

SIEMENS

SIPROTEC 5
PIXIT, PICS, TICS
IEC 61850

V9.60 and higher

Manual

Preface

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**NOTE**

For your own safety, observe the warnings and safety instructions contained in this document, if available.

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Document version: C53000-G5040-C013-E.02

Edition: 09.2023

Version of the product described: V9.60 and higher

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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 SIPROTEC 5 device.

Scope of validity

SIPROTEC 5 Configuration version 6.0 and higher.

This manual is valid for SIPROTEC 5 devices changed to Edition 1, Edition 2, and Edition 2.1 mode of IEC 61850.

Standards

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

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Siemens AG

Smart Infrastructure – Protection Automation

Customer Support Center

Tel.: +49 911 2155 4466

E-Mail: energy.automation@siemens.com

Training Courses

Inquiries regarding individual training courses should be addressed to our Training Center:

Siemens AG

Siemens Power Academy TD

Humboldtstraße 59

90459 Nuremberg

Germany

Phone: +49 911 9582 7100

E-mail: poweracademy@siemens.com

Internet: www.siemens.com/poweracademy

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1.1 General

This manual specifies the protocol implementation extra information for testing (PIXIT) of the IEC 61850 interface in SIPROTEC 5.

It is based on the service subset definition given in the protocol implementation conformance statement (PICS), which is specified within the Clause 2.2.

The following applicable ACSI service models are specified:

- Association model
- Server model
- Data set model
- Substitution model
- Setting group control model
- Reporting model
- Logging model
- GOOSE publish model
- GOOSE subscribe model
- Control model
- Time and time synchronisation model
- File transfer model
- Tracking
- General items

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

The mapping between the IEC 61850 server data model and the SIPROTEC specific data is specified in DIGSI.

1.2 Documentation

ID	ED	Description	Value / Clarification
Do1	2	How to expose the required firmware version(s) when not present in the datamodel	Value is present in the datamodel

1.3 Configuration

ID	ED	Description	Value / Clarification
Cf1	2	Can IED tool export ICD file or IID file (SICS I12)	ICD: Y IID: Y

1.4 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_KEEPLIVE value. The recommended range is 1..20 s	4 seconds
As3	1, 2	Lost connection detection time range	up to 15 seconds
As4	-	Authentication is not supported yet	N, it is not supported
As5	1, 2	What association parameters are necessary for successful association? Called values:	Y Transport selector Y Session selector Y Presentation selector Y AP Title (ANY) Y AE Qualifier (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 called values e.g.	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 65536 Min MMS PDU size 8192
As8	1, 2	What is the maximum startup time after a power supply interrupt?	Typical 60 seconds The value depends on the size of the object directory
As9	1, 2	Does this device function only as test equipment? (test equipment need not have a non-volatile configuration; but it cannot be part of the substation automation system)	N
As10	2	How does the server behave when the associate request fails	The server does not send associate requests.

1.5 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 Y Questionable N Overflow Y OutofRange N BadReference N Oscillatory Y Failure N OldData N Inconsistent Y Inaccurate Source: Y Process N Substituted Y Test Y 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 N BadReference Y Oscillatory N Failure Y OldData N Inconsistent N Inaccurate Source: Y Process Y Substituted Y Test Y OperatorBlocked
Sr3		What is the maximum number of data values in one GetDataValues request ?	Deprecated
Sr4		What is the maximum number of data values in one SetDataValues request ?	Deprecated
Sr5		Which Mode / Behaviour values are supported?	Y On Y (On-)Blocked Y Test Y Test/Blocked Y Off

ID	ED	Description	Value / Clarification
additional items			
		What is the behaviour of the device by GetAllDataValues?	<p>GetAllDataValues is not supported without functional constraint indication. The functional constraints SG and SP can not be read as functional constraint logical nodes;</p> <p>for those functional constraint only FCD's and FCDA's access are supported: GetDataValues, GetSGValues/GetEditSGValue.</p>

1.6 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)	Not limited by an internal configuration parameter. It depends on the available memory.
Ds2	1	How many persistent data sets can be created by one or more clients ?	30 data sets for each LD. It depends on the available memory.
Ds3	1	How many non-persistent data sets can be created by one or more clients ?	10 data sets. It depends on the available memory.

1.7 Substitution Model

ID	ED	Description	Value / Clarification
Sb1	1	Are substituted values stored in volatile memory?	N

1.8 Setting Group Control Model

ID	ED	Description	Value / Clarification
Sg1	1	What is the number of supported setting groups for each logical device?	Configurable, up to 8, see SGCB value
Sg2	1, 2	What is the effect of when and how the non-volatile storage is updated ? (compare IEC 61850-8-1 §16.2.4)	The settings will be available after a restart since they are non-volatile, as long as the setting group editing succeed.
Sg3	1	Can multiple clients edit the same setting group?	Y but not at the same time.
Sg4	1	What happens if the association is lost while editing a setting group?	The setting group edition is canceled
Sg5	1	Is EditSG value 0 allowed?	Y It cancels the current editing and unreserves the SGCB.
Sg6	2	When ResvTms is not present, how long is an edit setting group locked?	ResvTms is present and configurable with the ICT; default 120 s
Sg7	2	Can the active setting group be changed locally? Can a setting in the active setting group be changed locally?	Y Y
		additional items:	
		What happens if during the editing of a setting group, the EditSG is set again by the client that performs the editing?	The currently edited buffer is overwritten with the value contained in the setting group. The edited values that were not confirmed are lost.

1.9 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 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 - for Buffered report Y EntryID - for Buffered report Y Conf-rev Y Segmentation
Rp3	1, 2	Can the server send segmented reports? (when not supported it is allowed to refuse an association with a smaller than minimum PDU size)	Y
Rp4	1, 2	Mechanism on second internal data change notification of the same analog 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?	Deprecated
Rp7	1, 2	What is the buffer size for each BRCB or how many reports can be buffered ?	About 1 MB are available for the buffering. Each BRCB has an extension attribute Memory that display the percentage of those 1 MB that have been reserved/forseen for its own entries. Amount is 1 MB/Number of all BRCB's
Rp8	-	Pre-configured RCB attributes that are dynamic, compare SCL report settings	Deprecated
Rp9	1	May the reported dataset contain: - structured data objects? - data attributes?	Y Y
Rp10	1, 2	What is the scan cycle for binary events? Is this fixed, configurable?	1 msecond Fixed
Rp11	1	Does the device support to pre-assign a RCB to a specific client in SCL?	Y
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
Rp13	1, 2	Does the server accept any client to configure/enable a BRCB with ResvTms=-1?	Y What fields are used to do the identification? AP-Title N AE-Qualifier N <other field> N

ID	ED	Description	Value / Clarification
Rp14	1, 2	When BRCB.ResvTms is exposed, what is default value for BRCB.ResvTms if client does not write (must be > 0)	60 seconds
		When BRCB.ResvTms is not exposed, what is the internal reservation time (must be ≥ 0)	N/A
Rp15	2	Is data model db=0 supported	Y
additional items			
		Interrupt of general interrogation	Running GI could not be interrupted. If a new GI request occurs during a running GI, the current GI will be finished first before the second GI request will be processed.
		Integrity period	Configurable 1 second
		Optional use of a flow control for transmitting history of a BRCB	As specified in the IEC61850-7-2, transmission of entries may require some time, depending of the amount of entries that have to be transmitted. Therefore, the SIPROTEC has an optional flow control feature to accelerate the transmission of the entries: each BRCB has an extended attribute MaxOutReports that can be set from the associated client to change the transmission strategy of the entries. Those attributes are located in VMD variables. The number ordered will then be transmitted as long as they exist in the buffer; the server then reset the attribute to 0 and wait for the client to set it again in order to continue the history transmission with MaxOutReports entries. The attribute only influences the flow control of entries while dealing with the history, and not after the history transmission has completed.

1.10 GOOSE Publish Model

ID	ED	Description	Value / Clarification
Gp1	1, 2	Can the test/simulation flag in the published GOOSE be turned on / off	N
Gp2	1	What is the behavior when the GOOSE publish configuration is incorrect	DUT will send GOOSE with NdsCom = TRUE as long as the minimum required configuration is available (dstAddress)
Gp3	1, 2	Published FCD supported common data classes are	SPS, DPS, INS, ENS, ACT, ACD, BCR, MV, CMV, WYE, DEL, SEQ, SPC, DPC, INC, ENC, APC, BAC, BSC Arrays are not supported
Gp4	1, 2	What is the maximum value of TAL (maxTime)? Is it fixed or configurable?	Configured by SCD file
Gp5	1, 2	What is the fastest retransmission time?	Configured by SCD file
Gp6	-	Can the GOOSE publish be turned on / off by using SetGoCBValues(GoEna)?	Deprecated See PICS - SetGoCBValues
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?	Y Y
Gp9	1, 2	Does ICT refuse GOOSE payload dataset length greater than SCSM supports?	Y
additional items			
		Maximum number of GOOSE messages which could be sent	≤ 16 ; It depends on the available memory
		What is the behavior of the DUT when a user configures a GoCB with a dataset which values will not fit in a single GOOSE message?	Not possible. IED Tool DIGSI informs the users that the DataSet configuration exceeds the maximum size allowed.
		Which TAL (time allowed to live) value is sent by the GOOSE Publishers?	TAL is set to 1,5 * maxTime configured in the SCD file

1.11 GOOSE Subscribe Model

ID	ED	Description	Value / Clarification
Gs1	1, 2	<p>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:</p> <ul style="list-style-type: none"> The VLAN tag may be removed by an Ethernet switch and should not be checked. The simulation flag shall always be checked (Ed2). The ndsCom shall always be checked. 	<p>Y Destination MAC address Y Ethertype = 0x88B8 Y APPID Y gocbRef N timeAllowedtoLive Y datSet Y goID N t Y stNum Y sqNum Y simulation/test Y confRev Y ndsCom Y numDatSetEntries Y out-of-order dataset members</p>
Gs2	1, 2	<p>When is a subscribed GOOSE marked as lost ? (TAL = time allowed to live value from the last received GOOSE message)</p>	<p>When message does not arrive by $2 \cdot \text{TAL}$</p>
Gs3	1, 2	<p>What is the behavior when one or more subscribed GOOSE message isn't received or syntactically incorrect ? (missing GOOSE)</p>	<p>The behavior is configurable in DIGSI - Advanced Quality Attributes via the Communication outage respectively Invalidity properties for each receiving signal. If Keep flag is unchecked, the signal is substituted with the value specified in defined value. If Keep flag is checked, the value invalid is set internally.</p>
Gs4	1, 2	<p>What is the behavior when a subscribed GOOSE message is out-of-order ?</p>	<p>When a given state Number n, sequence number l is received, only the following telegrams will be accepted: $n, l + 1$; $n, l + 2$; $n + 1, 0$; $n + 1, 1$, All other telegrams are ignored. After TAL expiration, a resynchronization with first GOOSE telegram is done.</p>
Gs5	1, 2	<p>What is the behavior when a subscribed GOOSE message is duplicated ?</p>	<p>The repetition will be ignored.</p>
Gs6	1	<p>Does the device subscribe to GOOSE messages with/without the VLAN tag?</p>	<p>Y with the VLAN tag Y without the VLAN tag</p>
Gs7	1	<p>May the GOOSE dataset contain: - structured data objects? - time stamp data attributes?</p>	<p>Y Y</p>
Gs8	1, 2	<p>Subscribed FCD supported common data classes are</p>	<p>SPS, DPS, INS, ENS, ACT, ACD, BCR, MV, CMV, WYE, DEL, SEQ, SPC, DPC, INC, ENC, BSC, ISC, APC, BAC, ING, ENG Arrays are not supported</p>

ID	ED	Description	Value / Clarification
Gs9	1	Are subscribed GOOSE with test=T (Ed1) / simulation=T (Ed2) accepted in test/simulation mode	Y - even in Edition 1 mode, the device exposes and fulfills LHPD.Sim requirement.
Gs10	1, 2	Max number of dataset members	Unlimited
Gs11	1	Is fixed-length encoded GOOSE supported	Y
Gs12	Amd1	Is IEC 62351-6 security supported	N
Gs13	Amd1	How does the subscriber handle incoming data flagged as test when the destination LN.Beh is On or Blocked?	Received GOOSE data objects with test mismatch can be internally configured to be substituted with a predefined value.
additional items			
		Maximum number of GOOSE messages which could be received	≤ 128; It depends on the available memory.
		Interpretation of GOOSE messages at subscriber side	Received GOOSE data objects without assigned quality attribute are interpreted as invalid.
		Processing of Quality attribute at subscriber side	Received GOOSE data objects with a quality attribute set to invalid, questionable, operatorBlock, or with a test mismatch can be internally configured to be substituted with a predefined value.
		Processing of time stamp attribute at subscriber side.	Received GOOSE data object are time stamped at reception time. Published attribute time stamp of the GOOSE data object can be used internally if accordingly configured.
		GOOSE subscriber behavior in case of missing GOOSE messages	After a GOOSE multicast application association has been interrupted, the reception of a valid GOOSE telegram is required to validate the state of this GOOSE association again. However, the IED tolerates a missing telegram as long as the next telegram (expected n, received n+1) is received within the time allowed to live time-out detection (the time allowed to live time-out detection occurs after 1 · TAL).
		What is the behavior when a GOOSE header parameter is mismatching with the expected one? (datSet, gold, confRev, numDatSetEntries, number of allData)	The Rx-mismatch counter available at the diagnostic buffer is incremented. The received telegram with the mismatched attribute will be discarded: it has not been subscribed. In that case only the time-out detection will set the data to invalid.
		What is the behavior when there is an out-of-order entry in the allData?	The confRev attribute in the header guarantees that the allData entries are in the correct order. Therefore, it's necessary to check the confRev attribute. There is no chance to detect a semantic out-of-order if the types are identical.
		What is the behavior when numDatSetEntries and number of allData are inconsistent?	The telegram is discarded since it is corrupt (not well formed). The data objects are declared invalid.

1.12 Control Model

ID	ED	Description	Value / Clarification
Ct1	-	What control models are supported? (compare PICS)	Y Status-only Y Direct-with-normal-security Y Sbo-with-normal-security Y Direct-with-enhanced-security Y Sbo-with-enhanced-security
Ct2	1, 2	Is the control model fixed, configurable and/or online changeable?	Configurable
Ct3	-	Is TimeActivatedOperate supported (compare PICS or SCL)	Deprecated
Ct4	-	Is "operate-many" supported (compare sboClass)?	Deprecated
Ct5	1	What is the behavior of the DUT when the test attribute is set in the SelectWithValue and/or Operate request?	Y if own behavior is in test. The request will be processed if the Beh of the logical node where the controlled object is located is Test. Otherwise, it will be discarded as "Blocked-by-mode".
Ct6	-	What are the conditions for the time (T) attribute in the SelectWithValue and/or Operate request?	Deprecated
Ct7	-	Is pulse configuration supported?	Deprecated
Ct8	1, 2	What is the behavior of the DUT when the check conditions are not set Is this behavior fixed, configurable, online changeable?	DUT uses the check value to perform the check according to the control request Configurable

ID	ED	Description	Value / Clarification
Ct9	1, 2	What additional cause diagnosis are supported?	<p>Y Blocked-by-switching-hierarchy Y Select-failed Y Invalid-position Y Position-reached Y Step-limit Y Blocked-by-Mode Y Blocked-by-process Y Blocked-by-interlocking Y Blocked-by-synchrocheck Y Command-already-in-execution Y Blocked-by-health Y 1-of-n-control Y Abortion-by-cancel Y Time-limit-over N Abortion-by-trip Y Object-not-selected</p> <p>When in Ed1 mode Edition 1 specific values: Y Parameter-change-in-excecution (Ed1 semantics) When in Edition 2 mode and higher: 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 Y Inconsistent-parameters Y Locked-by-other-client N Parameter-change-in-execution (Ed2 semantics)</p>
Ct10	1, 2	How to force a "test-not-ok" respond with SelectWithValue request?	<p>Control parameter test is set while logical node Beh is not in test Wrong orCat</p>
Ct11	1, 2	How to force a "test-not-ok" respond with Select request?	<p>When the control object has already been selected</p>

ID	ED	Description	Value / Clarification
Ct12	1, 2	How to force a "test-not-ok" respond with Operate request?	DOns: Test and logical node Beh do not match Wrong orCat SBOs: Test and logical node Beh do not match Wrong orCat DOes: Test and logical node Beh do not match Wrong orCat SBOes: Test and logical node Beh do not match Wrong orCat
Ct13	1, 2	Which origin categories are supported?	Bay-control, station-control, remote-control, automatic-station, automatic-remote, maintenance, process
Ct14	1, 2	What happens if the orCat value is not supported?	DOns: oper.Resp-, not-supported SBOs: oper.Resp-, not-supported DOes: oper.Resp-, not-supported SBOes: SelectWithValue.Resp- Not-supported
Ct15	1, 2	Does the IED accept a SelectWithValue/Operate with the same ctlVal as the current status value?	DOns: N SBOs: N DOes: N SBOes: N
Ct16	1	Does the IED accept a select/operate on the same control object from 2 different clients at the same time?	DOns: N SBOs: N DOes: N SBOes: N No, if the second request occurred when the object is not in unselected state (SBOs, SBOes), resp. Ready state (DOns, DOes), then it will lead to a negative response
Ct17	1	Does the IED accept a Select/SelectWithValue from the same client when the control object is already selected (tissue 334)?	SBOs: N SBOes: N
Ct18	1, 2	Is for SBOes the internal validation performed during the SelectWithValue and/or Operate step?	SelectWithValue and Operate
Ct19	-	Can a control operation be blocked by Mod=Off or Blocked	Y
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?	SBOs: Y DOns: Y
Ct22	2	How to force a "parameter-change-in-execution"	SBOs: SBOes: Parmeter-change-in-execution is supported in Ed1 only
Ct23	1, 2	How many SBOs/SBOes control objects can be selected at the same time?	SBOs: multiple SBOes: multiple except for controllable object with an 1-of-n control check

ID	ED	Description	Value / Clarification
Ct24	1, 2	Can a controllable object be forced to keep its old state, for example, Internal Controllable Objects may not be accessible to force this, whereas a switch like Circuit Breaker outside the DUT can?	N for internal objects. Y otherwise.
Ct25	1, 2	When CDC = DPC is supported, is it possible to have DPC (Controllable Double Point) go to the intermediate state? (00)	Y
Ct26	1, 2	Name a DOes point (if any) with a finite operate time-out and specify the time-out (in milliseconds)	DOes: Any CSWI.Pos with appropriate ctlModel SBOes: Any CSWI.Pos with appropriate ctlModel
Ct27	2	Does the IED support control objects with external signals?	DONs; Y SBOs: Y DOes: Y SBOes: Y
Ct29	Amd1	Does the IED support XCBR/XSWI.Loc = False and LLN0/CSWI.Loc = True When yes, does the IED accept the control when orCat = 1 or 4 Local	DONs: Y, orCat 1-4: N SBOs: Y, orCat 1-4: N DOes: Y, orCat 1-4: N SBOes: Y, orCat 1-4: N
Ct30	2	What is the Operate timeout?	operTimeout in datamodel
additional items			
		Inconsistency between Select and (Oper or cancel)	Oper or cancel will be acknowledged with negative response if inconsistencies to the select request are detected. The following attributes will not be checked in this case: T (Time). The controlled object returns then in state "unselected".
		Cancel request could be sent after an operate request.	Y
		Format of the control time stamp attribute?	Time stamp instead of EntryTime acc. to the 7-2 Errata List
		Negative response for select request could be performed only	If the logical Mod and the Test attribute do not match. If the selection is already done. If the service parameter of Select are not supported (e.g. wrong orCat)
		What is the behavior of the control state machines when the association control is lost with the client that issued a successful control?	For SBOes and SBOs: If the current state is "Ready", then the selection ends.

1.13 Time and Synchronization Model

ID	ED	Description	Value / Clarification
Tm1	1, 2	What quality bits are supported (may be set by the IED)?	Y LeapSecondsKnown Y ClockFailure (however cannot be simulated - will only be set as indicated in Tm4). Y ClockNotSynchronized
Tm2	1, 2	Describe the behavior when the time server(s) ceases to respond -> On all configured timer servers: The quality attribute "ClockNotSynchronized" will be set to TRUE after a configured time period. What is the time server lost detection time: -> Configurable - typically 10 min	The quality attribute "ClockNotSynchronized" will be set to TRUE after a configured time period.
Tm3	1, 2	How long does it take to take over the new time from time server?	Almost immediately after the first received synchronization telegram
Tm4	1, 2	When is the time quality bit "Clock failure" set?	Clock failure is set when the device internal clock drifts from the external synchronization.
Tm5	1, 2	When is the time quality bit "Clock not synchronized" set?	The "ClockNotSynchronized" attribute is set to TRUE as long as no time synchronization is established.
Tm6	-	Is the timestamp of a binary event adjusted to the configured scan cycle?	Deprecated
Tm7	1, 2	Does the device support time zone and daylight saving?	Y
Tm8	1, 2	Which attributes of the SNTP response packet are validated?	N Leap indicator not equal to 3? Y Mode is equal to SERVER Y OriginateTimestamp is equal to value sent by the SNTP client as Transmit Timestamp Y RX/TX timestamp fields are checked for reasonableness Y SNTP version 3 and/or 4 Y Other (describe): Stratum is not KISS OF DEATH Clock of STNP Server is synchronized Response comes from the server to which the request was sent
Tm9	1, 2	Do the COMTRADE files have local time or UTC time and is this configurable	UTC or local time depending on device type (UTC for 7KE85 devices, local time for other devices) Not configurable

1.14 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?	Directory name / COMTRADE / *; Directory name / LD / *; Files according to the comtrade standard
Ft2	1, 2	Directory names are separated from the file name by	"/"
Ft3	1	The maximum file name size including path (default 64 chars)	64
Ft4	1, 2	Are directory/file name case sensitive	Case sensitive
Ft5	1, 2	Maximum file size for SetFile	SetFile is not supported
Ft6	1	Is the requested file path included in the file name of the MMS fileDirectory respond?	Y
Ft7	1	Is the wild char supported MMS fileDirectory request?	Y only as *; not as name completion wild card
Ft8	1, 2	Is it allowed that 2 clients get a file at the same time?	N same file Y different files
Ft9	1, 2	Which files can be deleted	None - Service fileDelete is not supported
additional items			
		Maximum time the file transfer service is locked for one client	10 min

1.15 Service Tracking Model

ID	ED	Description	Value / Clarification
Tr1	2	Which ACSI services are tracked by LTRK.GenTrk?	SetEditSGValue

1.16 General Items

ID	ED	Description	Value / Clarification
additional items:			
		What is the type of the attribute actVal in the BCR (Binary Counter Reading) CDC?	Depending on the edition mode used. The type is integer 32 (INT32) if the software is running in edition 1 mode, otherwise it is integer 64 (INT64).
		What is the behaviour of the Device by GetAllDataValues?	GetAllDataValues is not supported without functional constraint indication.

1.17 Sampled-Value Publisher

IEC 61850-9-2LE Publisher

As published in Conformance-Test procedures for Sampled Values Publishers according to IEC 61850-9-2 (9-2LE) version 1.1.

ID	Description	Value / Clarification
M1	Supported rated frequencies	50 Hz Y 60 Hz Y
M2	Supported sampling rates	80 samples per cycle Y 256 samples per cycle Y
M3	9-2 connector type	LC connector
M4	Support test mode	Y
M5	Input voltage and current signals	4 phase currents 4 phase voltages
M6	Are neutral sampled values calculated	No, measured
M7	How are the CT/VT ratios configured (only applicable for MU connected to conventional CT/VT)?	Via the ICT. The values are exposed in the settings in TCTRs, TVTRs logical nodes following the name space IEC 61850-7-4:2007B
M8	At losing the PPS signal after how much time sets the MU SmpSynch to <i>false</i> (hold over mode)?	Up to 25 s depending on the accuracy of the synchronization signal
M9	At restoring the PPS signal after how much time sets the MU SmpSynch to <i>true</i> ?	Up to 15 s depending of the accuracy of the synchronization signal
M10	Max length for IED name	Max length of MsvID = 129
M11	What is the (rated) delay between taking the sample and sending the corresponding SV message?	Exposed in LPHD.MaxDI 1150 microseconds
M12	Which quality codes are supported?	Derived N Test Y
M13	What data is sent in test mode?	All current and voltages
M14	What is the maximum start time after a power supply interrupt?	See As8
M15	Does this device function only as test equipment? (test equipment need not have a non-volatile configuration; but it cannot be part of the substation automation system)).	N
additional items:		

IEC 61869-9 Publisher

ID	Description	Value / Clarification
Svp1	Supported application class (compare table 901)	Protective and measuring
Svp2	Support behaviour = test Support behaviour = off	Y N
Svp3	Support simulation mode <ul style="list-style-type: none"> Preferred rates How to enable simulation mode	N not applicable
Svp4	Are neutral sampled values calculated	N
Svp5	How are the CT/VT ratios configured (only applicable for MU connected to conventional CT/VT)	Via DIGSI → Power System Settings

ID	Description	Value / Clarification
Svp6	Support time synchronization method	Y PTP Y PPS
Svp7	What is the maximum time required to achieve synchronization after restoring the time synch	12 s to 15 s
Svp8	What is the maximum time required to achieve synchronization after power up	60 s It depends on the configuration within the merging unit device, for large configurations, it takes longer)
Svp9	In which conditions is the quality field Validity set to Invalid	Quality is always valid, unless an HW error is detected (not testable)
Svp10	What is the maximum time to start-up the device	28 s
Svp11	How can the date of manufacture be derived from PhyNam.serNum?	Per IEC61850 read access The format is ##YYMMDD####
Svp12	Calculated IN = (Ia, Ib, Ic) = -(Ia, Ib, Ic)	Only with IO240 N Y
Svp13	Is detail quality "out-of-range" supported How to force out-of-range?	Y Exceeding the clipping limit.
Svp14	Maximum number of channels by rate (0=rate not supported)	<u>Backwards-compatible/Legacy rates:</u> F4000S1: 8 (I4U4) F4800S1: 8 (I4U4) F5760S1: 0 F12800S8: 8 (I4U4) F15360S8: 8 (I4U4) <u>Preferred rate:</u> F4800S2: 32 F14400S6: 24 F96000S1: 0
additional items:		

1.18 Sampled-Value Subscriber

IEC 61869-9 Subscriber

ID	Description	Value / Clarification
Svs1a	How does the subscriber process subscribed sampled values (one is mandatory)	MMXU Y MMTR Y Pxxx Y Web interface Y Display Y File N Other N
Svs1b	How does the subscriber supervise subscribed sampled values (optional)	LSVS Y Web interface Y Error log Y Display N Other N
Svs2A	Which variants can be subscribed to <ul style="list-style-type: none"> Downward compatible variants (at least one shall be supported)	F4000S1I4U4 Y F4800S1I4U4 Y F5760S1I4U4 N F12800S8I4U4 Y F15360S8I4U4 Y
Svs2B	Which variants can be subscribed to <ul style="list-style-type: none"> Preferred variants (at least one shall be supported)	F4800S2IxUy Y F14400S6IxUy N F96000S1IxUy N Supported values for x: 0-32 Supported values for y: 0-32 Note: $x+y \leq 32$ For restrictions and recommendations on the number and variants of subscribable channels, refer to the <i>SIPROTEC 5 Process Bus Manual</i> chapters <i>Technical Data</i> and <i>Network Usage</i> .
Svs3	Support simulation mode <ul style="list-style-type: none"> Preferred rates Downward compatible rates How to enable simulation mode	Y Y Controlling of LPHD.Sim
Svs4	Which element of the SV header are verified (when yes the SV packet is ignored)	MAC-address Y APPID Y SVID Y ConfRev > Y ConfRev < Y smpSynch N (additional check at application level) synchSourceId N (additional check at application level)

ID	Description	Value / Clarification
Svs5	What will happen in case an extra element is added to the end of the data set	If the length information in the ASN.1 is consistent with this additional data, the data set is valid. Extra element is ignored Y Message is ignored N If the ASN.1 data structure is corrupted, the data will be invalid Message is ignored Y
	What will happen in case the last element(s) of the data set are missing	If the ASN.1 data structure is corrupted, the data will be invalid Message is ignored Y If the ASN.1 data structure is valid, available data will be used, missing elements will be skipped Message is ignored N
Svs6	How does the subscriber behave in case a broken path is detected	LSVS.St = false MMXU.Health = Alarm Web interface, error log, display values will be displayed as failure, protection functions will be set to inactive (logged), supervision logs data delay error or waiting for telegram, module homepage stops incrementing telegram counter Timeout(s) = 3 ms
Svs7	How does the subscriber behave in case packets are missing <ul style="list-style-type: none"> • 1 packet • 3 consecutive packets • 5 consecutive packets • 10 consecutive packets • Packet with smpCnt = 0 	If 1 sample are missing, it will be interpolated For more than 1 missing sample, an error will be detected Sample count 0 has no effect on reaction Module homepage has counter for missing packets
Svs8	How does the subscriber behave in case <ul style="list-style-type: none"> • smpSynch = 0 • smpSynch = 1 • smpSynch = 3..255 	LSVS contains a diagnostic proprietary DO for time synchronization status, the values and their meaning is described in the manual. The behaviour of the subscriber depends on configuration and additional available information (Accepted smpSynch Setting and synchSourceId). A synchronization mismatch between merging unit and subscriber will result in an indication to protection functionality regarding missing synchronization. Default behavior use synchSourceId by smpSynch = 1, smpSynch 0, 3 to 255 is equivalent to error
Svs9	How does the subscriber behave in case <ul style="list-style-type: none"> • one sample value continuously has quality invalid • all sample values continuously have quality invalid 	The corresponding application data will have quality invalid Most of the protection functions will indicate an Health.Alarm since they need all 3 phases for function properly

ID	Description	Value / Clarification
Svs10	Declare smallest value of publisher maximum processing delay time that the subscriber requires.	2 ms
Svs11	What is the total delay that can be tolerated (Svs10 processing time + maximum network delay)	3 ms
additional items:		

1.19 TICS - Technical Issues Implementation Conformance Statement

1.19.1 TISSUES Edition 1

The implemented TISSUES are only relevant when the Edition Setting is set to Edition 1, otherwise those TISSUES are not relevant for Edition 2.

TISSUE No	Link	Description	Implemented - Y/na
433	http://tissue.iec61850.com/tissue/433	Order of attributes in specialized CDCs for control service mapping	na
422	http://tissue.iec61850.com/tissue/422	Order of extension data objects and data attributes	na
168	http://tissue.iec61850.com/tissue/168	Order of attributes in MMS components	na
141	http://tissue.iec61850.com/tissue/141	Desc: object reference length extended to 129	Y ¹⁾
120	http://tissue.iec61850.com/tissue/120	Type - Mod.stVal and Mod.ctlVal	na
146	http://tissue.iec61850.com/tissue/146	CtxInt	na
173	http://tissue.iec61850.com/tissue/173	Ctl modelling harmonization	na
234	http://tissue.iec61850.com/tissue/234	New type CtxInt	Y
75	http://tissue.iec61850.com/tissue/75	Desc: Str and Op Data Object in GAPC	na
377	http://tissue.iec61850.com/tissue/377	DeleteDataSet response-	na
276	http://tissue.iec61850.com/tissue/276	File Services Negative Responses	na
183	http://tissue.iec61850.com/tissue/183	GetNameList error handling	Y
165	http://tissue.iec61850.com/tissue/165	Improper Error Response for GetDataSetValues	Y
116	http://tissue.iec61850.com/tissue/116	GetNameList with empty response?	Y
474	http://tissue.iec61850.com/tissue/474	GI for URCB	na
453	http://tissue.iec61850.com/tissue/453	Reporting & Logging model revision	Y
438	http://tissue.iec61850.com/tissue/438	EntryTime base should be GMT	na
349	http://tissue.iec61850.com/tissue/349	BRCB TimeOfEntry has two definitions	Y
348	http://tissue.iec61850.com/tissue/348	URCB class and report	Y
344	http://tissue.iec61850.com/tissue/344	TimeOfEntry misspelled	na
335	http://tissue.iec61850.com/tissue/335	Clearing of Bufovfl	Y
332	http://tissue.iec61850.com/tissue/332	Ambiguity in use of trigger options	Y
329	http://tissue.iec61850.com/tissue/329	Reporting and BufOvl	Y
322	http://tissue.iec61850.com/tissue/322	Write Configuration attribute of BRCBs	na
301	http://tissue.iec61850.com/tissue/301	SqNum in Buffered Reports	na
300	http://tissue.iec61850.com/tissue/300	Attribute Resv in BRCB	Y
298	http://tissue.iec61850.com/tissue/298	Type of SqNum	Y
297	http://tissue.iec61850.com/tissue/297	Sequence number	Y
278	http://tissue.iec61850.com/tissue/278	EntryId not valid for a server	Y
275	http://tissue.iec61850.com/tissue/275	Confusing statement on GI usage	Y
191	http://tissue.iec61850.com/tissue/191	BRCB: Integrity and buffering reports	Y
190	http://tissue.iec61850.com/tissue/190	BRCB: EntryId and TimeOfEntry	Y
177	http://tissue.iec61850.com/tissue/177	Ignoring OptFlds bits for URCB	na
52	http://tissue.iec61850.com/tissue/52	Ambiguity GOOSE SqNum	Y
49	http://tissue.iec61850.com/tissue/49	BRCB TimeOfEntry?	Y
46	http://tissue.iec61850.com/tissue/46	Synchro check cancel	Y
44	http://tissue.iec61850.com/tissue/44	AddCause - Object not sel	Y
30	http://tissue.iec61850.com/tissue/30	control parameter T	Y

TISSUE No	Link	Description	Implemented - Y/na
520	http://tissue.iec61850.com/tissue/520	Desc: control canceling at connection loss	na
593	http://tissue.iec61850.com/tissue/593	Desc: Setting Group Canceling, eding	Y
545	http://tissue.iec61850.com/tissue/545	Files Directories	Y
1) No impact as long as the IED Name and the logical device inst have together a length smaller than 13 char.			

1.19.2 TISSUES Edition 2

Edition 2 TISSUES have already been implemented in the device Object Model and are active within the name space of IEC 61850-7-4:2007.

TISSUE No	Link	Description	Impact of Interoper.
658	http://tissue.iec61850.com/tissue/658	Tracking related features	Y
663	http://tissue.iec61850.com/tissue/663	FCDA element cannot be a "functionally constrained logical node"	Y
668	http://tissue.iec61850.com/tissue/668	Autotransformer modeling	Y
687	http://tissue.iec61850.com/tissue/687	SGCB ResvTms	Y
719	http://tissue.iec61850.com/tissue/719	ConfDataSet - maxAttributes definition is confusing	Y
721	http://tissue.iec61850.com/tissue/721	Log element name	na
768	http://tissue.iec61850.com/tissue/768	bType VisString65 is missing	na
779	http://tissue.iec61850.com/tissue/779	object references	Y
788	http://tissue.iec61850.com/tissue/788	SICS S56 from optional to mandatory	na
789	http://tissue.iec61850.com/tissue/789	ConfLdName as services applies to both server and client	Y
804	http://tissue.iec61850.com/tissue/804	valKind and IED versus System configuration	na
806	http://tissue.iec61850.com/tissue/806	Max length of log name inconsistent between -6 and -7-2	na
807	http://tissue.iec61850.com/tissue/807	Need a way to indicate if "Owner" present in RCB	na
823	http://tissue.iec61850.com/tissue/823	ValKind for structured data attributes	Y
824	http://tissue.iec61850.com/tissue/658	Short addresses on structured data attributes	na
825	http://tissue.iec61850.com/tissue/825	Floating point value	na
845	http://tissue.iec61850.com/tissue/845	SGCB ResvTms	Y
853	http://tissue.iec61850.com/tissue/853	SBO and ProtNs	Y
855	http://tissue.iec61850.com/tissue/855	Recursive SubFunction	na
856	http://tissue.iec61850.com/tissue/856	VoltageLevel frequency and phases	na
857	http://tissue.iec61850.com/tissue/857	Function/SubFunction for ConductingEquipment	na
886	http://tissue.iec61850.com/tissue/886	Missing 8-1 P-types	na
901	http://tissue.iec61850.com/tissue/901	tServices as AP or as IED element	Y
936	http://tissue.iec61850.com/tissue/936	SupSubscription parameter usage is difficult	na
1175	http://tissue.iec61850.com/tissue/1175	IPv6 address lowercase only	na
828	http://tissue.iec61850.com/tissue/828	Data model namespace revision IEC 61850-7-4:2007[A]	Y
1151	http://tissue.iec61850.com/tissue/1151	simulated GOOSE disappears after 1st appearance when LPHD.Sim = TRUE	Y
1468	http://tissue.iec61850.com/tissue/1468	Reuse DO from other LN	Y
778	http://tissue.iec61850.com/tissue/778	AddCause values – add value not-supported	na
780	http://tissue.iec61850.com/tissue/780	What are unsupported trigger option at a control block?	Y
783	http://tissue.iec61850.com/tissue/783	TimOper Resp- ; add Authorization check	na

TISSUE No	Link	Description	Impact of Interoper.
786	http://tissue.iec61850.com/tissue/786	AddCause values 26 and 27 are switched	na
820	http://tissue.iec61850.com/tissue/820	Mandatory ACSI services (use for PICS template)	Y
858	http://tissue.iec61850.com/tissue/858	typo in enumeration ServiceType	Y
861	http://tissue.iec61850.com/tissue/861	dchg of ConfRev attribute	Y
876	http://tissue.iec61850.com/tissue/876	GenLogicNodeClass and SGCB, GoCB, MsvCB, UsvCB	Y
1038	http://tissue.iec61850.com/tissue/1038	Loss of Info Detection After Resynch	Y
1050	http://tissue.iec61850.com/tissue/1050	GTS Phycomaddr definition in SCL	na
1062	http://tissue.iec61850.com/tissue/1062	Entrytime not used in CDC	Y
1071	http://tissue.iec61850.com/tissue/1071	Length of DO name	Y
1091	http://tissue.iec61850.com/tissue/1091	The sentence "The initial value of EditSG shall be 0", has to be stated in part 7.2 not in 8.1	Y
1127	http://tissue.iec61850.com/tissue/1127	Missing owner attribute in BTS and UTS	na
1202	http://tissue.iec61850.com/tissue/1202	GI not optional	Y
697	http://tissue.iec61850.com/tissue/697	persistent command / PulseConfig	Y
698	http://tissue.iec61850.com/tissue/698	Wrong case is BAC.dB attribute	na
722	http://tissue.iec61850.com/tissue/722	Units for "h" and "min" not in UnitKind enumeration.	Y
919	http://tissue.iec61850.com/tissue/919	Presence Condition for sVC	Y
925	http://tissue.iec61850.com/tissue/925	Presence of i or f attribute - Problem with writing	Y
926	http://tissue.iec61850.com/tissue/926	Presence Conditions within RangeConfig	na
671	http://tissue.iec61850.com/tissue/671	mistake in definition of Mod & Beh	Y
674	http://tissue.iec61850.com/tissue/674	CDC of ZRRCLocSta is wrong	na
676	http://tissue.iec61850.com/tissue/676	Same data object name used with different CDC	na
677	http://tissue.iec61850.com/tissue/677	MotStr is used with different CDC in PMMS and SOPM LN classes	na
679	http://tissue.iec61850.com/tissue/679	Remove CycTrMod Enum	na
680	http://tissue.iec61850.com/tissue/680	SI unit for MHYD.Cndct	na
681	http://tissue.iec61850.com/tissue/681	Enum PIDAlg	na
682	http://tissue.iec61850.com/tissue/682	ANCR.ParColMod	na
683	http://tissue.iec61850.com/tissue/683	Enum QVVR.IntrDetMth	na
685	http://tissue.iec61850.com/tissue/685	Enum ParTraMod	na
686	http://tissue.iec61850.com/tissue/686	New annex H - enums types in XML	Y
694	http://tissue.iec61850.com/tissue/694	Data object CmdBlk	na
696	http://tissue.iec61850.com/tissue/696	LSVS.St (Status of subscription)	na
712	http://tissue.iec61850.com/tissue/712	interpretation of quality operatorBlocked	na
713	http://tissue.iec61850.com/tissue/713	DO Naming of time constants in FFIL	na
724	http://tissue.iec61850.com/tissue/724	ANCR.Auto	na
725	http://tissue.iec61850.com/tissue/725	Loc in LN A-group	na
734	http://tissue.iec61850.com/tissue/734	LLN0.OpTmh vs. LPHD.OpTmh	na
736	http://tissue.iec61850.com/tissue/736	PFSign	na
742	http://tissue.iec61850.com/tissue/742	GAPC.Str, GAPC.Op and GAPC.StrVal	Y
743	http://tissue.iec61850.com/tissue/743	CCGR.PmpCtl and CCGR.FanCtl	na
744	http://tissue.iec61850.com/tissue/744	LN STMP, EEHealth and EEName	Y
773	http://tissue.iec61850.com/tissue/773	Loc, LocKey and LocSta YPSH and YLTC	Y
774	http://tissue.iec61850.com/tissue/774	ITCI.LockKey	na
800	http://tissue.iec61850.com/tissue/800	Misspelling in CSYN	na
802	http://tissue.iec61850.com/tissue/802	CCGR and Harmonized control authority	na

TISSUE No	Link	Description	Impact of Interoper.
808	http://tissue.iec61850.com/tissue/808	Presence condition of ZMoT.DExt and new DOs	Y
831	http://tissue.iec61850.com/tissue/831	Setting of ConfRevNum in LGOS	Y
838	http://tissue.iec61850.com/tissue/838	Testing in Beh=Blocked	na
844	http://tissue.iec61850.com/tissue/844	MFLK.PhPiMax, MFLK.PhPiLoFil, MFLK.PhPiRoot DEL->WYE	na
849	http://tissue.iec61850.com/tissue/849	Presence conditions re-assessing in case of derived statistical calculation	Y
877	http://tissue.iec61850.com/tissue/877	QVUB -settings should be optional	na
909	http://tissue.iec61850.com/tissue/909	Remove ANCR.ColOpR and ColOpL	na
920	http://tissue.iec61850.com/tissue/920	Resetable Counter is NOT resetable	na
932	http://tissue.iec61850.com/tissue/932	Rename AVCO.SptVol to AVCO.VolSpt	na
939	http://tissue.iec61850.com/tissue/939	Change CDC for ANCR.FixCol	na
991	http://tissue.iec61850.com/tissue/991	LGOS: GoCBRef (as well as LSVS.SvCBRef) should be mandatory	Y
1007	http://tissue.iec61850.com/tissue/1007	PTRC as fault indicator - Update of description required	na
1044	http://tissue.iec61850.com/tissue/1044	TapChg in AVCO	na
1077	http://tissue.iec61850.com/tissue/1077	Rename DOnames within LTIM	Y
784	http://tissue.iec61850.com/tissue/784	Tracking of control (CTS)	na
817	http://tissue.iec61850.com/tissue/817	Fixed-length GOOSE float encoding	na
834	http://tissue.iec61850.com/tissue/834	File dir name length 64	Y
951	http://tissue.iec61850.com/tissue/951	Encoding of Owner attribute	na
1040	http://tissue.iec61850.com/tissue/1040	More associate error codes	na
1178	http://tissue.iec61850.com/tissue/1178	Select Response+ is non-null value	Y

1.19.3 TISSUES Edition 2 Amendment 1

Mandatory Edition 2 Amendment 1 Tissues

Below tables give an overview of the applicable mandatory Tissues as specified in IEC 57/2445/INF. The original TISSUE should be consulted for details of changes.

“Implemented by server”:

- “Y”: means that the server has implemented the respective tissue.
- “ni”: No impact on testing
- “na”: not applicable if the server does not support the corresponding ACSI service(s)

Part 7-2 Tissue	Link	Description	Implemented by Server
1676	https://iec61850.tissue-db.com/tissue/1676	Multiple figures	ni
1679	https://iec61850.tissue-db.com/tissue/1679	GoEna behavior at startup	Y
1681	https://iec61850.tissue-db.com/tissue/1681	LActTm representation is not actual	Y
1696	https://iec61850.tissue-db.com/tissue/1696	Blocked/Test-blocked does not impact CSWI -> XCBR interface	na
1697	https://iec61850.tissue-db.com/tissue/1697	Status texts	ni

Part 7-2 Tissue	Link	Description	Implemented by Server
1702	https://iec61850.tissue-db.com/tissue/1702	Limit LTRK to one instance on a server	Y
1703	https://iec61850.tissue-db.com/tissue/1703	Cancel for a select in SBOs	ni
1707	https://iec61850.tissue-db.com/tissue/1707	Integrity will be buffered	Y
1719	https://iec61850.tissue-db.com/tissue/1719	Service ID in ACSI conformance statement	ni
1735	https://iec61850.tissue-db.com/tissue/1735	Control cancel support is mandatory if SBO or SBOw is supported	ni
1742	https://iec61850.tissue-db.com/tissue/1742	ACSI client abort and release requirements in conformance tables	ni

Part 7-3 Tissue	Link	Description	Implemented by Server
1699	https://iec61850.tissue-db.com/tissue/1699	dbRef should not be mandatory for APC and BAC	Y
1713	https://iec61850.tissue-db.com/tissue/1713	SIUnitKind new values in AMD1 versus consolidated version	ni
1714	https://iec61850.tissue-db.com/tissue/1714	Description of attribute 'general' in AMD1 versus consolidated version	ni

Part 7-4 Tissue	Link	Description	Implemented by Server
1682	https://iec61850.tissue-db.com/tissue/1682	ITCI.Alm description text	ni
1689	https://iec61850.tissue-db.com/tissue/1689	Attribute Namespace name wrong	ni
1718	https://iec61850.tissue-db.com/tissue/1718	RFLO LN, extension	na
1721	https://iec61850.tissue-db.com/tissue/1721	Power factor related data objects in LN MMXU	na
1722	https://iec61850.tissue-db.com/tissue/1722	ClcNxtTmms common data class	na
1726	https://iec61850.tissue-db.com/tissue/1726	Enumeration ClockSyncKind of LTMSTmSynn is not correct	na
1732	https://iec61850.tissue-db.com/tissue/1732	Missing Presence conditions 'MONamPlt' in amd 2.1 of 7-1	ni
1769	https://iec61850.tissue-db.com/tissue/1769	When Beh=On, result with test=true not clear	Y
1770	https://iec61850.tissue-db.com/tissue/1770	Enumeration TransientPerformanceClassKind	Y
1775	https://iec61850.tissue-db.com/tissue/1775	IREG-B should be IRIG-B	ni

2 IEC 61850 Conformance Statements

2.1	Definitions of the ISO/OSI Reference Model	42
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2.1 Definitions of the ISO/OSI Reference Model

To achieve stable data exchange, all communication is based on the OSI Reference Model (OSI/IEC 7498-1) for a multi-layer communication function.

This section on using the ISO application (application profile) and transport profiles (T profile) describes the various stack profiles. An ISO application profile is a set of specifications and declarations regarding the top 3 layers of the ISO/OSI reference model (i.e. the application, presentation, and session layers). The T profile is a set of specifications and declarations regarding the lower 4 layers (i.e. transport, network, data link, and physical layers).

A and T profiles can be combined in various ways to form different types of services and information items that can be exchanged. The services specified in Part 7-2 of the IEC 61850 standard are mapped onto 4 different combinations of the profiles.

These 4 combinations are used for

- Client/server services
- GOOSE/GSE management services
- GSSE services
- Time synchronization
- Services for measured value sampling.

2.2 Definition of the Communication Services Acc. to Standard (PICS)

The tables in the sections 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).

The IEC 61850-9-3 PICS is described in the users manual SIPROTEC 5 Communication Protocols - Clause 10.6.

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 descriptions below refer to implementation in the SIPROTEC 5 device range.

The tables give the names stated in the standard.

SIPROTEC 5 is compliant to IEC 61869-9 conformance class d.

2.2.1 Profile Compliance

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	Y	Y	
B22	SCSM: IEC 6185-9-1 used			deprecated
B23	SCSM: IEC 6185-9-2 used	Y	Y	Only available with the ETH-BD-2FO communication module
B24	SCSM: other			
Generic substation event model (GSE)				
B31	Publisher side		Y	
B32	Subscriber side	Y		
Transmission of sample value model (SVC)				
B41	Publisher side	--	Y	Only available with the ETH-BD-2FO communication module

		Client/ Subscriber	Server/ Publisher	Value/ Comments
B42	Subscriber side	Y	--	Only available with the ETH-BD-2FO communication module
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		Y	
M2	Logical node		Y	
M3	Data		Y	
M4	Data set		Y	
M5	Substitution		Y	
M6	Setting group control		Y	
	Reporting			
M7	Buffered report control		Y	
M7-1	sequence-number		Y	
M7-2	report-time-stamp		Y	
M7-3	reason-for-inclusion		Y	
M7-4	data-set-name		Y	
M7-5	data-reference		Y	
M7-6	buffer-overflow		Y	
M7-7	entryID		Y	
M7-8	BufTim		Y	
M7-9	IntgPd		Y	
M7-10	GI		Y	
M7-11	conf-revision		Y	
M8	Unbuffered report control		Y	
M8-1	sequence-number		Y	
M8-2	report-time-stamp		Y	
M8-3	reason-for-inclusion		Y	
M8-4	data-set-name		Y	
M8-5	data-reference		Y	
M8-6	BufTim		Y	
M8-7	IntgPd		Y	
M8-8	GI		Y	
M8-9	conf-revision		Y	
	Logging		N	
M9	Log control		N	
M9-1	IntgPd		N	
M10	Log		N	
M11	Control		Y	
M17	File Transfer	N	Y	

		Client/ Subscriber	Server/ Publisher	Value/ Comments
M18	Application association		Y	
M19	GOOSE Control Block		Y	
M20	Sampled Value Control Block		Y	Only available with the ETH-BD-2FO communication module
If GSE (B31/32) is supported				
M12	GOOSE	Y	Y	
M13	GSE	N	N	
If SVC (41/42) is supported				
M14	Multicast SVC	Y	Y	Only available with the ETH-BD-2FO communication module
M15	Unicast SVC	N	N	
For all IEDs				
M16	Time	N	Y	
Y = supported N or empty = not supported				

ACSI Service Conformance Statement

	Services	AA: TP/MC	Client/Subscriber	Server/Publisher	Value/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	Y	
S10	GetDataDirectory	TP	N	Y	

	Services	AA: TP/MC	Client/Subscriber	Server/Publisher	Value/Comments
S11	GetDataDefinition	TP	N	Y	
Data set					
S12	GetDataSetValues	TP	N	Y	
S13	DataSetValues	TP	N	N	
S14	CreateDataSet	TP	N	Y	
S15	DeleteDataSet	TP	N	Y	
S16	GetDataSetDirectory	TP	N	Y	
Substitution					
S17	SetDataValues	TP	N	Y	
Setting group control					
S18	SelectActiveSG	TP	N	Y	If there is more than one setting group
S19	SelectEditSG	TP	N	Y	
S20	SetSGValues/ SetEditSGValue	TP	N	Y	
S21	ConfirmEditSGValues	TP	N	Y	
S22	GetSGValues/ GetEditSGValue	TP	N	Y	
S23	GetSGCBValues	TP	N	Y	
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	

	Services	AA: TP/MC	Client/Subscriber	Server/Publisher	Value/Comments
S34	GetLogStatusValues	TP	N	N	
Generic substation event model (GSE)					
GOOSE					
S35	SendGOOSEMessage	MC	Y	Y	
GOOSE Control Block					
S36	GetGoReference	TP	N	N	
S37	GetGOOSEElementNumber	TP	N	N	
S38	GetGoCBValues	TP	N	Y	
S39	SetGoCBValues	TP	N	Y	
GSSE					
S40	SendGSSEMessage	MC	N	N	
GSSE Control Block					
S41	GetGsReference	TP	N	N	
S42	GetGSSEElementNumber	TP	N	N	
S43	GetGsCBValues	TP	N	N	
S44	SetGsCBValues	TP	N	N	
Transmission of sample value model (SVC)					
Multicast Sampled Value Control Block					
S45	SendMSVMessage	MC	Y	Y	Only available with the ETH-BD-2FO communication module
S46	GetMSVCBValues	TP	N	Y	Only available with the ETH-BD-2FO communication module
S47	SetMSVCBValues	TP	N	Y	Only available with the ETH-BD-2FO communication module
Unicast Sampled Value Control Block					
S48	SendUSVMessage	TP	N	N	
S49	GetUSVCBValues	TP	N	N	
S50	SetUSVCBValues	TP	N	N	
Control					
S51	Select	TP	N	Y	
S52	SelectWithValue	TP	N	Y	
S53	Cancel	TP	N	Y	
S54	Operate	TP	N	Y	
S55	CommandTermination	TP	N	Y	
S56	TimeActivatedOperate	TP	N	N	
File transfer					
S57	GetFile	TP	N	Y	
S58	SetFile	TP	N	N	

	Services	AA: TP/MC	Client/Subscriber	Server/Publisher	Value/Comments
S59	DeleteFile	TP	N	N	Not needed as oldest file is overwritten when the file system is full (ring buffer)
S60	GetFileAttributeValues	TP	N	Y	
Time					
T1	Time resolution of internal clock			24 (60 ns)	nearest negative power of 2 in seconds
T2	Time accuracy of internal clock			Y	T0
				Y	T1
				Y, when synchronized over PTP	T2
				Y, when synchronized over PTP	T3
				Y, when synchronized over PTP	T4
				Y, when synchronized over PTP	T5
T3	Supported TimeStamp resolution			10 (1 ms)	nearest negative power of 2 in seconds
Y = supported N or empty = not supported					

2.3 Model Implementation Conformance Statement (MICS)

Content of the statement

This statement contains the description of all objects that are provided by a device and is especially important if devices are connected to a central system that supplies data to certain applications via the objects provided by the device.

In the case of SIPROTEC 5, this document depends on both the device type and the defined user objects and can therefore not be a permanent part of the manual. It is therefore generated from DIGSI.

Generation in DIGSI 5

Generation is selected in the device processing. Select the device and open via context menu Export IEC 61850 data formats:MICS the dialog to enter an editable filename under which the MICS document to be generated will be stored (XML file and the corresponding files MICS.css and MICS.xslt). The XML file can be opened, viewed and printed within a web browser.

The document is generated with the correct version and device type data. It shows the model implementation of the SIPROTEC 5 device. The whole document is shown in a hyperlinked table of contents. The MICS is a readable form of the current mapping of a device on IEC 61850.

In addition to the MICS, an ICD file and IID file (XML files) can be created which describes the mapping of a device. Those ICD/IID files are used by the System Configurator, or can be imported into the system configurators of other manufacturers, in order to integrate these devices into the communication.

3 IEC 62351 Conformance Statements

3.1	IEC 61850-8-1 MMS Conformance to IEC 62351-4 Edition 1.1 2020	52
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3.1 IEC 61850-8-1 MMS Conformance to IEC 62351-4 Edition 1.1 2020

3.1.1 General Conformance

Affects following standards:

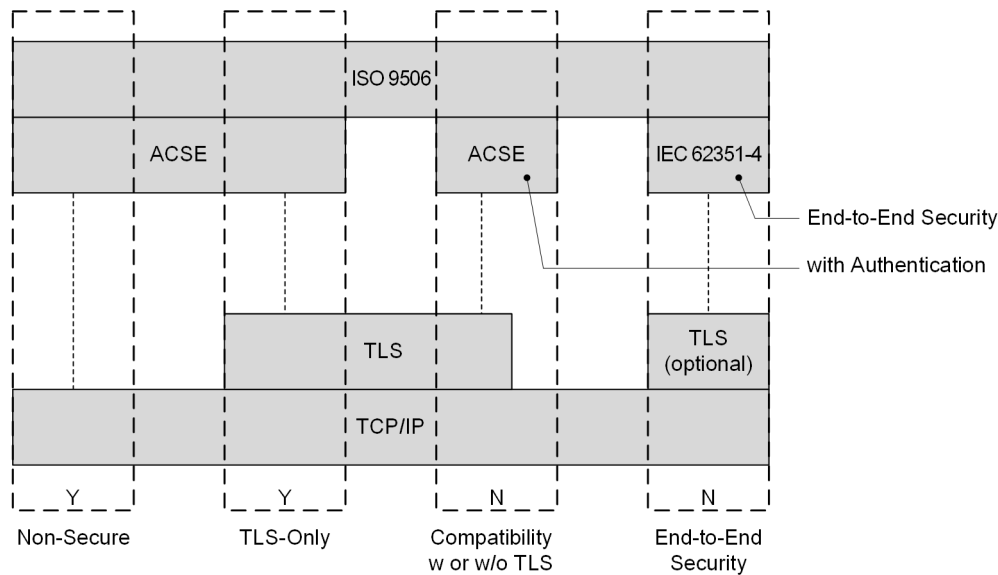
- IEC 62351-4:2018+AMD1:2020 (IEC 62351-4 Edition 1.1 2020)
- IEC 62351-6:2020
- IEC 62351-3:2014+AMD1:2018+AMD2:2020

For the following clauses and tables, the following definitions apply:

- m: mandatory support – the item shall be implemented
- c: conditional support – the item shall be implemented if the stated condition exists
- o: optional support – the implementation may decide to implement the item
- x: excluded – the implementation shall not implement this item
- i: out-of-scope – the implementation of the item is not within the scope of this specification
- na: not applicable – in case the mentioned protocol is not implemented
- AtLeastOne(x) – indicates that at least one of the declarations must be supported for the grouping of (x).

3.1.2 MMS Security Profiles according to IEC 62351-4:2018+AMD1:2020

The implemented MMS security profile in SIPROTEC5 V9.20 are illustrated in [Figure 3-1](#) and [Table 3-1](#).



[ldw_PIXIT_MMS_security_profiles_IEC62351-6_1_en_US]

Figure 3-1 MMS Security Profiles according to IEC 62351-6:2020

Source 1: Chapter 5.2.1 IEC 62351-6:2020

- Non-Secure: Implementations claiming conformance to this clause and Client/Server capability shall support the ability to be configured without securing connections per IEC 62351-4.
- Compatibility (per IEC 62351-4): Client implementations claiming conformance shall support the configuration and exchange of information utilizing ACSE Authentication per IEC 62351-4 and TLS. The use of TLS is mandatory.
- End-to-End: The support for this security profile is optional. However, in future editions of this standard, it is intended to make the support of this profile mandatory.

Table 3-1 Relationship between Security and Security-Measure Combinations

Application Security)	A-security profile	None	A-security profile	E2E security without encryption	E2E security without encryption	E2E security with encryption	E2E security with encryption
Transport Security	none	TLS	TLS	none	TLS	none	TLS
Siprotec5	No	Yes With FW 9.20 and higher	No	No			

Source 2: Chapter 4.2 Table 1 IEC 62351-4:2018+AMD1:2020

3.1.3 Conformity Tables to IEC 62351-6:2020

3.1.3.1 Conformance for Compatibility and E2E Mode

Conformance

Table 3-2 Conformance (Focused to IEC 61850-8-1 MMS)

Profile Description		Client		Server		Value/ Comments
		F/S	Declared	F/S	Declared	
G1	Support for IEC 61850-8-1/ISO 9506 security Client/Server	o	na	o	Y	--
G2	Support for IEC 61850-8-1 L2 GOOSE security	o	n	o	n	--
G3	Support for IEC 61850-9-2 L2 SMV security	o	n	o	n	--
G4	Support for IEC 61850-8-1 Routable GOOSE security	o	na	o	na	--
G5	Support for IEC 61850-9-2 Routable SMV security	o	na	o	na	--
G6	Supported for IEC 61850-8-2	o	na	o	na	--
G7	Support for SNTP security	o	na	o	n	--
Y = supported N = not supported na = not applicable						

Source 3: Chapter 11.1 Table 5 IEC 62351-6:2020

General

Table 3-3 Conformance (Focused to IEC 61850-8-1 MMS)

Capability		Client		Server		Value/ Comments
		F/S	Declared	F/S	Declared	
S1h	Non-Secure Support	m	na	m	Y	--
S1i	VPN Support	i	na	i	i	--
S1j	Tracking Services Supported	m	na	o	n	--
S1k	Control Services Supported	o	na	c1	n	--
Y = supported N = not supported na = not applicable						

Source 4: Chapter 11.2.1 Table 6 IEC 62351-6:2020

PICS for SNTP Profiles

Table 3-4 PICS for SNTP Profiles

Capability		Client		Server		Value/ Comments
		F/S	Declared	F/S	Declared	
S7	RFC 5905	o	y	o	n	--
Y = supported N = not supported						

Source 5: Chapter 11.4 Table 13 IEC 62351-6:2020

3.1.3.2 Conformance for Compatibility Mode (incl. TLS only)**PICS for IEC 61850-8-1 ISO 9506 Profile**

Table 3-5 PICS for IEC 61850-8-1 ISO 9506 Profile

Capability		Client		Server		Value/ Comments
		F/S	Declared	F/S	Declared	
S1a	IEC 62351-4 ACSE Authentication	m	na	o	n	--
S1b	IEC 62351-4 TLS Support for ACSE Authentication	m	na	c1	n	--
S1c	TLS authentication evaluation on application layer	o	n	o	n	The TLS certificate is not used on application level for authentication, only on transport level.

Capability		Client		Server		Value/ Comments
		F/S	Declared	F/S	Declared	
S1d	IEC 62351-4 Mandatory TLS Cipher Suites	m	na	c2	partly	See Table Conformance to TLS cipher suites in native mode
c1- shall be m if IEC 62351-4 TLS Support for ACSE Authentication support is declared.						
c2- shall be m if IEC 62351-4 TLS Support for ACSE Authentication or TLS for Authentication is declared.						

Source 6: Chapter 11.2.1 Table 6 IEC 62351-6:2020

PICS for TLS IEC 61850-8-1 Client/Server using ACSE Authentication

Table 3-6 PICS for TLS IEC 61850-8-1 Client/Server using ACSE Authentication

Capability		Client		Server		Value/ Comments
		F/S	Declared	F/S	Declared	
TLS81 1	TLS conformity – IEC 62351-4 clause 6.3.4.2	o	na	o	na	The specified cipher suites have security vulnerabilities
TLS81 2	TLS conformity – IEC 62351-4 clause 6.3.4.3	m	na	m	na	See Table 1-9

Source 7: Chapter 11.2.2 Table 7 IEC 62351-6:2020

3.1.3.3 Conformance for E2E Mode

End-to-End Profile

Table 3-7 End-to-End Profile

Capability		Client		Server		Value/ Comments
		F/S	Declared	F/S	Declared	
S1e	IEC 62351-4 E2E Support	o	na	o	n	--
S1f	IEC 62351-4 TLS Support with E2E	c1	na	c1	n	--
S1g	IEC 62351-4 Mandatory TLS Cipher Suites	c1	na	c1	n	--
c1 – shall be m if E2E support is declared						

Source 8: Chapter 11.2.1 Table 6 IEC 62351-6:2020

3.1.4 Conformance Table to IEC 62351-4:2018+AMD1:2020

3.1.4.1 Conformance for Compatibility and E2E Mode

Conformance for TCP Ports

Table 3-8 Conformance for TCP Ports

Capability	Client		Server		Value/ Comments
	F/S	Declared	F/S	Declared	
When there is no transport security, TCP port 102 shall be used as specified by IETF RFC 1006.	m	na	m	y	--
Implementations claiming conformance to this part of IEC 62351-4 shall use TCP port 3782 to indicate the use of the transport security. This port is registered by IANA as a secure ISO TPO port.	m	na	m	y	--

Source 9: Chapter 6.3.2 IEC 62351-4:2018+AMD1:2020

Conformance to TLS Cipher Suites

Table 3-9 Conformance to TLS Cipher Suites

Cipher Suite	Client		Server		Value/ Comments
	F/S	Declared	F/S	Declared	
TLS_RSA_WITH_AES_128_CBC_SHA256	m	na	m	n	0x00,0x3C
TLS_DH_RSA_WITH_AES_128_CBC_SHA256	o	na	o	n	0x00,0x31
TLS_DH_RSA_WITH_AES_128_GCM_SHA256	m	na	m	n	0x00,0xA0
TLS_DHE_RSA_WITH_AES_128_GCM_SHA256	m	na	m	n	0xC0,0x9E
TLS_DH_RSA_WITH_AES_256_GCM_SHA256	o	na	o	n	0x00,0xA1
TLS_ECDHE_RSA_WITH_AES_128_GCM_SHA256	o	na	o	n	0xC0,0x2F
TLS_ECDHE_RSA_WITH_AES_256_GCM_SHA384	o	na	o	n	0xC0,0x30
TLS_ECDHE_ECDSA_WITH_AES_128_GCM_SHA256	m	na	m	y	0xC0,0x2B
TLS_ECDHE_ECDSA_WITH_AES_256_GCM_SHA384	o	na	o	y	0xC0,0x2C
All implementations that claim conformance to the native mode shall support the mandatory cipher suites listed in this Table.					
Note: This is also valid for the Compatibility mode (see TLS812 requirement)					
The server only offers a ECDSA signed certificate. The server accepts RSA and ECDSA signed certificates from the client.					

Source 10: Chapter 17.6 Table 10 IEC 62351-4:2018+AMD1:2020

Application of transport layer security (TLS)

Table 3-10 Application of transport layer security (TLS)

Application of TLS	Capability	Client		Server		Value/ Comments
		F/S	Declared	F/S	Declared	
TLS Session resumption	At least every 2 hours	m	na	m	24h	Every 24 hours Overrules value in Table 1-16
TLS Session renegotiation	At least half of the CRL update period. 10 minutes for the lower bound for the session renegotiation	m	na	m	24h	Every 24 hours Overrules value in Table 1-16
Supported number of trust anchors	At least two different trust anchors	m	na	m	1	Overrules value in Table 1-17
Public-key certificate size	Public-key certificate size if of minimum and maximum 8192 octets	m	na	m	8192	Overrules value in Table 1-17
Evaluation period for revocation state of public-key certificates	CRL refresh at minimum every 24 hours	m	na	m	na	CRL not supported
	Configurable evaluation period	m	na	m	na	CRL not supported
OCSP revocation check cache	Cache the OCSP response no longer than 24 hours	c1	na	c1	n	OCSP not supported
Public-key certificate validation	Terminate a connection establishment or connection renegotiation, where one of the public-key certificates used by either the client or the server is revoked or has been expired.	m	na	m	n	

c1 – shall be **m** if OCSP support is declared

Source 11: Chapter 6.2 (6.2.1 - 6.2.7) IEC 62351-4:2018+AMD1:2020

Conformance to Operational Environment

Table 3-11 Conformance to Operational Environment

Operational Environment	Client		Server		Value/ Comments
	F/S	Declared	F/S	Declared	
OSI	c[2]	na	c[2]	n	--
XMPP	c[2]	na	c[2]	n	--

c[2]: To be specified by referencing specification. At least one row shall specify **m** for both client and server.

Source 12: Chapter 17.3 Table 6 IEC 62351-4:2018+AMD1:2020

3.1.4.2 Conformance for E2E Mode

Not applicable

3.1.5 Conformance to IEC 62351-3:2014+AMD1:2018+AMD2:2020**Conformance to TLS Cipher Suites**

Table 3-12 Conformance to TLS Cipher Suites

Cipher Suite	Client		Server		Value/ Comments
	F/S	Declared	F/S	Declared	
TLS_NULL_WITH_NULL_NULL	x	na	x	n	--
TLS_RSA_WITH_NULL_MD5	x	na	x	n	--
TLS_RSA_WITH_NULL_SHA	o	na	o	n	SHA-1 deprecated
TLS_RSA_WITH_NULL_SHA256	o	na	o	n	--

Source 15: Chapter 8.3 Table 1 IEC 62351-3:2014+AMD1:2018+AMD2:2020

Conformance to TLS Versions

TLS Version	Client		Server		Value/Comments
	F/S	Declared	F/S	Declared	
1.0	o	na	o	n	Weaknesses known, only for back- ward compatibility
1.1	o	na	o	n	Weaknesses known, only for back- ward compatibility
1.2	m	na	m	y	--
1.3	o	na	o	n	Not all features specified in this document

Source 16: Chapter 8.4 Table 2 IEC 62351-3:2014+AMD1:2018+AMD2:2020

Conformance to TLS Protocol Features

Table 3-13 Conformance to TLS Protocol Features

TLS Feature	Client		Server		Value/Comments
	F/S	Declared	F/S	Declared	
TLS Session resumption at least every 24 hours	m	na	m	y	Every 24 hours Referencing standard IEC 62351-4:2018+AM D1:2020 defined – see Table 1-10
TLS Session resumption initiation using ClientHello	m	na	x	x	--
TLS Session resumption initiation using HelloRequest	x	na	m	y	Every 24 hours
TLS Session resumption using session tickets	o	na	o	y	According to RFC5077

TLS Feature	Client		Server		Value/Comments
	F/S	Declared	F/S	Declared	
TLS Session renegotiation at least every 24 hours	m	na	m	y	Every 24 hours Referencing standard IEC 62351-4:2018+AMD1:2020 defined – see Table 1-10
TLS Session renegotiation initiation using ClientHello	m	na	x	x	--
TLS Session renegotiation initiation using HelloRequest	x	na	m	y	Every 24 hours
TLS Session renegotiation extension	m	na	m	y	According to RFC5077
Support of trusted CA extension (RFC 6066)	o	na	o	y	--

Source 17: Chapter 8.5 Table 3 IEC 62351-3:2014+AMD1:2018+AMD2:2020

Conformance to Certificate Support

Table 3-14 Conformance to Certificate Support

	Client		Server		Value/Comments
	F/S	Declared	F/S	Declared	
Support of multiple CA (root certificates)	o	na	o	n	Referencing standard IEC 62351-4:2018+AMD1:2020 defined – see Table 1-10
Maximum supported certificate size is 8 192 bytes	m	na	m	y	Referencing standard IEC 62351-4:2018+AMD1:2020 defined – see Table 1-10
Follow certificate validation rules according to RFC5280 (validity, CA signature, revocation state, etc.)	m	na	m	partly	No CRL supported
Certificate revocation state validation using CRL	m	na	m	n	Evaluation period to be specified by the referencing standard. Referencing standard IEC 62351-4:2018+AMD1:2020 defined – see Table 1-10.
Certificate revocation state validation using OCSP	o	na	o	n	
Certificate while listing according to IEC 62351-9	o	na	o	n	
The server only offers a ECDSA signed certificate. The server accepts RSA and ECDSA signed certificates from the client.					

Source 18: Chapter 8.6 Table 4 IEC 62351-3:2014+AMD1:2018+AMD2:2020

Conformance to Cryptographic Algorithm Support

Table 3-15 Conformance to Cryptographic Algorithm Support

	Client		Server		Value/Comments
	F/S	Declared	F/S	Declared	
Support of RSA 2048	m	na	m	y	Only during certificate verification
Support of RSA 1024	o	na	o	n	deprecated
Support of ECDSA with 256 bit keys, OID: 1.2.840.10045.4.3.2; Support of curve secp256r1, OID: 1.2.840.10045.3.1.7	o	na	o	y	--
Support of ECGDSA with 256 bit keys, OID: 1.3.36.3.3.2.5.4.4; Support of curve brain-poolP256r1, OID: 1.3.36.3.3.2.8.1.1.7	o	na	o	n	--
Support of SHA-256	m	na	m	y	--
Support of SHA-1	o	na	o	n	deprecated
Support of MD5	x	na	x	n	--

Source 19: Chapter 8.7 Table 5 IEC 62351-3:2014+AMD1:2018+AMD2:2020