

7SR181

Line Differential Protection Relays

IEC 61850 PIXIT, PICS, TICS

Document Release History

This document is issue 2016/11. The list of revisions up to and including this issue is:

2016/11	First issue
---------	-------------

Software Revision History

2016/11	2436H80016 R4d-1b (7SR181)	First IEC 61850 Release
---------	----------------------------	-------------------------

The copyright and other intellectual property rights in this document, and in any model or article produced from it (and including any registered or unregistered design rights) are the property of Siemens Protection Devices Limited. No part of this document shall be reproduced or modified or stored in another form, in any data retrieval system, without the permission of Siemens Protection Devices Limited, nor shall any model or article be reproduced from this document unless Siemens Protection Devices Limited consent.

While the information and guidance given in this document is believed to be correct, no liability shall be accepted for any loss or damage caused by any error or omission, whether such error or omission is the result of negligence or any other cause. Any and all such liability is disclaimed.

Contents

DOCUMENT RELEASE HISTORY	1
SOFTWARE REVISION HISTORY.....	1
1. PROTOCOL IMPLEMENTATION EXTRA INFORMATION FOR TESTING (PIXIT)	7
1.1 General	7
1.2 Association model	8
1.3 Server model.....	9
1.4 Data set model	10
1.5 Setting group control model	11
1.6 Reporting model	12
1.7 GOOSE publish model	14
1.8 GOOSE subscribe model	15
1.9 Control model.....	17
1.10 Time and time synchronisation model.....	20
1.11 File transfer model.....	21
1.12 General items.....	22
1.13 TICS - Technical Issues Implementation Conformance Statement.....	23
1.13.1 TISSUES Edition 1	23
1.13.1 TISSUES Edition 2	25
2. IEC 61850 CONFORMANCE STATEMENTS.....	26
2.1 Definitions of the ISO/OSI Reference Model	27
2.2 Definition of the Communication Services Acc. to Standard (PICS).....	28
2.2.1 Profile Compliance.....	28
2.3 Model Implementation Conformance Statement (MICS)	34
3. FUNCTION PARAMETERS 7SR181	35
3.1 Line Differential	35
3.2 Differential High Set.....	35
3.3 Differential Intertrip	35
3.4 Intertrip.....	35
3.5 Line Check.....	35
3.6 Phase Overcurrent	36
3.7 Derived E/F	36
3.8 Measured E/F.....	37
3.9 NPS Overcurrent	37
3.10 Under Current	37
3.11 Auto-reclose.....	38
3.12 Thermal Overload.....	38
3.13 CB Fail.....	38
3.14 Broken Conductor.....	38
3.15 Inrush Detector.....	38
3.16 Current Measurements	38
3.17 Current Sequence Components Measurements.....	38
3.18 Voltage Measurements.....	39

3.19	Voltage Sequence Components Measurements.....	39
3.20	Frequency Measurement.....	39
3.21	Power Measurements	39
3.22	Energy Measurements	40
3.23	Circuit Breaker Counters	40
3.24	Circuit Breaker.....	40
3.25	Demand Measurements	40
3.26	User Single Point I/P Values.....	42
3.27	User Single Point O/P Values	43
3.28	User Double Point I/P Values	43
3.29	User Double Point O/P Values.....	44
3.30	User Single Point Control Values	44
3.31	User Double Point Control Values.....	44
3.32	Binary I/P Status Values.....	45
3.33	Binary O/P Status Values	45
3.34	Quick Logic Equation Status Values	45
3.35	LED Status Values.....	46
3.36	Virtuals Status Values	46
4.	MAPPING	47
4.1	Device (LPHD1).....	48
4.2	Protection Trip Conditioning (PTRC1)	49
4.3	Control LLN0 (CTRL/LLN0)	50
4.4	Protection LLN0 (PROT/LLN0)	51
4.5	Line Differential 87L-1, 87L-2 (A87LPDIF1, A87LPDIF2)	52
4.6	Differential High Set 87HS-1, 87HS-2 (A87HsPDIF1, A87HsPDIF2)	54
4.7	Differential Intertrip (A87R2GGIO1)	55
4.8	Differential Intertrip (A87S2GGIO1).....	56
4.9	Intertrip (A85R6GGIO1).....	57
4.10	Intertrip (A85S6GGIO1).....	58
4.11	Line Check 50LC-1, 50LC-2 (A50LCPTOC1, A50LCPTOC2).....	59
4.12	Line Check 50G LC-1, 50G LC-2 (A50gLCPTOC1, A50gLCPTOC2).....	61
4.13	Overcurrent Protection 51-1, 51-2, 51-3 & 51-4 (A51PTOC1, A51PTOC2, A51PTOC3, A51PTOC4)	62
4.14	Overcurrent Protection 50-1, 50-2, 50-3 & 50-4 (A50PTOC1, A50PTOC2, A50PTOC3, A50PTOC4).....	64
4.15	Derived E/F Protection 51N-1, 51N-2, 51N-3 & , 51N-4 (A51nPTOC1, A51nPTOC2, A51nPTOC3, A51nPTOC4)	67
4.16	Derived E/F Protection 50N-1, 50N-2, 50N-3 & 50N-4 (A50nPTOC1, A50nPTOC2, A50nPTOC3, A50nPTOC4)	68
4.17	Measured E/F Protection 51G-1, 51G-2, 51G-3 & 51G-4 (A51gPTOC1, A51gPTOC2, A51gPTOC3, A51gPTOC4)	69
4.18	Measured E/F Protection 50G-1, 50G-2, 50G-3 & 50G-4 (A50gPTOC1, A50gPTOC2, A50gPTOC3, A50gPTOC4)	70
4.19	Negative Sequence Protection 46DT, 46IT (A46ItPTOC1, A46DtPTOC1)	71
4.20	Under Current Protection 37-1 & 37-2 (A37PTUC1, A37PTUC2)	72
4.21	Under Current Protection 37G-1 & 37G2 (A37gPTUC1, A37gPTUC2).....	74

4.22	Thermal Overload 49 (A49PTTR1).....	75
4.23	CB Fail 50BF (A50BfRBRF1).....	76
4.24	Broken Conductor 46BC (A46BcPTOC1).....	77
4.25	Inrush Detector 81HBL2 (A81Hb2PHAR1).....	78
4.26	Measurement (MMXU1).....	79
4.27	Demand Measurement (MeanMMXU1, MaxMMXU1, MinMMXU1).....	84
4.28	Measurement (I_MSQI1).....	89
4.29	Measurement (V_MSQI1).....	90
4.30	Energy Measurements (MMTR1).....	91
4.31	Autoreclosing (A79RREC1).....	93
4.32	Interlocking (Q0CILO1).....	94
4.33	Switch controller (Q0CSWI1).....	95
4.34	Circuit Breaker (Q0XCBR1).....	96
4.35	Inrush Detector Measurement (Har2MMXU1).....	98
4.36	Circuit Breaker Counters (CntDelGGIO1, CntLoGGIO1, CntEFGGIO1, CntPhAGGIO1, CntPhBGGIO1, CntPhCGGIO1).....	99
4.37	User Single Point GGIO Inputs (SPi64GGIO1).....	104
4.38	User Single Point GGIO Outputs (SPo32GGIO1).....	105
4.39	User Single Point GGIO Control Elements (Normal Security) (SPDOsGGIO1, SPDOsGGIO2, SPDOsGGIO3, SPDOsGGIO4).....	106
4.40	User Single Point GGIO Control Elements (Enhanced Security) (SPDOesGGIO1, SPDOesGGIO2, SPDOesGGIO3, SPDOesGGIO4).....	107
4.41	User Double Point GGIO Control Elements (Normal Security) (DPDOsGGIO1, DPDOsGGIO2, DPDOsGGIO3, DPDOsGGIO4).....	108
4.42	User Double Point GGIO Control Elements (Enhanced Security) (DPDOesGGIO1, DPDOesGGIO2, DPDOesGGIO3, DPDOesGGIO4).....	109
4.43	User Double Point GGIO Input (DPI8GGIO1, DPI8GGIO2).....	110
4.44	User Double Point GGIO Output (DPo8GGIO1, DPo8GGIO2).....	111
4.45	Binary Input Status (BI6GGIO1).....	112
4.46	Binary Output Status (BO8GGIO1).....	113
4.47	LED Status (L17GGIO1).....	114
4.48	Quick Logic Equation Status (E4GGIO1).....	115
4.49	Virtuals Status (V8GGIO1).....	116

1. PROTOCOL IMPLEMENTATION EXTRA INFORMATION FOR TESTING (PIXIT)

1.1 General

The EN100 is widely used within Siprotec 4 and has been chosen as the most cost effective option for adding IEC 61850 functionality to Reyrolle devices. This module offers the following major features:-

1. Peer to peer communications via GOOSE message
2. A standardized browsable interface for discovery of communication functional capability
3. Abstract Communications Service Interface models including
 - Association model
 - Server model
 - Data set model
 - Reporting model
 - Setting Group model
 - GOOSE publish model
 - GOOSE subscribe model
 - Control model
 - Time and time synchronisation model
 - File transfer model
 - General items

1.2 Association model

ID	ED	Description	Value / Clarification
As1	1	Maximum number of clients that can set-up an association simultaneously	6
As2	1, 2	TCP_KEEPALIVE value	1 second to 20 seconds
As3	1, 2	Lost connection detection time range	10 seconds
As4		Authentication is not supported	Not supported
As5	1, 2	What association parameters are necessary for successful association ?	Y Transport selector Y Session selector Y Presentation selector Y AP Title (ANY) Y AE Qualifier (ANY) Where Y means: as defined within the ICD-File ANY means: any value accepted
As6	1, 2	If association parameters are necessary for association, describe the correct values e.g.	Transport selector 0001 Session selector 0001 Presentation selector 00000001
As7	1, 2	What is the maximum and minimum MMS PDU size ?	Max MMS PDU size 32768 Min MMS PDU size 8192
As8	1, 2	What is the maximum startup time after a power supply interrupt ?	60 Seconds

1.3 Server model

ID	ED	Description	Value / Clarification
Sr1	1, 2	Which analogue value (MX) quality bits are supported (can be set by server) ?	Validity: Y Good, Y Invalid, N Reserved, Y Questionable Y Overflow Y OutofRange N BadReference N Oscillatory Y Failure Y OldData N Inconsistent Y Inaccurate Source: Y Process N Substituted Y 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 Y OldData N Inconsistent N Inaccurate Source: Y Process N Substituted Y Test N OperatorBlocked
Sr3		What is the maximum number of data values in one GetDataValues request ?	Not restricted; depends on the max. MMS PDU size given above.
Sr4		What is the maximum number of data values in one SetDataValues request ?	Not restricted; depends on the max. MMS PDU size given above.
Sr5		Which Mode / Behaviour values are supported?	Y On Y (On-)Blocked Y Test Y Test/Blocked Y Off

1.4 Data set model

ID	ED	Description	Value / Clarification
Ds1	1	What is the maximum number of data elements in one data set? (compare ICD setting)	Not limited by an internal configuration parameter. It depends on the available memory and MMS PDU size.
Ds2	1	How many persistent data sets can be created by one or more clients ?	64 data sets for each LD. It depends on the available memory.
Ds3	1	How many non-persistent data sets can be created by one or more clients ?	10 data sets. It depends on the available memory.

1.5 Setting group control model

ID	ED	Description	Value / Clarification
Sg1	1	What is the number of supported setting groups for each logical device?	Setting groups available for LLN0 only in LD PROT. The number of supported setting groups is 4. Specified in the ICD-File.
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)	Not applicable
Sg3	1	Can multiple clients edit the same setting group?	Not applicable
Sg4	1	What happens if the association is lost while editing a setting group?	Not applicable
Sg5	1	Is EditSG value 0 allowed?	Not applicable

1.6 Reporting model

ID	ED	Description	Value / Clarification
Rp1	1	The supported trigger conditions are (compare PICS)	Y Integrity Y Data change Y Quality change Y Data update Y General Interrogation
Rp2	1	The supported optional fields are	Y Sequence-number Y Report-time-stamp Y Reason-for-inclusion Y Data-set-name Y Data-reference Y Buffer-overflow - for Buffered report Y EntryID - for Buffered report Y Conf-rev Y Segmentation
Rp3	1, 2	Can the server send segmented reports ?	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 immediatly for Buffered Report: Buffer the Entry Send report if the report is enabled
Rp5	1	Multi client URCB approach (Compare IEC 61850-7-2 §14.2.1)	All clients can access all URCB's
Rp6	-	What is the format of EntryID?	First 2 Byte : Integer Last 6 Bytes: BTime6 time stamp
Rp7	1, 2	What is the buffer size for each BRCB or how many reports can be buffered ?	About 1 MB are available for the buffering. Each BRCB has an extension attribute Memory that display the percentage of those 1 MB that have been reserved/forseen for its own entries. Default amount 1 MB/(2*Number of logical devices)
Rp8	-	Pre-configured RCB attributes that cannot be changed online when RptEna = FALSE (see also the ICD report settings)	For Buffered and Unbuffered: All pre-configured RCB attributes can be changed online when RptEna = FALSE
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 events? Is this fixed, configurable	1 msecond Fixed
Rp11	1	Does the device support to pre-assign a RCB to a specific client in SCL	N
Rp12	2	After restart of the server is the value of ConfRev restored from the original configuration or retained prior to restart	Restore from original configuration
additional items:			
		Interrupt of general interrogation	Running GI could not be interrupted. If a new GI request occurs during a running GI, the current GI will be finished first before the second GI request will be processed.

ID	ED	Description	Value / Clarification
		Integrity period	Configurable ≥ 1 second;
		URCB reservation after an abort of the client/server association	Reservation of the URCB is lost. After a re-establishment of the association the URCB reservation has to be renewed by the client. This behavior is implemented to avoid unnecessary memory residuals if temporarily client associations (e.g. for maintenance) are established.
		Configured URCB reservation after an abort of the client/server association	Reservation of the URCB is lost.
		Optional use of a flow control for transmitting history of a BRCB	As specified in the IEC61850-7-2, transmission of entries may require some time, depending of the amount of entries that have to be transmitted. Therefore, the EN100 has an optional flow control feature to accelerate the transmission of the entries: each BRCB has an extended attribute MaxOutReports that can be set from the associated-client to change the transmission strategy of the entries. Those attributes are located in VMD variables. The number ordered will then be transmitted as long as they exist in the buffer; the server then reset the attribute to 0 and wait for the client to set it again in order to continue the history transmission with MaxOutReports entries. The attribute only influences the flow control of entries while dealing with the history, and not after the history transmission has completed.

1.7 GOOSE publish model

ID	ED	Description	Value / Clarification
Gp1	1, 2	Can the test flag in the published GOOSE be turned on / off	N
Gp2	1	What is the behavior when the GOOSE publish configuration is incorrect	DUT will send GOOSE with NdsCom = TRUE as long as the minimum required configuration is available (dstAddress, dataSet)
Gp3	1, 2	Published FCD supported common data classes are	SPS, DPS, INS, ENS, ACT, ACD, BCR, MV, CMV, WYE, DEL, SEQ, SPC, DPC, INC, ENC, APC, BAC, BSC Arrays are not supported
Gp4	1, 2	What is the slow retransmission time? Is it fixed or configurable?	Configured by SCD file
Gp5	1, 2	What is the fast retransmission scheme? Is it fixed or configurable?	Configured by SCD file
Gp6	-	Can the GOOSE publish be turned on / off by using SetGoCBValues(GoEna)	Deprecated See PICS - SetGoCBValues
Gp7	1, 2	What is the initial GOOSE sqNum after restart	sqNum = 1
Gp8	1	May the GOOSE data set contain: - structured data objects (FCD)? - Timestamp data attributes?	N Y
additional items:			
		Maximum number of GOOSE messages which could be sent	≤ 16 ; It depends on the available memory.

1.8 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. Note: the VLAN tag may be removed by a ethernet switch and should not be checked	<p>N source MAC address Y destinationon MAC address Y Ethertype = 0x88B8 Y¹ APPID Y¹ goCBRef Y timeAllowedtoLive Y² datSet Y² goID N t Y stNum Y³ sqNum Y⁴ test Y² confRev Y² ndsCom Y¹ numDatSetEntries</p> <p>1) stVal is ignored, Data marked as invalid after 2x TAL. 2) stVal is ignored, Data marked as invalid immediately. 3) 1x missing message tolerated, else Data marked as invalid after 2x TAL. 4) stVal is ignored, but TAL Will not expire.</p>
Gs2	1, 2	When is a subscribed GOOSE marked as lost ? (TAL = time allowed to live value from the last received GOOSE message)	When message does not arrive by 2 · TAL
Gs3	1, 2	What is the behavior when one or more subscribed GOOSE message isn't received or syntactically incorrect ? (missing GOOSE)	The telegram will be discarded (i.e not forwarded to the application) since it is corrupt or syntactically incorrect and therefore not readable. The data objects will be declared as invalid after a timeout detection since no telegram have been received by the application.
Gs4	1, 2	What is the behavior when a subscribed GOOSE message is out-of-order ?	When a given state number n, sequence number l is received, only the following telegrams will be accepted: n, l + 1 n, l + 2 n + 1, 0 n + 1, 1 1, 0 All other telegramms are ignored
Gs5	1, 2	What is the behavior when a subscribed GOOSE message is duplicated ?	The repetition 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? - timestamp data attributes?	N Y
Gs8	1, 2	Subscribed FCD supported common data classes are	SPS, DPS, INS, ENS, ACT, ACD, BCR, MV, CMV, WYE, DEL, SEQ, SPC, DPC, INC, ENC, BSC, ISC, APC, BAC Arrays are not supported
additional items:			
		Maximum number of GOOSE messages which could be received	≤ 128 ; It depends on the available memory.

	Interpretation of GOOSE messages at subscriber side	<ol style="list-style-type: none"> 1. Received GOOSE data objects without assigned quality attribute are interpreted as invalid. 2. Received GOOSE data objects which quality attribute are set to questionable are changed to invalid.
	GOOSE subscriber behavior in case of missing GOOSE messages	After a GOOSE multicast application association has been interrupted, the reception of a valid GOOSE telegram is required to validate the state of this GOOSE association again.
	<p>What is the behavior when a GOOSE header parameter is mismatching with the expected one?</p> <p>(datSet, goID, confRev, numDatSetEntries, number of allData)</p>	<p>Error message will be stored into the error buffer (could be accessed by EN100 web-server).</p> <p>The received telegram with the mismatched attribute will be discarded: It has not been subscribed.</p>
	What is the behavior when there is an out-of-order entry in the allData?	<p>The confRev attribute in the header guarantees that the allData entries are in the correct order. Therefore, it's necessary to check the confRev attribute. There is no chance to detect a semantic out-of-order if the types are identical.</p>
	What is the behavior when numDatSetEntries and number of allData are inconsistent?	The telegram is discarded since it is corrupt (not well formed). After the timeout detection (no telegram forwarded to the application) the data objects are declared invalid.

1.9 Control model

ID	ED	Description	Value / Clarification
Ct1	-	What control models are supported? (compare PICS)	Y Status-only Y Direct-with-normal-security N Sbo-with-normal-security Y Direct-with-enhanced-security Y Sbo-with-enhanced-security
Ct2	1, 2	Is the control model fixed, configurable and/ or online changeable?	Fixed
Ct3	-	Is TimeActivatedOperate supported (compare PICS or SCL)	N
Ct4	-	Is "operate-many" supported (compare sboClass)?	N
Ct5	1	What is the behavior of the DUT when the test attribute is set in the SelectWithValue and/or Operate request	It will be discarded as "not-supported"
Ct6	-	What are the conditions for the time (T) at- tribute in the SelectWithValue and/or Operate request	Time attribute is not relevant.
Ct7	-	Is pulse configuration supported ?	N
Ct8	1	What is the behavior of the DUT when the check conditions are set Is this behavior fixed, configurable, online changeable?	N Synchrocheck N Interlock-check "The interlock check is always performed irrespective of the Interlock check bit"

ID	ED	Description	Value / Clarification
Ct9	1, 2	What additional cause diagnosis are supported	Y Blocked-by-switching-hierarchy Y Select-failed Y Invalid-position Y Position-reached Y Parameter-change-in-execution (in Ed1 only) Y Step-limit Y Blocked-by-Mode Y Blocked-by-process Y Blocked-by-interlocking Y Blocked-by-synchrocheck Y Command-already-in-execution N Blocked-by-health Y 1-of-n-control Y Abortion-by-cancel Y Time-limit-over N Abortion-by-trip Y Object-not-selected 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
Ct10	1, 2	How to force a "test-not-ok" respond with SelectWithValue request?	Wrong orCat
Ct11	1, 2	How to force a "test-not-ok" respond with Select request?	When the control object has already been selected
Ct12	1, 2	How to force a "test-not-ok" respond with Operate request?	DOns: Wrong orCat SBOs: na DOes: Wrong orCat SBOes: Wrong orCat
Ct13	1, 2	Which origin categories are supported?	Bay-control, station-control, remote-control, automatic-station, automatic-remote, maintenance, process
Ct14	1, 2	What happens if the orCat value is not supported?	DOns: Operate.Resp- SBOs: na DOes: Operate.Resp-, addCause = not-supported SBOes: SelectWithValue.Resp-, addCause = not-supported
Ct15	1, 2	Does the IED accept a SelectWithValue/Operate with the same ctVal as the current status value?	DOns: Y SBOs: na DOes: N SBOes: N

ID	ED	Description	Value / Clarification
Ct16	1	Does the IED accept a Select/Operate on the same control object from 2 different clients at the same time?	DOs: Y SBOs: na DOes: N SBOes: N No, if the second request occurred when the object is not in unselected state (SBOes), resp. Ready state (DOs, DOes), then it will lead to a negative response
Ct17	1	Does the IED accept a Select/SelectWithValue from the same client when the control object is already selected (tissue 334)	SBOs: na SBOes: N
Ct18	1, 2	Is for SBOes the internal validation performed during the SelectWithValue and/or Operate step?	SelectWithValue and Operate
Ct19	-	Can a control operation be blocked by Mod=Off or Blocked	N
Ct20	1, 2	Does the IED support local / remote operation?	Y
Ct21	1, 2	Does the IED send an InformationReport with LastAppError as part of the Operate response for control with normal security?	SBOs: na DOs: N
Ct22	2	How to force a "parameter-change-in-execution"	SBOs: na SBOes: parameter-change-in-execution is supported in Ed1 only
additional items:			
		Inconsistency between SelectWithValue and (Operate or Cancel)	Operate or Cancel will be acknowledged with negative response if inconsistencies to the SelectWithValue request are detected. The following attributes will not be checked in this case: T (Time) The controlled object returns then in state "unselected"
		Cancel request could be sent after an operate request.	Y
		Format of the control time stamp attribute ?	Time stamp instead of EntryTime acc. to the 7-2 Errata List.
		What is the behavior of the control state machines when the association is lost with the client that issued a successful control?	For SBOes: If the current state is "Ready", then the selection ends.

1.10 Time and time synchronisation model

ID	ED	Description	Value / Clarification
Tm1	1, 2	What quality bits are supported (may be set by the IED)?	N LeapSecondsKnown Y ClockFailure Y ClockNotSynchronized
Tm2	1, 2	Describe the behavior when the time synchronization signal/messages are lost	The quality attribute "ClockNotSynchronized" will be set to TRUE after a configured time period
Tm3	1, 2	How long does it take to take over the new time from time server	Configurable Default: 10 min
Tm4	1, 2	When is the time quality bit "Clock failure" set?	Clock failure is set when the device internal clock drifts from the external synchronization
Tm5	1, 2	When is the time quality bit "Clock not synchronised" set?	The "ClockNotSynchronized" attribute is set to TRUE as long as no time synchronization is established.
Tm6	-	Is the timestamp of a binary event adjusted to the configured scan cycle?	Deprecated
Tm7	1	Does the device support time zone and daylight saving?	Y
Tm8	1,2	Which attributes of the SNTP response packet are validated?	N Leap indicator not equal to 3? Y Mode is equal to SERVER Y OriginateTimestamp is equal to value sent by the SNTP client as Transmit Timestamp Y RX/TX timestamp fields are checked for reasonableness Y SNTP version 3 and/or 4 Y Other (describe): Stratum is not KISS OF DEATH Clock of SNTP Server is synchronized Response comes from the server to which the request was sent
Tm9	1, 2	Do the COMTRADE files have local time or UTC time and is this configurable	Local time Not configurable
additional items:			
		What is the behaviour when the time synchronisation messages indicate that the stratum is greater than 3?	A stratum with a value greater than 3 with the SNTP time synchronization messages indicates that the time server has a questionable synchronisation. It might also indicate that no GPS connection are available. Therefore the time quality attribute "ClockNotSynchronized" will be set to TRUE as long as the stratum content is greater than 3.

1.11 File transfer model

ID	ED	Description	Value / Clarification
Ft1	1	What is structure of files and directories? Where are the COMTRADE files stored? Are COMTRADE Files zipped and what files are included in each zip file?	Directory name / COMTRADE / *; Files according to the comtrade standard and not zipped.
Ft2	1, 2	Directory names are separated from the file name by	"/"
Ft3	1	The maximum file name size including path (default 64 chars)	64
Ft4	1, 2	Are directory/file name case sensitive	Case sensitive
Ft5	1, 2	Maximum file size for SetFile	SetFile is not supported
Ft6	1	Is the requested file path included in the file name of the MMS fileDirectory respond?	Y
Ft7	1	Is the wild char supported MMS fileDirectory request?	Y only as *; not as name completion wild card
Ft8	1, 2	Is it allowed that 2 clients get a file at the same time?	N
additional items:			
		Maximum number of clients that can use the File transfer service simultaneously	1
		Maximum number of files that can be accessed simultaneously	1
		Maximum time the file transfer service is locked for one client	10 min

1.12 General items

Description	Value / Clarification
additional items:	
GOOSE Proxy object	To be able to subscribe Data over GOOSE, Proxy Objects are added into the object directory. Typically, they are Data of GGIO logical nodes: SPCSOxx, DPCSOxx. The Data Attributes of those Data are ctIVal, q and t. The control model associated to those Data is status-only. They are not controllable from an IEC61850 client, and their function is only to enable the GOOSE subscribing.
What is the behaviour of the Device by GetAllDataValues?	GetAllDataValues is not supported without functional constraint indication.

1.13 TICS - Technical Issues Implementation Conformance Statement

1.13.1 TISSUES Edition 1

Topic	TISSUE No.	Link	Description	Impact of Interoper.
Object Directory	433	http://tissue.iec61850.com/tissue.msp?issueid=433	Order of attributes in specialized CDCs for control service mapping	-
	422	http://tissue.iec61850.com/tissue.msp?issueid=422	Order of extension data objects and data attributes	-
	168	http://tissue.iec61850.com/tissue.msp?issueid=168	Order of attributes in MMS components	-
	141	http://tissue.iec61850.com/tissue.msp?issueid=141	Desc: object reference length extended to 129	x ¹⁾
Object Model	120	http://tissue.iec61850.com/tissue.msp?issueid=120	Type - Mod.stVal and Mod.ctlVal	-
	146	http://tissue.iec61850.com/tissue.msp?issueid=146	CtxInt	-
	173	http://tissue.iec61850.com/tissue.msp?issueid=173	Ctl modelling harmonization	-
	234	http://tissue.iec61850.com/tissue.msp?issueid=234	New type CtxInt	x
	75	http://tissue.iec61850.com/tissue.msp?issueid=75	Desc: Str and Op Data Object in GAPC	-
Services	377	http://tissue.iec61850.com/tissue.msp?issueid=377	DeleteDataSet response-	-
	276	http://tissue.iec61850.com/tissue.msp?issueid=276	File Services Negative Responses	-
	183	http://tissue.iec61850.com/tissue.msp?issueid=183	GetNameList error handling	x
	165	http://tissue.iec61850.com/tissue.msp?issueid=165	Improper Error Response for GetDataSetValues	x
	116	http://tissue.iec61850.com/tissue.msp?issueid=116	GetNameList with empty response?	x

Topic	TISSUE No.	Link	Description	Impact of Interoper.
Reporting	474	http://tissue.iec61850.com/tissue.aspx?issueid=474	GI for URCB	-
	453	http://tissue.iec61850.com/tissue.aspx?issueid=453	Reporting & Logging model revision	x
	438	http://tissue.iec61850.com/tissue.aspx?issueid=438	EntryTime base should be GMT	-
	349	http://tissue.iec61850.com/tissue.aspx?issueid=349	BRCB TimeOfEntry has two definitions	x
	348	http://tissue.iec61850.com/tissue.aspx?issueid=348	URCB class and report	x
	344	http://tissue.iec61850.com/tissue.aspx?issueid=344	TimeOfEntry misspelled	-
	335	http://tissue.iec61850.com/tissue.aspx?issueid=335	Clearing of Bufovfl	x
	332	http://tissue.iec61850.com/tissue.aspx?issueid=332	Ambiguity in use of trigger options	x
	329	http://tissue.iec61850.com/tissue.aspx?issueid=329	Reporting and BufOvl	x
	322	http://tissue.iec61850.com/tissue.aspx?issueid=322	Write Configuration attribute of BRCBs	
	301	http://tissue.iec61850.com/tissue.aspx?issueid=301	SqNum in Buffered Reports	-
	300	http://tissue.iec61850.com/tissue.aspx?issueid=300	Attribute Resv in BRCB	x
	298	http://tissue.iec61850.com/tissue.aspx?issueid=298	Type of SqNum	x
	297	http://tissue.iec61850.com/tissue.aspx?issueid=297	Sequence number	x
	278	http://tissue.iec61850.com/tissue.aspx?issueid=278	EntryId not valid for a server	x
	275	http://tissue.iec61850.com/tissue.aspx?issueid=275	Confusing statement on GI usage	x
	191	http://tissue.iec61850.com/tissue.aspx?issueid=191	BRCB: Integrity and buffering reports	x
	190	http://tissue.iec61850.com/tissue.aspx?issueid=190	BRCB: EntryId and TimeOfEntry	x
	177	http://tissue.iec61850.com/tissue.aspx?issueid=177	Ignoring OptFlds bits for URCB	-
	52	http://tissue.iec61850.com/tissue.aspx?issueid=52	Ambiguity GOOSE SqNum	x
49	http://tissue.iec61850.com/tissue.aspx?issueid=49	BRCB TimeOfEntry?	x	

Topic	TISSUE No.	Link	Description	Impact of Interoper.
Control Model	46	http://tissue.iec61850.com/tissue.aspx?issueid=46	Synchro check cancel	x
	44	http://tissue.iec61850.com/tissue.aspx?issueid=44	AddCause - Object not sel	x
	30	http://tissue.iec61850.com/tissue.aspx?issueid=30	control parameter T	x
	520	http://tissue.iec61850.com/tissue.aspx?issueid=520	Desc: control canceling at connection loss	-
Setting Group	593	http://tissue.iec61850.com/tissue.aspx?issueid=593	Desc: Setting Group Canceling, eding	x
File Transfer	545	http://tissue.iec61850.com/tissue.aspx?issueid=545	Files Directories	x

- 1) No impact as long as the IED Name and the logical device inst have together a length smaller than 13 char.

1.13.1 TISSUES Edition 2

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

Topic	TISSUE No.	Link	Description	Impact of Interoper.
Object Model	671	http://tissue.iec61850.com/tissue.aspx?issueid=671	Mistake in definition of Mod & Beh	x
	686	http://tissue.iec61850.com/tissue.aspx?issueid=686	Desc: New annex H - enums types in XML	x
	722	http://tissue.iec61850.com/tissue.aspx?issueid=722	Desc: unit enumeration for min and h	x
	742	http://tissue.iec61850.com/tissue.aspx?issueid=742	Desc: GAPC.Str, Op, StrVal are not instanceable	x
	929	http://tissue.iec61850.com/tissue.aspx?issueid=929	AC_SCAV presence condition definition	x
Configuration	719	http://tissue.iec61850.com/tissue.aspx?issueid=719	ConfDataSet - maxAttributes definition is confusing	x
	823	http://tissue.iec61850.com/tissue.aspx?issueid=823	ValKind for structured data attributes	

2. IEC 61850 CONFORMANCE STATEMENTS

Contents

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

2.1	Definitions of the ISO/OSI Reference Model	27
2.2	Definition of the Communication Services Acc. to Standard (PICS)	28
2.3	Model Implementation Conformance Statement (MICS)	34

2.1 Definitions of the ISO/OSI Reference Model

To achieve stable data exchange, all communication is based on the OSI Reference Model (OSI/IEC 7498-1) for a multi-layer communication function. Fig. 2-1 shows the seven layers defined there.

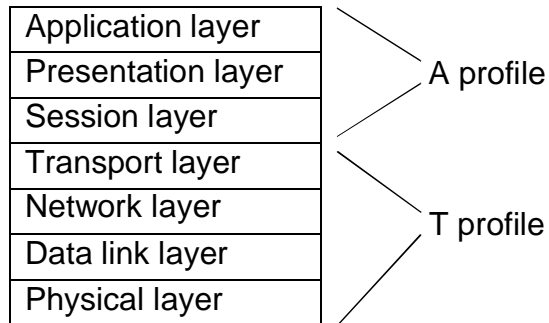


Fig. 2-1 OSI reference model and profiles

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

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

- Client/server services,
- GOOSE services,
- Time synchronization,
- Services for sampled measured values.

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

The tables in the sections below are specified according to IEC61850 Part 7-2 Annex A.

The descriptions below refer to implementation in the SIPROTEC 4, the SIPROTEC Compact and the Reyrolle IED device range.

The tables give the names stated in the standard.

2.2.1 Profile Compliance

Basic conformance statement

		Client/ Subscriber	Server/ Publisher	Value/Comments
Client-Server roles				
B11	Server side (of TWO-PARTY-APPLICATION-ASSOCIATION)	--	Y	
B12	Client side (of TWO-PARTY-APPLICATION-ASSOCIATION)	N	--	
SCSMs supported				
B21	SCSM: IEC 6185-8-1 used	Y	Y	
B22	SCSM: IEC 6185-9-1 used			
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 sample value model (SVC)				
B41	Publisher side	--	N	
B42	Subscriber side	N	--	
Y = supported N or empty = not supported				

ACSI models conformance statement

		Client/ Subscriber	Server/ Publisher	Value/Comments
If Server or Client side (B11/12) 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	BufTim		Y	
M7-9	IntgPd		Y	
M7-10	GI		Y	
M7-11	conf-revision		Y	
M8	Unbuffered report control		Y	
M8-1	sequence-number		Y	
M8-2	report-time-stamp		Y	
M8-3	reason-for-inclusion		Y	
M8-4	data-set-name		Y	
M8-5	data-reference		Y	
M8-6	BufTim		Y	
M8-7	IntgPd		Y	
M8-8	GI		Y	
M8-9	conf-revision		Y	
	Logging		N	
M9	Log control		N	
M9-1	IntgPd		N	
M10	Log		N	
M11	Control		Y	

		Client/ Subscriber	Server/ Publisher	Value/Comments
If GSE (B31/32) is supported				
M12	GOOSE	Y	Y	
M13	GSSE	N	N	
If SVC (41/42) is supported				
M14	Multicast SVC	N	N	
M15	Unicast SVC	N	N	
If Server or Client side (B11/B12) supported				
M16	Time	Y	N	
M17	File Transfer	N	Y	
Y = supported N or empty = not supported				

ACSI service conformance statement

	Services	AA: TP/MC	Client (C)	Server (S)	
Server					
S1	GetServerDirectory	TP	N	Y	
Application association					
S2	Associate	TP	N	Y	
S3	Abort	TP	N	Y	
S4	Release	TP	N	Y	
Logical device					
S5	GetLogicalDeviceDirectory	TP	N	Y	
Logical Node					
S6	GetLogicalNodeDirectory	TP	N	Y	
S7	GetAllDataValues	TP	N	Y	
Data					
S8	GetDataValues	TP	N	Y	
S9	SetDataValues	TP	N	Y	
S10	GetDataDirectory	TP	N	Y	
S11	GetDataDefinition	TP	N	Y	
Data set					
S12	GetDataSetValues	TP	N	Y	
S13	SetDataSetValues	TP	N	N	
S14	CreateDataSet	TP	N	Y	
S15	DeleteDataSet	TP	N	Y	
S16	GetDataSetDirectory	TP	N	Y	
Substitution					
S17	SetDataValues	TP	N	N	
Setting group control					
S18	SelectActiveSG	TP	N	Y	
S19	SelectEditSG	TP	N	N	
S20	SetSGValues/ SetEditSGValue	TP	N	N	
S21	ConfirmEditSGValues	TP	N	N	
S22	GetSGValues/ GetEditSGValue	TP	N	N	
S23	GetSGCBValues	TP	N	Y	

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

	Services	AA: TP/MC	Client (C)	Server (S)	
Transmission of sample value model (SVC)					
Multicast SVC					
S45	SendMSVMessage	MC	N	N	
S46	GetMSVCBValues	TP	N	N	
S47	SetMSVCBValues	TP	N	N	
Unicast SVC					
S48	SendUSVMessage	TP	N	N	
S49	GetUSVCBValues	TP	N	N	
S50	SetUSVCBValues	TP	N	N	
Control					
S51	Select	TP	N	N	
S52	SelectWithValue	TP	N	Y	
S53	Cancel	TP	N	Y	
S54	Operate	TP	N	Y	
S55	Command-Termination	TP	N	Y	
S56	TimeActivated-Operate	TP	N	N	
File transfer					
S57	GetFile	TP	N	Y	
S58	SetFile	TP	N	N	
S59	DeleteFile	TP	N	N	
S60	GetFileAttributeValues	TP	N	Y	
Time					
T1	Time resolution of internal clock			10 (1 ms)	nearest negative power of 2 in seconds
T2	Time accuracy of internal clock				T0
				ClassT1	T1
					T2
					T3
					T4
					T5
T3	Supported TimeStamp resolution	-		10 (approx. 0.9 ms)	nearest negative power of 2 in seconds
Y = supported N or empty = not supported					

2.3 Model Implementation Conformance Statement (MICS)

Content of the statement

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

This document depends on the device type and is provided in separate MICS documents. It shows the assignment lists of the device to IEC 61850 and vice versa. The whole document is shown in a hyperlinked table of contents. The MICS is a readable form of the current mapping of a device on IEC 61850.

3. FUNCTION PARAMETERS 7SR181

The following is a combined list of functions for 7SR181 devices, the actual functionality available is dependent on device variant.

Function	Element	LD	LN	DOI
3.1 Line Differential	87L-1	PROT	A87LPDIF1	Mod, Beh, Health, NamPlt, Str, DifAClc, RstA, Op
	87L-2	PROT	A87LPDIF2	Mod, Beh, Health, NamPlt, Str, DifAClc, RstA, Op
3.2 Differential High Set	87HS-1	PROT	A87HsPDIF1	Mod, Beh, Health, NamPlt, Str, Op
	87HS-2	PROT	A87HsPDIF2	Mod, Beh, Health, NamPlt, Str, Op
3.3 Differential Intertrip	87R	CTRL	A87R2GGIO1	Mod, Beh, Health, NamPlt, Ind1, Ind2
	87S	CTRL	A87S2GGIO1	Mod, Beh, Health, NamPlt, Ind1, Ind2
3.4 Intertrip	85R	CTRL	A85R6GGIO1	Mod, Beh, Health, NamPlt, Ind1, Ind2, Ind3, Ind4, Ind5, Ind6
	85S	CTRL	A85S6GGIO1	Mod, Beh, Health, NamPlt, Ind1, Ind2, Ind3, Ind4, Ind5, Ind6
3.5 Line Check	50 LC-1	PROT	A50LCPTOC1	Mod, Beh, Health, NamPlt, Str, Op
	50 LC-2	PROT	A50LCPTOC2	Mod, Beh, Health, NamPlt, Str, Op
	50G LC-1	PROT	A50gLCPTOC1	Mod, Beh, Health, NamPlt, Str,

Function	Element	LD	LN	DOI
				Op
	50G LC-2	PROT	A50gLCPTOC2	Mod, Beh, Health, NamPlt, Str, Op
3.6 Phase Overcurrent	51-1	PROT	A51PTOC1	Mod, Beh, Health, NamPlt, Str, Op
	51-2	PROT	A51PTOC2	Mod, Beh, Health, NamPlt, Str, Op
	51-3	PROT	A51PTOC3	Mod, Beh, Health, NamPlt, Str, Op
	51-4	PROT	A51PTOC4	Mod, Beh, Health, NamPlt, Str, Op
	50-1	PROT	A50PTOC1	Mod, Beh, Health, NamPlt, Str, Op
	50-2	PROT	A50PTOC2	Mod, Beh, Health, NamPlt, Str, Op
	50-3	PROT	A50PTOC3	Mod, Beh, Health, NamPlt, Str, Op
	50-4	PROT	A50PTOC4	Mod, Beh, Health, NamPlt, Str, Op
3.7 Derived E/F	51N-1	PROT	A51nPTOC1	Mod, Beh, Health, NamPlt, Str, Op
	51N-2	PROT	A51nPTOC2	Mod, Beh, Health, NamPlt, Str, Op
	51N-3	PROT	A51nPTOC3	Mod, Beh, Health, NamPlt, Str, Op
	51N-4	PROT	A51nPTOC4	Mod, Beh, Health, NamPlt, Str, Op
	50N-1	PROT	A50nPTOC1	Mod, Beh, Health, NamPlt, Str, Op
	50N-2	PROT	A50nPTOC2	Mod, Beh, Health, NamPlt, Str, Op

Function	Element	LD	LN	DOI
	50N-3	PROT	A50nPTOC3	Mod, Beh, Health, NamPlt, Str, Op
	50N-4	PROT	A50nPTOC4	Mod, Beh, Health, NamPlt, Str, Op
3.8 Measured E/F				Mod, Beh, Health, NamPlt, Str, Op
	51G-1	PROT	A51gPTOC1	Mod, Beh, Health, NamPlt, Str, Op
	51G-2	PROT	A51gPTOC2	Mod, Beh, Health, NamPlt, Str, Op
	51G-3	PROT	A51gPTOC3	Mod, Beh, Health, NamPlt, Str, Op
	51G-4	PROT	A51gPTOC4	Mod, Beh, Health, NamPlt, Str, Op
	50G-1	PROT	A50gPTOC1	Mod, Beh, Health, NamPlt, Str, Op
	50G-2	PROT	A50gPTOC2	Mod, Beh, Health, NamPlt, Str, Op
	50G-3	PROT	A50gPTOC3	Mod, Beh, Health, NamPlt, Str, Op
	50G-4	PROT	A50gPTOC4	Mod, Beh, Health, NamPlt, Str, Op
3.9 NPS Overcurrent				Mod, Beh, Health, NamPlt, Str, Op
	46IT	PROT	A46ItPTOC1	Mod, Beh, Health, NamPlt, Str, Op
	46DT	PROT	A46DtPTOC1	Mod, Beh, Health, NamPlt, Str, Op
3.10 Under Current				Mod, Beh, Health, NamPlt, Str, Op
	37-1	PROT	A37PTUC1	Mod, Beh, Health, NamPlt, Str, Op
	37-2	PROT	A37PTUC2	Mod, Beh, Health, NamPlt, Str, Op
	37G-1	PROT	A37gPTUC1	Mod, Beh, Health, NamPlt, Str,

Function	Element	LD	LN	DOI
				Op
	37G-2	PROT	A37gPTUC2	Mod, Beh, Health, NamPlt, Str, Op
3.11 Auto-reclose	79	PROT	A79RREC1	Mod, Beh, Health, NamPlt, Op, AutoRecSt
3.12 Thermal Overload	49	PROT	A49PTTR1	Mod, Beh, Health, NamPlt, Str, Op, AlmThm
3.13 CB Fail	50BF	PROT	A50BfRBRF1	Mod, Beh, Health, NamPlt, OpEx, Opln, Str
3.14 Broken Conductor	46BC	PROT	A46BcPTOC1	Mod, Beh, Health, NamPlt, Op, Str
3.15 Inrush Detector	81HBL2	MEAS	Har2MMXU1	A
	81HBL2	PROT	A81Hb2PHAR1	Mod, Beh, Health, NamPlt, Str
3.16 Current Measurements				
	Ia	MEAS	MMXU1	A
	Ib	MEAS	MMXU1	A
	Ic	MEAS	MMXU1	A
	In	MEAS	MMXU1	A
	Ig	MEAS	MMXU1	A
3.17 Current Sequence Components Measurements				
	Current	MEAS	I_MSQI1	SeqA

Function	Element	LD	LN	DOI	
3.18 Voltage Measurements	Vab	MEAS	MMXU1	PPV	
	Vbc	MEAS	MMXU1	PPV	
	Vca	MEAS	MMXU1	PPV	
	Va	MEAS	MMXU1	PhV	
	Vb	MEAS	MMXU1	PhV	
	Vc	MEAS	MMXU1	PhV	
	Vn	MEAS	MMXU1	PhV	
3.19 Voltage Sequence Components Measurements	Voltage	MEAS	V_MSQI1	SeqV	
3.20 Frequency Measurement	Frequency	MEAS	MMXU1	Hz	
3.21 Power Measurements	W phs A (P)	MEAS	MMXU1	W	
	W phs B (P)	MEAS	MMXU1	W	
	W phs C (P)	MEAS	MMXU1	W	
	Total W (P)	MEAS	MMXU1	TotW	
	VAr phs A (Q)	MEAS	MMXU1	VAr	
	VAr phs B (Q)	MEAS	MMXU1	VAr	
	VAr phs C (Q)	MEAS	MMXU1	VAr	
	Total VAr (Q)	MEAS	MMXU1	TotVAr	
	VA phs A (S)	MEAS	MMXU1	VA	
	VA phs B (S)	MEAS	MMXU1	VA	
	VA phs C (S)	MEAS	MMXU1	VA	
	Total VA (S)	MEAS	MMXU1	TotVA	
	PF phs A	MEAS	MMXU1	PF	
	PF phs B	MEAS	MMXU1	PF	
	PF phs C	MEAS	MMXU1	PF	
	Total PF	MEAS	MMXU1	TotPF	

Function	Element	LD	LN	DOI
3.22 Energy Measurements	Reactive Energy Imp	MEAS	MMTR1	DmdVArh
	Active Energy Imp	MEAS	MMTR1	DmdWh
	Reactive Energy Exp	MEAS	MMTR1	SupVArh
	Active Energy Exp	MEAS	MMTR1	SupWh
3.23 Circuit Breaker Counters	CB Delta Trip Count	PROT	CntDelGGIO1	ISCSO1
	CB Delta Trip Count Target	PROT	CntDelGGIO1	ISCSO2
	CB Delta Trip Count Target Reached	PROT	CntDelGGIO1	SPCSO
	CB Count To AR Block	PROT	CntLOGGIO1	ISCSO1
	CB Count To AR Block Target	PROT	CntLOGGIO1	ISCSO2
	CB Count To AR Block Target Reached	PROT	CntLOGGIO1	SPCSO
	CB PhA Trip Count	PROT	CntPhAGGIO1	ISCSO1
	CB PhA Trip Count Target	PROT	CntPhAGGIO1	ISCSO2
	CB PhA Trip Count Target Reached	PROT	CntPhAGGIO1	SPCSO
	CB PhB Trip Count	PROT	CntPhBGGIO1	ISCSO1
	CB PhB Trip Count Target	PROT	CntPhBGGIO1	ISCSO2
	CB PhB Trip Count Target Reached	PROT	CntPhBGGIO1	SPCSO
	CB PhC Trip Count	PROT	CntPhCGGIO1	ISCSO1
	CB PhC Trip Count Target	PROT	CntPhCGGIO1	ISCSO2
	CB PhC Trip Count Target Reached	PROT	CntPhCGGIO1	SPCSO
	CB E/F Trip Count	PROT	CntEFGGIO1	ISCSO1
	CB E/F Trip Count Target	PROT	CntEFGGIO1	ISCSO2
	CB E/F Trip Count Target Reached	PROT	CntEFGGIO1	SPCSO
	3.24 Circuit Breaker	CB Control Close Block	CTRL	Q0XCBR1
CB Control Open Block		CTRL	Q0XCBR1	BlkOpn
CB Status Open		CTRL	Q0XCBR1	Pos
CB Status Closed		CTRL	Q0XCBR1	Pos
CB Operations Counter		CTRL	Q0XCBR1	OpCnt
CB Wear PhA		CTRL	Q0XCBR1	SumSwARs1
CB Wear PhB		CTRL	Q0XCBR1	SumSwARs2
CB Wear PhC		CTRL	Q0XCBR1	SumSwARs3
Not Block Close		CTRL	Q0CILO1	EnaCls
Not Block Open		CTRL	Q0CILO1	EnaOpn
Close CB		CTRL	Q0SWI1	Pos
Open CB	CTRL	Q0SWI1	Pos	
3.25 Demand Measurements	Active Power (P =)	MEAS	MinMMXU1	TotW
	Reactive Power (Q =)	MEAS	MinMMXU1	TotVAr

Function	Element	LD	LN	DOI
	Apparent Power (S =)	MEAS	MinMMXU1	TotVA
	Va-b (Vab =)	MEAS	MinMMXU1	PPV.phsAB
	Vb-c (Vbc =)	MEAS	MinMMXU1	PPV.phsBC
	Vc-a (Vca =)	MEAS	MinMMXU1	PPV.phsCA
	Ia (Ia =)	MEAS	MinMMXU1	A.phsA
	Ib (Ib =)	MEAS	MinMMXU1	A.phsB
	Ic (Ic =)	MEAS	MinMMXU1	A.phsC
	Frequency	MEAS	MinMMXU1	Hz
	Reactive Power (Q =)	MEAS	MaxMMXU1	TotVAr
	Apparent Power (S =)	MEAS	MaxMMXU1	TotVA
	Va-b (Vab =)	MEAS	MaxMMXU1	PPV.phsAB
	Vb-c (Vbc =)	MEAS	MaxMMXU1	PPV.phsBC
	Vc-a (Vca =)	MEAS	MaxMMXU1	PPV.phsCA
	Ia (Ia =)	MEAS	MaxMMXU1	A.phsA
	Ib (Ib =)	MEAS	MaxMMXU1	A.phsB
	Ic (Ic =)	MEAS	MaxMMXU1	A.phsC
	Frequency	MEAS	MaxMMXU1	Hz
	Reactive Power (Q =)	MEAS	MeanMMXU1	TotVAr
	Apparent Power (S =)	MEAS	MeanMMXU1	TotVA
	Va-b (Vab =)	MEAS	MeanMMXU1	PPV.phsAB
	Vb-c (Vbc =)	MEAS	MeanMMXU1	PPV.phsBC
	Vc-a (Vca =)	MEAS	MeanMMXU1	PPV.phsCA
	Ia (Ia =)	MEAS	MeanMMXU1	A.phsA
	Ib (Ib =)	MEAS	MeanMMXU1	A.phsB
	Ic (Ic =)	MEAS	MeanMMXU1	A.phsC
	Frequency	MEAS	MeanMMXU1	Hz

Function	Element	LD	LN	DOI
3.26 User Single Point I/P Values	SPI64GGIO	CTRL	SPI64GGIO1	Mod, Beh, Health, NamPlt, SPCSO1 SPCSO2 SPCSO3 SPCSO4 SPCSO5 SPCSO6 SPCSO7 SPCSO8 SPCSO9 SPCSO10 SPCSO11 SPCSO12 SPCSO13 SPCSO14 SPCSO15 SPCSO16 SPCSO17 SPCSO18 SPCSO19 SPCSO20 SPCSO21 SPCSO22 SPCSO23 SPCSO24 SPCSO25 SPCSO26 SPCSO27 SPCSO28 SPCSO29 SPCSO30 SPCSO31 SPCSO32 SPCSO33 SPCSO34 SPCSO35 SPCSO36 SPCSO37 SPCSO38 SPCSO39 SPCSO40 SPCSO41 SPCSO42 SPCSO43 SPCSO44 SPCSO45 SPCSO46 SPCSO47 SPCSO48 SPCSO49 SPCSO50 SPCSO51 SPCSO52 SPCSO53 SPCSO54 SPCSO55 SPCSO56 SPCSO57 SPCSO58 SPCSO59 SPCSO60 SPCSO61 SPCSO62 SPCSO63

Function	Element	LD	LN	DOI
				SPCSO64
3.27 User Single Point O/P Values	SPo32GGIO	CTRL	SPo32GGIO1	Mod, Beh, Health, NamPIt, Ind1 Ind2 Ind3 Ind4 Ind5 Ind6 Ind7 Ind8 Ind9 Ind10 Ind11 Ind12 Ind13 Ind14 Ind15 Ind16 Ind17 Ind18 Ind19 Ind20 Ind21 Ind22 Ind23 Ind24 Ind25 Ind26 Ind27 Ind28 Ind29 Ind30 Ind31 Ind32
3.28 User Double Point I/P Values	DPI8GGIO1	CTRL	DPI8GGIO1	Mod, Beh, Health, NamPIt, DPCSO1 DPCSO2 DPCSO3 DPCSO4 DPCSO5 DPCSO6 DPCSO7 DPCSO8
	DPI8GGIO2	CTRL	DPI8GGIO2	Mod, Beh, Health, NamPIt, DPCSO1 DPCSO2 DPCSO3 DPCSO4 DPCSO5 DPCSO6 DPCSO7 DPCSO8

Function	Element	LD	LN	DOI	
3.29 User Double Point O/P Values	DPo8GGIO1	CTRL	DPo8GGIO1	Mod, Beh, Health, NamPlt, DPCSO1 DPCSO2 DPCSO3 DPCSO4 DPCSO5 DPCSO6 DPCSO7 DPCSO8	
	DPo8GGIO2	CTRL	DPo8GGIO2	Mod, Beh, Health, NamPlt, DPCSO1 DPCSO2 DPCSO3 DPCSO4 DPCSO5 DPCSO6 DPCSO7 DPCSO8	
3.30 User Single Point Control Values	SPDOns 1	CTRL	SPDOnsGGIO1	Mod, Beh, Health, NamPlt, SPCSO	
	SPDOns 2	CTRL	SPDOnsGGIO2	Mod, Beh, Health, NamPlt, SPCSO	
	SPDOns 3	CTRL	SPDOnsGGIO3	Mod, Beh, Health, NamPlt, SPCSO	
	SPDOns 4	CTRL	SPDOnsGGIO4	Mod, Beh, Health, NamPlt, SPCSO	
	SPDOes 1	CTRL	SPDOesGGIO1	Mod, Beh, Health, NamPlt, SPCSO	
	SPDOes 2	CTRL	SPDOesGGIO2	Mod, Beh, Health, NamPlt, SPCSO	
	SPDOes 3	CTRL	SPDOesGGIO3	Mod, Beh, Health, NamPlt, SPCSO	
	SPDOes 4	CTRL	SPDOesGGIO4	Mod, Beh, Health, NamPlt, SPCSO	
	3.31 User Double Point Control Values	DPDOns 1	CTRL	DPDOnsGGIO1	Mod, Beh, Health, NamPlt, DPCSO
		DPDOns 2	CTRL	DPDOnsGGIO2	Mod, Beh,

Function	Element	LD	LN	DOI
				Health, NamPlt, DPCSO
	DPDOs 3	CTRL	DPDOsGGIO3	Mod, Beh, Health, NamPlt, DPCSO
	DPDOs 4	CTRL	DPDOsGGIO4	Mod, Beh, Health, NamPlt, DPCSO
	DPDOes 1	CTRL	DPDOesGGIO1	Mod, Beh, Health, NamPlt, DPCSO
	DPDOes 2	CTRL	DPDOesGGIO2	Mod, Beh, Health, NamPlt, DPCSO
	DPDOes 3	CTRL	DPDOesGGIO3	Mod, Beh, Health, NamPlt, DPCSO
	DPDOes 4	CTRL	DPDOesGGIO4	Mod, Beh, Health, NamPlt, DPCSO
3.32 Binary I/P Status Values	BI6GGIO	CTRL	BI6GGIO1	Mod, Beh, Health, NamPlt, Ind1 Ind2 Ind3 Ind4 Ind5 Ind6
3.33 Binary O/P Status Values	BO8GGIO	CTRL	BO8GGIO1	Mod, Beh, Health, NamPlt, Ind1 Ind2 Ind3 Ind4 Ind5 Ind6 Ind7 Ind8
3.34 Quick Logic Equation Status Values	E4GGIO	CTRL	E4GGIO1	Mod, Beh, Health, NamPlt, Ind1 Ind2 Ind3 Ind4

Function	Element	LD	LN	DOI
3.35 LED Status Values	L17GGIO	CTRL	L17GGIO1	Mod, Beh, Health, NamPlt, Ind1 Ind2 Ind3 Ind4 Ind5 Ind6 Ind7 Ind8 Ind9 Ind10 Ind11 Ind12 Ind13 Ind14 Ind15 Ind16 Ind17
3.36 Virtuals Status Values	V8GGIO	CTRL	V8GGIO1	Mod, Beh, Health, NamPlt, Ind1 Ind2 Ind3 Ind4 Ind5 Ind6 Ind7 Ind8

4. MAPPING

This section shows the mapping of the information relevant to the device to the Logical Node of protocol IEC61850. It is structured according to function. General information about IEC61850 mapping can be found in Chapter 3.

4.5 Line Differential 87L-1, 87L-2 (A87LPDIF1, A87LPDIF2)

A87LPDIF*.Mod

No	Information				
	Line Differential Enabled (Function Config)	x	0	x	1
	Element Disabled	1	0	0	0
	Element Inhibited	x	x	1	0
A87LPDIF *.Mod.stVal		5	2	2	1

device annunciation: 1 – ON/TRUE IEC61850 Value: 1 – ON
 0 – OFF/FALSE 2 – BLOCKED
 x – Irrelevant 3 – TEST
 4 – TEST/BLOCKED
 5 – OFF

A87LPDIF *.Health

No	Information		
	Protection Healthy	0	1
A87LPDIF *.Health.stVal		3	1

device annunciation: 1 – ON/TRUE IEC61850 Value: 1 – OK
 0 – OFF/FALSE 2 – WARNING
 3 – ALARM

A87LPDIF *.Str

No	Information		
	Trip picked up	0	1
A87LPDIF *.Str.general		0	1

device annunciation: 1 – ON/TRUE IEC61850 Value: 0 – FALSE
 0 – OFF/FALSE 1 – TRUE

A87LPDIF *.Op

No	Information		
	Element Operated	0	1
A87LPDIF *.Op.general		0	1

device annunciation: 1 – ON/TRUE IEC61850 Value: 0 – FALSE
 0 – OFF/FALSE 1 – TRUE

A87LPPDIF *.DifAClc

Info	Value		
87L Ia Operate	A87LPPDIF1.DifAClc.phsA.instCVal.mag.f	Measured Value	Value
	A87LPPDIF1.DifAClc.phsA.cVal.mag.f	Measured Value	Value
	A87LPPDIF1.DifAClc.phsA.units.SIUnit	5	A
	A87LPPDIF1.DifAClc.phsA.units.multiplier	0	1

Info	Value		
87L Ib Operate	A87LPPDIF1.DifAClc.phsB.cVal.mag.f	Measured Value	Value
	A87LPPDIF1.DifAClc.phsB.instCVal.mag.f	Measured Value	Value
	A87LPPDIF1.DifAClc.phsB.units.SIUnit	5	A
	A87LPPDIF1.DifAClc.phsB.units.multiplier	0	1

Info	Value		
87L Ic Operate	A87LPPDIF1.DifAClc.phsC.cVal.mag.f	Measured Value	Value
	A87LPPDIF1.DifAClc.phsC.instCVal.mag.f	Measured Value	Value
	A87LPPDIF1.DifAClc.phsC.units.SIUnit	5	A
	A87LPPDIF1.DifAClc.phsC.units.multiplier	0	1

A87LPPDIF *.RstA

Info	Value		
87L Ia Restrain	A87LPPDIF1.RstA.phsA.cVal.mag.f	Measured Value	Value
	A87LPPDIF1.RstA.phsA.instCVal.mag.f	Measured Value	Value
	A87LPPDIF1.RstA.phsA.units.SIUnit	5	A
	A87LPPDIF1.RstA.phsA.units.multiplier	0	1

Info	Value		
87L Ib Restrain	A87LPPDIF1.RstA.phsB.cVal.mag.f	Measured Value	Value
	A87LPPDIF1.RstA.phsB.instCVal.mag.f	Measured Value	Value
	A87LPPDIF1.RstA.phsB.units.SIUnit	5	A
	A87LPPDIF1.RstA.phsB.units.multiplier	0	1

Info	Value		
87L Ic Restrain	A87LPPDIF1.RstA.phsC.cVal.mag.f	Measured Value	Value
	A87LPPDIF1.RstA.phsC.instCVal.mag.f	Measured Value	Value
	A87LPPDIF1.RstA.phsC.units.SIUnit	5	A
	A87LPPDIF1.RstA.phsC.units.multiplier	0	1

4.6 Differential High Set 87HS-1, 87HS-2 (A87HsPDIF1, A87HsPDIF2)

A87HsPDIF*.Mod

No	Information				
	Differential High Set Enabled (Function Config)	x	0	x	1
	Element Disabled	1	0	0	0
	Element Inhibited	x	x	1	0
A87HsPDIF *.Mod.stVal		5	2	2	1

device annunciation: 1 – ON/TRUE IEC61850 Value: 1 – ON
 0 – OFF/FALSE 2 – BLOCKED
 x – Irrelevant 3 – TEST
 4 – TEST/BLOCKED
 5 – OFF

A87HsPDIF *.Health

No	Information		
	Protection Healthy	0	1
A87HsPDIF *.Health.stVal		3	1

device annunciation: 1 – ON/TRUE IEC61850 Value: 1 – OK
 0 – OFF/FALSE 2 – WARNING
 3 – ALARM

A87HsPDIF *.Op

No	Information		
	Element Operated	0	1
A87HsPDIF *.Op.general		0	1

device annunciation: 1 – ON/TRUE IEC61850 Value: 0 – FALSE
 0 – OFF/FALSE 1 – TRUE

A87HsPDIF *.Str

No	Information		
	Element Phase A picked up or Element Phase B picked up or Element Phase C picked up	0	1
A87HsPDIF *.Str.general		0	1

device annunciation: 1 – ON/TRUE IEC61850 Value: 0 – FALSE
 0 – OFF/FALSE 1 – TRUE

4.11 Line Check 50LC-1, 50LC-2 (A50LCPTOC1, A50LCPTOC2)

A50LCPTOC*.Mod

No	Information				
	Line Check Enabled (Function Config)	x	0	x	1
	Element Disabled	1	0	0	0
	Element Inhibited	x	x	1	0
A50LCPTOC *.Mod.stVal		5	2	2	1

device annunciation: 1 – ON/TRUE IEC61850 Value: 1 – ON
 0 – OFF/FALSE 2 – BLOCKED
 x – Irrelevant 3 – TEST
 4 – TEST/BLOCKED
 5 – OFF

A50LCPTOC*.Health

No	Information		
	Protection Healthy	0	1
A50LCPTOC *.Health.stVal		3	1

device annunciation: 1 – ON/TRUE IEC61850 Value: 1 – OK
 0 – OFF/FALSE 2 – WARNING
 3 – ALARM

A50LCPTOC*.Str

No	Information		
	Element Phase A picked up or Element Phase B picked up or Element Phase C picked up	0	1
A50LCPTOC *.Str.general		0	1

device annunciation: 1 – ON/TRUE IEC61850 Value: 0 – FALSE
 0 – OFF/FALSE 1 – TRUE

No	Information												
	Element Phase A picked up & Fwd Direction	x	1	1	0	0	0	0	1	0	0	1	0
	Element Phase A picked up & Rev Direction	x	x	x	1	0	0	1	0	0	0	0	0
	Element Phase B picked up & Fwd Direction	x	x	x	0	0	0	0	1	0	1	0	0
	Element Phase B picked up & Rev Direction	1	x	1	1	0	1	0	0	0	0	0	0
	Element Phase C picked up & Fwd Direction	1	x	x	0	0	0	0	1	1	0	0	0
	Element Phase C picked up & Rev Direction	x	1	x	1	1	0	0	0	0	0	0	0
A50LCPTOC *.Str.dirGeneral		3	3	3	2	2	2	2	1	1	1	1	0

device annunciation: 1 – ON/TRUE IEC61850 Value: 0 – NO-DIR
 0 – OFF/FALSE 1 – FWD
 2 – REV
 3 – FWD & REV

No	Information		
	Element Phase A picked up	0	1
A50LCPTOC *.Str.phsA		0	1

device annunciation: 1 – ON/TRUE IEC61850 Value: 0 – FALSE
 0 – OFF/FALSE 1 – TRUE

No	Information			
	Element Phase A picked up & Fwd Direction	0	1	0
	Element Phase A picked up & Rev Direction	1	0	0
A50LCPTOC *.Str.dirPhsA		2	1	0

device annunciation: 1 – ON/TRUE IEC61850 Value: 0 – NO-DIR
0 – OFF/FALSE 1 – FWD
2 – REV

No	Information		
	Element Phase B picked up	0	1
A50LCPTOC *.Str.phsB		0	1

device annunciation: 1 – ON/TRUE IEC61850 Value: 0 – FALSE
0 – OFF/FALSE 1 - TRUE

No	Information			
	Element Phase B picked up & Fwd Direction	0	1	0
	Element Phase B picked up & Rev Direction	1	0	0
A50LCPTOC *.Str.dirPhsB		2	1	0

device annunciation: 1 – ON/TRUE IEC61850 Value: 0 – NO-DIR
0 – OFF/FALSE 1 – FWD
2 – REV

No	Information		
	Element Phase C picked up	0	1
A50LCPTOC *.Str.phsC		0	1

device annunciation: 1 – ON/TRUE IEC61850 Value: 0 – FALSE
0 – OFF/FALSE 1 - TRUE

No	Information			
	Element Phase C picked up & Fwd Direction	0	1	0
	Element Phase C picked up & Rev Direction	1	0	0
A50LCPTOC *.Str.dirPhsC		2	1	0

device annunciation: 1 – ON/TRUE IEC61850 Value: 0 – NO-DIR
0 – OFF/FALSE 1 – FWD
2 – REV

A50LCPTOC*.Op

No	Information		
	Element Operated	0	1
A50LCPTOC *.Op.general		0	1

device annunciation: 1 – ON/TRUE IEC61850 Value: 0 – FALSE
0 – OFF/FALSE 1 - TRUE

4.12 Line Check 50G LC-1, 50G LC-2 (A50gLCPTOC1, A50gLCPTOC2)

A50gLCPTOC*.Mod

No	Information				
	Line Check Enabled (Function Config)	x	0	x	1
	Element Disabled	1	0	0	0
	Element Inhibited	x	x	1	0
A50gLCPTOC *.Mod.stVal		5	2	2	1

device annunciation: 1 – ON/TRUE IEC61850 Value: 1 – ON
 0 – OFF/FALSE 2 – BLOCKED
 x – Irrelevant 3 – TEST
 4 – TEST/BLOCKED
 5 – OFF

A50gLCPTOC*.Health

No	Information		
	Protection Healthy	0	1
A50gLCPTOC *.Health.stVal		3	1

device annunciation: 1 – ON/TRUE IEC61850 Value: 1 – OK
 0 – OFF/FALSE 2 – WARNING
 3 – ALARM

A50gLCPTOC*.Str

No	Information		
	Element Phase A picked up or Element Phase B picked up or Element Phase C picked up	0	1
A50gLCPTOC *.Str.general		0	1

device annunciation: 1 – ON/TRUE IEC61850 Value: 0 – FALSE
 0 – OFF/FALSE 1 – TRUE

No	Information												
	Element Phase A picked up & Fwd Direction	x	1	1	0	0	0	0	1	0	0	1	0
	Element Phase A picked up & Rev Direction	x	x	x	1	0	0	1	0	0	0	0	0
	Element Phase B picked up & Fwd Direction	x	x	x	0	0	0	0	1	0	1	0	0
	Element Phase B picked up & Rev Direction	1	x	1	1	0	1	0	0	0	0	0	0
	Element Phase C picked up & Fwd Direction	1	x	x	0	0	0	0	1	1	0	0	0
	Element Phase C picked up & Rev Direction	x	1	x	1	1	0	0	0	0	0	0	0
A50gLCPTOC *.Str.dirGeneral		3	3	3	2	2	2	2	1	1	1	1	0

device annunciation: 1 – ON/TRUE IEC61850 Value: 0 – NO-DIR
 0 – OFF/FALSE 1 – FWD
 2 – REV
 3 – FWD & REV

A50gLCPTOC*.Op

No	Information		
	Element Operated	0	1
A50gLCPTOC *.Op.general		0	1

device annunciation: 1 – ON/TRUE IEC61850 Value: 0 – FALSE
 0 – OFF/FALSE 1 – TRUE

No	Information		
	Element Phase A picked up	0	1
A50PTOC*.Str.phsA		0	1

device annunciation: 1 – ON/TRUE IEC61850 Value: 0 – FALSE
0 – OFF/FALSE 1 - TRUE

No	Information			
	Element Phase A picked up & Fwd Direction	0	1	0
	Element Phase A picked up & Rev Direction	1	0	0
A50PTOC*.Str.dirPhsA		2	1	0

device annunciation: 1 – ON/TRUE IEC61850 Value: 0 – NO-DIR
0 – OFF/FALSE 1 – FWD
2 – REV

No	Information		
	Element Phase B picked up	0	1
A50PTOC*.Str.phsB		0	1

device annunciation: 1 – ON/TRUE IEC61850 Value: 0 – FALSE
0 – OFF/FALSE 1 - TRUE

No	Information			
	Element Phase B picked up & Fwd Direction	0	1	0
	Element Phase B picked up & Rev Direction	1	0	0
A50PTOC*.Str.dirPhsB		2	1	0

device annunciation: 1 – ON/TRUE IEC61850 Value: 0 – NO-DIR
0 – OFF/FALSE 1 – FWD
2 – REV

No	Information		
	Element Phase C picked up	0	1
A50PTOC*.Str.phsC		0	1

device annunciation: 1 – ON/TRUE IEC61850 Value: 0 – FALSE
0 – OFF/FALSE 1 - TRUE

No	Information			
	Element Phase C picked up & Fwd Direction	0	1	0
	Element Phase C picked up & Rev Direction	1	0	0
A50PTOC*.Str.dirPhsC		2	1	0

device annunciation: 1 – ON/TRUE IEC61850 Value: 0 – NO-DIR
0 – OFF/FALSE 1 – FWD
2 – REV

4.15 Derived E/F Protection 51N-1, 51N-2, 51N-3 & , 51N-4 (A51nPTOC1, A51nPTOC2, A51nPTOC3, A51nPTOC4)

A51nPTOC*.Mod

No	Information				
	Derived E/F Enabled (Function Config)	x	0	x	1
	Element Disabled	1	0	0	0
	Element Inhibited	x	x	1	0
A51nPTOC*.Mod.stVal		5	2	2	1

device annunciation: 1 – ON/TRUE IEC61850 Value: 1 – ON
 0 – OFF/FALSE 2 – BLOCKED
 x – Irrelevant 3 – TEST
 4 – TEST/BLOCKED
 5 – OFF

A51nPTOC*.Health

No	Information		
	Protection Healthy	0	1
A51nPTOC*.Health.stVal		3	1

device annunciation: 1 – ON/TRUE IEC61850 Value: 1 – OK
 0 – OFF/FALSE 2 – WARNING
 3 – ALARM

A51nPTOC*.Str

No	Information		
	Element Picked up	0	1
A51nPTOC*.Str.general		0	1

device annunciation: 1 – ON/TRUE IEC61850 Value: 0 – FALSE
 0 – OFF/FALSE 1 – TRUE

No	Information			
	Element picked up & Fwd Direction	0	1	0
	Element picked up & Rev Direction	1	0	0
A51nPTOC*.Str.dirGeneral		2	1	0

device annunciation: 1 – ON/TRUE IEC61850 Value: 0 – NO-DIR
 0 – OFF/FALSE 1 – FWD
 2 – REV

A51nPTOC*.Op

No	Information		
	Element Operated	0	1
A51nPTOC*.Op.general		0	1

device annunciation: 1 – ON/TRUE IEC61850 Value: 0 – FALSE
 0 – OFF/FALSE 1 – TRUE

4.17 Measured E/F Protection 51G-1, 51G-2, 51G-3 & 51G-4 (A51gPTOC1, A51gPTOC2, A51gPTOC3, A51gPTOC4)

A51gPTOC*.Mod

No	Information				
	Measured E/F Enabled (Function Config)	x	0	x	1
	Element Disabled	1	0	0	0
	Element Inhibited	x	x	1	0
A51gPTOC*.Mod.stVal		5	2	2	1

device annunciation: 1 – ON/TRUE IEC61850 Value: 1 – ON
 0 – OFF/FALSE 2 – BLOCKED
 x – Irrelevant 3 – TEST
 4 – TEST/BLOCKED
 5 – OFF

A51gPTOC*.Health

No	Information		
	Protection Healthy	0	1
A51gPTOC*.Health.stVal		3	1

device annunciation: 1 – ON/TRUE IEC61850 Value: 1 – OK
 0 – OFF/FALSE 2 – WARNING
 3 – ALARM

A51gPTOC*.Str

No	Information		
	Element Picked up	0	1
A51gPTOC*.Str.general		0	1

device annunciation: 1 – ON/TRUE IEC61850 Value: 0 – FALSE
 0 – OFF/FALSE 1 – TRUE

No	Information			
	Element picked up & Fwd Direction	0	1	0
	Element picked up & Rev Direction	1	0	0
A51gPTOC*.Str.dirGeneral		2	1	0

device annunciation: 1 – ON/TRUE IEC61850 Value: 0 – NO-DIR
 0 – OFF/FALSE 1 – FWD
 2 – REV

A51gPTOC*.Op

No	Information		
	Element Operated	0	1
A51gPTOC*.Op.general		0	1

device annunciation: 1 – ON/TRUE IEC61850 Value: 0 – FALSE
 0 – OFF/FALSE 1 – TRUE

4.18 Measured E/F Protection 50G-1, 50G-2, 50G-3 & 50G-4 (A50gPTOC1, A50gPTOC2, A50gPTOC3, A50gPTOC4)

A50gPTOC*.Mod

No	Information				
	Measured E/F Enabled (Function Config)	x	0	x	1
	Element Disabled	1	0	0	0
	Element Inhibited	x	x	1	0
A50gPTOC*.Mod.stVal		5	2	2	1

device annunciation: 1 – ON/TRUE IEC61850 Value: 1 – ON
 0 – OFF/FALSE 2 – BLOCKED
 x – Irrelevant 3 – TEST
 4 – TEST/BLOCKED
 5 – OFF

A50gPTOC*.Health

No	Information		
	Protection Healthy	0	1
A50gPTOC*.Health.stVal		3	1

device annunciation: 1 – ON/TRUE IEC61850 Value: 1 – OK
 0 – OFF/FALSE 2 – WARNING
 3 – ALARM

A50gPTOC*.Str

No	Information		
	Element Picked up	0	1
A50gPTOC*.Str.general		0	1

device annunciation: 1 – ON/TRUE IEC61850 Value: 0 – FALSE
 0 – OFF/FALSE 1 – TRUE

No	Information			
	Element picked up & Fwd Direction	0	1	0
	Element picked up & Rev Direction	1	0	0
A50gPTOC*.Str.dirGeneral		2	1	0

device annunciation: 1 – ON/TRUE IEC61850 Value: 0 – NO-DIR
 0 – OFF/FALSE 1 – FWD
 2 – REV

A50gPTOC*.Op

No	Information		
	Element Operated	0	1
A50gPTOC*.Op.general		0	1

device annunciation: 1 – ON/TRUE IEC61850 Value: 0 – FALSE
 0 – OFF/FALSE 1 – TRUE

4.20 Under Current Protection 37-1 & 37-2 (A37PTUC1, A37PTUC2)

A37PTUC*.Mod

No	Information				
	Under Current Enabled (Function Config)	x	0	x	1
	Element Disabled	1	0	0	0
	Element Inhibited	x	x	1	0
A37PTUC*.Mod.stVal		5	2	2	1

device annunciation: 1 – ON/TRUE IEC61850 Value: 1 – ON
 0 – OFF/FALSE 2 – BLOCKED
 x – Irrelevant 3 – TEST
 4 – TEST/BLOCKED
 5 – OFF

A37PTUC*.Health

No	Information		
	Protection Healthy	0	1
A37PTUC*.Health.stVal		3	1

device annunciation: 1 – ON/TRUE IEC61850 Value: 1 – OK
 0 – OFF/FALSE 2 – WARNING
 3 – ALARM

A37PTUC*.Str

No	Information		
	Element Phase A picked up or Element Phase B picked up or Element Phase C picked up	0	1
A37PTUC*.Str.general		0	1

device annunciation: 1 – ON/TRUE IEC61850 Value: 0 – FALSE
 0 – OFF/FALSE 1 – TRUE

No	Information		
	Element Phase A picked up	0	1
A37PTUC*.Str.phsA		0	1

device annunciation: 1 – ON/TRUE IEC61850 Value: 0 – FALSE
 0 – OFF/FALSE 1 – TRUE

No	Information		
	Element Phase B picked up	0	1
A37PTUC*.Str.phsB		0	1

device annunciation: 1 – ON/TRUE IEC61850 Value: 0 – FALSE
 0 – OFF/FALSE 1 – TRUE

No	Information		
	Element Phase C picked up	0	1
A37PTUC*.Str.phsC		0	1

device annunciation: 1 – ON/TRUE IEC61850 Value: 0 – FALSE
 0 – OFF/FALSE 1 – TRUE

A37PTUC*.Op

No	Information		
	Element Operated	0	1
	A37PTUC*.Op.general	0	1

device annunciation: 1 – ON/TRUE
0 – OFF/FALSE

IEC61850 Value: 0 – FALSE
1 - TRUE

4.23 CB Fail 50BF (A50BfRBRF1)

A50BfRBRF1.Mod

No	Information				
	Broken Conductor Enabled (Function Config)	x	0	x	1
	Element Disabled	1	0	0	0
	Element Inhibited	x	x	1	0
A50BfRBRF1.Mod.stVal		5	2	2	1

device annunciation: 1 – ON/TRUE IEC61850 Value: 1 – ON
 0 – OFF/FALSE 2 – BLOCKED
 x – Irrelevant 3 – TEST
 4 – TEST/BLOCKED

A50BfRBRF1.Health

No	Information		
	Protection Healthy	0	1
A50BfRBRF1.Health.stVal		3	1

device annunciation: 1 – ON/TRUE IEC61850 Value: 1 – OK
 0 – OFF/FALSE 2 – WARNING
 3 – ALARM
 5 – OFF

A50BfRBRF1.Str

No	Information		
	Element picked up	0	1
A50BfRBRF1.Str.general		0	1

device annunciation: 1 – ON/TRUE IEC61850 Value: 0 – FALSE
 0 – OFF/FALSE 1 – TRUE

A50BfRBRF1.OpEx

No	Information		
	External trip raised	0	1
A50BfRBRF1.OpEx.general		0	1

device annunciation: 1 – ON/TRUE IEC61850 Value: 0 – FALSE
 0 – OFF/FALSE 1 – TRUE

A50BfRBRF1.OpIn

No	Information		
	Internal trip raised	0	1
A50BfRBRF1.OpIn.general		0	1

device annunciation: 1 – ON/TRUE IEC61850 Value: 0 – FALSE
 0 – OFF/FALSE 1 – TRUE

MMXU1.Hz

No	Information	Value		
			Measured Value	Value
	Frequency (Freq =)	MMXU1.Hz.mag.f		
		MMXU1.Hz.units.SIunit	33	Hz
		MMXU1.Hz.units.multiplier	0	1

MMXU1.PPV

No	Information	Value		
			Measured Value	Value
	Va-b (Vab =)	MMXU1.PPV.phsAB.cVal.mag.f		
		MMXU1.PPV.phsAB.units.SIunit	29	V
		MMXU1.PPV.phsAB.units.multiplier	0	1

No	Information	Value		
			Measured Value	Value
	Vb-c (Vbc =)	MMXU1.PPV.phsBC.cVal.mag.f		
		MMXU1.PPV.phsBC.units.SIunit	29	V
		MMXU1.PPV.phsBC.units.multiplier	0	1

No	Information	Value		
			Measured Value	Value
	Vc-a (Vca =)	MMXU1.PPV.phsCA.cVal.mag.f		
		MMXU1.PPV.phsCA.units.SIunit	29	V
		MMXU1.PPV.phsCA.units.multiplier	0	1

MMXU1.PhV

No	Information	Value		
			Measured Value	Value
	Va (Va =)	MMXU1.PhV.phsA.cVal.mag.f	Measured Value	Value
		MMXU1.PhV.phsA.cVal.ang.f	Measured Value	Value
		MMXU1.PhV.phsA.units.SIunit	29	V
		MMXU1.PhV.phsA.units.multiplier	0	1

No	Information	Value		
			Measured Value	Value
	Vb (Vb =)	MMXU1.PhV.phsB.cVal.mag.f	Measured Value	Value
		MMXU1.PhV.phsB.cVal.ang.f	Measured Value	Value
		MMXU1.PhV.phsB.units.SIunit	29	V
		MMXU1.PhV.phsB.units.multiplier	0	1

No	Information	Value		
			Measured Value	Value
	Vc (Vc =)	MMXU1.PhV.phsC.cVal.mag.f	Measured Value	Value
		MMXU1.PhV.phsC.cVal.ang.f	Measured Value	Value
		MMXU1.PhV.phsC.units.SIunit	29	V
		MMXU1.PhV.phsC.units.multiplier	0	1

No	Information	Value		
			Measured Value	Value
	Vneut (Vneut =)	MMXU1.PhV.neut.cVal.mag.f	Measured Value	Value
		MMXU1.PhV.neut.cVal.ang.f	Measured Value	Value
		MMXU1.PhV.neut.units.SIunit	29	V
		MMXU1.PhV.neut.units.multiplier	0	1

No	Information	Value		
	Vres (Vres =)	MMXU1.PhV.res.cVal.mag.f	Measured Value	Value
		MMXU1.PhV.res.cVal.ang.f	Measured Value	Value
		MMXU1.PhV.res.units.SIunit	29	V
		MMXU1.PhV.res.units.multiplier	0	1

MMXU1.A

No	Information	Value		
	Ia (Ia =)	MMXU1.A.phsA.cVal.mag.f	Measured Value	Value
		MMXU1.A.phsA.cVal.ang.f	Measured Value	Value
		MMXU1.A.phsA.units.SIunit	5	A
		MMXU1.A.phsA.units.multiplier	0	1

No	Information	Value		
	Ib (Ib =)	MMXU1.A.phsB.cVal.mag.f	Measured Value	Value
		MMXU1.A.phsB.cVal.ang.f	Measured Value	Value
		MMXU1.A.phsB.units.SIunit	5	A
		MMXU1.A.phsB.units.multiplier	0	1

No	Information	Value		
	Ic (Ic =)	MMXU1.A.phsC.cVal.mag.f	Measured Value	Value
		MMXU1.A.phsC.cVal.ang.f	Measured Value	Value
		MMXU1.A.phsC.units.SIunit	5	A
		MMXU1.A.phsC.units.multiplier	0	1

No	Information	Value		
	Ineut (Ineut =)	MMXU1.A.neut.cVal.mag.f	Measured Value	Value
		MMXU1.A.neut.cVal.ang.f	Measured Value	Value
		MMXU1.A.neut.units.SIunit	5	A
		MMXU1.A.neut.units.multiplier	0	1

No	Information	Value		
	Ires (Ires =)	MMXU1.A.res.cVal.mag.f	Measured Value	Value
		MMXU1.A.res.cVal.ang.f	Measured Value	Value
		MMXU1.A.res.units.SIunit	5	A
		MMXU1.A.res.units.multiplier	0	1

MMXU1.W

No	Information	Value		
	Active Power (P =) Phase A	MMXU1.W.phsA.cVal.mag.f	Measured Value	Value
		MMXU1.W.phsA.units.SIunit	62	W
		MMXU1.W.phsA.units.multiplier	0	1

No	Information	Value		
	Active Power (P =) Phase B	MMXU1.W.phsB.cVal.mag.f	Measured Value	Value
		MMXU1.W.phsB.units.SIunit	62	W
		MMXU1.W.phsB.units.multiplier	0	1

No	Information	Value		
	Active Power (P =) Phase C	MMXU1.A.phsC.cVal.mag.f	Measured Value	Value
		MMXU1.A.phsC.units.SIunit	62	W
		MMXU1.A.phsC.units.multiplier	0	1

MMXU1.VAr

No	Information	Value		
	Reactive Power (Q =) Phase A	MMXU1.VAr.phsA.cVal.mag.f	Measured Value	Value
		MMXU1.VAr.phsA.units.SIunit	63	VAr
		MMXU1.VAr.phsA.units.multiplier	0	1

No	Information	Value		
	Reactive Power (Q =) Phase B	MMXU1.VAr.phsB.cVal.mag.f	Measured Value	Value
		MMXU1.VAr.phsB.units.SIunit	63	VAr
		MMXU1.VAr.phsB.units.multiplier	0	1

No	Information	Value		
	Reactive Power (Q =) Phase C	MMXU1.VAr.phsC.cVal.mag.f	Measured Value	Value
		MMXU1.VAr.phsC.units.SIunit	63	VAr
		MMXU1.VAr.phsC.units.multiplier	0	1

MMXU1.VA

No	Information	Value		
	Apparent Power (S =) Phase A	MMXU1.VA.phsA.cVal.mag.f	Measured Value	Value
		MMXU1.VA.phsA.units.SIunit	61	VAr
		MMXU1.VA.phsA.units.multiplier	0	1

No	Information	Value		
	Apparent Power (S =) Phase B	MMXU1.VA.phsB.cVal.mag.f	Measured Value	Value
		MMXU1.VA.phsB.units.SIunit	61	VAr
		MMXU1.VArphsB.units.multiplier	0	1

No	Information	Value		
	Apparent Power (S =) Phase C	MMXU1.VA.phsC.cVal.mag.f	Measured Value	Value
		MMXU1.VA.phsC.units.SIunit	61	VAr
		MMXU1.VA.phsC.units.multiplier	0	1

MMXU1.PF

No	Information	Value		
	Power Factor (PF =) Phase A	MMXU1.PF.phsA.cVal.mag.f	Measured Value	Value
		MMXU1.PF.phsA.units.SIunit	1	None
		MMXU1.PF.phsA.units.multiplier	0	1

No	Information	Value		
		MMXU1.PF.phsB.cVal.mag.f	Measured Value	Value
	Power Factor (PF =) Phase B	MMXU1.PF.phsB.cVal.mag.f	Measured Value	Value
		MMXU1.PF.phsB.units.Stunit	1	None
		MMXU1.PF.phsB.units.multiplier	0	1

No	Information	Value		
		MMXU1.PF.phsC.cVal.mag.f	Measured Value	Value
	Power Factor (PF =) Phase C	MMXU1.PF.phsC.cVal.mag.f	Measured Value	Value
		MMXU1.PF.phsC.units.Stunit	1	none
		MMXU1.PF.phsC.units.multiplier	0	1

No	Information	Value		
			Measured Value	Value
	Vc-a (Vca =)	MeanMMXU1.PPV.phsCA.cVal.mag.f		
		MeanMMXU1.PPV.phsCA.units.SIunit	29	V
		MeanMMXU1.PPV.phsCA.units.multiplier	0	1

MeanMMXU1.A

No	Information	Value		
			Measured Value	Value
	Ia (Ia =)	MeanMMXU1.A.phsA.cVal.mag.f		
		MeanMMXU1.A.phsA.cVal.ang.f		
		MeanMMXU1.A.phsA.units.SIunit	5	A
		MeanMMXU1.A.phsA.units.multiplier	0	1

No	Information	Value		
			Measured Value	Value
	Ib (Ib =)	MeanMMXU1.A.phsB.cVal.mag.f		
		MeanMMXU1.A.phsB.cVal.ang.f		
		MeanMMXU1.A.phsB.units.SIunit	5	A
		MeanMMXU1.A.phsB.units.multiplier	0	1

No	Information	Value		
			Measured Value	Value
	Ic (Ic =)	MeanMMXU1.A.phsC.cVal.mag.f		
		MeanMMXU1.A.phsC.cVal.ang.f		
		MeanMMXU1.A.phsC.units.SIunit	5	A
		MeanMMXU1.A.phsC.units.multiplier	0	1

MeanMMXU1.Hz

No	Information	Value		
			Measured Value	Value
	Frequency	MeanMMXU1.Hz.mag.f		

MaxMMXU1.Mod

No	Information	
	Reset Device	x
	MaxMMXU1.Mod.stVal	1

device annunciation: 1 – ON/TRUE IEC61850 Value: 1 – OK
0 – OFF/FALSE 2 – WARNING
x - irrelevant 3 - ALARM

MaxMMXU1.Health

No	Information		
	Protection Healthy	0	1
	MaxMMXU1.Health.stVal	3	1

device annunciation: 1 – ON/TRUE IEC61850 Value: 1 – OK
0 – OFF/FALSE 2 – WARNING
3 - ALARM

MaxMMXU1.TotW

No	Information	Value		
			Measured Value	Value
	Active Power (P =)	MaxMMXU1.TotW.mag.f		
		MaxMMXU1.TotW.units.SIunit	62	W (Watt)
		MaxMMXU1.TotW.units.multiplier	0	1

MaxMMXU1.TotVAr

No	Information	Value		
	Reactive Power (Q =)	MaxMMXU1.TotVAr.mag.f	Measured Value	Value
		MaxMMXU1.TotVAr.units.SIunit	63	VAr
		MaxMMXU1.TotVAr.units.multiplier	0	1

MaxMMXU1.TotVA

No	Information	Value		
	Apparent Power (S =)	MaxMMXU1.TotVA.mag.f	Measured Value	Value
		MaxMMXU1.TotVA.units.SIunit	61	VA
		MaxMMXU1.TotVA.units.multiplier	0	1

MaxMMXU1.PPV

No	Information	Value		
	Va-b (Vab =)	MaxMMXU1.PPV.phsAB.cVal.mag.f	Measured Value	Value
		MaxMMXU1.PPV.phsAB.units.SIunit	29	V
		MaxMMXU1.PPV.phsAB.units.multiplier	0	1

No	Information	Value		
	Vb-c (Vbc =)	MaxMMXU1.PPV.phsBC.cVal.mag.f	Measured Value	Value
		MaxMMXU1.PPV.phsBC.units.SIunit	29	V
		MaxMMXU1.PPV.phsBC.units.multiplier	0	1

No	Information	Value		
	Vc-a (Vca =)	MaxMMXU1.PPV.phsCA.cVal.mag.f	Measured Value	Value
		MaxMMXU1.PPV.phsCA.units.SIunit	29	V
		MaxMMXU1.PPV.phsCA.units.multiplier	0	1

MaxMMXU1.A

No	Information	Value		
	Ia (Ia =)	MaxMMXU1.A.phsA.cVal.mag.f	Measured Value	Value
		MaxMMXU1.A.phsA.cVal.ang.f	Measured Value	Value
		MaxMMXU1.A.phsA.units.SIunit	5	A
		MaxMMXU1.A.phsA.units.multiplier	0	1

No	Information	Value		
	Ib (Ib =)	MaxMMXU1.A.phsB.cVal.mag.f	Measured Value	Value
		MaxMMXU1.A.phsB.cVal.ang.f	Measured Value	Value
		MaxMMXU1.A.phsB.units.SIunit	5	A
		MaxMMXU1.A.phsB.units.multiplier	0	1

No	Information	Value		
	Ic (Ic =)	MaxMMXU1.A.phsC.cVal.mag.f	Measured Value	Value
		MaxMMXU1.A.phsC.cVal.ang.f	Measured Value	Value
		MaxMMXU1.A.phsC.units.SIunit	5	A
		MaxMMXU1.A.phsC.units.multiplier	0	1

MaxMMXU1.Hz

No	Information	Value		
	Frequency	MaxMMXU1.Hz.mag.f	Measured Value	Value

MinMMXU1.Mod

No	Information	
	Reset Device	x
MinMMXU1.Mod.stVal		1

device annunciation: 1 – ON/TRUE IEC61850 Value: 1 – OK
 0 – OFF/FALSE 2 – WARNING
 x - irrelevant 3 - ALARM

MinMMXU1.Health

No	Information		
	Protection Healthy	0	1
MinMMXU1.Health.stVal		3	1

device annunciation: 1 – ON/TRUE IEC61850 Value: 1 – OK
 0 – OFF/FALSE 2 – WARNING
 3 - ALARM

MinMMXU1.TotW

No	Information	Value		
		MinMMXU1.TotW.mag.f	Measured Value	Value
	Active Power (P ⇒)	MinMMXU1.TotW.mag.f	Measured Value	Value
		MinMMXU1.TotW.units.Slunit	62	W (Watt)
		MinMMXU1.TotW.units.multiplier	0	1

MinMMXU1.TotVAr

No	Information	Value		
		MinMMXU1.TotVAr.mag.f	Measured Value	Value
	Reactive Power (Q ⇒)	MinMMXU1.TotVAr.mag.f	Measured Value	Value
		MinMMXU1.TotVAr.units.Slunit	63	VAr
		MinMMXU1.TotVAr.units.multiplier	0	1

MinMMXU1.TotVA

No	Information	Value		
		MinMMXU1.TotVA.mag.f	Measured Value	Value
	Apparent Power (S ⇒)	MinMMXU1.TotVA.mag.f	Measured Value	Value
		MinMMXU1.TotVA.units.Slunit	61	VA
		MinMMXU1.TotVA.units.multiplier	0	1

MinMMXU1.PPV

No	Information	Value		
		MinMMXU1.PPV.phsAB.cVal.mag.f	Measured Value	Value
	Va-b (Vab ⇒)	MinMMXU1.PPV.phsAB.cVal.mag.f	Measured Value	Value
		MinMMXU1.PPV.phsAB.units.Slunit	29	V
		MinMMXU1.PPV.phsAB.units.multiplier	0	1

No	Information	Value		
		MinMMXU1.PPV.phsBC.cVal.mag.f	Measured Value	Value
	Vb-c (Vbc ⇒)	MinMMXU1.PPV.phsBC.cVal.mag.f	Measured Value	Value
		MinMMXU1.PPV.phsBC.units.Slunit	29	V
		MinMMXU1.PPV.phsBC.units.multiplier	0	1

No	Information	Value		
		MinMMXU1.PPV.phsCA.cVal.mag.f	Measured Value	Value
	Vc-a (Vca ⇒)	MinMMXU1.PPV.phsCA.cVal.mag.f	Measured Value	Value
		MinMMXU1.PPV.phsCA.units.Slunit	29	V
		MinMMXU1.PPV.phsCA.units.multiplier	0	1

MinMMXU1.A

No	Information	Value		
	Ia (Ia =)	MinMMXU1.A.phsA.cVal.mag.f	Measured Value	Value
		MinMMXU1.A.phsA.cVal.ang.f	Measured Value	Value
		MinMMXU1.A.phsA.units.Stunit	5	A
		MinMMXU1.A.phsA.units.multiplier	0	1

No	Information	Value		
	Ib (Ib =)	MinMMXU1.A.phsB.cVal.mag.f	Measured Value	Value
		MinMMXU1.A.phsB.cVal.ang.f	Measured Value	Value
		MinMMXU1.A.phsB.units.Stunit	5	A
		MinMMXU1.A.phsB.units.multiplier	0	1

No	Information	Value		
	Ic (Ic =)	MinMMXU1.A.phsC.cVal.mag.f	Measured Value	Value
		MinMMXU1.A.phsC.cVal.ang.f	Measured Value	Value
		MinMMXU1.A.phsC.units.Stunit	5	A
		MinMMXU1.A.phsC.units.multiplier	0	1

MinMMXU1.Hz

No	Information	Value		
	Frequency	MinMMXU1.Hz.mag.f	Measured Value	Value

		MMTR1.SupWh.pulsQty	10*	-
--	--	---------------------	-----	---

*dependant on the Reactive Exp Energy Unit setting

4.31 Autoreclosing (A79RREC1)

A79RREC1.Mod

No	Information					
	Reset Device	x	x	x	x	x
	Autoreclose In	1	0	x	1	0
	Autoreclose Out	0	1	x	1	0
	Autoreclose Blocked	0	0	1	0	0
A79RREC1.Mod.stVal		1	1	2	1	1

device annunciation: 1 – ON/TRUE
0 – OFF/FALSE
x – Irrelevant

IEC61850 Value: 1 – ON
2 – BLOCKED
3 – TEST
4 – TEST/BLOCKED
5 – OFF

A79RREC1.Health

No	Information		
	Protection Healthy	0	1
A79RREC1.Health.stVal		3	1

device annunciation: 1 – ON/TRUE
0 – OFF/FALSE

IEC61850 Value: 1 – OK
2 – WARNING
3 – ALARM

A79RREC1.Op

No	Information		
	Autoreclose Operated	0	1
A79RREC1.Op.general		0	1

device annunciation: 1 – ON/TRUE
0 – OFF/FALSE

IEC61850 Value: 0 – FALSE
1 – TRUE

A79RREC1.AutoRecSt

No	Information			
	Autoreclose In Progress	0	1	0
	Autoreclose Successful	0	0	1
A79RREC1.AutoRecSt.stVal		1	2	3

device annunciation: 1 – ON/TRUE
0 – OFF/FALSE

IEC61850 Value: 1 – READY
2 – IN PROGRESS
3 – SUCCESSFUL

4.32 Interlocking (Q0CILO1)

Q0CILO1

Q0CILO1.Mod

No	Information	
	Reset Device	x
Q0CILO1.Mod.stVal		1

device annunciation: 1 – ON/TRUE
 0 – OFF/FALSE
 x – Irrelevant

IEC61850 Value: 1 – ON
 2 – BLOCKED
 3 – TEST
 4 – TEST/BLOCKED
 5 – OFF

Q0CILO1.Health

No	Information		
	Protection Healthy	0	1
Q0CILO1.Health.stVal		3	1

device annunciation: 1 – ON/TRUE
 0 – OFF/FALSE

IEC61850 Value: 1 – OK
 2 – WARNING
 3 – ALARM

Q0CILO1.EnaCls

No	Information		
	NOT CB Control Close Block	0	1
Q0CILO1.EnaCls.stVal		0	1

device annunciation: 1 – ON/TRUE
 0 – OFF/FALSE

IEC61850 Value: 0 – FALSE
 1 – TRUE

Q0CILO1.EnaOpn

No	Information		
	NOT CB Control Close Open	0	1
Q0CILO1.EnaOpn.stVal		0	1

device annunciation: 1 – ON/TRUE
 0 – OFF/FALSE

IEC61850 Value: 0 – FALSE
 1 – TRUE

4.34 Circuit Breaker (Q0XCBR1)

Q0XCBR1.Mod

No	Information	
	Reset Device	x
Q0XCBR1.Mod.stVal		1

device annunciation: 1 – ON/TRUE IEC61850 Value: 1 – ON
 0 – OFF/FALSE 2 – BLOCKED
 x – Irrelevant 3 – TEST
 4 – TEST/BLOCKED
 5 – OFF

Q0XCBR1.Health

No	Information		
	Protection Healthy	0	1
Q0XCBR1.Health.stVal		3	1

device annunciation: 1 – ON/TRUE IEC61850 Value: 1 – OK
 0 – OFF/FALSE 2 – WARNING
 3 – ALARM

Q0XCBR1.BlkCls

No	Information		
	CB Control Close Block	0	1
Q0XCBR1.BlkCls.stVal		0	1

device annunciation: 1 – ON/TRUE IEC61850 Value: 0 – FALSE
 0 – OFF/FALSE 1 – TRUE

Q0XCBR1.BlkOpn

No	Information		
	CB Control Open Block	0	1
Q0XCBR1.BlkOpn.stVal		0	1

device annunciation: 1 – ON/TRUE IEC61850 Value: 0 – FALSE
 0 – OFF/FALSE 1 – TRUE

Q0XCBR1.BlkOpCnt

No	Information	Measurand	Value
	CB Operations Counter	Q0XCBR1.OpCnt.stVal	0-10000

Q0XCBR1.Pos

No	Information				
	CB Status Open	0	1	0	1
	CB Status Closed	0	0	1	1
Q0XCBR1.Pos.stVal		00	01	10	11

device annunciation: 1 – ON/TRUE IEC61850 Value: 00 – INTERMEDIATE STATE
 0 – OFF/FALSE 01 – OFF
 10 – ON
 11 – INVALID STATE

Q0XCBR1.SumSwARs1

No	Information	Measurand	Value
	CB Wear PhA	Q0XCBR1.SumSwARs1.stVal	0-10000

Q0XCBR1.SumSwARs2

No	Information	Measurand	Value
----	-------------	-----------	-------

	CB Wear PhB	Q0XCBR1. SumSwARs2.stVal	0-10000
--	-------------	--------------------------	---------

Q0XCBR1.SumSwARs3

No	Information	Measurand	Value
	CB Wear PhC	Q0XCBR1. SumSwARs3.stVal	0-10000

4.36 Circuit Breaker Counters (CntDelGGIO1, CntLoGGIO1, CntEFGGIO1, CntPhAGGIO1, CntPhBGGIO1, CntPhCGGIO1)

CntDelGGIO1.Mod

No	Information	
	Reset Device	x
CntDelGGIO1.Mod.stVal		1

device annunciation: 1 – ON/TRUE IEC61850 Value: 1 – ON
 0 – OFF/FALSE 2 – BLOCKED
 x – Irrelevant 3 – TEST
 4 – TEST/BLOCKED
 5 – OFF

CntDelGGIO1.Health

No	Information		
	Protection Healthy	0	1
CntDelGGIO1.Health.stVal		3	1

device annunciation: 1 – ON/TRUE IEC61850 Value: 1 – OK
 0 – OFF/FALSE 2 – WARNING
 3 – ALARM

CntDelGGIO1.ISCSO1

No	Information	Measurand	Value
	CB Delta Trip Count	CntDelGGIO1.ISCSO1.stVal	0-10000

No	Information	Value
	CB Delta Trip Count	Value (0-10000)
CntDelGGIO1.ISCSO1.Oper.ctlVal		Value (0–10000)

CntDelGGIO1.ISCSO2

No	Information	Measurand	Value
	CB Delta Trip Count Target	CntDelGGIO1.ISCSO2.stVal	0-10000

No	Information	Value
	CB Delta Trip Count Target	Value (0-10000)
CntDelGGIO1.ISCSO2.Oper.ctlVal		Value (0–10000)

CntDelGGIO1.SPCSO

No	Information		
	CB Delta Trip Count Target Reached	0	1
CntDelGGIO1.SPCSO		0	1

device annunciation: 1 – ON/TRUE IEC61850 Value: 0 – FALSE
 0 – OFF/FALSE 1 – TRUE

CntLoGGIO1.Mod

No	Information	
	Reset Device	x
CntLoGGIO1.Mod.stVal		1

device annunciation: 1 – ON/TRUE IEC61850 Value: 1 – ON
 0 – OFF/FALSE 2 – BLOCKED
 x – Irrelevant 3 – TEST
 4 – TEST/BLOCKED
 5 – OFF

CntLoGGIO1.Health

No	Information		
	Protection Healthy	0	1
CntLOGGIO1.Health.stVal		3	1

device annunciation: 1 – ON/TRUE IEC61850 Value: 1 – OK
 0 – OFF/FALSE 2 – WARNING
 3 – ALARM

CntLOGGIO1.ISCSO1

No	Information	Measurand	Value
	CB Count To AR Block	CntLOGGIO1.ISCSO1.stVal	0-10000

No	Information	Value
	CB Count To AR Block	Value (0-10000)
CntLOGGIO1.ISCSO1.Oper.ctlVal		Value (0–10000)

CntLOGGIO1.ISCSO2

No	Information	Measurand	Value
	CB Count To AR Block Target	CntLOGGIO1.ISCSO2.stVal	0-10000

No	Information	Value
	CB Count To AR Block Target	Value (0-10000)
CntLOGGIO1.ISCSO2.Oper.ctlVal		Value (0–10000)

CntLOGGIO1.SPCSO

No	Information		
	CB Count To AR Block Target Reached	0	1
CntLOGGIO1.SPCSO		0	1

device annunciation: 1 – ON/TRUE IEC61850 Value: 0 – FALSE
 0 – OFF/FALSE 1 - TRUE

CntEFGGIO1.Mod

No	Information		
	Reset Device		x
CntEFGGIO1.Mod.stVal			1

device annunciation: 1 – ON/TRUE IEC61850 Value: 1 – ON
 0 – OFF/FALSE 2 – BLOCKED
 x – Irrelevant 3 – TEST
 4 - TEST/BLOCKED
 5 – OFF

CntEFGGIO1.Health

No	Information		
	Protection Healthy	0	1
CntEFGGIO1.Health.stVal		3	1

device annunciation: 1 – ON/TRUE IEC61850 Value: 1 – OK
 0 – OFF/FALSE 2 – WARNING
 3 – ALARM

CntEFGGIO1.ISCSO1

No	Information	Measurand	Value
	CB E/F Trip Count	CntEFGGIO1.ISCSO1.stVal	0-10000

No	Information	Value
	CB E/F Trip Count	Value (0-10000)
CntEFGGIO1.ISCSO1.Oper.ctlVal		Value (0–10000)

CntEFGGIO1.ISCSO2

No	Information	Measurand	Value
	CB E/F Trip Count Target	CntEFGGIO1.ISCSO2.stVal	0-10000

No	Information	Value
	CB E/F Trip Count Target	Value (0-10000)
CntEFGGIO1.ISCSO2.Oper.ctlVal		Value (0-10000)

CntEFGGIO1.SPCSO

No	Information		
	CB E/F Trip Count Target Reached	0	1
CntEFGGIO1.SPCSO		0	1

device annunciation: 1 – ON/TRUE IEC61850 Value: 0 – FALSE
0 – OFF/FALSE 1 - TRUE

CntPhAGGIO1.Mod

No	Information	
	Reset Device	x
CntPhAGGIO1.Mod.stVal		1

device annunciation: 1 – ON/TRUE IEC61850 Value: 1 – ON
0 – OFF/FALSE 2 – BLOCKED
x – Irrelevant 3 – TEST
4 - TEST/BLOCKED
5 – OFF

CntPhAGGIO1.Health

No	Information		
	Protection Healthy	0	1
CntPhAGGIO1.Health.stVal		3	1

device annunciation: 1 – ON/TRUE IEC61850 Value: 1 – OK
0 – OFF/FALSE 2 – WARNING
3 – ALARM

CntPhAGGIO1.ISCSO1

No	Information	Measurand	Value
	CB Phase A Trip Count	CntPhAGGIO1.ISCSO1.stVal	0-10000

No	Information	Value
	CB Phase A Trip Count	Value (0-10000)
CntPhAGGIO1.ISCSO1.Oper.ctlVal		Value (0-10000)

CntPhAGGIO1.ISCSO2

No	Information	Measurand	Value
	CB Phase A Trip Count Target	CntPhAGGIO1.ISCSO2.stVal	0-10000

No	Information	Value
	CB Phase A Trip Count Target	Value (0-10000)
CntPhAGGIO1.ISCSO2.Oper.ctlVal		Value (0-10000)

CntPhAGGIO1.SPCSO

No	Information		
	CB Phase A Trip Count Target Reached	0	1
CntPhAGGIO1.SPCSO		0	1

device annunciation: 1 – ON/TRUE IEC61850 Value: 0 – FALSE
0 – OFF/FALSE 1 - TRUE

CntPhBGGIO1.Mod

No	Information	
	Reset Device	x
CntPhBGGIO1.Mod.stVal		1

device annunciation: 1 – ON/TRUE IEC61850 Value: 1 – ON
 0 – OFF/FALSE 2 – BLOCKED
 x – Irrelevant 3 – TEST
 4 – TEST/BLOCKED
 5 – OFF

CntPhBGGIO1.Health

No	Information		
	Protection Healthy	0	1
CntPhBGGIO1.Health.stVal		3	1

device annunciation: 1 – ON/TRUE IEC61850 Value: 1 – OK
 0 – OFF/FALSE 2 – WARNING
 3 – ALARM

CntPhBGGIO1.ISCSO1

No	Information	Measurand	Value
	CB Phase B Trip Count	CntPhBGGIO1.ISCSO1.stVal	0-10000

No	Information	Value
	CB Phase B Trip Count	Value (0-10000)
CntPhBGGIO1.ISCSO1.Oper.ctlVal		Value (0-10000)

CntPhBGGIO1.ISCSO2

No	Information	Measurand	Value
	CB Phase B Trip Count Target	CntPhBGGIO1.ISCSO2.stVal	0-10000

No	Information	Value
	CB Phase B Trip Count Target	Value (0-10000)
CntPhBGGIO1.ISCSO2.Oper.ctlVal		Value (0-10000)

CntPhBGGIO1.SPCSO

No	Information		
	CB Phase B Trip Count Target Reached	0	1
CntPhBGGIO1.SPCSO		0	1

device annunciation: 1 – ON/TRUE IEC61850 Value: 0 – FALSE
 0 – OFF/FALSE 1 - TRUE

CntPhCGGIO1.Mod

No	Information	
	Reset Device	x
CntPhCGGIO1.Mod.stVal		1

device annunciation: 1 – ON/TRUE IEC61850 Value: 1 – ON
 0 – OFF/FALSE 2 – BLOCKED
 x – Irrelevant 3 – TEST
 4 – TEST/BLOCKED
 5 – OFF

CntPhCGGIO1.Health

No	Information		
	Protection Healthy	0	1
CntPhCGGIO1.Health.stVal		3	1

device annunciation: 1 – ON/TRUE IEC61850 Value: 1 – OK
 0 – OFF/FALSE 2 – WARNING
 3 – ALARM

CntPhCGGIO1.ISCSO1

No	Information	Measurand	Value
	CB Phase C Trip Count	CntPhCGGIO1.ISCSO1.stVal	0-10000

No	Information	Value (0-10000)
	CB Phase C Trip Count	Value (0-10000)
CntPhCGGIO1.ISCSO1.Oper.ctlVal		Value (0-10000)

CntPhCGGIO1.ISCSO2

No	Information	Measurand	Value
	CB Phase C Trip Count Target	CntPhCGGIO1.ISCSO2.stVal	0-10000

No	Information	Value (0-10000)
	CB Phase C Trip Count Target	Value (0-10000)
CntPhCGGIO1.ISCSO2.Oper.ctlVal		Value (0-10000)

CntPhCGGIO1.SPCSO

No	Information		
	CB Phase C Trip Count Target Reached	0	1
CntPhCGGIO1.SPCSO		0	1

device annunciation: 1 – ON/TRUE IEC61850 Value: 0 – FALSE
 0 – OFF/FALSE 1 - TRUE

4.42 User Double Point GGIO Control Elements (Enhanced Security) (DPDOesGGIO1, DPDOesGGIO2, DPDOesGGIO3, DPDOesGGIO4)

DPDOesGGIO*.Mod

No	Information	
	Reset Device	x
DPDOesGGIO*.Mod.stVal		1

device annunciation: 1 – ON/TRUE IEC61850 Value: 1 – ON
 0 – OFF/FALSE 2 – BLOCKED
 x – Irrelevant 3 – TEST
 4 – TEST/BLOCKED
 5 – OFF

DPDOesGGIO*.Health

No	Information		
	Protection Healthy	0	1
DPDOesGGIO*.Health.stVal		3	1

device annunciation: 1 – ON/TRUE IEC61850 Value: 1 – OK
 0 – OFF/FALSE 2 – WARNING
 3 – ALARM

DPDOesGGIO*.DPCSO

No	Information		
	DPDOes (OFF/OPEN)	1	-
	DPDOes (ON/CLOSE)	-	1
DPDOesGGIO*.DPCSO.ctlVal		0	1

device annunciation: 1 – ON/TRUE IEC61850 Value: 0 – OFF
 0 – OFF/FALSE 1 – ON

No	Information				
	DPDOes Status (OFF/OPEN)	0	1	0	1
	DPDOes Status (ON/CLOSED)	0	0	1	1
DPDOesGGIO*.DPCSO.stVal		00	01	10	11

device annunciation: 1 – ON/TRUE IEC61850 Value: 00 – INTERMEDIATE STATE
 0 – OFF/FALSE 01 – OFF
 10 – ON
 11 – INVALID STATE (DBI)

* Values of 1 to 4

