FANOX

SIL-G

Feeder Relay



Model Implementation Conformance Statement (MICS)

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1 Introduction

The IEC 61850 standard defines a framework for substation communications networks and systems. The standard consists of several parts ranging from the requirements on substation automation systems to the details of a communication protocol.

The IEC 61850 standard specifies an expandable data model and services for substation automation. The standard does not specify any protection or control functions but specifies how the functions expose their information to a communication network.

SILG IED has been designed around IEC 61850 edition 2.0. This means that the functionality of the IED is represented in a data model in accordance with the standard and the IEDs support a range of the services provided by the standard.

- Process data: monitoring of status information, measurements.
- Application data: protection activations, tripping, fault recordings.
- Control commands.
- Self-supervision messages.
- Fast horizontal communication between devices.

2 PICS - Protocol Implementation Conformance Statement

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

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

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

2.1 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	Client should initiate association
B12	**Client** side of (TWO-PARTY-APPLICATION-ASSOCIATION)	—	—	
SCSMs supported				
B21	**SCSM**:IEC 61850-8-1used	—	Y	
B22	**SCSM**:IEC 61850-9-1used			Deprecated Ed2
B23	**SCSM**:IEC 61850-9-2used			
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	—	—	

– = not applicable
Y = supported
N or empty = not supported

2.2 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** side (B11) and/or **Client** side (B12) supported				
M1	**Logical device**		Y	
M2	**Logical node**		Y	
M3	**Data**		Y	
M4	**Data set**		Y	
M5	**Substitution**		N	
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		N	
M9	**Log control**		N	
M9-1	IntgPd		N	
M10	**Log**		N	
M11	**Control**		Y	
M17	**File Transfer**		N	Only Offline SCL transfer is support
M18	**Application association**		N	Only Client can associate
M19	**GOOSE Control Block**		Y	
M20	**Sampled Value Control Block**		N	
If **GSE** (B31/32) is supported				
M12	**GOOSE**		Y	
M13	**GSSE**		N	Deprecated Ed2
If **SVC** (B41/42) is supported				
M14	Multicast SVC		N	
M15	Unicast SVC		N	
For all IEDs				
M16	**Time**		Y	Time source with required accuracy shall be available. Only Time Master are SNTP (Mode 4 response) time server. All other Client / Server devices require SNTP (Mode 3 request) clients
Y = service is supported				

N or empty = service is not supported

2.3 ACSI service conformance statement

The ACSI service conformance statement is defined in Table A. (depending on the statements in Table A.1and in Table A.2).

Table A.3 – ACSI service Conformance statement

	Ed.	Services	AA: TP/MC	Client (C)	Server (S)	Comments
Server						
S1	1,2	GetServerDirectory (LOGICAL-DEVICE)	TP		Y	
Application association						
S2	1,2	Associate			N	Only Client can associate
S3	1,2	Abort			N	Only Client can abort
S4	1,2	Release			N	Only Client can release
Logical device						
S5	1,2	GetLogicalDeviceDirectory	TP		Y	
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		N	
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		Y	
S15	1,2	DeleteDataSet	TP		Y	
S16	1,2	GetDataSetDirectory	TP		Y	

Substitution						
S17	1	SetDataValues	TP		N	

Setting group control						
S18	1,2	SelectActiveSG	TP		Y	
S19	1,2	SelectEditSG	TP		Y	
S20	1,2	SetSGValues	TP		Y	
S21	1,2	ConfirmEditSGValues	TP		Y	
S22	1,2	GetSGValues	TP		Y	
S23	1,2	GetSGCBValues	TP		Y	
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)			N	
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)			N	
S27-3	1,2	data-update (dupd)			N	
S28	1,2	GetURCBValues	TP		Y	
S29	1,2	SetURCBValues	TP		Y	

Logging						
Log control block						
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		Y	
S37	1,2	GetGOOSEElementNumber	TP		Y	
S38	1,2	GetGoCBValues	TP		Y	
S39	1,2	SetGoCBValues	TP		Y	
GSSE						
S40	1	SendGSSEMessage	MC		N	Deprecated in Edition 2

GSSE-CONTROL-BLOCK						
S41	1	GetReference	TP		N	Deprecated in Edition 2
S42	1	GetGSSEElementNumber	TP		N	Deprecated in Edition 2
S43	1	GetGsCBValues	TP		N	Deprecated in Edition 2
S44	1	SetGsCBValues	TP		N	Deprecated in Edition 2

Transmission of sampled value model (SVC)						
Multicast SV						
S45	1,2	SendMSVMessage	MC		N	
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			Y	
S52	1,2	SelectWithValue	TP		N	
S53	1,2	Cancel	TP		Y	
S54	1,2	Operate	TP		Y	
S55	1,2	CommandTermination	TP		N	
S56	1,2	TimeActivatedOperate	TP		N	
File transfer						
S57	1,2	GetFile	TP		N	
S58	1,2	SetFile	TP		N	
S59	1,2	DeleteFile	TP		N	
S60	1,2	GetFileAttributeValues	TP		N	
S61	1,2	GetServerDirectory (FILE-SYSTEM)	TP		N	

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)			N	
S27-3	1,2	data-update (dupd)			N	
S28	1,2	GetURCBValues	TP		Y	
S29	1,2	SetURCBValues	TP		Y	

Logging						
Log control block						
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		Y	
S37	1,2	GetGOOSEElementNumber	TP		Y	
S38	1,2	GetGoCBValues	TP		Y	
S39	1,2	SetGoCBValues	TP		Y	
GSSE						
S40	1	SendGSSEMessage	MC		N	Deprecated in Edition 2

GSSE-CONTROL-BLOCK						
S41	1	GetReference	TP		N	Deprecated in Edition 2
S42	1	GetGSSEElementNumber	TP		N	Deprecated in Edition 2
S43	1	GetGsCBValues	TP		N	Deprecated in Edition 2
S44	1	SetGsCBValues	TP		N	Deprecated in Edition 2

Transmission of sampled value model (SVC)						
Multicast SV						
S45	1,2	SendMSVMessage	MC		N	
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			Y	
S52	1,2	SelectWithValue	TP		N	
S53	1,2	Cancel	TP		Y	
S54	1,2	Operate	TP		Y	
S55	1,2	CommandTermination	TP		N	
S56	1,2	TimeActivatedOperate	TP		N	
File transfer						
S57	1,2	GetFile	TP		N	
S58	1,2	SetFile	TP		N	
S59	1,2	DeleteFile	TP		N	
S60	1,2	GetFileAttributeValues	TP		N	
S61	1,2	GetServerDirectory (FILE-SYSTEM)	TP		N	

Time						
T1	1,2	Time resolution of internal clock			12	Nearest negative power of 2^{-9} in seconds (number 9)
T2	1,2	Time accuracy of internal clock			T1	T0 (ms) (<= 10 ms)
T3	1,2	Supported TimeStamp resolution	-		12	Nearest value of 2^{-9} in seconds (number 9)

3 PIXIT - Protocol Implementation Extra Information for Testing

This document specifies the protocol implementation extra information for testing (PIXIT) of the IEC 61850 interface in SILG family relayswith firmware version M03.00.00

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.

3.1 PIXIT for Documentation

ID	Ed	Description	Value / Clarification
Do1	2	How to expose required firmware versions not present in the datamodel	On screen of DUT
		<additional items>	

3.2 PIXIT for Configuration

ID	Ed	Description	Value / Clarification
Cf1	2	Can IED tool export ICD file or IID file(SICS I12)	ICD: N IID: N
		<additional items>	

3.3 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	60 seconds
As3	1,2	Lost connection detection time	120 seconds
As4	-	Authentication is not supported yet	Y

ID	Ed	Description	Value / Clarification
As5	1,2	What association parameters are necessary for successful association:Called values: Calling values:	Transport selector Y Session selector Y Presentation selector Y AP Title N AE Qualifier N other Transport selector N Session selector N Presentation selector N AP Title N AE Qualifier N other
As6	1,2	If association parameters are necessary for association, describe the correct Called values: e.g. Calling parameters: e.g.	Transport selector 0001 Session selector 0001 Presentation selector 00000001 AP Title 1,1,9999,1 AE Qualifier 12 other Transport selector 0001 Session selector 0001 Presentation selector 00000001 AP Title 1,3,9999,23 AE Qualifier 23 other
As7	1,2	What is the maximum and minimum MMS PDU size	Max MMS PDU size 32768 Min MMS PDU size 125
As8	1,2	What is the maximum start up time after a power supply interrupt	120 seconds
As9	1,2	Does this device function only as testequipment? (test equipment need not have a non- volatile configuration; but it cannot be part of the substation automation system)	N
		<additional items>	

3.4 PIXIT for Server model

ID	Ed	Description	Value / Clarification
Sr1	1,2	Which analogue value (MX) quality bits aresupported (can be set by server)	Validity: N Good, N Invalid, N Reserved, N Questionable Detail Quality N Overflow N OutofRange N BadReferenceN Oscillatory N Failure N OldData N InconsistentN Inaccurate Miscellaneous: N Source N Test N OperatorBlocked
Sr2	1,2	Which status value (ST) quality bits aresupported (can be set by server)	Validity: N Good, N Invalid, N Reserve N Questionable Detail Quality N BadReferenceN Oscillatory N Failure N OldData N InconsistentN Inaccurate Miscellaneous: N Source N Test N Operator Blocked
Sr3	-	What is the maximum number of data object references in one GetDataValues request	Deprecated
Sr4	-	What is the maximum number of data object references in one SetDataValues request	Deprecated

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

3.5 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)	80 data attributes (Depends upon the size of each attribute, application size and the device model)
Ds2	1	How many persistent data sets can becreated by one or more clients (this number includes predefined datasets)	0
Ds3	1	How many non-persistent data sets can be created by one or more clients	0
		<additional items>	

3.6 PIXIT for Substitution model

ID	Ed	Description	Value / Clarification
Sb1	1	Are substituted values stored in volatile memory	Not Supported
		<additional items>	

3.7 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	4
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 non volatile storage is updated some seconds after ConfirmEditSGValues service is received.
Sg3	1	Can multiple clients edit the same setting group	Not Supported

ID	Ed	Description	Value / Clarification
Sg4	1	What happens if the association is lost whileediting a setting group	The EditSG is reset to 0
Sg5	1	Is EditSG value 0 allowed	Y
Sg6	2	When ResvTms is not present how long is an edit setting group locked	300 s
Sg7	2	Can the active setting group be changedlocally Can a setting in the active setting group be changed locally	Not Supported
		<additional items>	

3.8 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 N 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 N
Rp3	1,2	Can the server send segmented reports (when not supported the device shall refusean association request with a smaller than minimum PDU size)	N
Rp4	1,2	Mechanism on second internal data changenotification of the same analogue data valuewithin buffer period (Compare IEC 61850-7- 2 Ed2 §17.2.2.9)	Send report immediately(depends on the Report scan time configured for the server)
Rp5	1	Multi client URCB approach (compare IEC 61850-7-2:2003 §14.2.1)	Each URCB is visible to one client only

ID	Ed	Description	Value / Clarification
Rp6	-	What is the format of EntryID	Deprecated
Rp7	1,2	What is the buffer size for each BRCB orhow many reports can be buffered	32 KB for single report 32 KB for all the reports and 32 reports can be buffered
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
Rp10	1,2	What is the scan cycle for binary eventsIs this fixed, configurable	1ms Fixed
Rp11	1	Does the device support to pre-assign a RCB to a specific client in the SCL	Y
Rp12	2	After restart of the server is the value of ConfRev restored from the original configuration or retained prior to restart	Restored from original configuration
Rp13	1,2	Does the server accept any client to configure / enable an RCB with BRCB.ResvTms=-1 or URCB.Resv=T?What fields are used to do the identification?	N IP-address Y AP-Title N AE-Qualifier Y <other field> N
Rp14	1,2	When BRCB.ResvTms is exposed, what isthe default value for BRCB.ResvTms if client does not write (must be > 0) or When BRCB.ResvTms is not exposed, whatis the internal reservation time (must be >= 0) Note: for Amd1 the client shall always writeResvTms and ResvTms is mandatory	N/A 1 seconds
Rp15	2	Is data model db=0 supported	N
		<additional items>	

3.9 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	Not Supported
Lg3	1,2	Are there multiple Log Control Blocks that specify the Journaling of the same MMS NamedVariable and TrgOps and the EventCondition (Compare IEC 61850-8-1 §17.3.3.3.2)	Not Supported
Lg4	-	Pre-configured LCB attributes that cannot be changed online	Not Supported
Lg5	1	Which TrgOps are supported for logging (note Ed2 and up requires support forall TrgOps)	Not Supported
		<additional items>	

3.10 PIXIT for GOOSE publish model

ID	Ed	Description	Value / Clarification
Gp1	1,2	Can the test (Ed1) / simulation (Ed2) flag inthe published GOOSE be set Note: simulation is intended for test equipment	N
Gp2	1	What is the behaviour when the GOOSE publish configuration is incorrect	NdsCom=T (NA) DUT keeps GoEna=F(No Goose message published)
Gp3	1,2	Published FCD supported common data classes are	SPS,ENS,DPL,LPL,ENC,ACT, SPC,DPC,INS,MV,WYE,DEL,SPG,ENS,ACD,ING,ASG,CURVE,CMV,SEQ,BCR
Gp4	1,2	What is the maximum value of TAL(maxTime) Is it fixed or configurable	Fixed at 4000 ms
Gp5	1,2	What is the fastest retransmission time	4 ms
Gp6	-	Can the GOOSE publish be turned on / off by using SetGoCBValues(GoEna)	Deprecated See PICS – SetGoCBValues
Gp7	1,2	What is the initial GOOSE sqNum after restart	sqNum = 1
Gp8	1	May the GOOSE data set contain: - structured data objects (FCD) - timestamp data attributes	 Y Y

ID	Ed	Description	Value / Clarification
Gp9	1,2	Does Server or ICT refuse GOOSE payloaddataset length greater than SCSM supports?	Y
		<additional items>	

3.11 PIXIT for GOOSE subscribe model

ID	Ed	Description	Value / Clarification
Gs1	1,2	What elements of a subscribed GOOSE message are checked to decide the message is valid and theallData values are accepted? If yes, describe the conditions. Notes: • the VLAN tag may be removed byan Ethernet switch and shall not be checked • the simulation flag shall always bechecked (Ed2) • the ndsCom shall always bechecked	N destination MAC addressY APPID N gocbRef N timeAllowedtoLiveN datSet Y goID N T Y stNum N sqNum N simulation / testN confRev Y numDatSetEntries Y out-of-order dataset members
Gs2	1,2	When is a subscribed GOOSEmarked as lost (TAL = time allowed to live valuefrom the last received GOOSE message)	Message does not arrive by 2x TAL
Gs3	1,2	What is the behaviour when one or more subscribed GOOSE messagesis not received or syntactically incorrect (missing GOOSE)	First arriving GOOSE message is accepted
Gs4	1,2	What is the behaviour when a subscribed GOOSE message is out-of-order	DUT accepts the GOOSE message
Gs5	1,2	What is the behaviour when a subscribed GOOSE message is duplicated	First GOOSE Message are accepted.
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 Y
Gs8	1,2	Subscribed FCD supported common data classes are	SPS

ID	Ed	Description	Value / Clarification
Gs9	1	Are subscribed GOOSE with test=T (Ed1) / simulation=T (Ed2) accepted in test/simulation mode	N
Gs10	1,2	Max number of dataset members	80
Gs11	1	Is Fixed-length encoded GOOSE supported	Y
Gs12	Amd1	Is IEC 62351-6 security supported	N
Gs13	Amd1	How does the subscriber handle incoming data flagged as test whenthe destination LN.Beh is On or Blocked? Is this behavior:	Keep last non test value. fixed
		<additional items>	

3.12 PIXIT for GOOSE performance

ID	Ed	Description	Value / Clarification	
Gf1	1,2	Performance class	P1 = 3 ms	
Gf2	1,2	GOOSE ping-pong processing method	Event driven based	
Gf3	1,2	Application logic scan cycle (ms)	Max.	10 Ms
			Min.	1 Ms
Gf4	1	Maximum number of data attributes in GOOSE dataset (value and quality has to be counted as separate attributes)	80	
		<additional items>		

3.13 PIXIT for IEC 61869-9 publisher

ID	Description	Value / Clarification
Svp1	Supported application class(compare table 901)	Not Supported
Svp2	Support behaviour = testSupport behaviour = off	Not Supported
Svp3	Support simulation mode - Backwards rates - Preferred rates When supported how to enablesimulation mode Note: simulation mode is intended for test equipment	Not Supported
Svp4	Are neutral sampled valuescalculated	Not Supported
Svp5	How are the CT/VT ratios configured(only applicable for MU connected to conventional CT/VT)	Not Supported
Svp6	Support time synchronization method	Not Supported
Svp7	What is the maximum time requiredto achieve synchronization after restoring the time synch	Not Supported
Svp8	What is the maximum time requiredto achieve synchronization after power up	Not Supported
Svp9	In which conditions is the quality fieldValidity set to Invalid	Not Supported

Svp10	What is the maximum time to start-upthe device	Not Supported
Svp11	How can the date of manufacture bederived from PhyNam.serNum?	Not Supported

Svp12	Calculated IN = (Ia, Ib, Ic). = -(Ia, Ib, Ic)	Not Supported
Svp13	Is detail quality “out-of-range”supported? How to force out-of-range?	Not Supported
Svp14	Maximum number of channels by rate(0=rate not supported)	Not Supported
	<additional items>	

3.14 PIXIT for IEC 61869-9 subscriber

ID	Description	Value / Clarification
Svs1a	How does the subscriber process subscribed sampled **values** (one ismandatory) Telco 21jul: how to observe that …	Not Supported
Svs1b	How does the subscriber **supervise** subscribed sampled values (optional)	Not Supported

Svs2a	Which backwards compatible variantscan be subscribed to (at least one shall be supported)	Not Supported
Svs2b	Which preferred variants can besubscribed to (at least one shall be supported)	Not Supported
Svs3	Support simulation mode - Preferred rates - Backwards compatible ratesHow to enable simulation mode	Not Supported
Svs4	Which element of the SV header are verified (when yes the SV packets areignored)	Not Supported
Svs5	What will happen in case an extra element pair is added to the data set What will happen in case an element pairof the data set is missing	Not Supported
Svs6	How does the subscriber behave in casea broken path is detected	Not Supported

Svs7	How does the subscriber behave in casepackets are missing - 1 packet - 3 consecutive packets - 5 consecutive packets - 10 consecutive packets - Packet with smpCnt = 0	Not Supported
Svs8	How does the subscriber behave in case - smpSynch = 0 - smpSynch = 1 - smpSynch = 3..255	Not Supported
Svs9	How does the subscriber behave in case - one sample value continuously hasquality invalid - all sample values continuously have quality invalid	Not Supported
Svs10	Declare smallest value of publisher maximum processing delay time that the subscriber requires (per Table 901).	Not Supported
Svs11	What is the total delay that can be tolerated (Svs10 processing time + maximum network delay)	
	<additional items>	

3.15 PIXIT for Control model

ID	Ed	Description	Value / Clarification
Ct1	1	What control models are supported(compare ICD file for Ed2)	direct-with-normal-security sbo-with-normal-security
Ct2	1,2	Is the control model fixed, configurable and/or dynamic	Configurable
Ct3	-	Is TimeActivatedOperate supported (compare PICS or SCL)	Deprecated
Ct4	-	Is “operate-many” supported (compare sboClass)	Deprecated, see sboClass in datamodel (ICD)

ID	Ed	Description	Value / Clarification
Ct5	1	Will the DUT activate the control output when the test attribute is setin the SelectWithValue and/or Operate request (when N test Procedure 2 is applicable)	Not Supported
Ct6	-	What are the conditions for the time (T) attribute in the SelectWithValueand/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 notset This behaviour is:	Not Supported

ID	Ed	Description	Value / Clarification
Ct9	1,2	Which additional cause diagnosisare supported	Not Supported
Ct10	1,2	How to force a “test-not-ok” respond with SelectWithValuerequest	Not Supported

ID	Ed	Description	Value / Clarification
Ct11	1,2	How to force a “test-not-ok” respond with Select request	Not Supported
Ct12	1,2	How to force a “test-not-ok” respond with Operate request	Not Supported
Ct13	1,2	Which origin categories are accepted in control direction	Not Supported
Ct14	1,2	What happens if the orCat value isnot supported or invalid	Not Supported
Ct15	1,2	Does the IED accept a SelectWithValue / Operate with thesame control value as the current status value Is this behaviour configurable	Not Supported
Ct16	1	Does the IED accept a select/operate on the same controlobject from 2 different clients at the same time	Not Supported
Ct17	1	Does the IED accept a Select/SelectWithValue from the same client when the control object is already selected (Tissue #334)	Not Supported

Ct18	1	Deprecated	
Ct19	-	Can a control operation be blocked by Mod=Off or [On-]Blocked(Compare PIXIT-Sr5)	Deprecated
Ct20	1,2	Does the IED support local / remote operation	Y

ID	Ed	Description	Value / Clarification
Ct21	1,2	Does the IED send an Information Report with LastApplError as part of the Operate response-for control with normal security	Not Supported
Ct22	2	How to force a “parameter-change- in-execution”	Not Supported
Ct23	1,2	How many SBOns/SBOes controlobjects can be selected at the same time?	Not Supported
Ct24	1,2	Can a controllable object be forcedto keep its old state e.g. Internal Controllable Objects may not be accessible to force this, whereas aswitch like Circuit Breaker outside the DUT can?	Not Supported
Ct25	1,2	When CDC=DPC is supported, is itpossible to have DPC (ControllableDouble Point) go to the intermediate state? (00)	Not Supported
Ct26	1,2	Name an enhanced security controlpoint (if any) with a finite operate timeout Specify the operate timeout (in milliseconds)	Not Supported

Ct27	2	Does the IED support controlobjects with external signals?	Not Supported
Ct28		Deprecated, kept as placeholder	
Ct29	Amd1	Does the IED support XCBR/XSWI.Loc=False and LLN0/CSWI.Loc=True When yes, does the IED accept thecontrol when orCat=1 or 4 Local	Not Supported

ID	Ed	Description	Value / Clarification
Ct30	2	What is the Operate timeout?	Not Supported

3.16 PIXIT for Time synchronisation model

ID	Ed	Description	Value / Clarification
Tm1	1	What time quality bits are supported (maybe set by the IED) Note: Ability to set ClockNotSynchronized and LeapSecondKnown is mandatory in Ed2	Y LeapSecondsKnownN ClockFailure Y ClockNotSynchronized
Tm2	1,2	Describe the behaviour when all timeserver(s) cease to respond What is the time server lost detection time	Assert CNS after lost detectiontime 280 seconds
Tm3	1,2	How long does it take to take over the new time from time server	140 seconds
Tm4	1,2	When is the time quality bit “ClockFailure”set	After CNS assertion

Tm5	1	When is the time quality bit “Clock notSynchronized” set	When connection to all time servers is lost.
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	N

ID	Ed	Description	Value / Clarification
Tm8	1,2	Which attributes of the SNTP responsepacket are validated	N Leap indicator not equal to 3 Y Mode is equal to SERVER Y OriginateTimestamp is equal to value sent by the SNTPclient as Transmit Timestamp N RX/TX timestamp fields are checked for reasonableness Y SNTP version 3 and/or 4
Tm9	1,2	When COMTRADE files are supported dothese have local time or UTC time and is this configurable	Not Supported
		<additional items>	

3.17 PIXIT for File transfer model

ID	Ed	Description	Value / Clarification
Ft1	1	What is the structure of files anddirectories Where are the COMTRADE files stored Are COMTRADE files zipped and whatfiles are included in each zip file	Not Supported
Ft2	1,2	Directory names are separated from the	Not Supported

		file name by	
Ft3	1	The maximum file name size including path (recommended 64 chars)	Not Supported
Ft4	1,2	Are directory/file name case sensitive	Not Supported
Ft5	1,2	Maximum file size for SetFile	
Ft6	1	Is the requested file path included in the MMS fileDirectory respond file name	Not Supported
Ft7	1	Is the wild card supported in the MMS fileDirectory request	Not Supported
Ft8	1,2	Is it allowed that 2 clients get a file at the same time	Not Supported
Ft9	1,2	Which files can be deleted	
		<additional items>	

3.18 PIXIT for Service tracking model

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

4 MICS - Model Implementation Conformance Statement

This model implementation conformance statement is applicable for SILG family relays, with firmware M03.00.00 or above.

This MICS document specifies the data model implemented, based on IEC 61850 edition 2.

4.1 Logical Nodes List

LN	Description
L group	System logical nodes
LPHD	Physical device information
LLNO	Common Logical Node Information
C group	System logical nodes
CSWI	Switch controller.
G group	Logical nodes for generic references
GGIO	Generic process I/O
M group	Logical nodes for metering and measurement
MHAI	Harmonics or interharmonics
MMTR	Metering 3 Phase
MMXU	Measurement
MSQI	Sequence and imbalance
P group	Logical nodes for protection functions
PDIF	Differential
PDOP	Directional overpower
PFRC	Rate of change of frequency
PHAR	Harmonic restraint
PIOC	Instantaneous Overcurrent
PPAM	Phase angle measuring
PTOC	Time overcurrent
PTOF	Overfrequency
PTOV	Overvoltage
PTRC	Protection trip conditioning
PTTR	Thermal overload
PTUC	Undercurrent
PTUF	Underfrequency
PTUV	Undervoltage
PVPH	Volts per Hz
R group	Logical nodes for protection related functions
RBRF	Breaker failure
RREC	Autoreclosing
RSYN	Synchronism-check
S group	Logical nodes for supervision and monitoring
SARC	Monitoring and diagnostics for arcs
SCBR	Circuit breaker supervision
X group	Logical nodes for switchgear
XCBR	Circuit breaker

4.2 Data model

Server IEDs have all the information of all their events, measures, parameters, and services, organized in a hierarchical structure with device's functional units as main ones.

The main level of the structure is the name of the IED, by default the model of the SILG relay. The IEC61850 data model is contained within an unique Logical Device.

Down the IED there are Logical Nodes that represent the functional units of the IED (Protection, Control and measure units, status of external elements like circuit breaker, etc.).

Inside Logical Nodes there are Data objects that compose a functional unit, and inside each Data object, there are Data attributes that give complete information about this Data object.

As example, the ground overcurrent protection unit is represented in SILG according to IEC 61850 as the logical node PIOC, with the prefix F50G and the instance 1: F50GPIOC1.

In the Logical Node, the starting of the unit is represented by its Data Object, Str, with a list of Data Attributes that give information about the starting.

A single logical device is used for all SILG models. The ICD file is family specific and includes the complete set of functions available for all the models.

There are not Extended Logical Nodes.

4.3 Common Data Classes (CDC)

4.3.1 SPS

Single point status (SPS)					
DATA ATTRIBUTE					
Data Attribute Name	**Type**	**FC**	**TrgOp**	**Value / Value Range**	**M/O/C**
STATUS					
stVal	BOOLEAN	ST	dchg	True / False	M
q	Quality	ST	qchg		M
t	Time Stamp	ST			M

4.3.2 ENS

Enumerated Status (ENS)					
DATA ATTRIBUTE					
Data Attribute Name	**Type**	**FC**	**TrgOp**	**Value / Value Range**	**M/O/C**
STATUS					
stVal	ENUMERATED	ST	dchg. dupd		M
q	Quality	ST	qchg		M
t	Time Stamp	ST			M

4.3.3 ACT

Protection activation information (ACT)					
DATA ATTRIBUTE					
Data Attribute Name	**Type**	**FC**	**TrgOp**	**Value / Value Range**	**M/O/C**
STATUS					
general	BOOLEAN	ST	dchg		M
phsA	BOOLEAN	ST	dchg		O
phsB	BOOLEAN	ST	dchg		O
phsC	BOOLEAN	ST	dchg		O
neutr	BOOLEAN	ST	dchg		O
q	Quality	ST	qchg		M
t	Time Stamp	ST			M

4.3.4 ACD

Directional protection activation information (ACD)					
DATA ATTRIBUTE					
Data Attribute Name	**Type**	**FC**	**TrgOp**	**Value / Value Range**	**M/O/C**
STATUS					
general	BOOLEAN	ST	dchg		M
dirGeneral	ENUMERATED	ST	dchg	Unknown | forward | backward | both	M
phsA	BOOLEAN	ST	dchg		GC_2_1
dirPhsA	ENUMERATED	ST	dchg		GC_2_1
phsB	BOOLEAN	ST	dchg		GC_2_2
dirPhsB	ENUMERATED	ST	dchg		GC_2_2
phsC	BOOLEAN	ST	dchg		GC_2_3
dirPhsC	ENUMERATED	ST	dchg		GC_2_3
Neutr	BOOLEAN	ST	dchg		GC_2_4
dirNeutr	ENUMERATED	ST	dchg		GC_2_4
q	Quality	ST	qchg		M
t	Time Stamp	ST			M

4.3.5 BCR

Binary counter reading (BCR)					
DATA ATTRIBUTE					
Data Attribute Name	**Type**	**FC**	**TrgOp**	**Value / Value Range**	**M/O/C**
STATUS					
actVal	INT64	ST	dchg		M
q	Quality	ST	qchg		M
t	Time Stamp	ST			M
CONFIGURATION					
plusQty	FLOAT32	CF	Dchg		M

4.3.6 MV

Measured value (MV)					
DATA ATTRIBUTE					
Data Attribute Name	**Type**	**FC**	**TrgOp**	**Value / Value Range**	**M/O/C**
MEASURED					
mag	Analogue Value	MX	dchg. dupd		M
q	Quality	ST	qchg		M
t	Time Stamp	ST			M

4.3.7 CMV

Complex measured value (CMV)					
DATA ATTRIBUTE					
Data Attribute Name	**Type**	**FC**	**TrgOp**	**Value / Value Range**	**M/O/C**
MEASURED					
cVal	Analogue Value	MX	dchg. dupd		M
q	Quality	ST	qchg		M
t	Time Stamp	ST			M

4.3.8 WYE

Phase to ground/neutral related measured values of a three-phase system (WYE)					
DATA ATTRIBUTE					
Data Attribute Name	**Type**	**FC**	**TrgOp**	**Value / Value Range**	**M/O/C**
SubDataObject					
phsA	CMV				GC_1
phsB	CMV				GC_1
phsC	CMV				GC_1
Net	CMV				GC_1
Res	CMV				GC_1

4.3.9 DEL

Phase to phase related measured values of a three-phase system (DEL)					
DATA ATTRIBUTE					
Data Attribute Name	**Type**	**FC**	**TrgOp**	**Value / Value Range**	**M/O/C**
SubDataObject					
phsAB	CMV				GC_1
phsBC	CMV				GC_1
phsCA	CMV				GC_1

4.3.10 SPC

Controllable single point (SPC)					
DATA ATTRIBUTE					
Data Attribute Name	**Type**	**FC**	**TrgOp**	**Value / Value Range**	**M/O/C**
MEASURED					
cVal	BOOLEAN	ST	Dchg	FALSE | TRUE	AC_ST
q	Quality	ST	qchg		AC_ST
t	Time Stamp	ST			AC_ST

4.3.11 DPC

Controllable double point (DPC)					
DATA ATTRIBUTE					
Data Attribute Name	**Type**	**FC**	**TrgOp**	**Value / Value Range**	**M/O/C**
STATUS					
cVal	CODED ENUM	ST	Dchg		AC_ST
q	Quality	ST	qchg		AC_ST
t	Time Stamp	ST			AC_ST
CONFIGURATION					
CtlModel	CtlModel	CF	Dchg		M

4.3.12 INC

Controllable integer status (INC)					
DATA ATTRIBUTE					
Data Attribute Name	**Type**	**FC**	**TrgOp**	**Value / Value Range**	**M/O/C**
STATUS					
cVal	CODED ENUM	ST	Dchg		M
q	Quality	ST	qchg		M
t	Time Stamp	ST			M
CONFIGURATION					
CtlModel	CtlModel	CF	Dchg		M

4.3.13 LPL

Logical node name plate (LPL)					
DATA ATTRIBUTE					
Data Attribute Name	**Type**	**FC**	**TrgOp**	**Value / Value Range**	**M/O/C**
CONFIGURATION					
vendor	VISIBLE STRING255	DC			M
swRev	VISIBLE STRING255	DC			M
ConfigRev	VISIBLE STRING255	DC			AC_LN0_M

4.4 Logical Nodes (LN)

The following tables list possible attributes in Logical Node (LN). The ICD file is family specific and includes the complete set of Logical Nodes available for the complete model list of a relay family. Logical nodes not found in this description are not supported. Logical nodes found in this description could not be supported in specific models, depending the adaptation and additional function selected.

4.4.1 System logical nodes LN group: L

4.4.1.1 Physical device information (LPHD class)

Physical device information			
PREFIX	**LOGICAL NODE**	**INSTANCE**	**VALUE**
-	LPHD	1	LPHD1
DATA OBJECTS			
Data Object Name	**Attribute Name**	**Common Data Class**	**Data Object Description**
Descriptions			
PhyNam	vendor	DPL	Fanox Electronic S.L.
PhyNam	model	DPL	SILG
STATUS INFORMATION			
PhyHealth	-	ENS	Physical device health
Proxy	-	SPS	Indicates if this LN is a proxy

4.4.1.2 Common Logical Node Information (LLN0 class)

Common Logical Node information			
PREFIX	**LOGICAL NODE**	**INSTANCE**	**VALUE**
-	LLN0	1	LLN01
DATA OBJECTS			
Data Object Name	**Attribute Name**	**Common Data Class**	**Data Object Description**
Descriptions			
NamPlt	-	LPL	
Status information			
Beh	-	ENS	Behavior
Health	-	ENS	Health
Controls			
Mod	-	ENC	Mode

4.4.2 System logical nodes LN group: C

4.4.2.1 LN: Switch controller. Name: CSWI

Common Logical Node information			
PREFIX	**LOGICAL NODE**	**INSTANCE**	**VALUE**
F52	CSWI	1	F52CSWI
DATA OBJECTS			
Data Object Name	**Attribute Name**	**Common Data Class**	**Data Object Description**
Status information			
Beh	stVal	ENS	Behavior
Controls			
Pos	ctlModel	DPC	Direct Operate with normal security

4.4.3 Logical nodes for generic references: G group

4.4.3.1 LN: Generic process I/O. Name: GGIO

Alarms & LEDs			
PREFIX	**LOGICAL NODE**	**INSTANCE**	**VALUE**
ALM	GGIO	1	ALMGGIO1
DATA OBJECTS			
Data Object Name	**Attribute Name**	**Common Data Class**	**Data Object Description**
STATUS INFORMATION			
Beh	stVal	ENS	Behavior
Ind1	stVal	SPS	General Indication – Alarm 01
Ind2	stVal	SPS	General Indication – Alarm 02
Ind3	stVal	SPS	General Indication – Alarm 03
Ind4	stVal	SPS	General Indication – Alarm 04
Ind5	stVal	SPS	General Indication – Alarm 05
Ind6	stVal	SPS	General Indication – Alarm 06
Ind7	stVal	SPS	General Indication – Alarm 07
Ind8	stVal	SPS	General Indication – Alarm 08
Ind9	stVal	SPS	General Indication – Alarm 09
Ind10	stVal	SPS	General Indication – Alarm 10
Ind11	stVal	SPS	General Indication – Alarm 11
Ind12	stVal	SPS	General Indication – Alarm 12
Ind13	stVal	SPS	General Indication – Alarm 13
Ind14	stVal	SPS	General Indication – Alarm 14
Ind15	stVal	SPS	General Indication – Alarm 15
Ind16	stVal	SPS	General Indication – Alarm 16
Ind17	stVal	SPS	General Indication – Alarm 17
Ind18	stVal	SPS	General Indication – Alarm 18

Ind19	stVal	SPS	General Indication – Alarm 19
Ind20	stVal	SPS	General Indication – Alarm 20
Ind21	stVal	SPS	General Indication – Alarm 21
Ind22	stVal	SPS	General Indication – Alarm 22
Ind23	stVal	SPS	General Indication – Alarm 23
Ind24	stVal	SPS	General Indication – Alarm 24
Ind25	stVal	SPS	General Indication – Alarm 25
Ind26	stVal	SPS	General Indication – Alarm 26
Ind27	stVal	SPS	General Indication – Alarm 27
Ind28	stVal	SPS	General Indication – Alarm 28
Ind29	stVal	SPS	General Indication – Alarm 29
Ind30	stVal	SPS	General Indication – Alarm 30
Ind31	stVal	SPS	General Indication – Alarm 31
Ind32	stVal	SPS	General Indication – Alarm 32

Cold Load Pickup			
PREFIX	**LOGICAL NODE**	**INSTANCE**	**VALUE**
CLP	GGIO	1	CLPGGIO1
DATA OBJECTS			
Data Object Name	**Attribute Name**	**Common Data Class**	**Data Object Description**
STATUS INFORMATION			
Beh	stVal	ENS	Behavior
Ind1	stVal	SPS	General Indication – Standby
Ind2	stVal	SPS	General Indication – 52 Closed
Ind3	stVal	SPS	General Indication – 52 Open
Ind4	stVal	SPS	General Indication – 52 Def. Open
Ind5	stVal	SPS	General Indication – 52 Close CLP
Ind6	stVal	SPS	General Indication – 52 Open CLP
Ind7	stVal	SPS	General Indication – CLP Activity

Commands				
PREFIX	**LOGICAL NODE**		**INSTANCE**	**VALUE**
CMD	GGIO		1	CMDGGIO1
DATA OBJECTS				
Data Object Name	**Sub DO Name**	**Attribute Name**	**Common Data Class**	**Data Object Description**
STATUS INFORMATION				
Beh	stVal		ENS	Behavior
ISCSO1	stVal		INC	Integer status controllable status output
CF				
ISCSO1	ctlModel		INC	Integer status controllable status output (direct with normal security)
CO				
ISCSO1	Oper	Check	INC	Integer status controllable status output
ISCSO1	Oper	T	INC	Integer status controllable status output
ISCSO1	Oper	Test	INC	Integer status controllable status output
ISCSO1	Oper	ctlNum	INC	Integer status controllable status output
ISCSO1	Oper	ctlVal	INC	Integer status controllable status output
ISCSO1	Oper	origin	INC	Integer status controllable status output

Control - Operation (ctVal)			
1	Open Breaker	**11**	HLT on
2	Close Breaker	**12**	HLT off
3	79 Block	**13**	User Command 1
4	79 Unblock	**14**	User Command 2
5	Local Control	**15**	User Command 3
6	Remote Control	**16**	User Command 4
7	Reset	**17**	User Command 5
9	Thermal I. Reset	**18**	User Command 6

Control LEDs			
PREFIX	**LOGICAL NODE**	**INSTANCE**	**VALUE**
CTRLED	GGIO	1	CTRLEDGGIO1
DATA OBJECTS			
Data Object Name	**Attribute Name**	**Common Data Class**	**Data Object Description**
STATUS INFORMATION			
Beh	stVal	ENS	Behavior
Ind1	stVal	SPS	General Indication – Local Led
Ind2	stVal	SPS	General Indication – Led 79
Ind3	stVal	SPS	General Indication – Led 52
Ind4	stVal	SPS	General Indication – Virtual LED-1
Ind5	stVal	SPS	General Indication – Virtual LED-2
Ind6	stVal	SPS	General Indication – Virtual LED-3

Date and Time			
PREFIX	**LOGICAL NODE**	**INSTANCE**	**VALUE**
DATE	GGIO	1	DATEGGIO1
DATA OBJECTS			
Data Object Name	**Attribute Name**	**Common Data Class**	**Data Object Description**
STATUS INFORMATION			
Beh	stVal	ENS	Behavior
Ind1	stVal	SPS	General Indication – Date/Time Set
Ind2	stVal	SPS	General Indication – Need Sync
Ind3	stVal	SPS	General Indication – Summer Time
Ind4	stVal	SPS	General Indication – IRIGB sync
Ind5	stVal	SPS	General Indication – SNTP sync

General Information			
PREFIX	**LOGICAL NODE**	**INSTANCE**	**VALUE**
GEN	GGIO	1	GENGGIO1
DATA OBJECTS			
Data Object Name	**Attribute Name**	**Common Data Class**	**Data Object Description**
STATUS INFORMATION			
Beh	stVal	ENS	Behavior
Alm1	stVal	SPS	General Single Alarm – Event Error
Alm2	stVal	SPS	General Single Alarm – Event Overflow
Ind1	stVal	SPS	General Indication – Ready
Ind2	stVal	SPS	General Indication – Set Date & Time
Ind3	stVal	SPS	General Indication – SER Deleted
Ind4	stVal	SPS	General Indication – Settings Changed
Ind5	stVal	SPS	General Indication – Configuration Changed
Ind6	stVal	SPS	General Indication – LDP Erased
Ind7	stVal	SPS	General Indication – New DFR
Ind8	stVal	SPS	General Indication – Trip Block Active
Ind9	stVal	SPS	General Indication – Settings Group 1
Ind10	stVal	SPS	General Indication – Settings Group 2
Ind11	stVal	SPS	General Indication – Settings Group 3
Ind12	stVal	SPS	General Indication – Settings Group 4
Loc	stVal	SPS	Local control behavior
Wrn1	stVal	SPS	General Single Warning – Wrong Password
Wrn2	stVal	SPS	General Single Warning – Wrong Access

GOOSE Input			
PREFIX	**LOGICAL NODE**	**INSTANCE**	**VALUE**
GIN	GGIO	1	GINGGIO1
DATA OBJECTS			
Data Object Name	**Attribute Name**	**Common Data Class**	**Data Object Description**
STATUS INFORMATION			
Beh	stVal	ENS	Behavior
Ind1	stVal	SPS	General Indication – Goose Input 01
Ind2	stVal	SPS	General Indication – Goose Input 02
Ind3	stVal	SPS	General Indication – Goose Input 03
Ind4	stVal	SPS	General Indication – Goose Input 04
Ind5	stVal	SPS	General Indication – Goose Input 05
Ind6	stVal	SPS	General Indication – Goose Input 06
Ind7	stVal	SPS	General Indication – Goose Input 07
Ind8	stVal	SPS	General Indication – Goose Input 08
Ind9	stVal	SPS	General Indication – Goose Input 09
Ind10	stVal	SPS	General Indication – Goose Input 10
Ind11	stVal	SPS	General Indication – Goose Input 11
Ind12	stVal	SPS	General Indication – Goose Input 12
Ind13	stVal	SPS	General Indication – Goose Input 13
Ind14	stVal	SPS	General Indication – Goose Input 14
Ind15	stVal	SPS	General Indication – Goose Input 15
Ind16	stVal	SPS	General Indication – Goose Input 16
Ind17	stVal	SPS	General Indication – Goose Input 17
Ind18	stVal	SPS	General Indication – Goose Input 18
Ind19	stVal	SPS	General Indication – Goose Input 19
Ind20	stVal	SPS	General Indication – Goose Input 20
Ind21	stVal	SPS	General Indication – Goose Input 21
Ind22	stVal	SPS	General Indication – Goose Input 22
Ind23	stVal	SPS	General Indication – Goose Input 23
Ind24	stVal	SPS	General Indication – Goose Input 24
Ind25	stVal	SPS	General Indication – Goose Input 25
Ind26	stVal	SPS	General Indication – Goose Input 26
Ind27	stVal	SPS	General Indication – Goose Input 27
Ind28	stVal	SPS	General Indication – Goose Input 28
Ind29	stVal	SPS	General Indication – Goose Input 29
Ind30	stVal	SPS	General Indication – Goose Input 30
Ind31	stVal	SPS	General Indication – Goose Input 31
Ind32	stVal	SPS	General Indication – Goose Input 32

INPUTS			
PREFIX	**LOGICAL NODE**	**INSTANCE**	**VALUE**
INP	GGIO	1	INPGGIO1
DATA OBJECTS			
Data Object Name	**Attribute Name**	**Common Data Class**	**Data Object Description**
STATUS INFORMATION			
Beh	stVal	ENS	Behavior
Ind1	stVal	SPS	General Indication – Input 1
Ind2	stVal	SPS	General Indication – Input 2
Ind3	stVal	SPS	General Indication – Input 3
Ind4	stVal	SPS	General Indication – Input 4
Ind5	stVal	SPS	General Indication – Input 5
Ind6	stVal	SPS	General Indication – Input 6
Ind7	stVal	SPS	General Indication – Input 7
Ind8	stVal	SPS	General Indication – Input 8
Ind9	stVal	SPS	General Indication – Input 9
Ind10	stVal	SPS	General Indication – Input 10
Ind11	stVal	SPS	General Indication – Input 11
Ind12	stVal	SPS	General Indication – Input 12
Ind13	stVal	SPS	General Indication – Input 13
Ind14	stVal	SPS	General Indication – Input 14
Ind15	stVal	SPS	General Indication – Input 15
Ind16	stVal	SPS	General Indication – Input 16
Ind17	stVal	SPS	General Indication – Input 17
Ind18	stVal	SPS	General Indication – Input 18
Ind19	stVal	SPS	General Indication – Input 19
Ind20	stVal	SPS	General Indication – Input 20
Ind21	stVal	SPS	General Indication – Input 21
Ind22	stVal	SPS	General Indication – Input 22
Ind23	stVal	SPS	General Indication – Input 23
Ind24	stVal	SPS	General Indication – Input 24

Measurements			
PREFIX	**LOGICAL NODE**	**INSTANCE**	**VALUE**
MSR	GGIO	1	MSRGGIO1
DATA OBJECTS			
Data Object Name	**Attribute Name**	**Common Data Class**	**Data Object Description**
STATUS INFORMATION			
Beh	stVal	ENS	Behavior
Alm1	stVal	SPS	Alarm – Measurement Error
Ind1	stVal	SPS	Indication – Setting = 50Hz (True) / 60Hz (False)
Wrn1	stVal	SPS	Warning – Line Frequency Blocked
Wrn2	stVal	SPS	Warning – Busbar Frequency Blocked

OUTPUTS			
PREFIX	**LOGICAL NODE**	**INSTANCE**	**VALUE**
OUT	GGIO	1	OUTGGIO1
DATA OBJECTS			
Data Object Name	**Attribute Name**	**Common Data Class**	**Data Object Description**
STATUS INFORMATION			
Beh	stVal	ENS	Behavior
Ind1	stVal	SPS	General Indication – Output 1
Ind2	stVal	SPS	General Indication – Output 2
Ind3	stVal	SPS	General Indication – Output 3
Ind4	stVal	SPS	General Indication – Output 4
Ind5	stVal	SPS	General Indication – Output 5
Ind6	stVal	SPS	General Indication – Output 6
Ind7	stVal	SPS	General Indication – Output 7
Ind8	stVal	SPS	General Indication – Output 8
Ind9	stVal	SPS	General Indication – Output 9
Ind10	stVal	SPS	General Indication – Output 10
Ind11	stVal	SPS	General Indication – Output 11
Ind12	stVal	SPS	General Indication – Virtual Output 12
Ind13	stVal	SPS	General Indication – Virtual Output 13
Ind14	stVal	SPS	General Indication – Virtual Output 14
Ind15	stVal	SPS	General Indication – Virtual Output 15
Ind16	stVal	SPS	General Indication – Virtual Output 16
Ind17	stVal	SPS	General Indication – Virtual Output 17
Ind18	stVal	SPS	General Indication – Virtual Output 18
Ind19	stVal	SPS	General Indication – Virtual Output 19
Ind20	stVal	SPS	General Indication – Virtual Output 20
Ind21	stVal	SPS	General Indication – Virtual Output 21
Ind22	stVal	SPS	General Indication – Virtual Output 22
Ind23	stVal	SPS	General Indication – Virtual Output 23
Ind24	stVal	SPS	General Indication – Virtual Output 24
Ind25	stVal	SPS	General Indication – Virtual Output 25
Ind26	stVal	SPS	General Indication – Virtual Output 26
Ind27	stVal	SPS	General Indication – Virtual Output 27
Ind28	stVal	SPS	General Indication – Virtual Output 28
Ind29	stVal	SPS	General Indication – Virtual Output 29
Ind30	stVal	SPS	General Indication – Virtual Output 30
Ind31	stVal	SPS	General Indication – Virtual Output 31
Ind32	stVal	SPS	General Indication – Virtual Output 32

Programmable Logic Control			
PREFIX	**LOGICAL NODE**	**INSTANCE**	**VALUE**
PGC	GGIO	1	PGCGGIO1
DATA OBJECTS			
Data Object Name	**Attribute Name**	**Common Data Class**	**Data Object Description**
STATUS INFORMATION			
Beh	stVal	ENS	Behavior
Ind1	stVal	SPS	General indication – Open Breaker
Ind2	stVal	SPS	General indication – Close Breaker
Ind3	stVal	SPS	General indication – 79 Block
Ind4	stVal	SPS	General indication – 79 Unblock
Ind5	stVal	SPS	General indication – Local Control
Ind6	stVal	SPS	General indication – Remote Control
Ind7	stVal	SPS	General indication – 52a
Ind8	stVal	SPS	General indication – 52b
Ind9	stVal	SPS	General indication – Setting group x1
Ind10	stVal	SPS	General indication – Setting group x2
Ind11	stVal	SPS	General indication – Hot Line Tag
Ind12	stVal	SPS	General indication – 79 Enable
Ind13	stVal	SPS	General indication – 79N1 Start
Ind14	stVal	SPS	General indication – 79N2 Start
Ind15	stVal	SPS	General indication – 79N3 Start
Ind16	stVal	SPS	General indication – 79N4 Start
Ind17	stVal	SPS	General indication – DFR Start
Ind18	stVal	SPS	General indication – 50BF Start
Ind19	stVal	SPS	General indication – SOTF Start
Ind20	stVal	SPS	General indication – Thermal I. Reset
Ind21	stVal	SPS	General indication – 74TCS Coil A
Ind22	stVal	SPS	General indication – 74TCS Coil B
Ind23	stVal	SPS	General indication – Neutral Block
Ind24	stVal	SPS	General indication – Phase Block
Ind25	stVal	SPS	General indication – External Trip
Ind26	stVal	SPS	General indication – Reset HMI
Ind27	stVal	SPS	General indication – 52 Open Block
Ind28	stVal	SPS	General indication – 52 Close Block
Ind29	stVal	SPS	General indication – empty
Ind30	stVal	SPS	General indication – PGC 1
Ind31	stVal	SPS	General indication – PGC 2
Ind32	stVal	SPS	General indication – PGC 3

Self-Diagnosis			
PREFIX	**LOGICAL NODE**	**INSTANCE**	**VALUE**
SELFD	GGIO	1	SELFDGGIO1
DATA OBJECTS			
Data Object Name	**Attribute Name**	**Common Data Class**	**Data Object Description**
STATUS INFORMATION			
Beh	stVal	ENS	Behavior
Alm1	stVal	SPS	General Single Alarm – Model error
Alm2	stVal	SPS	General Single Alarm – HW error
Alm3	stVal	SPS	General Single Alarm – COM error
Alm4	stVal	SPS	General Single Alarm – Settings default
Alm5	stVal	SPS	General Single Alarm – Settings error
Alm6	stVal	SPS	General Single Alarm – Config default
Alm7	stVal	SPS	General Single Alarm – Config error
Alm8	stVal	SPS	General Single Alarm – NVM Full
Ind1	stVal	SPS	General Indication – Test mode

25 - Synchrocheck			
PREFIX	**LOGICAL NODE**	**INSTANCE**	**VALUE**
F25	GGIO	1	F25GGIO1
DATA OBJECTS			
Data Object Name	**Attribute Name**	**Common Data Class**	**Data Object Description**
STATUS INFORMATION			
Beh	stVal	ENS	Behavior
Ind1	stVal	SPS	General Indication - DLDB
Ind2	stVal	SPS	General Indication – DLLB
Ind3	stVal	SPS	General Indication – LLDB
Ind4	stVal	SPS	General Indication – LLLB

27 - Instantaneous phase undervoltage			
PREFIX	**LOGICAL NODE**	**INSTANCE**	**VALUE**
F27P	GGIO	1 / 2	F27PGGIO1, F27PGGIO2
DATA OBJECTS			
Data Object Name	**Attribute Name**	**Common Data Class**	**Data Object Description**
STATUS INFORMATION			
Beh	stVal	ENS	Behavior
Alm1	stVal	SPS	General Single Alarm – 27 AB Trip
Alm2	stVal	SPS	General Single Alarm – 27 BC Trip
Alm3	stVal	SPS	General Single Alarm – 27 CA Trip
Ind1	stVal	SPS	General Indication – 27 AB Pickup
Ind2	stVal	SPS	General Indication – 27 BC Pickup
Ind3	stVal	SPS	General Indication – 27 CA Pickup

59 - Instantaneous phase overvoltage			
PREFIX	**LOGICAL NODE**	**INSTANCE**	**VALUE**
F59P	GGIO	1 / 2	F59PGGIO1, F59PGGIO2
DATA OBJECTS			
Data Object Name	**Attribute Name**	**Common Data Class**	**Data Object Description**
STATUS INFORMATION			
Beh	stVal	ENS	Behavior
Alm1	stVal	SPS	General Single Alarm – 59 AB Trip
Alm2	stVal	SPS	General Single Alarm – 59 BC Trip
Alm3	stVal	SPS	General Single Alarm – 59 CA Trip
Ind1	stVal	SPS	General Indication – 59 AB Pickup
Ind2	stVal	SPS	General Indication – 59 BC Pickup
Ind3	stVal	SPS	General Indication – 59 CA Pickup

60CTS - Phase CT Supervision			
PREFIX	**LOGICAL NODE**	**INSTANCE**	**VALUE**
F60CTS	GGIO	1	F60CTSGGIO1
DATA OBJECTS			
Data Object Name	**Attribute Name**	**Common Data Class**	**Data Object Description**
STATUS INFORMATION			
Beh	stVal	ENS	Behavior
Alm1	stVal	SPS	General Single Alarm – 60CTS Trip
Ind1	stVal	SPS	General Indication – 60CTS Pickup

60VTS - Phase VT supervision			
PREFIX	**LOGICAL NODE**	**INSTANCE**	**VALUE**
F60VTS	GGIO	1	F60VTSGGIO1
DATA OBJECTS			
Data Object Name	**Attribute Name**	**Common Data Class**	**Data Object Description**
STATUS INFORMATION			
Beh	stVal	ENS	Behavior
Alm1	stVal	SPS	General Single Alarm – 60VTS A Trip
Alm2	stVal	SPS	General Single Alarm – 60VTS B Trip
Alm3	stVal	SPS	General Single Alarm – 60VTS C Trip
Alm4	stVal	SPS	General Single Alarm – 60VTS Trip
Ind1	stVal	SPS	General Indication – 60VTS Pickup

4.4.4 Logical nodes for metering and measurement: M group

4.4.4.1 LN: Harmonics or interharmonics Name: MHAI

Total Harmonic Measurements				
PREFIX	**LOGICAL NODE**		**INSTANCE**	**VALUE**
BAR	MHAI		1	BARMHAI1
DATA OBJECTS				
Data Object Name	**Sub DO Name**	**Attribute Name**	**Common Data Class**	**Data Object Description**
STATUS INFORMATION				
Beh	stVal		ENS	Behavior
MEASURED ANS METERED VALUES				
HZ		mag	MV	Frequency
HA	phsA	mag	HWYE	Analogue Input – Phase A Second harmonic current
HA	phsB	mag	HWYE	Analogue Input – Phase B Second harmonic current
HA	phsC	mag	HWYE	Analogue Input – Phase C Second harmonic current
HA	neut	mag	HWYE	Analogue Input – Neutral Second harmonic current
ThdA	phsA	cVal instCVal	WYE	Analogue Input – Phase A total harmonic measurement
ThdA	phsB	cVal instCVal	WYE	Analogue Input – Phase B total harmonic measurement
ThdA	phsC	cVal instCVal	WYE	Analogue Input – Phase C total harmonic measurement

4.4.4.2 LN: Metering 3 Phase. Name: MMTR

Measurements				
PREFIX	**LOGICAL NODE**		**INSTANCE**	**VALUE**
BAR	MMTR		1	BARMMTR1
DATA OBJECTS				
Data Object Name	**Sub DO Name**	**Attribute Name**	**Common Data Class**	**Data Object Description**
STATUS INFORMATION				
Beh	stVal		ENS	Behavior
MEASURED ANS METERED VALUES				
SupWh	neut	cVal instCVal	BCR	Real energy supply (default supply direction: energy flow towards busbar)
SupVArh	phsA	cVal instCVal	BCR	Reactive energy supply (default supply direction: energy flow towards busbar
DmdWh	phsB	cVal instCVal	BCR	Real energy demand (default demand direction: energy flow from busbar away)
DmdVArh	phsC	cVal instCVal	BCR	Reactive energy demand (default demand direction: energy flow from busbar away)

4.4.4.3 LN: Measurement. Name: MMXU

Measurements on the Busbar					
PREFIX	**LOGICAL NODE**			**INSTANCE**	**VALUE**
BAR	MMXU			1	BARMMXU1
DATA OBJECTS					
Data Object Name	**Sub DO Name**	**Attribute Name**		**Common Data Class**	**Data Object Description**
STATUS INFORMATION					
Beh	stVal			ENS	Behavior
MEASURED ANS METERED VALUES					
A	phsA	cVal	mag ang	WYE	Phase A currents (I-A)
		instCVal	mag ang		
A	phsB	cVal	mag ang	WYE	Phase B current (I-B)
		instCVal	mag ang		
A	phsC	cVal	mag ang	WYE	Phase C current (I-C)
		instCVal	mag ang		
A	neut	cVal	mag ang	WYE	Neutral current (I-N)
		instCVal	mag ang		
PNV	phsA	cVal	mag ang	WYE	Phase to neutral voltage (V-A)
		instCVal	mag ang		
PNV	phsB	cVal	mag ang	WYE	Phase to neutral voltage (V-B)
		instCVal	mag ang		
PNV	phsC	cVal	mag ang	WYE	Phase to neutral voltage (V-C)
		instCVal	mag ang		
PNV	neut	cVal	mag ang	WYE	Phase to neutral voltage (V-R)
		instCVal	mag ang		
PPV	phsAB	cVal	mag ang	DEL	Phase to phase voltages (VL1, VL2, VL3) (U-AB)
		instCVal	mag ang		
PPV	phsBC	cVal	mag ang	DEL	Phase to phase voltages (VL1, VL2, VL3) (U-BC)
		instCVal	mag ang		

PPV	phsCA	cVal	mag ang	DEL	Phase to phase voltages (VL1, VL2, VL3) (U-CA)
		instCVal	mag ang		
MaxAPhs		mag instMag		MV	Maximum magnitude of current of the 3 phases. Max(Ia,Ib,Ic) (I-MAX)
MaxPhVPhs		mag instMag		MV	Maximum magnitude of phase to reference voltage of the 3 phases. Max (PhVa, PhVb, PhVc)
Hz		mag instMag		MV	Frequency
TotW		mag instMag		MV	Total active power (P-3P)
TotVAr		mag instMag		MV	Total reactive power (Q-3P)
TotVA		mag instMag		MV	Total apparent power (S-3P)
TotPF		mag instMag		MV	Average Power Factor (cos ϕ)
W	phsA	cVal	mag	WYE	Phase active power (P-A)
		instCVal	mag		
VAr	phsA	cVal	mag	WYE	Phase reactive power (Q-A)
		instCVal	mag		
VA	phsA	cVal	mag	WYE	Phase apparent power (S-A)
		instCVal	mag		
PF	phsA	cVal	mag	WYE	Phase A power Factor (cos ϕA)
		instCVal	mag		
W	phsB	cVal	mag	WYE	Phase active power (P-B)
		instCVal	mag		
VAr	phsB	cVal	mag	WYE	Phase reactive power (Q-B)
		instCVal	mag		
VA	phsB	cVal	mag	WYE	Phase apparent power (S-B)
		instCVal	mag		
PF	phsB	cVal	mag	WYE	Phase A power Factor (cos ϕB)
		instCVal	mag		
W	phsC	cVal	mag	WYE	Phase active power (P-C)
		instCVal	mag		
VAr	phsC	cVal	mag	WYE	Phase reactive power (Q-C)
		instCVal	mag		
VA	phsC	cVal	mag	WYE	Phase apparent power (S-C)
		instCVal	mag		
PF	phsC	cVal	mag	WYE	Phase A power Factor (cos ϕC)
		instCVal	mag		

Measurements on the Line					
PREFIX	**LOGICAL NODE**			**INSTANCE**	**VALUE**
LINE	MMXU			1	LINEMMXU1
DATA OBJECTS					
Data Object Name	**Sub DO Name**	**Attribute Name**		**Common Data Class**	**Data Object Description**
STATUS INFORMATION					
Beh	stVal			ENS	Behavior
MEASURED ANS METERED VALUES					
Hz		mag instMag		MV	Frequency
PNV	phsB	cVal instCVal	mag ang mag ang	WYE	Phase to neutral voltage (V-L)

Fault measurements on the Busbar					
PREFIX	**LOGICAL NODE**			**INSTANCE**	**VALUE**
DFRB	MMXU			1	DFRBMMXU1
DATA OBJECTS					
Data Object Name	**Sub DO Name**	**Attribute Name**		**Common Data Class**	**Data Object Description**
STATUS INFORMATION					
Beh	stVal			ENS	Behavior
MEASURED ANS METERED VALUES					
A	phsA	cVal	mag	CMV	Phase A fault current (I-A)
A	phsB	cVal	mag	CMV	Phase B fault current (I-B)
A	phsC	cVal	mag	CMV	Phase C fault current (I-C)
A	neut	cVal	mag	CMV	Neutral fault current (I-N)
PNV	phsA	cVal	mag	CMV	Phase to neutral fault voltage (V-A)
PNV	phsB	cVal	mag	CMV	Phase to neutral fault voltage (V-B)
PNV	phsC	cVal	mag	CMV	Phase to neutral fault voltage (V-C)
PNV	neut	cVal	mag	CMV	Phase to neutral fault voltage (V-R)
Hz		mag		MV	Fault frequency

Fault measurements on the Line					
PREFIX	**LOGICAL NODE**			**INSTANCE**	**VALUE**
DFRL	MMXU			1	DFRLMMXU1
DATA OBJECTS					
Data Object Name	**Sub DO Name**	**Attribute Name**		**Common Data Class**	**Data Object Description**
STATUS INFORMATION					
Beh	stVal			ENS	Behavior
MEASURED ANS METERED VALUES					
PNV	phsB	cVal	mag	CMV	Phase to neutral line fault voltage (V-L)

4.4.4.4 LN: Sequence and imbalance. Name: MSQI

Measurements					
PREFIX	**LOGICAL NODE**			**INSTANCE**	**VALUE**
BAR	MSQI			1	BARMSQI1
DATA OBJECTS					
Data Object Name	**Sub DO Name**	**Attribute Name**		**Common Data Class**	**Data Object Description**
STATUS INFORMATION					
Beh	stVal			ENS	Behavior
MEASURED ANS METERED VALUES					
SeqA	c1	cVal	mag	CMV	Positive, negative and zero sequence current – Positive (I-1)
		instCVal	mag		
SeqA	c2	cVal	mag	CMV	Positive, negative and zero sequence current – Negative (I-2)
		instCVal	mag		
SeqA	c3	cVal	mag ang	CMV	Positive, negative and zero sequence current – Zero (3I-0)
		instCVal	mag ang		
SeqA		seqT		MX	Dir-quad-zero
SeqV	c1	cVal	mag	CMV	Positive, negative and zero sequence voltage – Positive (V-1)
		instCVal	mag		
SeqV	c2	cVal	mag	CMV	Positive, negative and zero sequence voltage – Negative (V-2)
		instCVal	mag		
SeqV	c3	cVal	mag ang	CMV	Positive, negative and zero sequence voltage – Zero (3V-0)
		instCVal	mag ang		
SeqV		seqT		MX	Dir-quad-zero

4.4.5 Logical nodes for protection functions: P group

4.4.5.1 LN: Differential. Name: PDIF

64REF - Restricted Earth Fault			
PREFIX	**LOGICAL NODE**	**INSTANCE**	**VALUE**
F64REF	PDIF	1	F64REFPDIF1
DATA OBJECTS			
Data Object Name	**Attribute Name**	**Common Data Class**	**Data Object Description**
STATUS INFORMATION			
Beh	stVal	ENS	Behavior
Str	general	ACD	Start
Op	general	ACT	Operate

4.4.5.2 LN: Directional overpower. Name: PDOP

32-1 / 32-2 / 32-3 / 32-4 – Directional overpower			
PREFIX	**LOGICAL NODE**	**INSTANCE**	**VALUE**
F32	PDOP	1 / 2 / 3 / 4	F32PDOP1 / F32PDOP2 / F32PDOP3 / F32PDOP4
DATA OBJECTS			
Data Object Name	**Attribute Name**	**Common Data Class**	**Data Object Description**
STATUS INFORMATION			
Beh	stVal	ENS	Behavior
Str	dirGeneral	ACD	Start
Str	dirPhsA	ACD	Start
Str	dirPhsB	ACD	Start
Str	dirPhsC	ACD	Start
Str	general	ACD	Start
Str	phsA	ACD	Start
Str	phsB	ACD	Start
Str	phsC	ACD	Start
Op	general	ACT	Operate
Op	phsA	ACT	Operate
Op	phsB	ACT	Operate
Op	phsC	ACT	Operate

4.4.5.3 LN: Rate of change of frequency. Name PFRC

81R-1 / 81R-2 / 81R-3 / 81R-4 – Rate of change of frequency (ROCOF)			
PREFIX	**LOGICAL NODE**	**INSTANCE**	**VALUE**
F81R	PFRC	1 / 2 / 3 / 4	F81RPFRC1 / F81RPFRC2 / F81RPFRC3 / F81RPFRC4
DATA OBJECTS			
Data Object Name	**Attribute Name**	**Common Data Class**	**Data Object Description**
STATUS INFORMATION			
Beh	stVal	ENS	Behavior
BlkV	stVal	SPS	Blocked because of voltage
Str	dirGeneral	ACD	Start
Str	general	ACD	Start
Op	general	ACT	Operate

4.4.5.4 LN: Harmonic restraint. Name: PHAR

SHB – Second Harmonic Blocking			
PREFIX	**LOGICAL NODE**	**INSTANCE**	**VALUE**
FSHB	PHAR	1	FSHBPHAR1
DATA OBJECTS			
Data Object Name	**Attribute Name**	**Common Data Class**	**Data Object Description**
STATUS INFORMATION			
Beh	stVal	ENS	Behavior
Str	general	ACD	Start
Str	phsA	ACD	Start
Str	phsB	ACD	Start
Str	phsC	ACD	Start

4.4.5.5 LN: Instantaneous Overcurrent. Name: PIOC

50-1 / 50-2 – Instantaneous phase overcurrent			
PREFIX	**LOGICAL NODE**	**INSTANCE**	**VALUE**
F50P	PIOC	1 / 2	F50PPIOC1 / F50PPIOC2
DATA OBJECTS			
Data Object Name	**Attribute Name**	**Common Data Class**	**Data Object Description**
STATUS INFORMATION			
Beh	stVal	ENS	Behavior
Str	general	ACD	Start
Str	phsA	ACD	Start
Str	phsB	ACD	Start
Str	phsC	ACD	Start
Op	general	ACT	Operate
Op	phsA	ACT	Operate
Op	phsB	ACT	Operate
Op	phsC	ACT	Operate

50G – Instantaneous measured neutral overcurrent			
PREFIX	**LOGICAL NODE**	**INSTANCE**	**VALUE**
F50G	PIOC	1	F50GPIOC1
DATA OBJECTS			
Data Object Name	**Attribute Name**	**Common Data Class**	**Data Object Description**
STATUS INFORMATION			
Beh	stVal	ENS	Behavior
Str	general	ACD	Start
Op	general	ACT	Operate

50N – Instantaneous calculated neutral overcurrent			
PREFIX	**LOGICAL NODE**	**INSTANCE**	**VALUE**
F50N	PIOC	1	F50NPIOC1
DATA OBJECTS			
Data Object Name	**Attribute Name**	**Common Data Class**	**Data Object Description**
STATUS INFORMATION			
Beh	stVal	ENS	Behavior
Str	general	ACD	Start
Op	general	ACT	Operate

46BC – Broken conductor detection			
PREFIX	**LOGICAL NODE**	**INSTANCE**	**VALUE**
F46BC	PIOC	1	F46BCPIOC1
DATA OBJECTS			
Data Object Name	**Attribute Name**	**Common Data Class**	**Data Object Description**
STATUS INFORMATION			
Beh	stVal	ENS	Behavior
Str	general	ACD	Start
Op	general	ACT	Operate

SOTF – Switch on To Fault			
PREFIX	**LOGICAL NODE**	**INSTANCE**	**VALUE**
SOTF	PIOC	1	SOTFPIOC1
DATA OBJECTS			
Data Object Name	**Attribute Name**	**Common Data Class**	**Data Object Description**
STATUS INFORMATION			
Beh	stVal	ENS	Behavior
Str	general	ACD	Start
Str	phsA	ACD	Start
Str	phsB	ACD	Start
Str	phsC	ACD	Start
Op	general	ACT	Operate
Op	phsA	ACT	Operate
Op	phsB	ACT	Operate
Op	phsC	ACT	Operate

4.4.5.6 LN: Phase angle measuring. Name PPAM

78 – Out of Step (Vector shift)			
PREFIX	**LOGICAL NODE**	**INSTANCE**	**VALUE**
F78	PPAM	1	F78PPAM1
DATA OBJECTS			
Data Object Name	**Attribute Name**	**Common Data Class**	**Data Object Description**
STATUS INFORMATION			
Beh	stVal	ENS	Behavior
Op	general	ACT	Operate

4.4.5.7 LN: Time overcurrent. Name: PTOC

(*) Status defined as unknow (0), forward (1) and reverse (2).

67/51-1 / 67/51-2 / 67/51-3 / 67/51-4 – Inverse time directional phase overcurrent			
PREFIX	**LOGICAL NODE**	**INSTANCE**	**VALUE**
F67P51P	PTOC	1 / 2 / 3 / 4	F67P51PPTOC1 / F67P51PPTOC2 / F67P51PPTOC3 / F67P51PPTOC4
DATA OBJECTS			
Data Object Name	**Attribute Name**	**Common Data Class**	**Data Object Description**
STATUS INFORMATION			
Beh	stVal	ENS	Behavior
Str	dirGeneral	ACD	Start (*)
Str	dirPhsA	ACD	Start (*)
Str	dirPhsB	ACD	Start (*)
Str	dirPhsC	ACD	Start (*)
Str	general	ACD	Start
Str	phsA	ACD	Start
Str	phsB	ACD	Start
Str	phsC	ACD	Start
Op	general	ACT	Operate
Op	phsA	ACT	Operate
Op	phsB	ACT	Operate
Op	phsC	ACT	Operate

67/51G-1 / 67/51G-2 – Inverse time directional measured neutral overcurrent

PREFIX	LOGICAL NODE	INSTANCE	VALUE
F67G51G	PTOC	1 / 2	F67G51GPTOC1 / F67G51GPTOC1
DATA OBJECTS			
Data Object Name	**Attribute Name**	**Common Data Class**	**Data Object Description**
STATUS INFORMATION			
Beh	stVal	ENS	Behavior
Str	dirGeneral	ACD	Start (*)
Str	general	ACD	Start
Op	general	ACT	Operate

67/51N-1 / 67/51N-2 – Inverse time directional calculated neutral overcurrent			
PREFIX	**LOGICAL NODE**	**INSTANCE**	**VALUE**
F67N51N	PTOC	1 / 2	F67N51NPTOC1 / F67N51NPTOC2
DATA OBJECTS			
Data Object Name	**Attribute Name**	**Common Data Class**	**Data Object Description**
STATUS INFORMATION			
Beh	stVal	ENS	Behavior
Str	dirGeneral	ACD	Start (*)
Str	general	ACD	Start
Op	general	ACT	Operate

46 – Phase balance current protection			
PREFIX	**LOGICAL NODE**	**INSTANCE**	**VALUE**
F46	PTOC	1	F46PTOC1
DATA OBJECTS			
Data Object Name	**Attribute Name**	**Common Data Class**	**Data Object Description**
STATUS INFORMATION			
Beh	stVal	ENS	Behavior
Str	general	ACD	Start
Op	general	ACT	Operate

67GI – Directional isolated measured neutral overcurrent			
PREFIX	**LOGICAL NODE**	**INSTANCE**	**VALUE**
F67GI	PTOC	1	F67GIPTOC1
DATA OBJECTS			
Data Object Name	**Attribute Name**	**Common Data Class**	**Data Object Description**
STATUS INFORMATION			
Beh	stVal	ENS	Behavior
Str	dirGeneral	ACD	Start (*)
Str	general	ACD	Start
Op	general	ACT	Operate

67NI– Directional isolated calculated neutral overcurrent			
PREFIX	**LOGICAL NODE**	**INSTANCE**	**VALUE**
F67NI	PTOC	1	F67NIPTOC1
DATA OBJECTS			
Data Object Name	**Attribute Name**	**Common Data Class**	**Data Object Description**
STATUS INFORMATION			
Beh	stVal	ENS	Behavior
Str	dirGeneral	ACD	Start (*)
Str	general	ACD	Start
Op	general	ACT	Operate

4.4.5.8 LN: Overfrequency. Name: PTOF

81-1 / 81-2 / 81-3 / 81-4 / 81-5 – Overfrequency			
PREFIX	**LOGICAL NODE**	**INSTANCE**	**VALUE**
F81	PTOF	1 / 2 / 3 / 4 / 5	F81PTOF1 / F81PTOF2 / F81PTOF3 / F81PTOF4 / F81PTOF5
DATA OBJECTS			
Data Object Name	**Attribute Name**	**Common Data Class**	**Data Object Description**
STATUS INFORMATION			
Beh	stVal	ENS	Behavior
BlkV	stVal	SPS	Blocked because of voltage
Str	general	ACD	Start
Op	general	ACT	Operate

4.4.5.9 LN: Overvoltage. Name: PTOV

59-1 / 59-2 – Instantaneous phase overvoltage (Bus bar)			
PREFIX	**LOGICAL NODE**	**INSTANCE**	**VALUE**
F59P	PTOV	1 / 2	F59PPTOV1 / F59PPTOV2
DATA OBJECTS			
Data Object Name	**Attribute Name**	**Common Data Class**	**Data Object Description**
STATUS INFORMATION			
Beh	stVal	ENS	Behavior
Str	general	ACD	Start
Str	phsA	ACD	Start
Str	phsB	ACD	Start
Str	phsC	ACD	Start
Op	general	ACT	Operate
Op	phsA	ACT	Operate
Op	phsB	ACT	Operate
Op	phsC	ACT	Operate

59N/G-1 / 59N/G-2 – Instantaneous calculated / measured neutral overvoltage (Bus bar)			
PREFIX	**LOGICAL NODE**	**INSTANCE**	**VALUE**
F59NG	PTOV	1 / 2	F59NGPTOV1 / F59NGPTOV2
DATA OBJECTS			
Data Object Name	**Attribute Name**	**Common Data Class**	**Data Object Description**
STATUS INFORMATION			
Beh	stVal	ENS	Behavior
Str	general	ACD	Start
Op	general	ACT	Operate

59L – Instantaneous phase overvoltage (Line)			
PREFIX	**LOGICAL NODE**	**INSTANCE**	**VALUE**
F59L	PTOV	1	F59LPTOV1
DATA OBJECTS			
Data Object Name	**Attribute Name**	**Common Data Class**	**Data Object Description**
STATUS INFORMATION			
Beh	stVal	ENS	Behavior
Str	general	ACD	Start
Op	general	ACT	Operate

47 – Phase balance voltage protection (Bus bar)			
PREFIX	**LOGICAL NODE**	**INSTANCE**	**VALUE**
F47	PTOV	1	F47PTOV1
DATA OBJECTS			
Data Object Name	**Attribute Name**	**Common Data Class**	**Data Object Description**
STATUS INFORMATION			
Beh	stVal	ENS	Behavior
Str	general	ACD	Start
Op	general	ACT	Operate

4.4.5.10 LN: Protection trip conditioning. Name: PTRC

General Trips Status			
PREFIX	**LOGICAL NODE**	**INSTANCE**	**VALUE**
GEN	PTRC	1	GENPTRC1
DATA OBJECTS			
Data Object Name	**Attribute Name**	**Common Data Class**	**Data Object Description**
STATUS INFORMATION			
Beh	stVal	ENS	Behavior
Tr	general	ACT	Trip
Str	general	ACD	Start
Str	phsA	ACD	Start
Str	phsB	ACD	Start
Str	phsC	ACD	Start
Str	neut	ACD	Start
Op	general	ACT	Operate
Op	phsA	ACT	Trip
Op	phsB	ACT	Trip
Op	phsC	ACT	Trip
Op	neut	ACT	Trip

4.4.5.11 LN: Thermal overload. Name: PTTR

49 - Thermal Overload			
PREFIX	**LOGICAL NODE**	**INSTANCE**	**VALUE**
F49	PTTR	1	F49PTTR1
DATA OBJECTS			
Data Object Name	**Attribute Name**	**Common Data Class**	**Data Object Description**
STATUS INFORMATION			
Beh	stVal	ENS	Behavior
AlmThm	stVal	SPS	Thermal Alarm
Op	general	ACT	Operate
MEASURED AND METERED VALUES			
TmpRl	mag instMag	MV	Relation between temperature and maximum temperature

4.4.5.12 LN: Undercurrent. Name: PTUC

37 - Instantaneous phase undercurrent			
PREFIX	**LOGICAL NODE**	**INSTANCE**	**VALUE**
F37P	PTUC	1	F37PPTUC1
DATA OBJECTS			
Data Object Name	**Attribute Name**	**Common Data Class**	**Data Object Description**
STATUS INFORMATION			
Beh	stVal	ENS	Behavior
Str	general	ACD	Start
Str	phsA	ACD	Start
Str	phsB	ACD	Start
Str	phsC	ACD	Start
Op	general	ACT	Operate
Op	phsA	ACT	Operate
Op	phsB	ACT	Operate
Op	phsC	ACT	Operate

4.4.5.13 LN: Underfrequency. Name: PTUF

81-1 / 81-2 / 81-3 / 81-4 / 81-5 – Underfrequency			
PREFIX	**LOGICAL NODE**	**INSTANCE**	**VALUE**
F81	PTUF	1 / 2 / 3 / 4 / 5	F81PTUF1 / F81PTUF2 / F81PTUF3 / F81PTUF4 / F81PTUF5
DATA OBJECTS			
Data Object Name	**Attribute Name**	**Common Data Class**	**Data Object Description**
STATUS INFORMATION			
Beh	stVal	ENS	Behavior
Str	general	ACD	Start
BlkV	stVal	SPS	Blocked because of voltage
Op	general	ACT	Operate

4.4.5.14 LN: Undervoltage. Name: PTUV

27-1 / 27-2 – Instantaneous phase undervoltage (Bus bar)			
PREFIX	**LOGICAL NODE**	**INSTANCE**	**VALUE**
F27P	PTUV	1 / 2	F27PPTUV1 / F27PPTUV2
DATA OBJECTS			
Data Object Name	**Attribute Name**	**Common Data Class**	**Data Object Description**
STATUS INFORMATION			
Beh	stVal	ENS	Behavior
Str	general	ACD	Start
Str	phsA	ACD	Start
Str	phsB	ACD	Start
Str	phsC	ACD	Start
Op	general	ACT	Operate
Op	phsA	ACT	Operate
Op	phsB	ACT	Operate
Op	phsC	ACT	Operate

27V1 – Instantaneous positive sequence undervoltage (Bus bar)			
PREFIX	**LOGICAL NODE**	**INSTANCE**	**VALUE**
F27V1	PTUV	1	F27V1PTUV1
DATA OBJECTS			
Data Object Name	**Attribute Name**	**Common Data Class**	**Data Object Description**
STATUS INFORMATION			
Beh	stVal	ENS	Behavior
Str	general	ACD	Start
Op	general	ACT	Operate

27L – Instantaneous phase undervoltage (Line)			
PREFIX	**LOGICAL NODE**	**INSTANCE**	**VALUE**
F27L	PTUV	1	F27LPTUV1
DATA OBJECTS			
Data Object Name	**Attribute Name**	**Common Data Class**	**Data Object Description**
STATUS INFORMATION			
Beh	stVal	ENS	Behavior
Str	general	ACD	Start
Op	general	ACT	Operate

4.4.5.15 LN: Volts per Hz. Name: PVPH

24 – Overfluxing			
PREFIX	**LOGICAL NODE**	**INSTANCE**	**VALUE**
F24	PVPH	1 / 2	F24PVPH1 / F24PVPH2
DATA OBJECTS			
Data Object Name	**Attribute Name**	**Common Data Class**	**Data Object Description**
STATUS INFORMATION			
Beh	stVal	ENS	Behavior
Str	general	ACD	Start
Op	general	ACT	Operate

4.4.6 Logical nodes for protection related functions: R group

4.4.6.1 LN: Breaker failure. Name: RBRF

50BF – Circuit Breaker opening failure			
PREFIX	**LOGICAL NODE**	**INSTANCE**	**VALUE**
F50BF	RBRF	1	F50BFRBRF1
DATA OBJECTS			
Data Object Name	**Attribute Name**	**Common Data Class**	**Data Object Description**
STATUS INFORMATION			
Beh	stVal	ENS	Behavior
Str	general	ACD	Start
OpEx	general	ACT	Breaker failure trip
OpIn	general	ACT	Breaker failure backup trip

4.4.6.2 LN: Autoreclosing. Name: RREC

79 – AC Reclosing device			
PREFIX	**LOGICAL NODE**	**INSTANCE**	**VALUE**
F79	RREC	1	F79RREC1
DATA OBJECTS			
Data Object Name	**Attribute Name**	**Common Data Class**	**Data Object Description**
STATUS INFORMATION			
Beh	stVal	ENS	Behavior
RecCyc	stVal	INS	Actual reclose cycle (number between 1 and UseCyc) (**)
OpCls	general	ACT	Operation ”close switch” issued to close the XCBR
AutoRecSt	stVal	ENS	Auto reclosing status (*)

(*) Automaton for reclosing device has the following states and values :

- Standby (Ready) – AutoRecSt.stVal = 1.
- Reclosing time (In progress) – AutoRecSt.stVal = 2.
- IS 52 Open? (Waiting for trip) – AutoRecSt.stVal = 4.
- Hold time – AutoRecSt.stVal = 8.
- Closing Time – AutoRecSt.stVal = 16.
- Reset Time – AutoRecSt.stVal = 32.
- Lockout – AutoRecSt.stVal = 64.
- Safe Time - AutoRecSt.stVal = 128.

(**) This number is updated after the reclosing attempt (Closing Time).

4.4.6.3 LN: Synchronism-check. Name: RSYN

25 – Synchronism check			
PREFIX	**LOGICAL NODE**	**INSTANCE**	**VALUE**
F25	RSYN	1	F25RSYN1
DATA OBJECTS			
Data Object Name	**Attribute Name**	**Common Data Class**	**Data Object Description**
STATUS INFORMATION			
Beh	stVal	ENS	Behavior
Rel	stVal	SPS	Release
VInd	stVal	SPS	Voltage difference indicator
AngInd	stVal	SPS	Angle difference indicator
HzInd	stVal	SPS	Frequency difference indicator

4.4.7 Logical nodes for supervision and monitoring: S group

4.4.7.1 LN: Monitoring and diagnostics for arcs. Name: SARC

(*) Only available for model with AFD inputs: SILGxxxxxxAxxx.

AFD – Arc Flash Detector			
PREFIX	**LOGICAL NODE**	**INSTANCE**	**VALUE**
FAFD	SARC	1 / 2 / 3 / 4	FAFDSARC1 / FAFDSARC2 / FAFDSARC3 / FAFDSARC4
DATA OBJECTS			
Data Object Name	**Attribute Name**	**Common Data Class**	**Data Object Description**
STATUS INFORMATION			
Beh	stVal	ENS	Behavior
FADet	stVal	SPS	Fault arc detected
FACntRs	stVal	SPS	Fault arc counter – Not available
CONTROLS			
FACntRs	ctlModel	INC	Fault arc counter – Not available

4.4.7.2 LN: Circuit breaker supervision. Name: SCBR

74TCS – Trip Circuit Supervision			
PREFIX	**LOGICAL NODE**	**INSTANCE**	**VALUE**
F74TCS	SCBR	1	F74TCSSCBR1
DATA OBJECTS			
Data Object Name	**Attribute Name**	**Common Data Class**	**Data Object Description**
STATUS INFORMATION			
Beh	stVal	ENS	Behavior
ColOpn	stVal	SPS	Open Command of trip coil
ColAlm	stVal	SPS	Coil Alarm
OpCntAlm	stVal	SPS	Number of operations has exceeded the alarm level for number of operations

4.4.8 Logical nodes for switchgear: X group

4.4.8.1 LN: Circuit breaker. Name: XCBR

52 – Circuit Breaker Monitoring			
PREFIX	**LOGICAL NODE**	**INSTANCE**	**VALUE**
F52	XCBR	1	F52XCBR1
DATA OBJECTS			
Data Object Name	**Attribute Name**	**Common Data Class**	**Data Object Description**
STATUS INFORMATION			
Beh	stVal	ENS	Behavior
BlkCls	stVal	SPC	Block closing
BlkOpn	stVal	SPC	Block opening
Loc	stVal	SPS	Local control behavior
OpCnt	stVal	INS	Operation counter
Pos	stVal	DPC	Switch position: - 00 Intermediate position - 01 Open - 10 Closed - 11 Error
CONTROLS			
BlkCls	ctlModel	SPC	Block closing – Only Status available
BlkOpn	ctlModel	SPC	Block opening – Only Status available
Pos	ctlModel	DPC	Switch position
MEASURED ANS METERED VALUES			
SumSwARs	actVal	BCR	Sum of switches amperes (k(A^2)), resettable.

On the communication protocol despite units are indicated as A^2 the quantity is expressed in k(A^2).

5 TICS - TISSUES Implementation Conformance Statement

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

“Implemented by server”:

”Y”: means that the server has implemented the respective tissue.

“ni”: No impact on testing

“na”: not applicable if the server does not support the corresponding ACSI service(s)

“Supported by client”:

”Y”: means that the client supports servers that have implemented the respective tissue.

“ni”: No impact on testing

“na”: not applicable if the client does not support the corresponding ACSI service(s)

Part 7-2 Tissue	Description	Implemented by Server	Supported by Client
1676	Multiple figures	ni	na
1679	GoEna behavior at startup	Y	na
1681	LActTm representation is not actual	na	na
1696	Blocked/Test-blocked does not impact CSWI -> XCBR interface	ni	na
1697	Status texts	ni	na
1702	Limit LTRK to one instance on a server	Y	na
1703	Cancel for a select in SBOns	ni	na
1707	Integrity will be buffered	Y	na
1719	Service ID in ACSI conformance statement	ni	na
1735	Control cancel support is mandatory if SBO or SBOw is supported	ni	na
1742	ACSI client abort and release requirements in conformance tables	ni	na

Part 7-3 Tissue	Description	Implemented by Server	Supported by Client
1699	dbRef should not be mandatory for APC and BAC	na	na
1713	SIUnitKind new values in AMD1 versus consolidated version	ni	na
1714	Description of attribute ‘general’ in AMD1 versus consolidated version	ni	na

TICS Revision History

Version	Date	Who	Why
Original	2022-02-17	RS	Original from Ed2Am1 Server Test Procedures Rev1.2

6 FNX61850 – Configuration software

The latest version of FNX61850 software can be found on Fanox Web page:

https://www.fanox.com/downloads/



The default license is a DEMO mode as it can be seen on the software name on the top left part of the screen after the installation.

To unlock the functionality, it's necessary to add the client license from the management screen. It can be found on the following path inside the installation folder:

FNX61850 → extrsc → lic → license.lic

An installation guide is available in the web page with step by step guide on installation and license activation.

The user manual is included on the software and can be found on the "Help" button.



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