CSWI class				
...	...	...		...
Controls				
Pos	DPC	Switch, general		M
PosA	DPC	Switch L1		O
PosB	DPC	Switch L2		O
PosC	DPC	Switch L3		O
Status Information				
OpOpn	ACT	Operation “Open Switch” (issued)	T	O
OpCls	ACT	Operation “Close Switch” (issued)	T	O

5.7 Logical nodes for generic references LN Group: G

5.7.1 LN: Generic automatic process control Name: GAPC

Update the description in front of the table resulting in

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

Change Str and Op from Mandatory to Optional resulting in

Status Information				
Str	ACD	Start		O
Op	ACT	Operate	T	O

5.7.2 LN: Generic process I/O Name: GGIO

Update the description in front of the table resulting in

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

5.7.3 LN: Generic security application Name: GSAL

Modify the Explanation of Data bOpCntRs as follows

GSAL class				
Attribute Name	**Attr. Type**	**Explanation**	**T**	**M/O**
LNName		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
OpCntRs	INC	Resetable operation counter. NOTE – An operation in the context of this logical node is a security violation		M
...	...	...		...

4.12 Logical Nodes for interfacing and archiving LN Group: I

5.7.1 LN: Archiving Name: IARC

Modify the Explanation of Data OpCntRs as follows and delete Data NumCntRs

IARC class				
Attribute Name	**Attr. Type**	**Explanation**	**T**	**M/O**
LNName		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
OpCntRs	INC	Resetable operation counter		M
Controls				
~~NumCntRs~~	~~INC~~	~~Number of counter resets~~		~~M~~
...	...	...		...

5.10 Logical Nodes for metering and measurement LN Group: M

Most LNs of this chapter have data related to an external sensor (EEHealth, EEName). However, the interface to a sensor is not modelled by these LNs. It is instead modelled by TCTR and TVTR. Hence, the EEHealth and EEName is part of these LNs. Depending on the number of sources for these metering and measuring devices, there could be a lot of such LNs. This has to be considered in the modelling. For all LNs of the group M the data EEHealth and EEName shall be deleted.

5.10.1 Modelling Remarks

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

Table 1 – Relation IEC 61850-5 and IEC 61850-7-4 for metering and measurement LNs

Update Table 7 with the new LN MMTN resulting in

Functionality	Defined in part IEC 61850-5 by LN	Modelled in part IEC 61850-7-4 by LN	Comments
Measurement	MMXU	MMXU MMXN	Three-phase version Non-phase related version (single phase)
Metering (three-phase)	MMTR	MMTR MMTN MSTA	Metering (three-phase values) Metering (single-phase values) Metering (statistics)
Harmonics and interharmonics	MHAI	MHAI MHAN	Three-phase version Non-phase related version (single phase)
Differential measurements		MDIF	Calculated data for differential protection

Editors Note: This table has to be updated with the related entries from other Amendments.

Insert new LN class

5.10.5 LN: Metering Name: MMTN

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

MMTN class				
Attribute Name	**Attr. Type**	**Explanation**	**T**	**M/O**
LNName		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
Metered Values				
TotVAh	BCR	Net apparent energy since last reset		O
TotWh	BCR	Net Real energy since last reset		O
TotVArh	BCR	Net Reactive energy since last reset		O
SupWh	BCR	Real energy supply (default supply direction: energy flow towards busbar)		O
SupVArh	BCR	Reactive energy supply (default supply direction: energy flow towards busbar)		O

MMTN class				
Attribute Name	**Attr. Type**	**Explanation**	**T**	**M/O**
DmdWh	BCR	Real energy demand (default demand direction: energy flow from busbar away)		O
DmdVArh	BCR	Reactive energy demand (default demand direction: energy flow from busbar away)		O

Editors Note1: The data from the LN class MMTR are reused since they contain no information being three phase values. The information if the values are metered in a three-phase or single-phase system are contained in the related LN class name.

Editors Note 2: The new LN class shifts the numbering of the remaining sections 5.10.x

4.13 Logical Nodes for sensors and monitoring LN Group: S

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

Modify last sentence before the table to result in

"General description of this LN see IEC 61850-5. Insulation medium is gas, e.g. SF6 in gas isolated devices. If more measurement positions are needed and they are located to the same measuring object, these shall be added by numbered extensions of the data (e.g. Tmp1, Tmp2, .) in the existing LN SIMG. For other measuring objects related to the same IED, a new instance of SIMG may be used. If the new measuring point(s) is/are related to a new IED a new instance of SIMG shall be used."

134..17 LN: Insulation medium supervision (liquid) Name: SIML

Modify last sentence before the table to result in

"Description of this LN see IEC 61850-5. Insulation medium is a liquid like oil as used e.g. for some transformers and tap changers. If more measurement positions are needed and they are located to the same measuring object, these shall be added by numbered extensions of the data (e.g. Tmp1, Tmp2, .) in the existing LN SIML. For other measuring objects related to the same IED, a new instance of SIML may be used. If the new measuring point(s) is/are related to a new IED a new instance of SIML shall be used."

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

Skip in the table of LN class SIMG the data PresAlm, DenAlm, and TmpAlm. Remove after the table the sentence referring to Conditional data since they exist not anymore. By this measure, the Status information part shall look like as follows.

SIMG class				
Attribute Name	**Attr. Type**	**Explanation**	**T**	**M/O**
...	...	...		...
Status Information				
InsAlm	SPS	Insulation gas critical (refill isolation medium)		M
InsBlk	SPS	Insulation gas not safe (block device operation)		O
InsTr	SPS	Insulation gas dangerous (trip for device isolation)		O
InsLevMax	SPS	Insulation gas level maximum (relates to predefined filling value)		O
InsLevMin	SPS	Insulation gas level minimum (relates to predefined filling value)		O

134..18 LN: Insulation medium supervision (liquid) Name: SIML

Skip in the table of LN class SIML the data PresAlm, PreTr, and TmpAlm. Remove after the table the sentence referring to Conditional data since they exist not anymore. By this measure, the Status information part shall look like as follows.

SIML class

Attribute Name	Attr. Type	Explanation	T	M/O
...	...	...		...
Status Information				
InsAlm	SPS	Insulation liquid critical (refill isolation medium)		M
InsBlk	SPS	Insulation liquid not safe (block device operation)		O
InsTr	SPS	Insulation liquid dangerous (trip for device isolation)		O
GasInsAlm	SPS	Gas in insulation liquid alarm (may be used for Buchholz alarm)		O
GasInsTr	SPS	Gas in insulation liquid trip (may be used for Buchholz trip)		O
GasFlwTr	SPS	Insulation liquid flow trip because of gas (may be used for Buchholz trip)		O
InsLevMax	SPS	Insulation liquid level maximum		O
InsLevMin	SPS	Insulation liquid level minimum		O
H2Alm	SPS	H2 alarm		O
MstAlm	SPS	Moisture sensor alarm		O

4.14 Logical Nodes for switchgear LN Group: X

5.10.1 LN: Circuit breaker Name: XCBR

Change CBOpCap from Mandatory to Optional resulting in

CBOpCap	INS	Circuit breaker operating capability		O

144..19 LN: Circuit switch Name: XSWI

Change SWOpCap from Mandatory to Optional resulting in

SwOpCap	INS	Switch operating capability		O

4.15 Logical Nodes for instrument transformers LN Group: T

Change Amp and Vol from Mandatory to Conditional

5.10.1 LN: Current transformer Name: TCTR

Measured values				
Amp	SAV	Current (Sampled value)		C

Condition C: The data is mandatory if the data are transmitted over a communication link

154..20 LN: Voltage transformer Name: TVTR

Measured values				
Vol	SAV	Voltage (sampled value)		C

Condition C: The data is mandatory if the data are transmitted over a communication link

5.15 Logical Nodes for Further Power System Equipment LN Group: Z

5.15.9 LN: Power overhead line Name: ZLIN

Change headline from “ZCAB” to "ZLIN " resulting in

ZLIN class

6 Data name semantics

Table 9 – Description of Data

Add Data classes A, W, Var, and VA to table 9 "Data name semantic". The semantic is used according to data entries in LN class MMXU resulting in

Data Name	Semantics
A	Phase currents (IL1, IL2, IL3)
W	Phase active power (P)
VAr	Phase reactive power (Q)
VA	Phase apparent power

Add the following data to the table

Data Name	Semantics
StoRte	Storage rate (often called sampling rate) of the disturbance recorder in samples per second
OpMod	This Data is used to defined the operation mode of mass storages ***Direction Mode*** / **Value** Saturation / 1 Overwrite / 2

Change definition of PresTr resulting in

Data Name	Semantics
PresTr	Pressure trip because of an abnormal condition (FALSE = Normal, TRUE = alert).

Add the following Data Names with the related semantics for the statistical data to table 9 "Data name semantic".

<table>
<tr><th>Data Name</th><th>Semantics</th></tr>
<tr><td>...</td><td></td></tr>
<tr><td>CalcExpd</td><td>Indicates that the calculation period of a statistical logical node has expired.
This DATA shall be mandatory for all logical nodes that are intended to represent statistical data, indicated by the common data classes, e.g., CDC MV, CMV, WYE, etc.</td></tr>
<tr><td>CalcStr</td><td>Starts the calculation of statistical data. Either at once, or if available and set at operTm of the control model.
This DATA shall be mandatory for all logical nodes that are intended to represent statistical data, indicated by the common data classes, e.g., CDC MV, CMV, WYE, etc.</td></tr>
<tr><td>CalcMthd</td><td>The calculation method specifies how the Data Attributes that represent analogue values have been calculated. The calculation method shall be the same for all data of a given logical node instance.
The possible values shall be :

<table>
<tr><th>value</th><th>Description</th></tr>
<tr><td>PRES</td><td>Indicates that all analogue values (i. e. all common attributes i and f) are present values.</td></tr>
<tr><td>MIN</td><td>Indicates that all analogue values (i. e. all common attributes i and f) are minimum values calculated during the corresponding calculation period calPd.</td></tr>
<tr><td>MAX</td><td>Indicates that all analogue values (i. e. all common attributes i and f) are maximum values calculated during the corresponding calculation period calPd.</td></tr>
<tr><td>TOTMIN</td><td>Indicates that all analogue values (i. e. all common attributes i and f) are total minimum values calculated since the start of the system</td></tr>
<tr><td>TOTMAX</td><td>Indicates that all analogue values (i. e. all common attributes i and f) are total maximum values calculated since the start of the system</td></tr>
<tr><td>AVG</td><td>Indicates that all analogue values (i. e. all common attributes i and f) are average values calculated during the corresponding calculation period calPd.</td></tr>
<tr><td>SDV</td><td>Indicates that all analogue values (i. e. all common attributes i and f) are standard deviation values calculated during the corresponding calculation period calPd.</td></tr>
</table>

This DATA shall be mandatory for all logical nodes that are intended to represent statistical data, indicated by the common data classes, e.g., CDC MV, CMV, WYE, etc.
NOTE 1 – If different calculation periods are required for the data of a logical node, then different logical nodes could be instantiated – with different calculation periods.
NOTE 2 – The calculation algorithm and number of samples used for the calculation is an implementation issue.</td></tr>
<tr><td>CalcPd</td><td>The calculation period of a statistical logical node. The period shall always be in seconds [s].
This DATA shall be mandatory for all logical nodes that are intended to represent statistical data, indicated by the common data classes, e.g., CDC MV, CMV, WYE, etc.
NOTE 3 – The calculation algorithm and number of samples used for the calculation is an implementation issue.</td></tr>
<tr><td>CalcSrc</td><td>The reference to the logical node whose analogue data attributes are used to calculate the value contained in this logical node instance.
This DATA shall be mandatory for all logical nodes that are intended to represent statistical data, indicated by the common data classes, e.g., CDC MV, CMV, WYE, etc.</td></tr>
</table>

Change definition of the following Data resulting in

Data Name	Semantics
InOv	This Data indicates that a buffer overflow occurred for the input buffer and that messages could not received properly. Important service requests may be lost (TRUE) in the communication. Appropriate actions shall be taken.

<table>
<tr><th>Data Name</th><th>Semantics</th></tr>
<tr><td>LevMod</td><td>Internal Trigger Mode for disturbance recording.
<table>
<tr><th>Internal Trigger Mode</th><th>Value</th></tr>
<tr><td>Positive or Rising</td><td>1</td></tr>
<tr><td>Negative or Falling</td><td>2</td></tr>
<tr><td>Both</td><td>3</td></tr>
<tr><td>Other</td><td>4</td></tr>
</table>
The disturbance recorder trigger mode is defined by TrgMod.
LevMod exists both for the disturbance recorder as a whole (RDRE) and for each of its individual channels (RADR, RBDR). The interaction of both is determined by the individual disturbance recorder.</td></tr>
<tr><td>NumPwrUp</td><td>The number of power up operations of the physical device since the last reset.</td></tr>
<tr><td>RsStat</td><td>This Data resets device statistics of this LN.</td></tr>
<tr><td>PwrSupAlm</td><td>Alarm from power supply allocated to the Physical Device if PwrSupAlm is TRUE. May be an external contact. It refers always to the local power supply of the IED modelled by LPHD and not to the health (EEHealth) of the complete external supply system.</td></tr>
<tr><td>Proxy</td><td>TRUE indicates that the LN (LPHD) is a proxy. This means that the LD embedding this LN is representing another physical device.</td></tr>
</table>

For the RREC modify the data according to the following enries

<table>
<tr><th>Data Name</th><th>Semantic</th></tr>
<tr><td>BlkRec</td><td>Block Reclosing.</td></tr>
<tr><td>ChkRec</td><td>Determines if the reclosing is with (TRUE) or without (FALSE) synch-check.</td></tr>
<tr><td>Auto</td><td>This Data is responsible for the enabling or disabling of the output circuit of the automatic controller; automatic (TRUE) = output circuit is enabled, not automatic (FALSE) = output circuit is disabled.</td></tr>
<tr><td>TrBeh</td><td>Indicates for the next Trip if Single Pole Tripping is allowed or Three Pole Tripping requested.
<table>
<tr><th>Trigger Behavior</th><th>Value</th></tr>
<tr><td>Single Pole Tripping</td><td>1</td></tr>
<tr><td>Undefined</td><td>2</td></tr>
<tr><td>Three Pole Tripping</td><td>3</td></tr>
</table></td></tr>
<tr><td>RecCyc</td><td>Number of the actual recluse cycle (1 to n, typically n=3). Default value 0 if no Autoreclosing is going on.</td></tr>
<tr><td>OpCls</td><td>Operation Close Switch. OpCls shall be used if no real time services are available between CSWI and XCBR.</td></tr>
<tr><td>AutoRecSt</td><td>This Data represents whether or not the auto reclosing is ready, in progress, or successful.
<table>
<tr><th>Auto Reclosing Status</th><th>Value</th></tr>
<tr><td>Ready</td><td>1</td></tr>
<tr><td>In Progress</td><td>2</td></tr>
<tr><td>Successful</td><td>3</td></tr>
</table></td></tr>
<tr><td>TrMod1
TrMod2
TrMod3
etc.</td><td>Setting for single-pole or three-pole tripping to be used for protection if applicable. The index allows to set the Trip Mode per cycle or step.
<table>
<tr><th>Trip Mode</th><th>Value</th></tr>
<tr><td>Single Pole Tripping</td><td>1</td></tr>
<tr><td>Undefined</td><td>2</td></tr>
<tr><td>Three Pole Tripping</td><td>3</td></tr>
</table></td></tr>
<tr><td>MaxCyc</td><td>Maximum number of allowed cycles for any cyclic process, e.g. used for the Autorecloser</td></tr>
<tr><td>MaxTmms</td><td>Maximum time in ms to be used for any application if needed</td></tr>
<tr><td>MaxTmms</td><td>Maximum time in ms to be used for any application if needed</td></tr>
</table>

Data Name	Semantic
RecTmms1 RecTmms2 RecTmms3 etc.	Reclose delay time (shot) in milliseconds. The index allows to set the Reclose delay time per cycle or step.
~~Rec2Tmms~~	~~Second reclose delay time after first reclose (shot) in milliseconds.~~
~~Rec3Tmms~~	~~Third reclose delay time after second reclose (shot) in milliseconds.~~
PlsTmms	Defines the length of the breaker closing pulse from the reclosing LN.
RclTmms	Recloser reclaim time (after successful reclose) in milliseconds.

The entries for Data Mod shall be modified as follows

Data Name	Semantic
Mod	See table below

Mode	**1**	**2**	**3**	**4**	**5**
ON (enabled)	**1**				
BLOCKED		**2**			
TEST			**3**		
TEST/BLOCKED				**4**	
OFF (disabled)					**5**
Function active	yes	yes	yes[3]	yes[3]	no
Outputs (to process) generated	yes	no	yes	no	no
GOOSE output	yes	yes	yes[4]	yes[4]	yes[7]
GOOSE input	yes	yes	yes[5]	yes[5]	n.a.
SV stream out	yes	yes	yes[8]	yes[8]	yes[7]
SV stream in	yes	yes	yes[5]	yes[5]	n.a.
Reporting (to clients)	yes	no[1]	yes[9]	yes[9]	no[1]
Controls (from clients) accepted	yes	no[2]	yes[6]	yes[6]	no[2]
Participating in GI / Integrity Scans	yes	yes	yes	yes	no
Functional (process related) data visible	yes	yes	yes	yes	yes[7]
Configuration (capability) data writable	yes	yes	yes	yes	yes
(Normal state)					

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

Annex B

(Informative)

Modelling Examples

Add to the informative Annex B

Version 0.2 / 2005-08-18

B.9 RREC

The LD “Distance Protection” (with the LN PDIS*i* for the zone *i*) or any other protection function trips via the allocated PTRC (PTRC.Tr). The LD “Recloser” is informed about the trip commonly both by the PTRC.Str and the PTRC.Op.

The recloser represented by the LN RREC has information about the allowed behavior of the potential retrip after the first autorecloser cycle. The setting RREC.TrMod describes if the first retrip may be done single pole or three pole. For second and higher reclose cycles, only three pole tripping is allowed normally. Therefore, the autorecloser calculates out of the setting TrMod and the status RecCyc (actual reclose cycle number) the actually requested trip behavior TrBeh for the protection. This information has to be subscribed by the protection.

If the time of the actual cycle (Rec*i*Tmms) is elapsed, the close command to the breaker is issued by the recloser status OpCls. If no retrip happens the autoreclosing is over, otherwise the next cycle will start.

If different types of protections are involved in the Autoreclosing process, all relevant data have to be published and subscribed by the allocated protection LNs.