ENERDIS
CHAUVIN ARNOUX GROUP

ELINK 61850

Mesurer pour mieux Agir

You have just purchased an **ELINK 61850**. Thank you for your choice. To get the best from your device:

- **Read** this user's manual before installing and using the device.
- **Follow** the precautions for use stated in this document.

Symbol	***Meaning***
	HAZARD WARNING! The operator must consult this manual whenever this danger symbol is encountered.
	Device fully protected by double insulation or reinforced insulation.
	This symbol indicates compliance with European directives, including LVD and EMC.
	This symbol means that in the European Union, the product is subject to separate collection in accordance with WEEE 2002/96/EC: this material should not be treated as household waste.
	Information

- Make sure the device is intact and undamaged upon receipt. In the event of any problems, please contact the after-sales department for any repairs or replacements.
- The device described in this manual is intended to be used by trained staff only.
- Any maintenance operations must be carried out by qualified and authorized personnel only.
- For correct and safe use and for all maintenance operations, it is essential that staff follow standard safety procedures.
- This device is intended to be used in Category III installation and pollution degree 2 conditions in accordance with standard IEC 61010-1.
- This device is intended for indoor use.
- Before installation, check that the supply voltage matches that of the mains supply network.

1. SAFETY PRECAUTIONS

Safety precautions

Before any intervention, check that the device is unplugged from all power sources.

Precautions against electrical noise

Although the ELINK 61850 is protected from electrical and electromagnetically induced interference, keep away from the immediate vicinity of equipment generating significant electrical noise (high-power switches, busbars, etc.). The quality of data communication on the data bus depends heavily on taking such precautions.

Precautions in the event of downgraded operation

When safe operation is no longer possible, the instrument must be switched off and isolated. This applies when:

- the device is visibly damaged during operation (whether the device still operates or not),
- the device does not work after prolonged storage in poor conditions,
- the device no longer works following severe damage during transport.

Cleaning instructions

When the device is disconnected from the mains, clean the outer surface using only a dry cloth. Do not use abrasives or solvents. Prevent the connector terminals getting wet.

CONTENTS

2. PHYSICAL DESCRIPTION

2.1 OVERVIEW

2.1.1 UNPACKING

Designation	*Quantity*
Product	1
Getting Started Guide	1

2.1.2 OPTIONAL ACCESSORIES

Designation	*Comment*	*Code*
Mounting kit for electrical panel	For fitting to the backplane of an electrical cabinet	ACCT1007

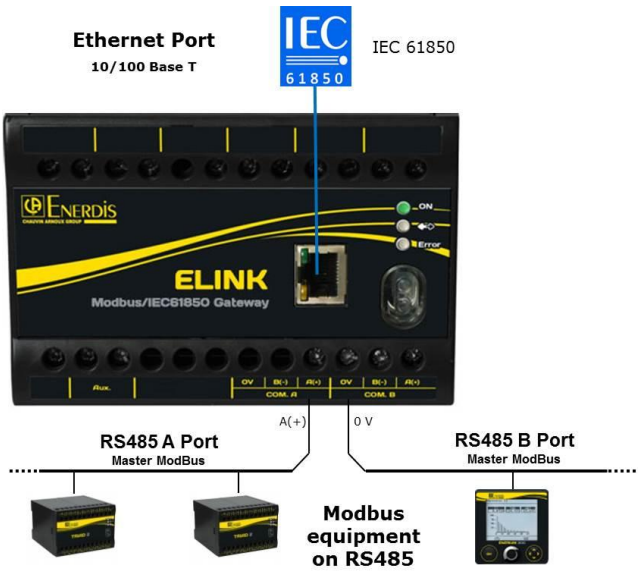
2.1.3 INTRODUCTION

ELINK 61850 is a gateway for transmitting information according to the IEC618550 protocol, collected in Modbus slave measuring instruments via 2 RS485 fieldbuses.

ELINK 61850 features embedded web pages for configuring the product.

- **1 Ethernet communications port for several uses**:
  - server mode with the IEC61850 protocol: communication with a IEC61850 client;
  - web server: embedded web pages for configuration and consultation;
  - Ethernet network: for connection to an Ethernet link.
- **2 RS485 master digital communication ports**:
  - Modbus RTU master mode : Real-time reading of values from devices communicating with Modbus RTU protocol.
- **1 optical communications interface**:
  - connectivity reserved for manufacturer maintenance.

ELINK 61850, connected to the Ethernet network, can communicate with any IEC 61850 client supervisor on the bus station (IEC 61850-8-1) in a station environment:

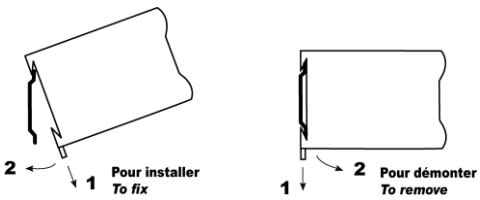


A large number of ELINK 61850s can be connected to the same network, for which they must be programmed with different IP addresses compatible on the same network.

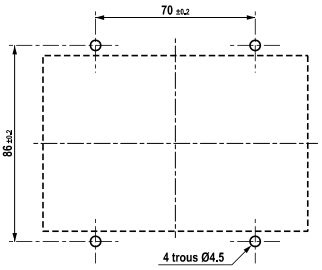
2.1.4 FASTENING

ELINK 61850 is mounted on a DIN 35 mm rail, either in standard form or with screws thanks to the optional plate mounting kit (ACCT1007). The normal operating position of ELINK 61850 is the horizontal position.

Assembly on DIN rail



Drilling diagram for fastening with screws



ELINK 61850 dimensions: 120.5 x 120 x 81 mm (D x W x H)

2.2 CONNECTION

PRELIMINARY REMARKS

Maximum applicable values

⚠	It should be noted that exceeding the maximum applicable values can cause permanent damage to the device.

Cables and terminal blocks

ℹ	Connections are made on fixed-screw terminal blocks for cables of a maximum section of 6mm² (multistrand) or 4 mm² (single-strand) for all circuits.

2.2.1 FRONT PANEL

The front panel of the ELINK 61850 is as follows:

No.	*Function*
1.	Status LED
2.	Ethernet Port (C)
3.	Optical interface port
4.	RS485 Ports (A & B)
5.	Auxiliary power supply

2.2.2 POWER SUPPLY FOR THE ELINK 61850

2.2.2.1 Connection

The power supply circuit must be protected by fuses or a thermal magnetic circuit breaker placed close to the device.

ELINK 61850's power supply is connected to the ports marked as Aux.

2.2.2.2 Characteristics

Source	*Characteristics*
AC	80 Vac to 265 Vac. Frequency in the range of 42.5 Hz and 69 Hz on AC.
DC	80 Vdc to 265 Vdc. Polarity-insensitive
Consumption	< 10 VA – 5 W
Non-removable terminals	2 connection points. Screw terminals, with mobile cage. **Connection of rigid or flexible wires of 4 to 6 mm^2.** Maximum permitted torque on the terminal: 0.4 Nm.

2.2.3 STATUS INDICATORS

Three status indicators (LEDs) provide information on the functioning of the ELINK 61850.

ON	Unlit	Product off
	Steady green light	Product on
	Unlit	No communication
	Flashing green light	Communication on RS485 or optical ports in progress
ERROR	Unlit	No error
	Steady red light	Product error

2.2.4 THE ETHERNET PORT (PORT C)

Item	*Characteristics*
Protocol	**HTTP in slave mode**
Speed	10/100 Base T
Default address	192.168.0.2
Default mask	255.255.0.0
Maximum length	Transmission up to 100 m max.
Connection	8-pin RJ45 plug.

Ethernet connector LEDs

LED 1		*LED 2*	
Colour	*Meaning*	*Colour*	*Meaning*
Unlit	No connection.	Unlit	No activity.
Amber	Connection at 10 Mb per second.	Amber	Half duplex.
Green	Connection at 100 Mb per second.	Green	Full duplex.

2.2.5 THE RS485 PORTS (PORTS A AND B)

2.2.5.1 Preamble

The ELINK 61850 is equipped with two RS485 (RS485 A and RS485 B) digital inputs using Modbus/Jbus protocol which operate in master mode. This enables the ELINK 61850 to communicate with ENERIUM and TRIAD2 measurement devices connected to Modbus networks.

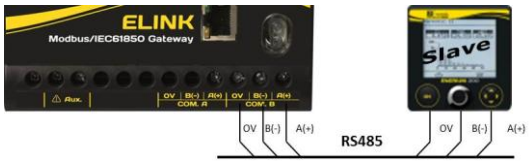
2.2.5.2 Layout

The RS485 communications ports are marked as COM A and COM B on the front panel.

The ELINK 61850 runs in master mode for these two ports RS485 A and B.

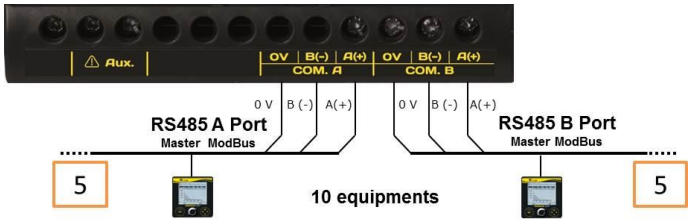
2.2.5.3 Connection principle

Only tests on the real network can confirm the best combination (speed, network length, impedance matching, number of slave products, etc.). The refresh performance of the ELINK 61850 according to the network configuration can be accessed from the web pages.

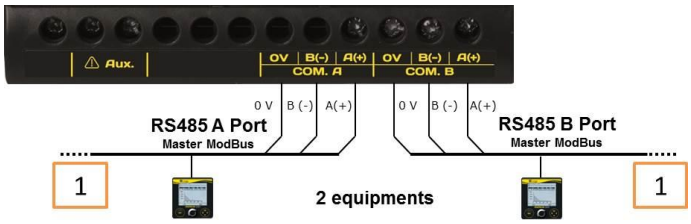


Typical configurations in terms of the number of measuring instruments associated with an Elink 61850 are shown below:

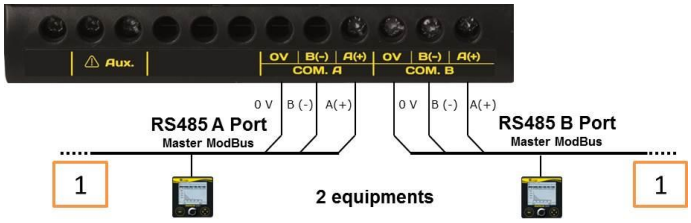
20 Triad2: 31 values @ 1s



10 Enerium light: 41 values @ 1s



2 Enerium intermediate: 216 values @ 1s



2 Enerium full: 612 values @ 1s

The various profiles above correspond to a provision of the following electrical quantities:

Quantity (*)			***Enerium***			***Triad2***
			"Full" version	***"Inter" version***	***"Light" version***	
V, U per phase / Vearth	inst. / min / max / avg	MMXU MMXN	Inst / avg	X	Inst	Inst
I per phase	Inst. / min / max / avg		Inst / avg	X	Inst	Inst
I neutral	Inst. / min / max / avg		Inst / avg	X	inst	inst
P, Q, S per phase and total	Inst. / min / max / avg		Inst / avg	X	inst	inst
F	Inst. / min / max / avg		Inst / avg	X	inst	inst
FP per phase and total	Inst. / avg		Inst / avg	X	inst	inst
Cos phi per phase and total	Inst. / min / max / avg		Inst / avg	X	inst	inst
Tan phi	Inst. / min / max / avg		Inst / avg	X	inst	inst
Phi, phase shift between U	Inst. / avg		Inst / avg	X	inst	inst
Ea, Eq, Es 4 quadrants	Inst.	MMTR	Inst	X	X	-
THDV, THDU, THDI	Inst.	MHAI MHAN	Inst	-	-	-
THDIn	Inst. / max / avg		Inst / avg	-	-	-
Harmonics V, U, I	Inst.		Inst	-	-	-

2.2.5.4 Technical reminders and precautions for the 2-wire RS485 network

Type of cable to use:

Screened twisted-pair cable with a section of more than 0.2 mm^2 (UL2493 or UL2919 type with multiple screening for very noisy areas). The continuity of screening along the communications network must be ensured, and the screening must be connected to the 0 V of the RS485 output on a single equipment of the RS485 MODBUS/JBUS network, generally at the start or end of line.

Installation of the RS485 cable:

The multi-pair cable must not be severed. Make a cut in the protective sheath and remove a pair (the continuity of screening along the communications network is therefore ensured). If the cable has to be cut, re-establish the continuity of screening by connecting the screening of the two ends of both cables.

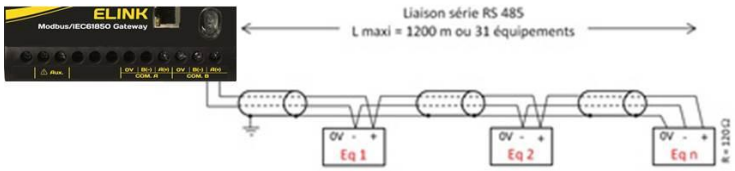
RS485 network structure:

If the routing of the RS485 network forces the network to be split into two or more distinct branches, the route node must be equipped with an RS485 line amplifier or an nxRS485 line repeater HUB.

The maximum characteristics of an RS485 network are:

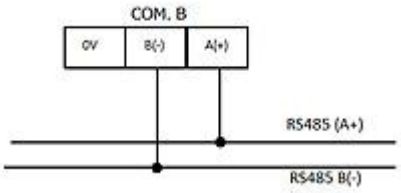
- maximum length: 1.2 km,
- Maximum 31 pieces of equipment connected to an RS485 segment.

The RS485 network can be extended to more than 1.2 km and 31 pieces of equipment through the use of Modbus RS485 hubs / amplifiers.



2.2.5.5 Connection in a clean environment

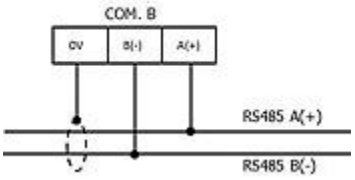
For a RS485 network in a clean electrical environment, use a twisted-pair cable. This cable should be connected to terminals A(+) and B(-). The convention adopted for terminals A and B corresponds to EIA 485, specifying logic level "1" on the line corresponds to VB > VA and a logic level "0" corresponds to VA > VB.



2.2.5.6 Connection in a noisy environment

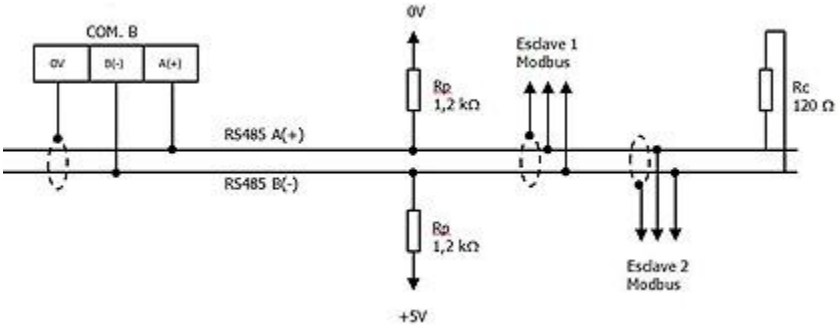
- With screening

In the case of particularly noisy electrical environment, a screened twisted pair should be used, and the screening should be connected to the 0 V terminal of the ELINK 61850.



- With screening and resistors (bias and load)

To improve the quality of transmission in noisy environments, it is possible to bias the line at a single point. This bias sets the idle level in the absence of transmission by two 1.2 kΩ resistors between the 0 V and 5 V lines. It is sometimes necessary to



adapt the line by connecting a 120 Ωresistor across the two ends of the bus.

2.2.5.7 RS485 port characteristics

Item	*Characteristics*
Protocol	Modbus RTU.
Operating mode	Half duplex Master mode
Speed	2,400, 4,800, 9,600, 19,200 and 115,200 Bauds.
Parity	no, even or odd.
Number of stop bits	1 or 2
Connection	Screened 2-wire, half duplex
Non-removable terminals	3 connection points. Screw terminals. Connection of rigid or flexible wires of 4 to 6 mm^2 Maximum permitted torque on the terminal: 0.4 Nm.

- Communication is in half duplex mode. The functions implemented are:
  - Function 03: read N words
  - Function 04: read N words
  - Function 16: write N words (depending on model)

2.2.6 OPTICAL INTERFACE PORT

This optical interface is exclusively reserved for manufacturer maintenance.

3. EMBEDDED WEB PAGES

3.1 QUICK PRESENTATION

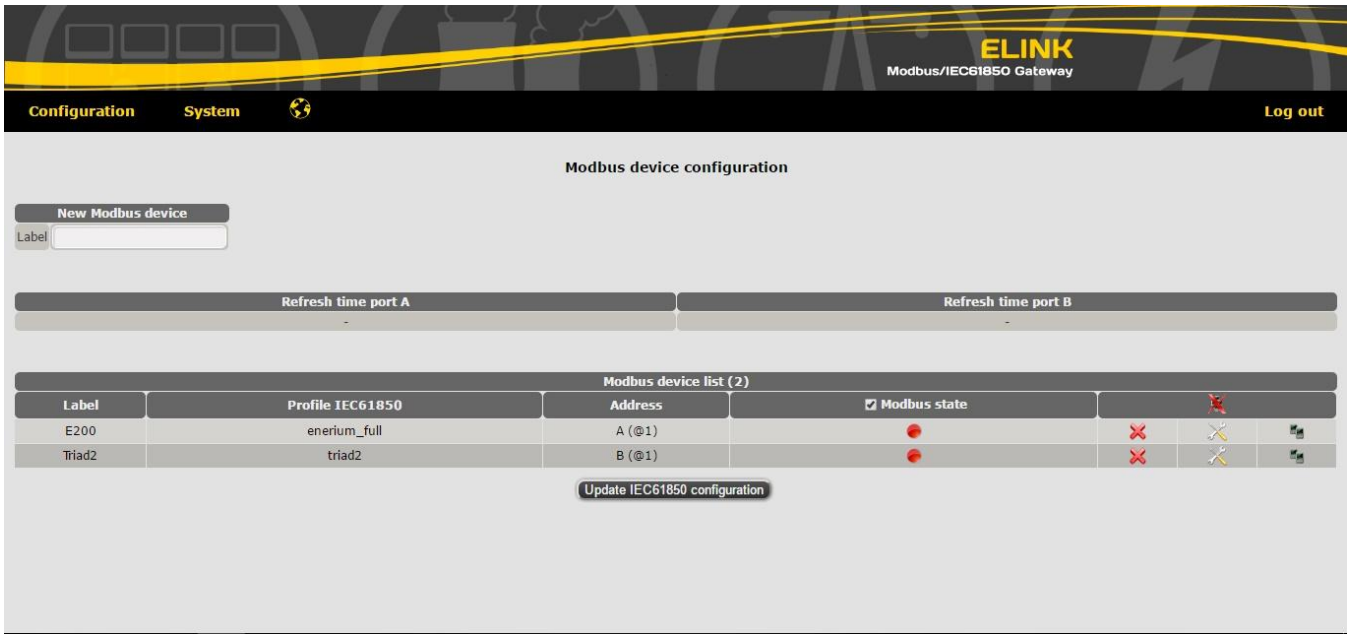
3.1.1 PREREQUISITES

Communication ports revision 1.0:

Protocol	*Port*	*Mode*	*Stream*	*ELINK 61850 service*
http	8080, 80	input	TCP/IP	Access to embedded web pages
https	443	input	TCP/IP	Access to embedded web pages
NTP	123	output	UDP/IP	Synchronize date and time on NTP server
Modbus RS485 port A or port B	3002			Query to Modbus RS485 devices

3.1.2 WEB PAGE LAYOUT

The general web interface of the ELINK 61850 appears as follows:



Use the menu bar to browse the ELINK 61850. You can access all the functionalities of your ELINK 61850 through its web pages.

The globe icon allow you to select the language in which the menus are displayed.

3.2 CONNECTION TO AN ELINK 61850

3.2.1 PREREQUISITES

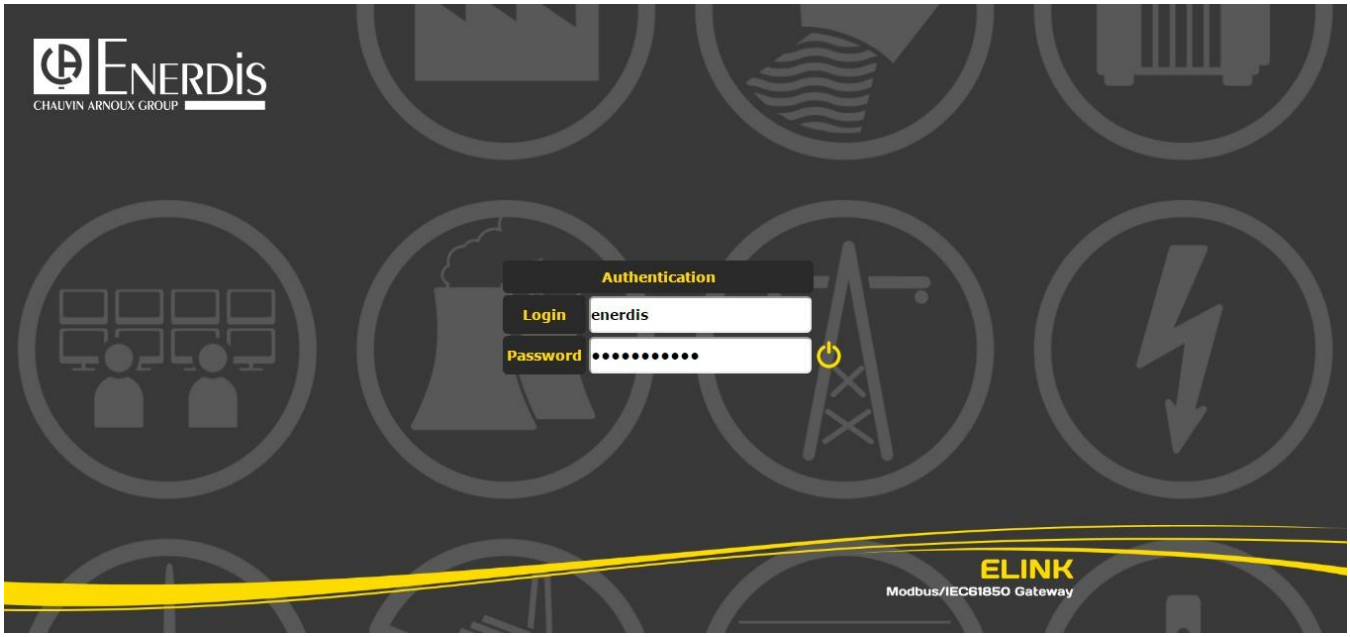
- You have an internet browser and access to the network that the ELINK 61850 is connected to.

3.2.2 PROCEDURE

The default IP address of your ELINK 61850 is 192.168.0.2 (mask: 255.255.0.0).

For connection to the default IP address of your ELINK 61850:

- Configure the network card of your computer to connect to the same subnet as ELINK 61850 (for example, configure IP address 192.168.0.3 / 255.255.0.0).
- Open your internet browser and enter the following HTTP address in the URL bar: http://192.168.0.2
- Enter Login: "enerdis" (default login).
- Enter the password: "!elink2017!" (default password).
- Click on the icon to validate.



3.3 LOG OUT FROM AN ELINK 61850

3.3.1 PREREQUISITES

- You are connected to one of the pages of an ELINK 61850 (apart from the authentication page).

3.3.2 PROCEDURE

- Click on "Log out" to return to the authentication page.
- Close your internet browser.

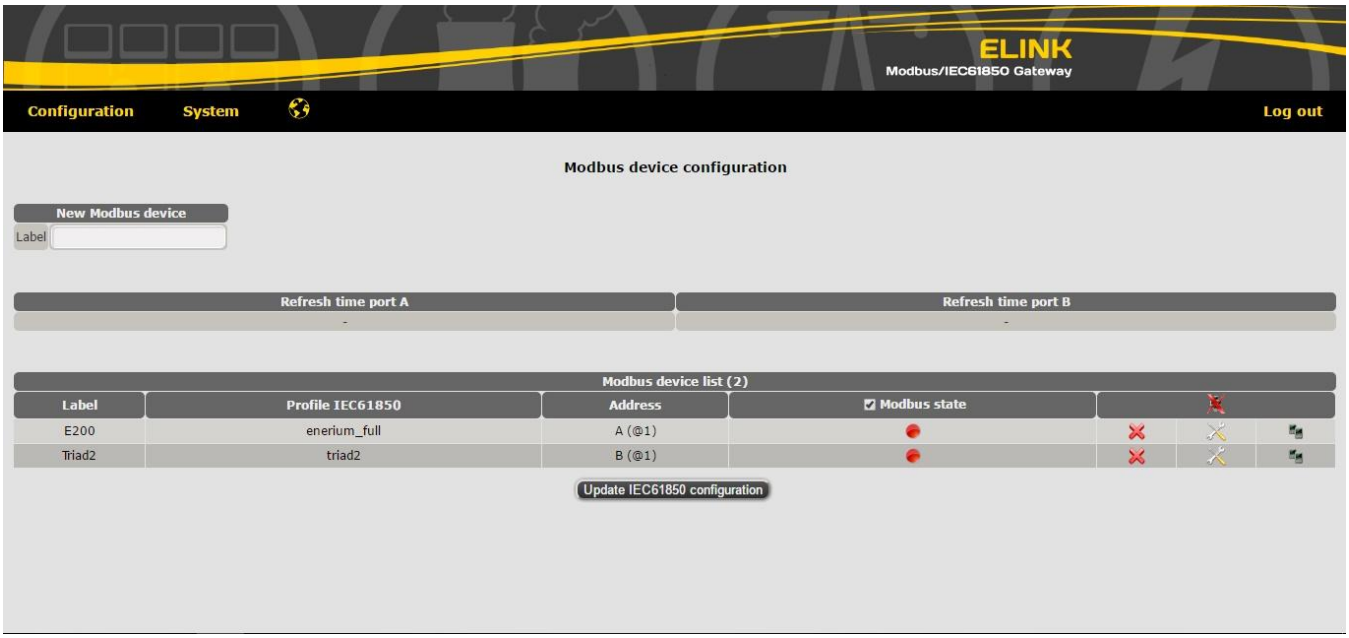
3.4 ADD A MODBUS MEASUREMENT DEVICE

3.4.1 PREREQUISITES

- ELINK 61850 is accessible and you are logged into the embedded web pages.
- The IEC61850 profile exists for the measurement device.

3.4.2 PROCEDURE

- Go to "Configuration > Modbus Products".
- The following window is displayed:



- Click on the "New Modbus product" field.
- Fill in:
  - a "Label" for your product;
  - its "IEC61850" profile;
  - the communication port (A or B) onto which the measurement device has been physically connected;
  - the modbus address on the RS485 bus where the device has been physically connected.
- Click on "Add".
- The product is added to the list of products connected to ELINK 61850.

Note 1

When all the products in the configuration have been added, click "Update IEC61850 configuration" to apply the changes.

Note 2

The correct connection between the ELINK 61850 and these slaves can be checked in the "Modbus state" column.

Red light = Failed to communicate with product

Green light = Communication with product enabled

Note 3

Data refresh performance is available for each bus. Performance varies according to the number of devices per bus and their profiles, as well as the speed of the communication link.

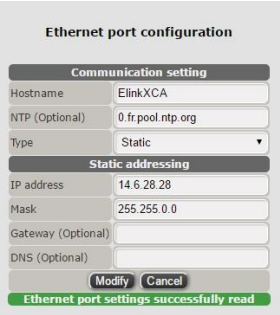
3.5 CONFIGURATION OF THE ETHERNET PORT

3.5.1 PREREQUISITES

- Your computer is connected to your ELINK 61850 and you have logged in.

3.5.2 PROCEDURE

- Click on "Configurations > Ethernet port".
- You have to fill in:
  - The host name of your ELINK 61850 on the network.
  - The length of the Timeout: (by default 500 ms).
  - The type of assignment of the IP address of your ELINK 61850.
    - Select "Static" if you want to configure the IP address and network mask of your ELINK 61850. Warning, if you change your subnet, ELINK 61850 will no longer be visible from your computer and you will need to reconfigure your own network settings. (Recommended).
    - Select "DHCP" (Dynamic Host Configuration Protocol) if your ELINK 61850 is connected to a network with a DHCP server. An address IP is then automatically assigned to your ELINK 61850 by the DHCP server of the network. Connect to the ELINK 61850 via its host name.
  - The new IP address.
  - The value of the subnet mask.
- Fill in the optional fields:
  - DNS: must be configured if you use a domain name as destination address in the settings for an automatic file export task to an FTP server.
  - NTP: must be configured if you wish to synchronize the time on the product with a remote server. Example of ntp server: 0.fr.pool.ntp.org
  - Read Ethernet settings: displays the product's Ethernet settings.



- Click on "Modify" for the new settings to be taken into account. The message "**Ethernet port modified successfully**" confirms that the operation has been successfully completed. Click "Cancel" to exit the section without making any changes.

3.6 IMPORTING PROFILES INTO ELINK 61850

3.6.1 PREREQUISITES

- ELINK 61850 is accessible and you are logged into the embedded web pages.
- You know the location of the configuration file to import.

3.6.2 PROCEDURE

- Go to "Configurations > IEC61850 profile management".
- Two options are available:

Import the Enerdis profiles:

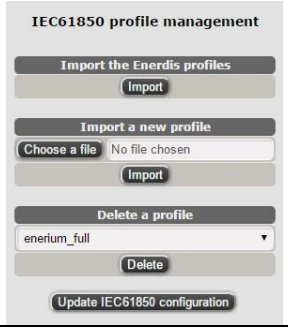
- The complete list for the 4 basic profiles are imported into the equipment.

Import a new profile:

- The new profile is imported into Elink 61850.

Delete a profile:

- The profile selected is deleted in the ELINK61850.



3.7 IMPORT/EXPORT AN ELINK 61850 CONFIGURATION

3.7.1 PREREQUISITES

- Your ELINK 61850 is accessible and you are logged into the embedded web pages.

3.7.2 PROCEDURE

- Go to "Configurations > Import/Export of all the configuration".

Two options are available:

Export of all of the configuration:

- The entire list of modbus products and the associated profiles are saved in a file.

Import of all of the configuration:

- Apply to ELINK 61850 a complete configuration associating modbus products and profiles from a backup file.

The files in question are in ***config.tar.gz*** format.

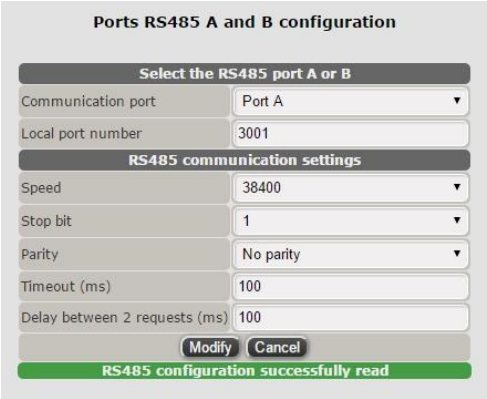
3.8 CONFIGURATION OF PORTS RS485 A AND RS485 B

3.8.1 PREREQUISITES

- ELINK 61850 is accessible and you are logged into the embedded web pages.

3.8.2 PROCEDURE

- Click on "Configurations > Ports RS485 A and B".
- Select the communication port to configure (Port A or Port B).
- In the "RS485 communication settings" section, you must fill in the following fields:
  - Port number (3001 by default on A and 3002 by default on B)
  - Speed (bauds - Default setting: 9600)
  - Stop bits (bits - Default setting: 1)
  - Parity (Default setting: No parity)
  - Timeout: (ms – Default setting: 500)
  - Delay between 2 requests: (ms – Default setting: 50)
- Click on "Modify" to save the settings or "Cancel" to exit the section without making any changes.



3.9 ELINK 61850 FIRMWARE UPDATE

3.9.1 PREREQUISITES

- ELINK 61850 is accessible and you are logged into the embedded web pages.
- You know the location of the firmware version to import.

3.9.2 PROCEDURE

- Click on "System > Firmware".
- Click on "Choose a file" in the "Firmware Update" window, and select the file to import (xxxx.tar.gz type file) in the tree structure of your computer, then click on "Update". A message confirms that the programme update has been successfully completed.

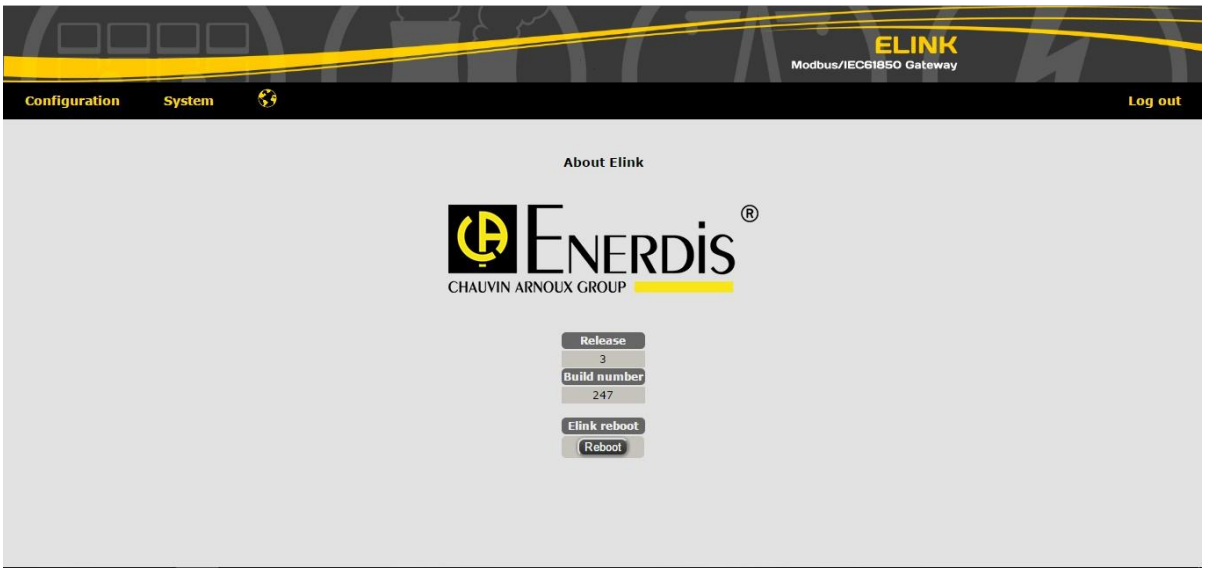
3.10 SYSTEM DATA INFORMATION

3.10.1 PREREQUISITES

- ELINK 61850 is accessible and you are logged into the embedded web pages.

3.10.2 PROCEDURE

- Click on "System > About".
- The window displayed provides information on the "Release" version and "Build number" of your ELINK 61850.



4. IEC61850 MAPPING OF THE TRIAD2 AND ENERIUM VALUES

4.1 MAPPING OF ENERIUM MODBUS VALUES

- The data attributes coloured in orange are not known within the IEC61850 standard ed. 2.0 B.

Modbus Variable	IEC61850 Data Attribute	Modbus Address	Data Format	Modbus Unit	EC61850 Unit	"Full" Profile	"Inter" Profile	"Light" Profile
V1 1s	INSTMMXU1.PNV.phsA.cVal.mag.f	0x500	uint32	$1/100^{e}$ V	V	X	X	X
V2 1s	INSTMMXU1.PNV.phsB.cVal.mag.f	0x502	uint32	$1/100^{e}$ V	V	X	X	X
V3 1s	INSTMMXU1.PNV.phsC.cVal.mag.f	0x504	uint32	$1/100^{e}$ V	V	X	X	X
Vt 1s	INSTMMXU1.PhV.neut.cVal.mag.f	0x506	uint32	$1/100^{e}$ V	V	X	X	X
U12 1s	INSTMMXU1.PPV.phsAB.cVal.mag.f	0x508	uint32	$1/100^{e}$ V	V	X	X	X
U23 1s	INSTMMXU1.PPV.phsBC.cVal.mag.f	0x50a	uint32	$1/100^{e}$ V	V	X	X	X
U31 1s	INSTMMXU1.PPV.phsCA.cVal.mag.f	0x50c	uint32	$1/100^{e}$ V	V	X	X	X
I1 1s	INSTMMXU1.A.phsA.cVal.mag.f	0x50e	uint32	$1/10000^{e}$ A	A	X	X	X
I2 1s	INSTMMXU1.A.phsB.cVal.mag.f	0x510	uint32	$1/10000^{e}$ A	A	X	X	X
I3 1s	INSTMMXU1.A.phsC.cVal.mag.f	0x512	uint32	$1/10000^{e}$ A	A	X	X	X
In 1s	INSTMMXU1.A.neut.cVal.mag.f	0x514	uint32	$1/10000^{e}$ A	A	X	X	X
P1 1s	INSTMMXU1.W.phsA.cVal.mag.f	0x516	int32	W	kW	X	X	X
P2 1s	INSTMMXU1.W.phsB.cVal.mag.f	0x518	int32	W	kW	X	X	X
P3 1s	INSTMMXU1.W.phsC.cVal.mag.f	0x51a	int32	W	kW	X	X	X
Pt 1s	INSTMMXU1.TotW.mag.f	0x51c	int32	W	kW	X	X	X
Q1 1s	INSTMMXU1.VAr.phsA.cVal.mag.f	0x51e	int32	VAr	kVAr	X	X	X
Q2 1s	INSTMMXU1.VAr.phsB.cVal.mag.f	0x520	int32	VAr	kVAr	X	X	X
Q3 1s	INSTMMXU1.VAr.phsC.cVal.mag.f	0x522	int32	VAr	kVAr	X	X	X
Qt 1s	INSTMMXU1.TotVAr.mag.f	0x524	int32	VAr	kVAr	X	X	X
S1 1s	INSTMMXU1.VA.phsA.cVal.mag.f	0x526	uint32	VA	kVA	X	X	X

Modbus Variable	IEC61850 Data Attribute	Modbus Address	Data Format	Modbus Unit	EC61850 Unit	"Full" Profile	"Inter" Profile	"Light" Profile
S2 1s	INSTMMXU1.VA.phsB.cVal.mag.f	0x528	uint32	VA	kVA	X	X	X
S3 1s	INSTMMXU1.VA.phsC.cVal.mag.f	0x52a	uint32	VA	kVA	X	X	X
St 1s	INSTMMXU1.TotVA.mag.f	0x52c	uint32	VA	kVA	X	X	X
FP1 1s	INSTMMXU1.PF.phsA.cVal.mag.f	0x52e	int16	$1/10000^{e}$	$1/1^{e}$	X	X	X
FP2 1s	INSTMMXU1.PF.phsB.cVal.mag.f	0x530	int16	$1/10000^{e}$	$1/1^{e}$	X	X	X
FP3 1s	INSTMMXU1.PF.phsC.cVal.mag.f	0x532	int16	$1/10000^{e}$	$1/1^{e}$	X	X	X
FPt 1s	INSTMMXU1.TotPF.mag.f	0x534	int16	$1/10000^{e}$	$1/1^{e}$	X	X	X
Frequency 1s	INSTMMXU1.Hz.mag.f	0x545	uint16	$1/100^{e}$ Hz	Hz	X	X	X
Cos phi 1 1s	INSTMMXU1.CosPhi.phsA.cVal.mag.f	0x536	int16	$1/10000^{e}$	$1/1^{e}$	X	X	X
Cos phi 2 1s	INSTMMXU1.CosPhi.phsB.cVal.mag.f	0x538	int16	$1/10000^{e}$	$1/1^{e}$	X	X	X
Cos phi 3 1s	INSTMMXU1.CosPhi.phsC.cVal.mag.f	0x53a	int16	$1/10000^{e}$	$1/1^{e}$	X	X	X
Cos phi t 1s	INSTMMXU1.TotCosPhi.mag.f	0x53c	int16	$1/10000^{e}$	$1/1^{e}$	X	X	X
Tan phi t 1s	INSTMMXU1.TotTanPhi.mag.f	0x546	int32	$1/10000^{e}$	$1/1^{e}$	X	X	X
THD V1 1s	INSTMHAI1.HRmsPNV.phsA.cVal.mag.f	0x7dd	uint16	$1/100^{e}$ %	%	X		
THD V2 1s	INSTMHAI1.HRmsPNV.phsB.cVal.mag.f	0x7de	uint16	$1/100^{e}$ %	%	X		
THD V3 1s	INSTMHAI1.HRmsPNV.phsC.cVal.mag.f	0x7df	uint16	$1/100^{e}$ %	%	X		
THD U12 1s	INSTMHAI1.HRmsPPV.phsAB.cVal.mag.f	0x7e0	uint16	$1/100^{e}$ %	%	X		
THD U23 1s	INSTMHAI1.HRmsPPV.phsBC.cVal.mag.f	0x7e1	uint16	$1/100^{e}$ %	%	X		
THD U31 1s	INSTMHAI1.HRmsPPV.phsCA.cVal.mag.f	0x7e2	uint16	$1/100^{e}$ %	%	X		
THD I1 1s	INSTMHAI1.HRmsA.phsA.cVal.mag.f	0x7e3	uint16	$1/100^{e}$ %	%	X		
THD I2 1s	INSTMHAI1.HRmsA.phsB.cVal.mag.f	0x7e4	uint16	$1/100^{e}$ %	%	X		
THD I3 1s	INSTMHAI1.HRmsA.phsC.cVal.mag.f	0x7e5	uint16	$1/100^{e}$ %	%	X		
THD In 1s	INSTMHAI1.HRmsA.neut.cVal.mag.f	0x82d	uint16	$1/100^{e}$ %	%	X		
Harmonics V1 1s	INSTMHAI1.HPNV.phsAHar	0x600	51 x uint16	$1/100^{e}$ %	%	X		
Harmonics V2 1s	INSTMHAI1.HPNV.phsBHar	0x633	51 x uint16	$1/100^{e}$ %	%	X		
Harmonics V3 1s	INSTMHAI1.HPNV.phsCHar	0x666	51 x uint16	$1/100^{e}$ %	%	X		

Modbus Variable	IEC61850 Data Attribute	Modbus Address	Data Format	Modbus Unit	EC61850 Unit	"Full" Profile	"Inter" Profile	"Light" Profile
Harmonics U12 1s	INSTMHAI1.HPPV.phsABHar	0x699	51 x uint16	$1/100^{e}$ %	%	X		
Harmonics U23 1s	INSTMHAI1.HPPV.phsBCHar	0x6cc	51 x uint16	$1/100^{e}$ %	%	X		
Harmonics U31 1s	INSTMHAI1.HPPV.phsCAHar	0x6ff	51 x uint16	$1/100^{e}$ %	%	X		
Harmonics I1 1s	INSTMHAI1.HA.phsAHar	0x732	51 x uint16	$1/100^{e}$ %	%	X		
Harmonics I2 1s	INSTMHAI1.HA.phsBHar	0x765	51 x uint16	$1/100^{e}$ %	%	X		
Harmonics I3 1s	INSTMHAI1.HA.phsCHar	0x798	51 x uint16	$1/100^{e}$ %	%	X		
Harmonics In 1s	INSTMHAI1.HA.neutHar	0x7f8	51 x uint16	$1/100^{e}$ %	%	X		
Receiver Active Energy	MMTR1.DmdWh.actVal	0x996	uint32	kWh	kWh	X	X	X
Provider Active Energy	MMTR1.SupWh.actVal	0x998	uint32	kWh	kWh	X	X	X
Reactive Energy quadrant 1	MMTR1.Q1Varh.actVal	0x99a	uint32	kVArh	kVArh	X	X	X
Reactive Energy quadrant 2	MMTR1. Q2Varh.actVal	0x99c	uint32	kVArh	kVArh	X	X	X
Reactive Energy quadrant 3	MMTR1. Q3Varh.actVal	0x99e	uint32	kVArh	kVArh	X	X	X
Reactive Energy quadrant 4	MMTR1. Q4Varh.actVal	0x9a0	uint32	kVArh	kVArh	X	X	X
Receiver Apparent Energy	MMTR1.DmdVAh.actVal	0x9a2	uint32	kVAh	kVAh	X	X	X
Provider Apparent Energy	MMTR1.SupVAh.actVal	0x9a4	uint32	kVAh	kVAh	X	X	X
V1 mean value	AVGMMXU1.PNV.phsA.cVal.mag.f	0x900	uint32	$1/100^{e}$ V	V	X	X	
V2 mean value	AVGMMXU1.PNV.phsB.cVal.mag.f	0x902	uint32	$1/100^{e}$ V	V	X	X	
V3 mean value	AVGMMXU1.PNV.phsC.cVal.mag.f	0x904	uint32	$1/100^{e}$ V	V	X	X	
Vt mean value	AVGMMXU1.PhV.neut.cVal.mag.f	0x906	uint32	$1/100^{e}$ V	V	X	X	
U12 mean value	AVGMMXU1.PPV.phsAB.cVal.mag.f	0x908	uint32	$1/100^{e}$ V	V	X	X	
U23 mean value	AVGMMXU1.PPV.phsBC.cVal.mag.f	0x90a	uint32	$1/100^{e}$ V	V	X	X	
U31 mean value	AVGMMXU1.PPV.phsCA.cVal.mag.f	0x90c	uint32	$1/100^{e}$ V	V	X	X	
I1 mean value	AVGMMXU1.A.phsA.cVal.mag.f	0x90e	uint32	$1/100^{e}$ V	V	X	X	
I2 mean value	AVGMMXU1.A.phsB.cVal.mag.f	0x910	uint32	$1/100^{e}$ V	V	X	X	
I3 mean value	AVGMMXU1.A.phsC.cVal.mag.f	0x912	uint32	$1/100^{e}$ V	V	X	X	
In mean value	AVGMMXU1.A.neut.cVal.mag.f	0x914	uint32	$1/100^{e}$ V	V	X	X	

Modbus Variable	IEC61850 Data Attribute	Modbus Address	Data Format	Modbus Unit	EC61850 Unit	"Full" Profile	"Inter" Profile	"Light" Profile
receiver P1 mean value	DMDAVGMMXU1.W.phsA.cVal.mag.f	0x916	uint32	W	kW	X	X	
receiver P2 mean value	DMDAVGMMXU1.W.phsB.cVal.mag.f	0x91a	uint32	W	kW	X	X	
receiver P3 mean value	DMDAVGMMXU1.W.phsC.cVal.mag.f	0x91e	uint32	W	kW	X	X	
receiver Pt mean value	DMDAVGMMXU1.TotW.mag.f	0x922	uint32	W	kW	X	X	
receiver Q1 mean value	DMDAVGMMXU1.VAr.phsA.cVal.mag.f	0x926	int32	VAr	kVAr	X	X	
receiver Q2 mean value	DMDAVGMMXU1.VAr.phsB.cVal.mag.f	0x92a	int32	VAr	kVAr	X	X	
receiver Q3 mean value	DMDAVGMMXU1.VAr.phsC.cVal.mag.f	0x92e	int32	VAr	kVAr	X	X	
receiver Qt mean value	DMDAVGMMXU1.TotVAr.mag.f	0x932	int32	VAr	kVAr	X	X	
provider P1 mean value	SUPAVGMMXU1.W.phsA.cVal.mag.f	0x918	uint32	W	kW	X	X	
provider P2 mean value	SUPAVGMMXU1.W.phsB.cVal.mag.f	0x91c	uint32	W	kW	X	X	
provider P3 mean value	SUPAVGMMXU1.W.phsC.cVal.mag.f	0x920	uint32	W	kW	X	X	
provider Pt mean value	SUPAVGMMXU1.TotW.mag.f	0x924	uint32	W	kW	X	X	
provider Q1 mean value	SUPAVGMMXU1.VAr.phsA.cVal.mag.f	0x928	int32	VAr	kVAr	X	X	
provider Q2 mean value	SUPAVGMMXU1.VAr.phsB.cVal.mag.f	0x92c	int32	VAr	kVAr	X	X	
provider Q3 mean value	SUPAVGMMXU1.VAr.phsC.cVal.mag.f	0x930	int32	VAr	kVAr	X	X	
provider Qt mean value	SUPAVGMMXU1.TotVAr.mag.f	0x934	int32	VAr	kVAr	X	X	
S1 mean value	AVGMMXU1.VA.phsA.cVal.mag.f	0x936	uint32	VA	kVA	X	X	
S2 mean value	AVGMMXU1.VA.phsB.cVal.mag.f	0x938	uint32	VA	kVA	X	X	
S3 mean value	AVGMMXU1.VA.phsC.cVal.mag.f	0x93a	uint32	VA	kVA	X	X	
St mean value	AVGMMXU1.TotVA.mag.f	0x93c	uint32	VA	kVA	X	X	
Frequency mean value	AVGMMXU1.Hz.mag.f	0x94e	int16	$1/100^{e}$ Hz	Hz	X	X	
receiver FP1 mean value	DMDAVGMMXU1.PF.phsA.cVal.mag.f	0x93e	int16	$1/10000^{e}$	$1/1^{e}$	X	X	
receiver FP2 mean value	DMDAVGMMXU1.PF.phsB.cVal.mag.f	0x943	int16	$1/10000^{e}$	$1/1^{e}$	X	X	
receiver FP3 mean value	DMDAVGMMXU1.PF.phsC.cVal.mag.f	0x947	int16	$1/10000^{e}$	$1/1^{e}$	X	X	
receiver FPt mean value	DMDAVGMMXU1.TotPF.mag.f	0x94b	int16	$1/10000^{e}$	$1/1^{e}$	X	X	
provider FP1 mean value	SUPAVGMMXU1.PF.phsA.cVal.mag.f	0x940	int16	$1/10000^{e}$	$1/1^{e}$	X	X	

Modbus Variable	IEC61850 Data Attribute	Modbus Address	Data Format	Modbus Unit	EC61850 Unit	"Full" Profile	"Inter" Profile	"Light" Profile
provider FP2 mean value	SUPAVGMMXU1.PF.phsB.cVal.mag.f	0x944	int16	$1/10000^{e}$	$1/1^{e}$	X	X	
provider FP3 mean value	SUPAVGMMXU1.PF.phsC.cVal.mag.f	0x948	int16	$1/10000^{e}$	$1/1^{e}$	X	X	
provider FPt mean value	SUPAVGMMXU1.TotPF.mag.f	0x94c	int16	$1/10000^{e}$	$1/1^{e}$	X	X	
receiver Cos phi 1 mean value	DMDAVGMMXU1.CosPhi.phsA.cVal.mag.f	0x95f	int16	$1/10000^{e}$	$1/1^{e}$	X	X	
receiver Cos phi 2 mean value	DMDAVGMMXU1.CosPhi.phsB.cVal.mag.f	0x963	int16	$1/10000^{e}$	$1/1^{e}$	X	X	
receiver Cos phi 3 mean value	DMDAVGMMXU1.CosPhi.phsC.cVal.mag.f	0x967	int16	$1/10000^{e}$	$1/1^{e}$	X	X	
receiver Cos phi t mean value	DMDAVGMMXU1.TotCosPhi.mag.f	0x96b	int16	$1/10000^{e}$	$1/1^{e}$	X	X	
provider Cos phi 1 mean value	SUPAVGMMXU1.CosPhi.phsA.cVal.mag.f	0x961	int16	$1/10000^{e}$	$1/1^{e}$	X	X	
provider Cos phi 2 mean value	SUPAVGMMXU1.CosPhi.phsB.cVal.mag.f	0x965	int16	$1/10000^{e}$	$1/1^{e}$	X	X	
provider Cos phi 3 mean value	SUPAVGMMXU1.CosPhi.phsC.cVal.mag.f	0x969	int16	$1/10000^{e}$	$1/1^{e}$	X	X	
provider Cos phi t mean value	SUPAVGMMXU1.TotCosPhi.mag.f	0x96d	int16	$1/10000^{e}$	$1/1^{e}$	X	X	
receiver Tan phi t	DMDAVGMMXU1.TotTanPhi.mag.f	0x970	int32	$1/10000^{e}$	$1/1^{e}$	X	X	
provider Tan phi t	SUPAVGMMXU1.TotTanPhi.mag.f	0x972	int32	$1/10000^{e}$	$1/1^{e}$	X	X	
THD In mean value	AVGMHAI1.HRmsA. neut.cVal.mag.f	0x974	uint16	$1/100^{e}$ %	%	X	X	
Min V1	MINMMXU1.PNV.phsA.cVal.mag.f	0xae4	uint32	$1/100^{e}$ V	V		X	
Date Min V1	MINMMXU1.PNV.phsA.t	0xae6	int32	Timestamp UNIX	Timestamp 61850		X	
Min V2	MINMMXU1.PNV.phsB.cVal.mag.f	0xae8	uint32	$1/100^{e}$ V	V		X	
Date Min V2	MINMMXU1.PNV.phsB.t	0xaea	int32	Timestamp UNIX	Timestamp 61850		X	
Min V3	MINMMXU1.PNV.phsC.cVal.mag.f	0xaec	uint32	$1/100^{e}$ V	V		X	
Date Min V3	MINMMXU1.PNV.phsC.t	0xaee	int32	Timestamp UNIX	Timestamp 61850		X	
Min Vt	MINMMXU1.PhV.neut.cVal.mag.f	0xaf0	uint32	$1/100^{e}$ V	V		X	
Date Min Vt	MINMMXU1.PhV.neut.t	0xaf2	int32	Timestamp UNIX	Timestamp 61850		X	
Min U12	MINMMXU1.PPV.phsAB.cVal.mag.f	0xaf4	uint32	$1/100^{e}$ V	V		X	
Date Min U12	MINMMXU1.PPV.phsAB.t	0xaf6	int32	Timestamp UNIX	Timestamp 61850		X	
Min U23	MINMMXU1.PPV.phsBC.cVal.mag.f	0xaf8	uint32	$1/100^{e}$ V	V		X	
Date Min U23	MINMMXU1.PPV.phsBC.t	0xafa	int32	Timestamp UNIX	Timestamp 61850		X	

Modbus Variable	IEC61850 Data Attribute	Modbus Address	Data Format	Modbus Unit	EC61850 Unit	"Full" Profile	"Inter" Profile	"Light" Profile
Min U31	MINMMXU1.PPV.phsCA.cVal.mag.f	0xafc	uint32	$1/100^{e}$ V	V		X	
Date Min U31	MINMMXU1.PPV.phsCA.t	0xafe	int32	Timestamp UNIX	Timestamp 61850		X	
Min I1	MINMMXU1.A.phsA.cVal.mag.f	0xb00	uint32	$1/10000^{e}$ A	A		X	
Date Min I1	MINMMXU1.A.phsA.t	0xb02	int32	Timestamp UNIX	Timestamp 61850		X	
Min I2	MINMMXU1.A.phsB.cVal.mag.f	0xb04	uint32	$1/10000^{e}$ A	A		X	
Date Min I2	MINMMXU1.A.phsB.t	0xb06	int32	Timestamp UNIX	Timestamp 61850		X	
Min I3	MINMMXU1.A.phsC.cVal.mag.f	0xb08	uint32	$1/10000^{e}$ A	A		X	
Date Min I3	MINMMXU1.A.phsC.t	0xb0a	int32	Timestamp UNIX	Timestamp 61850		X	
In min	MINMMXU1.A.neut.cVal.mag.f	0xb0c	uint32	$1/10000^{e}$ A	A		X	
Date In min	MINMMXU1.A.neut.t	0xb0e	int32	Timestamp UNIX	Timestamp 61850		X	
receiver min Pt	MINDMDMMXU1.TotW.mag.f	0xb10	uint32	W	kW		X	
date Receiver min Pt	MINDMDMMXU1.TotW.t	0xb12	int32	Timestamp UNIX	Timestamp 61850		X	
provider min Pt	MINSUPMMXU1.TotW.mag.f	0xb14	uint32	W	kW		X	
Date provider min Pt	MINSUPMMXU1.TotW.t	0xb16	int32	Timestamp UNIX	Timestamp 61850		X	
receiver min Qt	MINDMDMMXU1.TotVAr.mag.f	0xb18	int32	VAr	kVAr		X	
Date receiver min Qt	MINDMDMMXU1.TotVAr.t	0xb1a	int32	Timestamp UNIX	Timestamp 61850		X	
provider min Qt	MINSUPMMXU1.TotVAr.mag.f	0xb1c	int32	VAr	kVAr		X	
Date provider min Qt	MINSUPMMXU1.TotVAr.t	0xb1e	int32	Timestamp UNIX	Timestamp 61850		X	
min St	MINMMXU1.TotVA.mag.f	0xc44	uint32	VA	kVA		X	
Date min St	MINMMXU1.TotVA.t	0xc46	int32	Timestamp UNIX	Timestamp 61850		X	
min Frequency	MINMMXU1.Hz.mag.f	0xb20	uint16	$1/100^{e}$ Hz	Hz		X	
Date min Frequency	MINMMXU1.Hz.t	0xb22	int32	Timestamp UNIX	Timestamp 61850		X	
receiver min FPt mean value	MINDMDMMXU1.TotPF.mag.f	0xb24	int16	$1/10000^{e}$	$1/1^{e}$		X	
Date receiver min FPt mean value	MINDMDMMXU1.TotPF.t	0xb26	int32	Timestamp UNIX	Timestamp 61850		X	
min FPt provider mean value	MINSUPMMXU1.TotPF.mag.f	0xb28	int16	$1/10000^{e}$	$1/1^{e}$		X	
Date min FPt provider mean value	MINSUPMMXU1.TotPF.t	0xb2a	int32	Timestamp UNIX	Timestamp 61850		X	

Modbus Variable	IEC61850 Data Attribute	Modbus Address	Data Format	Modbus Unit	EC61850 Unit	"Full" Profile	"Inter" Profile	"Light" Profile
receiver min Cos phi t mean value	MINDMDMMXU1.TotCosPhi.mag.f	0xb2c	int16	1/10000^{e}	1/1^{e}		X	
Date receiver min Cos phi t mean value	MINDMDMMXU1.TotCosPhi.t	0xb2e	int32	Timestamp UNIX	Timestamp 61850		X	
provider min Cos phi t mean value	MINSUPMMXU1.TotCosPhi.mag.f	0xb30	int16	1/10000^{e}	1/1^{e}		X	
Date provider min Cos phi t mean value	MINSUPMMXU1.TotCosPhi.t	0xb32	int32	Timestamp UNIX	Timestamp 61850		X	
receiver min Tan phi t mean value	MINDMDMMXU1.TotTanPhi.mag.f	0xc4c	int32	1/10000^{e}	1/1^{e}		X	
Date receiver min Tan phi t mean value	MINDMDMMXU1.TotTanPhi.t	0xc4e	int32	Timestamp UNIX	Timestamp 61850		X	
provider min Tan phi t mean value	MINSUPMMXU1.TotTanPhi.mag.f	0xc50	int32	1/10000^{e}	1/1^{e}		X	
Date provider min Tan phi t mean value	MINSUPMMXU1.TotTanPhi.t	0xc52	int32	Timestamp UNIX	Timestamp 61850		X	
max V1	MAXMMXU1.PNV.phsA.cVal.mag.f	0xb34	uint32	1/100^{e} V	V		X	
Date V1 max	MAXMMXU1.PNV.phsA.t	0xb36	int32	Timestamp UNIX	Timestamp 61850		X	
Max V2	MAXMMXU1.PNV.phsB.cVal.mag.f	0xb38	uint32	1/100^{e} V	V		X	
Date Max V2	MAXMMXU1.PNV.phsB.t	0xb3a	int32	Timestamp UNIX	Timestamp 61850		X	
Max V3	MAXMMXU1.PNV.phsC.cVal.mag.f	0xb3c	uint32	1/100^{e} V	V		X	
Date Max V3	MAXMMXU1.PNV.phsC.t	0xb3e	int32	Timestamp UNIX	Timestamp 61850		X	
Max Vt	MAXMMXU1.PhV.neut.cVal.mag.f	0xb40	uint32	1/100^{e} V	V		X	
Date Max Vt	MAXMMXU1.PhV.neut.t	0xb42	int32	Timestamp UNIX	Timestamp 61850		X	
Max U12	MAXMMXU1.PPV.phsAB.cVal.mag.f	0xb44	uint32	1/100^{e} V	V		X	
Date Max U12	MAXMMXU1.PPV.phsAB.t	0xb46	int32	Timestamp UNIX	Timestamp 61850		X	
Max U23	MAXMMXU1.PPV.phsBC.cVal.mag.f	0xb48	uint32	1/100^{e} V	V		X	
Date Max U23	MAXMMXU1.PPV.phsBC.t	0xb4a	int32	Timestamp UNIX	Timestamp 61850		X	
Max U31	MAXMMXU1.PPV.phsCA.cVal.mag.f	0xb4c	uint32	1/100^{e} V	V		X	
Date Max U31	MAXMMXU1.PPV.phsCA.t	0xb4e	int32	Timestamp UNIX	Timestamp 61850		X	
Max I1	MAXMMXU1.A.phsA.cVal.mag.f	0xb50	uint32	1/10000^{e} A	A		X	
Date Max I1	MAXMMXU1.A.phsA.t	0xb52	int32	Timestamp UNIX	Timestamp 61850		X	
Max I2	MAXMMXU1.A.phsB.cVal.mag.f	0xb54	uint32	1/10000^{e} A	A		X	
Date Max I2	MAXMMXU1.A.phsB.t	0xb56	int32	Timestamp UNIX	Timestamp 61850		X	

Modbus Variable	IEC61850 Data Attribute	Modbus Address	Data Format	Modbus Unit	EC61850 Unit	"Full" Profile	"Inter" Profile	"Light" Profile
Max I3	MAXMMXU1.A.phsC.cVal.mag.f	0xb58	uint32	$1/10000^{e}$ A	A		X	
Date Max I3	MAXMMXU1.A.phsC.t	0xb5a	int32	Timestamp UNIX	Timestamp 61850		X	
Max In	MAXMMXU1.A.neut.cVal.mag.f	0xb5c	uint32	$1/10000^{e}$ A	A		X	
Date Max In	MAXMMXU1.A.neut.t	0xb5e	int32	Timestamp UNIX	Timestamp 61850		X	
receiver max P1	MAXDMDMMXU1.W.phsA.cVal.mag.f	0xb60	uint32	W	kW		X	
Date receiver max P1	MAXDMDMMXU1.W.phsA.t	0xb62	int32	Timestamp UNIX	Timestamp 61850		X	
provider max P1	MAXSUPMMXU1.W.phsA.cVal.mag.f	0xb64	uint32	W	kW		X	
Date provider max P1	MAXSUPMMXU1.W.phsA.t	0xb66	int32	Timestamp UNIX	Timestamp 61850		X	
receiver max P2	MAXDMDMMXU1.W.phsB.cVal.mag.f	0xb68	uint32	W	kW		X	
Date receiver max P2	MAXDMDMMXU1.W.phsB.t	0xb6a	int32	Timestamp UNIX	Timestamp 61850		X	
provider max P2	MAXSUPMMXU1.W.phsB.cVal.mag.f	0xb6c	uint32	W	kW		X	
Date provider max P2	MAXSUPMMXU1.W.phsB.t	0xb6e	int32	Timestamp UNIX	Timestamp 61850		X	
receiver max P3	MAXDMDMMXU1.W.phsC.cVal.mag.f	0xb70	uint32	W	kW		X	
Date receiver max P3	MAXDMDMMXU1.W.phsC.t	0xb72	int32	Timestamp UNIX	Timestamp 61850		X	
provider max P3	MAXSUPMMXU1.W.phsC.cVal.mag.f	0xb74	uint32	W	kW		X	
Date provider max P3	MAXSUPMMXU1.W.phsC.t	0xb76	int32	Timestamp UNIX	Timestamp 61850		X	
receiver max Pt	MAXDMDMMXU1.TotW.mag.f	0xb78	uint32	W	kW		X	
Date receiver max Pt	MAXDMDMMXU1.TotW.t	0xb7a	int32	Timestamp UNIX	Timestamp 61850		X	
provider max Pt	MAXSUPMMXU1.TotW.mag.f	0xb7c	uint32	W	kW		X	
Date provider max Pt	MAXSUPMMXU1.TotW.t	0xb7e	int32	Timestamp UNIX	Timestamp 61850		X	
receiver max Q1	MAXDMDMMXU1.VAr.phsA.cVal.mag.f	0xb80	int32	VAr	kVAr		X	
Date receiver max Q1	MAXDMDMMXU1.VAr.phsA.t	0xb82	int32	Timestamp UNIX	Timestamp 61850		X	
provider max Q1	MAXSUPMMXU1.VAr.phsA.cVal.mag.f	0xb84	int32	VAr	kVAr		X	
Date provider max Q1	MAXSUPMMXU1.VAr.phsA.t	0xb86	int32	Timestamp UNIX	Timestamp 61850		X	
receiver max Q2	MAXDMDMMXU1.VAr.phsB.cVal.mag.f	0xb88	int32	VAr	kVAr		X	
Date receiver max Q2	MAXDMDMMXU1.VAr.phsB.t	0xb8a	int32	Timestamp UNIX	Timestamp 61850		X	

Modbus Variable	IEC61850 Data Attribute	Modbus Address	Data Format	Modbus Unit	EC61850 Unit	"Full" Profile	"Inter" Profile	"Light" Profile
provider max Q2	MAXSUPMMXU1.VAr.phsB.cVal.mag.f	0xb8c	int32	VAr	kVAr		X	
Date provider max Q2	MAXSUPMMXU1.VAr.phsB.t	0xb8e	int32	Timestamp UNIX	Timestamp 61850		X	
receiver max Q3	MAXDMDMMXU1.VAr.phsC.cVal.mag.f	0xb90	int32	VAr	kVAr		X	
Date receiver max Q3	MAXDMDMMXU1.VAr.phsC.t	0xb92	int32	Timestamp UNIX	Timestamp 61850		X	
provider max Q3	MAXSUPMMXU1.VAr.phsC.cVal.mag.f	0xb94	int32	VAr	kVAr		X	
Date provider max Q3	MAXSUPMMXU1.VAr.phsC.t	0xb96	int32	Timestamp UNIX	Timestamp 61850		X	
receiver max Qt	MAXDMDMMXU1.TotVAr.mag.f	0xb98	int32	VAr	kVAr		X	
Date receiver max Qt	MAXDMDMMXU1.TotVAr.t	0xb9a	int32	Timestamp UNIX	Timestamp 61850		X	
provider max Qt	MAXSUPMMXU1.TotVAr.mag.f	0xb9c	int32	VAr	kVAr		X	
Date provider max Qt	MAXSUPMMXU1.TotVAr.t	0xb9e	int32	Timestamp UNIX	Timestamp 61850		X	
max mean value S1	MAXMMXU1.VA.phsA.cVal.mag.f	0xba0	uint32	VA	kVA		X	
Date max mean value S1	MAXMMXU1.VA.phsA.t	0xba2	int32	Timestamp UNIX	Timestamp 61850		X	
max mean value S2	MAXMMXU1.VA.phsB.cVal.mag.f	0xba4	uint32	VA	kVA		X	
Date max mean value S2	MAXMMXU1.VA.phsB.t	0xba6	int32	Timestamp UNIX	Timestamp 61850		X	
max mean value S3	MAXMMXU1.VA.phsC.cVal.mag.f	0xba8	uint32	VA	kVA		X	
Date max mean value S3	MAXMMXU1.VA.phsC.t	0xbaa	int32	Timestamp UNIX	Timestamp 61850		X	
max mean value St	MAXMMXU1.TotVA.mag.f	0xbac	uint32	VA	kVA		X	
Date max mean value St	MAXMMXU1.TotVA.t	0xbae	int32	Timestamp UNIX	Timestamp 61850		X	
Max Frequency	MAXMMXU1.Hz.mag.f	0xbb0	uint16	$1/100^{e}$ Hz	Hz		X	
Date max Frequency	MAXMMXU1.Hz.t	0xbb2	int32	Timestamp UNIX	Timestamp 61850		X	
receiver max FPt mean value	MAXDMDMMXU1.TotPF.mag.f	0xbf4	int16	$1/10000^{e}$	$1/1^{e}$		X	
Date receiver max FPt mean value	MAXDMDMMXU1.TotPF.t	0xbf6	int32	Timestamp UNIX	Timestamp 61850		X	
provider max FPt mean value	MAXSUPMMXU1.TotPF.mag.f	0xbf8	int16	$1/10000^{e}$	$1/1^{e}$		X	
Date provider max FPt mean value	MAXSUPMMXU1.TotPF.t	0xbfa	int32	Timestamp UNIX	Timestamp 61850		X	
receiver max Cos phi t mean value	MAXDMDMMXU1.TotCosPhi.mag.f	0xc3c	int16	$1/1000^{e}$	$1/1^{e}$		X	
Date receiver max Cos phi t mean value	MAXDMDMMXU1.TotCosPhi.t	0xc3e	int32	Timestamp UNIX	Timestamp 61850		X	

Modbus Variable	IEC61850 Data Attribute	Modbus Address	Data Format	Modbus Unit	EC61850 Unit	"Full" Profile	"Inter" Profile	"Light" Profile
provider max Cos phi t mean value	MAXSUPMMXU1.TotCosPhi.mag.f	0xc40	int16	$1/10000^{e}$	$1/1^{e}$		X	
Date provider max Cos phi t mean value	MAXSUPMMXU1.TotCosPhi.t	0xc42	int32	Timestamp UNIX	Timestamp 61850		X	
receiver max Tan phi t mean value	MAXDMDMMXU1.TotTanPhi.mag.f	0xc54	int32	$1/10000^{e}$	$1/1^{e}$		X	
Date receiver max Tan phi t mean value	MAXDMDMMXU1.TotTanPhi.t	0xc56	int32	Timestamp UNIX	Timestamp 61850		X	
provider max Tan phi t mean value	MAXSUPMMXU1.TotTanPhi.mag.f	0xc58	int32	$1/10000^{e}$	$1/1^{e}$		X	
Date provider max Tan phi t mean value	MAXSUPMMXU1.TotTanPhi.t	0xc5a	int32	Timestamp UNIX	Timestamp 61850		X	
max THD In mean value	MAXMHAI1.HRmsA.neut.cVal.mag.f	0xc5c	int32	$1/10000^{e}$	$1/1^{e}$		X	
Date max THD In mean value	MAXMHAI1.HRmsA.neut.t	0xc5e	int32	Timestamp UNIX	Timestamp 61850		X	

4.2 MAPPING OF TRIAD2 MODBUS VALUES

- The data attributes coloured in orange are not present in the IEC61850 standard ed. 2.0 B.

Modbus Variable	IEC61850 Data Attribute	Modbus Address	Data Type	Modbus Unit	IEC61850 Unit
V1 1s	INSTMMXU1.PNV.phsA.cVal.mag.f	0x500	uint32	$1/100^{e}$ V	V
V2 1s	INSTMMXU1.PNV.phsB.cVal.mag.f	0x502	uint32	$1/100^{e}$ V	V
V3 1s	INSTMMXU1.PNV.phsC.cVal.mag.f	0x504	uint32	$1/100^{e}$ V	V
U12 1s	INSTMMXU1.PPV.phsAB.cVal.mag.f	0x506	uint32	$1/100^{e}$ V	V
U23 1s	INSTMMXU1.PPV.phsBC.cVal.mag.f	0x508	uint32	$1/100^{e}$ V	V
U31 1s	INSTMMXU1.PPV.phsCA.cVal.mag.f	0x50a	uint32	$1/100^{e}$ V	V
I1 1s	INSTMMXU1.A.phsA.cVal.mag.f	0x50c	uint32	$1/10000^{e}$ A	A
I2 1s	INSTMMXU1.A.phsB.cVal.mag.f	0x50e	uint32	$1/10000^{e}$ A	A
I3 1s	INSTMMXU1.A.phsC.cVal.mag.f	0x510	uint32	$1/10000^{e}$ A	A
P1 1s	INSTMMXU1.W.phsA.cVal.mag.f	0x514	int32	W	kW
P2 1s	INSTMMXU1.W.phsB.cVal.mag.f	0x516	int32	W	kW
P3 1s	INSTMMXU1.W.phsC.cVal.mag.f	0x518	int32	W	kW
Pt 1s	INSTMMXU1.TotW.mag.f	0x51a	int32	W	kW
Q1 1s	INSTMMXU1.VAr.phsA.cVal.mag.f	0x51c	int32	VAr	kVAr
Q2 1s	INSTMMXU1.VAr.phsB.cVal.mag.f	0x51e	int32	VAr	kVAr
Q3 1s	INSTMMXU1.VAr.phsC.cVal.mag.f	0x520	int32	VAr	kVAr
Qt 1s	INSTMMXU1.TotVAr.mag.f	0x522	int32	VAr	kVAr
S1 1s	INSTMMXU1.VA.phsA.cVal.mag.f	0x524	uint32	VA	kVA
S2 1s	INSTMMXU1.VA.phsB.cVal.mag.f	0x526	uint32	VA	kVA
S3 1s	INSTMMXU1.VA.phsC.cVal.mag.f	0x528	uint32	VA	kVA
St 1s	INSTMMXU1.TotVA.mag.f	0x52a	uint32	VA	kVA
FP1 1s	INSTMMXU1.PF.phsA.cVal.mag.f	0x52c	int16	$1/10000^{e}$	$1/1^{e}$
FP2 1s	INSTMMXU1.PF.phsB.cVal.mag.f	0x52e	int16	$1/10000^{e}$	$1/1^{e}$
FP3 1s	INSTMMXU1.PF.phsC.cVal.mag.f	0x530	int16	$1/10000^{e}$	$1/1^{e}$

Modbus Variable	IEC61850 Data Attribute	Modbus Address	Data Type	Modbus Unit	IEC61850 Unit
FPt 1s	INSTMMXU1.TotPF.mag.f	0x532	int16	$1/10000^{e}$	$1/1^{e}$
Frequency 1s	INSTMMXU1.Hz.mag.f	0x512	uint16	$1/100^{e}$ Hz	Hz
Cos phi 1 1s	INSTMMXU1.CosPhi.phsA.cVal.mag.f	0x534	int16	1/10000e	1/1e
Cos phi 2 1s	INSTMMXU1.CosPhi.phsB.cVal.mag.f	0x536	int16	1/10000e	1/1e
Cos phi 3 1s	INSTMMXU1.CosPhi.phsC.cVal.mag.f	0x538	int16	1/10000e	1/1e
Cos phi t 1s	INSTMMXU1.TotCosPhi.mag.f	0x53a	int16	1/10000e	1/1e
Tan phi t 1s	INSTMMXU1.TotTanPhi.mag.f	0x53c	int32	1/10000e	1/1e

5. MICS: MODEL IMPLEMENTATION CONFORMANCE STAREMENT

5.1 LOGICAL NODES FOR METERING AND MEASUREMENT LN GROUP: M

5.1.1 MMXU

Data Object Name	Common Data Class	Explanation	T	M/O/C	ELINK? Y/N
Measured and metered values					
TotW	MV	Total active power (total P)		O	Y
TotVAr	MV	Total reactive power (total Q)		O	Y
TotVA	MV	Total apparent power (total S)		O	Y
TotPF	MV	Average power factor (total PF)		O	Y
Hz	MV	Frequency		O	Y
PPV	DEL	Phase to phase voltages (VL1,VL2, …)		O	Y
PNV	WYE	Phase to neutral voltage		O	Y
PhV	WYE	Phase to ground voltages (VL1ER, …)		O	Y
A	WYE	Phase currents (IL1, IL2, IL3)		O	Y
W	WYE	Phase active power (P)		O	Y
VAr	WYE	Phase reactive power (Q)		O	Y
VA	WYE	Phase apparent power (S)		O	Y
PF	WYE	Phase power factor		O	Y
Z	WYE	Phase impedance		O	N
AvAPhs	MV	Arithmetic average of the magnitude of current of the 3 phases. Average(Ia,Ib,Ic)		O	N
AvPPVPhs	MV	Arithmetic average of the magnitude of phase to phase voltage of the 3 phases. Average(PPVa, PPVb, PPVc)		O	N
AvPhVPhs	MV	Arithmetic average of the magnitude of phase to reference voltage of the 3 phases. Average(PhVa, PhVb, PhVc)		O	N
AvWPhs	MV	Arithmetic average of the magnitude of active power of the 3 phases. Average(Wa, Wb, Wc)		O	N
AvVAPhs	MV	Arithmetic average of the magnitude of apparent power of the 3 phases. Average(VAa, VAb, VAc)		O	N
AvVArPhs	MV	Arithmetic average of the magnitude of reactive power of the 3 phases. Average(VAra, VArb, VArc)		O	N

Data Object Name	Common Data Class	Explanation	T	M/O/C	ELINK? Y/N
AvPFPhs	MV	Arithmetic average of the magnitude of power factor of the 3 phases. Average(PFa, PFb, PFc)		O	N
AvZPhs	MV	Arithmetic average of the magnitude of impedance of the 3 phases. Average(Za, Zb, Zc)		O	N
MaxAPhs	MV	Maximum magnitude of current of the 3 phases. Max(Ia,Ib,Ic)		O	N
MaxPPVPhs	MV	Maximum magnitude of phase to phase voltage of the 3 phases. Max(PPVa, PPVb, PPVc)		O	N
MaxPhVPhs	MV	Maximum magnitude of phase to reference voltage of the 3 phases. Max(PhVa, PhVb, PhVc)		O	N
MaxWPhs	MV	Maximum magnitude of active power of the 3 phases. Max(Wa, Wb, Wc)		O	N
MaxVAPhs	MV	Maximum magnitude of apparent power of the 3 phases. Max(VAa, VAb, VAc)		O	N
MaxVArPhs	MV	Maximum magnitude of reactive power of the 3 phases. Max(VAra, VArb, VArc)		O	N
MaxPFPhs	MV	Maximum magnitude of power factor of the 3 phases. Max(PFa, PFb, PFc)		O	N
MaxZPhs	MV	Maximum magnitude of impedance of the 3 phases. Max(Za, Zb, Zc)		O	N
MinAPhs	MV	Minimum magnitude of current of the 3 phases. Min(Ia,Ib,Ic)		O	N
MinPPVPhs	MV	Minimum magnitude of phase to phase voltage of the 3 phases. Min(PPVa, PPVb, PPVc)		O	N
MinPhVPhs	MV	Minimum magnitude of phase to reference voltage of the 3 phases. Min(PhVa, PhVb, PhVc)		O	N
MinWPhs	MV	Minimum magnitude of active power of the 3 phases. Min(Wa, Wb, Wc)		O	N
MinVAPhs	MV	Minimum magnitude of apparent power of the 3 phases. Min(VAra, VArb, VArc)		O	N
MinVArPhs	MV	Minimum magnitude of reactive power of the 3 phases. Min(VAra, VArb, VArc)		O	N
MinPFPhs	MV	Minimum magnitude of power factor of the 3 phases. Min(PFa, PFb, PFc)		O	N
MinZPhs	MV	Minimum magnitude of impedance of the 3 phases. Min(Za, Zb, Zc)		O	N
Settings					
ClcTotVA	ENG	Calculation method used for total apparent power (TotVA)		O	N
PFSign	ENG	Sign convention for VAr and power factor (PF)		O	N
Not in the IEC61850-7-3 standard					
CosPhi	WYE	Cosinus of the Phase shift between voltage and current		/	Y
TotCosPhi	WYE	Total Cosinus of the Phase shift between voltage and current		/	Y
TotTanPhi	WYE	Total Tangente of the Phase shift between voltage and current		/	Y

5.1.2 MHAI

Data Object Name	Common Data Class	Explanation	T	M/O/C	ELINK? Y/N
Measured and metered values					
Hz	MV	Basic frequency		C	N
HA	HWYE	Sequence of harmonics or interharmonics current		O	Y
HPhV	HWYE	Sequence of harmonics or interharmonics phase to ground voltages		O	N
HPPV	HDEL	Sequence of harmonics or interharmonics phase to phase voltages		O	Y
HW	HWYE	Sequence of harmonics or interharmonics active power		O	N
HVAr	HWYE	Sequence of harmonics or interharmonics reactive power		O	N
HVA	HWYE	Sequence of harmonics or interharmonics apparent power		O	N
HRmsA	WYE	Current RMS harmonic or interharmonics (un-normalized total harmonic distortion, Thd)		O	Y
HRmsPhV	WYE	Voltage RMS harmonic or interharmonics (un-normalized Thd) for phase to ground		O	N
HRmsPPV	DEL	Voltage RMS harmonic or interharmonics (un-normalized Thd) for phase to phase		O	Y
HTuW	WYE	Total phase harmonic or interharmonics active power (no fundamental) unsigned sum		O	N
HTsW	WYE	Total phase harmonic or interharmonic active power (no fundamental) signed sum		O	N
HATm	WYE	Current time product		O	N
HKf	WYE	K factor		O	N
HTdf	WYE	Transformer derating factor		O	N
ThdA	WYE	Current total harmonic or interharmonic distortion (different methods)		O	N
ThdOddA	WYE	Current total harmonic or interharmonic distortion (different methods – odd components)		O	N
ThdEvnA	WYE	Current total harmonic or interharmonic distortion (different methods – even components)		O	N
TddA	WYE	Current total demand distortion per IEEE 519		O	N
TddOddA	WYE	Current total demand distortion per IEEE 519 (odd components)		O	N
TddEvnA	WYE	Current total demand distortion per IEEE 519 (even components)		O	N
ThdPhV	WYE	Voltage total harmonic or Interharmonic Distortion (different methods) for phase to ground		O	N
ThdOddPhV	WYE	Voltage total harmonic or interharmonic distortion (different methods) for phase to ground (odd components)		O	N
ThdEvnPhV	WYE	Voltage total harmonic or interharmonic distortion (different methods) for phase to ground (even components)		O	N
ThdPPV	DEL	Voltage total harmonic or interharmonic distortion (different methods) for phase to phase		O	N

Data Object Name	Common Data Class	Explanation	T	M/O/C	ELINK? Y/N
ThdOddPPV	DEL	Voltage total harmonic or interharmonic distortion (different methods) for phase to phase (odd components)		O	N
ThdEvnPPV	DEL	Voltage total harmonic or interharmonic distortion (different methods) for phase to phase (even components)		O	N
HCfPhV	WYE	Voltage crest factors (peak waveform value/sqrt(2)/fundamental) for phase to ground		O	N
HCfPPV	DEL	Voltage crest factors (peak waveform value/sqrt(2)/fundamental) for phase to phase		O	N
HCfA	WYE	Current crest factors (peak waveform value/sqrt(2)/fundamental)		O	N
HTif	WYE	Voltage telephone influence factor		O	N
Settings					
HzSet	ASG	Basic frequency		C	N
EvTmms	ING	Evaluation time (time window) determines the lowest frequency		O	N
NumCyc	ING	Number of cycles of the basic frequency		O	N
ThdAVal	ASG	ThdA alarm setting – value entered in %		O	N
ThdVVal	ASG	ThdPhV / ThdPPV alarm setting – value entered in %		O	N
ThdATmms	ING	ThdA alarm time delay in ms		O	N
ThdVTmms	ING	ThdPhV / ThdPPV alarm time delay in ms		O	N
NomA	ASG	Normalising demand current used in IEEE 519 TDD calculation		O	N
Not in the IEC61850-7-3 standard					
HRmsPNV	WYE	Voltage RMS harmonic or interharmonics (un-normalized Thd) for phase to neutre		/	Y
HPNV	HWYE	Sequence of harmonics or interharmonics phase to neutre voltages		/	Y

5.1.3 MMTR

Data Object Name	Common Data Class	Explanation	T	M/O/C	ELINK? Y/N
Measured and metered values					
TotVAh	BCR	Net apparent energy		O	N
TotWh	BCR	Net real energy		O	N
TotVArh	BCR	Net reactive energy		O	N
SupWh	BCR	Real energy supply (default supply direction: energy flow towards busbar)		O	Y
SupVArh	BCR	Reactive energy supply (default supply direction: energy flow towards busbar)		O	N
DmdWh	BCR	Real energy demand (default demand direction: energy flow from busbar away)		O	Y
DmdVArh	BCR	Reactive energy demand (default demand direction: energy flow from busbar away)		O	N
Not in the IEC61850-7-3 standard					
Q1VArh	BCR	Q1 reactive energy		/	Y
Q2VArh	BCR	Q2 reactive energy		/	Y
Q3VArh	BCR	Q3 reactive energy		/	Y
Q3VArh	BCR	Q4 reactive energy		/	Y
SupVAh	BCR	Apparent energy supply (default supply direction: energy flow towards busbar)		/	Y
DmdVAh	BCR	Apparent energy demand (default demand direction: energy flow from busbar away)		/	Y

5.2 COMMON DATA CLASS SPECIFICATION FOR STATUS INFORMATION

5.2.1 MEASURED VALUE (MV)

Data Attribute Name	Type	FC	TrgOp	Value/Value Range	M/O/C	ELINK? Y/N
measured attributes						
instMag	AnalogueValue	MX			O	N
mag	AnalogueValue	MX	dchg, dupd		M	Y
range	ENUMERATED	MX	dchg, dupd	normal|high|low|high-high|low-low	O	N
q	Quality	MX	qchg		M	Y
t	TimeStamp	MX			M	Y
substitution and blocked						
subEna	BOOLEAN	SV			PICS_SUBST	N
subMag	AnalogueValue	SV			PICS_SUBST	N
subQ	Quality	SV			PICS_SUBST	N
subID	VISIBLE STRING255	SV			PICS_SUBST	N
blkEna	BOOLEAN	BL			O	N
configuration, description and extension						
units	Unit	CF	dchg	see Annex A	O	Y
db	INT32U	CF	dchg	0 … 100 000	O	N
zeroDb	INT32U	CF	dchg	0 … 100 000	O	N
sVC	ScaledValueConfig	CF	dchg		AC_SCAV	N
rangeC	RangeConfig	CF	dchg		GC_CON_range	N
smpRate	INT32U	CF	dchg		O	N
d	VISIBLE STRING255	DC		Text	O	N
dU	UNICODE STRING255	DC			O	N
cdcNs	VISIBLE STRING255	EX			AC_DLNDA_M	N
cdcName	VISIBLE STRING255	EX			AC_DLNDA_M	N
dataNs	VISIBLE STRING255	EX			AC_DLN_M	N

5.2.2 PHASE TO PHASE RELATED MEASURED VALUES OF A THREE-PHASE SYSTEM (DEL)

Data Attribute Name	Type	FC	TrgOp	Value/Value Range	M/O/C	ELINK? Y/N
SubDataObject						
phsAB	CMV				GC_1	Y
phsBC	CMV				GC_1	Y
phsCA	CMV				GC_1	Y
DataAttribute						
Configuration, description and extension						
angRef	ENUMERATED	CF	dchg	Va | Vb |Vc | Aa | Ab | Ac | Vab | Vbc | Vca | Vother | Aother | Synchrophasor	O	N
d	VISIBLE STRING255	DC		Text	O	N
dU	UNICODE STRING255	DC			O	N
cdcNs	VISIBLE STRING255	EX			AC_DLNDA_M	N
cdcName	VISIBLE STRING255	EX			AC_DLNDA_M	N
dataNs	VISIBLE STRING255	EX			AC_DLN_M	N

5.2.3 PHASE TO GROUND/NEUTRAL RELATED MEASURED VALUES OF A THREE-PHASE SYSTEM (WYE)

Data Attribute Name	Type	FC	TrgOp	Value/Value Range	M/O/C	ELINK ? Y/N
SubDataObject						
phsA	CMV				GC_1	Y
phsB	CMV				GC_1	Y
phsC	CMV				GC_1	Y
neut	CMV				GC_1	Y
net	CMV				GC_1	N
res	CMV				GC_1	N
DataAttribute						
Configuration, description and extension						
angRef	ENUMERATED	CF	dchg	Va | Vb |Vc | Aa | Ab | Ac | Vab | Vbc | Vca | Vother | Aother | Synchrophasor	O	N
phsToNeut	BOOLEAN	CF	dchg	DEFAULT = FALSE	O	N
d	VISIBLE STRING255	DC		Text	O	N
dU	UNICODE STRING255	DC			O	N
cdcNs	VISIBLE STRING255	EX			AC_DLNDA_M	N
cdcName	VISIBLE STRING255	EX			AC_DLNDA_M	N
dataNs	VISIBLE STRING255	EX			AC_DLN_M	N

5.2.4 BINARY COUNTER READING (BCR)

Data Attribute Name	Type	FC	TrgOp	Value/Value Range	M/O/C	ELINK? Y/N
status						
actVal	INT64	ST	dchg		M	Y
frVal	INT64	ST	dupd		GC_2_1	N
frTm	TimeStamp	ST			GC_2_1	N
q	Quality	ST	qchg		M	Y
t	TimeStamp	ST			M	Y
configuration, description and extension						
units	Unit	CF	dchg	see Annex A	O	Y
pulsQty	FLOAT32	CF	dchg		M	N
frEna	BOOLEAN	CF	dchg		GC_2_1	N
strTm	TimeStamp	CF	dchg		GC_2_1	N
frPd	INT32	CF	dchg		GC_2_1	N
frRs	BOOLEAN	CF	dchg		GC_2_1	N
d	VISIBLE STRING255	DC			O	N
dU	UNICODE STRING255	DC			O	N
cdcNs	VISIBLE STRING255	EX			AC_DLNDA_M	N
cdcName	VISIBLE STRING255	EX			AC_DLNDA_M	N
dataNs	VISIBLE STRING255	EX			AC_DLN_M	N

5.2.5 HARMONIC VALUE FOR DEL (HDEL)

Data Attribute Name	Type	FC	TrgOp	Value/Value Range	M/O/C	ELINK? Y/N
SubDataObject						
phsABHar	ARRAY 0..numHar OF CMV				M	Y
phsBCHar	ARRAY 0..numHar OF CMV				O	Y
phsCAHar	ARRAY 0..numHar OF CMV				O	Y
DataAttribute						
Configuration, description and extension						
numHar	INT16U	CF	dchg	> 0	M	Y
numCyc	INT16U	CF	dchg	> 0	M	Y
evalTm	INT16U	CF	dchg		M	Y
angRef	ENUMERATED	CF	dchg	Va | Vb |Vc | Aa | Ab | Ac | Vab | Vbc | Vca | Vother | Aother | Synchrophasor	O	N
smpRate	INT32U	CF	dchg		O	N
frequency	FLOAT32	CF	dchg	nominal frequency	M	Y
hvRef	ENUMERATED	CF	dchg	fundamental | rms | absolute	O	N
rmsCyc	INT16U	CF	dchg		AC_RMS_M	N
d	VISIBLE STRING255	DC		Text	O	N
dU	UNICODE STRING255	DC			O	N
cdcNs	VISIBLE STRING255	EX			AC_DLNDA_M	N
cdcName	VISIBLE STRING255	EX			AC_DLNDA_M	N
dataNs	VISIBLE STRING255	EX			AC_DLN_M	N

5.2.6 HARMONIC VALUE FOR WYE (HWYE)

Data Attribute Name	Type	FC	TrgOp	Value/Value Range	M/O/C	ELINK ? Y/N
SubDataObject						
phsAHar	ARRAY 0..numHar OF CMV				M	Y
phsBHar	ARRAY 0..numHar OF CMV				O	Y
phsCHar	ARRAY 0..numHar OF CMV				O	Y
neutHar	ARRAY 0..numHar OF CMV				O	Y
netHar	ARRAY 0..numHar OF CMV				O	N
resHar	ARRAY 0..numHar OF CMV				O	N
DataAttribute						
Configuration, description and extension						
numHar	INT16U	CF	dchg	>0	M	Y
numCyc	INT16U	CF	dchg	>0	M	Y
evalTm	INT16U	CF	dchg		M	Y
angRef	ENUMERATED	CF	dchg	Va | Vb | Vc | Aa | Ab | Ac | Vab | Vbc |Vca| Vother | Aother | Synchrophasor	O	N
smpRate	INT32U	CF	dchg		O	N
frequency	FLOAT32	CF	dchg	fundamental frequency	M	Y
hvRef	ENUMERATED	CF	dchg	fundamental | rms | absolute	O	N
rmsCyc	INT16U	CF	dchg		AC_RMS_M	N
d	VISIBLE STRING255	DC		Text	O	N
dU	UNICODE STRING255	DC			O	N
cdcNs	VISIBLE STRING255	EX			AC_DLNDA_M	N
cdcName	VISIBLE STRING255	EX			AC_DLNDA_M	N
dataNs	VISIBLE STRING255	EX			AC_DLN_M	N

5.2.7 COMPLEX MEASURED VALUE (CMV)

Data Attribute Name	Type	FC	TrgOp	Value/Value Range	M/O/C	ELINK ? Y/N
measured attributes						
instCVal	Vector	MX			O	N
cVal	Vector	MX	dchg,dupd		M	Y
range	ENUMERATED	MX	dchg	normal|high|low|high-high|low-low	O	N
rangeAng	ENUMERATED	MX	dchg	normal|high|low|high-high|low-low	O	N
q	Quality	MX	qchg		M	Y
t	TimeStamp	MX			M	Y
substitution and blocked						
subEna	BOOLEAN	SV			PICS_SUBST	N
subCVal	Vector	SV			PICS_SUBST	N
subQ	Quality	SV			PICS_SUBST	N
subID	VISIBLE STRING64	SV			PICS_SUBST	N
blkEna	BOOLEAN	BL			O	N
configuration, description and extension						
units	Unit	CF	dchg	see Annex A	O	Y
db	INT32U	CF	dchg	0 … 100 000	O	N
dbAng	INT32U	CF	dchg	0 … 100 000	O	N
zeroDb	INT32U	CF	dchg	0 … 100 000	O	N
rangeC	RangeConfig	CF	dchg		GC_CON_range	N
rangeAngC	RangeConfig	CF	dchg		GC_CON_range Ang	N
magSVC	ScaledValueConfig	CF	dchg		AC_SCAV	N
angSVC	ScaledValueConfig	CF	dchg		AC_SCAV	N
angRef	ENUMERATED	CF	dchg	Va | Vb | Vc | Aa | Ab | Ac | Vab | Vbc |Vca| Vother | Aother | Synchrophasor	O	N
smpRate	INT32U	CF	dchg		O	N
d	VISIBLE STRING255	DC		Text	O	N

Data Attribute Name	Type	FC	TrgOp	Value/Value Range	M/O/C	ELINK ? Y/N
dU	UNICODE STRING255	DC			O	N
cdcNs	VISIBLE STRING255	EX			AC_DLNDA_M	N
cdcName	VISIBLE STRING255	EX			AC_DLNDA_M	N
dataNs	VISIBLE STRING255	EX			AC_DLN_M	N

5.2.8 LOGICAL NODE NAME PLATE (LPL)

Data Attribute Name	Type	FC	TrgOp	Value/Value Range	M/O/C	ELINK ? Y/N
configuration, description and extension						
vendor	VISIBLE STRING255	DC			M	Y
swRev	VISIBLE STRING255	DC			M	Y
d	VISIBLE STRING255	DC			O	Y
dU		DC			O	N
configRev	VISIBLE STRING255	DC			AC_LN0_M	Y
paramRev		ST	dchg		O	N
valRev		ST	dchg		O	N
ldNs	VISIBLE STRING255	EX		Shall be included in LLN0 only; for example "IEC 61850-7-4:2010"; details of the name space concept are defined in IEC 61850-7-1.	AC_LN0_EX	Y
lnNs	VISIBLE STRING255	EX			AC_DLD_M	N
cdcNs	VISIBLE STRING255	EX			AC_DLNDA_M	N
cdcName	VISIBLE STRING255	EX			AC_DLNDA_M	N
dataNs	VISIBLE STRING255	EX			AC_DLN_M	N

5.2.9 ENUMERATED STATUS (ENS)

Data Attribute Name	Type	FC	TrgOp	Value/Value Range	M/O/C	ELINK ? Y/N
status						
stVal	ENUMERATED	ST	dchg, dupd		M	Y
q	Quality	ST	qchg		M	Y
t	TimeStamp	ST			M	Y
substitution and blocked						
subEna	BOOLEAN	SV			PICS_SUBST	N
subVal	ENUMERATED	SV			PICS_SUBST	N
subQ	Quality	SV			PICS_SUBST	N
subID	VISIBLE STRING64	SV			PICS_SUBST	N
blkEna	BOOLEAN	BL			O	N
configuration, description and extension						
d	VISIBLE STRING255	DC		Text	O	N
dU	UNICODE STRING255	DC			O	N
cdcNs	VISIBLE STRING255	EX			AC_DLNDA_M	N
cdcName	VISIBLE STRING255	EX			AC_DLNDA_M	N
dataNs	VISIBLE STRING255	EX			AC_DLN_M	N

5.2.10 CONTROLLABLE ENUMERATED STATUS (ENC)

Data Attribute Name	Type	FC	TrgOp	Value/Value Range	M/O/C	ELINK ? Y/N
status and control mirror						
origin	Originator	ST			AC_CO_O	N
ctlNum	INT8U	ST		0…255	AC_CO_O	N
stVal	ENUMERATED	ST	dchg		M	Y
q	Quality	ST	qchg		M	Y
t	TimeStamp	ST			M	Y
stSeld	BOOLEAN	ST	dchg		O	N
opRcvd	BOOLEAN	OR	dchg		O	N
opOk	BOOLEAN	OR	dchg		O	N
tOpOk	TimeStamp	OR			O	N
substitution and blocked						
subEna	BOOLEAN	SV			PICS_SUBST	N
subVal	ENUMERATED	SV			PICS_SUBST	N
subQ	Quality	SV			PICS_SUBST	N
subID	VISIBLE STRING64	SV			PICS_SUBST	N
blkEna	BOOLEAN	BL			O	N
configuration, description and extension						
ctlModel	CtlModels	CF	dchg		M	Y
sboTimeout	INT32U	CF	dchg		AC_CO_O	N
sboClass	SboClasses	CF	dchg		AC_CO_O	N
operTimeout	INT32U	CF	dchg		AC_CO_O	N
d	VISIBLE STRING255	DC		Text	O	N
dU	UNICODE STRING255	DC			O	N
cdcNs	VISIBLE STRING255	EX			AC_DLNDA_M	N
cdcName	VISIBLE STRING255	EX			AC_DLNDA_M	N
dataNs	VISIBLE STRING255	EX			AC_DLN_M	N

5.2.11 SINGLE POINT STATUS (SPS)

Data Attribute Name	Type	FC	TrgOp	Value/Value Range	M/O/C	ELINK ? Y/N
status and control mirror						
stVal	ENUMERATED	ST	dchg	TRUE | FALSE	M	Y
q	Quality	ST	qchg		M	Y
t	TimeStamp	ST			M	Y
substitution and blocked						
subEna	BOOLEAN	SV			PICS_SUBST	N
subVal	ENUMERATED	SV		TRUE | FALSE	PICS_SUBST	N
subQ	Quality	SV			PICS_SUBST	N
subID	VISIBLE STRING64	SV			PICS_SUBST	N
blkEna	BOOLEAN	BL			O	N
configuration, description and extension						
d	VISIBLE STRING255	DC		Text	O	N
dU	UNICODE STRING255	DC			O	N
cdcNs	VISIBLE STRING255	EX			AC_DLNDA_M	N
cdcName	VISIBLE STRING255	EX			AC_DLNDA_M	N
dataNs	VISIBLE STRING255	EX			AC_DLN_M	N

5.3 VECTOR DEFINITION

Attribute Name	Attribute Type	Value/Value Range	M/O/C	ELINK ? Y/N
mag	AnalogueValue		M	Y
ang	AnalogueValue	$-180 < n \leq +180$	AC_CLC_O	N

5.4 UNIT DEFINITION

Attribute Name	Attribute Type	Value/Value Range	M/O/C	ELINK ? Y/N
SIUnit	ENUMERATED	According to Tables A.1 to A.4 in Annex A	M	Y
multiplier	ENUMERATED	According to Table A.5 in Annex A	O	Y

5.5 SYSTEM LOGICAL NODES: L GROUP

5.5.1 PHYSICAL DEVICE INFORMATION (LPHD CLASS)

Data Object Name	Common Data Class	Explanation	T	M/O/C	ELINK? Y/N
Data objects					
PhyNam	DPL	Physical device name plate		M	Y
Status information					
PhyHealth	ENS	Physical device health		M	Y
OutOv	SPS	Output communications buffer overflow		O	N
Proxy	SPS	Indicates if this LN is a proxy		M	Y
InOv	SPS	Input communications buffer overflow		O	N
NumPwrUp	INS	Number of power-ups		O	N
WrmStr	INS	Number of warm starts		O	N
WacTrg	INS	Number of watchdog device resets detected		O	N
PwrUp	SPS	Power-up detected		O	N
PwrDn	SPS	Power-down detected		O	N
PwrSupAlm	SPS	External power supply alarm		O	N
Controls					
RsStat	SPC	Reset device statistics	T	O	N
Sim	SPC	Receive simulated GOOSE or simulated SV		O	N

5.5.2 LOGICAL NODE ZERO (LLN0 CLASS)

Data Object Name	Common Data Class	Explanation	T	M/O/C	ELINK? Y/N
Descriptions					
NamPlt	LPL	Name Plate		M	Y
Status information					
Beh	ENS	Behaviour		M	Y
Health	ENS	Health		M	Y
Blk	SPS	Dynamic blocking of function described by the LN		O	N
Controls					
Mod	ENC	Mode		M	Y
CmdBlk	SPC	Blocking of control sequences and action triggers of controllable data objects		O	N

6. PIXIT

6.1 ASSOCIATION MODEL

ID	Edition	Description	Value / Clarification
As1	**1**	Maximum number of clients that can set-up an association simultaneously	5
As2	**1.2**	TCP_KEEPALIVE value. The recommended range is 1..20	5s
As3	**1.2**	Lost connection detection time	7s
As4	**-**	Authentication is not supported yet	
As5	**1.2**	What association parameters are necessary for successful association	Transport selector Y Session selector Y Presentation selector Y AP Title N AE Qualifier N
As6	**1.2**	If association parameters are necessary for association, describe the correct values e.g.	Transport selector 0001 Session selector 0001 Presentation selector 00000001
As7	**1.2**	What is the maximum and minimum MMS PDU size	Max MMS PDU size 8kB
As8	**1.2**	What is the maximum start up time after a power supply interrupt	90s until IEC61850 is operable

6.2 SERVER MODEL

ID	Edition	Description	Value / Clarification
Sr1	1.2	Which analogue value (MX) quality bits are supported (can be set by server)	Validity: Y Good Y Invalid N Reserved N Questionable N Overflow N OutofRange N BadReference N Oscillatory N Failure N OldData N Inconsistent N Inaccurate Source: N Process N Substituted N Test N OperatorBlocked
Sr2	1.2	Which status value (ST) quality bits are supported (can be set by server)	Validity: Y Good Y Invalid N Reserved N Questionable N Overflow N OutofRange N BadReference N Oscillatory N Failure N OldData N Inconsistent N Inaccurate Source: N Process N Substituted N Test N OperatorBlocked

ID	Edition	Description	Value / Clarification
Sr3	-	What is the maximum number of data object references in one GetDataValues request	Not restricted; MMS PDU is the limit.
Sr4	-	What is the maximum number of data object references in one SetDataValues request	Not restricted; MMS PDU is the limit.
Sr5	1	Which Mode values are supported Note : IEC61850-6 :2009 clause 9.5.6 states that only a subrange of the enumeration value sets is supported, this shall be indicated within an ICD file by an enumeration type, where the unsupported values are missing	On Y [On-]Blocked N Test N Test/Blocked N Off N

6.3 DATA SET MODEL

- Data set is not supported by the device

6.4 SUBSTITUTION MODEL

- Substitution model is not supported by the device

6.5 SETTING GROUP CONTROL MODEL

- Setting Group control model is not supported by the device

6.6 REPORTING MODEL

- Reporting model is not supported by the device

6.7 LOGGING MODEL

- Logging model is not supported by the device

6.8 GOOSE PUBLISH MODEL

- GOOSE publish model is not supported by the device

6.9 GOOSE SUBSCRIBE MODEL

- GOOSE subscribe model is not supported by the device

6.10 CONTROL MODEL

- Control model is not supported by the device

6.11 TIME AND TIME SYNCHRONISATION MODEL

ID	Edition	Description	Value / Clarification
Tm1	1.2	What time quality bits are supported (may be set by the IED)	Y LeapSecondsKnown Y ClockFailure Y ClockNotSynchronized
Tm2	1.2	Describe the behaviour when the time server(s) ceases to respond What is the time server lost detection time	Please refer to 6.12 “Quality bits management” Between 64 seconds and 1024 second
Tm3		How long does it take to take over the new time from time server	Between 64 seconds and 1024 seconds
Tm4		When is the time quality bit “ClockFailure” set	When connection to all time servers is lost (see PIXIT-Tm2)
Tm5		When is the time quality bit “Clock not Synchronized” set	When connection to all time servers is lost (see PIXIT-Tm2)
Tm6		Is the timestamp of a binary event adjusted to the configured scan cycle	Deprecated
Tm7		Does the device support time zone and daylight saving	Y
Tm8		Which attributes of the SNTP response packet are validated	N Leap indicator not equal to 3 N Mode is equal to SERVER N OriginateTimestamp is equal to value sent by the SNTP client as Transmit Timestamp N RX/TX timestamp fields are checked for reasonableness Y SNTP version 3 and/or 4 N other (describe)
Tm9		Information not supported by device	

6.12 QUALITY BITS MANAGEMENT

- In case of synchronization with the internal clock:
  - LeapSecondsKnown: 0
  - ClockFailure: 1
  - ClockNotSynchronized: 1
- In case of synchronization with an sntp server reachable but not responding to the ELINK requests:
  - LeapSecondsKnown: 0
  - ClockFailure: 1
  - ClockNotSynchronized: 1
- In case of synchronization with an sntp server reachable and responding to the ELINK requests, no difference between the 2 in terms of time:
  - LeapSecondsKnown: 1
  - ClockFailure: 0
  - ClockNotSynchronized: 0
- In case of synchronization with an sntp server reachable but not responding the ELINK request, difference between the 2 in terms of time:
  - LeapSecondsKnown: 1
  - ClockFailure: 1
  - ClockNotSynchronized: 1

6.13 FILE TRANSFER MODEL

- File transfer model is supported by the device.

6.14 SERVICE TRACKING MODEL

- Service tracking model is not supported by the device.

7. CAPABILITIES DESCRIPTION (PICS)

7.1 ACSI BASIC CONFORMANCE STATEMENT

		Client/Subscriber	Server/Publisher	Value/Comments
Client-Server roles				
B11	**Server** side (of TWO-PARTY-APPLICATION-ASSOCIATION)		•	
B12	**Client** side of (TWO-PARTY-APPLICATION-ASSOCIATION)			
SCSMs supported				
B21	**SCSM**: IEC 61850-8-1 used		•	
B22	**SCSM**: IEC 61850-9-1 used			Deprecated Ed2
B23	**SCSM**: IEC 61850-9-2 used			
B24	**SCSM**: other			
Generic substation event model (GSE)				
B31	**Publisher** side			
B32	**Subscriber** side			
Transmission of sampled value model (SVC)				
B41	**Publisher** side	—		
B42	**Subscriber** side		—	

7.2 ACSI SERVICE CONFORMANCE STATEMENT

	Ed.	Services	AA: TP/MC	Client (C)	Server (S)	Comments
Server						
S1	1.2	GetServerDirectory (LOGICAL-DEVICE)	TP		●	
Application association						
S2	1.2	Associate	TP		●	
S3	1.2	Abort	TP		●	
S4	1.2	Release	TP		●	
Logical device						
S5	1.2	GetLogicalDeviceDirectory	TP		●	
Logical node						
S6	1.2	GetLogicalNodeDirectory	TP		●	
S7	1.2	GetAllDataValues	TP		●	
Data						
S8	1.2	GetDataValues	TP		●	
S9	1.2	SetDataValues	TP		●	
S10	1.2	GetDataDirectory	TP		●	
S11	1.2	GetDataDefinition	TP		●	
Data set						
S12	1.2	GetDataSetValues	TP			
S13	1.2	SetDataSetValues	TP			
S14	1.2	CreateDataSet	TP			
S15	1.2	DeleteDataSet	TP			
S16	1.2	GetDataSetDirectory	TP			
Substitution						
S17	1	SetDataValues	TP			
Setting group control						
S18	1.2	SelectActiveSG	TP			

	Ed.	Services	AA: TP/MC	Client (C)	Server (S)	Comments
S19	1.2	SelectEditSG	TP			
S20	1.2	SetSGValues	TP			
S21	1.2	ConfirmEditSGValues	TP			
S22	1.2	GetSGValues	TP			
S23	1.2	GetSGCBValues	TP			
Reporting						
Buffered report control block (BRCB)						
S24	1.2	Report	TP			
S24-1	1.2	data-change (dchg)				
S24-2	1.2	quality-change (qchg)				
S24-3	1.2	data-update (dupd)				
S25	1.2	GetBRCBValues	TP			
S26	1.2	SetBRCBValues	TP			
Unbuffered report control block (URCB)						
S27	1.2	Report	TP			
S27-1	1.2	data-change (dchg)				
S27-2	1.2	quality-change (qchg)				
S27-3	1.2	data-update (dupd)				
S28	1.2	GetURCBValues	TP			
S29	1.2	SetURCBValues	TP			
Logging						
Log control block						
S30	1.2	GetLCBValues	TP			
S31	1.2	SetLCBValues	TP			
Log						
S32	1.2	QueryLogByTime	TP			
S33	1.2	QueryLogAfter	TP			

	Ed.	Services	AA: TP/MC	Client (C)	Server (S)	Comments
S34	1.2	GetLogStatusValues	TP			
Generic substation event model (GSE)						
GOOSE						
S35	1.2	SendGOOSEMessage	MC			
GOOSE-CONTROL-BLOCK						
S36	1.2	GetGoReference	TP			
S37	1.2	GetGOOSEElementNumber	TP			
S38	1.2	GetGoCBValues	TP			
S39	1.2	SetGoCBValues	TP			
GSSE						
S40	1	SendGSSEMessage	MC			Deprecated in Edition 2
GSSE-CONTROL-BLOCK						
S41	1	GetReference	TP			Deprecated in Edition 2
S42	1	GetGSSEElementNumber	TP			Deprecated in Edition 2
S43	1	GetGsCBValues	TP			Deprecated in Edition 2
S44	1	SetGsCBValues	TP			Deprecated in Edition 2
Transmission of sampled value model (SVC)						
Multicast SV						
S45	1.2	SendMSVMessage	MC			
Multicast Sampled Value Control Block						
S46	1.2	GetMSVCBValues	TP			
S47	1.2	SetMSVCBValues	TP			
Unicast SV						
S48	1.2	SendUSVMessage	TP			
Unicast Sampled Value Control Block						
S49	1.2	GetUSVCBValues	TP			

	Ed.	Services	AA: TP/MC	Client (C)	Server (S)	Comments
S50	1.2	SetUSVCBValues	TP			
Control						
S51	1.2	Select				
S52	1.2	SelectWithValue	TP			
S53	1.2	Cancel	TP			
S54	1.2	Operate	TP			
S55	1.2	CommandTermination	TP			
S56	1.2	TimeActivatedOperate	TP			
File transfer						
S57	1.2	GetFile	TP			
S58	1.2	SetFile	TP			
S59	1.2	DeleteFile	TP			
S60	1.2	GetFileAttributeValues	TP			
S61	1.2	GetServerDirectory (FILE-SYSTEM)	TP			
Time						
T1	1.2	Time resolution of internal clock			n = 0 (1s)	Nearest negative power of 2^{-n} in seconds (number 0 .. 24)
T2	1.2	Time accuracy of internal clock			T0	TL (ms) (low accuracy), T3 < 7) (only Ed2)
						T0 (ms) (<= 10 ms), 7 <= T3 < 9
						T1 (µs) (<= 1 ms), 10 <= T3 < 13
						T2 (µs) (<= 100 µs), 13 <= T3 < 15
						T3 (µs) (<= 25 µs), 15 <= T3 < 18
						T4 (µs) (<= 25 µs), 15 <= T3 < 18
						T5 (µs) (<= 1 µs), T3 >= 20
T3	1.2	Supported TimeStamp resolution			n = 0 (1s)	Nearest value of 2^{-n} in seconds (number 0 .. 24)

7.3 ACSI MODELS CONFORMANCE STATEMENT

		Client/Subscriber	Server/Publisher	Value/Comments
If **Server** side (B11) and/or **Client** side (B12) supported				
M1	**Logical device**		•	
M2	**Logical node**		•	
M3	**Data**		•	
M4	**Data set**			
M5	**Substitution**			
M6	**Setting group control**			
M7	**Buffered report control**			
M7-1	sequence-number			
M7-2	report-time-stamp			
M7-3	reason-for-inclusion			
M7-4	data-set-name			
M7-5	data-reference			
M7-6	buffer-overflow			
M7-7	entryID			
M7-8	BufTm			
M7-9	IntgPd			
M7-10	GI			
M7-11	conf-revision			
M8	**Unbuffered report control**			
M8-1	sequence-number			
M8-2	report-time-stamp			
M8-3	reason-for-inclusion			
M8-4	data-set-name			
M8-5	data-reference			
M8-6	BufTm			
M8-7	IntgPd			

		Client/Subscriber	Server/Publisher	Value/Comments
M8-8	GI			
M8-9	conf-revision			
M9	**Log control**			
M9-1	IntgPd			
M10	**Log**			
M11	**Control**			
M17	**File Transfer**			
M18	**Application association**			
M19	**GOOSE Control Block**			
M20	**Sampled Value Control Block**			
If **GSE** (B31/32) is supported				
M12	**GOOSE**			
M13	**GSSE**			Deprecated Ed2
If **SVC** (B41/42) is supported				
M14	Multicast SVC			
M15	Unicast SVC			
For all IEDs				
M16	**Time**			Time source with required accuracy shall be available. Only Time Master are SNTP (Mode 4 response) time server. All other Client / Server devices require SNTP (Mode 3 request) clients

Y = service is supported

N or empty = service is not supported

8. CHARACTERISTICS

AUXILIARY POWER SUPPLY	
AC network:	80 to 265 Vac - 10 VA - 42.5 to 69 Hz
DC network:	80 to 265 Vdc - 7W

STATUS LED	
Product in operation:	Green (on steady: equipment connected to power supply and 2 blinks: processor active)
Communication:	Green every 500 ms if communications in progress
Error:	Red if error detected

COMMUNICATIONS INTERFACES	
RS485 A and RS485 B:	Type: RS485 Protocol: Modbus in RTU mode Operating mode: master mode - half duplex Speed: 300 to 115,200 bauds Triad2/Enerium 2 400 bauds minimum Parity: no, even or odd Jbus address: 1 to 255 Stop bit: 1 or 2 Standard reference: EIA485
Ethernet:	Type: RJ45 - 8 points Protocol: http, JSON/REST, ntp Speed: 10-100 baseT Indication: 2 leds (activity on the line and type of network 10 or 100 BaseT) Maximum length: 100 m max

CLOCK	
Type:	RTC with external quartz
Precision:	±20ppm (±20 sec every 11.5 days)
Synchronization with NTP:	yes

PROCESSOR	
Type:	ARM9
Frequency:	180 MHz

MECHANICAL CHARACTERISTICS	
Size:	120.5 x 120 x 81 mm (DxLxH)
Weight:	560 gr
Number of terminals:	10
Connection:	screw terminal
Cable diameter:	6 mm² single-strand - 4 mm² multi-strand
Torque:	0.4 Nm maximum permitted torque on the terminal

ENVIRONMENTAL CONSTRAINTS	
Climatic constraints:	Nominal operating temperature: -10°C to +45°C Storage temperature: -25°C to +70°C Humidity in compliance with IEC 62052-11 (standard applied to electricity metering applications) - <75%, annual average - 95%, over 30 days naturally spread out over the course of the year - 85%, occasionally other days Altitude: <2,000 m Compliant with IEC 66068-2-1 for cold testing Compliant with IEC 66068-2-2 for dry heat testing Compliant with IEC 66068-2-30 for damp heat cyclic testing
Safety constraints:	Compliant with IEC 61010-1 Installation category: III Level of pollution: 2 Fire resistance: Conforms to UL94 for safety level V1
Mechanical constraints:	Protection level conforming to IEC 60529 for the following safety level: - IP 51 (on the front panel) - IP 20 (on the rear panel) Mechanical shock, compliant with IEC 66068-2-27 Vibrations according to 60068-2-6 Spring impact hammer resistance according to IEC 60068-2-75 Freefall in packaging from a height of 1m, in accordance with NF H 0042-1 Protection against mechanical impact according to NF 62262: rating IK05
Electromagnetic constraints:	Compliant with IEC 61000-6-5 (zones 1 and 2) Compliant with IEC 62052-11 (standard applied to electricity metering applications) Compliant with IEC 61000-4-2 with regard to electrostatic discharge Compliant with IEC 61000-4-3 with regard to electromagnetic fields Compliant with IEC 61000-4-4 with regards to bursts Compliant with IEC 61000-4-5 with regard to shockwaves Compliant with IEC 61000-4-6 with regard to disturbances caused by radioelectric fields Compliant with IEC 61000-4-8 with regard to magnetic fields at network frequency Compliant with IEC 61000-4-11 with regard to voltage dips, short interruptions and voltage fluctuations Compliant with CISPR22 with regard to conducted and radiated radioelectric interference

9. GLOSSARY

Delay between 2 requests: *minimum time between 2 consecutive requests on the RS485 bus.*

Modbus RTU: *non-proprietary communications protocol used for the exchange of information and data on a wired RS485 communications network. Frames are RTU (Remote Terminal Unit) type, with 8-bit data.*

Modbus slave address: *address of equipment fitted with a Modbus RS485 digital output.*

Profile: *set of variable(s) to be used in a device connected to the RS485 network.*

Slave address: *address associated with the IP address of equipment fitted with a ModbusTCP Ethernet output.*

Timeout: *Maximum time waiting for a response after sending a request through ELINK 61850 (3 attempts are made)*.

Definition of measurement categories:

- Measurement category IV corresponds to the measurements made at the source of the low-voltage installation.

Example: power supply, meters and protective devices.

- Measurement category III corresponds to measurements made in the building installation.

Example: electrical switchboard, circuit breakers, fixed industrial machines or apparatus.

- Measurement category II corresponds to the measurements made on circuits directly connected to the low-voltage installation.

Example: power supply to household electrical appliances and portable tools

10. WARRANTY, RESPONSIBILITY AND INTELLECTUAL PROPERTY

10.1 WARRANTY

Unless expressly stipulated, the warranty runs for twelve months after the date of supply of the monitor (extract from our General Conditions of Sale, available on request).

10.2 INTELLECTUAL PROPERTY RIGHTS

All manuals and documentation of any nature are the property of ENERDIS and protected by intellectual property rights, all rights reserved. They may not be distributed, reproduced, or translated, in whole or in part, in any manner and in any form whatsoever.

10.3 COPYRIGHT

First edition, June 2013.

10.4 REGISTERED TRADEMARKS

ELINK 61850 is a registered ENERDIS trademark.

10.5 EQUIPMENT END-OF-LIFE

The products which we sell do not fall within the scope of Decree No. 2005-829 relating to the construction of electrical and electronic equipment and the disposal of waste arising from this equipment.

In accordance with Article L541-2 of the Environmental Code, it is the responsibility of the holder of the waste to dispose of it, or to make sure it is disposed of, appropriately.

FRANCE
Enerdis
16, rue Georges Besse - Silic 44
92182 Antony cedex
Tel. : +33 1 75 60 10 30
Fax : +33 1 46 66 62 54
info@enerdis.fr
www.enerdis.fr

INTERNATIONAL
Enerdis
16, rue Georges Besse - Silic 44
92182 Antony cedex
Tel. : +33 1 75 60 10 30
Fax : +33 1 46 66 62 54
export@enerdis.fr
www.enerdis.fr