

SIEMENS

SIPROTEC

High Voltage Bay Control Unit 6MD66x

V4.83

IEC 61850

PIXIT

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Preface

Purpose of this manual

In this Manual, you will find the

- ❑ Specification of the applications of the IEC 61850 interface
- ❑ General information about the effects of configuration of your device to the different Logical Nodes and DOIs
- ❑ Mapping of device relevant information to Logical Nodes as part of protocol IEC61850.

Target audience

This manual is intended mainly for all persons who configure, parameterize and operate a SIPROTEC Device 6MD66.

Scope of validity of this Manual

SIPROTEC 6MD66, Version 4.83.

Standards

This document has been created according to the ISO 9001 quality standards.

Further Support

If you have questions about SIPROTEC IEC 61850 interface, please contact your Siemens sales representative.

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Literature

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Applications

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1.1 General

This chapter specifies the protocol implementation extra information for testing (PIXIT) of the IEC 61850 interface in SIPROTEC 6MD66 V4.8.

It is based on the service subset definition given in the protocol implementation conformance statement (PICS), which is specified within the user manual *SIPROTEC 4 Ethernet Module EN 100 IEC 61850 Electrical Interface 100 MBit, Manual /1/*.

The following applicable ACSI service models are specified:

- Association model
- Server model
- Data set model
- Substitution model
- Reporting model
- Logging model
- Generic substitution model
- Transmission of sample values model
- Control model
- Time and time synchronisation model
- File transfer model
- General items

Together with the PICS and the MICS the PIXIT forms the basis for a conformance test according to IEC 61850-10.

The mapping between the IEC 61850 server data model and the SIPROTEC specific data is specified in Chapter 3.

1.2 Association model

Description	Value / Clarification
Maximum number of clients that can set-up an association simultaneously	5 with IEC61850 Protocol Update Version EN100 V04.02 and lower 6 with IEC61850 Protocol Update Version EN100 V04.03 and higher
Lost connection detection time range (default range of TCP_KEEPALIVE is 1 – 20 seconds)	10 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
What is the typical startup time after a power supply interrupt ?	15 SECONDS
<additional items>	

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.
<additional items>	

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.
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 it not necessary from type conformance testing standpoint.

1.5 Substitution model

This service will not be supported (see also *SIPROTEC 4 Ethernet Module EN 100 IEC 61850 Electrical Interface 100 MBit, Manual /1/*).

1.6 Reporting model

1.6.1 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 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 not lost.

1.6.2 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
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/forseen 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.

<p>Configured BRCB reservation after an abort of the client/server association</p>	<p>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.</p>
<p>Optional use of a flow control for transmitting history of a BRCB</p>	<p>As specified in the IEC61850-7-2, transmission of entries may required some times, depending of the amount of entries that have to be transmmitted. Therefore, the SIPROTEC 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 transmmision strategy of the entries. The number ordered will then be transmmitted 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.</p>

1.7 Logging model

This service will not be supported (see also *SIPROTEC 4 Ethernet Module EN 100 IEC 61850 Electrical Interface 100 MBit, Manual /1/*).

1.8 Generic substation model

Description	Value / Clarification
What is the behavior 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 behavior 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). All expected data objects will be declared as invalid.
What is the behavior 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). All expected data objects will be declared as invalid.
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 behavior 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*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 behavior 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 behavior 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 behavior 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 behavior 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×TAL. The information is then declared as questionable, oldData.
What is the behavior when a GOOSE header parameter goCBRef is mismatching with the expected one?	Since the goCBRef shall be unique stationwide, the received telegram with the mismatched goCBRef will be discarded: it has not been published. In that case only the timeout detection will set the data to invalid.
What is the behavior 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.
What is the behavior 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 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 Transmission of sample values model

Compare the "Implementation Guidelines for Electrical Current and Voltage Transducers according to IEC 60044-7/8 with Digital Output according to IEC 61850-9-2; Version 1.0; as specified by ABB, Areva, Landis+Gyr, OMICRON and SIEMENS

This service will not be supported (see also *SIPROTEC 4 Ethernet Module EN 100 IEC 61850 Electrical Interface 100 MBit, Manual /1/*).

1.10 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 Time activated operate (operTm) supported	N
What is the behavior 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" with IEC61850 Protocol Update Version V04.10 and lower. Will be executed if the device is in test mode. Otherwise the control request will be rejected with IEC 61850 Protocol Update Version V04.20 and higher.
What are the conditions for the time (T) attribute in the SelectWithValue and/or Operate request ?	Time attribute is not relevant.
Is "operate-many" supported ?	N
Is pulse configuration supported ?	N
What check conditions are supported ?	Y Synchrocheck Y Interlock-check
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 ?	N Blocked-by-switching-hierarchy Y Select-failed Y Invalid-position Y Position-reached Y Parameter-change-in-execution 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
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)	Oper 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.

1.11 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 behavior 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.
additional items:	
What is the behavior 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.

1.12 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 behavior 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.
additional items:	
Maximum number of clients that can use the FTP service simultaneously	1
Maximum number of files that can be accessed simultaneously	1

1.13 General items

Description	Value / Clarification
IED behavior when the Logical Device is blocked : LLN0.Mod.stVal = blocked	Unlike the definition of the Data Objects “Mod/Beh” in IEC 61850-7-4, outputs to the process will be generated. Details to this behavior are specified in <i>SIPROTEC 4 Ethernet Module EN 100 IEC 61850 Electrical Interface 100 MBit, Manual /1/</i>
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, ISCSOxx. 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 type of the attribute actVal in the BCR (Binary Counter Reading) CDC?	The type is integer 32 (INT32).

1.14 TISSUES

Topic	TISSUE -No.	Link	Description	Impact of Interoper.
Object Model	120	http://www.tissue.iec61850.com/tissue.aspx?issueid=120	Type - Mod.stVal and Mod.ctlVal	-
	146	http://www.tissue.iec61850.com/tissue.aspx?issueid=146	CtxInt	-
	173	http://www.tissue.iec61850.com/tissue.aspx?issueid=173	Ctl modelling harmonization	-
	234	http://www.tissue.iec61850.com/tissue.aspx?issueid=234	New type CtxInt	x
Services	377	http://www.tissue.iec61850.com/tissue.aspx?issueid=377	DeleteDataSet response-	-
	276	http://www.tissue.iec61850.com/tissue.aspx?issueid=276	File Services Negative Responses	-
	183	http://www.tissue.iec61850.com/tissue.aspx?issueid=183	GetNameList error handling	x
	165	http://www.tissue.iec61850.com/tissue.aspx?issueid=165	Improper Error Response for GetDataSetValues	x
	116	http://www.tissue.iec61850.com/tissue.aspx?issueid=116	GetNameList with empty response?	x
Reporting	474	http://www.tissue.iec61850.com/tissue.aspx?issueid=474	GI for URCB	-
	453	http://www.tissue.iec61850.com/tissue.aspx?issueid=453	Reporting & Logging model revision	x
	438	http://www.tissue.iec61850.com/tissue.aspx?issueid=438	EntryTime base should be GMT	-
	349	http://www.tissue.iec61850.com/tissue.aspx?issueid=349	BRCB TimeOfEntry has two definitions	x
	348	http://www.tissue.iec61850.com/tissue.aspx?issueid=348	URCB class and report	x

Reporting	344	http://www.tissue.iec61850.com/tissue.aspx?issueid=344	TimeOfEntry misspelled	-
	335	http://www.tissue.iec61850.com/tissue.aspx?issueid=335	Clearing of Bufovfl	x
	332	http://www.tissue.iec61850.com/tissue.aspx?issueid=332	Ambiguity in use of trigger options	x
	329	http://www.tissue.iec61850.com/tissue.aspx?issueid=329	Reporting and BufOvl	x
	322	http://www.tissue.iec61850.com/tissue.aspx?issueid=322	Write Configuration attribute of BRCBs	
	301	http://www.tissue.iec61850.com/tissue.aspx?issueid=301	SqNum in Buffered Reports	-
	300	http://www.tissue.iec61850.com/tissue.aspx?issueid=300	Attribute Resv in BRCB	x
	298	http://www.tissue.iec61850.com/tissue.aspx?issueid=298	Type of SqNum	x
	297	http://www.tissue.iec61850.com/tissue.aspx?issueid=297	Sequence number	x
	278	http://www.tissue.iec61850.com/tissue.aspx?issueid=278	EntryId not valid for a server	x
	275	http://www.tissue.iec61850.com/tissue.aspx?issueid=275	Confusing statement on GI usage	x
	191	http://www.tissue.iec61850.com/tissue.aspx?issueid=191	BRCB: Integrity and buffering reports	x
	190	http://www.tissue.iec61850.com/tissue.aspx?issueid=190	BRCB: EntryId and TimeOfEntry	x
	177	http://www.tissue.iec61850.com/tissue.aspx?issueid=177	Ignoring OptFlds bits for URCB	-
	52	http://www.tissue.iec61850.com/tissue.aspx?issueid=52	Ambiguity GOOSE SqNum	x
	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
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

Basics

Contents

This chapter contains general information about the effects of device configuration on Logical Nodes and DOIs.

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2.1 General

The protocol IEC 61850 was developed to define a standard that can be internationally employed for the transmission of power automation system data.

This cross national standard enables an interoperability between automation systems and devices made by different manufacturers.

The devices and high voltage bay control units of the SIPROTEC 4 series can be equipped with an Ethernet module EN100 via which the protocol IEC 61850 is interpreted.

The configuration of the protocol and the integration of the device with redundant IEC 61850 interfaces in your network are performed via the configuration system DIGSI.

For details please refer to the manuals:

- ❑ *SIPROTEC 4 Ethernet Module EN 100 IEC 61850 Electrical Interface 100 MBit, Manual /1/ und*
- ❑ *SIPROTEC 4 System Description /2/.*



Note

The following definitions are taken mainly from standard IEC 61850, Technical Specification IEC TS 61850-2.

Logical Devices

LD Logical Devices represent a functional structuring of the LN Logical Nodes of a SIPROTEC device.

The following Logical Devices are present:

- ❑ Logical Device Protection PROT
- ❑ Logical Device Measurement MEAS
- ❑ Logical Device Disturbance Recorder DR
- ❑ Logical Device Control CTRL
- ❑ Logical Device Extended EXT

Each LD contains LN LLN0 and LN LPHD1.

The allocation of the Logical Nodes to the Logical Devices is listed in Chapter 2.3.

Logical Node LN

Smallest part of a function that exchanges data. A logical node is an object defined by its data and methods.

Data object instance DOI

A Data object is part of a logical node object representing specific information for example status of measurement. From an object-oriented point of view, a data object is an instance of a data class. Specific data classes carry the semantic within a logical node.

Data attribute instance DAI

A Data attribute defines the name (semantic), format, range of possible values, and representation of values while being communicated.

Annunciation types via GOOSE

Generic Object Oriented Substation Event

A GOOSE report enables high speed trip signals to be issued with a high probability of delivery.

The following types of information can be configured via GOOSE.

- External single point indication O/O
- External single point indication I/O
- External double point indication
- External double point indication, fast
- External operational measured values
- External metered values

2.2 Effects of Configuration to the Logical Nodes

2.2.1 Function parameters

Depending on the configuration of the function parameters the functions of the SIPROTEC are enabled or disabled. If a function is disabled, the corresponding Logical Node is not available.

The following Logical Nodes are always available

Logical Device Protection: LLN0, LPHD1
 Logical Device Measurement: LLN0, LPHD1, MMTR1
 Logical Device Disturbance Recorder: LLN0, LPHD1
 Logical Device Control: LLN0, LPHD1

The following table shows which Logical Nodes are available when setting the corresponding function parameter.

The setting (-) implies that no corresponding LN is available.

Table 2-1 Effects of Function parameters to the Logical Nodes

No.	Function	Setting	Logical Nodes
103	Setting Group Change Option		No effect
	Fault record	Disabled	-
		Enabled	RDRE1
	Measurement V	Disabled	-
		Enabled	MMXN4
	Measurement I	Disabled	-
		Enabled	MMXN5
	Measurement 1phase 1.packet	Disabled	-
		Enabled	MMXN1
	Measurement 1phase 2.packet	Disabled	-
		Enabled	MMXN2
	Measurement 1phase 3.packet	Disabled	-
		Enabled	MMXN3

Table 2-1 Effects of Function parameters to the Logical Nodes (Forts.)

No.	Function	Setting	Logical Nodes
	Measurement 3phase 1.packet	Disabled	-
		Enabled	MMXU1
	Measurement Aron 1.packet	Disabled	-
		Enabled	MMXU2
	Synchronizing Function 1	Disabled	-
		Enabled	RSYN1
	Synchronizing Function 2	Disabled	-
		Enabled	RSYN2
	Synchronizing Function 3	Disabled	-
		Enabled	RSYN3
	Synchronizing Function 4	Disabled	-
		Enabled	RSYN4
	Synchronizing Function 5	Disabled	-
		Enabled	RSYN5
	Synchronizing Function 6	Disabled	-
		Enabled	RSYN6
	Synchronizing Function 7	Disabled	-
		Enabled	RSYN7
	Synchronizing Function 8	Disabled	-
		Enabled	RSYN8
110	Trip mode	3pole only	XCBR1
		1-/3pole	XCBR2, XCBR3, XCBR4

Table 2-1 Effects of Function parameters to the Logical Nodes (Forts.)

No.	Function	Setting	Logical Nodes
133	Auto-Reclose Function	Disabled	-
		1 AR-cycle	RREC1
		2 AR-cycles	RREC1
		3 AR-cycles	RREC1
		4 AR-cycles	RREC1
		5 AR-cycles	RREC1
		6 AR-cycles	RREC1
		7 AR-cycles	RREC1
		8 AR-cycles	RREC1
		ADT	RREC1
134	Auto-Reclose control mode	Pickup with Tact	RREC1
		Pickup without Tact	RREC1
		Trip withTact	RREC1
		Trip withoutTact	RREC1
139	Breaker Failure Protection	Disabled	-
		Enabled	RBRF1

2.3 Allocation of Logical Nodes to Logical Devices

All Logical Nodes (LN) are allocated to Logical Devices (LD). The following tables show this allocation and the DOIs available for each LN.

LD PROT

The Logical Device PROT (protection) contains the following LNs:

Table 2-2 LD PROT - Logical Nodes

LN	Function	DOI
LLN0	General	Mod, Beh, Health, NamPlt
RBRF1	Breaker Failure Protection	Mod, Beh, Health, NamPlt, Str, OpEx, OpIn
XCBR1	Three-pole tripping	Mod, Beh, Health, NamPlt, Loc, OpCnt, Pos BlkOpn, BlkCls, CBOpCap
XCBR2 XCBR3 XCBR4	Single-pole / Three-pole tripping	Mod, Beh, Health, NamPlt, Loc, OpCnt, Pos BlkOpn, BlkCls, CBOpCap
LPHD1	Device	PhyNam, PhyHealth, Proxy

LD MEAS

The Logical Device MEAS (measurement) contains the following LNs:

Table 2-3 LD MEAS - Logical Nodes

LN	Function	DOIs
LLN0	General	Mod, Beh, Health, NamPlt
MMXU1	Measurement 3phase 1.packet	Mod, Beh, Health, NamPlt, TotW, TotVAr, TotVA, TotPF, Hz, PPV, PhV, A
MMXU2	Measurement ARON 1.packet	Mod, Beh, Health, NamPlt, TotW, TotVAr, TotVA, TotPF, Hz, PPV, A
MMXN1	Measurement 1phase 1.packet	Mod, Beh, Health, NamPlt, Amp, Vol, Watt, VolAmpr, VolAmp, PwrFact, Hz
MMXN2	Measurement 1phase 2.packet	Mod, Beh, Health, NamPlt, Amp, Vol, Watt, VolAmpr, VolAmp, PwrFact, Hz
MMXN3	Measurement 1phase 3.packet	Mod, Beh, Health, NamPlt, Amp, Vol, Watt, VolAmpr, VolAmp, PwrFact, Hz
MMXN4	Measurement I	Mod, Beh, Health, NamPlt, Vol, Hz
MMXN5	Measurement V	Mod, Beh, Health, NamPlt, Amp, Hz
MMTR1	Energy	Mod, Beh, Health, NamPlt, SupWh, SupVArh, DmdWh, DmdVArh
LPHD1	Device	PhyNam, PhyHealth Proxy

LD DR

The Logical Device DR (Disturbance Recorder) contains the following LNs:

Table 2-4 LD DR - Logical Nodes

LN	Function	DOIs
LLN0	General	Mod, Beh, Health, NamPlt
RDRE1	Fault Record	Mod, Beh, Health, NamPlt, RcdMade FltNum, GriFltNum RcdStr
LPHD1	Device	PhyNam, PhyHealth Proxy

LD CTRL

The Logical Device CTRL (Control) contains the following LNs:

Table 2-5 LD CTRL - Logical Nodes

LN	Function	DOIs
LLN0	General	Mod, Beh, Health, NamPlt, LEDRs, Loc
RSYN1 RSYN2 RSYN3 RSYN4 RSYN5 RSYN6 RSYN7 RSYN8	Synchronizing Functions	Mod, Beh, Health, NamPlt, Rel, VInd, AngInd, HzInd, DifVClc, DifHzClc, DifAngClc
RREC1	Auto-Reclose control mode	Mod, Beh, Health, NamPlt, Op, AutoRecSt
LPHD1	Device	PhyNam, PhyHealth Proxy, CtlNum, DevStr

The Logical Nodes of the switching (and userdefined) objects will be created by DIGSI during the parameterization of your SIPROTEC device.

MICS, Model Implementation Conformance Statement, shows the assignment of the DOIs; you can use DIGSI to print the MICS.

LD EXT

The Logical Device EXT (Extended) contains the following LNs:

Table 2-6 LD EXT - Logical Nodes

LN	Function	DOIs
LLN0	General	Mod, Beh, Health, NamPlt,
LPHD1	Device	PhyNam, PhyHealth, Proxy

2.4 Logical Node LLN0

2.4.1 Logical Device PROT

LLN0.Mod

No.	Information						
51	Device is Operational and Protecting (Device OK)	0	1	1	1	1	1
52	At Least 1 Protection Funct. is Active (ProtActive)	x	0	1	1	1	1
	Test mode (Test mode)	x	x	0	0	1	1
	Stop data transmission (DataStop)	x	x	0	1	0	1
LLN0.Mod.stVal		5	5	1	2	3	4

device annunciation: 1 - ON
0 - OFF
x - irrelevant

IEC Status Mod.stVal: 1 - ON
2 - BLOCKED
3 - Test
4 - TEST/BLOCKED
5 - OFF

LLN0.Beh

No.	Information						
51	Device is Operational and Protecting (Device OK)	0	1	1	1	1	1
52	At Least 1 Protection Funct. is Active (ProtActive)	x	0	1	1	1	1
	Test mode (Test mode)	x	x	0	0	1	1
	Stop data transmission (DataStop)	x	x	0	1	0	1
LLN0.Beh.stVal		5	5	1	2	3	4

device annunciation: 1 - ON
0 - OFF
x - irrelevant

IEC Status Beh.stVal: 1 - ON
2 - BLOCKED
3 - Test
4 - TEST/BLOCKED
5 - OFF

2.5 DOI Behavior

2.5.1 Logical Device PROT

For the Logical Nodes of the PROT Logical Device, **LNx.Beh.stVal** is formed from **LNx.Mod.stVal** of the Logical Node and the status of the following device messages:

- Test mode (Test mode),
- Stop data transmission and
- At Least 1 Protection Funct. is Active.

No.	Information								
	Test mode (Test mode)	x	0	1	0	1	0	1	x
	Stop data transmission (DataStop)	x	0	0	1	1	x	x	x
51	Device is Operational and Protecting (Device OK)	x	1	1	1	1	1	1	0
	LNx .Mod.stVal	5	1	1	1	1	2	2	x
LNx.Beh.stVal		5	1	3	2	4	2	4	5

device annunciation:
 1 - ON
 0 - OFF
 x - irrelevant

IEC Status stVal:
 1 - ON
 2 - BLOCKED
 3 - TEST
 4 - TEST/BLOCKED
 5 - OFF

2.5.2 Logical Devices MEAS, CTRL, DR and EXT

For the Logical Nodes of the MEAS, CTRL, DR and EXT Logical Devices, **LNx.Beh.stVal** is formed from **LNx.Mod.stVal** of the Logical Node and the status of the following device messages:

- Test mode (Test mode),
- Stop data transmission.

No.	Information								
	Test mode (Test mode)	x	0	1	0	1	0	1	
	Stop data transmission (DataStop)	x	0	0	1	1	x	x	
	LNx .Mod.stVal	5	1	1	1	1	2	2	
LNx.Beh.stVal		5	1	3	2	4	2	4	

device annunciation:

1 - ON
 0 - OFF
 x - irrelevant

IEC Status stVal:

1 - ON
 2 - BLOCKED
 3 - TEST
 4 - TEST/BLOCKED
 5 - OFF

Mapping

Contents

This chapter shows the mapping of the information relevant to the device on the Logical Node of protocol IEC61850. It is structured according to function. In Chapter 2 you can find what consequences non-configured functions have on the Logical Nodes as well as general information about IEC 61850 mapping of information.

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3.1.1 Error with a summary alarm and Alarm summary event

Logical Node CALH1 only available with Firmware V04.71 and higher.

CALH1.Mod

No.	Information		
55	Reset Device (Reset Device)	1	0
CALH1.Mod.stVal		1	5

device annunciation: 1 - ON
0 - OFF

IEC Status Mod.stVal: 1 - ON
2 - BLOCKED
3 - TEST
4 - TEST/BLOCKED
5 - OFF

CALH1.Health

No.	Information		
51	Device is Operational and Protecting (Device OK)	0	1
CALH1.Health.stVal		3	1

device annunciation: 1 - ON
0 - OFF

IEC Status Health.stVal: 1 - OK
2 - WARNING
3 - ALARM

CALH1.GrAlm

No.	Information		
140	Error with a summary alarm (Error Sum Alarm)	1	0
CALH1.GrAlm.stVal		1	0

device annunciation: 1 - ON
0 - OFF

IEC Status GrAlm.stVal: 0 - FALSE
1 - TRUE

CALH1.GrWrn

No.	Information		
160	Alarm Summary Event (Alarm Sum Event)	1	0
CALH1.GrWrn.stVal		1	0

device annunciation: 1 - ON
0 - OFF

IEC Status GrWrn.stVal: 0 - FALSE
1 - TRUE

RDRE1.FltNum

No.	Information	Value	
302	Fault Event (Fault Event)	RDRE1.FltNum.stVal	Present fault number

RDRE1.GriFltNum

No.	Information	Value	
301	Power System fault (Pow.Sys.Flt.)	RDRE1.GriFltNum.stVal	Network fault number

RDRE1.RcdStr

No.	Information		
30053	Fault recording is running (Fault rec. run.)	0	1
RDRE1.RcdStr.stVal		0	1

device annunciation:

1 - ON
0 - OFF

IEC Status RcdStr.stVal:

0 - FALSE
1 - TRUE

3.3 Measurement (MMXNx, MMXUx)

3.3.1 Measurement V (MMXN4)

MMXN4.Mod

No.	Information		
55	Reset Device (Reset Device)	1	0
MMXN4.Mod.stVal		1	5

device annunciation: 1 - ON
0 - OFF

IEC Status Mod.stVal: 1 - ON
2 - BLOCKED
3 - TEST
4 - TEST/BLOCKED
5 - OFF

MMXN4.Health

No.	Information		
51	Device is Operational and Protecting (Device OK)	0	1
MMXN4.Health.stVal		3	1

device annunciation: 1 - ON
0 - OFF

IEC Status Health.stVal: 1 - OK
2 - WARNING
3 - ALARM

MMXN4.Vol

No.	Information	Value		
		MMXN4.Vol.cVal.mag.f	Measured value	Absolute value
151.0002	Voltage U (U)	MMXN4.Vol.cVal.mag.f	Measured value	Absolute value
		MMXN4.Vol.units.SIUnit	29	V (Volt)
		MMXN4.Vol.units.multiplier	3	Kilo

MMXN4.Hz

No.	Information	Value		
		MMXN4.Hz.cVal.mag.f	Measured value	Absolute value
151.0021	Frequency (f)	MMXN4.Hz.cVal.mag.f	Measured value	Absolute value
		MMXN4.Hz.units.SIUnit	33	Hz
		MMXN4.Hz.units.multiplier	0	1

3.3.2 Measurement I (MMXN5)

MMXN5.Mod

No.	Information		
55	Reset Device (Reset Device)	1	0
MMXN5.Mod.stVal		1	5

device annunciation: 1 - ON
0 - OFF

IEC Status Mod.stVal: 1 - ON
2 - BLOCKED
3 - TEST
4 - TEST/BLOCKED
5 - OFF

MMXN5.Health

No.	Information		
51	Device is Operational and Protecting (Device OK)	0	1
MMXN5.Health.stVal		3	1

device annunciation: 1 - ON
0 - OFF

IEC Status Health.stVal: 1 - OK
2 - WARNING
3 - ALARM

MMXN5.Amp

No.	Information	Value		
		MMXN5.Amp.cVal.mag.f	Measured value	Absolute value
151.0010	Current I (I)	MMXN5.Amp.cVal.mag.f	Measured value	Absolute value
		MMXN5.Amp.units.SIUnit	5	A (Ampere)
		MMXN5.Amp.units.multiplier	0	1

MMXN5.Hz

No.	Information	Value		
		MMXN5.Hz.cVal.mag.f	Measured value	Absolute value
151.0021	Frequency (f)	MMXN5.Hz.cVal.mag.f	Measured value	Absolute value
		MMXN5.Hz.units.SIUnit	33	Hz
		MMXN5.Hz.units.multiplier	0	1

MMXN1.Watt

No.	Information	Value		
152.0015	1P1 Active Power P (1P1_P)	MMXN1.Watt.mag.f	Measured value	Absolute value
		MMXN1.Watt.units.SIUnit	62	W (Watt)
		MMXN1.Watt.units.multiplier	6	Mega

MMXN1.VolAmpr

No.	Information	Value		
152.0016	1P1 Reactive Power Q (1P1_Q)	MMXN1.VolAmpr.mag.f	Measured value	Absolute value
		MMXN1.VolAmpr.units.SIUnit	63	VAr
		MMXN1.VolAmpr.units.multiplier	6	Mega

MMXN1.VolAmp

No.	Information	Value		
152.0017	1P1 Apparent Power S (1P1_S)	MMXN1.VolAmp.mag.f	Measured value	Absolute value
		MMXN1.VolAmp.units.SIUnit	61	VA
		MMXN1.VolAmp.units.multiplier	6	Mega

MMXN1.PwrFact

No.	Information	Value		
152.0019	1P1 Active Power Factor Cosine Phi (1P1_cosφ)	MMXN1.PwrFact.mag.f	Measured value	Absolute value
		MMXN1.PwrFact.units.SIUnit	1	NONE
		MMXN1.PwrFact.units.multiplier	0	1

MMXN1.Hz

No.	Information	Information	Value	
152.0021	1P1 Frequency of U (1P1_f)	MMXN1.Hz.cVal.mag.f	Measured value	Absolute value
		MMXN1.Hz.units.SIUnit	33	Hz
		MMXN1.Hz.units.multiplier	0	1

3.3.4 Measurement 1phase 2.packet (MMXN2)

MMXN2.Mod

No.	Information		
55	Reset Device (Reset Device)	1	0
MMXN2.Mod.stVal		1	5

device annunciation: 1 - ON
 0 - OFF

IEC Status Mod.stVal: 1 - ON
 2 - BLOCKED
 3 - TEST
 4 - TEST/BLOCKED
 5 - OFF

MMXN2.Health

No.	Information		
51	Device is Operational and Protecting (Device OK)	0	1
MMXN2.Health.stVal		3	1

device annunciation: 1 - ON
 0 - OFF

IEC Status Health.stVal: 1 - OK
 2 - WARNING
 3 - ALARM

MMXN2.Amp

No.	Information	Value		
			Measured value	Absolute value
152.0010	1P2 Current I (1P2_I)	MMXN2.Amp.cVal.mag.f		
		MMXN2.Amp.units.SIUnit	5	A (Ampere)
		MMXN2.Amp.multiplier	0	1

MMXN2.Vol

No.	Information	Value		
			Measured value	Absolute value
152.0002	1P2 Voltage U (1P2_U)	MMXN2.Vol.cVal.mag.f		
		MMXN2.Vol.units.SIUnit	29	V (Volt)
		MMXN2.Vol.units.multiplier	3	Kilo

MMXN2.Watt

No.	Information	Value		
152.0015	1P2 Active Power P (1P2_P)	MMXN2.Watt.mag.f	Measured value	Absolute value
		MMXN2.Watt.units.SIUnit	62	W (Watt)
		MMXN2.Watt.units.multiplier	6	Mega

MMXN2.VolAmpr

No.	Information	Value		
152.0016	1P2 Reactive Power Q (1P2_Q)	MMXN2.VolAmpr.mag.f	Measured value	Absolute value
		MMXN2.VolAmpr.units.SIUnit	63	VAr
		MMXN2.VolAmpr.units.multiplier	6	Mega

MMXN2.VolAmp

No.	Information	Value		
152.0017	1P2 Apparent Power S (1P2_S)	MMXN2.VolAmp.mag.f	Measured value	Absolute value
		MMXN2.VolAmp.units.SIUnit	61	VA
		MMXN2.VolAmp.units.multiplier	6	Mega

MMXN2.PwrFact

No.	Information	Value		
152.0019	1P2 Active Power Factor Cosine Phi (1P2_cosφ)	MMXN2.PwrFact.mag.f	Measured value	Absolute value
		MMXN2.PwrFact.units.SIUnit	1	NONE
		MMXN2.PwrFact.units.multiplier	0	1

MMXN2.Hz

No.	Information	Value		
152.0021	1P2 Frequency of U (1P2_f)	MMXN2.Hz.cVal.mag.f	Measured value	Absolute value
		MMXN2.Hz.units.SIUnit	33	Hz
		MMXN2.Hz.units.multiplier	0	1

3.3.5 Measurement 1phase 3.packet (MMXN3)

MMXN3.Mod

No.	Information		
55	Reset Device (Reset Device)	1	0
MMXN3.Mod.stVal		1	5

device annunciation:
1 - ON
0 - OFF

IEC Status Mod.stVal:
1 - ON
2 - BLOCKED
3 - TEST
4 - TEST/BLOCKED
5 - OFF

MMXN3.Health

No.	Information		
51	Device is Operational and Protecting (Device OK)	0	1
MMXN3.Health.stVal		3	1

device annunciation:
1 - ON
0 - OFF

IEC Status Health.stVal:
1 - OK
2 - WARNING
3 - ALARM

MMXN3.Amp

No.	Information	Value		
		MMXN3.Amp.cVal.mag.f	Measured value	Absolute value
152.0010	1P3 Current I (1P3_I)	MMXN3.Amp.cVal.mag.f	Measured value	Absolute value
		MMXN3.Amp.units.SIUnit	5	A (Ampere)
		MMXN3.Amp.multiplier	0	1

MMXN3.Vol

No.	Information	Value		
		MMXN3.Vol.cVal.mag.f	Measured value	Absolute value
152.0002	1P3 Voltage U (1P3_U)	MMXN3.Vol.cVal.mag.f	Measured value	Absolute value
		MMXN3.Vol.units.SIUnit	29	V (Volt)
		MMXN3.Vol.units.multiplier	3	Kilo

MMXN3.Watt

No.	Information	Value		
152.0015	1P3 Active Power P (1P3_P)	MMXN3.Watt.mag.f	Measured value	Absolute value
		MMXN3.Watt.units.SIUnit	62	W (Watt)
		MMXN3.Watt.units.multiplier	6	Mega

MMXN3.VolAmpr

No.	Information	Value		
152.0016	1P3 Reactive Power Q (1P3_Q)	MMXN3.VolAmpr.mag.f	Measured value	Absolute value
		MMXN3.VolAmpr.units.SIUnit	63	VAr
		MMXN3.VolAmpr.units.multiplier	6	Mega

MMXN3.VolAmp

No.	Information	Value		
152.0017	1P3 Apparent Power S (1P3_S)	MMXN3.VolAmp.mag.f	Measured value	Absolute value
		MMXN3.VolAmp.units.SIUnit	61	VA
		MMXN3.VolAmp.units.multiplier	6	Mega

MMXN3.PwrFact

No.	Information	Value		
152.0019	1P3 Active Power Factor Cosine Phi (1P3_cosφ)	MMXN3.PwrFact.mag.f	Measured value	Absolute value
		MMXN3.PwrFact.units.SIUnit	1	NONE
		MMXN3.PwrFact.units.multiplier	0	1

MMXN3.Hz

No.	Information	Value		
152.0021	1P3 Frequency of U (1P3_f)	MMXN3.Hz.cVal.mag.f	Measured value	Absolute value
		MMXN3.Hz.units.SIUnit	33	Hz
		MMXN3.Hz.units.multiplier	0	1

MMXU1.TotVA

No.	Information	Value		
153.0017	3P1 Apparent Power Three Phase (3P1_S)	MMXU1.TotVA.mag.f	Measured value	Absolute value
		MMXU1.TotVA.units.SIUnit	61	VA
		MMXU1.TotVA.units.multiplier	6	Mega

MMXU1.TotPF

No.	Information	Value		
153.0019	3P1 Active Power Factor Three Phase (3P1_cosφ)	MMXU1.TotPF.mag.f	Measured value	Absolute value
		MMXU1.TotPF.units.SIUnit	1	NONE
		MMXU1.TotPF.units.multiplier	0	1

MMXU1.Hz

No.	Information	Value		
153.0021	3P1 Frequency (3P1_f)	MMXU1.Hz.mag.f	Measured value	Absolute value
		MMXU1.Hz.units.SIUnit	33	Hz
		MMXU1.Hz.units.multiplier	0	1

MMXU1.PPV

No.	Information	Value		
153.0007	3P1 Phase to Phase Voltage U12 (3P1_U12)	MMXU1.PPV.phsAB.cVal.mag.f	Measured value	Absolute value
		MMXU1.PPV.phsAB.units.SIUnit	29	V (Volt)
		MMXU1.PPV.phsAB.units.multiplier	3	Kilo

No.	Information	Value		
153.0008	3P1 Phase to Phase Voltage U23 (3P1_U23)	MMXU1.PPV.phsBC.cVal.mag.f	Measured value	Absolute value
		MMXU1.PPV.phsBC.units.SIUnit	29	V (Volt)
		MMXU1.PPV.phsBC.units.multiplier	3	Kilo

No.	Information	Value		
153.0009	3P1 Phase to Phase Voltage U31 (3P1_U31)	MMXU1.PPV.phsCA.cVal.mag.f	Measured value	Absolute value
		MMXU1.PPV.phsCA.units.SIUnit	29	V (Volt)
		MMXU1.PPV.phsCA.units.multiplier	3	Kilo

MMXU1.PhV

No.	Information	Value		
153.0004	3P1 Phase to Earth Voltage U1 (3P1_U1)	MMXU1.PhV.phsA.cVal.mag.f	Measured value	Absolute value
		MMXU1.PhV.phsA.units.SIUnit	29	V (Volt)
		MMXU1.PhV.phsA.units.multiplier	3	Kilo
No.	Information	Value		
153.0005	3P1 Phase to Earth Voltage U2 (3P1_U2)	MMXU1.PhV.phsB.cVal.mag.f	Measured value	Absolute value
		MMXU1.PhV.phsB.units.SIUnit	29	V (Volt)
		MMXU1.PhV.phsB.units.multiplier	3	Kilo
No.	Information	Value		
153.0006	3P1 Phase to Earth Voltage U3 (3P1_U3)	MMXU1.PhV.phsC.cVal.mag.f	Measured value	Absolute value
		MMXU1.PhV.phsC.units.SIUnit	29	V (Volt)
		MMXU1.PhV.phsC.units.multiplier	3	Kilo
No.	Information	Value		
153.0003	3P1 Zero Sequence Voltage (3P1_U0)	MMXU1.PhV.neut.cVal.mag.f	Measured value	Absolute value
		MMXU1.PhV.neut.units.SIUnit	29	V (Volt)
		MMXU1.PhV.neut.units.multiplier	3	Kilo

MMXU1.A

No.	Information	Value		
153.0012	3P1 Phase Current I1 (3P1_I1)	MMXU1.A.phsA.cVal.mag.f	Measured value	Absolute value
		MMXU1.A.phsA.units.SIUnit	5	A (Ampere)
		MMXU1.A.phsA.units.multiplier	0	1
No.	Information	Value		
153.0013	3P1 Phase Current I2 (3P1_I2)	MMXU1.A.phsB.cVal.mag.f	Measured value	Absolute value
		MMXU1.A.phsB.units.SIUnit	5	A (Ampere)
		MMXU1.A.phsB.units.multiplier	0	1
No.	Information	Value		
153.0014	3P1 Phase Current I3 (3P1_I3)	MMXU1.A.phsC.cVal.mag.f	Measured value	Absolute value
		MMXU1.A.phsC.units.SIUnit	5	A (Ampere)
		MMXU1.A.phsC.units.multiplier	0	1
No.	Information	Value		
153.0011	3P1 Zero Sequence Current (3P1_I0)	MMXU1.A.neut.cVal.mag.f	Measured value	Absolute value
		MMXU1.A.neut.units.SIUnit	5	A (Ampere)
		MMXU1.A.neut.units.multiplier	0	1

3.3.7 Measurement ARON 1.packet (MMXU2)

MMXU2.Mod

No.	Information		
55	Reset Device (Reset Device)	1	0
MMXU2.Mod.stVal		1	5

device annunciation: 1 - ON
0 - OFF

IEC Status Mod.stVal: 1 - ON
2 - BLOCKED
3 - TEST
4 - TEST/BLOCKED
5 - OFF

MMXU2.Health

No.	Information		
51	Device is Operational and Protecting (Device OK)	0	1
MMXU2.Health.stVal		3	1

device annunciation: 1 - ON
0 - OFF

IEC Status Health.stVal: 1 - OK
2 - WARNING
3 - ALARM

MMXU2.TotW

No.	Information	Value		
		MMXU2.TotW.mag.f	Measured value	Absolute value
154.0015	A1 Active Power P (A1_P)	MMXU2.TotW.mag.f	Measured value	Absolute value
		MMXU2.TotW.units.SIUnit	62	W (Watt)
		MMXU2.TotW.units.multiplier	6	Mega

MMXU2.TotVAr

No.	Information	Value		
		MMXU2.TotVAr.mag.f	Measured value	Absolute value
154.0016	A1 Reactive Power Q (A1_Q)	MMXU2.TotVAr.mag.f	Measured value	Absolute value
		MMXU2.TotVAr.units.SIUnit	63	VAr
		MMXU2.TotVAr.units.multiplier	6	Mega

MMXU2.TotVA

No.	Information	Value		
154.0017	A1 Apparent Power S (A1_S)	MMXU2.TotVA.mag.f	Measured value	Absolute value
		MMXU2.TotVA.units.SIUnit	61	VA
		MMXU2.TotVA.units.multiplier	6	Mega

MMXU2.TotPF

No.	Information	Value		
154.0019	A1 Active Power Factor Cosine Phi (A1_cosφ)	MMXU2.TotPF.mag.f	Measured value	Absolute value
		MMXU2.TotPF.units.SIUnit	1	NONE
		MMXU2.TotPF.units.multiplier	0	1

MMXU2.Hz

No.	Information	Value		
154.0021	A1 Frequency (A1_f)	MMXU2.Hz.mag.f	Measured value	Absolute value
		MMXU2.Hz.units.SIUnit	33	Hz
		MMXU2.Hz.units.multiplier	0	1

MMXU2.PPV

No.	Information	Value		
154.0007	A1 Phase to Phase Voltage U12 (A1_U12)	MMXU2.PPV.phsB.cVal.mag.f	Measured value	Absolute value
		MMXU2.PPV.phsB.units.SIUnit	29	V (Volt)
		MMXU2.PPV.phsB.units.multiplier	3	Kilo

No.	Information	Value		
154.0009	A1 Phase to Phase Voltage U12 (A1_U12)	MMXU2.PPV.phsC.cVal.mag.f	Measured value	Absolute value
		MMXU2.PPV.phsC.units.SIUnit	29	V (Volt)
		MMXU2.PPV.phsC.units.multiplier	3	Kilo

MMXU2.A

No.	Information	Value		
154.0013	A1 Phase Current I2 (A1_I2)	MMXU2.A.phsB.cVal.mag.f	Measured value	Absolute value
		MMXU2.A.phsB.units.SIUnit	5	A (Ampere)
		MMXU2.A.phsB.units.multiplier	0	1

No.	Information	Value		
154.0014	A1 Phase Current I3 (A1_I3)	MMXU2.A.phsC.cVal.mag.f	Measured value	Absolute value
		MMXU2.A.phsC.units.SIUnit	5	A (Ampere)
		MMXU2.A.phsC.units.multiplier	0	1

3.4 Power Metering (MMTR1)

Power Metering is not showed as configuration in DIGSI matrix, but they can be exported to .icd file.

MMTR1.Mod

No.	Information		
55	Reset Device (Reset Device)	1	0
MMTR1.Mod.stVal		1	5

device annunciation: 1 - ON
0 - OFF

IEC Status Mod.stVal: 1 - ON
2 - BLOCKED
3 - TEST
4 - TEST/BLOCKED
5 - OFF

MMTR1.Health

No.	Information		
51	Device is Operational and Protecting (Device OK)	0	1
MMTR1.Health.stVal		3	1

device annunciation: 1 - ON
0 - OFF

IEC Status Health.stVal: 1 - OK
2 - WARNING
3 - ALARM

MMTR1.SupWh

No.	Information	Value		
	Wp Forward (WpForward)	MMTR1.SupWh.actVal	Metered value	Current value of accumulated interrupted current = actVal × pulsQty
		MMTR1.SupWh.units.SIUnit	72	Wh
		MMTR1.SupWh.units.multiplier	6	Mega
		MMTR1.SupWh.pulsQty	1.905260e-001	Wh / Metered value

MMTR1.SupVARh

No.	Information	Value		
	Wq Forward (WqForward)	MMTR1.SupVARh.actVal	Metered value	Current value of accumulated interrupted current = actVal × pulsQty
		MMTR1.SupVARh.units.SIUnit	73	VARh
		MMTR1.SupVARh.units.multiplier	6	Mega
		MMTR1.SupVARh.pulsQty	1.905260e-001	VARh / Metered value

MMTR1.DmdWh

No.	Information	Value		
	Wp Reverse (WpReverse)	MMTR1.DmdWh.actVal	Metered value	Current value of accumulated interrupted current = actVal × pulsQty
		MMTR1.DmdWh.units.SIUnit	72	Wh
		MMTR1.DmdWh.units.multiplier	6	Mega
		MMTR1.DmdWh.pulsQty	1.905260e-001	Wh / Metered value

MMTR1.DmdVARh

No.	Information	Value		
	Wq Reverse (WqReverse)	MMTR1.DmdVARh.actVal	Metered value	Current value of accumulated interrupted current = actVal × pulsQty
		MMTR1.DmdVARh.units.SIUnit	73	VARh
		MMTR1.DmdVARh.units.multiplier	6	Mega
		MMTR1.DmdVARh.pulsQty	1.905260e-001	VARh / Metered value

3.5 Synchronism and voltage check (RSYNx)

RSYN1.Mod

No.	Information		
51	Device is Operational and Protecting (Device OK)	1	0
RSYN1.Mod.stVal		1	5

device annunciation: 1 - ON
0 - OFF

IEC Status Mod.stVal: 1 - ON
2 - BLOCKED
3 - TEST
4 - TEST/BLOCKED
5 - OFF

RSYN1.Health

No.	Information				
51	Device is Operational and Protecting (Device OK)	0	0	1	1
170.0050	Synchronization Error (Sync. Error)	0	1	0	1
RSYN1.Health.stVal		3	3	1	2

device annunciation: 1 - ON
0 - OFF

IEC Status Health.stVal: 1 - OK
2 - WARNING
3 - ALARM

RSYN1.Rel

No.	Information		
170.0049	Sync. Release of CLOSE Command (Sync. CloseRel)	0	1
RSYN1.Rel.stVal		0	1

device annunciation: 1 - ON
0 - OFF

IEC Status Rel.stVal: 0 - FALSE
1 - TRUE

RSYN1.DifVClc

No.	Information	Value		
170.0072	Sync. voltage difference U1,U2 (Sync. Vdiff)	RSYN1.DifVClc.mag.f	Measured value	Absolute value
		RSYN1.DifVClc.units.SIUnit	29	V (Volt)
		RSYN1.DifVClc.units.multiplier	3	Kilo

RSYN1.DifHzClc

No.	Information	Value		
170.0076	Sync. frequency difference f1, f2 (Sync. fdiff)	RSYN1. DifHzClc.mag.f	Measured value	Absolute value
		RSYN1. DifHzClc.units.SIUnit	33	Hz
		RSYN1. DifHzClc.units.multiplier	0	1

RSYN1.DifAngClc

No.	Information	Value		
170.003	Sync. angle between U1,U2 (Sync. α)	RSYN1. DifAngClc.mag.f	Measured value	Absolute value
		RSYN1. DifAngClc.units.SIUnit	9	° (Degree)
		RSYN1. DifAngClc.units.multiplier	0	1

RSYN2.DifVClc

No.	Information	Value		
170.0072	Sync. voltage difference U1,U2 (Sync. Vdiff)	RSYN2.DifVClc.mag.f	Measured value	Absolute value
		RSYN2.DifVClc.units.SIUnit	29	V (Volt)
		RSYN2.DifVClc.units.multiplier	3	Kilo

RSYN2.DifHzClc

No.	Information	Value		
170.0076	Sync. frequency difference f1, f2 (Sync. fdiff)	RSYN2. DifHzClc.mag.f	Measured value	Absolute value
		RSYN2. DifHzClc.units.SIUnit	33	Hz
		RSYN2. DifHzClc.units.multiplier	0	1

RSYN2.DifAngClc

No.	Information	Value		
170.0073	Sync. angle between U1,U2 (Sync. α)	RSYN2. DifAngClc.mag.f	Measured value	Absolute value
		RSYN2. DifAngClc.units.SIUnit	9	° (Degree)
		RSYN2. DifAngClc.units.multiplier	0	1

RSYN3.DifVClc

No.	Information	Value		
170.0072	Sync. voltage difference U1,U2 (Sync. Vdiff)	RSYN3.DifVClc.mag.f	Measured value	Absolute value
		RSYN3.DifVClc.units.SIUnit	29	V (Volt)
		RSYN3.DifVClc.units.multiplier	3	Kilo

RSYN3.DifHzClc

No.	Information	Value		
170.0076	Sync. frequency difference f1, f2 (Sync. fdiff)	RSYN3. DifHzClc.mag.f	Measured value	Absolute value
		RSYN3. DifHzClc.units.SIUnit	33	Hz
		RSYN3. DifHzClc.units.multiplier	0	1

RSYN3.DifAngClc

No.	Information	Value		
170.0073	Sync. angle between U1,U2 (Sync. α)	RSYN3. DifAngClc.mag.f	Measured value	Absolute value
		RSYN3. DifAngClc.units.SIUnit	9	° (Degree)
		RSYN3.DifAngClc.units.multiplier	0	1

RSYN4.DifVClc

No.	Information	Value		
170.0072	Sync. voltage difference U1,U2 (Sync. Vdiff)	RSYN4.DifVClc.mag.f	Measured value	Absolute value
		RSYN4.DifVClc.units.SIUnit	29	V (Volt)
		RSYN4.DifVClc.units.multiplier	3	Kilo

RSYN4.DifHzClc

No.	Information	Value		
170.0076	Sync. frequency difference f1, f2 (Sync. fdiff)	RSYN4. DifHzClc.mag.f	Measured value	Absolute value
		RSYN4. DifHzClc.units.SIUnit	33	Hz
		RSYN4. DifHzClc.units.multiplier	0	1

RSYN4.DifAngClc

No.	Information	Value		
170.0073	Sync. angle between U1,U2 (Sync. α)	RSYN4. DifAngClc.mag.f	Measured value	Absolute value
		RSYN4. DifAngClc.units.SIUnit	9	° (Degree)
		RSYN4.DifAngClc.units.multiplier	0	1

RSYN5.DifVClc

No.	Information	Value		
170.0072	Sync. voltage difference U1,U2 (Sync. Vdiff)	RSYN5.DifVClc.mag.f	Measured value	Absolute value
		RSYN5.DifVClc.units.SIUnit	29	V (Volt)
		RSYN5.DifVClc.units.multiplier	3	Kilo

RSYN5.DifHzClc

No.	Information	Value		
170.0076	Sync. frequency difference f1, f2 (Sync. fdiff)	RSYN5. DifHzClc.mag.f	Measured value	Absolute value
		RSYN5. DifHzClc.units.SIUnit	33	Hz
		RSYN5. DifHzClc.units.multiplier	0	1

RSYN5.DifAngClc

No.	Information	Value		
170.0073	Sync. angle between U1,U2 (Sync. α)	RSYN5. DifAngClc.mag.f	Measured value	Absolute value
		RSYN5. DifAngClc.units.SIUnit	9	° (Degree)
		RSYN5.DifAngClc.units.multiplier	0	1

RSYN6.Mod

No.	Information		
170.0051	Sync. blocked (Sync. block)	1	0
RSYN6.Mod.stVal		2	1

device annunciation: 1 - ON
0 - OFF

IEC Status Mod.stVal: 1 - ON
2 - BLOCKED
3 - TEST
4 - TEST/BLOCKED
5 - OFF

RSYN6.Health

No.	Information				
51	Device is Operational and Protecting (Device OK)	0	0	1	1
170.0050	Synchronization Error (Sync. Error)	0	1	0	1
RSYN6.Health.stVal		3	3	1	2

device annunciation: 1 - ON
0 - OFF

IEC Status Health.stVal: 1 - OK
2 - WARNING
3 - ALARM

RSYN6.Rel

No.	Information		
170.0049	Sync. Release of CLOSE Command (Sync. CloseRel)	0	1
RSYN6.Rel.stVal		0	1

device annunciation: 1 - ON
0 - OFF

IEC Status Rel.stVal: 0 - FALSE
1 - TRUE

3.5 Synchronism and voltage check (RSYNx)

RSYN6.VInd

No.	Information		
170.0057	Sync. Voltage difference exceeded (Sync. Vdiff>)	0	1
RSYN6.VInd.stVal		0	1

device annunciation: 1 - ON IEC Status VInd.stVal: 0 - FALSE
0 - OFF 1 - TRUE

RSYN6.AngInd

No.	Information		
170.0059	Sync.angle difference exceeded (Sync. α diff>)	0	1
RSYN6.AngInd.stVal		0	1

device annunciation: 1 - ON IEC Status AngInd.stVal: 0 - FALSE
0 - OFF 1 - TRUE

RSYN6.HzInd

No.	Information		
170.0058	Sync. frequency difference exceeded (Sync. fdiff>)	0	1
RSYN6.HzInd.stVal		0	1

device annunciation: 1 - ON IEC Status HzInd.stVal: 0 - FALSE
0 - OFF 1 - TRUE

RSYN6.DifVClc

No.	Information	Value		
170.0072	Sync. voltage difference U1,U2 (Sync. Vdiff)	RSYN6.DifVClc.mag.f	Measured value	Absolute value
		RSYN6.DifVClc.units.SIUnit	29	V (Volt)
		RSYN6.DifVClc.units.multiplier	3	Kilo

RSYN6.DifHzClc

No.	Information	Value		
170.0076	Sync. frequency difference f1, f2 (Sync. fdiff)	RSYN6. DifHzClc.mag.f	Measured value	Absolute value
		RSYN6. DifHzClc.units.SIUnit	33	Hz
		RSYN6. DifHzClc.units.multiplier	0	1

RSYN6.DifAngClc

No.	Information	Value		
170.0073	Sync. angle between U1,U2 (Sync. α)	RSYN6. DifAngClc.mag.f	Measured value	Absolute value
		RSYN6. DifAngClc.units.SIUnit	9	° (Degree)
		RSYN6.DifAngClc.units.multiplier	0	1

RSYN7.DifVClc

No.	Information	Value		
170.0072	Sync. voltage difference U1,U2 (Sync. Vdiff)	RSYN7.DifVClc.mag.f	Measured value	Absolute value
		RSYN7.DifVClc.units.SIUnit	29	V (Volt)
		RSYN7.DifVClc.units.multiplier	3	Kilo

RSYN7.DifHzClc

No.	Information	Value		
170.0076	Sync. frequency difference f1, f2 (Sync. fdiff)	RSYN7. DifHzClc.mag.f	Measured value	Absolute value
		RSYN7. DifHzClc.units.SIUnit	33	Hz
		RSYN7. DifHzClc.units.multiplier	0	1

RSYN7.DifAngClc

No.	Information	Value		
170.0073	Sync. angle between U1,U2 (Sync. α)	RSYN7. DifAngClc.mag.f	Measured value	Absolute value
		RSYN7. DifAngClc.units.SIUnit	9	° (Degree)
		RSYN7.DifAngClc.units.multiplier	0	1

RSYN8.DifVClc

No.	Information	Value		
170.0072	Sync. voltage difference U1,U2 (Sync. Vdiff)	RSYN8.DifVClc.mag.f	Measured value	Absolute value
		RSYN8.DifVClc.units.SIUnit	29	V (Volt)
		RSYN8.DifVClc.units.multiplier	3	Kilo

RSYN8.DifHzClc

No.	Information	Value		
170.0076	Sync. frequency difference f1, f2 (Sync. fdiff)	RSYN8. DifHzClc.mag.f	Measured value	Absolute value
		RSYN8. DifHzClc.units.SIUnit	33	Hz
		RSYN8. DifHzClc.units.multiplier	0	1

RSYN8.DifAngClc

No.	Information	Value		
170.0073	Sync. angle between U1,U2 (Sync. α)	RSYN8. DifAngClc.mag.f	Measured value	Absolute value
		RSYN8. DifAngClc.units.SIUnit	9	° (Degree)
		RSYN8. DifAngClc.units.multiplier	0	1

3.6 Circuit breaker failure protection (RBRF1)

RBRF1.Mod

No.	Information		
1451	Breaker failure is switched OFF (BkrFail OFF)	0	1
RBRF1.Mod.stVal		1	5

device annunciation: 1 - ON
0 - OFF

IEC Status Mod.stVal: 1 - ON
2 - BLOCKED
3 - TEST
4 - TEST/BLOCKED
5 - OFF

RBRF1.Health

No.	Information		
51	Device is Operational and Protecting (Device OK)	0	1
RBRF1.Health.stVal		3	1

device annunciation: 1 - ON
0 - OFF

IEC Status Health.stVal: 1 - OK
2 - WARNING
3 - ALARM

RBRF1.Str

No.	Information		
1461	Breaker failure protection started (BF Start)	0	1
RBRF1.Str.general		0	1

device annunciation: 1 - ON
0 - OFF

IEC Status Str.general: 0 - FALSE
1 - TRUE

RBRF1.OpEx

No.	Information		
1494	BF Trip T2 (busbar trip) (BF T2-TRIP(bus))	0	1
RBRF1.OpEx.general		0	1

device annunciation: 1 - ON IEC Status OpEx.general: 0 - FALSE
0 - OFF 1 - TRUE

RBRF1.OpIn

No.	Information					
1472	BF Trip T1 (local trip) - only phase L1 (BF T1-TRIP 1pL1)	0	1	x	x	x
1473	BF Trip T1 (local trip) - only phase L2 (BF T1-TRIP 1pL2)	0	x	1	x	x
1474	BF Trip T1 (local trip) - only phase L3 (BF T1-TRIP 1pL3)	0	x	x	1	x
1476	BF Trip T1 (local trip) - 3pole (BF T1-TRIP L123)	0	x	x	x	1
RBRF1.OpIn.general		0	1	1	1	1

device annunciation: 1 - ON IEC Status OpIn.general: 0 - FALSE
0 - OFF 1 - TRUE
x - irrelevant

3.7 Automatic reclosure function (RREC1)

RREC1.Mod

No.	Information				
2782	AR: Auto-reclose is switched on (AR on)	0	x	1	1
2784	AR: Auto-reclose is not ready (AR not ready)	x	x	0	1
2781	AR: Auto-reclose is switched off (AR off)	x	1	0	0
RREC1.Mod.stVal		5	5	1	2

device annunciation: 1 - ON
0 - OFF
x - irrelevant

IEC Status Mod.stVal: 1 - ON
2 - BLOCKED
3 - TEST
4 - TEST/BLOCKED
5 - OFF

RREC1.Health

No.	Information		
51	Device is Operational and Protecting (Device OK)	0	1
RREC1.Health.stVal		3	1

device annunciation: 1 - ON
0 - OFF

IEC Status Health.stVal: 1 - OK
2 - WARNING
3 - ALARM

3.8 Single-pole / Three-pole tripping

3.8.1 Three-pole tripping (XCBR1)

XCBR1.Mod

No.	Information		
52	At Least 1 Protection Funct. is Active (ProtActive)	1	0
XCBR1.Mod.stVal		1	5

device annunciation: 1 - ON
0 - OFF

IEC Status Mod.stVal: 1 - ON
2 - BLOCKED
3 - TEST
4 - TEST/BLOCKED
5 - OFF

XCBR1.Health

No.	Information		
51	Device is Operational and Protecting (Device OK)	0	1
XCBR1.Health.stVal		3	1

device annunciation: 1 - ON
0 - OFF

IEC Status Health.stVal: 1 - OK
2 - WARNING
3 - ALARM

XCBR1.Loc

No.	Information		
55	Reset Device (Reset Device)	1	0
XCBR1.Loc.stVal		1	0

device annunciation: 1 - ON
0 - OFF

IEC Status Loc.stVal: 0 - FALSE
1 - TRUE

XCBR1.OpCnt

No.	Information	Value		
		XCBR1.OpCnt.stVal	Metered value	Absolute value
1000	Number of breaker TRIP commands (# TRIPs=)			

XCBR1.Pos

No.	Information				
379	>CB aux. contact 3pole Closed (>CB 3p Closed)	1	1	0	0
380	>CB aux. contact 3pole Open (>CB 3p Open)	1	0	1	0
XCBR1.Pos.stVal		4	3	2	4

device annunciation: 1 - ON IEC Status Pos.stVal: 1 - INTERMEDIATE STATE
0 - OFF 2 - OFF
3 - ON
4 - BAD STATE

XCBR1.BIkOpn

No.	Information		
55	Reset Device (Reset Device)	1	0
XCBR1.BIkOpn.stVal		0	1

device annunciation: 1 - ON IEC Status BIkOpn.stVal: 0 - FALSE
0 - OFF 1 - TRUE

XCBR1.BIkCls

No.	Information		
55	Reset Device (Reset Device)	1	0
XCBR1.BIkCls.stVal		0	1

device annunciation: 1 - ON IEC Status BIkCls.stVal: 0 - FALSE
0 - OFF 1 - TRUE

XCBR1.CBOPCap

No.	Information	
XCBR1.CBOPCap.stVal		1

device annunciation: - IEC Status CBOPCap.stVal: 1 - NONE

3.8.2 Single-pole / Three-pole tripping (XCBR2, XCBR3, XCBR4)

XCBR2.Mod

No.	Information		
52	At Least 1 Protection Funct. is Active (ProtActive)	1	0
XCBR2.Mod.stVal		1	5

device annunciation: 1 - ON
0 - OFF

IEC Status Mod.stVal: 1 - ON
2 - BLOCKED
3 - TEST
4 - TEST/BLOCKED
5 - OFF

XCBR2.Health

No.	Information		
51	Device is Operational and Protecting (Device OK)	0	1
XCBR2.Health.stVal		3	1

device annunciation: 1 - ON
0 - OFF

IEC Status Health.stVal: 1 - OK
2 - WARNING
3 - ALARM

XCBR2.Loc

No.	Information		
55	Reset Device (Reset Device)	1	0
XCBR2.Loc.stVal		1	0

device annunciation: 1 - ON
0 - OFF

IEC Status Loc.stVal: 0 - FALSE
1 - TRUE

XCBR2.OpCnt

No.	Information	Value		
1001	Number of breaker TRIP commands L1 (TripNo L1=)	XCBR2.OpCnt.stVal	Metered value	Absolute value

XCBR3.Mod

No.	Information		
52	At Least 1 Protection Funct. is Active (ProtActive)	1	0
XCBR3.Mod.stVal		1	5

device annunciation: 1 - ON
0 - OFF

IEC Status Mod.stVal: 1 - ON
2 - BLOCKED
3 - TEST
4 - TEST/BLOCKED
5 - OFF

XCBR3.Health

No.	Information		
51	Device is Operational and Protecting (Device OK)	0	1
XCBR3.Health.stVal		3	1

device annunciation: 1 - ON
0 - OFF

IEC Status Health.stVal: 1 - OK
2 - WARNING
3 - ALARM

XCBR3.Loc

No.	Information		
55	Reset Device (Reset Device)	1	0
XCBR3.Loc.stVal		1	0

device annunciation: 1 - ON
0 - OFF

IEC Status Loc.stVal: 0 - FALSE
1 - TRUE

XCBR3.OpCnt

No.	Information	Value		
1002	Number of breaker TRIP commands L2 (TripNo L2=)	XCBR3.OpCnt.stVal	Metered value	Absolute value

Literature

- /1/ SIPROTEC 4 Ethernet Module EN 100 IEC 61850 Electrical Interface 100 MBit, Manual
C54000-G1100-C167-1
- /2/ SIPROTEC 4 System Description
E50417-H1176-C151
- /3/ SIPROTEC DIGSI, StartUP
E50417-G1100-C152
- /4/ DIGSI CFC, Manual
E50417-H1176-C098
- /5/ SIPROTEC SIGRA 4, Manual
E50417-H1100-C1100-C070
- /6/ SIPROTEC High Voltage Bay Control Unit 6MD66, Manual
C53000-G1800-C102-6

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