

SIEMENS

SICAM AI Unit
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IEC 61850

PIXIT, PICS, TICS

V1.00

Manual

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Preface

Purpose of this manual

In this manual you will find the specification of the applications of the IEC 61850 interface.

Target audience

This manual is intended mainly for all persons who configure, parameterize and operate a SICAM AI Unit device.

Scope of validity

SICAM AI Unit V01.11 and higher.

This manual is valid for SICAM AI Unit devices running Edition 1 mode of IEC 61850.

Standards

This manual has been created according to the ISO 9001 quality standards.

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1 Applications

Contents

This chapter specifies the protocol implementation extra information for testing (PIXIT) of the IEC 61850 interface in SICAM AI Unit.

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1.1 General

This manual specifies the protocol implementation extra information for testing (PIXIT) of the IEC 61850 interface in SICAM AI Unit.

It is based on the service subset definition given in the protocol implementation conformance (PICS), which is specified within the user manual SICAM AI Unit IEC 61850.

The following applicable ACSI service models are supported and specified:

- Association model
- Server model
- Data set model
- Reporting model
- GOOSE publish model
- Time and time synchronization model

Together with the PICS the PIXIT forms the basis for a conformance test according to IEC 61850-10.

1.2 Association model

ID	Ed	Description	Value / Clarification
As1	1	Maximum number of clients that can set-up an association simultaneously	6
As2	1,2	TCP_KEEPALIVE value. The recommended range is 1..20s	10 seconds Adjustable under "Configuration Modbus TCP"
As3	1,2	Lost connection detection time	30 seconds
As5	1,2	What association parameters are necessary for successful association?	Transport selector Y Session selector Y Presentation selector Y AP Title Y (ANY) AE Qualifier Y (ANY) Where Y means: as defined within the ICD file ANY means: any value accepted
As6	1,2	If association parameters are necessary for association, describe the correct values	Transport selector 0001 Session selector 0001 Presentation selector 00000001
As7	1,2	What is the maximum and minimum MMS PDU size?	Max MMS PDU size 20000 Min MMS PDU size 8192
As8	1,2	What is the maximum start up time after a power supply interrupt?	30 seconds

1.3 Server model

ID	Ed	Description	Value / Clarification
Sr1	1,2	Which analogue value (MX) quality bits are supported (can be set by server)?	Validity: Good Y Invalid Y Reserved N Questionable N Overflow Y OutofRange N BadReference Y Failure Y OldData N Inconsistent N Inaccurate N Source: Process Y Substituted N Test Y OperatorBlocked N
Sr2	1,2	Which status value (ST) quality bits are supported (can be set by server)?	Validity: Good Y Invalid Y Reserved N Questionable N BadReference Y Oscillatory N Failure Y OldData N Inconsistent N Inaccurate N Source: Process Y Substituted N Test Y OperatorBlocked N

1.4 Data set model

No additional information. See Services section in SCL files.

1.5 Substitution model

Substitution model is not supported by the device.

1.6 Setting group control model

Setting Group control model is not supported by the device.

1.7 Reporting model

ID	Ed	Description	Value / Clarification
Rp1	1	The supported trigger conditions are (compare PICS)	Integrity Y Data change Y Quality change Y Data update Y General Interrogation Y
Rp2	1	The supported optional fields are	Sequence-number Y Report-time-stamp Y Reason-for-inclusion Y Data-set-name Y Data-reference Y Buffer-overflow for Buffered report Y EntryID - for Buffered report Y Conf-rev Y Segmentation Y
Rp3	1,2	Can the server send segmented reports?	Y
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
Rp7	1,2	What is the buffer size for each BRCB or how many reports can be buffered?	No fixed size, depends on total number of BRCBs
Rp9	1	May the reported data set contain: - structured data objects? - data attributes?	Y N/A (datasets are fix)
Rp10	1,2	What is the scan cycle for binary events? Is this fixed, configurable?	200 ms if measurement inputs are used to generate binary events. 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?	Restored from original configuration (ConfRev is fix)

1.8 Logging model

Logging model is not supported by the device.

1.9 GOOSE publish model

ID	Ed	Description	Value / Clarification
Gp1	1,2	Can the test flag in the published GOOSE be turned on / off	N
Gp2	1	What is the behavior when the GOOSE publish configuration is incorrect	GOOSE Publisher cannot be configured incorrect. Default values are used. Initially GOOSE Publishers are disabled.
Gp3	1,2	Published FCD supported common data classes are	SPS Arrays are not supported
Gp4	1,2	What is the slow retransmission time? Is it fixed or configurable?	Configured by SCD file or via web server
Gp5	2	What is the fast retransmission scheme? Is it fixed or configurable?	Configured by SCD file or via web server
Gp7	1,2	What is the initial GOOSE sqNum after restart	sqNum = 0
Gp8	1	May the GOOSE data set contain: - structured data objects (FCD)? - Timestamp data attributes?	N/A (datasets are fix) N/A (datasets are fix)
additional items:			
	1,2	Which TAL (time allowed to live) value is sent by the GOOSE Publishers?	1.5 MaxTime

1.10 GOOSE subscribe model

GOOSE subscribe model is not supported by the device.

1.11 Control model

Control model is not supported by the device.

1.12 Time and time synchronization model

ID	Ed	Description	Value / Clarification
Tm1	1,2	What time quality bits are supported (may be set by the IED)?	LeapSecondsKnown Y ClockFailure Y ClockNotSynchronized Y
Tm2	1,2	Describe the behavior when the time server(s) ceases to respond What is the time server lost detection time?	On one time server: Time quality is set to ClockNotSynchronized and ClockFailure. On all time servers: Time quality is set to ClockNotSynchronized and ClockFailure. Configurable from 2 – 120 minutes (default 10 minutes)
Tm3	1,2	How long does it take to take over the new time from time server?	Max. 60 seconds
Tm4	1,2	When is the time quality bit "ClockFailure" set?	At faulty internal clock or failure of the synchronization source (SNTP, field bus) or RTC failure
Tm5	1,2	When is the time quality bit "ClockNotSynchronized" set?	When connection to all time servers is lost (see PIXIT-Tm2)
Tm7	1	Does the device support time zone and daylight saving?	Y
Tm8	1,2	Which attributes of the SNTP response packet are validated?	Leap indicator not equal to 3 Y Mode is equal to SERVER N OriginateTimestamp is equal to value sent by the SNTP client as Transmit Timestamp N RX/TX timestamp fields are checked for reasonableness Y SNTP version 3 and/or 4 N other (describe) N
Tm9	1,2	Do the COMTRADE files have local time or UTC time and is this configurable?	No COMTRADE files available

1.13 File transfer model

File transfer model is not supported by the device.

1.14 Service tracking model

Service tracking model is not supported by the device.

1.15 TICS – Technical Issues Implementation Conformance Statement

1.15.1 TISSUES Edition 1

The implemented TISSUES are only relevant when the Edition Setting is set to Edition 1.

Part 7-2 Tissue	Description	Implemented?
49	BRCB TimeOfEntry?	Y
52	Ambiguity GOOSE SqNum	Y
190	BRCB: EntryId and TimeOfEntry	Y
191	BRCB: Integrity and buffering reports	Y
234	New type CtxInt	Y
275	Confusing statement on GI usage	Y
278	EntryId not valid for a server	Y
297	Sequence number	Y
298	Type of SqNum	Y
300	Attribute Resv in BRCB	Y
322	Write Configuration attribute of BRCBs	Y
329	Reporting and BufOvl	Y
332	Ambiguity in use of trigger options	Y
335	Clearing of Bufovfl	Y
348	URCB class and report	Y
349	BRCB TimeOfEntry has two definitions	Y
453	Reporting & Logging model revision	Y
474	GI for URCB	Y

Part 8-1 Tissue	Description	Implemented?
116	GetNameList with empty response?	Y
120	Type - Mod.stVal and Mod.ctlVal	Y
165	Improper Error Response for GetDataSetValues	Y
168	Order of attributes in MMS components	Y
177	Ignoring OptFlds bits for URCB	Y
183	GetNameList error handling	Y
301	SqNum in Buffered Reports	Y
344	TimeOfEntry misspelled	Y
377	DeleteDataSet response-	Y
422	Order of extension data objects and data attributes	Y
433	Order of attributes in specialized CDCs for control service mapping	Y
438	EntryTime base should be GMT	Y

2 IEC 61850 Conformance Statements

Contents

This chapter describes conformity with IEC 61850. It does not describe the entire standard but only parts in which there is a choice in the services.

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2.1 Definition of the Communication Services acc. to Standard (PICS)

The tables in the section below appear in the same sequence as in standard IEC 61850, Part 8-1, Section 24.

The tables refer to Part 7 of the standard and the corresponding information must be contained in the PICS.

This section describes the conformance statements. The standard groups them together under the term Protocol Implementation Conformance Statement (PICS).

Mandatory services

Please note that a number of services are prescribed and must be implemented to comply with the standard. Only the optional services and protocols are listed here because they constitute freedom of implementation. None of the mandatory services is explicitly explained here. Please refer to the standard IEC 61850, Part 8-1.

The description below refers to implementation in the SICAM AI Unit device.

The tables give the names stated in the standard.

Basic conformance statement

		Client/ Subscriber	Server/ Publisher	Value/ Comments
Client-Server roles				
B11	Server side (of TWO-PARTY-APPLICATION-ASSOCIATION)	—	Y	
B12	Client side (of TWO-PARTY-APPLICATION-ASSOCIATION)	N	—	
SCSMs supported				
B21	SCSM: IEC 6185-8-1 used	N	Y	
B22	SCSM: IEC 6185-9-1 used	N	N	
B23	SCSM: IEC 6185-9-2 used	N	N	
B24	SCSM: other	N/A	N/A	
Generic substation event model (GSE)				
B31	Publisher side	—	Y	
B32	Subscriber side	N	—	
Transmission of sampled value model (SVC)				
B41	Publisher side	—	N	
B42	Subscriber side	N	—	
Y = supported N or empty = not supported				

ACSI models conformance statement

		Client/ Subscriber	Server/ Publisher	Value/Comments
If Server side (B11) and/or Client side (B12) supported				
M1	Logical device	N	Y	
M2	Logical node	N	Y	
M3	Data	N	Y	
M4	Data set	N	Y	
M5	Substitution	N	N	
M6	Setting group control	N	N	
Reporting				
M7	Buffered report control	N	Y	
M7-1	sequence-number	N	Y	
M7-2	report-time-stamp	N	Y	
M7-3	reason-for-inclusion	N	Y	
M7-4	data-set-name	N	Y	
M7-5	data-reference	N	Y	
M7-6	buffer-overflow	N	Y	
M7-7	entryID	N	Y	
M7-8	BufTm	N	Y	
M7-9	IntgPd	N	Y	
M7-10	GI	N	Y	
M8	Unbuffered report control	N	Y	
M8-1	sequence-number	N	Y	
M8-2	report-time-stamp	N	Y	
M8-3	reason-for-inclusion	N	Y	
M8-4	data-set-name	N	Y	
M8-5	data-reference	N	Y	
M8-6	BufTm	N	Y	
M8-7	IntgPd	N	Y	
M8-8	GI	N	Y	
Logging				
M9	Log control	N	N	
M9-1	IntgPd	N	N	
M10	Log	N	N	
M11	Control	N	N	
If GSE (B31/32) is supported				
M12	GOOSE	N	Y	
M13	GSSE	N	N	
If SVC (41/42) is supported				
M14	Multicast SVC	N	N	
M15	Unicast SVC	N	N	
If Server or Client side (B11/12) supported				
M16	Time	Y	N	

2.1 Definition of the Communication Services acc. to Standard (PICS)

		Client/ Subscriber	Server/ Publisher	Value/Comments
M17	File Transfer	N	N	
Y = supported N or empty = not supported				

ACSI service conformance statement

	Services	AA:TP/MC	Client (C)	Server (S)	Comments
Server					
S1	GetServerDirectory(LOGICAL-DEVICE)	TP	N	Y	

Application association					
S2	Associate		N	Y	
S3	Abort		N	Y	
S4	Release		N	Y	

Logical device					
S5	GetLogicalDeviceDirectory	TP	N	Y	

Logical node					
S6	GetLogicalNodeDirectory	TP	N	Y	
S7	GetAllDataValues	TP	N	Y	

Data					
S8	GetDataValues	TP	N	Y	
S9	SetDataValues	TP	N	N	
S10	GetDataDirectory	TP	N	Y	
S11	GetDataDefinition	TP	N	Y	

Data set					
S12	GetDataSetValues	TP	N	Y	
S13	DataSetValues	TP	N	N	
S14	CreateDataSet	TP	N	N	
S15	DeleteDataSet	TP	N	N	
S16	GetDataSetDirectory	TP	N	Y	

Substitution					
S17	SetDataValues	TP	N	N	

Setting group control					
S18	SelectActiveSG	TP	N	N	
S19	SelectEditSG	TP	N	N	
S20	SetSGValues	TP	N	N	
S21	ConfirmEditSGValues	TP	N	N	
S22	GetSGValues	TP	N	N	
S23	GetSGCBValues	TP	N	N	

	Services	AA:TP/MC	Client (C)	Server (S)	Comments
Reporting					
Buffered report control block (BRCB)					
S24	Report	TP	N	Y	
S24-1	data-change (dchg)		N	Y	
S24-2	quality-change (qchg)		N	Y	
S24-3	data-update (dupd)		N	Y	
S25	GetBRCBValues	TP	N	Y	
S26	SetBRCBValues	TP	N	Y	
Unbuffered report control block (URCB)					
S27	Report	TP	N	Y	
S27-1	data-change (dchg)		N	Y	
S27-2	quality-change (qchg)		N	Y	
S27-3	data-update (dupd)		N	Y	
S28	GetURCBValues	TP	N	Y	
S29	SetURCBValues	TP	N	Y	
Logging					
Log control block					
S30	GetLCBValues	TP	N	N	
S31	SetLCBValues	TP	N	N	
Log					
S32	QueryLogByTime	TP	N	N	
S33	QueryLogAfter	TP	N	N	
S34	GetLogStatusValues	TP	N	N	
Generic substation event model (GSE)					
GOOSE-CONTROL-BLOCK					
S35	SendGOOSEMessage	MC	N	Y	
S36	GetGoReference	TP	N	N	
S37	GetGOOSEElementNumber	TP	N	N	
S38	GetGoCBValues	TP	N	Y	
S39	SetGoCBValues	TP	N	Y	
GSSE-CONTROL-BLOCK					
S40	SendGSSEMessage	MC	N	N	
S41	GetGsReference	TP	N	N	
S42	GetGSSEDataOffset	TP	N	N	
S43	GetGsCBValues	TP	N	N	
S44	SetGsCBValues	TP	N	N	
Transmission of sampled value model (SVC)					
Multicast SVC					
S45	SendMSVMessage	MC	N	N	
S46	GetMSVCBValues	TP	N	N	
S47	SetMSVCBValues	TP	N	N	
Unicast SVC					

2.1 Definition of the Communication Services acc. to Standard (PICS)

	Services	AA:TP/MC	Client (C)	Server (S)	Comments
S48	SendUSVMessage	TP	N	N	
S49	GetUSVCBValues	TP	N	N	
S50	SetUSVCBValues	TP	N	N	

Control					
S51	Select	TP	N	N	
S52	SelectWithValue	TP	N	N	
S53	Cancel	TP	N	N	
S54	Operate	TP	N	N	
S55	CommandTermination	TP	N	N	
S56	TimeActivatedOperate	TP	N	N	

File transfer					
S57	GetFile	TP	N	N	
S58	SetFile	TP	N	N	
S59	DeleteFile	TP	N	N	
S60	GetFileAttributeValues	TP	N	N	

Time					
T1	Time resolution of internal clock			10 (1ms)	nearest negative power of 2 in seconds
T2	Time accuracy of internal clock			+5 ms → T0 (n = 7)	T0 (10ms) T1 (1ms) T2 (100µs) T3 (25µs) T4 (4µs) T5 (1µs)
T3	Supported TimeStamp resolution			10 (1ms)	nearest negative power of 2 in seconds