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TISSUES Implementation Conformance Statement for the IEC 61850  
interface in SEL-451-5, SEL-487E-3, SEL-487E-4, SEL-421-4, SEL-421-  
5, SEL-487V-0, SEL-487V-1, SEL-487B-1

Version 2.1  
July 14, 2023

## TICS TEMPLATE FOR EDITION 2 SERVER AND CLIENT

### Introduction

This document is applicable for SEL-451-5 with firmware R328,  
SEL-487E-3 with firmware R322,  
SEL-487E-4 with firmware R322,  
SEL-421-4 with firmware R331,  
SEL-421-5 with firmware R331,  
SEL-487V-0 with firmware R110,  
SEL-487V-1 with firmware R110 and  
SEL-487B-1 with firmware R318.

### Mandatory Edition 2 Tissues

Below tables give an overview of the applicable mandatory Tissues.

Items in *italic* are brief interpretations provided by the UCA International Users Group to aid in interpretation and is not normative.

The original TISSUE should be consulted for details of changes.

Part 6 Tissue	Description	Implemented Y/na
<a href="#">658</a>	Tracking related features <i>EntryID and CST missing, these are checked by schema</i>	Y
<a href="#">663</a>	FCDA element cannot be a "functionally constrained logical node" <i>doName now mandatory in FCDA element, SCT: refuse to make empty doName? ICT: Refuse SCD</i>	Y
<a href="#">668</a>	Autotransformer modeling <i>Autotransformer model in substation section has changed</i>	na
<a href="#">687</a>	SGCB ResvTms <i>SettingControl has added attribute resvTms see also TISSUE 845</i>	Y
<a href="#">719</a>	ConfDataSet - maxAttributes definition is confusing <i>maxAttributes now means max count of FCDA in dataset</i>	Y
<a href="#">721</a>	Log element name <i>LN0/Log now has optional attribute "name"</i>	na
<a href="#">768</a>	bType VisString65 is missing <i>VisString65 added as SCL BasicType</i>	Y
<a href="#">779</a>	object references <i>"@" as first character in object references now allowed</i>	Y

Part 6 Tissue	Description	Implemented Y/na
<a href="#">788</a>	SICS S56 from optional to mandatory <i>SICS S56="Interpret IED capabilities and prohibit unsupported usage"</i>	na
<a href="#">789</a>	ConfLdName as services applies to both server and client <i>Many changes made to Services section</i>	na
<a href="#">804</a>	valKind and IED versus System configuration <i>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.</i>	Y
<a href="#">806</a>	Max length of log name inconsistent between -6 and -7-2 <i>LogControl.logName and Log.name restricted to 32 chars</i>	na
<a href="#">807</a>	Need a way to indicate if "Owner" present in RCB <i>Services/ReportSettings @owner added</i>	Y
<a href="#">823</a>	ValKind for structured data attributes <i>valKind is prohibited on structured attributes</i>	Y
<a href="#">824</a>	Short addresses on structured data attributes <i>sAddr is now allowed for structured attributes</i>	na
<a href="#">825</a>	Floating point value <i>Server shall support &lt;Val&gt; with exponential notation</i>	Y
<a href="#">845</a>	SGCB ResvTms <i>Services/SettingGroups/SGEdit added attribute resvTms</i> <i>Services/SettingGroups/ConfSG added attribute resvTms</i> <i>See also TISSUE 687</i>	Y
<a href="#">853</a>	SBO and ProtNs <i>DA[@name=SBO] element shall have ProtNS element</i>	na
<a href="#">855</a>	Recursive SubFunction <i>Substation section extension must be tolerated</i>	na
<a href="#">856</a>	VoltageLevel frequency and phases <i>Substation section extension must be tolerated</i>	na
<a href="#">857</a>	Function/SubFunction for ConductingEquipment <i>Substation section extension must be tolerated</i>	na
<a href="#">886</a>	Missing 8-1 P-types <i>"tP_IP_UDP_PORT" and "tP_IP_TCP_PORT" added</i>	na
<a href="#">901</a>	tServices as AP or as IED element <i>Rules for contents of AP/Server/Services are now defined</i>	Y
<a href="#">936</a>	SupSubscription parameter usage is difficult <i>SupSubscription "max" replaced by "maxGo" and "maxSv"</i>	Y
<a href="#">1147</a>	tServices - FileHandling not consistent with -7-2 <i>Services/FileHandling now means only support for GetFile and GetFileAttributeValues and NOT SetFile/DeleteFile</i>	Y

<b>Part 6 Tissue</b>	<b>Description</b>	<b>Implemented Y/na</b>
<a href="#">1185</a>	Valkind value Conf for EX FC data <i>valKind=Conf is allowed for dataNs</i>	na
<a href="#">1284</a>	SCSM mapping may require a communication section in an ICD file <i>Server IEDs supporting client/server associations to 61850-8-1 shall include a &lt;Communication&gt; section</i>	Y
<a href="#">1328</a>	Limitation on the size of data type templates identifiers <i>Identifer now limited to 255 characters</i>	Y
<a href="#">1395</a>	Client LN attributes <i>ReportControl/RptEnabled/ClientLN@IdInst shall be "LD0" for pure clients (without any Logical Devices)</i>	na
<a href="#">1402</a>	ExtRef during engineering <i>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</i> <<applicable for SCL tool test>>	na
<a href="#">1415</a>	SICS-S110 IID import mandatory for Edition2 <i>only the import of data model modifications and CF value changes is mandatory for system tool</i> <<applicable for SCL tool test>>	na
<a href="#">1419</a>	Support of IdName on other IEDs <i>SICS I212 is now mandatory</i>	Y
<a href="#">1444</a>	Need to support fixed and SCT controlled Datasets <i>Services/xxxSettings@datSet=fix now means "data set pointed by Control Block cannot be altered from ICD/IID value</i> <<applicable for SCL tool test>>	na
<a href="#">1445</a>	ConfReportControl and a fixed ReportSettings <i>Control block capabilities must be consistent</i> <<applicable for SCL tool test>>	na
<a href="#">1450</a>	originalSclXxx computation rules <i>Ed2 ICD/IID files specifying SCL @version=2007 SHALL include originalSCLVersion=2007 and originalSCLRevision as attributes of the &lt;IED&gt;element</i>	Y
<a href="#">1485</a>	Need to supercede Tissue 1398 to clarify SCT behavior <i>Same as TISSUE 1450 &lt;&lt;applicable for SCL tool test&gt;&gt;</i>	na

<b>Part 7-1 Tissue</b>	<b>Description</b>	<b>Implemented Y/na</b>
<a href="#">828</a>	Data model namespace revision IEC 61850-7-4:2007[A] <i>Both 2007 and 2007A are allowed for namespace name</i>	Y
<a href="#">948</a>	Enumeration (string) values format <i>Enums are limited to 127 characters from Basic-Latin and Latin-1 character sets</i>	Y
<a href="#">1151</a>	simulated GOOSE disappears after 1st appearance when LPHD.Sim = TRUE <i>New LGOS state machine defined, but TISSUE is not IntOp2, therefore TISSUE is optional if LGOS is used</i>	Y
<a href="#">1396</a>	The use and configuration flow of LGOS and LSVS is unclear <i>If Services/SupSubscription@maxGo &gt; 1 then at least 1 LGOS must exist. Same for maxSv/LSVS. If maxGo &gt; count(LGOS) then SCT can create additional LGOS. Same for maxSv/LSVS</i>	Y
<a href="#">1447</a>	Restriction on ENUMtypes in SCL <i>If a ENUM DA limits write or configuration to a subset, then that subset must be declared</i>	Y
<a href="#">1457</a>	Multiple DOI nodes with the same name <i>LN can have no more than one DOI with same name</i>	Y
<a href="#">1468</a>	Re-use DO from other LN <i>allow standard or private dataNs</i>	Y
<a href="#">1491</a>	CmdBlk blocks itself? <i>The data CmdBlk shall have no effect on the controllable data Mod or CmdBlk</i>	na
<a href="#">1495</a>	GetVariableAccessAttributes error code <i>Return MMS error access/object-non-existent if the object does not exist</i>	Y

<b>Part 7-2 Tissue</b>	<b>Description</b>	<b>Implemented Y/na</b>
<a href="#">728</a>	BRCB: could PurgeBuf be set when RptEna=TRUE? <i>PurgeBuf while RptEna=true is prohibited</i>	Y
<a href="#">778</a>	AddCause values – add value not-supported <i>Align 7-2 with 8-1 (nothing new to 8-1)</i>	Y
<a href="#">780</a>	What are unsupported trigger option at a control block? <i>All control blocks must support all trigger options</i>	Y
<a href="#">783</a>	TimOper Resp- ; add Authorization check <i>Clarifies Time-Operated Controls</i>	na

<b>Part 7-2 Tissue</b>	<b>Description</b>	<b>Implemented Y/na</b>
<a href="#">786</a>	AddCause values 26 and 27 are switched <i>Annex B.2 has wrong AddCause values</i>	Y
<a href="#">820</a>	Mandatory ACSI services (use for PICS template) <i>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.</i>	Y
<a href="#">858</a>	typo in enumeration ServiceType <i>Tracking serviceType now has GetLogicalNodeDirectory</i>	na
<a href="#">861</a>	dchg of ConfRev attribute <i>Clarifies (tracking) BTS.confRev is AFTER BRCB change</i>	Y
<a href="#">1050</a>	GTS Phycomaddr definition in SCL <i>(Tracking) GTS needs a special structure for SCL</i>	na
<a href="#">1071</a>	Length of DO name <i>Private DO name length shall be &lt;=12 including instance</i>	Y
<a href="#">1127</a>	Missing owner attribute in BTS and UTS <i>NSD files for 61850-7-3 show owner in (tracking) BTS/UTS</i>	Y
<a href="#">1202</a>	GI not optional <i>GI support is mandatory for both URCB and BRCB</i>	Y
<a href="#">1232</a>	EntryID needs clarification <i>Segments of a report shall have same identifiers</i>	Y
<a href="#">1242</a>	NTS definition <i>NTS.resv have been added</i>	na
<a href="#">1307</a>	Segmented report with Buffer overflow <i>Segments of a report shall have identical buf-overflow value</i>	Y
<a href="#">1428</a>	MTS and NTS should use svOptFlds <i>MTS.optFlds and NTS.optFlds now have bType=SvOptFlds</i>	na
<a href="#">1630</a>	Attributes in CDC=LTS do not match 8-1 definition <i>Order of attributes in LTS changed to: logEna, logRef, datSet, oldEntrTm, newEntrTm, oldEnt, newEnt, trgOps, intgPd</i>	na

<b>Part 7-3 Tissue</b>	<b>Description</b>	<b>Implemented Y/na</b>
<a href="#">697</a>	persistent command / PulseConfig <i>PulseConfig adds enum "persistent-feedback" DPC.cmdQual=="persistent" is conditionally allowed</i>	na
<a href="#">698</a>	Wrong case is BAC.dB attribute <i>attribute renamed from "dB" to "db"</i>	na

<b>Part 7-3 Tissue</b>	<b>Description</b>	<b>Implemented Y/na</b>
<a href="#">711</a>	blkEna freeze data update while setting its quality to operaterBlocked <i>Mode=Blocked shall not cause q.operatorBlocked</i>	na
<a href="#">722</a>	Units for 'h' and 'min' not in UnitKind enumeration. <i>New unit enums 84=hours, 85=minutes</i>	Y
<a href="#">919</a>	Presence Condition for svC <i>svC may be valKind=Conf in ICD file</i>	na
<a href="#">925</a>	Presence of i or f attribute - Problem with writing <i>New constructed attribute class "AnalogueValueCtl"</i>	Y
<a href="#">926</a>	Presence Conditions within RangeConfig <i>All or none of hhLim+hLim+lLim+lLim shall be present</i>	na
<a href="#">954</a>	Data attributes with FC=CF should have trgOp=dchg <i>Some INS and HST and CSG attributes missing dchg</i>	Y
<a href="#">1078</a>	CMV.t update if rangeAng changed <i>Add rangeAng to "reasons-to-update-timestamp-of-CMV"</i>	na
<a href="#">1565</a>	db = 0 behaviour <i>db=0 not longer suppresses reporting</i>	na
<a href="#">1578</a>	dataAttribute NameSpace content <i>Attributes with FC=EX must be initialized in ICD/IID file</i>	Y

<b>Part 7-4 Tissue</b>	<b>Description</b>	<b>Implemented Y/na</b>
<a href="#">671</a>	mistake in definition of Mod & Beh <i>Beh=on, q=test should be "Processed as valid"</i>	Y
<a href="#">674</a>	CDC of ZRRC.LocSta is wrong <i>ZRRC LocSta should be CDC=SPC</i>	na
<a href="#">676</a>	Same data object name used with different CDC <i>LCCH.Fer renamed to FerCh, LCCH.RedFer to RedFerCh</i>	Y
<a href="#">677</a>	MotStr is used with different CDC in PMMS and SOPM LN classes <i>Rename SOPM.MotStr to MotStrNum</i>	na
<a href="#">679</a>	Remove CycTrMod Enum <i>Enum is no longer used, use TrMod instead</i>	na
<a href="#">680</a>	SI unit for MHYD.Cndct <i>Change unit from S/cm<sup>2</sup> to S/m</i>	na
<a href="#">681</a>	Enum PIDAlg <i>Typographical error, invalid XML syntax</i>	na

<b>Part 7-4 Tissue</b>	<b>Description</b>	<b>Implemented Y/na</b>
<a href="#">682</a>	ANCR.ParColMod <i>ParColMod enum values text have changed</i>	na
<a href="#">683</a>	Enum QVVR.IntrDetMth <i>IntrDetMth enum values text have changed</i>	na
<a href="#">685</a>	Enum ParTraMod <i>ParTraMod enum values text have changed</i>	na
<a href="#">686</a>	New annex H - enums types in XML <i>Many changes have been made to enumeration names</i>	Y
<a href="#">694</a>	Data object CmdBlk <i>CmdBlk semantics have changed</i>	na
<a href="#">696</a>	LSVS.St (Status of subscription) <i>LSVS.St is now mandatory</i>	na
<a href="#">712</a>	interpretation of quality operatorBlocked <i>Mode and Behavior semantics have changed</i>	na
<a href="#">713</a>	DO Naming of time constants in FFIL <i>Many DO names in FFIL have changed</i>	na
<a href="#">714</a>	Enums for ShOpCap and SwOpCap <i>Type for YPSH.ShOpCap and XSWI.SwOpCap have changed</i>	na
<a href="#">715</a>	RBDR.ChNum1 <i>RBDR.ChNum1 changes from optional to conditional</i>	na
<a href="#">716</a>	TAXD text for condition <i>TAXD.SmRte condition for inclusion has changed</i>	na
<a href="#">724</a>	ANCR.Auto <i>ANCR.Auto changes from mandatory to optional</i>	na
<a href="#">725</a>	Loc in LN A-group <i>Loc changes to optional, LockKey/LocSta conditions change</i>	na
<a href="#">734</a>	LLN0.OpTmh vs. LPHD.OpTmh <i>LLN0.OpTmh deleted, LPHD.OpTmH added as conditional</i>	na
<a href="#">736</a>	PFSign <i>MMXU.PFSign enum is extended with 3=Excitation</i>	na
<a href="#">742</a>	GAPC.Str, GAPC.Op and GAPC.StrVal <i>Objects have instance indicator removed (ex, Str1 to Str)</i>	na
<a href="#">743</a>	CCGR.PmpCtl and CCGR.FanCtl <i>Object have instance indicator added (ex:PmpCtl to PmpCtl1)</i>	na
<a href="#">744</a>	LN STMP, EEHealth and EEName <i>Removed STMP.EEHealth and STMP.EEName</i>	na
<a href="#">772</a>	LPHD.PwrUp/PwrDn should be transient <i>These objects are now transient</i>	na
<a href="#">773</a>	Loc, LockKey and LocSta YPSH and YLTC <i>Add Loc, LockKey and LocSta in YLTC and YPSH (optional)</i>	na

<b>Part 7-4 Tissue</b>	<b>Description</b>	<b>Implemented Y/na</b>
<a href="#">774</a>	ITCI.LockKey <i>Add ITCI.LockKey as optional</i>	na
<a href="#">776</a>	LPHD.OutOv/InOv and LCCH.OutOv/InOv <i>Clarified: stays true until buffer space again available</i>	na
<a href="#">800</a>	Misspelling in CSYN <i>CSYN.VInvTmms renamed to CSYN.VIntvTmms</i>	na
<a href="#">802</a>	CCGR and Harmonized control authority <i>Add Loc, LockSta to every controllable LN (e.g. FSPT)</i>	na
<a href="#">808</a>	Presence condition of ZMoT.DExt and new DOs <i>Change ZMOT.DExt to optional; add TotThmSt and MotSt</i>	na
<a href="#">831</a>	Setting of ConfRevNum in LGOS <i>Add RxConfRevNum to LGOS and LSVS</i>	Y
<a href="#">838</a>	Testing in Beh=Blocked <i>Change semantic of Beh=Blocked to allow controls to be acknowledged even when LN is blocked.</i>	na
<a href="#">844</a>	MFLK.PhPiMax, MFLK.PhPiLoFil, MFLK.PhPiRoot DEL->WYE <i>Change these NFLK objects from cdc=DEL to cdc=WYE</i>	na
<a href="#">877</a>	QVUB -settings should be optional <i>Change QVUB.UnbDetMth and QVUB.StrVal to optional</i>	na
<a href="#">908</a>	ARIS.StrSeq – transient <i>Change ARIS.StrSeq to transient</i>	na
<a href="#">909</a>	Remove ANCR.ColOpR and ColOpL <i>Replace ANCR.ColOpR and ANCR.ColOpL with ANCR.ColChg. Add YEFN.ColChg</i>	na
<a href="#">912</a>	Clarification of PwrRtg/VARtg <i>Change many DOs in YPTR, and ZGEN, see name space 2007A2.nsd for final result</i>	na
<a href="#">920</a>	Resetable Counter is NOT resetable <i>Change GGIO.CntRs to CntVal; Same for FCNT</i>	na
<a href="#">932</a>	Rename AVCO.SptVol to AVCO.VolSpt	na
<a href="#">933</a>	Presence of LCCH.RedFerCh and RedRxCnt <i>Change the presence condition of LCCH.RedChLiv</i>	Y
<a href="#">939</a>	Change CDC for ANCR.FixCol <i>Change ANCR.FixCol from APC to ASG</i>	na
<a href="#">991</a>	LGOS: GoCBRef (as well as LSVS.SvCBRef) should be mandatory <i>LGOS.GoCBRef and LSVS.SvCBRef are now both mandatory</i>	Y
<a href="#">1007</a>	PTRC as fault indicator - Update of description required <i>PTRC.Tr and Op and Str conditional (at least 1 of group)</i>	Y

Part 7-4 Tissue	Description	Implemented Y/na
<a href="#">1044</a>	TapChg in AVCO <i>AVCO.TapChg is now optional</i>	na
<a href="#">1077</a>	Rename DOnames within LTIM <i>LTIM.TmChgDayTm, changed to TmChgDay; LTIM.TmChgStdTm changed to TmChgStd</i>	Y
<a href="#">1256</a>	New DO for LTIM to set time "manually" <i>Add LTIM.TmSet</i>	na
<a href="#">1331</a>	Mod, Beh and Health with q=TEST, client can't receive their states <i>Mod while in Blocked will always be processed</i>	Y
<a href="#">1426</a>	Add two DO for leap seconds in LTIM <i>LTIM.Leap added,</i>	na
<a href="#">1456</a>	Annex A and Mod/Beh/Health <i>Mod.stVal writes always ignore test bits in controls</i>	Y
<a href="#">1568</a>	ISAF.AImReset ->transient <i>Change ISAF.AmIReset to transient</i>	na

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

Part 8-1 Tissue	Description	Implemented Y/na
<a href="#">770</a>	GoID type mismatch 18.1.1 and 18.1.2.5.2 <i>GoID string length is now 129</i>	Y
<a href="#">784</a>	Tracking of control (CTS) <i>Tracking CTS has been added</i>	Y
<a href="#">817</a>	Fixed-length GOOSE float encoding <i>GOOSE float is encoded Tag-0x87, length=5, first octet=8</i>	na
<a href="#">827</a>	Mandatory ACSI services (Part of 7-2 TISSUE resolution) <i>Change Table 111 (ServicesSupported): Add initiate, abort, and release. Change conditions for defineNamedVariables.</i>	Y
<a href="#">834</a>	File dir name length 64 <i>Filename length changed from 32 to 64</i>	Y
<a href="#">951</a>	Encoding of Owner attribute <i>xRCB.owner is encoded as 4 octets(IPv4) or 16 octets(IPv6)</i>	Y
<a href="#">1040</a>	More associate error codes <i>3 additional associate error codes added</i>	Y
<a href="#">1178</a>	Select Response+ is non-null value <i>Response to SBO read should be &lt;CO_CtrlObjectRef&gt;</i>	na
<a href="#">1324</a>	The response- for DeleteNamedVariableList is not defined <i>numDeleted=0; error=service/object-constraint-conflict</i>	na

Part 8-1 Tissue	Description	Implemented Y/na
<a href="#">1345</a>	Fixed-length GOOSE ASN.1 length encoding <i>GOOSE publisher shall always encode minimum size length field</i>	na
<a href="#">1441</a>	Optional fields in buffered reports <i>Writing BRCB.optFld shall not cause a purgeBuf operation</i>	Y
<a href="#">1442</a>	Journal variableTag for ReasonCode <i>Example in the standard is incorrect</i>	na
<a href="#">1453</a>	Purge buffer on write to BRCB <i>PurgeBuf only occurs if different value is written</i>	Y
<a href="#">1454</a>	Reports can be transmitted before write(RptEna=true) is confirmed	na
<a href="#">1500</a>	the response for DeleteNamedVariableList with a non-existent LN is not specified <i>CreateDataSet/DefineNamedVariableList specifying a non-existing LD/LN shall fail with access/object-non-existent</i>	na

Compare the TISSUE database for more details: <http://iec61850.tissue-db.com>

#### TICS Revision History

Version	Date	Who	Why
Original	2018-12-19	BAM	Original from Ed2 Server Test Procedures Rev2.0