SATEC

Phasor Measurement Unit

PMU PRO

IEC 61850 Conformance Statement

(PICS, PIXIT, MICS, TICS)

BG0654 Rev. A2

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REVISION HISTORY

A1	Feb 2024	Initial release
A2	Dec 2024	Fixed text misprints

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1 General

This document describes the implementation of the IEC 61850 server with the IEC 61850-8-1 and IEC 61850-9-2 interfaces in the PMU device.

The document contains the conformance statements that give the summary of the device data object model, protocol implementation and communication capabilities of the PMU IEC 61850 server.

See the PMU IEC 61850 Reference Guide for information on configuring the IEC 61850 server in the device.

For detailed information on operating the PMU and communication settings, refer to the PMU Installation and Operation Manual.

2 PICS - Protocol Implementation Conformance Statement

2.1 General

The following ACSI conformance statements are used to provide an overview and details about the PMU device:

- ACSI basic conformance statement,
- ACSI models conformance statement,
- ACSI service conformance statement

The statements specify the communication features mapped to IEC 61850-8-1 and IEC 61850-9-2.

2.2 ACSI basic conformance statement

The basic conformance statement is defined in Table A.1.

Table A.1 – Basic conformance statement

Services		Client/ Subscriber	Server/ Publisher	Value/ Comments
Client-Server roles				
B11	**Server** side (of TWO-PARTY-APPLICATION-ASSOCIATION)	N/A	Yes	
B12	**Client** side of (TWO-PARTY-APPLICATION-ASSOCIATION)		N/A	
SCSMs supported				
B21	**SCSM**:IEC 61850-8-1 used		Yes	
B22	**SCSM**:IEC 61850-9-1 used	N/A	N/A	Deprecated in Ed2
B23	**SCSM**:IEC 61850-9-2 used		Y	
B24	**SCSM**:other			
Generic substation event model (GSE)				
B31	**Publisher** side	N/A	Yes	
B32	**Subscriber** side	Yes	N/A	
Transmission of sampled value model (SVC)				
B41	**Publisher** side	N/A	Yes	
B42	**Subscriber** side	N/A	N/A	
N/A = not applicable Yes = supported No or empty = not supported				

2.3 ACSI models conformance statement

The ACSI models conformance statement is defined in Table A.2.

Table A.2 – ACSI models conformance statement

Services		Client/ Subscriber	Server/ Publisher	Value/ Comments
If **Server** side (B11) and/or **Client** side (B12) supported				
M1	**Logical device**		Yes	
M2	**Logical node**		Yes	
M3	**Data**		Yes	
M4	**Data set**		Yes	
M5	**Substitution**		Yes	
M6	**Setting group control**			

Services		Client/ Subscriber	Server/ Publisher	Value/ Comments
	Reporting			
M7	**Buffered report control**		Yes	
M7-1	sequence-number		Yes	
M7-2	report-time-stamp		Yes	
M7-3	reason-for-inclusion		Yes	
M7-4	data-set-name		Yes	
M7-5	data-reference		Yes	
M7-6	buffer-overflow		Yes	
M7-7	entryID		Yes	
M7-8	BufTm		Yes	
M7-9	IntgPd		Yes	
M7-10	GI		Yes	
M7-11	conf-revision		Yes	
M8	**Unbuffered report control**		Yes	
M8-1	sequence-number		Yes	
M8-2	report-time-stamp		Yes	
M8-3	reason-for-inclusion		Yes	
M8-4	data-set-name		Yes	
M8-5	data-reference		Yes	
M8-6	BufTm		Yes	
M8-7	IntgPd		Yes	
M8-8	GI		Yes	
M8-9	conf-revision		Yes	
	Logging			
M9	**Log control**			
M9-1	IntgPd			
M10	**Log**			
M11	**Control**		Yes	
M17	**File Transfer**			
M18	**Application association**		Yes	
M19	**GOOSE Control Block**		Yes	
M20	**Sampled Value Control Block**		Yes	
If **GSE** (B31/32) is supported				
M12	**GOOSE**		Yes	
M13	**GSSE**			Deprecated in Ed2
If **SVC** (B41/42) is supported				
M14	**Multicast SVC**		Yes	
M15	**Unicast SVC**			
For all IEDs				
M16	**Time**		Yes	IRIG-B or IEEE 1588 PTPv2 time source with required accuracy shall be available
Yes = service is supported No or empty = service is not supported				

2.4 ACSI service conformance statement

The ACSI service conformance statement is defined in Table A.4 (depending on the statements in Table A.1 and in Table A.3).

Table A.4 – ACSI service conformance statement

	Ed.	Services	AA: TP/MC	Client (C)	Server (S)	Comments
Server: if B11=Y or B12=Y						
S1	1,2	GetServerDirectory (LOGICAL-DEVICE)	TP		Yes	
Application association: if B11=Y or B12=Y						
S2	1,2	Associate			Yes	
S3	1,2	Abort			Yes	
S4	1,2	Release			Yes	
Logical device: if M1=Y						
S5	1,2	GetLogicalDeviceDirectory	TP		Yes	
Logical node: if M2=Y						
S6	1,2	GetLogicalNodeDirectory	TP		Yes	
S7	1,2	GetAllDataValues	TP		Yes	
Data: if M3=Y						
S8	1,2	GetDataValues	TP		Yes	
S9	1,2	SetDataValues	TP		Yes	
S10	1,2	GetDataDirectory	TP		Yes	
S11	1,2	GetDataDefinition	TP		Yes	
Data set: if M4=Y						
S12	1,2	GetDataSetValues	TP		Yes	
S13	1,2	SetDataSetValues	TP			
S14	1,2	CreateDataSet	TP		Yes	
S15	1,2	DeleteDataSet	TP		Yes	
S16	1,2	GetDataSetDirectory	TP		Yes	
Substitution: if M5=Y						
S17	1,2	SetDataValues	TP			
Setting group control: if M6=Y						
S18	1,2	SelectActiveSG	TP			
S19	1,2	SelectEditSG	TP			
S20	1,2	SetEditSGValues	TP			
S21	1,2	ConfirmEditSGValues	TP			
S22	1,2	GetEditSGValues	TP			
S23	1,2	GetSGCBValues	TP			
Reporting: If M7=Y or M8=Y						
Buffered report control block (BRCB); If M7=Y						
S24	1,2	Report	TP		Yes	
S24-1	1,2	data-change (dchg)			Yes	
S24-2	1,2	quality-change (qchg)			Yes	
S24-3	1,2	data-update (dupd)			Yes	
S25	1,2	GetBRCBValues	TP		Yes	
S26	1,2	SetBRCBValues	TP		Yes	
Unbuffered report control block (URCB) If M8=Y						
S27	1,2	Report	TP		Yes	
S27-1	1,2	data-change (dchg)			Yes	
S27-2	1,2	quality-change (qchg)			Yes	
S27-3	1,2	data-update (dupd)			Yes	
S28	1,2	GetURCBValues	TP		Yes	

	Ed.	Services	AA: TP/MC	Client (C)	Server (S)	Comments
S29	1,2	SetURCBValues	TP		Yes	
Logging: If M9=Y or M10=Y						
Log control block; If M9=Y						
S30	1,2	GetLCBValues	TP			
S31	1,2	SetLCBValues	TP			
Log; If M10=Y						
S32	1,2	QueryLogByTime	TP			
S33	1,2	QueryLogAfter	TP			
S34	1,2	GetLogStatusValues	TP			
Generic substation event model (GSE): If M19=Y						
GOOSE						
S35	1,2	SendGOOSEMessage	MC		Yes	Fixed-length encoding is not supported
GOOSE-CONTROL-BLOCK						
S36	1,2	GetGoReference	TP			
S37	1,2	GetGOOSEElementNumber	TP			
S38	1,2	GetGoCBValues	TP		Yes	
S39	1,2	SetGoCBValues	TP		Yes	
GSSE						
S40	1	SendGSSEMessage	MC			Deprecated in Edition 2
GSSE-CONTROL-BLOCK						
S41	1	GetReference	TP			Deprecated in Edition 2
S42	1	GetGSSEElementNumber	TP			Deprecated in Edition 2
S43	1	GetGsCBValues	TP			Deprecated in Edition 2
S44	1	SetGsCBValues	TP			Deprecated in Edition 2
Transmission of sampled value model (SVC): If M20=Y						
Multicast SV						
S45	1,2	SendMSVMessage	MC		Yes	
Multicast Sampled Value Control Block						
S46	1,2	GetMSVCBValues	TP		Yes	
S47	1,2	SetMSVCBValues	TP		Yes	
Unicast SV						
S48	1,2	SendUSVMessage	TP			
Unicast Sampled Value Control Block						
S49	1,2	GetUSVCBValues	TP			
S50	1,2	SetUSVCBValues	TP			
Control: If M11=Y						
S51	1,2	Select	TP		Yes	
S52	1,2	SelectWithValue	TP			
S53	1,2	Cancel	TP		Yes	
S54	1,2	Operate	TP		Yes	
S55	1,2	CommandTermination	TP		Yes	
S56	1,2	TimeActivatedOperate	TP			
File transfer: If M17=Y						
S57	1,2	GetFile	TP			
S58	1,2	SetFile	TP			
S59	1,2	DeleteFile	TP			
S60	1,2	GetFileAttributeValues	TP			
S61	1,2	GetServerDirectory (FILE-SYSTEM)	TP			
Time						
T1	1,2	Time resolution of internal clock			20	Nearest negative power of 2^{-n} in

	Ed.	Services	AA: TP/MC	Client (C)	Server (S)	Comments
						seconds (number 0 .. 24)
T2	1,2	Time accuracy of internal clock			T1	TL (ms) (low accuracy), T3 < 7 (only Ed2) T0 (ms) (<= 10 ms), 7 <= T3 < 10 T1 (µs) (<= 1 ms), 10<= T3 < 13 T2 (µs) (<= 100 µS), 13 <= T3 < 15 T3 (µs) (<= 25 µS), 15<= T3 < 18 T4 (µs) (<= 4 µS), 18<= T3 <20 T5 (µs) (<= 1 µS), T3>= 20
T3	1,2	Supported TimeStamp resolution	-		20	Nearest value of 2^{-n} in seconds (number 0..24)
N/A = not applicable Yes = supported No or empty = not supported AA – APPLICATION-ASSOCIATION; TP – Two-party; MC – Multicast						

3 PIXIT - Protocol Implementation Extra Information for Testing

This document specifies the protocol implementation extra information for testing (PIXIT) of the IEC 61850 interface in the PMU device.

Together with the PICS and the MICS the PIXIT forms the basis for a conformance test according to IEC 61850-10. The PIXIT entries contain information, which is not available in the PICS, MICS, TICS documents or SCL file.

Each table specifies the PIXIT for applicable ACSI service model as structured in IEC 61850-10. The "Ed" column indicates if the entry is applicable for IEC 61850 Edition 1 and/or Edition 2. A hyphen ("-") in the Ed column indicates the PIXIT entry is not applicable for any version.

3.1 PIXIT for Documentation

ID	Ed	Description	Value/Clarification
Do1	2	How to expose required firmware versions not present in the data model	The firmware version is present in the nameplates of the logical nodes of the data model

3.2 PIXIT for Association model

ID	Ed	Description	Value/Clarification
As1	1	Maximum number of clients that can set-up an association simultaneously	5 (RFC 1006 ISO Transport on top of TCP)
As2	1,2	TCP_KEEPALIVE value. The recommended range is 1..20 s	Keepalive idle time 1-60 s, configurable, default 20 s. Keepalive probe interval 2 s, 5 probes, fixed
As3	1,2	Lost connection detection time	Keepalive idle time + 5 times the probe interval time
As4	-	Authentication is not supported yet	
As5	1,2	What association parameters are necessary for successful association: Called value: Calling values:	 Y Transport selector Y Session selector Y Presentation selector N AP Title N AE Qualifier N Transport selector N Session selector N Presentation selector N AP Title N AE Qualifier
As6	1,2	If association parameters are necessary for association, describe the correct Called values:	 Transport selector 00000001 Session selector 0001 Presentation selector 0001 AP Title any AE Qualifier any

ID	Ed	Description	Value/Clarification
		Calling parameters:	Any
As7	1,2	What is the maximum and minimum MMS PDU size	Max MMS PDU size 8192 (including 22 bytes of ISO 8073, ISO 8327-1 and ISO 8823 TPDU headers)
As8	1,2	What is the maximum startup time after a power supply interrupt	15 seconds
As9	1,2	Does this device function only as test equipment?	N

3.3 PIXIT for Server model

ID	Ed	Description	Value/Clarification
Sr1	1,2	Which analogue value (MX) quality bits are supported (can be set by server)	Validity: Y Good, Y Invalid, N Reserved, N Questionable DetailQuality: N Overflow Y OutofRange Y BadReference N Oscillatory Y Failure N OldData N Inconsistent N Inaccurate Miscellaneous: Source: Y Process, N Substituted N Test N OperatorBlocked
Sr2	1,2	Which status value (ST) quality bits are supported (can be set by server)	Validity: Y Good, Y Invalid, N Reserved, Y Questionable DetailQuality: N BadReference N Oscillatory N Failure Y OldData N Inconsistent N Inaccurate Miscellaneous: Source: Y Process, Y Substituted N Test N OperatorBlocked
Sr3	-	What is the maximum number of data object references in one GetDataValues request	Deprecated
Sr4	-	What is the maximum number of data object references in one SetDataValues request	Deprecated
Sr5	1	Which Mode values are supported	Y On N On/Blocked N Test N Test/Blocked N Off

3.4 PIXIT for Data set model

ID	Ed	Description	Value/Clarification
Ds1	1	What is the maximum number of data elements in one data set (compare ICD setting)	64
Ds2	1	How many persistent data sets can be created by one or more clients	16
Ds3	1	How many non-persistent data sets can be created by one or more clients	N/A - non-persistent datasets are not supported

3.5 PIXIT for Substitution model

ID	Ed	Description	Value/Clarification
Sb1	1	Are substituted values stored in volatile memory	N/A

3.6 PIXIT for Reporting model

ID	Ed	Description	Value/Clarification
Rp1	1	The supported trigger conditions are (compare PICS)	Y integrity Y data change Y quality change Y data update (can be set but there is no process data to report for this condition) Y general interrogation
Rp2	1	The supported optional fields are	Y sequence-number Y report-time-stamp Y reason-for-inclusion Y data-set-name Y data-reference Y buffer-overflow (buffered reports) Y entryID (buffered reports) Y conf-rev Y segmentation
Rp3	1,2	Can the server send segmented reports (when not supported the device shall refuse an association request with a smaller than minimum PDU size)	Y (in case the report exceeds the negotiated PDU size)
Rp4	1,2	Mechanism on second internal data change notification of the same analogue data value within buffer period (Compare IEC 61850-7-2 §14.2.2.9)	Send report immediately
Rp5	1	Multi client URCB approach (Compare IEC 61850-7-2 §14.2.1)	Each URCB is visible to all clients
Rp6	-	What is the format of EntryID	First 2 Bytes: Integer Last 6 Bytes: BTime6 time stamp Deprecated
Rp7	1,2	What is the buffer size for each BRCB or how many reports can be buffered	64 KBytes per BRCB
Rp8	-	Pre-configured RCB attributes that cannot be changed online when RptEna = FALSE (see also the ICD report settings)	All attributes can be changed online when RptEna = FALSE Deprecated
Rp9	1	May the reported data set contain: - structured data objects - data attributes	 Y Y

ID	Ed	Description	Value/Clarification
Rp10	1,2	What is the scan cycle for binary events? Is this fixed, configurable	10/8 ms @50/60 Hz Fixed
Rp11	1	Does the device support to pre-assign a RCB to a specific client in SCL	N
Rp12	2	After restart of the server is the value of ConfRev restored from the original configuration or retained prior to restart	Retained prior to restart
Rp13	1,2	Does the server accept any client to configure/enable a BRCB with ResvTms=-1? What fields are used to do the identification?	N/A - BRCB.ResvTms is not exposed
Rp14	1,2	When BRCB.ResvTms is exposed, what is the default value for BRCB.ResvTms if client does not write (must be > 0) When BRCB.ResvTms is not exposed, what is the internal reservation time (must be >= 0)	N/A 0 seconds

3.7 PIXIT for GOOSE publish model

ID	Ed	Description	Value/Clarification
Gp1	1,2	Can the test (Ed1)/simulation (Ed2) flag in the published GOOSE be turned on/off	N
Gp2	1	What is the behavior when the GOOSE publish configuration is incorrect	DUT keeps GoEna=F until the minimum required configuration (dstAddress, dataSet) is available.
Gp3	1,2	Published FCD supported common data classes are	Any available in the data model. Arrays are not supported
Gp4	1,2	What is the maximum value of TAL (maxTime) Is it fixed or configurable	Configured by ICT (double the maximum retransmission time)
Gp5	1.2	What is the fastest retransmission time	8.3 ms/60Hz, 10 ms/50Hz for the first 5 messages, then geometric with a time multiplier of 2 up to the maximum configured retransmission time
Gp6	-	Can the GOOSE publish be turned on/off by using SetGoCBValues (GoEna)	Y Deprecated (see PICS – SetGoCBValues)
Gp7	1,2	What is the initial GOOSE sqNum after restart	sqNum = 1
Gp8	1	May the GOOSE data set contain: - structured data objects (FCD)? - timestamp data attributes?	 Y Y
Gp9	1,2	Does Server or ICT refuse GOOSE payload dataset length greater than SCSM supports?	N (ICT does not allow more than 64 data elements in the dataset)
Additional items			
		Simulation mode	Not supported

3.8 PIXIT for GOOSE subscribe model

ID	Ed	Description	Value/Clarification
Gs1	1,2	What elements of a subscribed GOOSE message are checked to decide the message is valid and the allData values are accepted? If yes, describe the conditions. Notes:	N/A

ID	Ed	Description	Value/Clarification
		- the VLAN tag may be removed by an Ethernet switch and shall not be checked - the simulation flag shall always be checked (Ed2)	
Gs2	1,2	When is a subscribed GOOSE marked as lost? (TAL = time allowed to live value from the last received GOOSE message)	N/A
Gs3	1,2	What is the behavior when one or more subscribed GOOSE message isn't received or syntactically incorrect? (missing GOOSE)	N/A
Gs4	1,2	What is the behavior when a subscribed GOOSE message is out-of-order?	N/A
Gs5	1,2	What is the behavior when a subscribed GOOSE message is duplicated?	N/A
Gs6	1	Does the device subscribe to GOOSE messages with/without the VLAN tag?	N/A
Gs7	1	May the GOOSE data set contain: - structured data objects? - timestamp data attributes?	N/A
Gs8	1,2	Subscribed FCD supported common data classes are	N/A
Gs9	1,2	Are subscribed GOOSE with test=T (Ed1) / simulation=T (Ed2) accepted in test/simulation mode	N/A
Gs10	1,2	Max number of dataset members	N/A
Gs11	1	Is Fixed-length encoded GOOSE supported	N/A

3.9 PIXIT for GOOSE performance

ID	Ed	Description	Value/Clarification
Gf1	1,2	Performance class	P2/P3
Gf2	1,2	GOOSE ping-pong processing method	Scan cycles based
Gf3	1,2	Application logic scan	10 ms for 50 Hz, 8.3 ms for 60 Hz
Gf4	1	Maximum number of data attributes in GOOSE dataset (value and quality has to be counted as separate attributes)	64 for GOOSE publisher

3.10 PIXIT for Sampled values publish model

ID	Ed	Description	Value/Clarification
		Not available yet	
Additional items			
		Simulation mode	Not supported

3.11 PIXIT for Control model

IMPORTANT

Control commands addressed to the CSWI switch controller nodes and to the boGGIO general binary output nodes will be rejected until the remote control mode is enabled in the device. See "Impact of the device settings" in the PMU IEC 61850 reference guide for details.

ID	Ed	Description	Value/Clarification
Ct1	1	What control models are supported (compare ICD file enums for Ed2 PICS)	Y DOns (boGGIO and evfGGIO LN) Y SBOns (boGGIO and evfGGIO LN) N DOes

ID	Ed	Description	Value/Clarification
			N SBOes
Ct2	1,2	Is the control model fixed, configurable and/or dynamic	Configurable/dynamic for boGGIO and evfGGIO LN
Ct3	-	Is TimeActivatedOperate supported (compare PICS or SCL)	Deprecated
Ct4	-	Is “operate-many” supported (compare sboClass)?	Deprecated
Ct5	1	Will the DUT activate the control output when the test attribute is set in the SelectWithValue and/or Operate request (when N test procedure Ctl2 is applicable)	Y
Ct6	-	What are the conditions for the time (T) attribute in the SelectWithValue and/or Operate request	Deprecated
Ct7	-	Is pulse configuration supported (compare pulseConfig)	Deprecated
Ct8	1	What is the behavior of the DUT when the check conditions are set Is this behavior fixed, configurable, online changeable	N synchrocheck N interlock-check Fixed
Ct9	1,2	What additional cause diagnosis are supported	Y Blocked-by-switching-hierarchy Y Select-failed Y Invalid-position Y Position-reached N Step-limit N Blocked-by-Mode Y Blocked-by-process Y Blocked-by-interlocking N Blocked-by-synchrocheck Y Command-already-in-execution Y Blocked-by-health Y 1-of-n-control N Abortion-by-cancel Y Time-limit-over N Abortion-by-trip Y Object-not-selected Edition 1 specific values: N Parameter-change-in-execution (Ed1 semantics) Edition 2 specific values: Y Object-already-selected N No-access-authority N Ended-with-overshoot N Abortion-due-to-deviation N Abortion-by-communication-loss N Blocked-by-command N None N Inconsistent-parameters Y Locked-by-other-client
Ct10	1,2	How to force a “test-not-ok” respond with SelectWithValue request	N/A – SBOes service is not supported
Ct11	1,2	How to force a “test-not-ok” respond with Select	a) Local control mode (boGGIO)

ID	Ed	Description	Value/Clarification
		request	b) Repeated Select request
Ct12	1,2	How to force a “test-not-ok” respond with Operate request	DOns: Local control mode (boGGIO) SBOns: Local control mode (boGGIO), not selected or SBO timeout has expired DOes: Local control mode or a repeated Operate request while the previous request is in execution
Ct13	1,2	Which origin categories are supported/accepted	N bay-control Y station-control Y remote-control N automatic-bay Y automatic-station Y automatic-remote Y maintenance Y process
Ct14	1,2	What happens if the orCat value is not supported	Any orCat is accepted
Ct15	1,2	Does the IED accept a SelectWithValue/Operate with the same ctlVal as the current status value?	N/A – SBOes service is not supported
Ct16	1	Does the IED accept a Select/Operate on the same control object from 2 different clients at the same time	N
Ct17	1	Does the IED accept a Select/SelectWithValue from the same client when the control object is already selected (tissue 334)	N SBOns N/A SBOes
Ct18	1	Deprecated	
Ct19	-	Can a control operation be blocked by Mod=Off or On-Blocked (Compare PIXIT-Sr5)	Deprecated
Ct20	1,2	Does the IED support local/remote operation	Y
Ct21	1,2	Does the IED send an InformationReport with LastApplError as part of the Operate response for control with normal security	Y SBOns Y DOns
Ct22	2	How to force a “parameter-change-in-execution”	N/A
Ct23	1,2	How many SBOns/SBOes control objects can be selected at the same time?	SBOns: 1 SBOes: N/A
Ct24	1,2	Can a controllable object be forced to keep its old state e.g. Internal Controllable Objects may not be accessible to force this, whereas a switch like Circuit Breaker outside the DUT can?	N
Ct25	1,2	When CDC=DPC is supported, is it possible to have DPC (Controllable Double Point) go to the intermediate state? (00)	N/A
Ct26	1,2	Name an enhanced security point (if any) with a finite operate timeout specify the timeout (in milliseconds)	N/A DOes: N/A SBOes: N/A
Ct27	2	Does the IED support control objects with external signals?	DOns: Y (boGGIO LN) SBOns: Y (boGGIO LN) DOes: N/A SBOes: N/A
Ct28	-	Deprecated, kept as placeholder	

3.12 PIXIT for Time and time synchronization model

ID	Ed	Description	Value/Clarification
Tm1	1	What time quality bits are supported (may be set by the IED)	N LeapSecondsKnown Y ClockFailure Y ClockNotSynchronized
Tm2	1,2	Describe the behaviour when all time server(s) cease to respond What is the time server lost detection time	Assert ClockNotSychronized (CNS) after lost detection time 1 minute
Tm3	1,2	How long does it take to take over the new time from time server	Configurable polling period 60-600 s, default 60 s
Tm4	1,2	When is the time quality bit "ClockFailure" set	Set when the device internal clock is not reliable
Tm5	1	When is the time quality bit "ClockNotSynchronized" set	When connection to all time servers is lost (see PIXIT-Tm2)
Tm6	-	Is the timestamp of a binary event adjusted to the configured scan cycle	Deprecated
Tm7	1	Does the device support time zone and daylight saving	Y
Tm8	1,2	Which attributes of the SNTP response packet are validated	N/A
Tm9	1,2	Do the COMTRADE files have local time or UTC time and is this configurable	N/A

3.13 PIXIT for File transfer model

ID	Ed	Description	Value/Clarification
Ft1	1	What is structure of files and directories Where are the COMTRADE files stored Are COMTRADE files zipped and what files are included in each zip file	N/A
Ft2	1,2	Directory names are separated from the file name by	N/A
Ft3	1	The maximum file name size including path (recommended 64 chars)	N/A
Ft4	1,2	Are directory/file name case sensitive	N/A
Ft5	1,2	Maximum file size for SetFile	N/A
Ft6	1	Is the requested file path included in the file name of the MMS fileDirectory respond	N/A
Ft7	1	Is the wild char supported MMS fileDirectory request	N/A
Ft8	1,2	Is it allowed that 2 clients get a file at the same time	N/A
Ft9	1,2	Which files can be deleted	N/A

4 MICS - Model Implementation Conformance Statement

4.1 General

This model implementation conformance statement is applicable for the PMU device.

This MICS document specifies the modeling extensions compared to IEC 61850 Edition 2. For the exact details on the standardized model please compare the ICD substation configuration file "PMU_2007B_Rev1.icd", version 48.2007B.

Clause 4.2 contains the list of implemented logical nodes. Clause 4.3 describes the new and extended logical nodes.

4.2 Logical Nodes List

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

Logical Device	Logical Nodes
L: System Logical Nodes	
CTRL	**LPHD** (Physical device information)
	LLN0 (Logical node zero)
MET1	**LPHD** (Physical device information)
	LLN0 (Logical node zero)
PMU1	**LPHD** (Physical device information)
	LLN0 (Logical node zero)
	LTIM1 (Time management)
	LTMS1 (Time master supervision)
G: Logical nodes for generic references	
CTRL	bi**GGIO**1 (Generic process I/O – digital inputs DI1-DI25)
	bo**GGIO**1 (Generic process I/O – relay outputs RO1-RO13)
	evf**GGIO**1 (Generic process I/O – event flags FLG1-FLG32)
	sp**GGIO**1 (Generic process I/O – control setpoint status SP1-SP32)
MET1	ai**GGIO**1 (Generic process I/O – analog input AI1)
M: Logical nodes for metering and measurement	
MET1	rt**MMXU**1 (Measurement – real-time measurements)
	avg**MMXU**1 (Measurement – average measurements)
	phsr**MMXU**1 (Measurement – phasors)
	seq**MSQI**1 (Measurement – sequence and imbalance)
PMU1	**MMXU**1 (Measurement – synchrophasor)

4.3 Logical Nodes Extensions

The following tables use:
M: Data is mandatory in the IEC 61850-7-4 Ed.2.
O: Data is optional in the IEC 61850-7-4 Ed.2 and is used in the device.
C: Data is conditional in the IEC 61850-7-4 Ed.2 and is used in the device.
E: Data is an extension to the IEC 61850-7-4 Ed.2.

4.3.1 Standardized Logical Nodes

LPHD - Physical device information

LPHD class				
Data Object Name	**Common Data Class**	**Explanation**	**M/O/C/E**	**Remarks**
Data Objects				
Descriptions				
PhyNam	DPL	Physical device name plate	M	
Status Information				
PhyHealth	ENS	Physical device health	M	
Proxy	SPS	Indicates if this LN is a proxy	M	

LLN0 - Logical node zero

LLN0 class				
Data Object Name	**Common Data Class**	**Explanation**	**M/O/C/E**	**Remarks**
Data Objects				
Common Logical Node Information				
Mod	ENC	Mode	M	
Beh	ENS	Behavior	M	
Health	ENS	Health	M	
NamePlt	LPL	Name plate	M	

CTRL/biGGIO - Digital inputs

GGIO class				
Data Object Name	**Common Data Class**	**Explanation**	**M/O/C/E**	**Remarks**
LNName		biGGIO1	M	
Data Objects				
Common Logical Node Information				
Mod	ENC	Mode	M	
Beh	ENS	Behavior	M	
Health	ENS	Health	M	
NamePlt	LPL	Name plate	M	
Status Information				
Ind1…Ind25	SPS	General indication DI1-DI25	O	TRUE = closed FALSE = open

CTRL/boGGIO - Relay outputs

GGIO class				
Data Object Name	**Common Data Class**	**Explanation**	**M/O/C/E**	**Remarks**
LNName		boGGIO1	M	
Data Objects				
Common Logical Node Information				
Mod	ENC	Mode	M	

GGIO class				
Data Object Name	**Common Data Class**	**Explanation**	**M/O/C/E**	**Remarks**
Beh	ENS	Behavior	M	
Health	ENS	Health	M	
NamePlt	LPL	Name plate	M	
Controls				
SPCSO1-SPCSO13	SPC	Single point controllable status output: relay outputs RO1-RO13	O	

CTRL/evfGGIO - Event flags

class				
Data Object Name	**Common Data Class**	**Explanation**	**M/O/C/E**	**Remarks**
LNName		evfGGIO1	M	
Data Objects				
Common Logical Node Information				
Mod	ENC	Mode	M	
Beh	ENS	Behavior	M	
Health	ENS	Health	M	
NamePlt	LPL	Name plate	M	
Controls				
SPCSO1-SPCSO32	SPC	Single point controllable status output: event flags FLG1-FLG32	O	

CTRL/spGGIO - Control setpoint status

GGIO class				
Data Object Name	**Common Data Class**	**Explanation**	**M/O/C/E**	**Remarks**
LNName		spGGIO1	M	
Data Objects				
Common Logical Node Information				
Mod	ENC	Mode	M	
Beh	ENS	Behavior	M	
Health	ENS	Health	M	
NamePlt	LPL	Name plate	M	
Status Information				
Ind1…Ind32	SPS	General indication: setpoints SP1-SP32	O	TRUE = setpoint operated FALSE = setpoint released

MET1/aiGGIO - Analog input

GGIO class				
Data Object Name	**Common Data Class**	**Explanation**	**M/O/C/E**	**Remarks**
LNName		aiGGIO1	M	
Data Objects				
Common Logical Node Information				
Mod	ENC	Mode	M	
Beh	ENS	Behavior	M	
Health	ENS	Health	M	
NamePlt	LPL	Name plate	M	
Measured Values				
AnIn1	MV	Scaled analog input AI1	O	

MET1/rtMMXU – Real-time measurements

MMXU class				
Data Object Name	**Common Data Class**	**Explanation**	**M/O/C/E**	**Remarks**
LNName		rtMMXU1	M	
Data Objects				
Common Logical Node Information				
Mod	ENC	Mode	M	
Beh	ENS	Behavior	M	
Health	ENS	Health	M	
NamePlt	LPL	Name plate	M	
Measured Values				
PhV	WYE	Phase to ground voltages	O	
A	WYE	Phase currents	O	
W	WYE	Phase active power	O	
VAr	WYE	Phase reactive power	O	
VA	WYE	Phase apparent power	O	
PF	WYE	Phase power factor	O	
TotW	MV	Total active power	O	
TotVAr	MV	Total reactive power	O	
TotVA	MV	Total apparent power	O	
TotPF	MV	Total power factor	O	
Hz	MV	Frequency	O	

MET1/avgMMXU - Average measurements

MMXU class				
Data Object Name	**Common Data Class**	**Explanation**	**M/O/C/E**	**Remarks**
LNName		avgMMXU1	M	
Data Objects				
Common Logical Node Information				
Mod	ENC	Mode	M	
Beh	ENS	Behavior	M	

MMXU class				
Data Object Name	**Common Data Class**	**Explanation**	**M/O/C/E**	**Remarks**
Health	ENS	Health	M	
NamePlt	LPL	Name plate	M	
Measured Values				
PhV	WYE	Phase to ground voltages	O	
A	WYE	Phase currents	O	
W	WYE	Phase active power	O	
VAr	WYE	Phase reactive power	O	
VA	WYE	Phase apparent power	O	
PF	WYE	Phase power factor	O	
TotW	MV	Total active power	O	
TotVAr	MV	Total reactive power	O	
TotVA	MV	Total apparent power	O	
TotPF	MV	Total power factor	O	
Hz	MV	Frequency	O	

MET1/phsrMMXU - Phasor

MMXU class				
Data Object Name	**Common Data Class**	**Explanation**	**M/O/C/E**	**Remarks**
LNName		phsrMMXU1	M	
Data Objects				
Common Logical Node Information				
Mod	ENC	Mode	M	
Beh	ENS	Behavior	M	
Health	ENS	Health	M	
NamePlt	LPL	Name plate	M	
Measured Values				
PhV	WYE	Phase to ground voltages (magnitude and angle)	O	
A	WYE	Phase currents (magnitude and angle)	O	
Hz	MV	Frequency	O	

MET1/seqMSQI - Sequence components

MSQI class				
Data Object Name	**Common Data Class**	**Explanation**	**M/O/C/E**	**Remarks**
LNName		seqMSQI1	M	
Data Objects				
Common Logical Node Information				
Mod	ENC	Mode	M	
Beh	ENS	Behavior	M	
Health	ENS	Health	M	
NamePlt	LPL	Name plate	M	

MSQI class				
Data Object Name	**Common Data Class**	**Explanation**	**M/O/C/E**	**Remarks**
Measured Values				
SeqV	SEQ	Positive, negative and zero sequence voltage	C	
ImbNgV	MV	Imbalance negative sequence voltage	O	
ImbZroV	MV	Imbalance zero sequence voltage	O	
SeqA	SEQ	Positive, negative and zero sequence current	C	
ImbNgA	MV	Imbalance negative sequence current	O	
ImbZroA	MV	Imbalance zero sequence current	O	

PMU/LTIM - Time management

LTIM class				
Data Object Name	**Common Data Class**	**Explanation**	**M/O/C/E**	**Remarks**
LNName		LTIM1	M	
Data Objects				
Common Logical Node Information				
Mod	ENC	Mode	M	
Beh	ENS	Behavior	M	
Health	ENS	Health	M	
NamePlt	LPL	Name plate	M	
Status Information				
TmDT	SPS	Indicating if daylight saving time is in effect	M	TRUE = active FALSE = not active
Settings				
TmOfsTmm	ING	Offset of local time from UTC in minutes	O	
TmUseDT	SPG	Flag indicating if this location is using daylight saving time	O	

4.3.2 New Logical Nodes

Not used.

4.3.3 Extended Logical Nodes

The following logical nodes have been extended with extra data. All extra data has been highlighted in the tables and marked as “E” (Extended).

PMU1/MMXU - Synchrophasor

MMXU class				
Data Object Name	**Common Data Class**	**Explanation**	**M/O/C/E**	**Remarks**
LNName		MMXU1	M	
Data Objects				
Common Logical Node Information				
Mod	ENC	Mode	M	

MMXU class				
Data Object Name	**Common Data Class**	**Explanation**	**M/O/C/E**	**Remarks**
Beh	ENS	Behavior	M	
Health	ENS	Health	M	
NamePlt	LPL	Name plate	M	
Measured Values				
PhV	WYE	Voltage synchrophasor (magnitude and angle)	O	
A	WYE	Current synchrophasor (magnitude and angle)	O	
Hz	MV	Frequency	O	Frequency deviation from nominal or actual frequency
HzRte	MV	Rate of change of frequency (ROCOF)	E	IEC 61850-90-5:2012

PMU1/LTMS - Time master supervision

LTMS class				
Data Object Name	**Common Data Class**	**Explanation**	**M/O/C/E**	**Remarks**
LNName		LTMS1	M	
Data Objects				
Common Logical Node Information				
Mod	ENC	Mode	M	
Beh	ENS	Behavior	M	
Health	ENS	**Health**	M	
NamePlt	LPL	Name plate	M	
Status Information				
TmSrc	VSS	Current time source	M	IRIG-B = IRIG-B source PTP = PTP source
TmSyn	ENS	Time synchronized according to IEC 61850-9-2	O	
TmLok	ENS	Unlock time (enumerated type TmLokKind)	E	IEC 61850-90-5:2012

4.4 Enum Types Extensions

4.4.1 New Enum Types

New enum types are listed in this clause.

TmLokKind

Value	Description	Remarks
1	Locked	
2	Unlocked10s	
3	Unlocked100s	
4	Unlocked1000s	
5	UnlockedMoreThan1000s	

4.4.2 Extended Enum Types

Not used.

4.5 Common Data Classes

The following tables indicate usage of common data classes.

Device name plate (DPL)

Attribute Name	Attribute Type	FC	M/O/C	Comments
vendor	VISIBLE STRING255	DC	M	
hwRev	VISIBLE STRING255	DC	O	
swRev	VISIBLE STRING255	DC	O	
serNum	VISIBLE STRING255	DC	O	
model	VISIBLE STRING255	DC	O	
location	VISIBLE STRING255	DC	O	

Logical node name plate (LPL)

Attribute Name	Attribute Type	FC	M/O/C	Comments
vendor	VISIBLE STRING255	DC	M	
swRev	VISIBLE STRING255	DC	M	
d	VISIBLE STRING255	DC	M	
confgRev	VISIBLE STRING255	DC	C	LLN0 only
ldNs	VISIBLE STRING255	EX	C	LLN0 only

Single point status (SPS)

Attribute Name	Attribute Type	FC	M/O/C	Comments
stVal	BOOLEAN	ST	M	
q	Quality	ST	M	
t	TimeStamp	ST	M	
d	VISIBLE STRING255	DC	O	
dataNs	VISIBLE STRING255	EX	C	Extended logical nodes only

Double point status (DPS)

Attribute Name	Attribute Type	FC	M/O/C	Comments
stVal	CODED ENUM	ST	M	
q	Quality	ST	M	
t	TimeStamp	ST	M	
d	VISIBLE STRING255	DC	O	

Integer status (INS)

Attribute Name	Attribute Type	FC	M/O/C	Comments
stVal	INT32	ST	M	
q	Quality	ST	M	
t	TimeStamp	ST	M	
d	VISIBLE STRING255	DC	O	

Enumerated status (ENS)

Attribute Name	Attribute Type	FC	M/O/C	Comments
stVal	ENUMERATED	ST	M	
q	Quality	ST	M	
t	TimeStamp	ST	M	
d	VISIBLE STRING255	DC	O	

Visible string status (VSS)

Attribute Name	Attribute Type	FC	M/O/C	Comments
stVal	VISIBLE STRING255	ST	M	
q	Quality	ST	M	
t	TimeStamp	ST	M	
d	VISIBLE STRING255	DC	O	

Enumerated status settings (ENG)

Attribute Name	Attribute Type	FC	M/O/C	Comments
setVal	ENUMERATED	SP	O	
d	VISIBLE STRING255	DC	O	

Integer status settings (ING)

Attribute Name	Attribute Type	FC	M/O/C	Comments
setVal	INT32	SP	M	
d	VISIBLE STRING255	DC	O	

Single point settings (SPG)

Attribute Name	Attribute Type	FC	M/O/C	Comments
setVal	INT32	SP	M	
d	VISIBLE STRING255	DC	O	

Single point settings (SPG)

Attribute Name	Attribute Type	FC	M/O/C	Comments
setVal	INT32	SP	M	
d	VISIBLE STRING255	DC	O	

Binary counter reading (BCR)

Attribute Name	Attribute Type	FC	M/O/C	Comments
actVal	INT32	ST	M	
q	Quality	ST	M	
t	TimeStamp	ST	M	
units	Unit	CF	O	
pulsQty	FLOAT32	CF	M	
d	VISIBLE STRING255	DC	O	

Measured value (MV)

Attribute Name	Attribute Type	FC	M/O/C	Comments
mag	AnalogueValue	MX	M	
q	Quality	MX	M	
t	TimeStamp	MX	M	
units	Unit	CF	O	
db	INT32U	CF	O	
d	VISIBLE STRING255	DC	O	
dataNs	VISIBLE STRING255	EX	C	Extended logical nodes only

Complex measured value (CMV)

Attribute Name	Attribute Type	FC	M/O/C	Comments
cVal	Vector	MX	M	
q	Quality	MX	M	
t	TimeStamp	MX	M	
units	Unit	CF	O	
db	INT32U	CF	O	
d	VISIBLE STRING255	DC	O	
dataNs	VISIBLE STRING255	EX	C	Extended logical nodes only

WYE

Attribute Name	Attribute Type	FC	M/O/C	Comments
phsA	CMV		C	
phsB	CMV		C	
phsC	CMV		C	
dataNs	VISIBLE STRING255	EX	C	Extended logical nodes only

Sequence (SEQ)

Attribute Name	Attribute Type	FC	M/O/C	Comments
c1	CMV		M	
c2	CMV		M	
c3	CMV		M	
seqT	ENUMERATED	MX	M	pos-neg-zero | dir-quad-zero
dataNs	VISIBLE STRING255	EX	C	Extended logical nodes only

Controllable single point (SPC)

Applied to boGGIO and evfGGIO class nodes.

Attribute Name	Attribute Type	FC	M/O/C	Comments
ctlVal	BOOLEAN	CO	C	See notes below for operation explanation
stVal	BOOLEAN	ST	M	
q	Quality	ST	M	
t	TimeStamp	ST	M	
d	VISIBLE STRING255	DC	O	
pulseConfig	PulseConfig	CF	O	

Attribute Name	Attribute Type	FC	M/O/C	Comments
ctlModel	CtlModels	CF	M	

Relay output operation depends on the configurable cmdQual attribute value (see pulseConfig) and the relay operation mode configured in the device via the Relay Setup as indicated in the following table.

cmdQual	Relay Operation Mode	Relay Output Operation
pulse	Pulse/KYZ	Pulse output. ctlVal = 1 – generates a pulse (normal/KYZ) with a duration defined by the onDur attribute; ctlVal = 0 – no effect
pulse	Latched/unlatched	No effect
persistent	Pulse/KYZ	Pulse output. ctlVal = 1 – generates a pulse (normal/KYZ) with a duration defined by the pulse width pre-configured in the device setup; ctlVal = 0 – no effect
persistent	Latched/unlatched	Latched output. ctlVal = 1 – switch on, ctlVal = 0 – switch off

Controllable integer status (INC)

Attribute Name	Attribute Type	FC	M/O/C	Comments
ctlVal	INT32	CO	C	
stVal	INT32	ST	M	
q	Quality	ST	M	
t	TimeStamp	ST	M	
d	VISIBLE STRING255	DC	O	

4.6 Constructed Attribute Classes

The following tables indicate usage of constructed attribute classes.

Quality

Attribute Name	Attribute Type	Value/range	M/O/C	Comments
validity	CODED ENUM	good | invalid | reserved | questionable	M	Supported
detailQual	PACKED LIST		M	Supported
overflow	BOOLEAN	FALSE	M	Defaulted
outOfRange	BOOLEAN	TRUE | FALSE	M	Supported
badReference	BOOLEAN	TRUE | FALSE	M	Supported
oscillatory	BOOLEAN	FALSE	M	Defaulted
failure	BOOLEAN	TRUE | FALSE	M	Supported
oldData	BOOLEAN	FALSE	M	Supported
inconsistent	BOOLEAN	FALSE	M	Defaulted
inaccurate	BOOLEAN	FALSE	M	Defaulted
source	CODED ENUM	process | substituted	M	Supported
test	BOOLEAN	FALSE	M	Defaulted
operatorBlocked	BOOLEAN	FALSE	M	Defaulted

Analog value

Attribute Name	Attribute Type	Value/range	M/O/C	Comments
f	FLOAT32	floating point value	C	

Pulse configuration

Attribute Name	Attribute Type	Value/range	M/O/C	Comments
cmdQual	ENUMERATED	pulse | persistent	M	For boGGIO pulse output, a relay must be set to pulse mode via the device Relay Setup
onDur	INT32U		M	boGGIO class nodes: default = 2000 ms CSWI class nodes: default = 0
offDur	INT32U		M	Not supported
numPls	INT32U	1	M	Read only

Originator

Attribute Name	Attribute Type	Value/range	M/O/C	Comments
orCat	ENUMERATED	not-supported | bay-control | station-control | remote-control | automatic-bay | automatic-station | automatic-remote | maintenance | process	M	
orIdent	OCTET STRING64		M	

Unit definition

Attribute Name	Attribute Type	Value/range	M/O/C	Comments
SIUnit	ENUMERATED	IEC61850-7-3, Tables A.1 to A.4	M	
multiplier	ENUMERATED	IEC61850-7-3, Table A.5	O	

Vector definition

Attribute Name	Attribute Type	Value/range	M/O/C	Comments
mag	AnalogueValue		M	
ang	AnalogueValue		O	

CtlModels definition

Attribute Value	Comments
status-only	Not controllable SPS, DPS and ENS
direct-with-normal-security	Controllable SPC. Supported by boGGIO and evfGGIO class nodes.
sbo-with-normal-security	Controllable SPC. Supported by boGGIO and evfGGIO class nodes.
direct-with-enhanced-security	Not supported
sbo-with-enhanced-security	Not supported

SboClasses definition

Attribute Value	Comments
operate-once	
operate-many	Not supported

5 TICS - TISSUES Implementation Conformance Statement

According to the UCA IUG QAP the tissue conformance statement is required to perform a conformance test and is referenced on the certificate.

This document is applicable for the PMU device.

Mandatory Edition 2 Tissues

The table below gives an overview of the applicable mandatory Tissues. The descriptions in greater detail can be found in the Tissue database at www.tissues.iec61850.com.

Part	No	Description	Implemented
6	658	Tracking related features *EntryID and CST missing, these are checked by schema*	na
	663	FCDA element cannot be a "functionally constrained logical node" *doName now mandatory in FCDA element, SCT: refuse to make empty doName? ICT: Refuse SCD*	Y
	668	Autotransformer modeling *Autotransformer model in substation section has changed*	na
	687	SGCB ResvTms *SettingControl has added attribute resvTms, see also TISSUE 845*	na
	719	ConfDataSet - maxAttributes definition is confusing *maxAttributes now means max count of FCDA in dataset*	Y
	721	Log element name *LN0/Log now has optional attribute "name"*	na
	768	bType VisString65 is missing *VisString65 added as SCL BasicType*	Y
	779	object references *"@" as first character in object references now allowed*	na
	788	SICS S56 from optional to mandatory *SICS S56="Interpret IED capabilities and prohibit unsupported usage"*	na
	789	ConfLdName as services applies to both server and client *Changes made to Services section*	na
	804	valKind and IED versus System configuration *valImport missing/false DAI means ICT shall ignore value in SCD and SCT shall not change from ICD/IID value. Instance section inherits from DA/BDA element.*	na
	806	Max length of log name inconsistent between -6 and -7-2 *LogControl.logName and Log.name restricted to 32 chars*	Y
	807	Need a way to indicate if "Owner" present in RCB *Services/ReportSettings owner added*	Y
	823	ValKind for structured data attributes *valKind is prohibited on structured attributes*	Y
	824	Short addresses on structured data attributes *sAddr is now allowed for structured attributes*	na
	825	Floating point value *Server shall support <Val> with exponential notation*	Y
	845	SGCB ResvTms *Services/SettingGroups/SGEdit added attribute resvTms* *Services/SettingGroups/ConfSG added attribute resvTms* *See also TISSUE 687*	na

Part	No	Description	Implemented
	853	SBO and ProtNs *DA[@name=SBO] element shall have ProtNS element*	na
	855	Recursive SubFunction *Substation section extension must be tolerated*	na
	856	VoltageLevel frequency and phases *Substation section extension must be tolerated*	na
	857	Function/SubFunction for ConductingEquipment *Substation section extension must be tolerated*	na
	886	Missing 8-1 P-types *"tP_IP_UDP_PORT" and "tP_IP_TCP_PORT" added*	na
	901	tServices as AP or as IED element *Rules for contents of AP/Server/Services are now defined*	na
	936	SupSubscription parameter usage is difficult *SupSubscription "max" replaced by "maxGo" and "maxSv"*	na
	1147	tServices - FileHandling not consistent with -7-2 *Services/FileHandling now means only support for GetFile and GetFileAttributeValues and NOT SetFile/DeleteFile*	na
	1185	Valkind value Conf for EX FC data *valKind=Conf is allowed for dataNs*	na
	1284	SCSM mapping may require a communication section in an ICD file *Server IEDs supporting client/server associations to 61850-8-1 shall include a <Communication> section*	Y
	1328	Limitation on the size of data type templates identifiers *Identifier now limited to 255 characters*	Y
	1395	Client LN attributes *ReportControl/RptEnabled/ClientLN@ldInst shall be "LD0" for pure clients (without any Logical Devices)*	na
	1402	ExtRef during engineering *an ExtRef.intAddr attribute value unequal to empty string (prescribed or filled by the IED tool) is the flag indicating that the ExtRef shall not be deleted by the system tool. The system tool can however remove the link to the source IED* <<applicable for SCL tool test>>	na
	1415	SICS-S110 IID import mandatory for Edition2 *only the import of data model modifications and CF value changes is mandatory for system tool* <<applicable for SCL tool test>>	na
	1419	Support of ldName on other IEDs *SICS I212 is now mandatory*	na
	1444	Need to support fixed and SCT controlled Datasets *Services/xxxSetttings@datSet=fix now means "data set pointed by Control Block cannot be altered from ICD/IID* value <<applicable for SCL tool test>>	na
	1445	ConfReportControl and a fixed ReportSettings *Control block capabilities must be consistent <<applicable for SCL tool test>>*	na
	1450	originalSclXxx computation rules *Ed2 ICD/IID files specifying SCL@version=2007 SHALL include originalSCLVersion=2007 and originalSCLRevision as attributes of the <IED>element*	na
	1485	Need to supersede Tissue 1398 to clarify SCT behavior *Same as TISSUE 1450 <<applicable for SCL tool test>>*	na
7-1	828	Data model namespace revision IEC 61850-7-4:2007[A]	Y

Part	No	Description	Implemented
		Both 2007 and 2007A are allowed for namespace name	
	948	Enumeration (string) values format *Enums are limited to 127 characters from Basic-Latin and Latin-1 character sets*	Y
	1151	Simulated GOOSE disappears after 1st appearance when LPHD.Sim = TRUE *New LGOS state machine defined, but TISSUE is not IntOp2, therefore TISSUE is optional if LGOS is used*	na
	1396	The use and configuration flow of LGOS and LSVS is unclear *If Services/SupSubscription@maxGo > 1 then at least 1 LGOS must exist. Same for maxSv/LSVS.* *If maxGo > count(LGOS) then SCT can create additional LGOS. Same for maxSv/LSVS*	na
	1447	Restriction on ENUMtypes in SCL *If a ENUM DA limits write or configuration to a subset, then that subset must be declared*	na
	1457	Multiple DOI nodes with the same name *LN can have no more than one DOI with same name*	Y
	1468	Re-use DO from other LN *allow standard or private dataNs*	na
	1491	CmdBlk blocks itself? *The data CmdBlk shall have no effect on the controllable data Mod or CmdBlk*	na
	1495	GetVariableAccessAttributes error code *Return MMS error access/object-non-existent if the object does not exist*	Y
7-2	728	BRCB: could PurgeBuf be set when RptEna=TRUE? *PurgeBuf while RptEna=true is prohibited*	Y
	778	AddCause values – add value not-supported *Align 7-2 with 8-1 (nothing new to 8-1)*	na
	780	What are unsupported trigger option at a control block? *All control blocks must support all trigger options*	Y
	783	TimOper Resp-; add Authorization check *Clarifies Time-Operated Controls*	na
	786	AddCause values 26 and 27 are switched *Annex B.2 has wrong AddCause values*	na
	820	Mandatory ACSI services (use for PICS template) *Model entries M18 (Application Association), M19 (GCB), M20 (SVCB) are new. Services S17 (Substitution) and S61 (GetServerDirectory) are new. Services S1, S3, S4, S5, S6, S8, S16, S18, S23, S36, S37, S41, S42 are changed.*	Y
	858	typo in enumeration ServiceType *Tracking serviceType now has GetLogicalNodeDirectory*	na
	861	dchg of ConfRev attribute *Clarifies (tracking) BTS.confRev is AFTER BRCB change*	na
	1050	GTS Phycomaddr definition in SCL *(Tracking) GTS needs a special structure for SCL*	na
	1071	Length of DO name *Private DO name length shall be <=12 including instance*	Y
	1127	Missing owner attribute in BTS and UTS	na
	1202	GI not optional *GI support is mandatory for both URCB and BRCB*	Y

Part	No	Description	Implemented
	1232	EntryID needs clarification *Segments of a report shall have same identifiers*	Y
	1242	NTS definition *NTS.resv have been added*	na
	1307	Segmented report with Buffer overflow *Segments of a report shall have identical buf-overflow value*	Y
	1428	MTS and NTS should use svOptFlds *MTS.optFlds and NTS.optFlds now have bType=SvOptFlds*	na
	1630	Attributes in CDC=LTS do not match 8-1 definition *Order of attributes in LTS changed to:* *logEna, logRef, datSet, oldEntrTm, newEntrTm, oldEnt, newEnt, trgOps, intgPd*	na
7-3	697	Persistent command/PulseConfig *PulseConfig adds enum "persistent-feedback"* *DPC.cmdQual=="persistent" is conditionally allowed*	Y
	698	Wrong case is BAC.dB attribute *attribute renamed from "dB" to "db"*	na
	711	blkEna freeze data update while setting its quality to operaterBlocked *Mode=Blocked shall not cause q.operatorBlocked*	na
	722	Units for 'h' and 'min' not in UnitKind enumeration. *New unit enums 84=hours, 85=minutes*	na
	919	Presence Condition for sVC *svC may be valKind=Conf in ICD file*	na
	925	Presence of i or f attribute - Problem with writing *New constructed attribute class "AnalogueValueCtl"*	na
	926	Presence Conditions within RangeConfig *All or none of hhLim+hLim+lLim+llLim shall be present*	na
	954	Data attributes with FC=CF should have trgOp=dchg *Some INS and HST and CSG attributes missing dchg*	na
	1078	CMV.t update if rangeAng changed *Add rangeAng to"reasons-to-update-timestamp-of-CMV"*	na
	1565	db = 0 behaviour *db=0 not longer suppresses reporting*	na
	1578	dataAttribute NameSpace content *Attributes with FC=EX must be initialized in ICD/IID file*	Y
7-4	671	Mistake in definition of Mod & Beh *Beh=on, q=test should be "Processed as valid"*	na
	674	CDC of ZRRC.LocSta is wrong *ZRRC LocSta should be CDC=SPC*	na
	676	Same data object name used with different CDC *LCCH.Fer renamed to FerCh, LCCH.RedFer to RedFerCh*	na
	677	MotStr is used with different CDC in PMMS and SOPM LN classes *Rename SOPM.MotStr to MotStrNum*	na
	679	Remove CycTrMod Enum *Enum is no longer used, use TrMod instead*	na
	680	SI unit for MHYD.Cndct *Change unit from S/cm^2 to S/m*	na
	681	Enum PIDAlg *Typographical error, invalid XML syntax*	na
	682	ANCR.ParColMod *ParColMod enum values text have changed*	na

Part	No	Description	Implemented
	683	Enum QVVR.IntrDetMth *IntrDetMth enum values text have changed*	na
	685	Enum ParTraMod *ParTraMod enum values text have changed*	na
	686	New annex H -enums types in XML *Changes have been made to enumeration names*	Y
	694	Data object CmdBlk *CmdBlk semantics have changed*	na
	696	LSVS.St (Status of subscription) *LSVS.St is now mandatory*	na
	712	Interpretation of quality operatorBlocked *Mode and Behavior semantics have changed*	na
	713	DO Naming of time constants in FFIL *Many DO names in FFIL have changed*	na
	714	Enums for ShOpCap and SwOpCap *Type for YPSH.ShOpCap and XSWI.SwOpCap have changed*	na
	715	RBDR.ChNum1 *RBDR.ChNum1 changes from optional to conditional*	na
	716	TAXD text for condition *TAXD.SmRte condition for inclusion has changed*	na
	724	ANCR.Auto *ANCR.Auto changes from mandatory to optional*	na
	725	Loc in LN A-group *Loc changes to optional, LocKey/LocSta conditions change*	na
	734	LLN0.OpTmh vs. LPHD.OpTmh *LLN0.OpTmh deleted, LPHD.OpTmH added as conditional*	na
	736	PFSign *MMXU.PFSign enum is extended with 3=Excitation*	na
	742	GAPC.Str, GAPC.Op and GAPC.StrVal *Objects have instance indicator removed (ex, Str1 to Str)*	na
	743	CCGR.PmpCtl and CCGR.FanCtl *Object have instance indicator added (ex:PmpCtl to PmpCtl1)*	na
	744	LN STMP, EEHealth and EEName *Removed STMP.EEHealth and STMP.EEName*	na
	772	LPHD.PwrUp/PwrDn should be transient *These objects are now transient*	na
	773	Loc, LocKey and LocSta YPSH and YLTC *Add Loc, LocKey and LocSta in YLTC and YPSH (optional)*	na
	774	ITCI.LocKey *Add ITCI.LocKey as optional*	na
	776	LPHD.OutOv/InOv and LCCH.OutOv/InOv *Clarified: stays true until buffer space again available*	na
	800	Misspelling in CSYN *CSYN.VInvTmms renamed to CSYN.VIntvTmms*	na
	802	CCGR and Harmonized control authority *Add Loc, LocKSta to every controllable LN (e.g. FSPT)*	na
	808	Presence condition of ZMoT.DExt and new DOs *Change ZMOT.DExt to optional; add TotThmSt and MotSt*	na
	831	Setting of ConfRevNum in LGOS *Add RxConfRevNum to LGOS and LSVS*	na

Part	No	Description	Implemented
	838	Testing in Beh=Blocked *Change semantic of Beh=Blocked to allow controls to be acknowledged even when LN is blocked.*	na
	844	MFLK.PhPiMax, MFLK.PhPiLoFil, MFLK.PhPiRoot DEL->WYE *Change these NFLK objects from cdc=DEL to cdc=WYE*	na
	877	QVUB -settings should be optional *Change QVUB.UnbDetMth and QVUB.StrVal to optional*	na
	908	ARIS.StrSeq – transient *Change ARIS.StrSeq to transient*	na
	909	Remove ANCR.ColOpR and ColOpL *Replace ANCR.ColOpR and ANCR.ColOpL with ANCR.ColChg. Add YEFN.ColChg*	na
	912	Clarification of PwrRtg/VARtg *Change many DOs in YPTR, and ZGEN, see name space 2007A2.nsd for final result*	na
	920	Resetable Counter is NOT resettable *Change GGIO.CntRs to CntVal; Same for FCNT*	na
	932	Rename AVCO.SptVol to AVCO.VolSpt	na
	933	Presence of LCCH.RedFerCh and RedRxCnt *Change the presence condition of LCCH.RedChLiv*	na
	939	Change CDC for ANCR.FixCol *Change ANCR.FixCol from APC to ASG*	na
	991	LGOS: GoCBRef (as well as LSVS.SvCBRef) should be mandatory *LGOS.GoCBRef and LSVS.SvCBRef are now both mandatory*	Y
	1007	PTRC as fault indicator - Update of description required *PTRC.Tr and Op and Str conditional (at least 1 of group)*	na
	1044	TapChg in AVCO *AVCO.TapChg is now optional*	na
	1077	Rename DOnames within LTIM *LTIM.TmChgDayTm, changed to TmChgDay;* *LTIM.TmChgStdTm changed to TmChgStd*	na
	1256	New DO for LTIM to set time "manually" *Add LTIM.TmSet*	na
	1331	Mod, Beh and Health with q=TEST, client can't receive their states *Mod while in Blocked will always be processed*	na
	1426	Add two DO for leap seconds in LTIM *LTIM.Leap added*	na
	1456	Annex A and Mod/Beh/Health *Mod.stVal writes always ignore test bits in controls*	na
	1568	ISAF.AlmReset ->transient *Change ISAF.AmlReset to transient*	na
8-1	770	GoID type mismatch 18.1.1 and 18.1.2.5.2 *GoID string length is now 129*	Y
	784	Tracking of control (CTS) *Tracking CTS has been added*	na
	817	Fixed-length GOOSE float encoding *GOOSE float is encoded Tag-0x87, length=5, first octet=8*	na
	827	Mandatory ACSI services (Part of 7-2 TISSUE resolution) *Change Table 111 (ServicesSupported): Add initiate, abort, and release.* *Change conditions for defineNamedVariables*	Y
	834	File dir name length 64	Y

Part	No	Description	Implemented
		Filename length changed from 32 to 64	
	951	Encoding of Owner attribute *xRCB.owner is encoded as 4 octets(IPv4) or 16 octets(IPv6)*	na
	1040	More associate error codes *3 additional associate error codes added*	na
	1178	Select Response+ is non-null value *Response to SBO read should be <CO_CtrlObjectRef>*	Y
	1324	The response- for DeleteNamedVariableList is not defined *numDeleted=0; error=service/object-constraint-conflict*	Y
	1345	Fixed-length GOOSE ASN.1 length encoding *GOOSE publisher shall always encode minimum size length field*	na
	1441	Optional fields in buffered reports *Writing BRCB.optFld shall not cause a purgeBuf operation*	Y
	1442	Journal variableTag for ReasonCode *Example in the standard is incorrect*	na
	1453	Purge buffer on write to BRCB *PurgeBuf only occurs if different value is written*	Y
	1454	Reports can be transmitted before write (RptEna=true) is confirmed	na
	1500	the response for DeleteNamedVariableList with a non-existent LN is not specified *CreateDataSet/DefineNamedVariableList specifying a non-existing LD/LN shall fail with access/object-non-existent*	Y

Note: Tissues 675, 735, 772, 775, 776, 878 are not relevant for conformance testing.

Mandatory Edition 1 Tissues

The table below lists the other applicable Edition 1 technical issues.

Part	No	Description	Implemented
6	1	Syntax	Y
	5	tExtensionAttributeNameEnum is restricted	Y
	8	SIUnit enumeration for W	Y
	10	Base type for bitstring usage	na
	17	DAI/SDI elements syntax	Y
	169	Ordering of enum differs from 7-3	na
	245	Attribute RptId in SCL	Y
	529	Replace sev - Unknown by unknown	na
7-2	30	Control parameter T	Y
	31	Typo	Y
	32	Typo in syntax	Y
	35	Typo Syntax Control time	Y
	36	Syntax parameter DSet-Ref missing	Y
	37	Syntax GOOSE "T" type	Y
	39	Add DstAddr to GoCB	Y
	40	GOOSE Message AppID to GoID	Y
	41	GsCB “AppID” to “GsID”	na
	42	SV timestamp: “EntryTime” to “TimeStamp"	Y
	43	Control "T" semantic	Y

Part	No	Description	Implemented
	44	AddCause - Object not selected	Y
	46	Synchrocheck cancel	na
	47	"." in LD Name?	na
	49	BRCB TimeOfEntry?	Y
	50	LNName start with number?	na
	51	ARRAY [0..num] missing	na
	52	Ambiguity GOOSE SqNum	Y
	53	Add DstAddr to GsCB, SV	Y
	151	Name constraint for control blocks etc.	Y
	166	DataRef attribute in Log	na
	185	Logging - Integrity period	na
	189	SV Format	Y
	190	BRCB: EntryId and TimeOfEntry	Y
	191	BRCB: Integrity and buffering reports	Y
	234	New type CtxInt	na
	275	Confusing statement on GI usage	Y
	278	EntryId not valid for a server	Y
	297	BRCB: SqNum generation	Y
	298	BRCB: SqNum attribute data type	Y
	305	BufTim=0 with 2 or more data set changes	Y
	322	BRCB: Buffer purge when changing configuration	Y
	329	BRCB: Conditions for setting buffer overflow	Y
	333	Enabling of an incomplete GoCB	Y
	335	BRCB: Clearance of BufOvl flag	Y
	348	URCB class and report	Y
	349	TimeOfEntry has two definitions	Y
7-3	28	Definition of APC	na
	54	Point def xVal, not cVal	na
	55	Ineut = Ires?	na
	60	Services missing in tables	Y
	63	mag in CDC CMV	na
	219	operTm in ACT	na
	270	WYE and DEL rms values	Y
8-1	116	GetNameList with empty response?	Y
	165	Improper Error Response for GetDataSetValues	Y
	183	GetNameList error handling	Y
	246	Control negative response (SBO-normal-security) with LastApplError	Y
	545	Skip file directories with no files	na

Note: Tissues 49, 190, 191, 275 and 278 are part of the optional tissue 453.