



650 Family

F650 IEC 61850 Ed1 and Ed2 Implementation

Addendum

Publication Number: GET-20053A

Copyright © 2017 GE VERNOVA

1 Introduction

The F650 7.52 Firmware release includes IEC 61850 Edition 1 Level B Certification, along with new F650 default CID files for both IEC 61850 Edition 1 and Edition 2. Details of the IEC 61850 Edition 1 implementation are given in this document, while the preexisting IEC 61850 Edition 2 implementation can be found in the F650 manual.

F650 with 7.52 firmware will be able to work with IEC 61850 Edition 1 or Edition 2 depend on which *.cid is configured and sent to the device. Consider your firmware version when choosing a default CID file from the files provided with 7.53Enervista 650 Setup. For a default installation, these files are located at: C:\GE Power Management\650PC\IEC61850\F650

For firmware versions from **7.52 onward**, two different *.cid files are available for each version:

- "default_F650_vXXX_Ed1.cid": Default IEC61850 CID Edition 1 file for F650
- "default_F650_vXXX_Ed2.cid": Default IEC61850 CID Edition 2 file for F650

For information about sending cid files to the relay refer to section 7.3.2 in the *F650 Instruction Manual*. Users should consider that conversions from IEC61850 CID Edition 1 to IEC61850 CID Edition 2 and viceversa are not allowed.

2 IEC 61850 Edition 2

The default IEC 61850 Edition 2 CID file, default_F650_v7.52_ed2.cid, can be found in the Enervista Setup v7.52 installation path. Find the software online at:

<https://www.gegridsolutions.com/app/ViewFiles.aspx?prod=f650&type=7>

IEC 61850 conformance documents are in the F650 Instruction Manual found online at:

<https://www.gegridsolutions.com/app/ViewFiles.aspx?prod=f650&type=3>

Refer to *Chapter 7: IEC 61850 Protocol* in the *F650 Instruction Manual* for the following conformance files

- PICS for 650 family of relays v1_4 firm7_20
- MICS for 650 family of relays v1_01 firm7_20
- TICS for 650 family of relays v1_0 firm7_20
- PIXIT for 650 family of relays v1_6 firm7_20

IEC 61850 Edition 1 (Level B Certification)

The default IEC 61850 Edition 1 CID file, default_F650_v7.52_ed1.cid, can be found in Enervista Setup v7.52 installation path. Find the software online at:

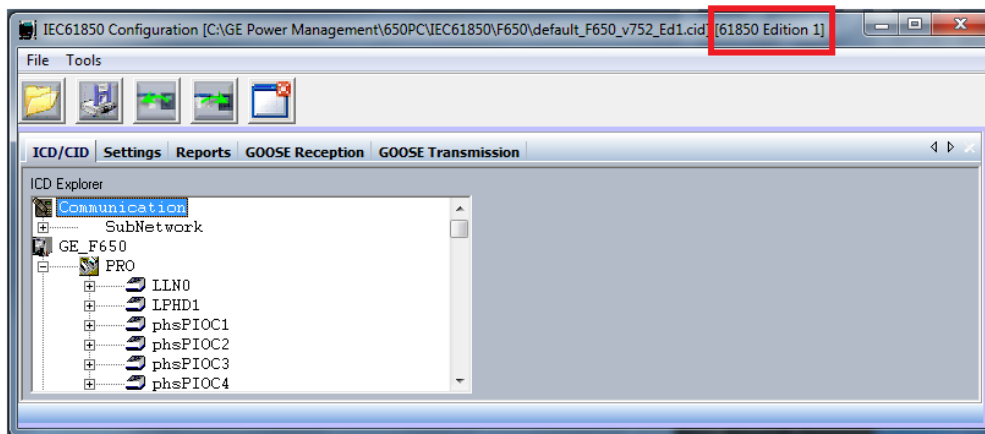
<https://www.gegridsolutions.com/app/ViewFiles.aspx?prod=f650&type=7>

IEC 61850 conformance documents are included in this addendum (and will also be in the *F650 Instruction Manual*, revision AF or later):

- [PICS For F650 relay V1_6 firm7_52](#) on page 3
- [MICS For F650 relay V1_4 firm7_52](#) on page 10
- [TICS For F650 relay V3_05 firm7_52](#) on page 103
- [PIXIT For F650 relay V1_10 firm7_52](#) on page 104

To determine whether the relay is working with CID Edition 1 or Edition 2, download the active CID file from the relay:

1. Open the Enervista Setup software, and click **IEC 61850 Configurator** on the menu bar.
2. Select **File > Receive CID file from device**, or click the download button.
3. Connect to the relay as prompted if you are not already connected.
Once the download completes, a message displays indicating a successful download. The CID file can then be viewed and edited in the IEC 61850 Configurator.
4. Check the title bar of the CID file to determine the IEC 61850 version, as shown in the figure below.



For more information about the IEC 61850 Configurator tool, refer to *Chapter 7: IEC 61850 Protocol* in the *F650 Instruction Manual*.

Protocol Implementation Conformance Statement
for the IEC 61850 interface in:
F650 Bay Controller

Date: December 19, 2016
Version 1.6

3 General

The following ACSI conformance statements are used to provide an overview and details about F650 bay controller, with firmware 7.52:

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

The statements specify the communication features mapped to IEC 61850-8-1 First Edition and/or Edition 2.

4 ACSI basic conformance statement

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

Table A.1 – 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)			
SCSMs supported				
B21	SCSM: IEC 6185-8-1 used		Y	
B22	SCSM: IEC 6185-9-1 used			Ed2:Deprecated
B23	SCSM: IEC 6185-9-2 used			
B24	SCSM: other			
Generic substation event model (GSE)				
B31	Publisher side		Y	
B32	Subscriber side	Y		
Transmission of sampled value model (SVC)				
B41	Publisher side			
B42	Subscriber side			
– Y = supported N or empty = not supported				

5 ACSI models conformance statement

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

Table A.2 – ACSI models conformance statement

		Client/ Subscriber	Server/ Publisher	Value/ Comments
If Server or Client side (B11/12) supported				
M1	Logical device		Y	
M2	Logical node		Y	
M3	Data		Y	
M4	Data set		Y	
M5	Substitution			
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	BufTm		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	BufTm		Y	
M8-7	IntgPd		Y	
M8-8	GI		Y	
M8-9	conf-revision		Y	
	Logging			
M9	Log control			
M9-1	IntgPd			

		Client/ Subscriber	Server/ Publisher	Value/ Comments
M10	Log			
M11	Control		Y	
M17	File Transfer		Y	
M18	Application association		Y	
M19	GOOSE Control Block		Y	
M20	Sampled Value Control Block			
If GSE (B31/32) is supported				
M12	GOOSE		Y	
M13	GSSE			Deprecated
If SVC (B41/B42) is supported				
M14	Multicast SVC			
M15	Unicast SVC			
For all IEDs				
M16	Time	Y	Y	
Y = service is supported				
N or empty = service is not supported				

6 ACSI service conformance statement

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

Table A.3 – ACSI service Conformance statement

	Ed	ACSI Service	AA: TP/MC	Client Sub(C)	Server Pub(S)	Comments
Server						
S1	1,2	GetServerDirectory(LOGICAL-DEVICE)	TP		Y	
Application association						
S2	1,2	Associate	TP		Y	
S3	1,2	Abort	TP		Y	
S4	1,2	Release	TP		Y	
Logical device						
S5	1,2	GetLogicalDeviceDirectory	TP		Y	

	Ed	ACSI Service	AA: TP/MC	Client Sub(C)	Server Pub(S)	Comments
Logical node						
S6	1,2	GetLogicalNodeDirectory	TP		Y	
S7	1,2	GetAllDataValues	TP		Y	

Data						
S8	1,2	GetDataValues	TP		Y	
S9	1,2	SetDataValues	TP		Y	
S10	1,2	GetDataDirectory	TP		Y	
S11	1,2	GetDataDefinition	TP		Y	

Data set						
S12	1,2	GetDataSetValues	TP		Y	
S13	1,2	SetDataSetValues	TP		N	
S14	1,2	CreateDataSet	TP		N	
S15	1,2	DeleteDataSet	TP		N	
S16	1,2	GetDataSetDirectory	TP		Y	

Substitution						
S17	1	SetDataValues	TP		N	Ed1 only

Setting group control						
S18	1,2	SelectActiveSG	TP		Y	
S19	1,2	SelectEditSG	TP		Y	
S20	1,2	SetEditSGValues	TP		Y	
S21	1,2	ConfirmEditSGValues	TP		Y	
S22	1,2	GetEditSGValues	TP		Y	
S23	1,2	GetSGCBValues	TP		Y	

	Ed	ACSI Service	AA: TP/MC	Client Sub(C)	Server Pub(S)	Comments
Reporting						
Buffered report control block (BRCB)						
S24	1,2	Report	TP		Y	
S24-1	1,2	data-change (dchg)			Y	
S24-2	1,2	quality-change (qchg)			Y	
S24-3	1,2	data-update (dupd)			N	
S25	1,2	GetBRCBValues	TP		Y	
S26	1,2	SetBRCBValues	TP		Y	
Unbuffered report control block (URCB)						
S27	1,2	Report	TP		Y	
S27-1	1,2	data-change (dchg)			Y	
S27-2	1,2	quality-change (qchg)			Y	
S27-3	1,2	data-update (dupd)			N	
S28	1,2	GetURCBValues	TP		Y	
S29	1,2	SetURCBValues	TP		Y	

Logging						
Log control						
S30	1,2	GetLCBValues	TP		N	
S31	1,2	SetLCBValues	TP		N	
Log						
S32	1,2	QueryLogByTime	TP		N	
S33	1,2	QueryLogAfter	TP		N	
S34	1,2	GetLogStatusValues	TP		N	

Generic substation event model (GSE)						
GOOSE						
S35	1,2	SendGOOSEMessage	MC		Y	
GOOSE Control Block						
S36	1,2	GetGoReference	TP			
S37	1,2	GetGOOSEElementNumber	TP			
S38	1,2	GetGoCBValues	TP		Y	
S39	1,2	SetGoCBValues	TP		Y	
GSSE (Ed2:61850-7-2 Annex C)						
S40	1,2	SendGSSEMessage	MC		N	Deprecated
GSSE Control Block (Ed2:61850-7-2 Annex C)						
S41	1,2	GetGsReference	TP		N	Deprecated
S42	1,2	GetGSSEDataOffset	TP		N	Deprecated
S43	1,2	GetGsCBValues	TP		N	Deprecated
S44	1,2	SetGsCBValues	TP		N	Deprecated

	Ed	ACSI Service	AA: TP/MC	Client Sub(C)	Server Pub(S)	Comments
Transmission of sampled value model (SVC)						
Multicast SV						
S45	1,2	SendMSVMessage	MC		N	Use for 9-2LE or IEC 61869-9
Multicast Sampled Value Control Block						
S46	1,2	GetMSVCBValues	TP		N	
S47	1,2	SetMSVCBValues	TP		N	
Unicast SV						
S48	1,2	SendUSVMessage	TP		N	
Unicast Sampled Value Control Block						
S49	1,2	GetUSVCBValues	TP		N	
S50	1,2	SetUSVCBValues	TP		N	

Control						
S51	1,2	Select	TP		Y	SBO Normal Security
S52	1,2	SelectWithValue	TP		Y	SBO Enhanced Security
S53	1,2	Cancel	TP		Y	
S54	1,2	Operate	TP		Y	
S55	1,2	CommandTermination	TP		Y	
S56	1,2	TimeActivatedOperate	TP		N	

File transfer						
S57	1,2	GetFile	TP		Y	
S58	1,2	SetFile	TP		N	
S59	1,2	DeleteFile	TP		N	
S60	1,2	GetFileAttributeValues	TP		Y	
S61	1,2	GetServerDirectory (FILE)	TP		Y	

Time						
T1	1,2	Time resolution of internal clock	-		2ms	nearest negative power of 2 in seconds
T2	2	Time accuracy of internal clock	-			TL (ms) (low accuracy), T3 < 7) (only Ed2)
	1,2		-			T0 (ms) (<= 10 ms), 7 <= T3 < 10)
	1,2		-		Y	T1 (μs) (<= 1 ms), 10 <= T3 < 13
	1,2		-			T2 (μs) (<= 100 μs), 13 <= T3 < 15
	1,2		-			T3 (μs) (<= 25 μs), 15 <= T3 < 18
	1,2		-			T4 (μs) (<= 4 μs), 18 <= T3 < 20
	1,2		-			T5 (μs) (<= 1 μs), T3 >= 20)
T3	1,2	Supported TimeStamp resolution	-		1ms	nearest negative power of 2 in seconds

Model Implementation Conformance Statement
for the IEC 61850 interface in F650 Bay Controller

Date : May 05, 2017

Version : 1.4

INDEX - MICS

1. Introduction	13
1.1 Logical Node List	13
2. LOGICAL NODES EXTENSIONS	14
2.1. System Logical Nodes. LN Group: L	14
2.1.1. LPHD (Physical device information)	14
2.1.2. LLN0 (Logical node zero)	14
2.1.3. LGOS (GOOSE subscription)	15
2.1.4. GoCB (GOOSE control block class definition)	16
2.2. Logical Nodes for protection functions. LN Group: P	17
2.2.1. PIOC (Instantaneous overcurrent)	17
2.2.2. PTOC (Time overcurrent)	22
2.2.3. PTOF (OverFrequency)	26
2.2.4. PTUF (Underfrequency)	27
2.2.5. PTUV (Undervoltage)	28
2.2.6. PTOV (Overvoltage)	30
2.2.7. PDOP (Directional Overpower)	34
2.2.8. PFRC (Frequency Rate of Change)	37
2.2.9. PDIS (Distance)	38
2.2.10. PTTR (Thermal Overload)	39
2.2.11. PTRC (Protection trip conditioning)	40
2.3. Logical Nodes for protection related functions. LN Group: R	41
2.3.1. RDIR (Directional element)	41
2.3.2. RREC (Autoreclosing)	44
2.3.3. RBRF (Breaker failure)	45
2.3.4. RFLO (Fault locator)	45
2.3.5. RSYN (Synchronism-check)	47
2.3.6. RDRE (Disturbance recorder function)	48
2.3.7. RBDR Disturbance recorder channel binary	50
2.4. Logical Nodes for control. LN Group: C	51
2.4.1. CSWI (Switch controller)	51
2.4.2. CILO (Interlocking)	52
2.5. Logical Nodes for generic references. LN Group: G	53
2.5.1. GGIO (Generic process I/O)	53
2.6. Logical Nodes for metering and measurement. LN Group: M	60
2.6.1. MMXU	60
2.6.2. MSQI	61
2.6.3. MMTR	61

2.7.	Logical Nodes for switchgear. LN Group: X	63
2.7.1.	XCBR (Circuit breaker).....	63
2.7.2.	XSWI (Circuit switch)	64
3.	COMMON DATA CLASS	65
3.1.	Common data class specifications for status information	65
3.1.1.	Single Point Status (SPS)	65
3.1.2.	Integer Status (INS)	65
3.1.3.	Enumerated Status (ENS)	66
3.1.4.	Protection activation information (ACT).....	69
3.1.5.	Directional protection activation information (ACD)	71
3.1.6.	Binary counter reading (BCR).....	74
3.2.	Common data class specifications for measurand information	76
3.2.1.	Measured Value (MV)	76
3.2.2.	Complex Measured Value (CMV).....	80
3.2.3.	Phase to ground related measured values of a three phase system (WYE).....	82
3.2.4.	Phase to phase related measured values of a three phase system (DEL).....	82
3.2.5.	Sequence (SEQ)	84
3.3.	Common data class specifications for controllable status information	85
3.3.1.	Controlable single point (SPC).	85
3.3.2.	Controlable double point (DPC).	87
3.3.3.	Controlable enumerated status (ENC).	88
3.4.	Common data class specifications for status settings	89
3.4.1.	Single point setting (SPG)	89
3.4.2.	Integer status setting (ING)	90
3.4.3.	Enumerated status setting (ENG)	92
3.4.4.	Object reference setting	93
3.5.	Common data class specifications for analogue settings.....	93
3.5.1.	Analogue setting (ASG).....	93
3.5.2.	Setting curve (CURVE)	97
3.6.	Common data class specifications for description information	98
3.6.1.	Device name plate (DPL).	98
3.6.2.	Logical node name plate (LPL).	98
4.	Enum types	99
4.1.	New Enum Types	99
4.1.1.	setCharact_2	99
4.1.2.	SamplesCycle	99

1. Introduction This model implementation conformance statement is applicable for [F650 Bay Controller](#), with firmware [7.52](#):

This MICS document specifies the modelling extensions compared to IEC 61850 edition 1. For the exact details on the standardized model please compare the ICD substation configuration file:

"<[F650_6SG_v752_Ed1.icd](#)>", version <[1.0](#)>.

Clause 2 contains the list of implemented logical nodes.

Clause 3 describes the new and extended logical nodes (if any).

Clause 4 describes the new and extended enum types (if any).

1.1 Logical Node List

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

L: System Logical Nodes
LPHD (Physical device information)
LLN0 (Logical node zero)
LGOS (GOOSE subscription)
GoCB (GOOSE Control Block Class definition)
P: Logical Nodes for protection functions
PIOC (Instantaneous overcurrent)
PTOC (Time overcurrent)
PTOF (Overfrequency)
PTOV (Overvoltage)
PTRC (Protection trip conditioning)
PTTR (Thermal overload)
PTUV (Undervoltage)
PTUF (Underfrequency)
PDOP (Power)
PFRC (Frequency Rate of Change)
PDIS (Load Enchroachment)
R: Logical nodes for protection related functions
RBDR (Disturbance recorder channel binary)
RBRF (Breaker failure)
RDIR (Directional element)
RDRE (Disturbance recorder function)
RFLO (Fault Locator)
RREC (Autoreclosing)
RSYN (Synchrocheck)
C: Logical Nodes for control
CILO (Interlocking)
CSWI (Switch controller)

G: Logical Nodes for generic references
GGIO (Generic process I/O)
M: Logical Nodes for metering and measurement
MMTR (Metering)
MMXU (Measurement)
MSQI (Sequence and imbalance)
X: Logical Nodes for switchgear
XCBR (Circuit breaker)
XSWI (Circuit switch)

2. LOGICAL NODES EXTENSIONS

The following table uses:

M: Data is mandatory in the IEC-61850-7-4.

O: Data is optional in the IEC-61850-7-4 and is used in the device.

E: Data is an extension to the IEC-61850-7-4.

2.1. System Logical Nodes. LN Group: LLPHD (Physical device information)

LPHD class				
Attribute Name	Attr. Type	Explanation	M/O	Notes
LPHD		Physical device information	M	
Data				
Common Logical Node Information				
PhyNam	geDPL	Physical device name plate	M	
PhyHealth	geHealthINS	Physical device health	M	
Proxy	geSPS	Indicates if this LN is a proxy	M	

2.1.2. LLN0 (Logical node zero)

LLN0 class				
Attribute Name	Attr. Type	Explanation	M/O	Notes
LLN0		Logical node zero		

Data				
Common Logical Node Information				
Mod	geModINC	Mode	M	
Beh	geBehINS	Behaviour	M	
Health	geHealthINS	Health	M	
NamPlt	geLPL_1	Name plate	M	
Loc	geSPS	Local control behaviour	O	
OpTmh	geINS	Operation time	O	
GoCB (ACSI class GOOSE control block)				
GoCB	GoCB			

2.1.3. LGOS (GOOSE subscription)

This LN Logical is used for monitoring GOOSE messages, diagnosing the subscription state of a GOOSE message and has 24 instances inside the device

LLN0 class				
Attribute Name	Attr. Type	Explanation	M/O	Notes
LLN0		Logical node zero		
Data				
Common Logical Node Information				
Mod	geModINC	Mode	M	
Beh	geBehINS	Behaviour	M	
Health	geHealthINS	Health	M	
NamPlt	geLPL	Name plate	M	
St	geSPS	Status of the subscription	M	
LastStNum	geINS	Last state number received	O	
ConfRevNum	geINS	Expected conf. revision num.	O	
GoCBRef	geORG	Ref. to the subscribed GOOSE control block	O	

2.1.4. GoCB (GOOSE control block class definition)

GoCB class			
Attribute Name	Attribute Type	FC	Notes
GoEna	BOOLEAN	GO	Enable (TRUE), disable (FALSE)
GoID	VISIBLE STRING65	GO	
DatSet	Object Reference	GO	
ConfRev	INT32U	GO	
NdsCom	BOOLEAN	GO	
DstAddress	PHYCOMADDR	GO	

2.2. Logical Nodes for protection functions. LN Group:P

2.2.1. PIOC (Instantaneous overcurrent)

2.2.1.1. gePhsPIOC_2

This logical node class is used for phase instantaneous overcurrent and has 6 instances inside the device.

PIOC class				
Attribute Name	Attr. Type	Explanation	M/O	Notes
PIOC		Instantaneous overcurrent		
Data				
Common Logical Node Information				
Mod	geModINC	Mode	M	
Beh	geBehINS	Behaviour	M	
Health	geHealthINS	Health	M	
NamPlt	geLPL	Name plate	M	
Status Information				
Str	gePhsACD	Start	O	IOC PKP
Op	gePhsACT	Operate	M	IOC OP
Blk	geSPS_1	Block	O	
Settings				
PIOCEna	geSPG_2	Function	O	
InMagTyp	geING_0_2	Input	O	
StrVal	geFloatASG_2	Pickup level	O	
OpDITmms	geING_8_2	Trip delay	O	
RsDITmms	geING_8_2	Reset delay	O	
SnpshtEvEna	geSPG_2	Snapshot events enabled	O	

2.2.1.2. geNdPIOC_2

This logical node class is used for neutral instantaneous overcurrent and has 3 instances inside the device.

PIOC class				
------------	--	--	--	--

Attribute Name	Attr. Type	Explanation	M/O	Notes
PIOC		Instantaneous overcurrent		
Data				
Common Logical Node Information				
Mod	geModINC	Mode	M	
Beh	geBehINS	Behaviour	M	
Health	geHealthINS	Health	M	
NamPlt	geLPL	Name plate	M	
Status Information				
Str	geNeutACD	Start	O	IOC PKP
Op	geNeutACT	Operate	M	IOC OP
Blk	geSPS_1	Block	O	
Settings				
PIOCEna	geSPG_2	Function	O	
StrVal	geFloatASG_2	Pickup level	O	
OpDITmms	geING_8_2	Trip delay	O	
RsDITmms	geING_8_2	Reset delay	O	
SnpshtEvEna	geSPG_2	Snapshot events enabled	O	

2.2.1.3. geGndPIOC_2

This logical node class is used for ground instantaneous overcurrent (3 instances) and sensitive ground instantaneous overcurrent (3 instances). There are 6 instances this logical node inside the device.

PIOC class				
Attribute Name	Attr. Type	Explanation	M/O	Notes
PIOC		Instantaneous overcurrent		
Data				
Common Logical Node Information				
Mod	geModINC	Mode	M	
Beh	geBehINS	Behaviour	M	
Health	geHealthINS	Health	M	
NamPlt	geLPL	Name plate	M	

Status Information				
Str	gePhsACD	Start	O	IOC PKP
Op	gePhsACT	Operate	M	IOC OP
Blk	geSPS_1	Block	O	
Settings				
PIOCEna	geSPG_2	Function	O	
InMagTyp	geING_0_2	Input	O	
StrVal	geFloatASG_2	Pickup level	O	
OpDITmms	geING_8_2	Trip delay	O	
RsDITmms	geING_8_2	Reset delay	O	
SnpshtEvEna	geSPG_2	Snapshot events enabled	O	

2.2.1.4. IsoGndPIOC_2

This logical node class is used for Isolated sensitive ground instantaneous overcurrent. There are 3 instances this logical node inside the device.

PIOC class				
Attribute Name	Attr. Type	Explanation	M/O	Notes
PIOC		Instantaneous overcurrent		
Data				
Common Logical Node Information				
Mod	geModINC	Mode	M	
Beh	geBehINS	Behaviour	M	
Health	geHealthINS	Health	M	
NamPlt	geLPL	Name plate	M	
Status Information				
Str	gePhsACD	Start	O	IOC PKP
Op	gePhsACT	Operate	M	IOC OP
Blk	geSPS_1	Block	O	
Settings				
PIOCEna	geSPG_2	Function	O	
VhStr	geIntASG_2	Vh level	O	
VIStr	geIntASG_2	VI level	O	
IhStr	geFloatASG_1_2	Ih level	O	
IIStr	geFloatASG_1_2	II level	O	
OpDITmms	geING_8_2	Trip delay	O	
RsDITmms	geING_8_2	Reset delay	O	
SnpshtEvEna	geSPG_2	Snapshot events enabled	O	

2.2.1.5. geBknCndPIOC_2

This logical node class is used for broken conductor instantaneous overcurrent. There are 3 instances this logical node inside the device.

PIOC class				
Attribute Name	Attr. Type	Explanation	M/O	Notes
PIOC		Instantaneous overcurrent		
Data				
Common Logical Node Information				
Mod	geModINC	Mode	M	
Beh	geBehINS	Behaviour	M	
Health	geHealthINS	Health	M	
NamPlt	geLPL	Name plate	M	
Status Information				
Str	gePhsACD	Start	O	IOC PKP
Op	gePhsACT	Operate	M	IOC OP
Blk	geSPS_1	Block	O	
Settings				
PIOCEna	geSPG_2	Function	O	
StrVal	geFloatASG_2	Pickup level	O	
OpDITmms	geING_8_2	Trip delay	O	
BlkCurrent	geFloatASG_1_2	Operation Threshold	O	
SnpshtEvEna	geSPG_2	Snapshot events enabled	O	

2.2.2. PTOC (Time overcurrent)

2.2.2.1. gePhsPTOC_2

This logical node class is used for phase time overcurrent and has 6 instances inside the device.

PTOC class				
Attribute Name	Attr. Type	Explanation	M/O	Notes
PTOC		Time overcurrent		
Data				
Common Logical Node Information				
Mod	geModINC	Mode	M	
Beh	geBehINS	Behaviour	M	
Health	geHealthINS	Health	M	
NamPlt	geLPL	Name plate	M	
Status Information				
Str	gePhsACD	Start	O	TOC PKP
Op	gePhsACT	Operate	M	TOC OP
Blk	geSPS_1	Block	O	TOC BLK
Settings				
PTOCEna	geSPG_2	Function	O	
InMagTyp	geING_0_2	Input	O	
TmACrv	geCURVE_3	Curve	O	
StrVal	geFloatASG_2	Pickup level	O	
VolRst	geSPG_2	Voltage Restraint	O	
TmMult	geFloatASG_2	TD Multiplier	O	
RsMod	geING_0_2	Reset	O	
SnpshtEvEna	geSPG_2	Snapshot events enabled	O	

2.2.2.2. geNdPTOC_2

This logical node class is used for neutral time overcurrent and has 3 instances inside the device.

PTOC class

Attribute Name	Attr. Type	Explanation	M/O	Notes
PTOC		Time overcurrent		
Data				
Common Logical Node Information				
Mod	geModINC	Mode	M	
Beh	geBehINS	Behaviour	M	
Health	geHealthINS	Health	M	
NamPlt	geLPL	Name plate	M	
Status Information				
Str	geNeutACD	Start	O	TOC PKP
Op	geNeutACT	Operate	M	TOC OP
Blk	geSPS	Block	O	TOC BLK
Settings				
PTOCEna	geSPG_2	Function	O	
TmACrv	geCURVE_3	Curve	O	
StrVal	geFloatASG_2	Pickup level	O	
TmMult	geFloatASG_2	TD Multiplier	O	
RsMod	geING_0_2	Reset	O	
SnpshtEvEna	geSPG_2	Snapshot events enabled	O	

2.2.2.3. geGndPTOC_2

This logical node class is used for ground time overcurrent (3 instances) and for sensitive ground time overcurrent (3 instances). There are 6 instances inside of this logical node inside the device

PTOC class				
Attribute Name	Attr. Type	Explanation	M/O	Notes
PIOC		Time overcurrent		
Data				
Common Logical Node Information				
Mod	geModINC	Mode	M	
Beh	geBehINS	Behaviour	M	
Health	geHealthINS	Health	M	

NamPlt	geLPL	Name plate	M	
Status Information				
Str	gePhsACD	Start	O	TOC PKP
Op	gePhsACT	Operate	M	TOC OP
Blk	geSPS	Block	O	TOC BLK
Settings				
PTOCEna	geSPG_2	Function	O	
InMagTyp	geING_0_2	Input	O	
TmACrv	geCURVE_3	Curve	O	
StrVal	geFloatASG_2	Pickup level	O	
TmMult	geFloatASG_2	TD Multiplier	O	
RsMod	geING_0_2	Reset	O	
SnpshtEvEna	geSPG_2	Snapshot events enabled	O	

2.2.2.4. geNgSeqPTOC_2

This logical node class is used for negative sequence time overcurrent. There are 3 instances this logical node inside the device.

PTOC class				
Attribute Name	Attr. Type	Explanation	M/O	Notes
PIOC		Time overcurrent		
Data				
Common Logical Node Information				
Mod	geModINC	Mode	M	
Beh	geBehINS	Behaviour	M	
Health	geHealthINS	Health	M	
NamPlt	geLPL	Name plate	M	
Status Information				
Str	gePhsACD	Start	O	TOC PKP
Op	gePhsACT	Operate	M	TOC OP
Blk	geSPS	Block	O	TOC BLK
Settings				
PTOCEna	geSPG_2	Function	O	
TmACrv	geCURVE_3	Curve	O	
StrVal	geFloatASG_2	Pickup level	O	
TmMult	geFloatASG_2	TD Multiplier	O	
RsMod	geING_0_2	Reset	O	
SnpshtEvEna	geSPG_2	Snapshot events enabled	O	

2.2.3. PTOF (OverFrequency)

2.2.3.1. gePTOF

This logical node class is used for overfrequency and has 6 instances inside the device.

PTOF class				
Attribute Name	Attr. Type	Explanation	M/O	Notes
PTOF		OverFrequency		
Data				
Common Logical Node Information				
Mod	geModINC	Mode	M	
Beh	geBehINS	Behaviour	M	
Health	geHealthINS	Health	M	
NamPlt	geLPL	Name plate	M	
Status Information				
Str	geGeneralACD	Start	M	TOF PKP
Op	geGeneralACT	Operate	M	TOF OP
Blk	geSPS_1	Block	O	TOF BLK
Settings				
PTOFena	geSPG_2	Function	O	
StrVal	geFloatASG_2	Start value (frequency)	O	
BlkVal	geIntASG_3	Voltage block value	O	
OpDITmms	geING_8_2	Operate delay time	O	
RsDITmms	geING_8_2	Reset delay time	O	
FreqSource	geSPG_2	Freq Source	O	
SnpshtEvEna	geSPG_2	Snapshot events enabled	O	

2.2.4. PTUF (Underfrequency)

2.2.4.1. gePTUF

This logical node class is used for phase underfrequency and has 6 instances inside the device.

PTUF class				
Attribute Name	Attr. Type	Explanation	M/O	Notes
PTUF		UnderFrequency		
Data				
Common Logical Node Information				
Mod	geModINC	Mode	M	
Beh	geBehINS	Behaviour	M	
Health	geHealthINS	Health	M	
NamPlt	geLPL	Name plate	M	
Status Information				
Str	geGeneralACD	Start	M	TUF PKP
Op	geGeneralACT	Operate	M	TUF OP
Blk	geSPS_1	Block	O	TUF BLK
Settings				
PTUFEna	geSPG_2	Function	O	
StrVal	geFloatASG_2	Start value (frequency)	O	
BlkVal	geIntASG_3	Voltage block value	O	
OpDITmms	geING_8_2	Operate delay time	O	
RsDITmms	geING_8_2	Reset delay time	O	
FreqSource	geSPG_2	Freq Source	O	
SnpshtEvEna	geSPG_2	Snapshot events enabled	O	

2.2.5. PTUV (Undervoltage)

2.2.5.1. gePhsPTUV_2

This logical node class is used for phase undervoltage and has 3 instances inside the device.

PTUV class				
Attribute Name	Attr. Type	Explanation	M/O	Notes
PTUV		Undervoltage		
Data				
Common Logical Node Information				
Mod	geModINC	Mode	M	
Beh	geBehINS	Behaviour	M	
Health	geHealthINS	Health	M	
NamPlt	geLPL	Name plate	M	
Status Information				
Str	geGeneralACD	Start	M	TUV PKP
Op	geGeneralACT	Operate	M	TUV OP
Blk	geSPS_1	Block	O	TUV BLK
StrPhGn	gePhsACD_1	Pickup Phase-Ground	O	
OpPhGn	gePhsACT_1	Operate Phase-Ground	O	
StrPhPh	gePhsACD_1	Pickup Phase-Phase	O	
OpPhPh	gePhsACT_1	Operate Phase-Phase	O	
Settings				
PTUVEna	geSPG_2	Function	O	
InMod	geING_0_2	Mode	O	
TmVCrv	geCURVE_4	Operating curve type	O	
StrVal	geIntASG_3	Start value	O	
TmMult	geFloatASG_2	Time dial multiplier	O	
DeaLinVal	geIntASG_3	Minimum Voltage	O	
PhLogic	geING_0_2	Logic	O	
BkrMon	geSPG_2	Supervised by 52	O	
SnpshtEvEna	geSPG_2	Snapshot events enabled	O	

2.2.5.2. geAuxPTUV_2

This logical node class is used for auxiliary undervoltage and has 3 instances inside the device.

PTUV class				
Attribute Name	Attr. Type	Explanation	M/O	Notes
PTUV		Undervoltage		
Data				
Common Logical Node Information				
Mod	geModINC	Mode	M	
Beh	geBehINS	Behaviour	M	
Health	geHealthINS	Health	M	
NamPlt	geLPL	Name plate	M	
Status Information				
Str	geGeneralACD	Start	M	TUV PKP
Op	geGeneralACT	Operate	M	TUV OP
Blk	geSPS_1	Block	O	TUV BLK
Settings				
PTUVEna	geSPG_2	Function	O	
TmVCrv	geCURVE_4	Operating curve type	O	
StrVal	geIntASG_3	Start value	O	
TmMult	geFloatASG_2	Time dial multiplier	O	
SnpshtEvEna	geSPG_2	Snapshot events enabled	O	

2.2.6. PTOV (Overvoltage)

2.2.6.1. gePhsPTOV_2

This logical node class is used for phase overvoltage and has 3 instances inside the device

PTOV class				
Attribute Name	Attr. Type	Explanation	M/O	Notes
PTOV		Overvoltage		
Data				
Common Logical Node Information				
Mod	geModINC	Mode	M	
Beh	geBehINS	Behaviour	M	
Health	geHealthINS	Health	M	
NamPlt	geLPL	Name plate	M	
Status Information				
Str	gePhsACD	Start	M	TOV PKP
Op	gePhsACT	Operate	M	TOV OP
Blk	geSPS_1	Block	O	TOV BLK
Settings				
PTOVEna	geSPG_2	Function	O	
StrVal	geIntASG_3	Start value	O	
OpDITmms	geING_8_2	Operate delay time	O	
RsDITmms	geING_8_2	Reset delay time	O	
PhLogic	geING_0_2	Logic	O	
SnpshtEvEna	geSPG_2	Snapshot events enabled	O	

2.2.6.2. geAuxPTOV_2

This logical node class is used for auxiliary overvoltage and has 3 instances inside the device.

PTOV class				
Attribute Name	Attr. Type	Explanation	M/O	Notes
PTOV		Overvoltage		
Data				
Common Logical Node Information				
Mod	geModINC	Mode	M	
Beh	geBehINS	Behaviour	M	
Health	geHealthINS	Health	M	
NamPlt	geLPL	Name plate	M	
Status Information				
Str	geGeneralACD	Start	M	TOV PKP
Op	geGeneralACT	Operate	M	TOV OP
Blk	geSPS_1	Block	O	TOV BLK
Settings				
PTOVEna	geSPG_2	Function	O	
StrVal	geIntASG_3	Start value	O	
OpDITmms	geING_8_2	Operate delay time	O	
RsDITmms	geING_8_2	Reset delay time	O	
SnpshtEvEna	geSPG_2	Snapshot events enabled	O	

2.2.6.3. geNeutPTOV_2

This logical node class is used for neutral overvoltage and has 6 instances inside the device.

PTOV class				
Attribute Name	Attr. Type	Explanation	M/O	Notes
PTOV		Overvoltage		
Data				
Common Logical Node Information				

Mod	geModINC	Mode	M	
Beh	geBehINS	Behaviour	M	
Health	geHealthINS	Health	M	
NamPlt	geLPL	Name plate	M	
Status Information				
Str	geGeneralACD	Start	M	TOV PKP
Op	geGeneralACT	Operate	M	TOV OP
Blk	geSPS_1	Block	O	TOV BLK
Settings				
PTOVEna	geSPG_2	Function	O	
StrVal	geIntASG_3	Start value	O	
OpDITmms	geING_8_2	Operate delay time	O	
RsDITmms	geING_8_2	Reset delay time	O	
SnpshtEvEna	geSPG_2	Snapshot events enabled	O	

2.2.6.4. geNgSeqPTOV_2

This logical node class is used for negative sequence overvoltage and has 3 instances inside the device.

PTOV class				
Attribute Name	Attr. Type	Explanation	M/O	Notes
PTOV		Overvoltage		
Data				
Common Logical Node Information				
Mod	geModINC	Mode	M	
Beh	geBehINS	Behaviour	M	
Health	geHealthINS	Health	M	
NamPlt	geLPL	Name plate	M	
Status Information				
Str	geGeneralACD	Start	M	TOV PKP
Op	geGeneralACT	Operate	M	TOV OP
Blk	geSPS_1	Block	O	TOV BLK
Settings				

PTOVEna	geSPG_2	Function	O	
StrVal	geIntASG_3	Start value	O	
OpDITmms	geING_8_2	Operate delay time	O	
RsDITmms	geING_8_2	Reset delay time	O	
SnpshtEvEna	geSPG_2	Snapshot events enabled	O	

2.2.7. PDOP (Directional Overpower)

2.2.7.1. geFwdPDOP_2

This logical node class shall be used to model the forward overpower function and has three instances inside the device.

PDOP class				
Attribute Name	Attr. Type	Explanation	M/O	Notes
PDOP		Overpower		
Data				
Common Logical Node Information				
Mod	geModINC	Mode	M	
Beh	geBehINS	Behaviour	M	
Health	geHealthINS	Health	M	
NamPlt	geLPL	Name plate	M	
Status Information				
Str	gePhsACD	Start	M	Stage 1 PKP
Op	gePhsACT	Operate	M	Stage 1 OP
Blk	geSPS_1	Block	O	
S2Str	gePhsACD_2	Start	O	Stage 2 PKP
S2Op	gePhsACT_1	Operate	O	Stage 2 OP
Settings				
PDOPEna	geSPG_2	Function	O	
BlkCloseTmms	geING_0_2	Blk time after close	O	
StrVal	geFloatASG_2	Stage 1 Tap	O	
OpDITmms	geING_8_2	Stage 1 Time	O	
S2StrVal	geFloatASG_2	Stage 2 Tap	O	
S2OpDITmms	geING_8_2	Stage 2 Time	O	
SnpshtEvEna	geSPG_2	Snapshot events enabled	O	

2.2.7.2. geDirPDOP_2

This logical node class shall be used to model the directional overpower function and has three instances inside the device.

PDOP class				
Attribute Name	Attr. Type	Explanation	M/O	Notes
PDOP		Overpower		
Data				
Common Logical Node Information				
Mod	geModINC	Mode	M	
Beh	geBehINS	Behaviour	M	
Health	geHealthINS	Health	M	
NamPlt	geLPL	Name plate	M	
Status Information				
Str	gePhsACD	Start	M	
Op	gePhsACT	Operate	M	
Blk	geSPS_1	Block	O	
S1Str	gePhsACD_2	Start	O	Stage 1 PKP
S1Op	gePhsACT_1	Operate	O	Stage 1 OP
S2Str	gePhsACD_2	Start	O	Stage 2 PKP
S2Op	gePhsACT_1	Operate	O	Stage 2 OP
Settings				
PDOPEna	geSPG_2	Function	O	
BlkCloseTmms	geING_0_2	Blk time after close	O	
S1DirPwrAng	geFloatASG_1_2	Dir Power Angle 1	O	
S1StrVal	geFloatASG_1_2	Stage 1 Tap	O	
S1OpDITmms	geING_0_2	Stage 1 Time	O	
S2DirPwrAng	geFloatASG_1_2	Dir Power Angle 2	O	
S2StrVal	geFloatASG_1_2	Stage 2 Tap	O	
S2OpDITmms	geING_0_2	Stage 2 Time	O	
SnpshtEvEna	geSPG_2	Snapshot events enabled	O	

2.2.7.3. geWattPDOP_2

This logical node class shall be used to model the wattmeter ground overpower function and has six instances inside the device.

PDOP class				
Attribute Name	Attr. Type	Explanation	M/O	Notes
PDOP		Overpower		
Data				
Common Logical Node Information				
Mod	geModINC	Mode	M	
Beh	geBehINS	Behaviour	M	
Health	geHealthINS	Health	M	
NamPlt	geLPL	Name plate	M	
Status Information				
Str	gePhsACD	Start	M	
Op	gePhsACT	Operate	M	
Blk	geSPS_1	Block	O	
SupStr	gePhsACD_2	Start	O	
Settings				
PDOPEna	geSPG_2	Function	O	
OVStrVal	geFloatASG_1_2	Voltage Pickup Level	O	
InMagTyp	geING_0_2	Current Selection	O	
OCStrVal	geFloatASG_1_2	OC Pickup level	O	
OCStrDITmms	geING_0_2	OC Pickup Delay	O	
PWStrVal	geFloatASG_1_2	Power Pickup	O	
ChrAng	geFloatASG_2	MTA	O	
PWStrDITmms	geING_0_2	Power Pickup Delay	O	
Curve	geING_0_2	Curve	O	
MltTmms	geING_0_2	Multiplier	O	
SnpshtEvEna	geSPG_2	Snapshot events enabled	O	

2.2.8. PFRC (Frequency Rate of Change)

2.2.8.1. gePFRC_2

This logical node class shall be used to model the frequency rate of change function and has three instances inside the device.

PFRC class				
Attribute Name	Attr. Type	Explanation	M/O	Notes
PFRC		Frequency Rate of Change		
Data				
Common Logical Node Information				
Mod	geModINC	Mode	M	
Beh	geBehINS	Behaviour	M	
Health	geHealthINS	Health	M	
NamPlt	geLPL	Name plate	M	
Status Information				
Str	gePhsACD	Start	M	
Op	gePhsACT	Operate	M	
Blk	geSPS_1	Block	O	
Settings				
PFRCEna	geSPG_2	Function	O	
Trend	geING_0_2	Freq Rate Trend	O	
StrVal	geFloatASG_2	Freq Rate Pickup	O	
BlkVal	geFloatASG_2	Freq Rate Min Volt	O	
BlkMinFreq	geFloatASG_1_2	Freq Rate Min Freq	O	
BlkMaxFreq	geFloatASG_1_2	Freq Rate Max Freq	O	
OpDITmms	geING_8_2	Freq Rate Delay	O	
SnpshtEvEna	geSPG_2	Snapshot events	O	

2.2.9. PDIS (Distance)

2.2.9.1. gePDIS_2

This logical node class shall be used to model the load encroachment function and has three instances inside the device.

PDIS class				
Attribute Name	Attr. Type	Explanation	M/O	Notes
PDIS		Distance		
Data				
Common Logical Node Information				
Mod	geModINC	Mode	M	
Beh	geBehINS	Behaviour	M	
Health	geHealthINS	Health	M	
NamPlt	geLPL	Name plate	M	
Status Information				
Str	gePhsACD	Start	M	
Op	gePhsACT	Operate	M	
Blk	geSPS_1	Block	O	
Settings				
PDISEna	geSPG_2	Function	O	
MinVoltage	geFloatASG_1_2	Freq Rate Trend	O	
RisLod	geFloatASG_2	Freq Rate Pickup	O	
AngLod	geFloatASG_2	Freq Rate Min Volt	O	
OpDITmms	geING_8_2	Operation Delay	O	
RsDITmms	geING_8_2	Reset Delay	O	
SnpshtEvEna	geSPG_2	Snapshot events	O	

2.2.10. PTTR (Thermal Overload)

2.2.10.1. gePTTR_2

This logical node class shall be used to model the thermal overload function and has three instances inside the device.

PTTR class				
Attribute Name	Attr. Type	Explanation	M/O	Notes
PTTR		Thermal Overload		
Data				
Common Logical Node Information				
Mod	geModINC	Mode	M	
Beh	geBehINS	Behaviour	M	
Health	geHealthINS	Health	M	
NamPlt	geLPL	Name plate	M	
Status Information				
Str	geGeneralACD	Start	M	
Op	gePhsACT	Operate	M	
Blk	geSPS_1	Block	O	
AlmThm	geGeneralACT		O	
AlmThmPhA	geSPS_1		O	
AlmThmPhB	geSPS_1		O	
AlmThmPhC	geSPS_1		O	
Settings				
PTTREna	geSPG_2	Function	O	
ConstmmHeat	geFloatASG_1_2	Heat Time Constant	O	
ConstmmCool	geFloatASG_1_2	Cool Time Constant	O	
strVal	geFloatASG_2	Pickup Level	O	
AlmVal	geFloatASG_2	Alarm Level	O	
SnpshtEvEna	geSPG_2	Snapshot events	O	

2.2.11. PTRC (Protection trip conditioning)

2.2.11.1. PTRC

This logical node shall be used to connect the operate outputs of one or more protection functions to a common trip to be transmitted to XCBR logical node and has 1 instance inside the device.

PTRC class				
Attribute Name	Attr. Type	Explanation	M/O	Notes
PTRC		Trip bus		
Data				
Common Logical Node Information				
Mod	geModINC	Mode	M	
Beh	geBehINS	Behaviour	M	
Health	geHealthINS	Health	M	
NamPlt	geLPL	Name plate	M	
Status Information				
Op	geGeneralACT	Operate	M	

2.3. Logical Nodes for protection related functions. LN Group: R

2.3.1. RDIR (Directional element)

2.3.1.1. gePhsRDIR_2

This logical node class is used for phase directional elements and has 3 instances inside the device.

RDIR class				
Attribute Name	Attr. Type	Explanation	M/O	Notes
RDIR		Directional Element		
Data				
Common Logical Node Information				
Mod	geModINC	Mode	M	
Beh	geBehINS	Behaviour	M	
Health	geHealthINS	Health	M	
NamPlt	geLPL	Name plate	M	
Status Information				
Dir	gePhsACD	Direction	M	
Op	gePhsACT	Operate	O	
Blk	geSPS_1	Block	O	
BlkIn	geGeneralACT_1	Block Input	O	
Settings				
RDIREna	geSPG_2	Function	O	
ChrAng	geFloatASG_2	Characteristic angle	O	
PolOpMod	geING_0_2	Direction	O	
BlkMod	geING_0_2	Block Logic	O	
BlkValV	geIntASG_3	Minimum operating current	O	
VMemTms	geFloatASG_1_2	Voltage Memory Time	O	
SnpshtEvEna	geSPG_2	Snapshot events enabled	O	

2.3.1.2. geNdRDIR_2

This logical node class is used for neutral directional elements and has 3 instances inside the device.

RDIR class				
Attribute Name	Attr. Type	Explanation	M/O	Notes
RDIR		Directional Element		
Data				
Common Logical Node Information				
Mod	geModINC	Mode	M	
Beh	geBehINS	Behaviour	M	
Health	geHealthINS	Health	M	
NamPlt	geLPL	Name plate	M	
Status Information				
Dir	geNeutACD	Direction	M	
Op	geNeutACT	Operate	O	
Blk	geSPS_1	Block	O	
BlkIn	geNeutACT_1	Block Input	O	
Settings				
RDIREna	geSPG_2	Function	O	
ChrAng	geFloatASG_2	Characteristic angle	O	
PolOpMod	geING_0_2	Direction	O	
BlkMod	geING_0_2	Block Logic	O	
BlkValV	geIntASG_3	Minimum operating current	O	
PolQty	geING_9	Polarizing quantity	O	
SnpshtEvEna	geSPG_2	Snapshot events enabled	O	

2.3.1.3. geGndRDIR_2

This logical node class is used for ground directional elements (3 instances) and for sensitive ground directional (3 instances).

RDIR class				
Attribute Name	Attr. Type	Explanation	M/O	Notes
RDIR		Directional Element		
Data				
Common Logical Node Information				
Mod	geModINC	Mode	M	
Beh	geBehINS	Behaviour	M	
Health	geHealthINS	Health	M	
NamPlt	geLPL	Name plate	M	
Status Information				
Dir	geNeutACD	Direction	M	
Op	geNeutACT	Operate	O	
Blk	geSPS_1	Block	O	
BlkIn	geNeutACT_1	Block Input	O	
Settings				
RDIREna	geSPG_2	Function	O	
ChrAng	geFloatASG_2	Characteristic angle	O	
PolOpMod	geING_0_2	Direction	O	
BlkMod	geING_0_2	Block Logic	O	
BlkValV	geIntASG_3	Minimum operating current	O	
PolQty	geING_9	Polarizing quantity	O	
SnpshtEvEna	geSPG_2	Snapshot events enabled	O	

2.3.2. RREC (Autoreclosing)

2.3.2.1. geRREC

This logical node class is used for autorecloser and has 1 instance inside the device.

RREC class				
Attribute Name	Attr. Type	Explanation	M/O	Notes
RREC		Autoreclosing Element		
Data				
Common Logical Node Information				
Mod	geModINC	Mode	M	
Beh	geBehINS	Behaviour	M	
Health	geHealthINS	Health	M	
NamPlt	geLPL	Name plate	M	
Status Information				
Op	geGeneralACT		M	
OpCls	geGeneralACT	Direction	M	
AutoRecSt	geAutoRecStINS	Operate	M	
AutoRecLo	geINS_1	Block	O	
AutoRecBlk	geINS_1	Block Input	O	
Settings				
RRECEna	geSPG	Function	O	
MaxNumShot	geING_0	Max. Number Shots	O	
Rec1Tmms1	geING_8	Dead Time 1	O	
Rec1Tmms2	geING_8	Dead Time 2	O	
Rec1Tmms3	geING_8	Dead Time 3	O	
Rec1Tmms4	geING_8	Dead Time 4	O	
RclTmms	geING_8	Reclaim time		
CondEna	geSPG	Cond. Permission		
HoldTmms	geFloatASG_1	Hold Time		
RsTmms	geFloatASG_1	Reset Time		

2.3.3. RBRF (Breaker failure)

2.3.3.1. RBRF

This logical node class is used for breaker failure and has 1 instance inside the device.

RREC class				
Attribute Name	Attr. Type	Explanation	M/O	Notes
RBRF		Breaker failure element		
Data				
Common Logical Node Information				
Mod	geModINC	Mode	M	
Beh	geBehINS	Behaviour	M	
Health	geHealthINS	Health	M	
NamPlt	geLPL	Name plate	M	
Status Information				
OpEx	geGeneralACT	Direction	M	

2.3.4. RFLO (Fault locator)

2.3.4.1. geRFLO

This logical node class is used modelling the fault locator function and has 1 instance inside the device.

RFLO class				
Attribute Name	Attr. Type	Explanation	M/O	Notes
RFLO		Fault locator element		
Data				
Common Logical Node Information				
Mod	geModINC	Mode	M	
Beh	geBehINS	Behaviour	M	
Health	geHealthINS	Health	M	
NamPlt	geLPL	Name plate	M	
Status Information				

FltRprtTrg	geSPS_1	Fault Report Trigger	O	
ClrFltRprts	geSPS_1	Clear fault reports	O	
FltZ	geFloatCMV	Fault impedance	M	
FltDiskm	geFloatMV_3	Fault distance in km	O	
RPriFlt	geFloatMV_2	Primary Fault Resistance	O	
XPriFlt	geFloatMV_2	Primary Fault Reactance	O	
RSeFlt	geFloatMV_2	Secondary Fault Resistance	O	
XSeFlt	geFloatMV_2	Secondary Fault Reactance	O	
RFault	geFloatMV_2	Fault Resistance	O	
FltTyp	geINS_1	Fault type	O	
FltRprtNum	geINS_1	Fault report number	O	
PreFltIaMod	geFloatMV_2	Prefault Ia module	O	
PreFltIaAng	geFloatMV_2	Prefault Ia angle	O	
PreFltIbMod	geFloatMV_2		O	
PreFltIbAng	geFloatMV_2		O	
PreFltIcMod	geFloatMV_2		O	
PreFltIcAng	geFloatMV_2		O	
PreFltIgMod	geFloatMV_2		O	
PreFltIgAng	geFloatMV_2		O	
PreFltIsgMod	geFloatMV_2		O	
PreFltIsgAng	geFloatMV_2		O	
PreFltVabMod	geFloatMV_2		O	
PreFltVabAng	geFloatMV_2		O	
PreFltVbcMod	geFloatMV_2		O	
PreFltVbcAng	geFloatMV_2		O	
PreFltVcaMod	geFloatMV_2		O	
PreFltVcaAng	geFloatMV_2		O	
PstFltIaMod	geFloatMV_2	Postfault Ia module	O	
PstFltIaAng	geFloatMV_2	Postfault Ia angle	O	
PstFltIbMod	geFloatMV_2		O	
PstFltIbAng	geFloatMV_2		O	
PstFltIcMod	geFloatMV_2		O	
PstFltIcAng	geFloatMV_2		O	
PstFltIgMod	geFloatMV_2		O	

PstFltIgAng	geFloatMV_2		O	
PstFltIsMod	geFloatMV_2		O	
PstFltIsAng	geFloatMV_2		O	
PstFltVabMod	geFloatMV_2		O	
PstFltVabAng	geFloatMV_2		O	
PstFltVbcMod	geFloatMV_2		O	
PstFltVbcAng	geFloatMV_2		O	
PstFltVcaMod	geFloatMV_2		O	
PstFltVcaAng	geFloatMV_2		O	
Settings				
RFLOEna	geSPG	Function		
Z1Mod	geFloatASG_1	Pos.Seq. Module		
Z1Ang	geIntASG_1	Pos.Seq. Angle		
Z0Mod	geFloatASG_1	Zero Seq. Module		
Z0Ang	geIntASG_1	Zero Seq. Angle		
LinLenkm	geFloatASG	Line length		
ShwFltHMI	geSPG	Show fault in HMI		
SnpshtEvEna	geSPG	Snapshot Events enabled		
PhCtPol	geSPG	Phase CT Polarity		

2.3.5. RSYN (Synchronism-check)

2.3.5.1. RSYN

This logical node class is used modelling the synchrocheck function and has 1 instance inside the device

RSYN class				
Attribute Name	Attr. Type	Explanation	M/O	Notes
RSYN		Synchronism-check		
Data				
Common Logical Node Information				
Mod	geModINC	Mode	M	
Beh	geBehINS	Behaviour	M	
Health	geHealthINS	Health	M	

NamPlt	geLPL	Name plate	M	
Status Information				
SynBlkIn	geSPS_1	Block signal	O	
SynOp	geSPS_1	Closing permission signal	O	
Rel	geSPS	Release	M	
SynCondOp	geSPS_1	Closing perm. according to logic	O	
DLDBOp	geSPS_1	Closing perm. in DLDB condition	O	
DLLBOP	geSPS_1	Closing perm. in DLLB condition	O	
LLDBOp	geSPS_1	Closing perm. in LLDB condition	O	
HzInd	geSPS	Frequency difference indicator	O	
BusHzHiLinHz	geSPS_1	Busbar frequency > line frequency	O	
BusHzLoLinHz	geSPS_1	Busbar frequency < line frequency	O	
Measured values				
DifVCIC	geFloatMV	Calculated difference in voltage	O	
DifHzCIC	geFloatMV	Calculated difference in frequency	O	
Settings				
RSYNEna	geSPG	Function	O	
DeaBusVal	geFloatASG	Dead bus value	O	
LivBusVal	geFloatASG	Live bus value	O	
DeaLinVal	geFloatASG	Dead line value	O	
LivLinVal	geFloatASG	Live line value	O	
DifV	geFloatASG	Difference voltage	O	
DifAng	geFloatASG	Difference angle	O	
DifHz	geIntASG	Difference frequency	O	
TotTmms	geING_8	Total time of synch. process	O	
DLDBEna	geSPG	Dead line - dead bus permission	O	
LLDBEna	geSPG	Live line - dead bus permission	O	
DLLBEna	geSPG	Dead line - live bus permission	O	
SnpshtEvEna	geSPG	Snapshot events enabled	O	

2.3.6. RDRE (Disturbance recorder function)

This logical node class is used modelling the disturbance recording function and has 1 instance inside the device. RBDR and RDRE logical nodes make available all attributes needed for the COMTRADE file.

RDRE class				
Attribute Name	Attr. Type	Explanation	M/O	Notes
RDRE		Disturbance recorder		
Data				
<i>Common Logical Node Information</i>				
Mod	geModINC	Mode	M	
Beh	geBehINS	Behaviour	M	
Health	geHealthINS	Health	M	
NamPlt	geLPL	Name plate	M	
<i>Status Information</i>				
RcdMade	geSPS	Recording made	M	
FltNum	geINS	Fault number	M	
CycRcd	geINS_1	Cycles per record	O	
RcdNum	geINS_1	Available records	O	
<i>Settings</i>				
RDREEna	geSPG	Function	O	
TrgPos	geING_0	Trigger position	O	
SmpCyc	geING_10	Samples per cycle	O	
MaxNumRcd	geING_8	Max. number of records	O	
RcdMod	geING_11	Recorder operation mode	O	
SnpshtEvEna	geSPG	Snapshot events enabled	O	

2.3.7. RBDR Disturbance recorder channel binary

This logical node class is used for providing the circuit component and phase identification and has 1 instance inside the device. RBDR and RDRE logical nodes make available all attributes needed for the COMTRADE file

RBDR class				
Attribute Name	Attr. Type	Explanation	M/O	Notes
RDRE		Disturbance recorder binary		
Data				
Common Logical Node Information				
Mod	geModINC	Mode	M	
Beh	geBehINS	Behaviour	M	
Health	geHealthINS	Health	M	
NamPlt	geLPL	Name plate	M	
Status Information				
ChTrg	geSPS	Channel triggered	M	
FltNum	geINS	Fault number	M	
DigCh01	geSPS_1	Oscillography digital channel 1	O	
DigCh02	geSPS_1	Oscillography digital channel 2	O	
...	...			
...	...			
DigCh16	geSPS_1	Oscillography digital channel 16	O	

2.4. Logical Nodes for control. LN Group: C

2.4.1. CSWI (Switch controller)

2.4.1.1. geCSWI

In the F650 there are up to 16 configurable switchgears. Currently ~~four~~ **sixteen** XSWI and ~~four~~ **sixteen** CSWI are implemented and mapped to first nine switchgears in F650. XSWI and CSWI Logical Nodes can be seen as paired objects in F650 as one pair of XSWI and CSWI map to the same switchgear. XSWI1 and CSWI1 map to Switchgear1, XSWI2 and CSWI2 map to Switchgear2, etc. The difference between XSWI and CSWI in F650 is that control commands cannot be sent directly via XSWI LN. Control commands have to be sent via CSWI LN.

CSWI class				
Attribute Name	Attr. Type	Explanation	M/O	Notes
CSWI		Switch controller		
Data				
Common Logical Node Information				
Mod	geModINC	Mode	M	
Beh	geBehINS	Behaviour	M	
Health	geHealthINS	Health	M	
NamPlt	geLPL	Name plate	M	
Controls				
Loc	geSPS	Local operation	M	Local / Remote
Pos	geDPC_1	Switch position	M	Breaker open, close

2.4.2. CILO (Interlocking)

2.4.2.1. geCILO → 16 switchgear

This node class is used for interlocking the operations performed over the switchgear and has 16 instances inside the device.

CILO class				
Attribute Name	Attr. Type	Explanation	M/O	Notes
CILO		Switch controller		
Data				
Common Logical Node Information				
Mod	geModINC	Mode	M	
Beh	geBehINS	Behaviour	M	
Health	geHealthINS	Health	M	
NamPlt	geLPL	Name plate	M	
Status information				
EnaOpn	geSPS	Enable Open	M	
EnaCls	geSPS	Enable Close		

2.5. Logical Nodes for generic references. LN Group: G

2.5.1. GGIO (Generic process I/O)

2.5.1.1. geBoardGGIO

This logical node class is used to map digital and analogue inputs of I/O boards F, G, H and J.

GGIO class				
Attribute Name	Attr. Type	Explanation	M/O	Notes
GGIO		Generic process I/O		
Data				
Common Logical Node Information				
Mod	geModINC	Mode	M	
Beh	geBehINS	Behaviour	M	
Health	geHealthINS	Health	M	
NamPlt	geLPL	Name plate	M	
Status information				
BoardSt	geSPS_1	Board status	O	
Ind1	geSPS	Status contact input 1	O	
Ind2	geSPS	Status contact input 2	O	
..	..	..	..	
Ind32	geSPS	Status contact input 32	O	
Ind33	geSPS	Status contact output 1	O	
..	..		..	
Ind48	geSPS	Status contact output 16	O	
Measured and metered values				
AnIn1	geFloatMV	Analog input 1	O	
AnIn2	geFloatMV	Analog input 2	O	
..	..		..	
AnIn8	geFloatMV	Analog input 8	O	
Settings				
VThrIdA	geIntASG_1	Voltage threshold A	O	
VThrIdB	geIntASG_1	Voltage threshold B	O	

VThrldC	geIntASG_1	Voltage threshold C	O	
VThrldD	geIntASG_1	Voltage threshold D	O	
DbceTmmsA	geING_0	Debounce time A	O	
DbceTmmsB	geING_0	Debounce time B	O	
DbceTmmsC	geING_0	Debounce time C	O	
DbceTmmsD	geING_0	Debounce time D	O	
InTyp01	geING_0	Type input 1	O	
InTyp02	geING_0	Type input 2	O	
..	..	..	..	
InTyp32	geING_0	Type input 32	O	
DlInTmms01	geING_0	Delay time input 1	O	
DlInTmms02	geING_0	Delay time input 2	O	
..	..	..	..	
DlInTmms32	geING_0	Delay time input 32	O	
OutLogic01	geING_0	Logic output 1	O	
OutLogic02	geING_0	Logic output 2	O	
..	..	..	..	
OutLogic16	geING_0	Logic output 16	O	
OutTyp01	geING_0	Type output 1	O	
OutTyp02	geING_0	Type output 2	O	
..		..	..	
OutTyp16	geING_0	Type output 16	O	
PlsOutTmms01	geING_0	Pulse time output 1	O	
PlsOutTmms02	geING_0	Pulse time output 2	O	
..	..		..	
PlsOutTmms16	geING_0	Pulse time output 16	O	
Rng01	geING_0	Range analog input 1	O	
Rng02	geING_0	Range analog input 2	O	
..	..	..	..	
Rng08	geING_0	Range analog input 8	O	
OscTmmsA	geING_0	Oscillation time A	O	
OscTmmsB	geING_0	Oscillation time B	O	
OscTmmsC	geING_0	Oscillation time C	O	
OscTmmsD	geING_0	Oscillation time D	O	

NumChgs	geING_0	Number of transient changes	O	
SnpshtEvEna	geSPG	Snapshot Events enabled	O	

2.5.1.2. geVirtualGGIO

This logical node type is used to map the latched and self reset virtual Inputs.

GGIO class				
Attribute Name	Attr. Type	Explanation	M/O	Notes
GGIO		Generic process I/O		
Data				
Common Logical Node Information				
Mod	geModINC	Mode	M	
Beh	geBehINS	Behaviour	M	
Health	geHealthINS	Health	M	
NamPlt	geLPL	Name plate	M	
Controls				
DPCSO01	geSPC	Virtual input 1	O	
DPCSO01	geSPC	Virtual input 2	O	
..	..	..	..	
DPCSO64	geSPC	Virtual input 32	O	

2.5.1.3. geEventsGGIO.

This logical node type is used to map data from the list of any all internal digital states (PLC control events).

GGIO class				
Attribute Name	Attr. Type	Explanation	M/O	Notes
GGIO		Generic process I/O		
Data				
Common Logical Node Information				
Mod	geModINC	Mode	M	
Beh	geBehINS	Behaviour	M	

Health	geHealthINS	Health	M	
NamPlt	geLPL	Name plate	M	
Status information				
Ind1	geSPS	Control event 1	O	
Ind2	geSPS	Control event 2	O	
..	..	..	..	
Ind192	geSPS	Control event 32	O	

2.5.1.4. geRemoteInputsGGIO

This logical node class is used to map data from incoming GOOSE messages.

GGIO class				
Attribute Name	Attr. Type	Explanation	M/O	Notes
GGIO		Generic process I/O		
Data				
Common Logical Node Information				
Mod	geModINC	Mode	M	
Beh	geBehINS	Behaviour	M	
Health	geHealthINS	Health	M	
NamPlt	geLPL	Name plate	M	
Status information				
Ind1	geSPS	Remote digital input 1	O	
Ind2	geSPS	Remote digital input 2	O	
..	..	..	..	
Ind64	geSPS	Remote digital input 32	O	
AnIn1	geFloatMV	Remote float input 1	O	
AnIn2	geFloatMV	Remote float input 2	O	
..	..	..	..	
AnIn8	geFloatMV	Remote float input 8	O	
AnIn9	geIntMV_1	Remote integer input 1	O	
AnIn10	geIntMV_1	Remote integer input 2	O	
..	..	..	..	

AnIn16	geIntMV_1	Remote integer input 8	O	
Settings				
OscTmms	geING_0	Oscillation time remote inputs	O	
NumChgs	geING_0	Number of transient changes	O	

2.5.1.5. geRemoteOutputsGGIO

This logical node class is used to map PLC digital states for outgoing GOOSE messages.

GGIO class				
Attribute Name	Attr. Type	Explanation	M/O	Notes
GGIO		Generic process I/O		
Data				
Common Logical Node Information				
Mod	geModINC	Mode	M	
Beh	geBehINS	Behaviour	M	
Health	geHealthINS	Health	M	
NamPlt	geLPL	Name plate	M	
Status information				
Ind1	geSPS	Remote digital output 1	O	
Ind2	geSPS	Remote digital output 2	O	
..	..	..	..	
Ind32	geSPS	Remote digital output 32	O	

2.5.1.6. geDigitalCountersGGIO

This logical node is used for modelling the eight digital counters of F650 relay

GGIO class				
Attribute Name	Attr. Type	Explanation	M/O	Notes
GGIO		Generic process I/O		
Data				
Common Logical Node Information				
Mod	geModINC	Mode	M	
Beh	geBehINS	Behaviour	M	
Health	geHealthINS	Health	M	
NamPlt	geLPL	Name plate	M	
Status information				
Cnt1	geBCR_2	Digital counter 1	O	
..	..	..	..	
Cnt8	geBCR_2	Digital counter 8	O	
CntBlk1	geSPS_1	Digital counter 1 block	O	
..	..	..		
CntBlk8	geSPS_1	Digital counter 8 block	O	
CntHi1	geSPS_1	Digital counter 1 high	O	
..	..	..		
CntHi8	geSPS_1	Digital counter 8 high	O	
CntEq1	geSPS_1	Digital counter 1 equal	O	
..	..	..		
CntEq8	geSPS_1	Digital counter 8 equal	O	
CntLo1	geSPS_1	Digital counter 1 low	O	
..	..	..		
CntLo8	geSPS_1	Digital counter 8 low	O	
CntUp1	geSPS_1	Digital counter 1 up	O	
..	..	..		
CntUp8	geSPS_1	Digital counter 8 up	O	
CntDwn1	geSPS_1	Digital counter 1 down	O	

..	..	..		
CntDwn8	geSPS_1	Digital counter 8 down	O	
CntSetPre1	geSPS_1	Digital counter 1 set preset	O	
..	..	..		
CntSetPre8	geSPS_1	Digital counter 8 set preset	O	
CntRst1	geSPS_1	Digital counter 1 reset	O	
..	..	..		
CntRst8	geSPS_1	Digital counter 8 reset	O	
CntFrzRst1	geSPS_1	Digital counter 1 FreezeReset	O	
..	..	..		
CntFrzRst8	geSPS_1	Digital counter 8 FreezeReset	O	
CntFrzCnt1	geSPS_1	Digital counter 1 FreezeCount	O	
..	..	..		
CntFrzCnt8	geSPS_1	Digital counter 8 FreezeCount	O	

2.6. Logical Nodes for metering and measurement. LN Group: M

2.6.1. MMXU

2.6.1.1. geMMXU

MMXU class				
Attribute Name	Attr. Type	Explanation	M/O	Notes
MMXU		Measurement		
Data				
Common Logical Node Information				
Mod	geModINC	Mode	M	
Beh	geBehINS	Behaviour	M	
Health	geHealthINS	Health	M	
NamPlt	geLPL	Name plate	M	
Measured values				
TotW	geFloatMV	Total active power (P)	O	
TotVAr	geFloatMV	Total reactive power (Q)	O	
TotVA	geFloatMV	Total apparent power (S)	O	
TotPF	geFloatMV	Average power factor (PF)	O	
Hz	geFloatMV	Line Frequency	O	
PPV	geFloatDEL	Phase to phase voltages (VL1L2,...)	O	
PhV	geFloatPhsWYE	Phase to ground voltages (VL1ER, ...)	O	
A	geFloatWYE	Phase currents (IL1, ...)	O	
AuxV	geFloatCMV_1	Auxiliar Phase Voltage	O	
BusHz	geFloatMV_1			

2.6.2. MSQI

2.6.2.1. geMSQI

MSQI class				
Attribute Name	Attr. Type	Explanation	M/O	Notes
MSQI		Measurement		
Data				
Common Logical Node Information				
Mod	geModINC	Mode	M	
Beh	geBehINS	Behaviour	M	
Health	geHealthINS	Health	M	
NamPlt	geLPL	Name plate	M	
Measured values				
SeqA	geFloatSEQ		O	
SeqV	geFloatSEQ		O	

2.6.3. MMTR

2.6.3.1. geMMTR

MMTR class				
Attribute Name	Attr. Type	Explanation	M/O	Notes
MMTR		Measurement		
Data				
Common Logical Node Information				
Mod	geModINC	Mode	M	
Beh	geBehINS	Behaviour	M	
Health	geHealthINS	Health	M	
NamPlt	geLPL	Name plate	M	
Measured values				
SupWh	geBCR		O	
SupVArh	geBCR		O	
DmdWh	geBCR		O	

DmdVARh	geBCR		O	
CntPsWh	geFloatMV_1		O	
CntNgWh	geFloatMV_1		O	
CntPsVARh	geFloatMV_1		O	
CntNgVARh	geFloatMV_1		O	

2.7. Logical Nodes for switchgear. LN Group: X

2.7.1. XCBR (Circuit breaker)

2.7.1.1. geXCBR → 1 circuit breaker

This logical node is used for modelling the circuit breaker of F650 relay

XCBR class				
Attribute Name	Attr. Type	Explanation	M/O	Notes
XCBR		Circuit breaker		
Data				
Common Logical Node Information				
Mod	geModINC	Mode	M	
Beh	geBehINS	Behaviour	M	
Health	geHealthINS	Health	M	
NamPlt	geLPL	Name plate	M	
Status information				
Loc	geSPS	Local operation	M	Local / Remote
OpCnt	geINS	Operation counter	M	Breaker openings
SumSWARs			O	
CBOpCap	geCBOpCapINS	Circuit breaker operating capability	O	
Controls				
Pos	geDPC_1	Switch position	M	Breaker open, close
BlkOpn	geSPC_1	Block opening	M	Virtual output
BlkClr	geSPC_1	Block closing	M	Virtual output
Settings				
ThAlSwA	geFloatASG_1	Maximum KI2t	O	
SumSwATmms	geFloatASG_1	KI2t Integ. Time	O	
ExNumTr	geIntASG_1	Maximum Openings	O	
ExNumTr1hr	geIntASG_1	Max.Openings 1 hour	O	

2.7.2. XSWI (Circuit switch)

2.7.2.1. geXSWI

In the F650 there are up to 16 configurable switchgears. Currently sixteen XSWI and sixteen CSWI are implemented and mapped to first nine switchgears in F650. XSWI and CSWI Logical Nodes can be seen as paired objects in F650 as one pair of XSWI and CSWI map to the same switchgear. XSWI1 and CSWI1 map to Switchgear1, XSWI2 and CSWI2 map to Switchgear2, etc. The difference between XSWI and CSWI in F650 is that control commands cannot be sent directly via XSWI LN. Control commands have to be sent via CSWI LN. "Pos" attribute is not controllable in XSWI it has ctlModel = Status-only. In order to control the switch mapped to given XSWI the corresponding CSWI LN should be used.

XCBR class				
Attribute Name	Attr. Type	Explanation	M/O	Notes
XSWI		Circuit switch		
Data				
Common Logical Node Information				
Mod	geModINC	Mode	M	
Beh	geBehINS	Behaviour	M	
Health	geHealthINS	Health	M	
NamPlt	geLPL	Name plate	M	
Status information				
Loc	geSPS	Local operation	M	Local / Remote
EEHealth	geHealthINS	Ext. equipment health	O	
OpCnt	geINS	Operation counter	M	Breaker openings
Controls				
Pos	geDPC_2	Switch position	M	Breaker open, close
BlkOpn	geSPC_1	Block opening	M	Virtual output
BlkClr	geSPC_1	Block closing	M	Virtual output
SwTyp	geSwTypINS	Switch type	M	
SwOpCap	geSwOpCapINS	Switch operating capability		

3. COMMON DATA CLASS

3.1. Common data class specifications for status information

3.1.1. Single Point Status (SPS)

SPS class (Single point status)					
gsSPS					
Attribute Name	Attribute Type	FC	TrgOp	Value/Value Range	M/O/C
DataAttribute					
<i>status</i>					
stVal	Boolean	ST	dchg		M
q	BVstring13	ST	qchg		M
t	Utctime	ST			M
<i>configuration, description and extension</i>					
d	Vstring255	DC			O
geSPS_1					
Attribute Name	Attribute Type	FC	TrgOp	Value/Value Range	M/O/C
DataAttribute					
<i>status</i>					
stVal	Boolean	ST	dchg		M
q	BVstring13	ST	qchg		M
t	Utctime	ST			M
<i>configuration, description and extension</i>					
d	Vstring255	DC			O
dataNs	Vstring255	EX			AC_DL_N_M

3.1.2. Integer Status (INS)

INS class (Integer status)					
geINS					

Attribute Name	Attribute Type	FC	TrgOp	Value/Value Range	M/O/C
DataAttribute					
<i>status</i>					
stVal	INT32	ST	dchg		M
q	BVstring13	ST	qchg		M
t	Utctime	ST			M
<i>configuration, description and extension</i>					
d	Vstring255	DC			O
geINS_1					
Attribute Name	Attribute Type	FC	TrgOp	Value/Value Range	M/O/C
DataAttribute					
<i>status</i>					
stVal	Boolean	ST	dchg		M
q	BVstring13	ST	qchg		M
t	Utctime	ST			M
<i>configuration, description and extension</i>					
d	Vstring255	DC			O
dataNs	Vstring255	EX			AC_DL_N_M

3.1.3. Enumerated Status (ENS)

ENS class (Enumerated status)					
geAutoRecStINS (AutoRecSt)					
Attribute Name	Attribute Type	FC	TrgOp	Value/Value Range	M/O/C
DataAttribute					
<i>status</i>					
stVal	Enum	ST	dchg	Ready,InProgress,Successful,..	M
q	BVstring13	ST	qchg		M
t	Utctime	ST			M

<i>configuration, description and extension</i>					
d	Vstring255	DC			O
geBehINS (Beh)					
Attribute Name	Attribute Type	FC	TrgOp	Value/Value Range	M/O/C
DataAttribute					
<i>status</i>					
stVal	Enum	ST	dchg	On,blocked,test,test/blocked,Off	M
q	BVstring13	ST	qchg		M
t	Utime	ST			M
<i>configuration, description and extension</i>					
d	Vstring255	DC			O
geHealthINS (Health)					
Attribute Name	Attribute Type	FC	TrgOp	Value/Value Range	M/O/C
DataAttribute					
<i>status</i>					
stVal	Enum	ST	dchg	Ok,Warning,Alarm	M
q	BVstring13	ST	qchg		M
t	Utime	ST			M
<i>configuration, description and extension</i>					
d	Vstring255	DC			O
geCBOpCapINS (CBOpCap)					
Attribute Name	Attribute Type	FC	TrgOp	Value/Value Range	M/O/C
DataAttribute					
<i>status</i>					
stVal	Enumerated	ST	dchg	None,Open,Close-Open,...	M
q	BVstring13	ST	qchg		M
t	Utime	ST			M
<i>configuration, description and extension</i>					
d	Vstring255	DC			O
geSwOpCapINS (SwOpCap)					
Attribute Name	Attribute Type	FC	TrgOp	Value/Value Range	M/O/C

DataAttribute					
<i>status</i>					
stVal	Enumerated	ST	dchg	None,Open,Close,...	M
q	BVstring13	ST	qchg		M
t	Utctime	ST			M
<i>configuration, descripcion and extension</i>					
d	Vstring255	DC			O
geSwTypINS (SwTyp)					
Attribute Name	Attribute Type	FC	TrgOp	Value/Value Range	M/O/C
DataAttribute					
<i>status</i>					
stVal	Enumerated	ST	dchg	Load Break,Disconnecter,...	M
q	BVstring13	ST	qchg		M
t	Utctime	ST			M
<i>configuration, descripcion and extension</i>					
d	Vstring255	DC			O

3.1.4. Protection activation information (ACT)

ACT class (Protection activation information)					
gePhsACT					
Attribute Name	Attribute Type	FC	TrgOp	Value/Value Range	M/O/C
DataAttribute					
control and status					
general	Boolean	ST	dchg		M
phsA	Boolean	ST	dchg		O
phsB	Boolean	ST	dchg		O
phsC	Boolean	ST	dchg		O
q	Bvstring13	ST	qchg		M
t	Utctime	ST			M
originSrc	Struct	ST			O
configuration, description and extension					
d	Vstring255	DC			O
cdcNs	Vstring255	EX			O
cdcName	Vstring255	EX			O
gePhsACT_1					
Attribute Name	Attribute Type	FC	TrgOp	Value/Value Range	M/O/C
DataAttribute					
control and status					
general	Boolean	ST	dchg		M
phsA	Boolean	ST	dchg		O
phsB	Boolean	ST	dchg		O
phsC	Boolean	ST	dchg		O
q	Bvstring13	ST	qchg		M
t	Utctime	ST			M
originSrc	Struct	ST			O
configuration, description and extension					
d	Vstring255	DC			O
cdcNs	Vstring255	EX			O
cdcName	Vstring255	EX			O

dataNs	Vstring255	EX			AC_DL_N_M
geNeutACT					
Attribute Name	Attribute Type	FC	TrgOp	Value/Value Range	M/O/C
DataAttribute					
<i>control and status</i>					
general	Boolean	ST	dchg		M
neut	Boolean	ST	dchg		O
q	Bvstring13	ST	qchg		M
t	Utctime	ST			M
originSrc	Struct	ST			O
<i>configuration, description and extension</i>					
d	Vstring255	DC			O
cdcNs	Vstring255	EX			O
cdcName	Vstring255	EX			O
geNeutACT_1					
Attribute Name	Attribute Type	FC	TrgOp	Value/Value Range	M/O/C
DataAttribute					
<i>control and status</i>					
general	Boolean	ST	dchg		M
neut	Boolean	ST	dchg		O
q	Bvstring13	ST	qchg		M
t	Utctime	ST			M
originSrc	Struct	ST			O
<i>configuration, description and extension</i>					
d	Vstring255	DC			O
cdcNs	Vstring255	EX			O
cdcName	Vstring255	EX			O
dataNs	Vstring255	EX			AC_DL_N_M
geGeneralACT					
Attribute Name	Attribute Type	FC	TrgOp	Value/Value Range	M/O/C
DataAttribute					

<i>control and status</i>					
general	Boolean	ST	dchg		M
q	Bvstring13	ST	qchg		M
t	Utctime	ST			M
<i>configuration, description and extension</i>					
d	Vstring255	DC			O
geGeneralACT_1					
Attribute Name	Attribute Type	FC	TrgOp	Value/Value Range	M/O/C
DataAttribute					
<i>control and status</i>					
general	Boolean	ST	dchg		M
q	Bvstring13	ST	qchg		M
t	Utctime	ST			M
<i>configuration, description and extension</i>					
d	Vstring255	DC			O
dataNs	Vstring255	EX			AC_DL_N_M

3.1.5. Directional protection activation information (ACD)

ACD class (Directional protection activation information)					
gePhsACD					
Attribute Name	Attribute Type	FC	TrgOp	Value/Value Range	M/O/C
DataAttribute					
<i>control and status</i>					
general	Boolean	ST	Dchg		M
dirGeneral	Enumerated (Byte)	ST	Dchg	unknown forward backward both	M
phsA	Boolean	ST	Dchg		GC_2(1)
dirPhsA	Enumerated (Byte)	ST	dchg	unknown forward backward	GC_2(1)
phsB	Boolean	ST	dchg		GC_2(2)
dirPhsB	Enumerated (Byte)	ST	dchg	unknown forward backward	GC_2(2)
phsC	Boolean	ST	dchg		GC_2(3)
dirPhsC	Enumerated (Byte)	ST	dchg	unknown forward backward	GC_2(3)
q	Bvstring13	ST	qchg		M
t	Utctime	ST			M

<i>configuration, description and extension</i>					
d	Vstring255	DC			O
gePhsACD_1					
Attribute Name	Attribute Type	FC	TrgOp	Value/Value Range	M/O/C
DataAttribute					
<i>control and status</i>					
general	Boolean	ST	Dchg		M
dirGeneral	Enumerated (Byte)	ST	Dchg	unknown forward backward both	M
phsA	Boolean	ST	Dchg		GC_2(1)
dirPhsA	Enumerated (Byte)	ST	dchg	unknown forward backward	GC_2(1)
phsB	Boolean	ST	dchg		GC_2(2)
dirPhsB	Enumerated (Byte)	ST	dchg	unknown forward backward	GC_2(2)
phsC	Boolean	ST	dchg		GC_2(3)
dirPhsC	Enumerated (Byte)	ST	dchg	unknown forward backward	GC_2(3)
q	Bvstring13	ST	qchg		M
t	Utctime	ST			M
<i>configuration, description and extension</i>					
d	Vstring255	DC			O
dataNs	Vstring255	EX			AC_DL N M
geNeutACD					
Attribute Name	Attribute Type	FC	TrgOp	Value/Value Range	M/O/C
DataAttribute					
<i>control and status</i>					
general	Boolean	ST	Dchg		M
dirGeneral	Enumerated (Byte)	ST	Dchg	unknown forward backward both	M
q	Bvstring13	ST	qchg		M
t	Utctime	ST			M
<i>configuration, description and extension</i>					
d	Vstring255	DC			O
geNeutACD_1					
Attribute Name	Attribute Type	FC	TrgOp	Value/Value Range	M/O/C

DataAttribute					
<i>control and status</i>					
general	Boolean	ST	Dchg		M
dirGeneral	Enumerated (Byte)	ST	Dchg	unknown forward backward both	M
q	Bvstring13	ST	qchg		M
t	Utctime	ST			M
<i>configuration, descripcion and extension</i>					
d	Vstring255	DC			O
dataNs	Vstring255	EX			AC_DL N M
geGeneralACD					
Attribute Name	Attribute Type	FC	TrgOp	Value/Value Range	M/O/C
DataAttribute					
<i>control and status</i>					
general	Boolean	ST	Dchg		M
dirGeneral	Enumerated (Byte)	ST	Dchg	unknown forward backward both	M
q	Bvstring13	ST	qchg		M
t	Utctime	ST			M
<i>configuration, descripcion and extension</i>					
d	Vstring255	DC			O

3.1.6. Binary counter reading (BCR)

BCR class (Binary counter reading)					
geBCR					
Attribute Name	Attribute Type	FC	TrgOp	Value/Value Range	M/O/C
DataAttribute					
<i>control and status</i>					
actVal	Int32	ST	Dchg		M
q	Bvstring13	ST	qchg		M
t	Utctime	ST			M
<i>configuration, description and extension</i>					
units	Unit	CF			O
pulsQty	Float32	CF			M
d	Vstring255	DC			O
geBCR_1					
Attribute Name	Attribute Type	FC	TrgOp	Value/Value Range	M/O/C
DataAttribute					
<i>control and status</i>					
actVal	Int32	ST	dchg		M
frVal	Int32	ST	dchg		GC 2 1
frTm	Utctime	ST			GC 2 1
q	Bvstring13	ST	qchg		M
t	Utctime	ST			M
<i>configuration, description and extension</i>					
pulsQty	Float32	CF			M
frEna	Boolean	CF			GC 2 1
strTm	Utctime	CF			GC 2 1
frPd	Int32	CF			GC 2 1
frRs	Boolean	CF			GC 2 1
d	Vstring255	DC			O
geBCR_2					

Attribute Name	Attribute Type	FC	TrgOp	Value/Value Range	M/O/C
DataAttribute					
<i>control and status</i>					
actVal	Int32	ST	dchg		M
frVal	Int32	ST	dchg		GC_2_1
frTm	Utctime	ST			GC_2_1
q	Bvstring13	ST	qchg		M
t	Utctime	ST			M
<i>configuration, descripcion and extension</i>					
pulsQty	Float32	CF			M
frEna	Boolean	CF			GC_2_1
strTm	Utctime	CF			GC_2_1
frPd	Int32	CF			GC_2_1
frRs	Boolean	CF			GC_2_1
d	Vstring255	DC			O
dataNs	Vstring255	EX			AC_DLN_ M

3.2. Common data class specifications for measurand information

3.2.1. Measured Value (MV)

MV class (Measured value)					
geFloatMV					
Attribute Name	Attribute Type	FC	TrgOp	Value/Value Range	M/O/C
DataAttribute					
<i>measured attributes</i>					
instMag	FloatAnalogueValue	MX	-----		O
	f FLOAT32				GC_1
mag	FloatAnalogueValue	MX	dchg		M
	f FLOAT32				GC_1
range	ENUMERATED(Byte)	MX	dchg		O
q	BVstring13	MX	qchg		M
t	Utctime	MX			M
<i>Configuration, description and extension</i>					
units	Unit	CF			O
	SIUnit	ENUMERATED(Byte)			M
	Multiplier	ENUMERATED(Byte)			O
db	INT32U	CF			O
zeroDb	INT32U	CF			O
rangeC	RangeConfig	CF			O
hhLim	FloatAnalogueValue				
	f FLOAT32				GC_1
hlim	FloatAnalogueValue				
	f FLOAT32				GC_1
lLim	FloatAnalogueValue				
	f FLOAT32				GC_1
llLim	FloatAnalogueValue				
	f FLOAT32				GC_1
min	FloatAnalogueValue				
	f FLOAT32				GC_1

	f	FLOAT32				GC_1
	max	FloatAnalogueValue				
	f	FLOAT32				GC_1
	limDb	INT32U				
d		Vstring255	DC			O
geFloatMV_1						
Attribute Name		Attribute Type	FC	TrgOp	Value/Value Range	M/O/C
DataAttribute						
<i>measured attributes</i>						
instMag		FloatAnalogueValue	MX	-----		O
	f	FLOAT32				GC_1
mag		FloatAnalogueValue	MX	dchg		M
	f	FLOAT32				GC_1
range		ENUMERATED(Byte)	MX	dchg		O
q		BVstring13	MX	qchg		M
t		Utctime	MX			M
<i>Configuration, description and extension</i>						
units		Unit	CF			O
	SIUnit	ENUMERATED(Byte)				M
	Multiplier	ENUMERATED(Byte)				O
db		INT32U	CF			O
zeroDb		INT32U	CF			O
rangeC		RangeConfig	CF			O
	hhLim	FloatAnalogueValue				
	f	FLOAT32				GC_1
	hlim	FloatAnalogueValue				
	f	FLOAT32				GC_1
	lLim	FloatAnalogueValue				
	f	FLOAT32				GC_1
	llLim	FloatAnalogueValue				
	f	FLOAT32				GC_1
	min	FloatAnalogueValue				
	f	FLOAT32				GC_1
	max	FloatAnalogueValue				
	f	FLOAT32				GC_1
		FLOAT32				GC_1

<i>limDb</i>	INT32U				
d	Vstring255	DC			O
dataNs	Vstring255	EX			AC_DL_N_M
geFloatMV_2					
Attribute Name	Attribute Type	FC	TrgOp	Value/Value Range	M/O/C
DataAttribute					
<i>measured attributes</i>					
mag	FloatAnalogueValue	MX	dchg		M
	<i>f</i> FLOAT32				GC_1
q	BVstring13	MX	qchg		M
t	Utctime	MX			M
<i>Configuration, description and extension</i>					
units	Unit	CF			O
	SIUnit	ENUMERATED(Byte)			M
	Multiplier	ENUMERATED(Byte)			O
d	Vstring255	DC			O
dataNs	Vstring255	EX			AC_DL_N_M
geFloatMV_3					
Attribute Name	Attribute Type	FC	TrgOp	Value/Value Range	M/O/C
DataAttribute					
<i>measured attributes</i>					
mag	FloatAnalogueValue	MX	dchg		M
	<i>f</i> FLOAT32				GC_1
q	BVstring13	MX	qchg		M
t	Utctime	MX			M
<i>Configuration, description and extension</i>					
units	Unit	CF			O
	SIUnit	ENUMERATED(Byte)			M
	Multiplier	ENUMERATED(Byte)			O
d	Vstring255	DC			O
geIntMV					
Attribute Name	Attribute Type	FC	TrgOp	Value/Value Range	M/O/C
DataAttribute					
<i>measured attributes</i>					

instMag	IntAnalogueValue	MX	-----		O
i	INT32				GC_1
mag	IntAnalogueValue	MX	dchg		M
i	INT32				GC_1
q	BVstring13	MX	qchg		M
t	Utctime	MX			M
<i>Configuration, description and extension</i>					
units	Unit	CF			O
SIUnit	ENUMERATED(Byte)				M
Multiplier	ENUMERATED(Byte)				O
db	INT32U	CF			O
d	Vstring255	DC			O
geIntMV_1					
Attribute Name	Attribute Type	FC	TrgOp	Value/Value Range	M/O/C
DataAttribute					
<i>measured attributes</i>					
instMag	IntAnalogueValue	MX	-----		O
i	INT32				GC_1
mag	IntAnalogueValue	MX	dchg		M
i	INT32				GC_1
range	ENUMERATED(Byte)	MX	dchg		O
q	BVstring13	MX	qchg		M
t	Utctime	MX			M
<i>Configuration, description and extension</i>					
units	Unit	CF			O
SIUnit	ENUMERATED(Byte)				M
Multiplier	ENUMERATED(Byte)				O
db	INT32U	CF			O
zeroDb	INT32U	CF			O
rangeC	RangeConfig	CF			O
hhLim	IntAnalogueValue				
i	INT32U				GC_1
hlim	IntAnalogueValue				
i	UINT32				GC_1
lLim	IntAnalogueValue				

	<i>i</i>	INT32U				GC_1
	lLim	IntAnalogueValue				
	<i>i</i>	INT32U				GC_1
	min	IntAnalogueValue				
	<i>i</i>	INT32U				GC_1
	max	IntAnalogueValue				
	<i>i</i>	INT32U				GC_1
	limDb	INT32U				
d		Vstring255	DC			O
dataNs		Vstring255	EX			AC_DL_N_M

3.2.2. Complex Measured Value (CMV)

CMV class (Complex measured value)					
geFloatCMV					
Attribute Name	Attribute Type	FC	TrgOp	Value/Value Range	M/O/C
DataAttribute					
<i>measured attributes</i>					
instCVal mag f	FloatVector	MX	-----		O
	FloatAnalogueValue				
	FLOAT32				
cVal mag f	FloatVector	MX	dchg		M
	FloatAnalogueValue				
	FLOAT32				
range	ENUMERATED(Byte)	MX	dchg		O
rangeAng	ENUMERATED(Byte)	MX	dchg		O
q	BVstring13	MX	qchg		M
t	Utctime	MX			M
<i>configuration, description and extension</i>					
units SIUnit Multiplier	Unit	CF			O
	Byte				M
	Byte				O

db	INT32U	CF			O
dbAng	INT32U	CF			O
zeroDb	INT32U	CF			O
rangeC	RangeConfig	CF			O
rangeAngC	RangeConfig	CF			O
d	Vstring255	DC			O
geFloatCMV_1					
Attribute Name	Attribute Type	FC	TrgOp	Value/Value Range	M/O/C
DataAttribute					
<i>measured attributes</i>					
instCVal mag f	FloatVector	MX	-----		O
	FloatAnalogueValue				
	FLOAT32				
cVal mag f	FloatVector	MX	dchg		M
	FloatAnalogueValue				
	FLOAT32				
range	ENUMERATED(Byte)	MX	dchg		O
rangeAng	ENUMERATED(Byte)	MX	dchg		O
q	BVstring13	MX	qchg		M
t	Utctime	MX			M
<i>configuration, descripcion and extension</i>					
units SIUnit Multiplier	Unit	CF			O
	Byte				M
	Byte				O
db	INT32U	CF			O
dbAng	INT32U	CF			O
zeroDb	INT32U	CF			O
rangeC	RangeConfig	CF			O
rangeAngC	RangeConfig	CF			O
d	Vstring255	DC			O
dataNs	Vstring255	EX			M

3.2.3. Phase to ground related measured values of a three phase system (WYE)

WYE class					
geFloatPhsWYE					
Attribute Name	Attribute Type	FC	TrgOp	Value/Value Range	M/O/C
Data					
phsA	CMV_0				GC_1
phsB	CMV_0				GC_1
phsC	CMV_0				GC_1
neut	CMV_0				GC_1
<i>configuration, description and extension</i>					
d	Vstring255	DC			O
geFloatWYE					
Attribute Name	Attribute Type	FC	TrgOp	Value/Value Range	M/O/C
Data					
phsA	CMV_0				GC_1
phsB	CMV_0				GC_1
phsC	CMV_0				GC_1
neut	CMV_0				GC_1
net	CMV_0				GC_1
res	CMV_0				GC_1
<i>configuration, description and extension</i>					
d	Vstring255	DC			O

3.2.4. Phase to phase related measured values of a three phase system (DEL)

DEL class (Phase to phase related measured values of a three phase system)					
geFloatDEL					
Attribute Name	Attribute Type	FC	TrgOp	Value/Value Range	M/O/C

Data					
phsAB	CMV_0				GC_1
phsBC	CMV_0				GC_1
phsCA	CMV_0				GC_1
configuration, description and extension					
d	Vstring255	DC			O

3.2.5. Sequence (SEQ)

SEQ class (Sequence)					
geFloatSEQ					
Attribute Name	Attribute Type	FC	TrgOp	Value/Value Range	M/O/C
Data					
c1	CMV_0				GC_1
c2	CMV_0				GC_1
c3	CMV_0				GC_1
Measured attributes					
seqT	enumerated	MX		Pos-neg-zero dir-quad-zero	O
configuration, descripcion and extension					
d	Vstring255	DC			O

3.3. Common data class specifications for controllable status information

3.3.1. Controllable single point (SPC).

SPC class					
geSPC					
Attribute Name	Attribute Type	FC	TrgOp	Value/Value Range	M/O/C
DataAttribute					
<i>control and status</i>					
stVal	Boolean	ST		FALSE TRUE	AC_ST
q	Quality	ST			AC_ST
t	TimeStamp	ST			AC_ST
<i>control and status</i>					
Oper	ctlVal	Boolean	CO		AC_CO_M
	origin	Originator	CO		AC_CO_M
	orCat	ENUMERATED			M
	orIdent	OCTECT64			M
	ctlNum	INT8U	CO		M
	T	Btime6	CO		M
	Test	Boolean	CO		M
	Check	ENUMERATED	CO		M
<i>configuration, description and extension</i>					
ctlModel	ENUMERATED	CF		ctlModel	M
operTimeout	INT32U	CF			AC_CO_O
d	Vstring255	DC			O
cdcNs	Vstring255	EX			
cdcName	Vstring255	EX			
geSPC_1					
Attribute Name	Attribute Type	FC	TrgOp	Value/Value Range	M/O/C
DataAttribute					
<i>control and status</i>					
stVal	Boolean	ST		FALSE TRUE	AC_ST
Q	Quality	ST			AC_ST

t	TimeStamp	ST			AC_ST
<i>configuration, descripcion and extension</i>					
ctlModel	ENUMERATED	CF		ctlModel_1	M
d	Vstring255	DC			O

3.3.2. Controlable double point (DPC).

DPC class (Controllable double point)						
geDPC						
Attribute Name		Attribute Type	FC	TrgOp	Value/Value Range	M/O/C
DataAttribute						
control and status						
Oper	ctlVal	Boolean	CO			AC_CO_M
	origin	Originator	CO,ST			AC_CO_M
	orCat	ENUMERATED				M
	orIdent	OCTECT64				M
	ctlNum	INT8U	CO,ST			M
	T	Btime6	CO			M
	Test	Boolean	CO			M
	Check	ENUMERATED	CO			M
stVal		CODE ENUM	ST	dchg	intermediate-state off on bad-state	M
q		BVstring13	ST	qchg		AC_ST
t		Utctime	ST			AC_ST
configuration, descripcion and extension						
ctlModel		ENUMERATED	CF			M
operTimeout		INT32U	CF			AC_CO_O
d		Vstring255	DC			O
cdcNs		Vstring255	EX			
cdcName		Vstring255	EX			
geDPC_1						
Attribute Name		Attribute Type	FC	TrgOp	Value/Value Range	M/O/C
DataAttribute						
control and status						
Oper	ctlVal	Boolean	CO			AC_CO_M
	origin	Originator	CO,ST			AC_CO_M
	orCat	ENUMERATED				M
	orIdent	OCTECT64				M
	ctlNum	INT8U	CO,ST			M

	T	Btime6	CO			M
	Test	Boolean	CO			M
	Check	ENUMERATED	CO			M
Cancel						
SBO						
SBOw						
stVal		CODE ENUM	ST	dchg	intermediate-state off on bad-state	M
q		BVstring13	ST	qchg		AC_ST
t		Utctime	ST			AC_ST
<i>configuration, descripcion and extension</i>						
ctlModel		ENUMERATED	CF			M
sboTimeout		INT32U	CF			AC_CO_O
sboClass		ENUMERATED	CF			AC_CO_O
operTimeout		INT32U	CF			AC_CO_O
d		Vstring255	DC			O
cdcNs		Vstring255	EX			
cdcName		Vstring255	EX			
geDPC_2						
Attribute Name	Attribute Type	FC	TrgOp	Value/Value Range	M/O/C	
DataAttribute						
<i>control and status</i>						
stVal		CODE ENUM	ST	dchg	intermediate-state off on bad-state	M
q		BVstring13	ST	qchg		AC_ST
t		Utctime	ST			AC_ST
<i>configuration, descripcion and extension</i>						
ctlModel		ENUMERATED	CF			M
d		Vstring255	DC			O

3.3.3. Controllable enumerated status (ENC).

ENC class (Controllable integer status)

geModINC (type Mod)					
Attribute Name	Attribute Type	FC	TrgOp	Value/Value Range	M/O/C
DataAttribute					
<i>status</i>					
stVal	Enum	ST	dcgh		M
q	BVstring13	ST	qchg		M
t	Utctime	ST			M
<i>configuration, description and extension</i>					
ctlModel	ENUMERATED	CF			M
d	Vstring255	DC			O

3.4. Common data class specifications for status settings

3.4.1. Single point setting (SPG)

SPG class					
geSPG					
Attribute Name	Attribute Type	FC	TrgOp	Value/Value Range	M/O/C
DataAttribute					
<i>setting</i>					
setVal	Boolean	SP			AC_NSG M
<i>configuration, description and extension</i>					
d	Vstring255	DC			O
dataNs	Vstring255	EX			O
geSPG_2					
Attribute Name	Attribute Type	FC	TrgOp	Value/Value Range	M/O/C
DataAttribute					
<i>setting</i>					
setVal	Boolean	SG			AC_SG M
<i>configuration, description and extension</i>					
d	Vstring255	DC			O
dataNs	Vstring255	EX			O

3.4.2. Integer status setting (ING)

ING class					
geING_0					
Attribute Name	Attribute Type	FC	TrgOp	Value/Value Range	M/O/C
DataAttribute					
setting					
setVal	Boolean	SP			AC_NSG_M
configuration, description and extension					
minVal	INT32	CF			O
maxVal	INT32	CF			O
stepSize	INT32	CF			O
d	Vstring255	DC			O
dataNs	Vstring255	EX			O
geING_0_2					
Attribute Name	Attribute Type	FC	TrgOp	Value/Value Range	M/O/C
DataAttribute					
setting					
setVal	Boolean	SG			AC_SG_M
configuration, description and extension					
minVal	INT32	CF			O
maxVal	INT32	CF			O
stepSize	INT32	CF			O
d	Vstring255	DC			O
dataNs	Vstring255	EX			O
geING_8					
Attribute Name	Attribute Type	FC	TrgOp	Value/Value Range	M/O/C
DataAttribute					
setting					
setVal	Boolean	SP			AC_NSG_M
configuration, description and extension					

minVal	INT32	CF			O
maxVal	INT32	CF			O
stepSize	INT32	CF			O
d	Vstring255	DC			O
geING_8_2					
Attribute Name	Attribute Type	FC	TrgOp	Value/Value Range	M/O/C
DataAttribute					
<i>setting</i>					
setVal	Boolean	SG			AC SG M
<i>configuration, descripcion and extension</i>					
minVal	INT32	CF			O
maxVal	INT32	CF			O
stepSize	INT32	CF			O
d	Vstring255	DC			O
geING_9					
Attribute Name	Attribute Type	FC	TrgOp	Value/Value Range	M/O/C
DataAttribute					
<i>setting</i>					
setVal	Boolean	SG			AC SG M
<i>configuration, descripcion and extension</i>					
d	Vstring255	DC			O
geING_10					
Attribute Name	Attribute Type	FC	TrgOp	Value/Value Range	M/O/C
DataAttribute					
<i>setting</i>					
setVal	Boolean	SG			AC SG M
<i>configuration, descripcion and extension</i>					
d	Vstring255	DC			O
dataNs	Vstring255	EX			
geING_11					
Attribute Name	Attribute Type	FC	TrgOp	Value/Value Range	M/O/C

DataAttribute					
<i>setting</i>					
setVal	Boolean	SP			
<i>configuration, descripcion and extension</i>					
d	Vstring255	DC			O
dataNs	Vstring255	EX			

3.4.3. Enumerated status setting (ENG)

ENG class					
geENG					
Attribute Name	Attribute Type	FC	TrgOp	Value/Value Range	M/O/C
DataAttribute					
<i>setting</i>					
setVal	Enumerated	SP		PolQty	AC_NSg_M
<i>configuration, descripcion and extension</i>					
d	Vstring255	DC			O
geENG_2					
Attribute Name	Attribute Type	FC	TrgOp	Value/Value Range	M/O/C
DataAttribute					
<i>setting</i>					
setVal	Enumerated	SG		PolQty	AC_Sg_M
<i>configuration, descripcion and extension</i>					
d	Vstring255	DC			O

3.4.4. Object reference setting

ORG class					
geORG					
Attribute Name	Attribute Type	FC	TrgOp	Value/Value Range	M/O/C
DataAttribute					
<i>setting</i>					
setSrcRef	ObjectReference	SP		Object reference	M
<i>configuration, description and extension</i>					
d	Vstring255	DC			O

3.5. Common data class specifications for analogue settings

3.5.1. Analogue setting (ASG)

ASG class					
gelntASG					
Attribute Name	Attribute Type	FC	TrgOp	Value/Value Range	M/O/C
DataAttribute					
<i>setting</i>					
setMag	IntAnalogueValue	SP			AC NSG M
	i INT32				GC_1
<i>configuration, description and extension</i>					
units	Unit	CF			
minVal	IntAnalogueValue	CF			O
	i INT32				GC_1
maxVal	IntAnalogueValue	CF			O
	i INT32				GC_1
stepSize	IntAnalogueValue	CF			O
	i INT32				GC_1
d	Vstring255	DC			O
gelntASG_1					
Attribute Name	Attribute Type	FC	TrgOp	Value/Value Range	M/O/C

DataAttribute					
<i>setting</i>					
setMag	IntAnalogueValue	SP			AC_NSG_M
i	INT32				GC_1
<i>configuration, description and extension</i>					
units	Unit	CF			
minVal	IntAnalogueValue	CF			O
i	INT32				GC_1
maxVal	IntAnalogueValue	CF			O
i	INT32				GC_1
stepSize	IntAnalogueValue	CF			O
i	INT32				GC_1
d	Vstring255	DC			O
dataNs	Vstring255	EX			O
geIntASG_2					
Attribute Name	Attribute Type	FC	TrgOp	Value/Value Range	M/O/C
DataAttribute					
<i>setting</i>					
setMag	IntAnalogueValue	SG			AC_NSG_M
i	INT32				GC_1
<i>configuration, description and extension</i>					
units	Unit	CF			
minVal	IntAnalogueValue	CF			O
i	INT32				GC_1
maxVal	IntAnalogueValue	CF			O
i	INT32				GC_1
stepSize	IntAnalogueValue	CF			O
i	INT32				GC_1
d	Vstring255	DC			O
dataNs	Vstring255	EX			O
geIntASG_3					
Attribute Name	Attribute Type	FC	TrgOp	Value/Value Range	M/O/C

DataAttribute					
<i>setting</i>					
setMag	IntAnalogueValue	SG			AC SG M
i	INT32				GC 1
<i>configuration, description and extension</i>					
units	Unit	CF			
minVal	IntAnalogueValue	CF			O
i	INT32				GC 1
maxVal	IntAnalogueValue	CF			O
i	INT32				GC 1
stepSize	IntAnalogueValue	CF			O
i	INT32				GC 1
d	Vstring255	DC			O
geFloatASG					
Attribute Name	Attribute Type	FC	TrgOp	Value/Value Range	M/O/C
DataAttribute					
<i>setting</i>					
setMag	FloatAnalogueValue	SP			AC NSG M
f	FLOAT32				GC 1
<i>configuration, description and extension</i>					
Units	Unit	CF			
minVal	FloatAnalogueValue	CF			O
f	FLOAT32				GC 1
maxVal	FloatAnalogueValue	CF			O
f	FLOAT32				GC 1
stepSize	FloatAnalogueValue	CF			O
f	FLOAT32				GC 1
d	Vstring255	DC			O
geFloatASG_1					
Attribute Name	Attribute Type	FC	TrgOp	Value/Value Range	M/O/C
DataAttribute					
<i>setting</i>					
setMag	FloatAnalogueValue	SP			AC NSG M

f	FLOAT32				GC_1
<i>configuration, description and extension</i>					
Units	Unit	CF			
minVal	FloatAnalogueValue	CF			O
f	FLOAT32				GC_1
maxVal	FloatAnalogueValue	CF			O
f	FLOAT32				GC_1
stepSize	FloatAnalogueValue	CF			O
f	FLOAT32				GC_1
d	Vstring255	DC			O
dataNs	Vstring255	EX			O
geFloatASG_1_2					
Attribute Name	Attribute Type	FC	TrgOp	Value/Value Range	M/O/C
DataAttribute					
<i>setting</i>					
setMag	FloatAnalogueValue	SG			AC NSG M
f	FLOAT32				GC_1
<i>configuration, description and extension</i>					
Units	Unit	CF			
minVal	FloatAnalogueValue	CF			O
f	FLOAT32				GC_1
maxVal	FloatAnalogueValue	CF			O
f	FLOAT32				GC_1
stepSize	FloatAnalogueValue	CF			O
f	FLOAT32				GC_1
d	Vstring255	DC			O
dataNs	Vstring255	EX			O
geFloatASG_2					
Attribute Name	Attribute Type	FC	TrgOp	Value/Value Range	M/O/C
DataAttribute					
<i>setting</i>					
setMag	FloatAnalogueValue	SG			AC SG M

f	Float32				GC_1
<i>configuration, description and extension</i>					
Units	Unit	CF			
minVal	FloatAnalogueValue	CF			O
f	Float32				GC_1
maxVal	FloatAnalogueValue	CF			O
f	Float32				GC_1
stepSize	FloatAnalogueValue	CF			O
f	Float32				GC_1
d	Vstring255	DC			O

3.5.2. Setting curve (CURVE)

geCURVE_3					
Attribute Name	Attribute Type	FC	TrgOp	Value/Value Range	M/O/C
DataAttribute					
<i>setting</i>					
setCharact	ENUMERATED	SG			O
d	Vstring255	DC			O
geCURVE_4					
Attribute Name	Attribute Type	FC	TrgOp	Value/Value Range	M/O/C
DataAttribute					
<i>setting</i>					
setCharact	ENUMERATED	SG			O
d	Vstring255	DC			O

3.6. Common data class specifications for description information

3.6.1. Device name plate (DPL).

DPL class (Device name plate)					
geDPL					
Attribute Name	Attribute Type	FC	TrgOp	Value/Value Range	M/O/C
DataAttribute					
<i>control and status</i>					
vendor	Vstring255	DC			M
hwRev	Vstring255	DC			O
swRev	Vstring255	DC			O
serNum	Vstring255	DC			O
model	Vstring255	DC			O

3.6.2. Logical node name plate (LPL).

LPL class (Logical node name plate)					
geLPL					
Attribute Name	Attribute Type	FC	TrgOp	Value/Value Range	M/O/C
DataAttribute					
<i>control and status</i>					
vendor	Vstring255	DC			M
swRev	Vstring255	DC			M
d	Vstring255	DC			M
configRev	Vstring255	DC			AC LN0 M
geLPL_1					
Attribute Name	Attribute Type	FC	TrgOp	Value/Value Range	M/O/C
DataAttribute					
<i>control and status</i>					

vendor	Vstring255	DC			M
swRev	Vstring255	DC			M
d	Vstring255	DC			M
configRev	Vstring255	DC			AC LN0 M
IdNs	Vstring255	EX			O

4. Enum types

4.1. New Enum Types

4.1.1. setCharact_2

Value	Description	Remarks
0	Definite Time	
1	Inverse Time	

4.1.2. SamplesCycle

Value	Description	Remarks
0	64 samples/cycle	
1	32 samples/cycle	
2	16 samples/cycle	
3	8 samples/cycle	
4	4 samples/cycle	

Tissues Implementation Conformance Statement(TICS)
for the IEC 61850 Ed 1 interface in:
F650 Bay Controller

Date: May 5, 2017
Version 3.05

TICS for Ed1 Server Version 3.04**F650 relay version 7.52****dated - 20 December - 2016****Mandatory Intop Tissues**

During the October 2006 meeting IEC TC57 working group 10 decided that:

- green Tissues with the category “IntOp” are mandatory for IEC 61850 edition 1
- Tissues with the category “Ed.2” Tissues should not be implemented.

Below table gives an overview of the implemented IntOp Tissues.

Part	Tissue Description Nr	Implemented Y/na
8-1	116 GetNameList with empty response?	Y
	165 Improper Error Response for GetDataSetValues	na
	183 GetNameList error handling	na
	246 Control negative response (SBOs) with LastApplError	na
	545 Skip file directories with no files	na
7-4	252 AlmThm should have CDC SPS	Y
7-3	28 Definition of APC	na
	54 Point def xVal, not cVal	na
	55 Ineut = Ires ?	na
	63 mag in CDC CMV	na
	65 Deadband calculation of a Vector and trigger option	na
	219 operTm in ACT	na
	270 WYE and DEL rms values	na
	1199 BCR	na
7-2	30 control parameter T	na
	31 Typo	na
	32 Typo in syntax	na
	35 Typo Syntax Control time	Y
	36 Syntax parameter DSet-Ref missing	na
	37 Syntax GOOSE "T" type	na

Part	Tissue Description	Implemented
Nr		Y/na
39	Add DstAddr to GoCB	na
40	GOOSE Message "AppID" to "GoID"	na
41	GsCB "AppID" to "GsID"	Y
42	SV timestamp: "EntryTime" to "TimeStamp"	na
43	Control "T" semantic	na
44	AddCause - Object not sel	na
45	Missing AddCauses	na
46	Synchro check cancel	na
47	"." in LD Name?	na
49	BRCB TimeOfEntry (part of #453)	-
50	LNNName start with number?	na
51	ARRAY [0..num] missing	na
52	Ambiguity GOOSE SqNum	na
53	Add DstAddr to GsCB, SV	na
151	Name constraint for control blocks etc.	na
166	DataRef attribute in Log	na
185	Logging - Integrity periode	na
189	SV Format	na
190	BRCB: EntryId and TimeOfEntry (part of #453)	-
191	BRCB: Integrity and buffering reports (part of #453)	-
278	EntryId not valid for a server (part of #453)	-
297	Sequence number	na
298	Type of SqNum	na
305	Reporting with BufTm = 0	na
322	Write Configuration attribute of BRCBs	na
329	Reporting and BufOvl	na
333	Enabling of an incomplete GoCB	na
335	Clearing of BufOvfl	na
348	URCB class and report	na
349	BRCB TimeOfEntry has two definitions	na
453	Combination of all reporting and logging tissues	na
1281	Trigger option GI is by default	na

Part	Tissue Description Nr	Implemented Y/na
Part 6	1 Syntax	na
	5 tExtensionAttributeNameEnum is restricted	Y
	8 SIUnit enumeration for W	Y
	10 Base type for bitstring usage	Y
	17 DAI/SDI elements syntax	Y
	169 Ordering of enum differs from 7-3	na
	245 Attribute RptId in SCL	na
	529 Replace sev - Unknown by unknown	na

NOTE: Tissue 49, 190, 191, 275 and 278 are part of tissue #453, all other technical tissues in the table are mandatory if applicable.

NOTE: Editorial tissues are marked as “na”.

Protocol Implementation eXtra Information for Testing (PIXIT)
for the IEC 61850 interface in:
F650 Bay Controller

Date: December 19, 2016

Version 1.10

PIXIT template for Server

Introduction

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

F650 Bay Controller with firmware version 7.52

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

Each table specifies the PIXIT for applicable ACSI service model as structured in IEC 61850-10. The “Ed” column indicates if the entry is applicable for IEC 61850 Edition 1 and/or Edition 2.

PIXIT for Association model

ID	Ed	Description	Value / Clarification
As1	1	Maximum number of clients that can set-up an association simultaneously	5
As2	1,2	TCP_KEEPALIVE value. The recommended range is 1..20s	5 seconds but if no application message is detected within the As3 value, the device will close the connection.
As3	1,2	Lost connection detection time	120 seconds (Configurable)
As4	-	Authentication is not supported yet	
As5	1,2	What association parameters are necessary for successful association	Transport selector Y Session selector Y Presentation selector Y AP Title N AE Qualifier N
As6	1,2	If association parameters are necessary for association, describe the correct values e.g.	Transport selector 0001 Session selector 0001 Presentation selector 00000001 AP Title NA AE Qualifier NA
As7	1,2	What is the maximum and minimum MMS PDU size	Max MMS PDU size 120000 Min MMS PDU size 700.
As8	1,2	What is the maximum start up time after a power supply interrupt	90 seconds

PIXIT for Server model

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

ID	Ed	Description	Value / Clarification
		request	
Sr5	1	Which Mode values are supported ¹	On Y [On-]Blocked N Test N Test/Blocked N Off N

PIXIT for Data set model

ID	Ed	Description	Value / Clarification
Ds1	1	What is the maximum number of data elements in one data set (compare ICD setting)	576
Ds2	1	How many persistent data sets can be created by one or more clients (this number includes predefined datasets)	NOT SUPPORTED
Ds3	1	How many non-persistent data sets can be created by one or more clients	NOT SUPPORTED

¹ IEC 61850-6:2009 clause 9.5.6 states that if only a subrange of the enumeration value set is supported, this shall be indicated within an ICD file by an enumeration type, where the unsupported values are missing

PIXIT for Substitution model

ID	Ed	Description	Value / Clarification
Sb1	1	Are substituted values stored in volatile memory	NOT SUPPORTED

PIXIT for Setting group control model

ID	Ed	Description	Value / Clarification
Sg1	1	What is the number of supported setting groups for each logical device	6 groups for "PRO" logical device
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 server will save to non-volatile storage 25 seconds after confirmation.
Sg3	1	Can multiple clients edit the same setting group	No
Sg4	1	What happens if the association is lost while editing a setting group	Lost Permission and EditSG = 0
Sg5	1	Is EditSG value 0 allowed	Yes
Sg6	2	When ResvTms is not present how long is an edit setting group locked	While EditSG > 0

PIXIT for 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 N 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 Y entryID 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 61850-7-2:2003 \$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	Buffer size = 50000 Bytes
Rp8	-	Pre-configured RCB attributes that are dynamic, compare SCL report settings	Deprecated
Rp9	1	May the reported data set contain: - structured data objects - data attributes	Y Y (timestamp attributes are not supported)
Rp10	1,2	What is the scan cycle for binary events Is this fixed, configurable	Event Driven Fixed
Rp11	1	Does the device support to pre-assign a RCB to a specific client in the 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
		<additional items>	

PIXIT for Logging model

ID	Ed	Description	Value / Clarification
Lg1	1,2	What is the default value of LogEna (Compare IEC 61850-8-1 §17.3.3.2.1, the default value should be FALSE)	NOT SUPPORTED
Lg2	-	What is the format of EntryID	Deprecated
Lg3	1,2	Are there are multiple Log Control Blocks that specify the Journaling of the same MMS NamedVariable and TrgOps and the Event Condition (Compare IEC 61850-8-1 §17.3.3.3.2)	NOT SUPPORTED
Lg4	1	Pre-configured LCB attributes that cannot be changed online	NOT SUPPORTED

PIXIT for GOOSE publish model

ID	Ed	Description	Value / Clarification
Gp1	1,2	Can the test (Ed1) / simulation (Ed2) flag in the published GOOSE be set	N
Gp2	1	What is the behaviour when the GOOSE publish configuration is incorrect	DUT keeps GoEna=F. Configuration tool does not allow wrong configuration to be uploaded into device. E.g.: empty dataset.
Gp3	1,2	Published FCD supported common data classes are	SPS, INS, ENS, ACT, ACD, MV, CMV, SAV, WYE, DEL, SEQ, INC, ENC, SPC, DPC, INC, ENC. (Only the elements with FC=ST or MX will be published).
Gp4	1,2	What is the slow retransmission time Is it fixed or configurable	Configured by SCL or GoCB MaxTime
Gp5	1,2	What is the fastest retransmission time Is it fixed or configurable	Fixed. MinTime = 5 ms
Gp6	-	Can the GOOSE publish be turned on / off by using SetGoCBValues(GoEna)	Y
Gp7	1,2	What is the initial GOOSE sqNum after restart	sqNum = 1
Gp8	1	May the GOOSE data set contain: - structured data objects (FCD) - timestamp data attributes	Y Y (timestamp attributes are not supported)

ID	Ed	Description	Value / Clarification
Gp9	2	How is the retransmission curve after a change.	- sqNum = 0 New change - sqNum = 1 -> 5ms later with TAL = 1000 - sqNum = 2 -> 10ms later with TAL = 1000 - sqNum = 3 -> 15ms later with TAL = 4000 - sqNum = 4 -> 1000ms later with TAL = Update time* multiplied by 4 - sqNum = 5 -> Update time* later with TAL = Update time* multiplied by 4 - sqNum = 6-> Update time* later with TAL = Update time* multiplied by 4 - sqNum = 7 - *Update time is configured in the ICT

PIXIT for GOOSE subscribe model

ID	Ed	Description	Value / Clarification
Gs1	1,2	What elements of a subscribed GOOSE header are checked to decide the message is valid and the allData values are accepted? If yes, describe the conditions. Notes: - the VLAN tag may be removed by a ethernet switch and shall not be checked - the simulation flag shall always be checked (Ed2) - the ndsCom shall always be checked (Ed2)	Y destination MAC address Y APPID N gocbRef Y timeAllowedtoLive N datSet Y goID N t N stNum N sqNum Y simulation / test N confRev Y ndsCom Y numDatSetEntries
Gs2	1,2	When is a subscribed GOOSE marked as lost (TAL = time allowed to live value from the last received GOOSE message)	message does not arrive after TAL
Gs3	1,2	What is the behaviour when one or more subscribed GOOSE messages isn't received or syntactically incorrect (missing GOOSE)	Message will be ignored, but when the next correct message will be received, it will be proceed as normal.
Gs4	1,2	What is the behaviour when a subscribed GOOSE message is out-of-order	Message will be proceeded
Gs5	1,2	What is the behaviour when a subscribed GOOSE message is duplicated	Message will be ignored
Gs6	1	Does the device subscribe to GOOSE messages with/without the VLAN tag	Y, with the VLAN tag Y, without the VLAN tag
Gs7	1	May the GOOSE data set contain: - structured data objects (FCD) - timestamp data attributes	Y N
Gs8	1,2	Subscribed FCD supported common data classes are	DUT can receive all kinds of data but only digitals can be mapped.
Gs9	1,2	Are subscribed GOOSE with test=T (Ed1) / simulation=T (Ed2) accepted in test/simulation mode	N
Gs10	2	What is the behaviour when a subscribed GOOSE message with TAL = 0 is received by the subscriber.	The message will be ignored. The mechanism applies where the new GOOSE message is not received within a TAL.

ID	Ed	Description	Value / Clarification
Gs11	2	What is the behaviour when a subscribed GOOSE message hasn't the expected data structure.	The message will be ignored. The mechanism applies where the new GOOSE message is not received within a TAL.

PIXIT for Control model

ID	Ed	Description	Value / Clarification
Ct1	-	What control models are supported (compare PICS)	Deprecated
Ct2	1,2	Is the control model fixed, configurable and/or dynamic	Configurable & Dynamic
Ct3	-	Is TimeActivatedOperate supported (compare PICS or SCL)	Deprecated
Ct4	-	Is "operate-many" supported (compare sboClass)	Deprecated
Ct5	1	Will the DUT activate the control output when the test attribute is set in the SelectWithValue and/or Operate request (when N test procedure Ct12 is applicable)	N
Ct6	-	What are the conditions for the time (T) attribute in the SelectWithValue and/or Operate request	Deprecated
Ct7	-	Is pulse configuration supported (compare pulseConfig)	Deprecated
Ct8	1,2	What is the behaviour of the DUT when the check conditions are set Is this behaviour fixed, configurable, online changeable	N synchrocheck N interlock-check DUT ignores the check value and always perform the check

ID	Ed	Description	Value / Clarification
Ct9	1,2	Which additional cause diagnosis are supported	Y UNKNOWN Y NOT-SUPPORTED Y BLOCKED-BY-SWITCHING-HIERARCHY N SELECT-FAILED Y INVALID-POSITION Y POSITION-REACHED N STEP-LIMIT N BLOCKED-BY-MODE N BLOCKED-BY-PROCESS N BLOCKED-BY-INTERLOCKING N BLOCKED-BY-SYNCHROCHECK Y COMMAND-ALREADY-IN-EXECUTION N BLOCKED-BY-HEALTH N 1-OF-N-CONTROL N ABORTION-BY-CANCEL Y TIME-LIMIT-OVER N ABORTION-BY-TRIP Y OBJECT-NOT-SELECTED EDITION 1 SPECIF VALUES: N PARAMETER-CHANGE-IN-EXECUTION 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

ID	Ed	Description	Value / Clarification
Ct10	1,2	How to force a “test-not-ok” respond with SelectWithValue request	Device in local mode
Ct11	1,2	How to force a “test-not-ok” respond with Select request	
Ct12	1,2	How to force a “test-not-ok” respond with Operate request	DOns: Sending T=1 SBOs: Sending T=1 DOes: Sending T=1 SBOes: Sending T=1
Ct13	1,2	Which origin categories are supported / accepted	N bay-control Y station-control Y remote-control N automatic-bay Y automatic-station Y automatic-remote N maintenance N process
Ct14	1,2	What happens if the orCat value is not supported or invalid	DOns: control is rejected (Oper-ObjectAccessDenied). SBOs: control is rejected (Oper-ObjectAccessDenied). DOes: control is rejected (Oper- ServiceError, ObjectAccessDenied). SBOes: control is rejected (SBOw- ServiceError, ObjectAccessDenied).
Ct15	1,2	Does the IED accept a SelectWithValue / Operate with the same control value as the current status value Is this behaviour configurable	DOns: N SBOs: N DOes: N SBOes: N Configurable N
Ct16	1,2	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
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

ID	Ed	Description	Value / Clarification
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 [On-]Blocked (Compare PIXIT-Sr5)	Deprecated
Ct20	1,2	Does the IED support local / remote operation	Y (Only for XCBR)
Ct21	1,2	Does the IED send an InformationReport with LastApplError as part of the Operate response- for control with normal security	SBOs: N DOs: N
Ct22	2	How to force a “parameter-change-in-execution”	SBOs:Not Applicable SBOes:Not Applicable
Ct23	1,2	How many SBOs/SBOes control objects be selected at the same time?	SBOs: n = “1” SBOes: n = “1”
Ct24	1,2	Does the DUT support any operate timeout > 0	Y
Ct25	1,2	When CDC=DPC is supported, is it possible to have DPC (Controllable Double Point) go to the intermediate state? (00)	N

PIXIT for Time synchronisation model

ID	Ed	Description	Value / Clarification
Tm1	1,2	What time quality bits are supported (may be set by the IED)	Y LeapSecondsKnown N ClockFailure Y ClockNotSynchronized.
Tm2	1,2	Describe the behaviour when the time server(s) ceases to respond What is the time server lost detection time	On one time server: An event is generated On all time servers: An event is generated 180 seconds
Tm3	1,2	How long does it take to take over the new time from time server	2 seconds
Tm4	1,2	When is the time quality bit “ClockFailure” set	Never
Tm5	1,2	When is the time quality bit “Clock not Synchronized” set	60 seconds after the time server(s) ceases to respond.
Tm6	-	Is the timestamp of a binary event adjusted to the configured scan cycle	Deprecated
Tm7	1	Does the device support time zone and daylight saving	Y

ID	Ed	Description	Value / Clarification
Tm8	1,2	Which attributes of the SNTP response packet are validated	Y 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 Y RX/TX TIMESTAMP FIELDS ARE CHECKED FOR REASONABLENESS Y SNTP VERSION 3 AND/OR 4 N OTHER (DESCRIBE)
Tm9	1,2	Do the COMTRADE files have local time or UTC time and is this configurable	Local N
		<additional items>	

PIXIT for File transfer model

ID	Ed	Description	Value / Clarification
Ft1	1	What is structure of files and directories	
		Where are the COMTRADE files stored	/COMTRADE
		Are comtrade files zipped and what files are included in each zip file	N
Ft2	1,2	Directory names are separated from the file name by	"/"
Ft3	1	The maximum file name size including path (recommended 64 chars)	255 chars
Ft4	1,2	Are directory/file name case sensitive	Case sensitive
Ft5	1,2	Maximum file size for SetFile	No Applicable
Ft6	1	Is the requested file path included in the MMS fileDirectory respond file name	Y
Ft7	1	Is the wild char supported MMS fileDirectory request	No
Ft8	1,2	Is it allowed that 2 clients get a file at the same time	Y same file
			Y different files
Ft9	1,2	Which files can be deleted	Not Applicable

PIXIT for Service tracking model

ID	Ed	Description	Value / Clarification
Tr1	2	Which ACSI services are tracked by LTRK.GenTrk	Not Applicable

For further assistance

For product support, contact the information and call center as follows:

GE VERNOVA

650 Markland Street

Markham, Ontario

Canada L6C 0M1

Worldwide telephone: +1 905 927 7070

Europe/Middle East/Africa telephone: +34 94 485 88 54

North America toll-free: 1 800 547 8629

Fax: +1 905 927 5098

Worldwide e-mail: multilin.tech@gevernova.com

Europe e-mail: multilin.tech.euro@gevernova.com

<https://www.gevernova.com/grid-solutions>