

TECH NOTE :: ClipX as OPC-UA server

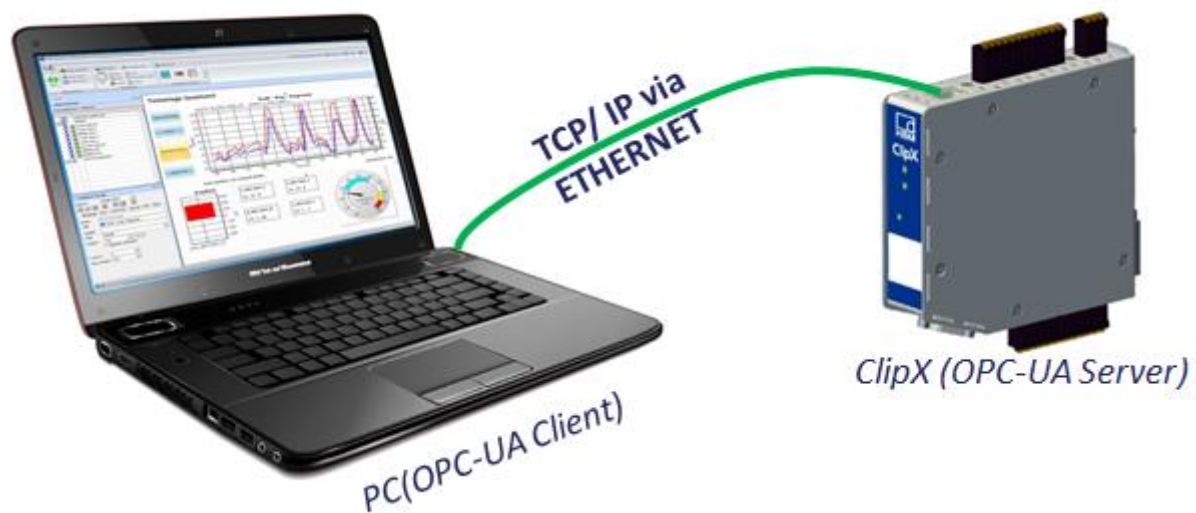
Version: 2019-05-28
Author: Michael Guckes
Status: HBM: Public

Brief description

This is a quick guide for using a ClipX-module as an OPC-UA server by controlling it with a pc.

In the following examples, the HBM software tool 'ClipX Dataviewer OPC UA' is used. The Software can be downloaded from the HBM ClipX website:

<https://www.hbm.com/de/7077/clipx-praeziser-leicht-integrierbarer-messverstaerker/>



Building sketch

Introduction

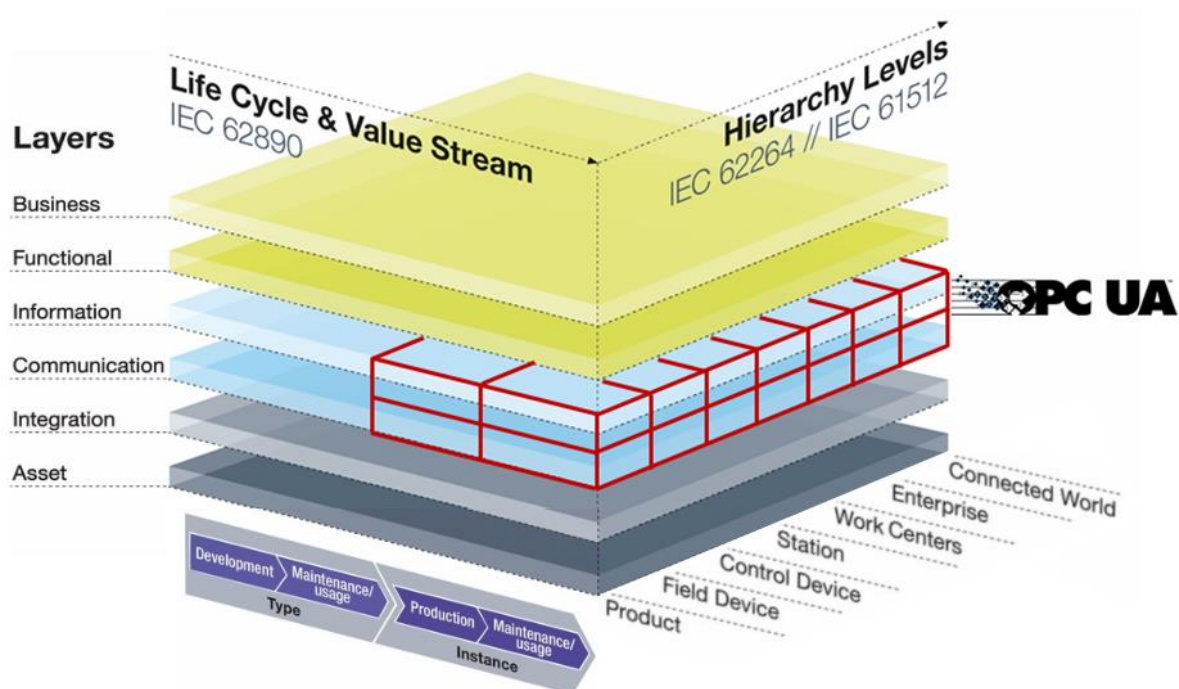
OPC Unified Architecture

OPC Unified Architecture (short OPC UA) is developed by the OPC Foundation. It is a TCP/IP based communication technology, which makes it possible not only to transmit machine data, but also to describe it machine-readable semantically. OPC-UA allows the user an independent exchange of data and information in the field of the industrial automation and is also designated as M2M (machine-to-machine) communication protocol.

This technology brings a lot of advantages for the user:

- The new network and communications technologies enable processes to be streamlined and made more transparent
- Production control becomes easier, since it is extensively automated and remote-controlled
- The systems themselves report on their “health”, which optimizes maintenance
- Using modern systems in the IIoT helps lower manufacturing costs while boosting quality and speed
- Deployment of a lot of manpower and staff trainings is no longer required.

Furthermore, OPC-UA covers a large part of the three-dimensional reference architecture model for Industry 4.0:



Connecting the PC (Client) to the ClipX OPC-UA Server

To control the ClipX OPC-UA server via a client (e.g. PC(C#), OPC-UA client, scada systems with OPC-UA), the client is connected via an Ethernet cable to the Ethernet port of the ClipX. The ClipX module can be connected directly to the client (Building sketch on page 1), or - to use several modules – via a switch (figure below).

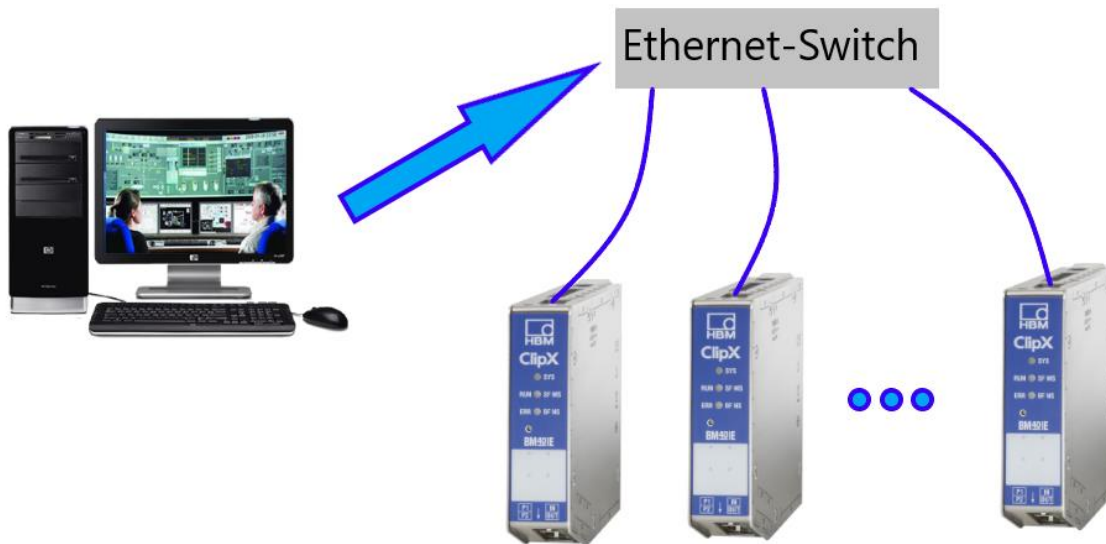


Figure: Connection of several ClipX-modules (OPC-UA Server) with a PC (Client)

This way up to several hundred ClipX modules can be controlled and used as a server. Optional the ClipX modules can be interconnected via the ClipX-bus (max. 6 modules), whereby only one module per group has to be connected to the switch or the client.

- Data rate up 20 Hz with NTP(Network Time protocol)-time-stamp (jitter up to 50ms)
- Up to 2 Sessions per device
- 1 subscription per device
- Up to 6 values per device
- All measured values and calculated channels are simultaneously available as data from the fieldbus
- Sampling interval 20ms
- Publishing interval 100ms (Queue size 1...10)
- Full configuration with commands of the software (C#) or the OPC-UA client

Outlook:

Furthermore an intelligent, networked and communicating production environment will be created, whereby maintenance, operation and the production process can be improved and simultaneously costs can be lowered.

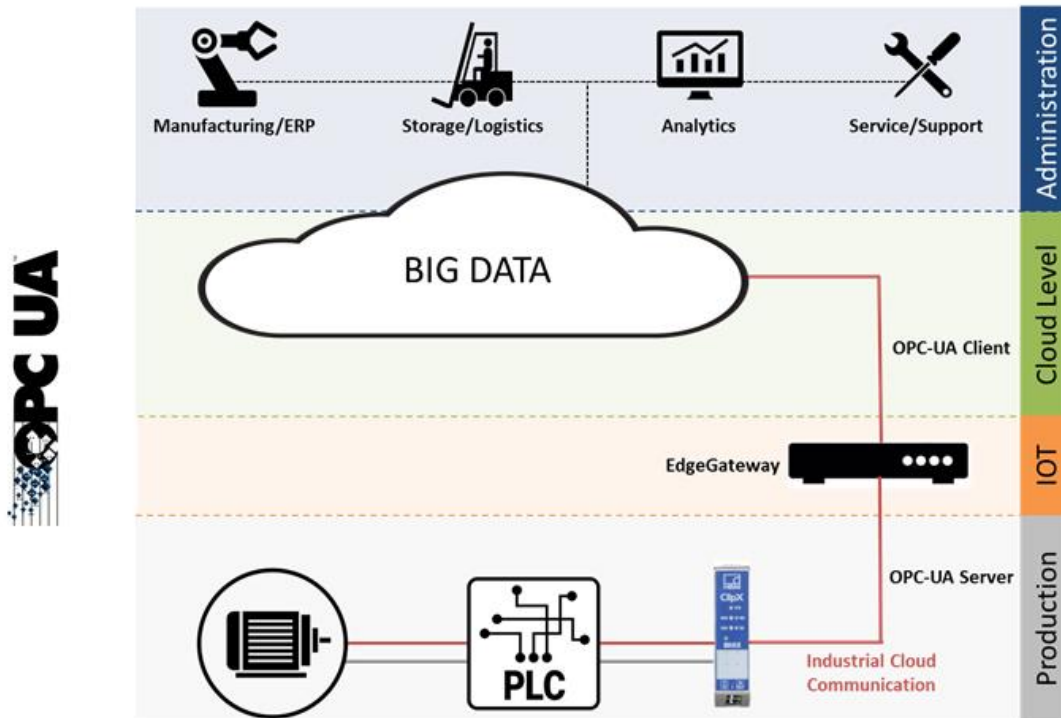


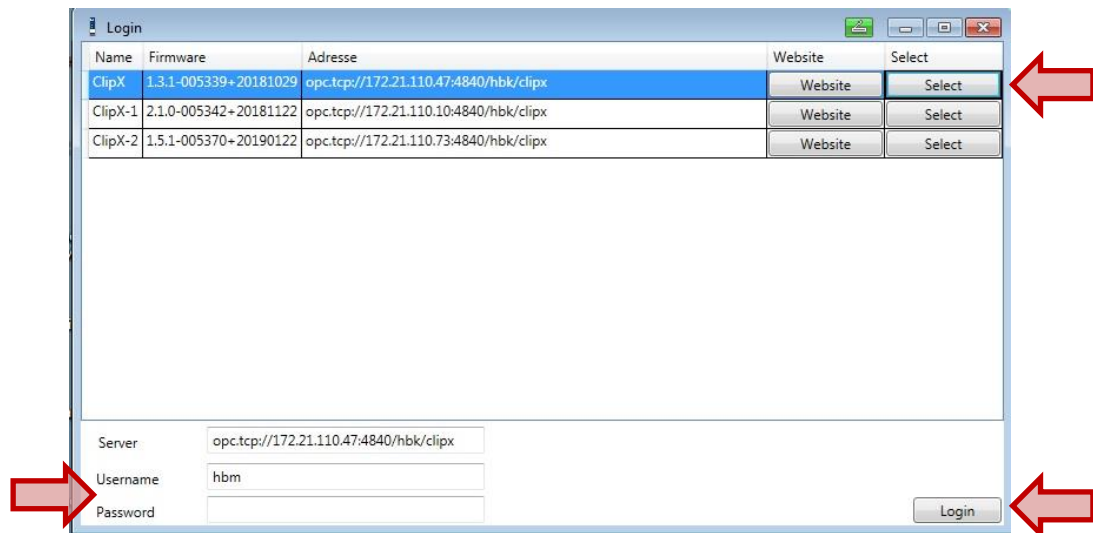
Figure: Example of integration into the Cloud

Connection and set up

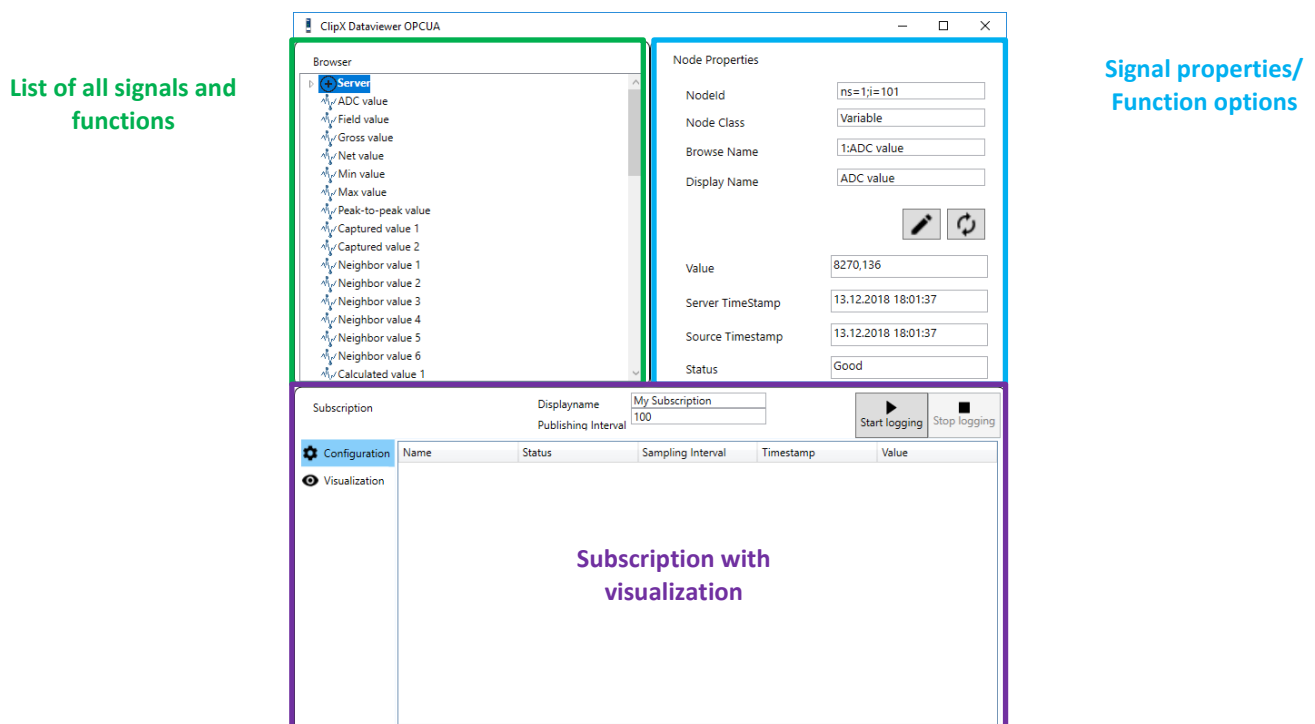
In the following, a few examples are shown, which illustrate using OPC-UA with the HBM tool 'ClipX Dataviewer OPC UA'.

To link the ClipX module with the software, the Endpoint-URL (IP or name) of the ClipX is required. It can either be taken from the 'Network' menu item of the ClipX web server or filled out using the 'Select' button in the integrated device scan of the tool. Enter your username and password and click 'Login'.

Note: Only devices with firmware and hardware version 2,0 or higher are supported.



The structure of the tool is as follows:



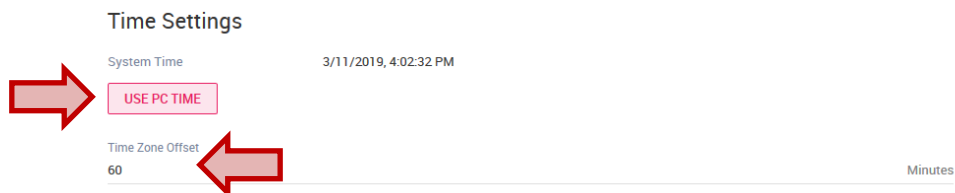
Information to the time stamp

During the measurement ClipX transmits the UTC time stamp (the time stamp without the time zone offset). The HBM tool 'ClipX Dataviewer OPC UA' adds the offset which is set in the operating system.

To get the right time in the data viewer the right offset must be set in ClipX and in the operating system.

Example:

We use ClipX in Germany (winter time). The corresponding UTC time stamp is UTC +01:00. So, the offset in ClipX has to be set to 60 minutes (menu item: 'Network') and then the PC time is used.



In this example it is 4:02 PM or 16:02 h. Because ClipX sends the time stamp without offset, the time 15:02 h is transmitted to the client. Now the software adds the time zone offset of the operating system (one hour).

ClipX time	ClipX offset	Send time	Offset of the OS	Time in data viewer
16:02	-120	18:02	60	19:02
16:02	-60	17:02	60	18:02
16:02	0	16:02	60	17:02
16:02	60	15:02	60	16:02
16:02	120	14:02	60	15:02

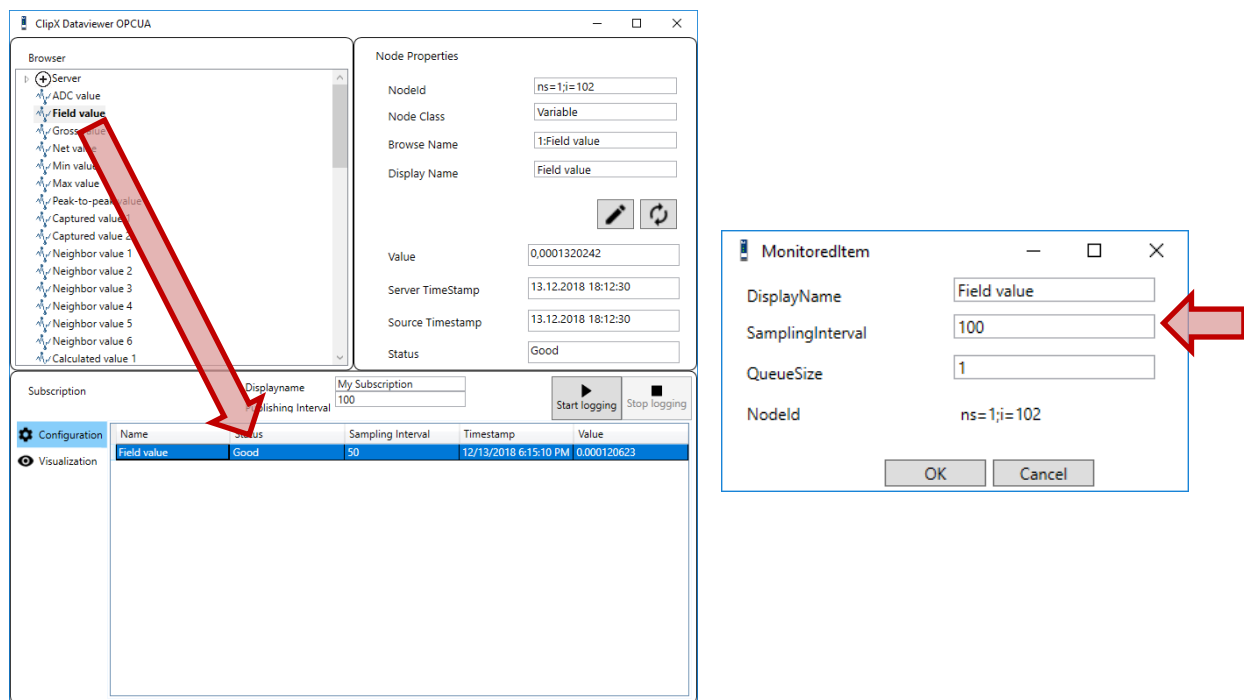
Table: Time error in case of wrong set offset

Examples

Adding a signal to the subscription and visualize

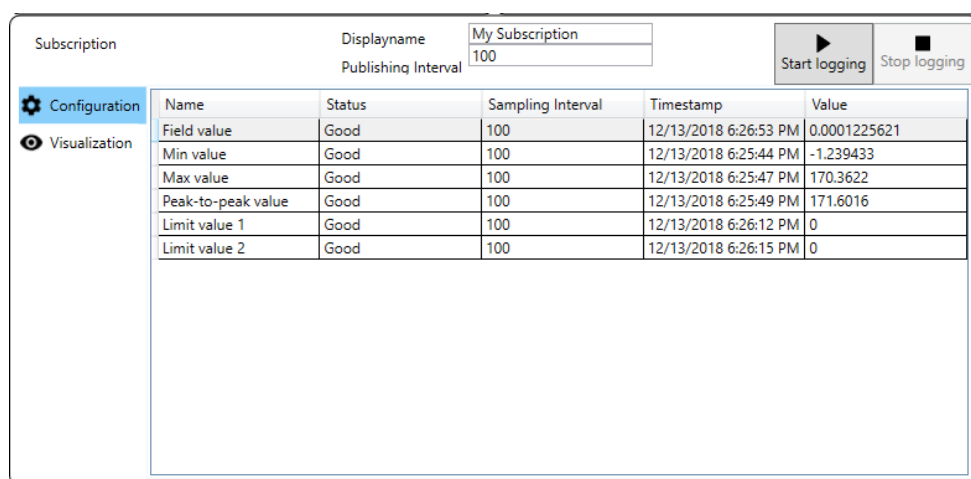
Now a Signal should be added to the subscription.

- Add the desired signal to the subscription via drag and drop
- In the following pop up menu a name, the sampling interval and the queue size can be selected



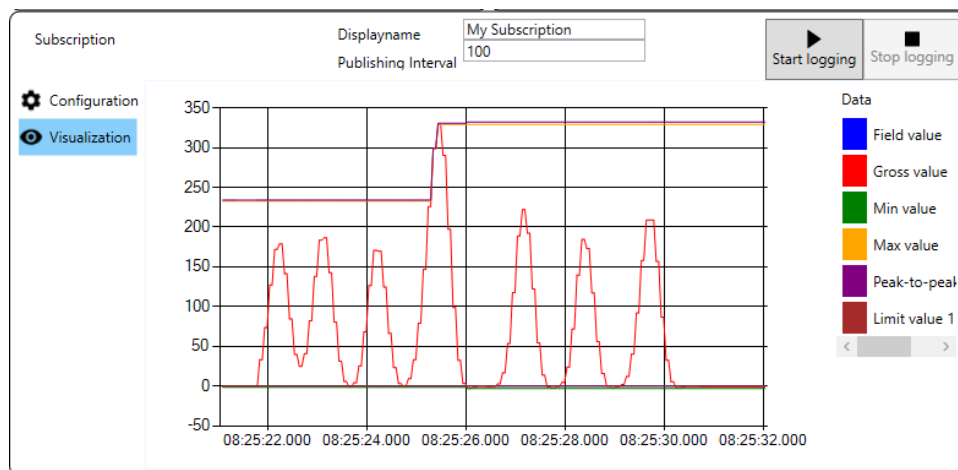
The signal is now also listed in the lower menu item 'Subscription'. Also you can see its current status, the sampling interval and the actual value.

Like this up to 6 signals can be added to the subscription.



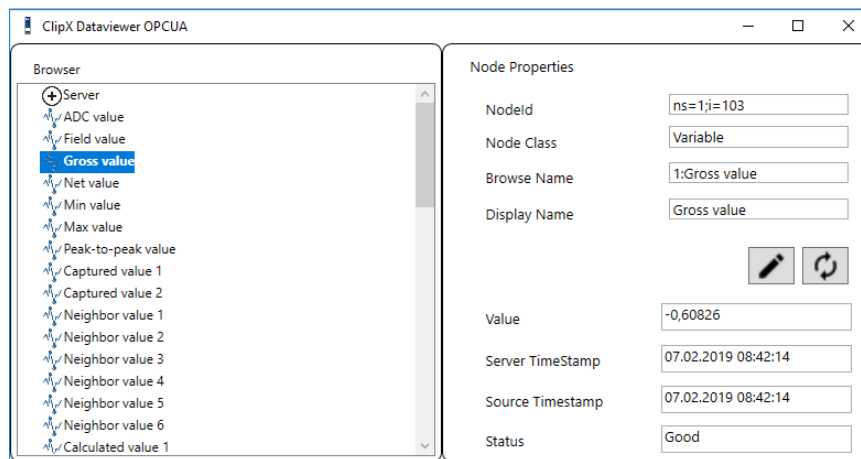
Note: The time is only shown correctly in the subscription if the time zone offset in ClipX is set to zero minutes!


The added Signals can be shown at the menu item 'Visualization':



The colors of the signals can be changed by right clicking the signal and then selecting 'Change Color'.

The current value of a signal is also shown in its 'Node Properties' on the right side.

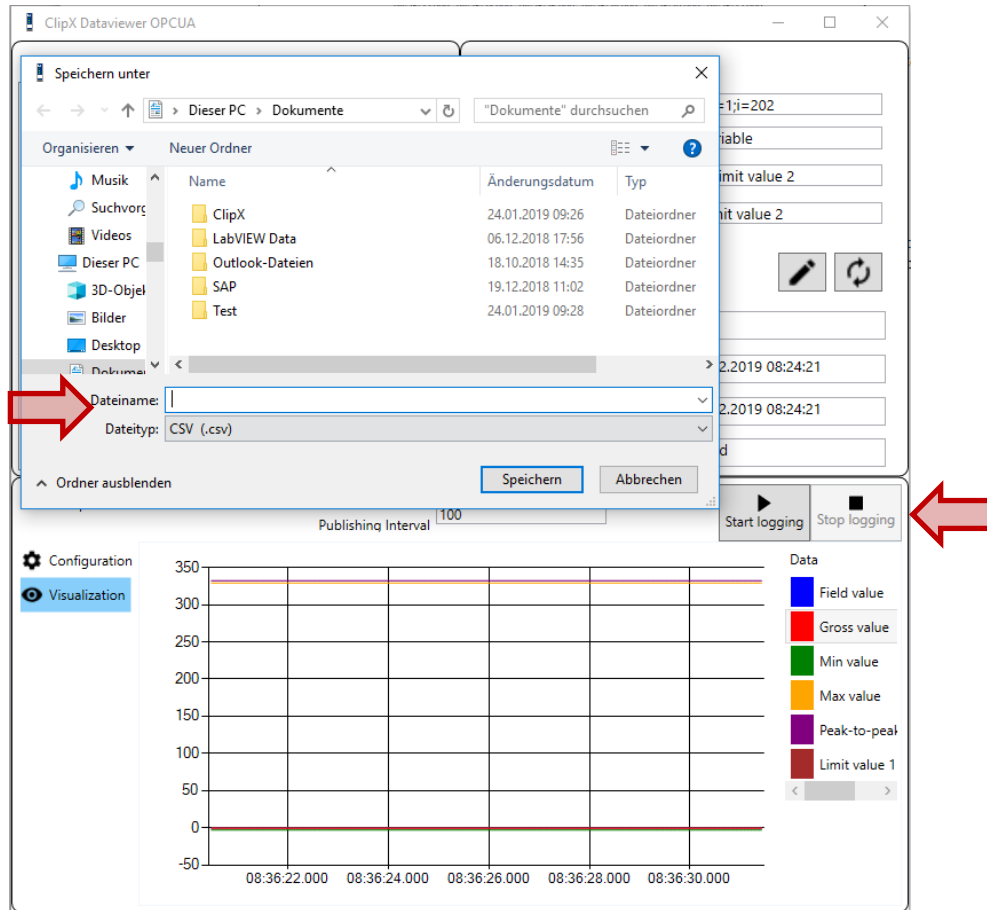


By clicking the  symbol the value is refreshed.

Logging a signal

Now the values of the signal added to the subscription should be logged.

To start click 'Start logging' and to stop it click 'Stop logging'. After the process is stopped, a menu pops up, where the file name and path can be selected.



Function call „Set ... zero“

In the upper left part ‘Browser’ of this tool, there are all signals and functions.


Signals:

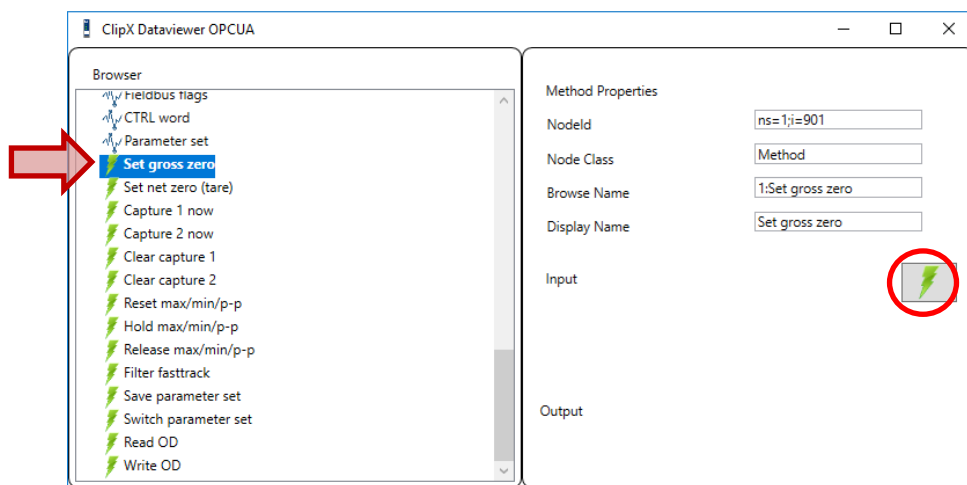


Functions:



In this example the gross value is zeroed.

- Select ‘Set gross zero’ in the browser
- Now click the  symbol on the right side to call the method



Function call „Object directory read/write“

Preparation: To read the object directory or write in it, the following data is required:

Task	Read	Write
Index	Yes	Yes
Subindex	Yes	Yes
Value & Type	No	Yes

Therefore, the object directory of the ClipX has to be downloaded. (ClipX menu item ‘Device Storage’; clipx_od.csv)

In our example we want to read from the object directory, which filter is currently used.
After that, we want we want to set the filter from Bessel (=3) to Butterworth (=2).

The following data can be taken from the csv-file:


Arbeitsmappenansichten		Anzeigen		Zoom		Fenster			
A109		measval/							
	A	B	C	D	E	F	G	H	I
1	Path	Name	Idx	SubIdx	Type	Access	Description		
105	teds/	usrDefIdStr	0x4300		22 STRING	RO	User defined ID		
106	teds/	uccStr	0x4300		23 STRING	RO	UCC string		
107	measval/	transdModeEnum	0x4400		1 UINT8	RWS	Transducer and mode enum		
108	measval/scaling/	pt100OutUnitEnum	0x4400		3 UINT8	RWS	PT100 output unit 0:degC, 1:degK, 2:degF		
109	measval/	filterType	0x4401		1 UINT8	RWS	Filter type, 3=Bes, 2=But		
110	measval/	filterCutOffFreq	0x4401		2 FLOAT	RWS	Filter cut-off frequency in Hz		

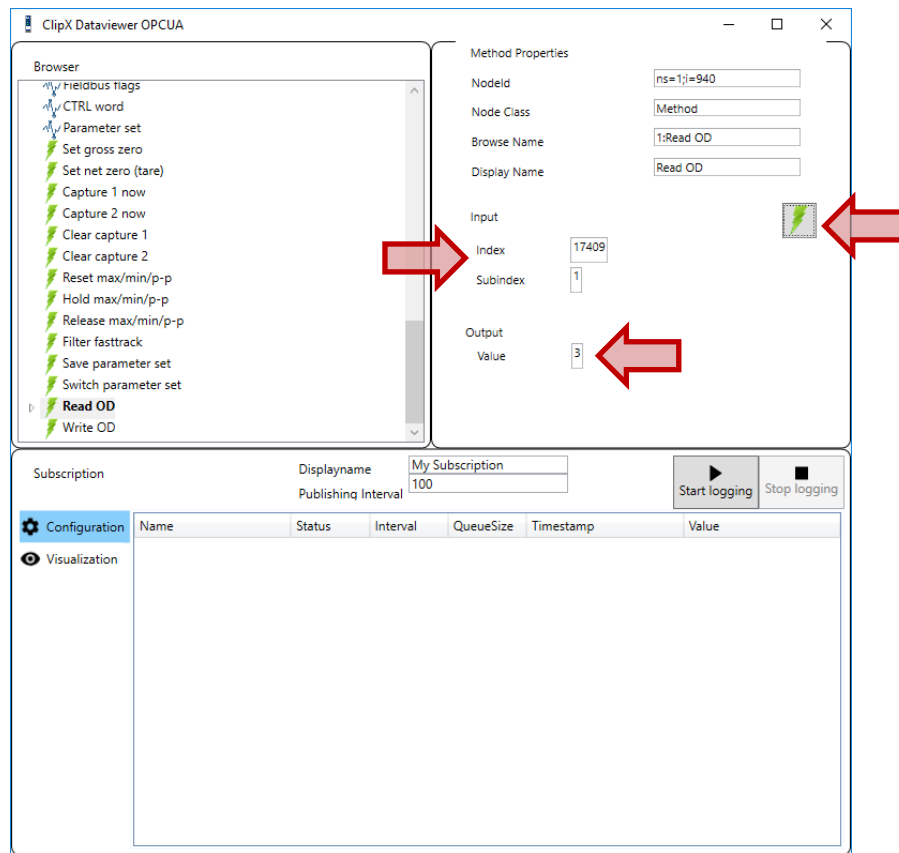
Index = 0x4401 Subindex = 1 Type = UINT8 → corresponds to Byte

What we need here is the decimal index:

Hex = 4401 → Dec = 17409

Read:

- Select the item 'Read OD' in the browser
- On the right side, index and sub index can be entered
- Call the method by clicking the 

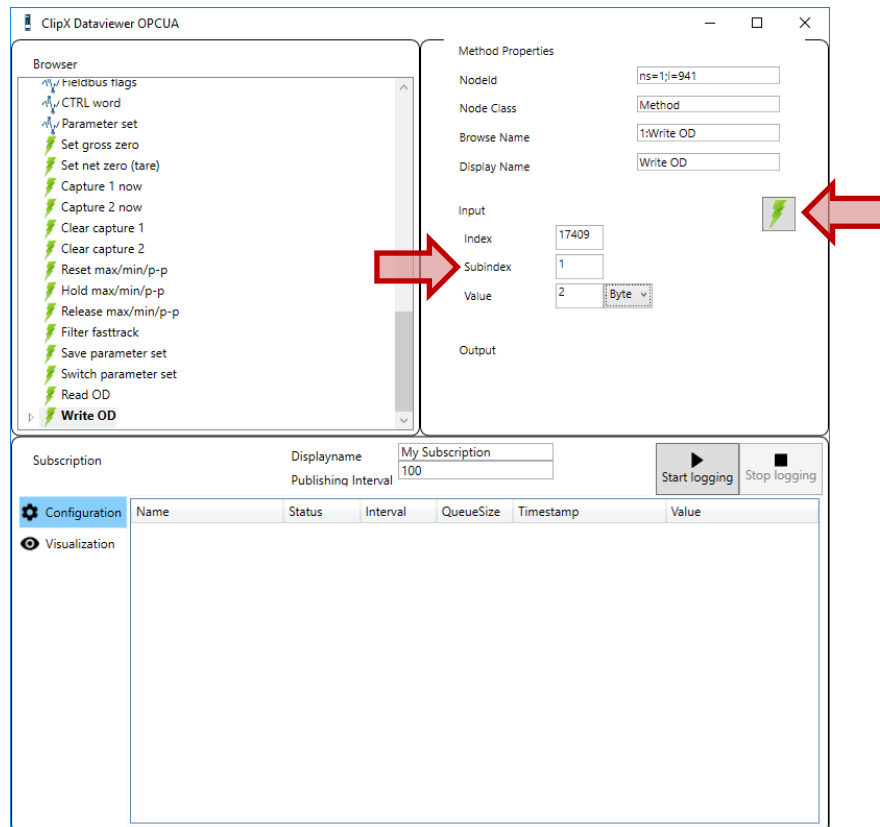


Write:

Now we want to set the filter to 'Butterworth'. This filter corresponds, as you can see in the csv-file, to the value 2.

- In the list 'Objects', select the item 'Write OD'
- In this case the data type must be set to 'Byte'
- In the right column, the input arguments (index, sub index and value) are entered

Hint: You won't receive an output.



Now the filter is changed.

Disclaimer

These examples are for illustrative purposes only. They cannot be used as the basis for any warranty or liability claims.