

7SR210 Non-Directional Relay

7SR220 Directional Relay

IEC 61850 PIXIT

(Protocol Implementation Extra Information
for Testing)

Description of the IEC61850 conformance test.

Document Release History

This document is issue 2013/01. The list of revisions up to and including this issue is:

2011/05	First issue
2013/01	Typographical revisions and added data. Updated in line with software release.

Software Revision History

2011/05	2435H85008R7a-7a (7SR210) 2435H85009R7a-7a (7SR220)	First Release
2013/01	2435H85008R7c-7b (7SR210) 2435H85009R7c-7b (7SR220)	Introduced journaling file system. Added 61850 logical nodes for CB Counters, metering, 50BF, 46BC, 81HBL2 and line check. Added Line Check on non-AR devices. Added 74CCS Close Circuit Supervision.

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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
 - a. Association model
 - b. Server model
 - c. Data set model
 - d. Substitution model
 - e. Setting group control model
 - f. Reporting model
 - g. Logging model
 - h. Generic substation model
 - i. Transmission of sample values model
 - j. Control model
 - k. Time and time synchronisation model
 - l. File transfer model
 - m. General items

1.2 Association model

Description	Value / Clarification
Maximum number of clients that can set-up an association simultaneously	6
Lost connection detection time range (default range of TCP_KEEPALIVE is 1-20 seconds)	20 seconds
Is authentication supported?	N
What called association parameters are necessary for successful association?	Transport selector Y Session selector Y Presentation selector Y AP Title ANY AE Qualifier ANY where Y means: as defined within the ICD-file ANY means: any value accepted
What is the maximum and minimum MMS PDU size?	Max MMS PDU size 32768 Min MMS PDU size. Dependant on packet size
What is the typical startup time after a power supply interrupt?	60 SECONDS

1.3 Server model

Description	Value / Clarification
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 Y OperatorBlocked
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 Y Substituted Y Test Y OperatorBlocked
What is the maximum number of data values in one GetDataValues request?	Not restricted; depends on the max. MMS PDU size given above.
What is the maximum number of data values in one SetDataValues request?	Not restricted; depends on the max. MMS PDU size given above. No Data Attribute within our object directory is writable with the service SetDataValues.
Which Mode / Behaviour values are supported?	On Y Blocked Y Test Y Test/Blocked Y Off Y

1.4 Data set model

Description	Value / Clarification
Maximum number of data elements in one data set	Not limited by an internal configuration parameter. It depends on the available memory.
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. (This number includes those defined in SCL)
How many non-persistent data sets can be created by one or more clients?	10 data sets. It depends on the available memory.
additional items:	
Maximum number of data sets	Could not be defined, it depends on the available memory space. In principle, this information is not necessary from type conformance testing standpoint.

1.5 Substitution model

This service will not be supported (see also *Ethernet Module EN 100 IEC 61850 Electrical Interface 100 MBit, Manual /1/*).

1.6 Setting group control model

Description	Value / Clarification
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.
What is the effect of when and how the non-volatile storage is updated? (compare IEC 61850-8-1 §16.2.4)	Just SelectActiveSG service will be supported according to PICS.

1.7 Reporting model

Unbuffered Report

Description	Value / Clarification
The supported trigger conditions are	Y Integrity Y Data change Y Quality change Y Data update Y General Interrogation
The supported optional fields are	Y Sequence-number Y Report-time-stamp Y Reason-for-inclusion Y Data-set-name Y Data-reference N Buffer-overflow N EntryID Y Conf-rev Y Segmentation
Can the server send segmented reports?	Y
Mechanism on second internal data change notification of the same analogue data value within buffer period (Compare IEC 61850-7-2 §14.2.2.9)	Send report immediately
Multi client URCB approach (Compare IEC 61850-7-2 §14.2.1)	All clients can access all URCB's
additional items:	
Interrupt of general interrogation	Running GI could not be interrupted. If a new GI request occurs during a running GI, the current GI will be finished first before the second GI request will be processed.
Integrity period	Configurable ≥ 1 second;
Dynamic 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 done by the client before. This behaviour 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 not lost.

Buffered Report

Description	Value / Clarification
The supported trigger conditions are	Y Integrity Y Data change Y Quality change Y Data update Y General Interrogation
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 Y EntryID Y Conf-rev Y Segmentation
Can the server send segmented reports?	Y

Description	Value / Clarification
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)	Buffer the Entry Send report if the report is enabled
Multi client BRCB approach (Compare IEC 61850-7-2 §14.2.1)	All clients can access all BRCB's
What is the format of EntryID?	First 2 Byte : Integer Last 6 Bytes: BTime6 time stamp
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 for its own entries. Default amount 1 MB/(2*Number of logical devices)
additional items:	
Interrupt of general interrogation	Running GI could not be interrupted. If a new GI request occurs during a running GI, the current GI will be finished first before the second GI request will be processed.
Integrity period	Configurable >=1 second;
Dynamic BRCB reservation after an abort of the client/server association	Reservation of the BRCB has been fixed with TISSUE 453. The value of the attribute ResvTms delivers the time interval during which the reservation is still active after the connection has been lost. In case a BRCB is still reserved, and a client connects with the same IP address as the one used during the reservation, then the BRCB attribute can be written by this client without prior setting the ResvTms attribute as long as the reservation timer has not expired.
Configured BRCB reservation after an abort of the client/server association	Reservation of the BRCB is not lost for BRCBs that have been pre-associated to a specific client (pre-association defined with means of the ClientLN element with the BRCB instantiation in the SCD file). Reservation of a BRCB is lost for BRCBs, that have not been pre-associated to a specific client, after the expiration of the reservation timer set with the ResvTms attribute. In case ResvTms is not set (backward compatibility), ResvTms will get a default value for all preconfigured BRCBs that are not pre-associated to a specific client.
Optional use of a flow control for transmitting history of a BRCB	As specified in the IEC61850-7-2, transmission of entries may be required some times, depending of the amount of entries that have to be transmitted. Therefore, the device 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 strategy of the entries. 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.

1.8 Logging model

This service will not be supported (see also *Ethernet Module EN 100 IEC 61850 Electrical Interface 100 MBit, Manual /1/*).

1.9 Generic substation model

Description	Value / Clarification
What is the behaviour when one subscribed GOOSE message isn't received or syntactically incorrect?	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.
What is the behaviour when a subscribed GOOSE message is out-of-order?	Error message will be stored into the error buffer (could be accessed by EN100 web-server).
What is the behaviour when a subscribed GOOSE message is duplicated?	The sequence number given in the GOOSE-message is out-of-order. Error message will be stored into the error buffer (could be accessed by EN100 web-server).
additional items:	
Maximum number of GOOSE messages which could be sent	≤ 16 ; It depends on the available memory.
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 behaviour in case of missing GOOSE messages	After a GOOSE multicast application association has been interrupted, the reception of the second consecutive GOOSE telegram is required to validate the state of this GOOSE association again. However, the IED tolerates a missing telegram as long as the next telegram (expected n, received n+1) is received within the time allowed to live time out detection (the time allowed to live timeout detection occurs after $2 \cdot \text{TAL}$).
GOOSE subscriber behaviour in case of multiple GOOSE messages	If a message is received twice or more, the IED already reports an error after the second reception. Therefore, network configuration error can be more easily tracked.
What is the behaviour when a GOOSE header parameter is mismatching with the expected one? (datSet, goID, confRev, numDatSetEntries, number of allData)	Error message will be stored into the error buffer (could be accessed by EN100 web-server). All expected data objects will be declared as invalid.
What is the behaviour when a timeAllowedToLive is 0?	Error message will be stored into the error buffer (could be accessed by EN100 web-server) since the timeAllowedToLive expired. All expected data objects will be declared as invalid.
What is the behaviour when there is an out-of-order entry in the allData?	The confRev attribute in the header guarantees that the allData entries are in the correct order. Therefore, it's necessary to check the confRev attribute. There is no chance to detect such an out-of-order.
What is the behaviour when no telegram is received within a TAL timeout?	To avoid an incorrect timeout detection, the subscriber detects a timeout after a period of $2 \times \text{TAL}$. The information is then declared as questionable, oldData.
What is the behaviour when a GOOSE header parameter goCRef is mismatching with the expected one?	Since the goCRef shall be unique station wide, the received telegram with the mismatched goCRef will be discarded: it has not been published. In that case only the timeout detection will set the data to invalid.
What is the behaviour when a GOOSE header parameter APPID is mismatching with the expected one?	The APPID is a link layer parameter. It is used as a filter on link layer. If the APPID is mismatching, the telegram will therefore be discarded on link layer without notifying the application. Only the timeout detection will set the data to invalid.

Description	Value / Clarification												
What is the behaviour when a GOOSE header parameter t is not increasing?	The t parameter is not checked. Therefore it doesn't lead to any error detection.												
What is the behaviour 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.												
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 an 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>												
Can the test flag in the published GOOSE be turned on / off	N												
What is the behaviour when the GOOSE publish configuration is incorrect	DUT keeps GoEna=F												
When is a subscribed GOOSE marked as lost? (TAL = time allowed to live value from the last received GOOSE message)	Message does not arrive by 2x TAL												
What is the behaviour when one or more subscribed GOOSE messages isn't received or syntactically incorrect (missing GOOSE)	If TAL expires, quality is set to invalid												
What is the behaviour when a subscribed GOOSE message is out-of-order	It will be tolerated												
What is the behaviour when a subscribed GOOSE message is duplicated	It will be tolerated												
Does the device subscribe to GOOSE messages with/without the VLAN tag?	Y, with the VLAN tag Y, without the VLAN tag												
May the GOOSE data set contain: - structured data objects (FCD)? - data attributes (FCDA)? - timestamp data attributes? Note: data attributes (FCDA) is mandatory	<table border="1"> <thead> <tr> <th></th> <th>Subscribed</th> <th>Published</th> </tr> </thead> <tbody> <tr> <td>- structured data objects (FCD)?</td> <td>N</td> <td>N</td> </tr> <tr> <td>- data attributes (FCDA)?</td> <td>Y</td> <td>Y</td> </tr> <tr> <td>- timestamp data attributes?</td> <td>N</td> <td>N</td> </tr> </tbody> </table>		Subscribed	Published	- structured data objects (FCD)?	N	N	- data attributes (FCDA)?	Y	Y	- timestamp data attributes?	N	N
	Subscribed	Published											
- structured data objects (FCD)?	N	N											
- data attributes (FCDA)?	Y	Y											
- timestamp data attributes?	N	N											
Can the Goose publish be turned on / off by using SetGoCBValues(GoEna)	Y												

1.10 Transmission of sample values model

This service will not be supported.

1.11 Control model

Description	Value / Clarification
What control models are supported?	Y Status-only Y Direct-with-normal-security N Sbo-with-normal-security Y Direct-with-enhanced-security Y Sbo-with-enhanced-security
Is the control model fixed, configurable and/or online changeable?	Fixed
Is Time activated operate (operTm) supported	N
What is the behaviour when the test attribute is set in the SelectWithValue and/or Operate request?	Will be acknowledged with negative response. The AddCause attribute will be set to "not supported"
What are the conditions for the time (T) attribute in the SelectWithValue and/or Operate request?	Time attribute is not relevant. DUT ignores the time value and executes the command as usual
Is "operate-many" supported?	N
Is pulse configuration supported?	N
What check conditions are supported?	N Synchrocheck N Interlock-check "The interlock check is always performed irrespective of the Interlock check bit"
What service error types are supported?	Y Instance-not-available Y Instance-in-use Y Access-violation Y Access-not-allowed-in-current-state Y Parameter-value-inappropriate Y Parameter-value-inconsistent Y Class-not-supported Y Instance-locked-by-other-client Y Control-must-be-selected Y Type-conflict Y Failed-due-to-communications Y Constraint failed-due-to-server-constraint
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 N Step-limit N Blocked-by-Mode Y Blocked-by-process Y Blocked-by-interlocking N Blocked-by-synchrocheck Y Command-already-in-execution N Blocked-by-health N 1-of-n-control Y Abortion-by-cancel Y Time-limit-over N Abortion-by-trip Y Object-not-selected
How to force a "test-not-ok" respond with SelectWithValue request?	Send an operate with Orcat=9(invalid)
How to force a "test-not-ok" respond with Select request?	NA
How to force a "test-not-ok" respond with Operate request?	DOns: Orcat=9(invalid) SBOs: NA DOes: Orcat=9(invalid) SBOes: Orcat=9(invalid)
Which origin categories are supported?	Categories 1-8
Does the IED accept a SelectWithValue/Operate with the same ctVal as the current status value?	DOns: Y SBOs: NA DOes: N SBOes: N
Does the IED accept a select/operate on the same	DOns: Y

Description	Value / Clarification
control object from 2 different clients at the same time?	SBOs: NA DOes: N SBOes: N
Does the IED accept a Select/SelectWithValue from the same client when the control object is already selected (tissue 334)	SBOs: NA SBOes: N
Does the IED accept a Select/SelectWithValue from the same client when the control object is already selected (tissue 334)	SBOs: NA SBOes: N
Is for SBOes the internal validation performed during the SelectWithValue and/or Operate step?	SelectWithValue and Operate
Can a control operation be blocked by Mod=Off or Blocked	N
Does the IED support local / remote operation?	Y
Does the IED send an InformationReport with LastApplError as part of the Operate response- for control with normal security?	SBOs: NA DOs: N
additional items:	
What additional cause diagnosis extensions are supported?	Y Plausibility_error Y Parameter_setting_invalid Y Hardware_error Y System_overload Y Internal_fault Y Command_sequence_error
Changing the control services by configuration	N
Inconsistency between Select and (Oper or cancel)	Operate or cancel will be acknowledged with negative response if inconsistencies to the select request are detected. The following attributes will not be checked in this case: T (Time)
Cancel request could be sent after an operate request.	Y
Format of the control time stamp attribute?	TimeStamp instead of EntryTime acc. to the 7-2 Errata List.
Negative response for select request could be performed only	If test mode is activated or If the selection is always done.

1.12 Time and time synchronisation model

Description	Value / Clarification
What kind of quality bits are supported ?	N LeapSecondsKnown Y ClockFailure Y ClockNotSynchronized
What kind of quality accuracy bits are supported ?	Y Invalid N Unspecified
What is the behaviour when the time synchronization signal/messages are lost ?	The quality attribute "ClockFailure" will be set to TRUE after a configured time period.
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.
When is the time quality bit "ClockFailure" set?	If there is an internal hardware error
When is the time quality bit "Clock not synchronised" set?	If the SNTP signal is lost for more than 60 seconds
Is the timestamp of a binary event adjusted to the configured scan cycle?	N
Does the device support time zone and daylight saving?	Y
additional items:	
What is the behaviour at start up time when a time synchronization via SNTP is configured ?	The "ClockNotSynchronized" attribute is set to TRUE as long as no time synchronization is established.

1.13 File transfer model

Description	Value / Clarification
What is structure of files and directories?	Directory name / COMTRADE / *; Directory name / LD / *; Files according to the comtrade standard.
What is the resulting behaviour if no file specification is present in the file directory request?	If no file specification is present in the directory request, all files are returned - not only the files in the root directory.
Is the IETF FTP protocol also implemented ?	N
Directory names are separated from the file name by	"/"
The maximum file name size including path (default 64 chars)	64
Are directory/file name case sensitive	Case sensitive
Maximum file size	Not limited by implementation or configuration. Depends on available memory.
Is the requested file path included in the MMS fileDirectory respond file name?	Y
Is the wild char supported MMS fileDirectory request?	N
Is it allowed that 2 clients get a file at the same time?	N
additional items:	
Maximum number of clients that can use the FTP service simultaneously	1
Maximum number of files that can be accessed simultaneously	1

1.14 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.

1.15 TISSUES

Topic	TISSUE -No.	Link	Description	Impact of Interoper.
Object Model	120	http://www.tissue.iec61850.com/tissue.msp?issueid=120	Type - Mod.stVal and Mod.ctlVal	-
	146	http://www.tissue.iec61850.com/tissue.msp?issueid=146	CtxInt	-
	173	http://www.tissue.iec61850.com/tissue.msp?issueid=173	Ctl modelling harmonization	-
	234	http://www.tissue.iec61850.com/tissue.msp?issueid=234	New type CtxInt	x
Services	377	http://www.tissue.iec61850.com/tissue.msp?issueid=377	DeleteDataSet response-	-
	276	http://www.tissue.iec61850.com/tissue.msp?issueid=276	File Services Negative Responses	-
	183	http://www.tissue.iec61850.com/tissue.msp?issueid=183	GetNameList error handling	x
	165	http://www.tissue.iec61850.com/tissue.msp?issueid=165	Improper Error Response for GetDataSetValues	x
	116	http://www.tissue.iec61850.com/tissue.msp?issueid=116	GetNameList with empty response?	x
Reporting	474	http://www.tissue.iec61850.com/tissue.msp?issueid=474	GI for URCB	-
	453	http://www.tissue.iec61850.com/tissue.msp?issueid=453	Reporting & Logging model revision	x
	438	http://www.tissue.iec61850.com/tissue.msp?issueid=438	EntryTime base should be GMT	-
	349	http://www.tissue.iec61850.com/tissue.msp?issueid=349	BRCB TimeOfEntry has two definitions	x
	348	http://www.tissue.iec61850.com/tissue.msp?issueid=348	URCB class and report	x
	344	http://www.tissue.iec61850.com/tissue.msp?issueid=344	TimeOfEntry misspelled	x
	335	http://www.tissue.iec61850.com/tissue.msp?issueid=335	Clearing of Bufovfl	x
	332	http://www.tissue.iec61850.com/tissue.msp?issueid=332	Ambiguity in use of trigger options	x
	329	http://www.tissue.iec61850.com/tissue.msp?issueid=329	Reporting and BufOvl	x
	322	http://www.tissue.iec61850.com/tissue.msp?issueid=322	Write Configuration attribute of BRCBs	
	301	http://www.tissue.iec61850.com/tissue.msp?issueid=301	SqNum in Buffered Reports	-
	300	http://www.tissue.iec61850.com/tissue.msp?issueid=300	Attribute Resv in BRCB	x
	298	http://www.tissue.iec61850.com/tissue.msp?issueid=297	Type of SqNum	x
	297	http://www.tissue.iec61850.com/tissue.msp?issueid=298	Sequence number	x
	278	http://www.tissue.iec61850.com/tissue.msp?issueid=278	EntryId not valid for a server	x
	275	http://www.tissue.iec61850.com/tissue.msp?issueid=275	Confusing statement on GI usage	x
	191	http://www.tissue.iec61850.com/tissue.msp?issueid=191	BRCB: Integrity and buffering reports	x
	190	http://www.tissue.iec61850.com/tissue.msp?issueid=190	BRCB: EntryId and TimeOfEntry	x
	177	http://www.tissue.iec61850.com/tissue.msp?issueid=177	Ignoring OptFlds bits for URCB	-
	52	http://www.tissue.iec61850.com/tissue.msp?issueid=52	Ambiguity GOOSE SqNum	x

Topic	TISSUE-No.	Link	Description	Impact of Interoper.
	49	http://www.tissue.iec61850.com/tissue.aspx?issueid=49	BRCB TimeOfEntry?	x
Control Model	46	http://www.tissue.iec61850.com/tissue.aspx?issueid=46	Synchro check cancel	x
	44	http://www.tissue.iec61850.com/tissue.aspx?issueid=44	AddCause - Object not sel	x
	30	http://www.tissue.iec61850.com/tissue.aspx?issueid=30	control parameter T	x

2. FUNCTION PARAMETERS 7SR220

Function	Element	LD	LN	DOI
		PROT	LLN0	
2.1 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
2.2 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
	50N-3	PROT	A50nPTOC3	Mod, Beh, Health, NamPlt, Str, Op

Function	Element	LD	LN	DOI
				Op
	50N-4	PROT	A50nPTOC4	Mod, Beh, Health, NamPlt, Str, Op
2.3 Measured E/F	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
2.4 Sensitive E/F	51SEF-1	PROT	A51SefPTOC1	Mod, Beh, Health, NamPlt, Str, Op
	51SEF-2	PROT	A51SefPTOC2	Mod, Beh, Health, NamPlt, Str, Op
	51SEF-3	PROT	A51SefPTOC3	Mod, Beh, Health, NamPlt, Str, Op
	51SEF-4	PROT	A51SefPTOC4	Mod, Beh, Health, NamPlt, Str, Op
	50SEF-1	PROT	A51SefPTOC1	Mod, Beh, Health, NamPlt, Str, Op
	50SEF-2	PROT	A51SefPTOC2	Mod, Beh, Health, NamPlt, Str, Op

Function	Element	LD	LN	DOI
	50SEF-3	PROT	A51SefPTOC3	Mod, Beh, Health, NamPlt, Str, Op
	50SEF-4	PROT	A51SefPTOC4	Mod, Beh, Health, NamPlt, Str, Op
2.5 Restrictive E/F	64H	PROT	A64hPTOC1	Mod, Beh, Health, NamPlt, Str, Op
2.6 NPS Overcurrent	46IT	PROT	A46ItPTOC1	Mod, Beh, Health, NamPlt, Str, Op
	46DT	PROT	A46DtPTOC1	Mod, Beh, Health, NamPlt, Str, Op
2.7 Under Current	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, Op
	37G-2	PROT	A37gPTUC2	Mod, Beh, Health, NamPlt, Str, Op
	37SEF-1	PROT	A37SefPTUC1	Mod, Beh, Health, NamPlt, Str, Op
	37SEF-2	PROT	A37SefPTUC2	Mod, Beh, Health, NamPlt, Str, Op
2.8 Thermal Overload	49	PROT	A49PTTR1	Mod, Beh, Health, NamPlt, Str, Op, AlmThm

Function	Element	LD	LN	DOI
2.9 Phase U/O Voltage	27/59-1	PROT	A2759PTOV1	Mod, Beh, Health, NamPlt, Str, Op
	27/59-2	PROT	A2759PTOV2	Mod, Beh, Health, NamPlt, Str, Op
	27/59-3	PROT	A2759PTOV3	Mod, Beh, Health, NamPlt, Str, Op
	27/59-4	PROT	A2759PTOV4	Mod, Beh, Health, NamPlt, Str, Op
	27/59-1	PROT	A2759PTUV1	Mod, Beh, Health, NamPlt, Str, Op
	27/59-2	PROT	A2759PTUV2	Mod, Beh, Health, NamPlt, Str, Op
	27/59-3	PROT	A2759PTUV3	Mod, Beh, Health, NamPlt, Str, Op
	27/59-4	PROT	A2759PTUV4	Mod, Beh, Health, NamPlt, Str, Op
2.10 Vx U/O Voltage	Vx 27/59	PROT	A2759PTOV5	Mod, Beh, Health, NamPlt, Str, Op
	Vx 27/59	PROT	A2759PTUV5	Mod, Beh, Health, NamPlt, Str, Op
2.11 NPS Over Voltage	47-1	PROT	A47PTOV1	Mod, Beh, Health, NamPlt, Str, Op
	47-2	PROT	A47PTOV2	Mod, Beh, Health, NamPlt, Str, Op
2.12 Neutral Over Voltage	59NIT	PROT	A59nItPTOV1	Mod, Beh, Health, NamPlt, Str, Op
	59NDT	PROT	A59nDtPTOV1	Mod, Beh, Health, NamPlt, Str, Op

Function	Element	LD	LN	DOI
2.13 U/O Frequency	81-1	PROT	A81PTOF1	Mod, Beh, Health, NamPlt, Str, Op
	81-2	PROT	A81PTOF2	Mod, Beh, Health, NamPlt, Str, Op
	81-3	PROT	A81PTOF3	Mod, Beh, Health, NamPlt, Str, Op
	81-4	PROT	A81PTOF4	Mod, Beh, Health, NamPlt, Str, Op
	81-5	PROT	A81PTOf5	Mod, Beh, Health, NamPlt, Str, Op
	81-6	PROT	A81PTOF6	Mod, Beh, Health, NamPlt, Str, Op
	81-1	PROT	A81PTUF1	Mod, Beh, Health, NamPlt, Str, Op
	81-2	PROT	A81PTUF2	Mod, Beh, Health, NamPlt, Str, Op
	81-3	PROT	A81PTuF3	Mod, Beh, Health, NamPlt, Str, Op
	81-4	PROT	A81PTUF4	Mod, Beh, Health, NamPlt, Str, Op
	81-5	PROT	A81PTUF5	Mod, Beh, Health, NamPlt, Str, Op
	81-6	PROT	A81PTUF6	Mod, Beh, Health, NamPlt, Str, Op
2.14 CB Fail	50BF	PROT	A50BfRBRF1	Mod, Beh, Health, NamPlt, OpEx, OpIn, Str
2.15 Broken Conductor	46BC	PROT	A46BcPTOC1	Mod, Beh, Health, NamPlt, Op, Str

Function	Element	LD	LN	DOI
2.16 Inrush Detector	81HBL2	MEAS	Har2MMXU1	A
	81HBL2	PROT	A81Hb2PHAR1	Mod, Beh, Health, NamPlt, Str
2.17 Current Measurements	la	MEAS	MMXU1	A
	lb	MEAS	MMXU1	A
	lc	MEAS	MMXU1	A
	ln	MEAS	MMXU1	A
	lg	MEAS	MMXU1	A
	Isef	MEAS	IsefMMXN1	Amp
	2.18 Current Sequence Components Measurements	Current	MEAS	I_MSQI1
2.19 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
2.20 Voltage Sequence Components Measurements	Voltage	MEAS	V_MSQI1	SeqV
2.21 Frequency Measurement	Frequency	MEAS	MMXU1	Hz

Function	Element	LD	LN	DOI
2.22 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
2.23 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
2.24 Circuit Breaker Counters	CB Delta Trip Count	CTRL	CntDelGGIO1	ISCSO1
	CB Delta Trip Count Target	CTRL	CntDelGGIO1	ISCSO2
	CB Delta Trip Count Target Reached	CTRL	CntDelGGIO1	SPCSO
	CB Ph A Trip Count	CTRL	CntPhAGGIO1	ISCSO1
	CB Ph A Trip Count Target	CTRL	CntPhAGGIO1	ISCSO2
	CB Ph A Trip Count Target Reached	CTRL	CntPhAGGIO1	SPCSO
	CB Ph B Trip Count	CTRL	CntPhBGGIO1	ISCSO1
	CB Ph B Trip Count Target	CTRL	CntPhBGGIO1	ISCSO2
	CB Ph B Trip Count Target Reached	CTRL	CntPhBGGIO1	SPCSO
	CB Ph C Trip Count	CTRL	CntPhCGGIO1	ISCSO1
	CB Ph C Trip Count Target	CTRL	CntPhCGGIO1	ISCSO2
	CB Ph C Trip Count Target Reached	CTRL	CntPhCGGIO1	SPCSO
	CB E/F Trip Count	CTRL	CntEFGGIO1	ISCSO1
	CB E/F Trip Count Target	CTRL	CntEFGGIO1	ISCSO2
	CB E/F Trip Count Target Reached	CTRL	CntEFGGIO1	SPCSO
	CB Count To AR Block	CTRL	CntLOGGIO1	ISCSO1
	CB Count To AR Block Target	CTRL	CntLOGGIO1	ISCSO2
	CB Count To AR Block	CTRL	CntLOGGIO1	SPCSO

Function	Element	LD	LN	DOI
	Target Reached			
2.25 Circuit Breaker				
	CB Control Close Block	CTRL	Q0XCBR1	BlkCls
	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
2.26 Demand Measurements				
	Active Power (P =)	MEAS	MinMMXU1	TotW
	Reactive Power (Q =)	MEAS	MinMMXU1	TotVAr
	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
2.27 User Single Point I/P Values				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				
	SPI64GGIO	CTRL	SPI64GGIO1	

Function	Element	LD	LN	DOI
				SPCSO64
2.28 User Single Point O/P Values				Mod, Beh, Health, NamPlt, 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
	SPo32GGIO	CTRL	SPo32GGIO1	
2.29 User Double Point I/P Values				Mod, Beh, Health, NamPlt, DPCSO1 DPCSO2 DPCSO3 DPCSO4 DPCSO5 DPCSO6 DPCSO7 DPCSO8
	DPI8GGIO1	CTRL	DPI8GGIO1	
				Mod, Beh, Health, NamPlt, DPCSO1 DPCSO2 DPCSO3 DPCSO4 DPCSO5 DPCSO6 DPCSO7 DPCSO8
	DPI8GGIO2	CTRL	DPI8GGIO2	

Function	Element	LD	LN	DOI
2.30 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
2.31 User Single Point Control Values	SPDOs 1	CTRL	SPDOsGGIO1	Mod, Beh, Health, NamPlt, SPCSO
	SPDOs 2	CTRL	SPDOsGGIO2	Mod, Beh, Health, NamPlt, SPCSO
	SPDOs 3	CTRL	SPDOsGGIO3	Mod, Beh, Health, NamPlt, SPCSO
	SPDOs 4	CTRL	SPDOsGGIO4	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

Function	Element	LD	LN	DOI
2.32 User Double Point Control Values	DPDOns 1	CTRL	DPDOnsGGIO1	Mod, Beh, Health, NamPlt, DPCSO
	DPDOns 2	CTRL	DPDOnsGGIO2	Mod, Beh, Health, NamPlt, DPCSO
	DPDOns 3	CTRL	DPDOnsGGIO3	Mod, Beh, Health, NamPlt, DPCSO
	DPDOns 4	CTRL	DPDOnsGGIO4	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
	2.33 Binary I/P Status Values	BI13GGIO	CTRL	BI13GGIO1

Function	Element	LD	LN	DOI
2.34 Binary O/P Status Values	BO14GGIO	CTRL	BI13GGIO1	Mod, Beh, Health, NamPit, Ind1 Ind2 Ind3 Ind4 Ind5 Ind6 Ind7 Ind8 Ind9 Ind10 Ind11 Ind12 Ind13 Ind14
2.35 Quick Logic Equation Status Values	E16GGIO	CTRL	E16GGIO1	Mod, Beh, Health, NamPit, Ind1 Ind2 Ind3 Ind4 Ind5 Ind6 Ind7 Ind8 Ind9 Ind10 Ind11 Ind12 Ind13 Ind14 Ind15 Ind16
2.36 LED Status Values	L16GGIO	CTRL	L16GGIO1	Mod, Beh, Health, NamPit, Ind1 Ind2 Ind3 Ind4 Ind5 Ind6 Ind7 Ind8 Ind9 Ind10 Ind11 Ind12 Ind13 Ind14 Ind15 Ind16

Function	Element	LD	LN	DOI
2.37 Virtuals Status Values				Mod, Beh, Health, NamPlt, Ind1 Ind2 Ind3 Ind4 Ind5 Ind6 Ind7 Ind8 Ind9 Ind10 Ind11 Ind12 Ind13 Ind14 Ind15 Ind16
	V16GGIO	CTRL	V16GGIO1	

3. 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 2.

3.5 Overcurrent Protection 51-1, 51-2, 51-3 & 51-4 (A51PTOC1, A51PTOC2, A51PTOC3, A51PTOC4)

A51PTOC*.Mod

No	Information				
	Phase Overcurrent Enabled (Function Config)	x	0	x	1
	Element Disabled	1	0	0	0
	Element Inhibited	x	x	1	0
A51PTOC*.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

A51PTOC*.Health

No	Information		
	Protection Healthy	0	1
A51PTOC*.Health.stVal		3	1

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

A51PTOC*.Str

No	Information		
	Element Phase A picked up or Element Phase B picked up or Element Phase C picked up	0	1
A51PTOC*.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
A51PTOC*.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
A51PTOC*.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	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

3.8 Derived E/F Protection 50N-1, 50N-2, 50N-3 & 50N-4 (A50nPTOC1, A50nPTOC2, A50nPTOC3, A50nPTOC4)

A50nPTOC*.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
A50nPTOC*.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

A50nPTOC*.Health

No	Information		
	Protection Healthy	0	1
A50nPTOC*.Health.stVal		3	1

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

A50nPTOC*.Str

No	Information		
	Element Picked up	0	1
A50nPTOC*.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
A50nPTOC*.Str.dirGeneral		2	1	0

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

A50nPTOC*.Op

No	Information		
	Element Operated	0	1
A50nPTOC*.Op.general		0	1

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

3.10 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

A37PTUC*.Op

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

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

3.16 Under Current Protection 37G-1 & 37G2 (A37gPTUC1, A37gPTUC2)

A37gPTUC*.Mod

No	Information				
	Under Current Enabled (Function Config)	x	0	x	1
	Element Disabled	1	0	0	0
	Element Inhibited	x	x	1	0
A37gPTUC*.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

A37gPTUC*.Health

No	Information		
	Protection Healthy	0	1
A37gPTUC*.Health.stVal		3	1

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

A37gPTUC*.Str

No	Information		
	Element Picked up	0	1
A37gPTUC*.Str.general		0	1

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

A37gPTUC*.Op

No	Information		
	Element Operated	0	1
A37gPTUC*.Op.general		0	1

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

3.18 Thermal Overload 49 (A49PTTR1)

A49PTTR1.Mod

No	Information				
	Thermal Overload Enabled (Function Config)	x	0	x	1
	Element Disabled	1	0	0	0
	Element Inhibited	x	x	1	0
A49PTTR1.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

A49PTTR1.Health

No	Information		
	Protection Healthy	0	1
A49PTTR1.Health.stVal		3	1

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

A49PTTR1.Str

No	Information		
	Element Picked up	0	1
A49PTTR1.Str.general		0	1

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

A49PTTR1.Op

No	Information		
	Element Operated	0	1
A49PTTR1.Op.general		0	1

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

A49PTTR1.AlmThm

No	Information		
	Element Alarm	0	1
A49PTTR1.AlmThm.general		0	1

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

3.26 Over Frequency 81-1, 81-2, 81-3, 81-4, 81-5 & 81-6 (A81PTOF1, A81PTOF2, A81PTOF3, A81PTOF4, A81PTOF5 & A81PTOF6)

A81PTOF*.Mod

No	Information				
	U/O Frequency Enabled (Function Config)	x	0	x	1
	Element Disabled	1	0	0	0
	Element Inhibited	x	x	1	0
A81PTOF*.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

A81PTOF*.Health

No	Information		
	Protection Healthy	0	1
A81PTOF*.Health.stVal		3	1

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

A81PTOF*.Str

No	Information		
	Element Picked up	0	1
A81PTOF*.Str.general		0	1

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

A81PTOF*.Op

No	Information		
	Element Operated	0	1
A81PTOF*.Op.general		0	1

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

3.27 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

3.28 Broken Conductor 46BC (A46BcPTOC1)

A46BcPTOC1.Mod

No	Information				
	Broken Conductor Enabled (Function Config)	x	0	x	1
	Element Disabled	1	0	0	0
	Element Inhibited	x	x	1	0
A46BcPTOC1.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

A46BcPTOC1.Health

No	Information		
	Protection Healthy	0	1
A46BcPTOC1.Health.stVal		3	1

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

A46BcPTOC1.Str

No	Information		
	Element picked up	0	1
A46BcPTOC1.Str.general		0	1

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

A46BcPTOC1.Op

No	Information		
	Element operated	0	1
A46BcPTOC1.Op.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.SIunit	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.SIunit	1	none
		MMXU1.PF.phsC.units.multiplier	0	1

3.31 I SEF Measurement (IsefMMXN1)

IsefMMXN1.Mod

No	Information	
	Reset Device	x
	IsefMMXN1.Mod.stVal	1

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

IsefMMXN1.Health

No	Information		
	Protection Healthy	0	1
	IsefMMXN1.Health.stVal	3	1

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

IsefMMXN1.Amp

No	Information	Value	
		Measured Value	Value
	Isef	IsefMMXN1.Amp.instMag.f	Value
		IsefMMXN1.Amp.mag.f	Value
		IsefMMXN1.Amp.units.SIunit	5 A
		IsefMMXN1.Amp.units.multiplier	0 1

3.32 Demand Measurement (MeanMMXU1, MaxMMXU1, MinMMXU1)

MeanMMXU1.Mod

No	Information	
	Reset Device	x
MeanMMXU1.Mod.stVal		1

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

MeanMMXU1.Health

No	Information		
	Protection Healthy	0	1
MeanMMXU1.Health.stVal		3	1

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

MeanMMXU1.TotW

No	Information	Value		
		MeanMMXU1.TotW.mag.f	Measured Value	Value
	Active Power (P =)	MeanMMXU1.TotW.units.SIunit	62	W (Watt)
		MeanMMXU1.TotW.units.multiplier	0	1

MeanMMXU1.TotVAR

No	Information	Value		
		MeanMMXU1.TotVAR.mag.f	Measured Value	Value
	Reactive Power (Q =)	MeanMMXU1.TotVAR.units.SIunit	63	VAR
		MeanMMXU1.TotVAR.units.multiplier	0	1

MeanMMXU1.TotVA

No	Information	Value		
		MeanMMXU1.TotVA.mag.f	Measured Value	Value
	Apparent Power (S =)	MeanMMXU1.TotVA.units.SIunit	61	VA
		MeanMMXU1.TotVA.units.multiplier	0	1

MeanMMXU1.PPV

No	Information	Value		
		MeanMMXU1.PPV.phsAB.cVal.mag.f	Measured Value	Value
	Va-b (Vab =)	MeanMMXU1.PPV.phsAB.units.SIunit	29	V
		MeanMMXU1.PPV.phsAB.units.multiplier	0	1

No	Information	Value		
		MeanMMXU1.PPV.phsBC.cVal.mag.f	Measured Value	Value
	Vb-c (Vbc =)	MeanMMXU1.PPV.phsBC.units.SIunit	29	V
		MeanMMXU1.PPV.phsBC.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	62	W (Watt)
		MinMMXU1.TotW.units.SIunit	0	1
		MinMMXU1.TotW.units.multiplier		

MinMMXU1.TotVAr

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

MinMMXU1.TotVA

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

MinMMXU1.PPV

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

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

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

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

3.33 Energy Measurements (MMTR1)

MMTR1.Mod

No	Information	
	Reset Device	x
MMTR1.Mod.stVal		1

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

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

MMTR1.Health

No	Information		
	Protection Healthy	0	1
MMTR1.Health.stVal		3	1

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

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

MMTR1.DmdVArh

No	Information	Value		
			Measured Value	Value
	Reactive Energy Imp	MMTR1.DmdVArh.actVal		
		MMTR1.DmdVArh.units.SIUnit	73	VArh
		MMTR1.DmdVArh.units.multiplier	3	-
		MMTR1.DmdVArh.pulsQty	10*	-

*dependant on the Reactive Imp Energy Unit setting

The unit of energy is calculated by combining the multiplier and the pulsQty.
By default this is $10^3 \times 10 = 10,000$ or 10kVArh.

MMTR1.DmdWh

No	Information	Value		
			Measured Value	Value
	Active Energy Imp	MMTR1.DmdWh.actVal		
		MMTR1.DmdWh.units.SIUnit	72	Wh
		MMTR1.DmdWh.units.multiplier	3	-
		MMTR1.DmdWh.pulsQty	10*	-

*dependant on the Active Imp Energy Unit setting

MMTR1.SupVArh

No	Information	Value		
			Measured Value	Value
	Reactive Energy Exp	MMTR1.SupVArh.actVal		
		MMTR1.SupVArh.units.SIUnit	73	VArh
		MMTR1.SupVArh.units.multiplier	3	-
		MMTR1.SupVArh.pulsQty	10*	-

*dependant on the Reactive Exp Energy Unit setting

MMTR1.SupWh

No	Information	Value		
			Measured Value	Value
	Active Energy Exp	MMTR1.SupWh.actVal		
		MMTR1.SupWh.units.SIUnit	72	Wh
		MMTR1.SupWh.units.multiplier	3	-
		MMTR1.SupWh.pulsQty	10*	-

*dependant on the Reactive Exp Energy Unit setting

3.34 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

3.36 Switch controller (Q0CSWI)

Q0CSWI1

Q0CSWI1.Mod

No	Information	
	Reset Device	x
Q0CSWI1.Mod.stVal		1

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

Q0CSWI1.Health

No	Information		
	Protection Healthy	0	1
Q0CSWI1.Health.stVal		3	1

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

Q0CSWI1.Pos

No	Information				
	CB Open	0	1	0	1
	CB Close	0	0	1	1
Q0CSWI1.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

3.37 Circuit Breaker (Q0XCBR1)

Q0XCBR1.Mod

No	Information	
	Reset Device	x
Q0XCBR1.Mod.stVal		1

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

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.BIkCls

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

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

Q0XCBR1.BIkOpn

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

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

Q0XCBR1.BIkOpCnt

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

3.38 Inrush Detector Measurement (Har2MMXU1)

Har2MMXU1.Mod

No	Information	
	Reset Device	x
Har2MMXU1.Mod.stVal		1

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

Har2MMXU1.Health

No	Information		
	Protection Healthy	0	1
Har2MMXU1.Health.stVal		3	1

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

Har2MMXU1.A

No	Information	Value		
	Ia (Ia =)	Har2MMXU1.A.phsA.cVal.mag.f	Measured Value	Value
		Har2MMXU1.A.phsA.cVal.ang.f	Measured Value	Value
		Har2MMXU1.A.phsA.units.Stunit	5	A
		Har2MMXU1.A.phsA.units.multiplier	0	1

No	Information	Value		
	Ib (Ib =)	Har2MMXU1.A.phsB.cVal.mag.f	Measured Value	Value
		Har2MMXU1.A.phsB.cVal.ang.f	Measured Value	Value
		Har2MMXU1.A.phsB.units.Stunit	5	A
		Har2MMXU1.A.phsB.units.multiplier	0	1

No	Information	Value		
	Ic (Ic =)	Har2MMXU1.A.phsC.cVal.mag.f	Measured Value	Value
		Har2MMXU1.A.phsC.cVal.ang.f	Measured Value	Value
		Har2MMXU1.A.phsC.units.Stunit	5	A
		Har2MMXU1.A.phsC.units.multiplier	0	1

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

CntDelGGIO1.Mod

No	Information	
	Reset Device	x
CntDelGGIO1.Mod.stVal		1

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

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	
	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	
	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

CntEFGGIO1.Mod

No	Information	
	Reset Device	x
CntEFGGIO1.Mod.stVal		1

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

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

CntLOGGIO1.Mod

No	Information		
	Reset Device		x
	CntLOGGIO1.Mod.stVal		1

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

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

CntPhAGGIO1.Mod

No	Information		
	Reset Device		x
CntPhAGGIO1.Mod.stVal		1	

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

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 Ph A Trip Count	CntPhAGGIO1.ISCSO1.stVal	0-10000

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

CntPhAGGIO1.ISCSO2

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

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

CntPhAGGIO1.SPCSO

No	Information		
	CB Ph 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 – OK
0 – OFF/FALSE 2 – WARNING
x - irrelevant 3 – ALARM

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 Ph B Trip Count	CntPhBGGIO1.ISCSO1.stVal	0-10000

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

CntPhBGGIO1.ISCSO2

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

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

CntPhBGGIO1.SPCSO

No	Information		
	CB Ph 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 – OK
0 – OFF/FALSE 2 – WARNING
x - irrelevant 3 - ALARM

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 Ph C Trip Count	CntPhCGGIO1.ISCSO1.stVal	0-10000

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

CntPhAGGIO1.ISCSO2

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

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

CntPhCGGIO1.SPCSO

No	Information		
	CB Ph 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

