TECH NOTE :: ClipX Mechanical work

Version: 2018-10-18
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Status: HBM: Public

Brief description

This is a guide to measuring mechanical work with the ClipX. This requires two ClipX modules; one to measure the force, the other to measure the distance. The calculation determines the (mechanical) work over a certain period of time from the two variables force and displacement (or torque/angle of rotation). The force must act along the path.
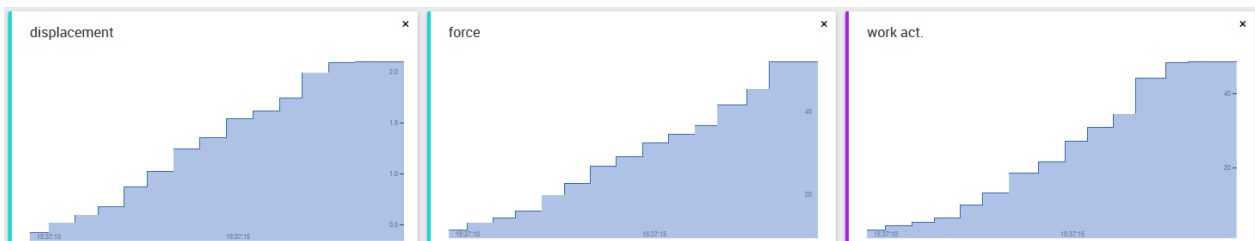
$$W = \int \vec{F} \, d\vec{s}$$

figure 1: measurement force, displacement; Calculation work

Preparations

The following materials are required to perform the measurement:
- 2 ClipX-systems
- Force transducer (here: HBM U9B)
- transducer (here: Novotechnik T25)
- 3 ethernet cables (two to connect the ClipX with the switch; one to connect your pc)
- Switch
- 2 connecttion cable: sensor ←→ClipX

Each ClipX has to be connected to one sensor and both of them must be connected to the switch.
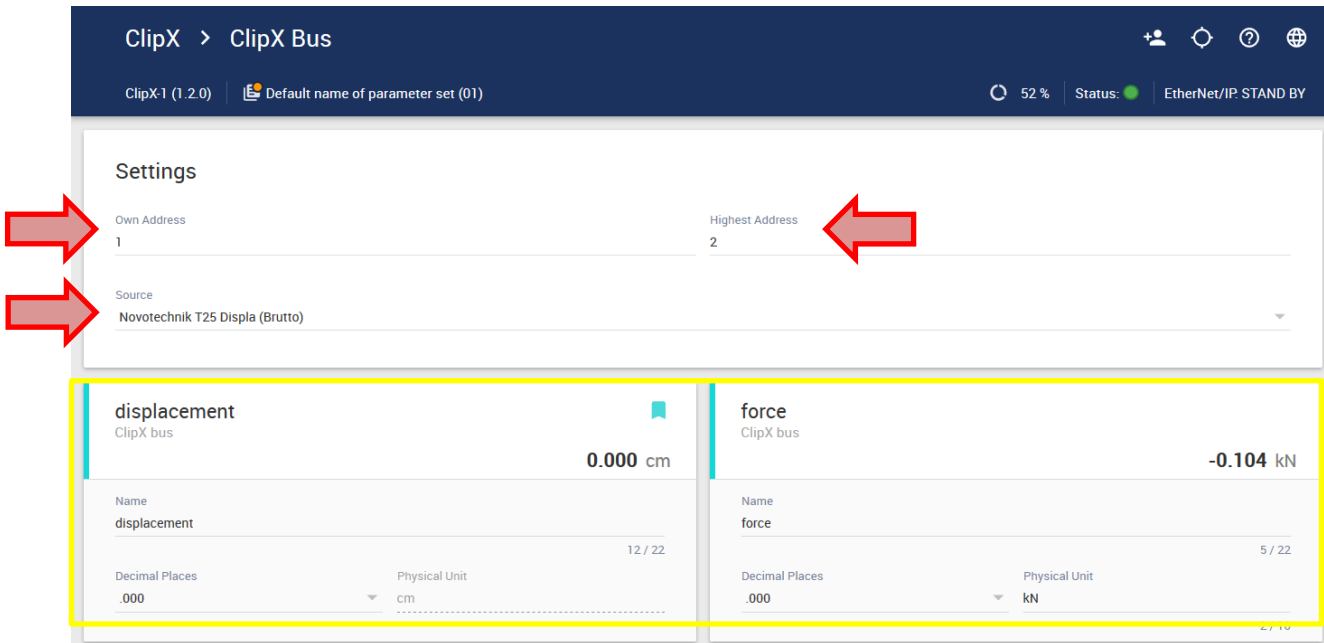
Builduing sketch
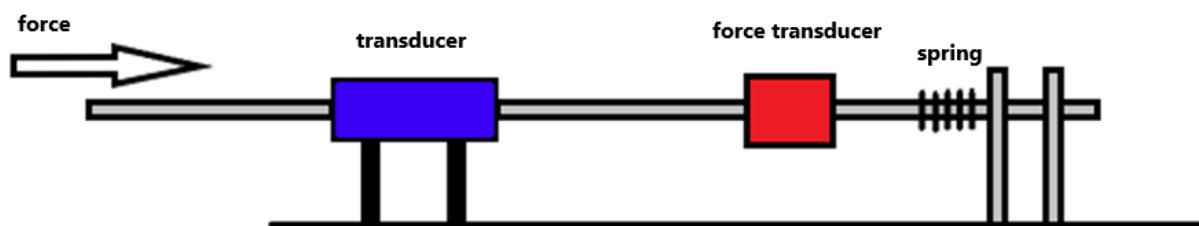
Note: The measured force must have the same direction as the displacement.
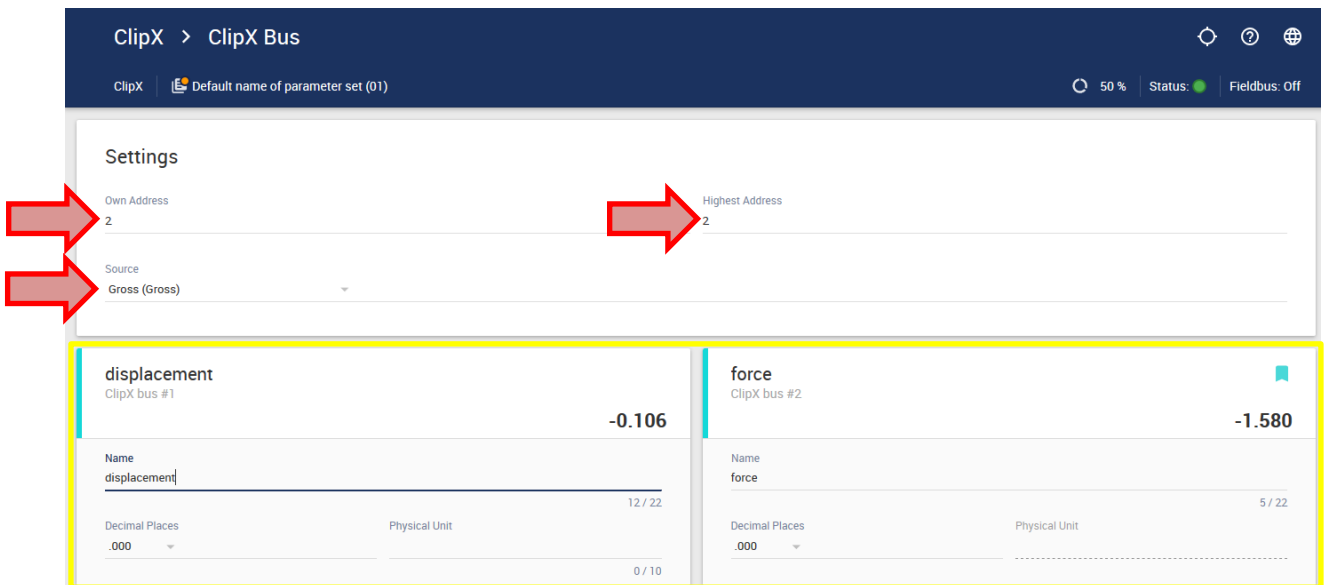
Presettings in the ClipX

To be able to work with both signals on one ClipX, a few settings have to be made.

In menu item "ClipX-Bus" of one of the two devices, the own address must be set to "1" and the highest address to "2". As source, we select our required signal (here: transducer signal).

In the second ClipX the own address must be set to "2" and the highest address to "2". As source, we select our required signal (here: force transducer signal).
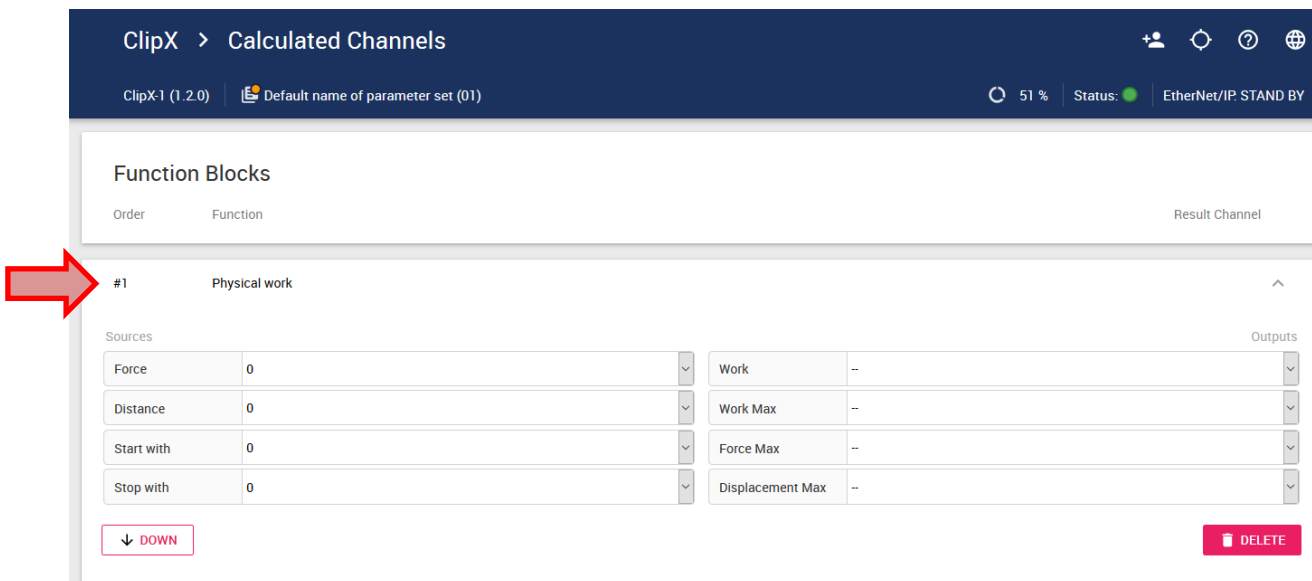

In this menu, names are assigned to the two buses for a better overview (here: force, displacement; yellow framed).

Now both ClipX-systems can work with the signal of the other.

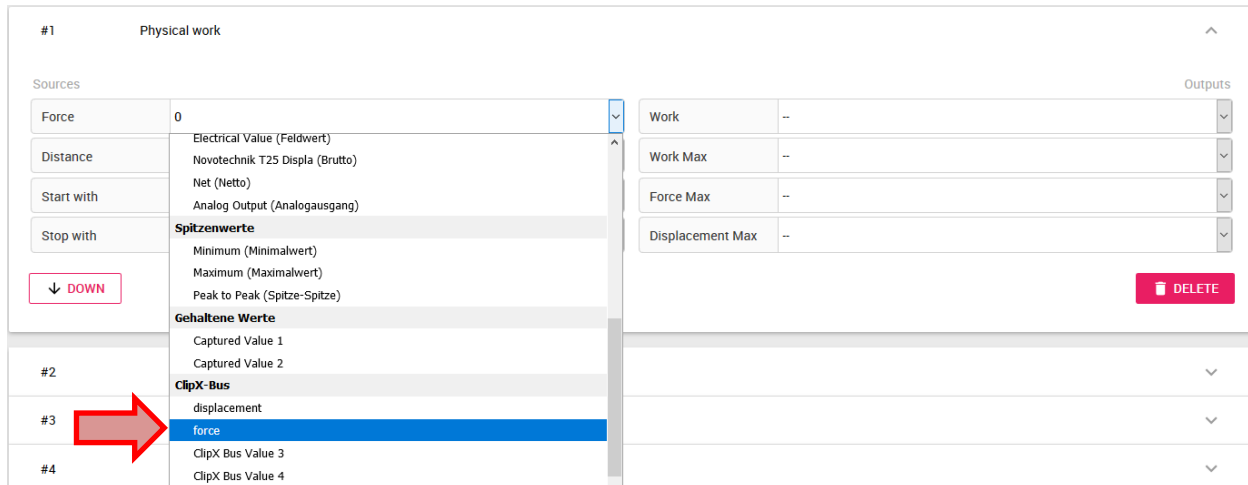# Measurement of the mechanical work

Settings in the ClipX

At first, in the menu item "Calculated Channels" a new function block with type "Physical work" must be added.

Now the sources are defined:

- Force: Here you select the ClipX-Bus on which the force signal resides (here: named as "force" in the ClipX-Bus settings).

- Displacement: Here you select the ClipX-Bus on which the displacement signal resides (here: named as "displacement" in the ClipX-Bus settings).
- Start with: "Digital input 1" is selected here as the start signal (any digital signals are possible here).
- Stop mit: "Digital input 2" is selected here as the start signal

Now the settings look like this:

Now the Outputs are defined:

The calculated channels can be renamed below for a better overview. Also a physical unit can be added.

Measurement

- The measurement starts with the rising flank of digital input 1
- It is finished with the rising flank of digital input 2
- At start of the measurement all measurement values are set to zero

Visualization

In menu item "Visualization", the signals can be visualized as y(t)-graph, level display or digital display.

This is shown here as an example for a signal.
Click the "+"-button to add a new signal and make for example the following settings.
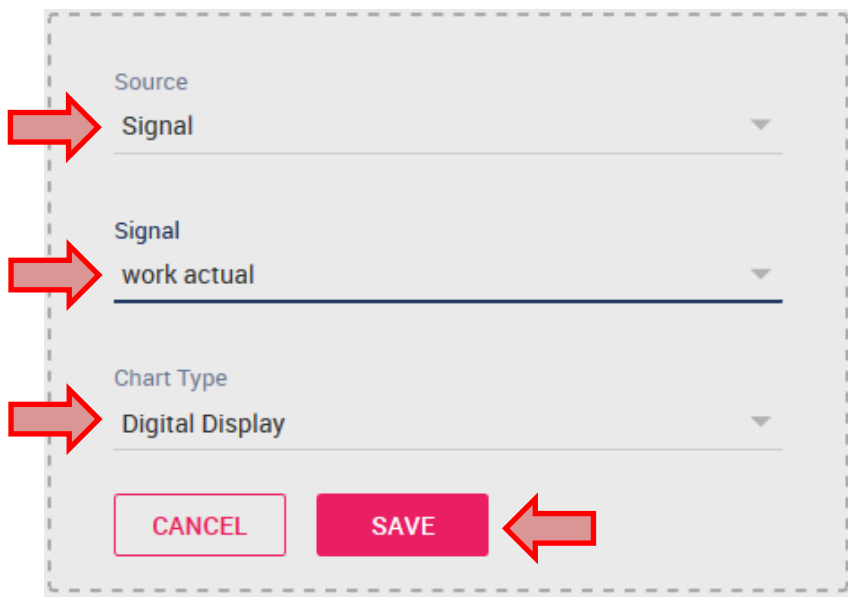
The finished visualization for all signals looks like this:
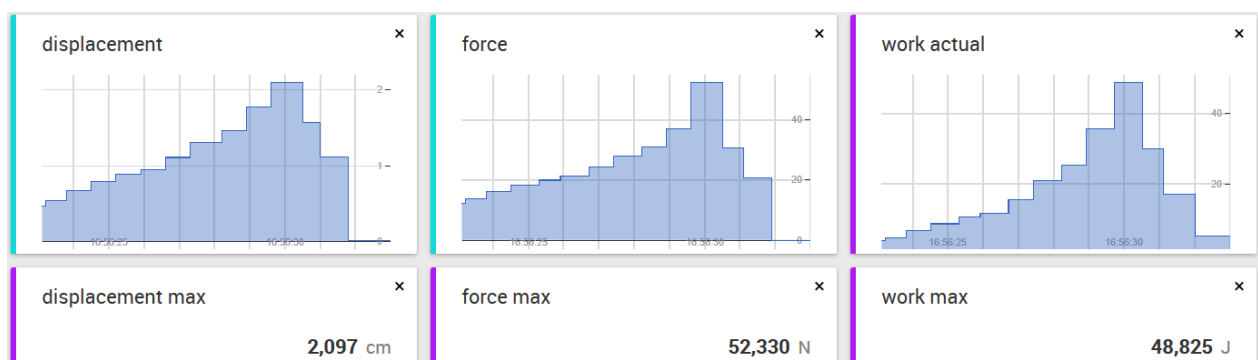
Disclaimer

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