

IEC 61850 interface LINAX PQ5000CL

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GMC INSTRUMENTS

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1 Introduction

This manual documents the possibilities of the IEC61850 interface for the devices LINAX PQ5000CL. It describes:

- All available nodes
- The possibility to assemble reports freely

This manual is primarily intended for persons who are familiar with the basic principles of IEC61850 and who configure devices to be used in an IEC61850 system, specify the data to be transmitted and / or establish the connection to the IEC61850 client.

The interface supports Edition 2 of IEC61850. Further information on the IEC61850 protocol can be found in the standard "IEC61850 - Communication networks and systems for power utility automation".

Interface

The device provides an interface for communication with IEC61850 clients and time synchronization via NTP servers.

The factory setting of the IP address is 192.168.1.102

2 IEC configuration and assembly of reports

2.1 Reporting

Report Control Blocks (RCBs) provide a way to transmit measurement data in form of data objects from the server (measurement device) to the client (control system) when a trigger condition arrives. The user can freely assemble these data sets. The following trigger options come in question:

- Data change
- Quality change
- Data update
- Exceeding a time limit without sending data
- General interrogation

There are two different classes of RCBs:

- *Buffered Report Control Blocks (BRCB)*: When a trigger condition arrives data will be sent to the client. If there is currently no connection to the client or there are restrictions concerning data flow, data will be buffered for later transmission.
- *Unbuffered Report Control Blocks (URCB)*: When a trigger condition arrives data will be sent to the client. If there is currently no connection to the client or there are restrictions concerning data flow data may get lost.

The user can freely assemble the content of the data sets monitored by report control blocks. These data sets can be assigned to the available 20 URCBs and 10 BRCBs. Assembly is performed by means of the software «CBM Current Link Manager».

Each RCB can be used by one client only. If multiple clients should receive the same data, multiple RCBs with the same information must be provided.

Note: Measurement data can be requested via polling or general interrogation as well.

2.2 IEC61850 configuration

The IEC61850 related configuration of a device may be divided into the following blocks:

Parameter	Changeable via ...		Part of ICD/CID
	CBM Current Link Manager	Device website	
IED Name	■	-	■
Network settings IEC61850			
• IP address, subnet mask	■	-	■
• Gateway, DNS, NTP	■	-	-
• Host name	■	-	-
Firewall, Client Whitelist	■	-	-
TCP Keep-alive	■	-	-
Data sets	■	-	■
RCB settings	■	-	■
Deadband settings	■	■	-

The table shows that all relevant parameters of the IEC 61850 communication can only be changed using the «CBM Current Link Manager» tool.

2.3 CBM Current Link Manager

2.3.1 Data types

The tool can work with the following data types:

Data type	Contains	Importable	Storable
cbmproj	Project file	■	■
.tgz	Archive file with CID and the IEC61850 specific device configuration in XML format	■	■
.icd .cid	These files contain the device specific settings acc. 2.2, which is only a part of the whole IEC61850 configuration. When importing all other settings remain unchanged.	■	■
.scd	Such files contain the information about a complete substation, of the IEDs used in it and communication settings. When importing the .cid of a specific device will be extracted.	■	-

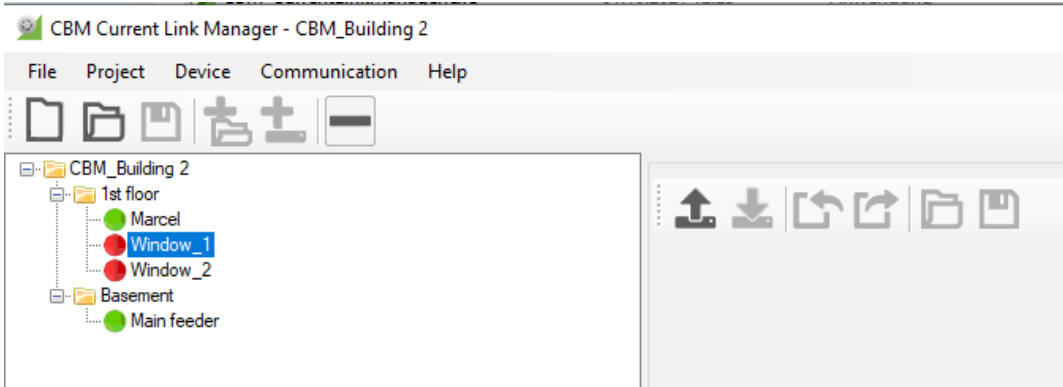
2.3.2 Structure of the software

Using the CBM Current Link Manager, similar devices can be managed in a network structure. This network structure can be set up after starting the software for the first time. Possible items are:

- Location (folder)
- Sublocation (sub-folder)
- Device

The structure can be saved as a project. The next time the software is started, the last used project is opened. All changes to the network structure must be saved in the project so that they are available the next time it is opened.

Project example

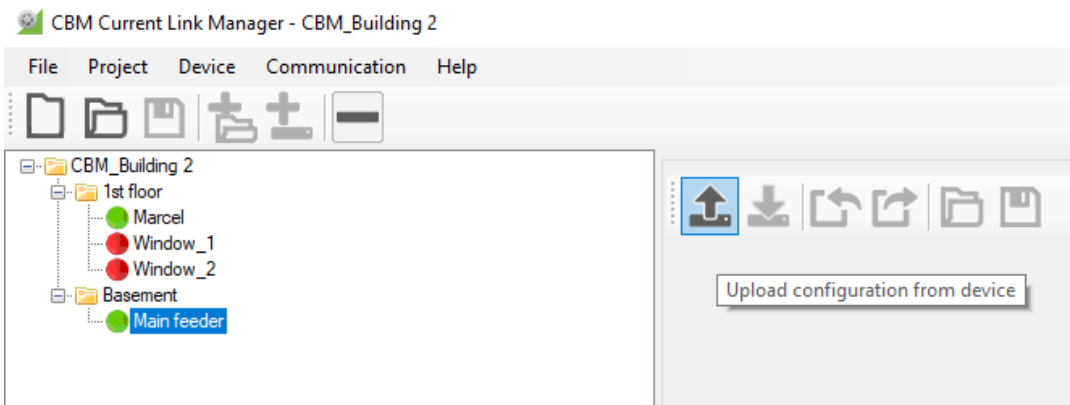


The tool monitors the connection to the devices and shows the state as follows:

- Device with existing connection
- Device with interrupted connection

2.3.3 Loading and saving

The tool allows changing the existing IEC61850 configurations of the devices. For that, the configuration of the device is read (as shown below for «Main feeder»).

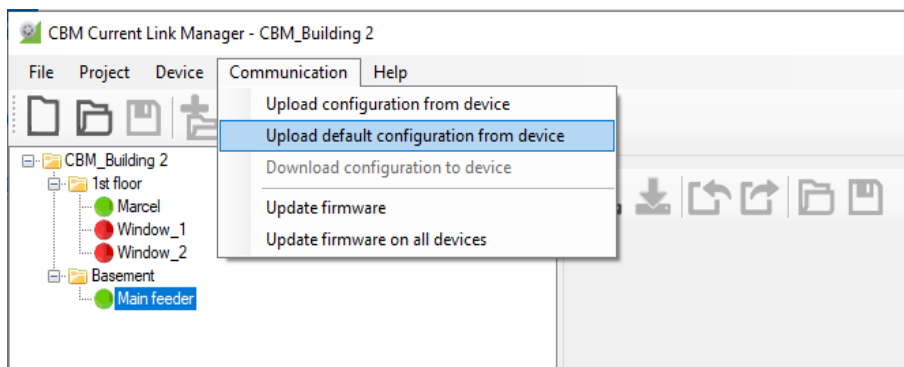


Reading the configuration from the device

Changed configurations can be directly transferred to the device or may be saved as tgz, icd or cid file.

Factory settings

In order to restore the factory settings with respect to IEC61850, a default configuration can be uploaded from the device:



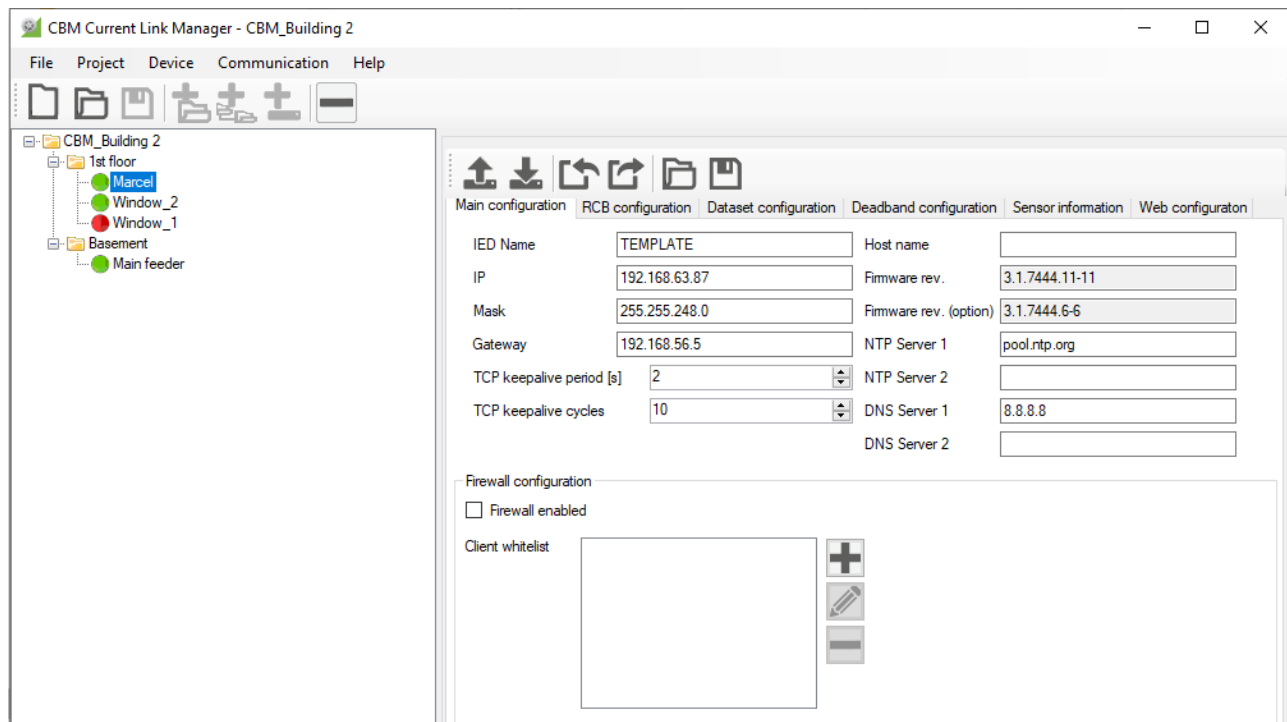
Hint

Only settings which are part of ICD/CID are reset, network settings as IP address and subnet mask remain unchanged.

2.3.4 Main configuration

In this part communication specific parameters can be adjusted:

- Network settings of the IEC61850 interface (IP address, subnet mask, gateway)
- NTP server addresses and (if required) DNS server addresses
- Behavior if there is no communication (TCP keep-alive)
- Access restrictions for IEC61850 communication via whitelist



Configuration overview

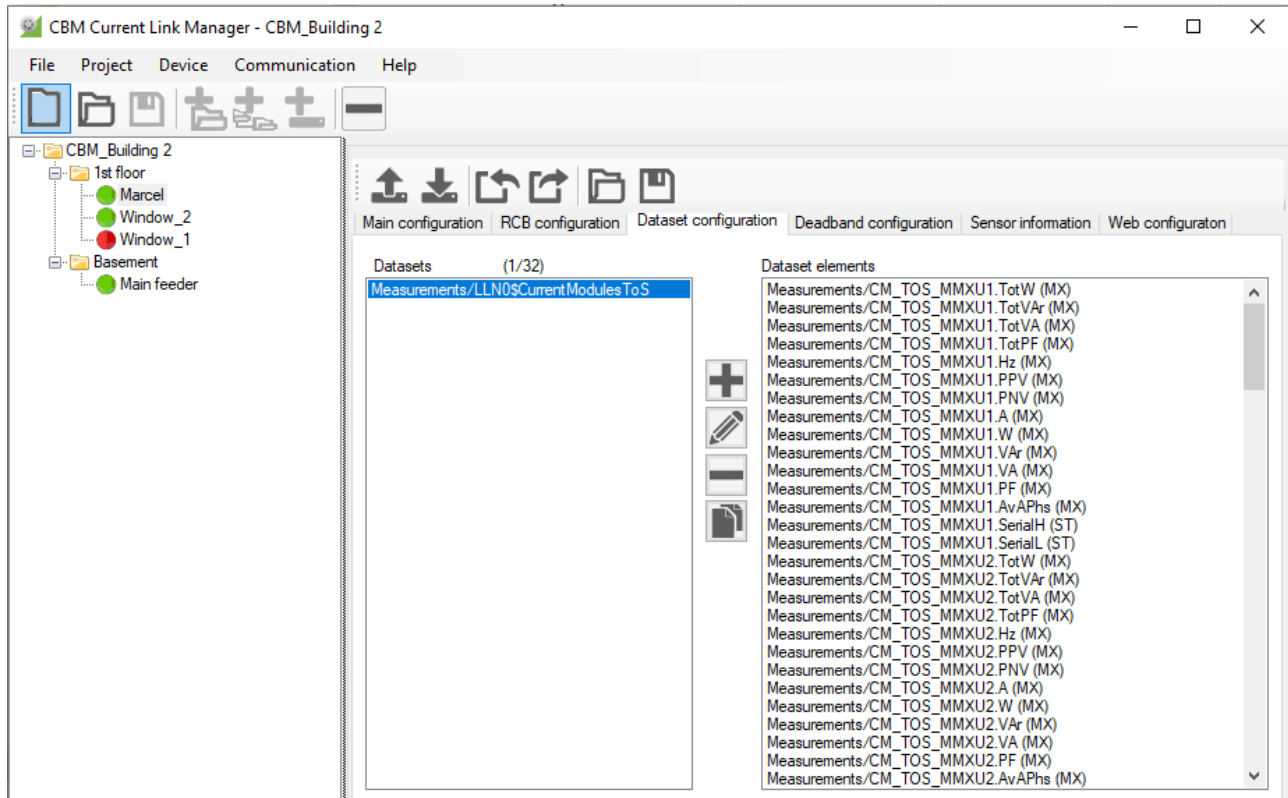
Hints

- DNS server settings are required only if NTP servers are defined via URL (e.g. pool.ntp.org) rather than via IP address
- The IED name has to be unique within the network, i.e. different for each IED
- If the firewall is enabled each attempt to establish a connection to the device is refused, if the IP address of the appropriate client is not listed in the client whitelist. Even a request via „ping“ will not be answered.

2.3.5 Assembly of datasets

A dataset is an assembly of measurement data, which are monitored by means of a Report Control Block. The basic configuration of the device contains already a pre-defined data set, containing the values of the Current Modules 1 up to 10.

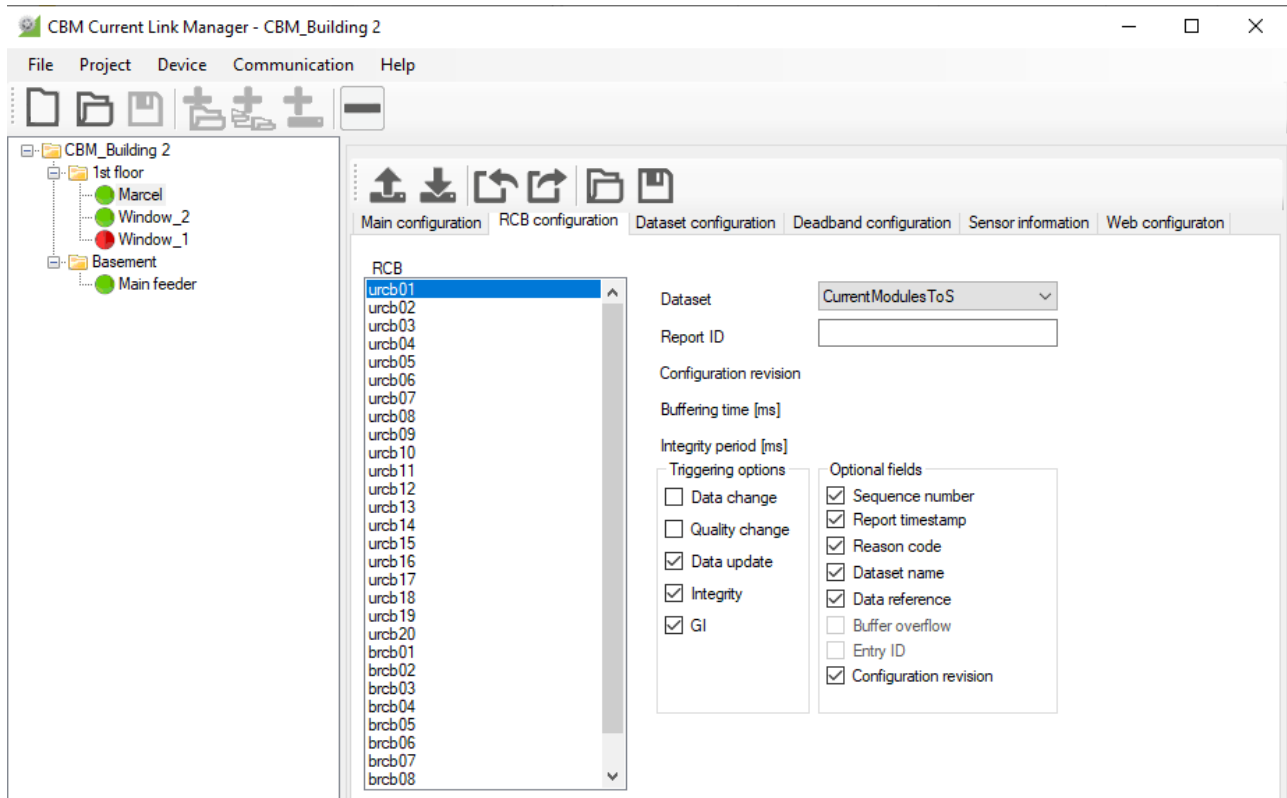
Device	Node	#	Quantity	Description	Object type
Current Module 1	CM_TOS_MMXU1	1f	Active power (system)	TotW	MV
		1f	Reactive power (system)	TotVAr	MV
		1f	Apparent power (system)	TotVA	MV
		1f	Power factor system	TotPF	MV
		1f	System frequency	Hz	MV
		3f	Voltage U12	PNV	DEL
		4f	Voltage U23	PNV	WYE
		10f	Phase currents, magnitude and angle	A	WYE
		3f	Active power per phase	W	WYE
		3f	Reactive power per phase	VAr	WYE
		3f	Apparent power per phase	VA	WYE
		3f	Power factor per phase	PF	WYE
		1f	Average current (I1+I2+I3)/3	AvAPhs	MV
		1i	Serial number (high word)	SerialH	INS
1i	Serial number (low word)	SerialL	INS		
...
Current Module 10	CM_TOS_MMXU10	1f	Active power (system)	TotW	MV
		1f	Reactive power (system)	TotVAr	MV
		1f	Apparent power (system)	TotVA	MV
		1f	Power factor system	TotPF	MV
		1f	System frequency	Hz	MV
		3f	Voltage U12	PNV	DEL
		4f	Voltage U23	PNV	WYE
		10f	Phase currents, magnitude and angle	A	WYE
		3f	Active power per phase	W	WYE
		3f	Reactive power per phase	VAr	WYE
		3f	Apparent power per phase	VA	WYE
		3f	Power factor per phase	PF	WYE
		1f	Average current (I1+I2+I3)/3	AvAPhs	MV
		1i	Serial number (high word)	SerialH	INS
1i	Serial number (low word)	SerialL	INS		



The user can rename, change, duplicate or delete the existing data set or create new data sets. A maximum of 32 data sets may be defined.

2.3.6 Defining Report Control Blocks

The user can freely select which data set is monitored via the appropriate RCB. Also, the trigger options to be monitored may be pre-selected, but can be changed by the client reserving the RCB for itself.

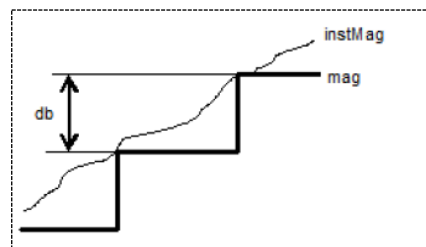


Hints

- „**Buffering time**“ is the time after recognizing a first trigger events, during which data of further event is collected until an RCB with all events is sent. A time of 0 disables the mechanism described.
- When the „**Integrity period**“ expires, which starts when the last RCB has been sent, a report including all elements of the associated data set will be sent. To do this, the triggering option „Integrity“ has to be selected. A value of 0 disables the described mechanism. However, this option avoids that no report is sent for a long time because none of the trigger conditions is met and therefore the connection is closed.

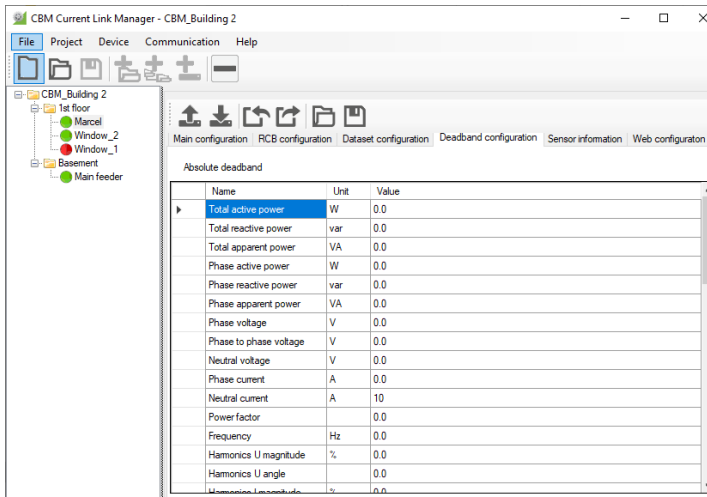
2.3.7 Deadband settings

Data are transferred e.g. due to data change. A data change is a change of a measured value within the dataset by a certain value, the deadband db, since the last reporting of the measured value. If the deadband is 0 or set to a very low value, measurements will be sent to the client after almost each update, which can lead to an unmanageable flood of data.



IEC 61850-7-3

Deadbands can be defined per measured value or measured value group. The default setting for all values is 0. The settings can be changed both via the CBM Current Link Manager and via the web interface of the device.



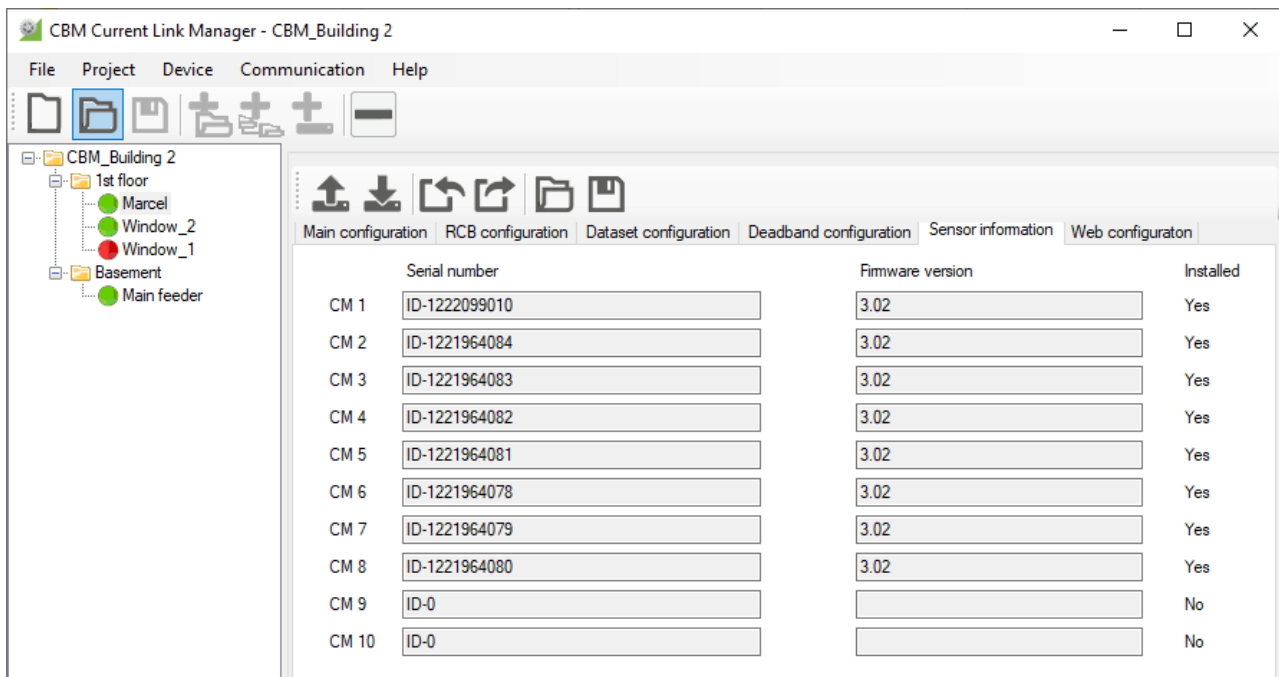
CBM Current Link Manager



WEB-Interface: Settings | IEC61850

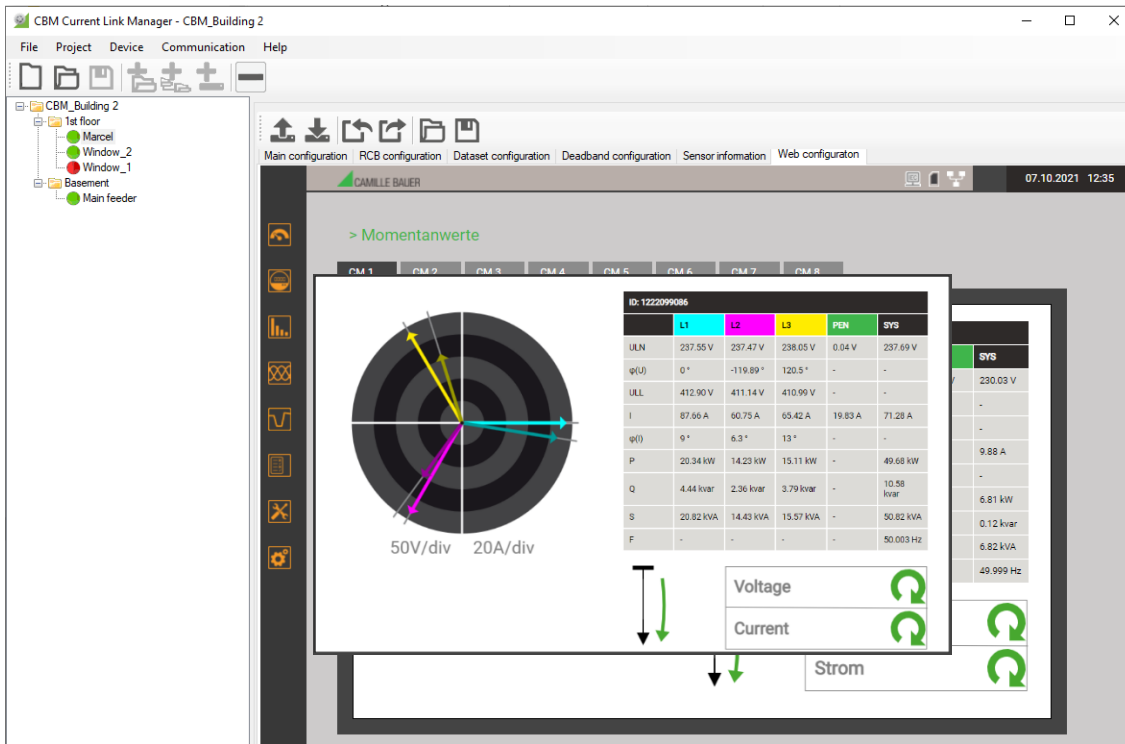
2.3.8 Sensor information

For each device an overview of the connected sensors can be displayed.



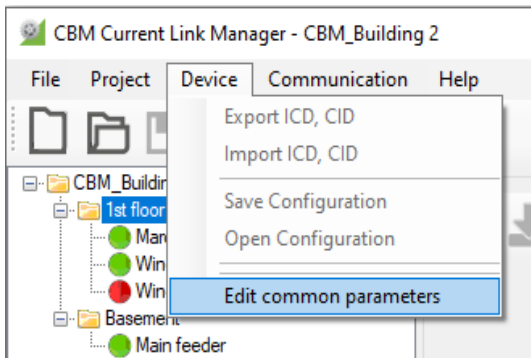
2.3.9 Web-configuration

For the selected device the Web-interface can be displayed. This way, measurement data can be displayed, service functions may be executed and the settings of the appropriate device can be changed.

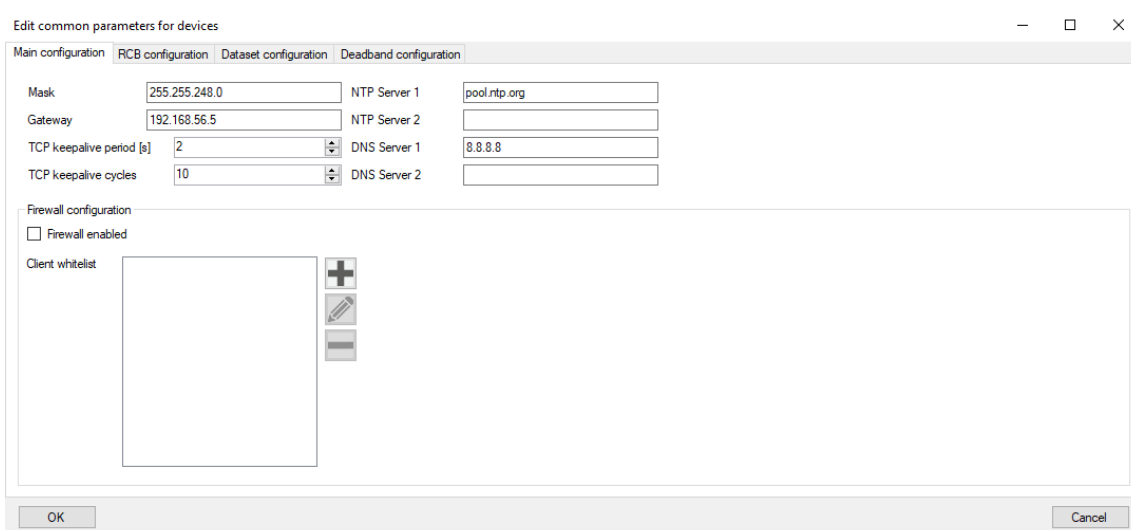


2.3.10 Changing IEC61850 parameters for multiple devices

IEC61850 parameters can be changed for multiple devices at the same time. For that, first the group of the devices to be changed needs to be fixed by selecting a Location / Sublocation. Then via «Device» the function «Edit common parameters» is selected.



In the window displayed then, any parameter can be changed, which then will be stored in all devices of the selected group after selecting «OK».



3 Available Nodes

3.1 Top-of-Second Measurements CM_TOS_MMXU1...10

Description	DO	CDC	AttrName	Explanation	Type
Settings (CF, DC)					
Calculation method	ClcMth	ENG		TRMS	
Calculation mode	ClcMod			Periodic	
Interval type	ClcIntvTyp			CYCLE	
Interval length	ClcIntPer			10	
LN Name Plate	LPL	VisString	d		
			swRev		
OverCurrentTrigger	A	RangeC	A.phs{A...C}.rangeC		
Measured values (MX)					
Active power	TotW	MV	mag.f	Active power (system)	float
Reactive power ²⁾	TotVAr	MV	mag.f	Reactive power (system)	float
Apparent power	TotVA	MV	mag.f	Apparent power (system)	float
Power factor	TotPF	MV	mag.f	Power factor system	float
Frequency	Hz	MV	mag.f	System frequency	float
Phase-to-phase voltages	PPV	DEL	phsAB.cVal.mag.f	Voltage U12	float
			phsBC.cVal.mag.f	Voltage U23	float
			phsCA.cVal.mag.f	Voltage U31	float
Phase-to-neutral voltages	PNV	WYE	phsA.cVal.mag.f	Voltage U1N	float
			phsB.cVal.mag.f	Voltage U2N	float
			phsC.cVal.mag.f	Voltage U3N	float
			neut.cVal.mag.f	Voltage UNE	float
Phase currents	A	WYE	phsA.cVal.mag.f	Current I1	float
			phsA.cVal.ang.f	Phase angle I1	
			phsB.cVal.mag.f	Current I2	float
			phsB.cVal.ang.f	Phase angle I2	
			phsC.cVal.mag.f	Current I3	float
			phsC.cVal.ang.f	Phase angle I3	
Neutral current ¹⁾			neut.cVal.mag.f	Current IN	float
			neut.cVal.ang.f	Phase angle IN	
Earth current ¹⁾			res.cVal.mag.f	Strom IPE	float
			res.cVal.ang.f	Phase angle IPE	
Active power per phase	W	WYE	phsA.cVal.mag.f	Active power L1	float
			phsB.cVal.mag.f	Active power L2	float
			phsC.cVal.mag.f	Active power L3	float
Reactive power per phase	VAr	WYE	phsA.cVal.mag.f	Reactive power L1	float
			phsB.cVal.mag.f	Reactive power L2	float
			phsC.cVal.mag.f	Reactive power L3	float
Apparent power per phase	VA	WYE	phsA.cVal.mag.f	Apparent power L1	float
			phsB.cVal.mag.f	Apparent power L2	float
			phsC.cVal.mag.f	Apparent power L3	float
Power factor per phase	PV	WYE	phsA.cVal.mag.f	Power factor L1	float
			phsB.cVal.mag.f	Power factor L2	float
			phsC.cVal.mag.f	Power factor L3	float
Average current	AvAPhs	MV	mag.f	Average current (I1+I2+I3)/3	float
Serial no. (high word) ²⁾	SerialH	INS	stVal	Module serial no. HWORD	INT32
Serial no. (low word)	SerialL	INS	stVal	Module serial no. LWORD	INT32

1) I_N is measured if 3PN modules are used and calculated when using 3P modules

I_{PE} is calculated if 3PN modules are used and zero when using 3P modules

2) The serial number of the modules (name plate) is divided in two 32-bit-values. It can be used in the system to assign a measurement of a node uniquely to a measuring point or the used Current Module.