

## **CeboMultiLogger**

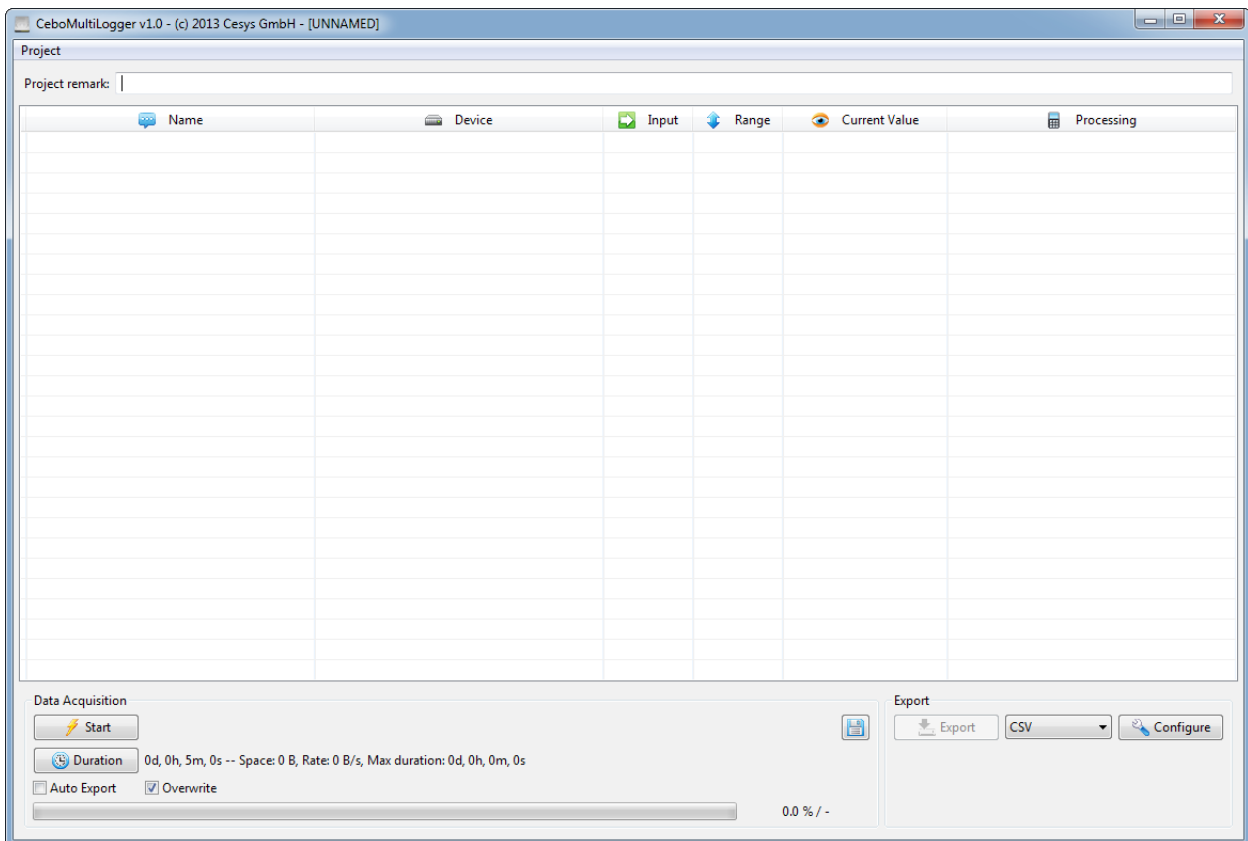
An application to log or capture a series of data from multiple CEBO-MSR compatible devices, offering a wide range of settings to setup the capture process.

## Introduction

CeboMultiLogger is an application to log or capture a series of data from multiple CeboMsr compatible devices, offering a wide range of settings to setup the capture process. Captured samples can be optionally transformed into different value systems or analyzed. After a successful capture, data can be exported to a comma separated value (CSV) file.

## Project setup

The screen below is shown after starting the application. The table which occupies the most space lists all inputs that will be captured (currently empty). All capture related controls are located in the lower left corner, while the lower right corner contains export related elements.

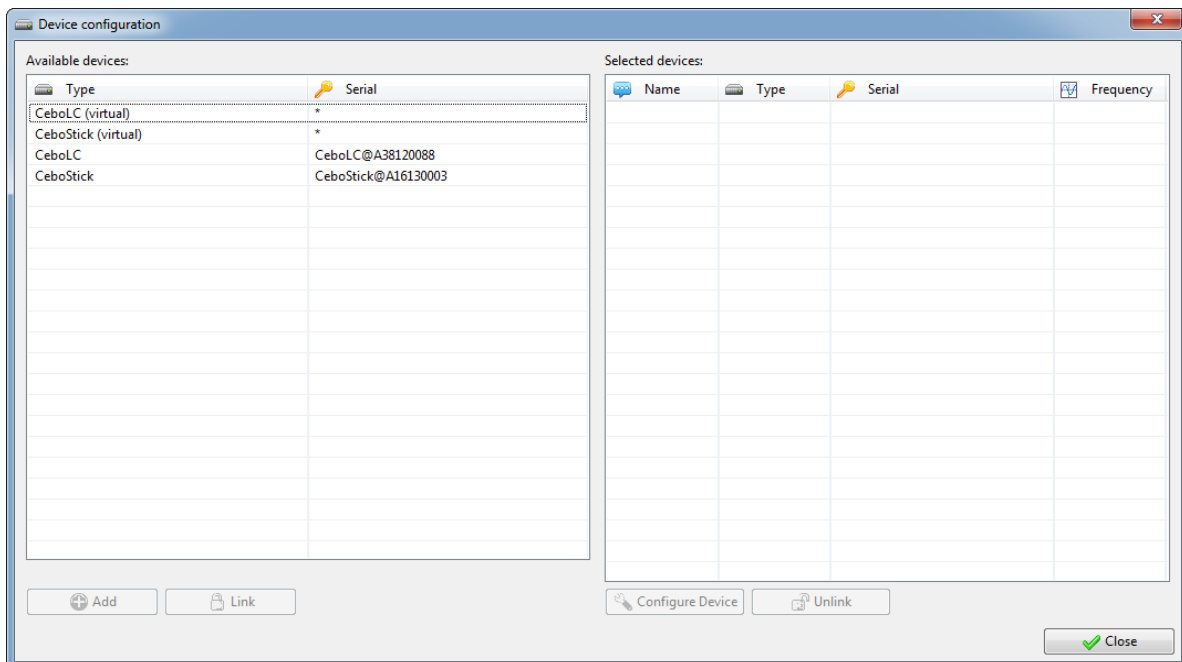


## Manage inputs

The whole input management is done with the main table. This table offers different context menus, which come up depending on the area where they are requested. Some options are available in different menus.

## Device configuration

Before adding an input, at least one device must be added and configured. Configuring devices is one of the options available in most context menus. Right clicking on the table let you choose this option. The dialog below occurs.



The left area contains the devices that can be added for logging. Those, having a '\*' as serial number are not really existing devices (virtual), all others are physically connected ones. These 'virtual' devices serve for three scenarios:

- You want configure the logging without connecting the device to the PC, maybe to transfer the project to a different machine and capture there (i.e. a PC without screen).
- The logging setup should not be made for a specific device (identified by its serial number), but work with different devices of the same type.

- You can relink a device from a serial number to another ('Unlink' removes the mapping with a serial number and make a virtual device of it. 'Link' it to a physically existing device maps it again to a different or the same serial number.)

When devices are accessed, the behavior is as follows: First, devices with a mapped serial number are connected to their physical instances. The remaining, virtual devices are then mapped to the remaining real devices, but the order is unpredictable. So using multiple virtual devices does not make any sense, as the behavior is unpredictable.

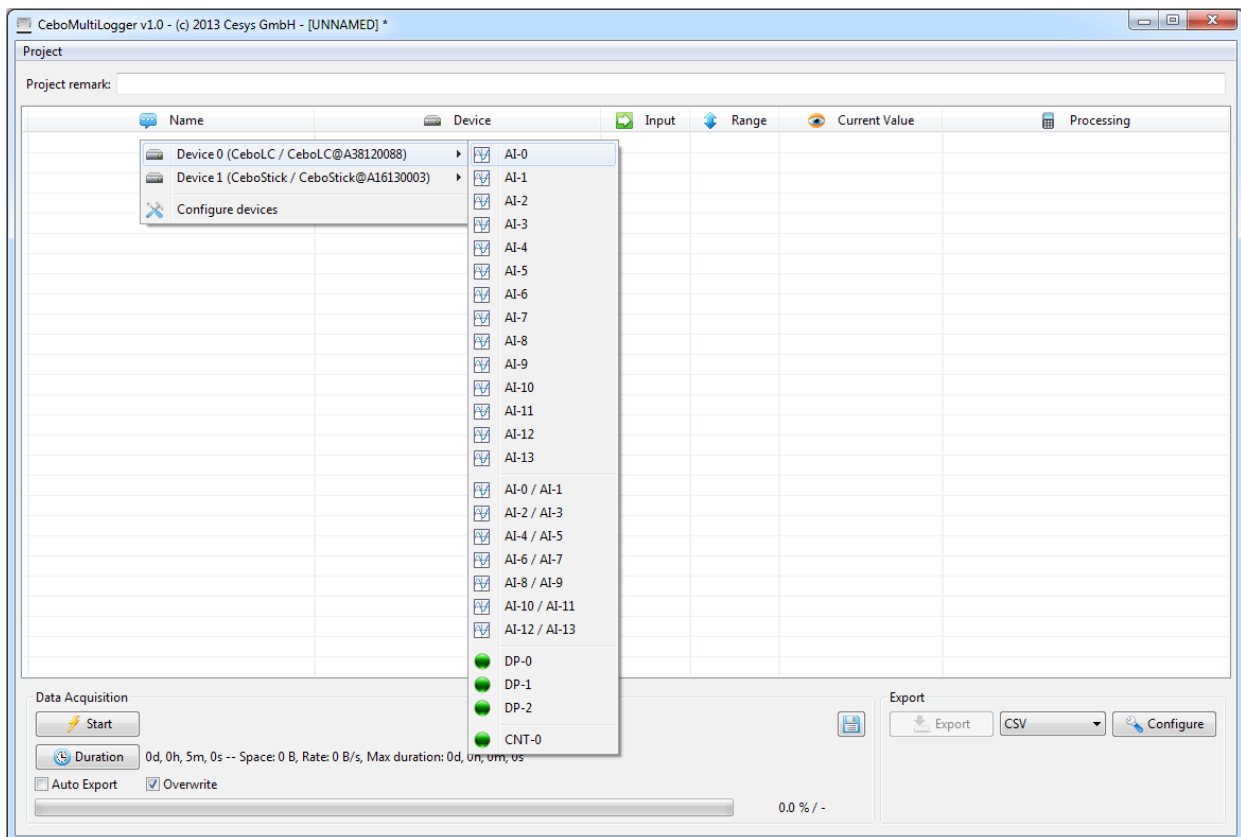
The right side of the device dialog contains all chosen devices. You can rebound serial numbers using link and unlink and configure the devices by pressing on the 'Configure Device' button while having a device selected. Device configuration options depend on the specific type.

For a better overview, the automatically created device names (i.e. 'Device 0') can be edited by left clicking it in the table.

Device removal is not possible at this point, as it may have an impact on already configured sources. You have this option in the main table.

## **Adding inputs**

After at least one device is chosen, its inputs can be added. To invoke the respective context menu, right click in a free area of the table, this will bring up a menu showing all selected devices, while each of it has a sub menu showing its inputs (Grayed out inputs are already in use). Click on one of it, so it is selected as active source.

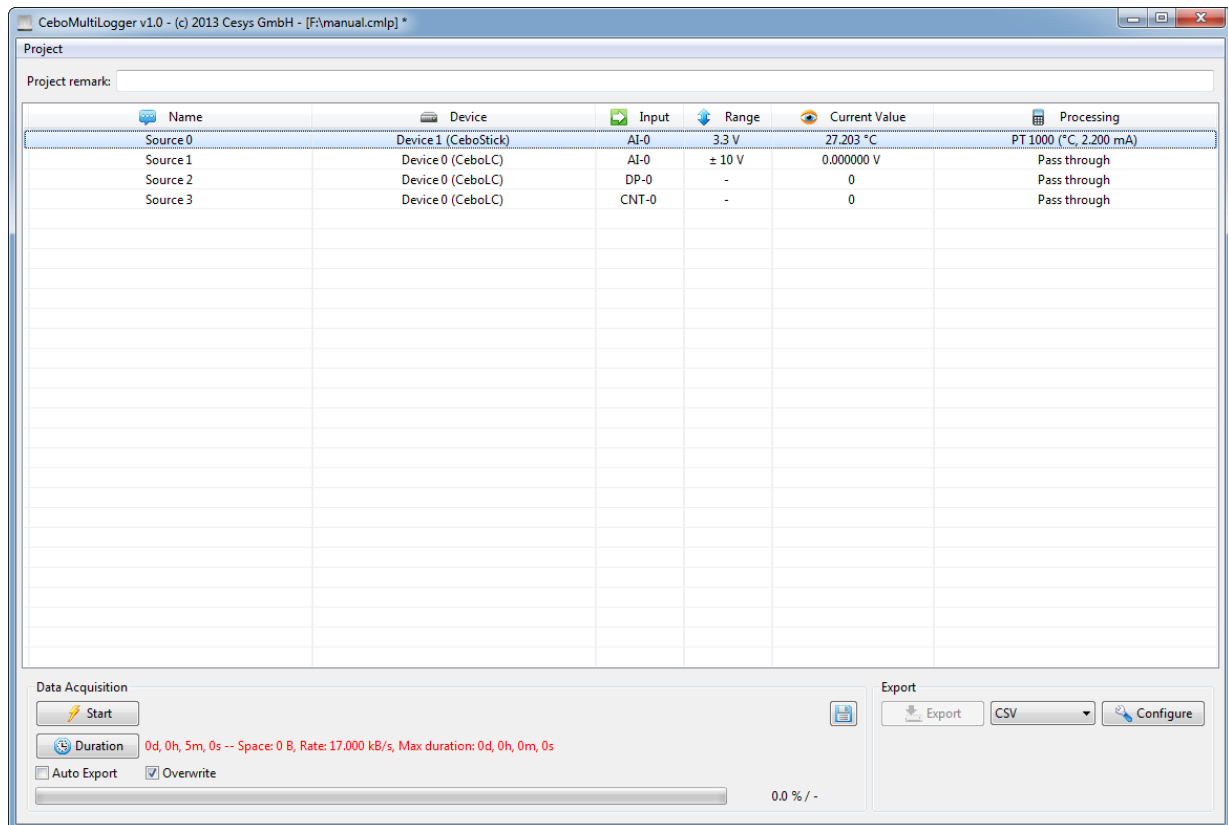


After adding an input, various settings can be made with it. You can name a source (which is later used in export) by left clicking on the name in the table. All other options are accessible using context menus. It depends on the table column where you request the context menu using a right click:

- Input: Switch to a different input from the same device.
- Range: Change the measure range of the input.
- Current value: Modify the style of the display in the live view.
- Processing: Select a post processing for the value (i.e. convert to temperature). If a processing is already chosen and has a configuration, this can be accessed from this menu as well.

Besides that, the context menu offers the removal of the device or input as well.

The following image shows a simple setup with 4 inputs from 2 different devices. The first input is transformed to a temperature, assuming a PT 1000 is used for measurement. The second inputs display has a higher precision in comparison to the default setting.



You may now set the logging rate in the device configuration dialog. Alternatively you can setup an external trigger. Either way, each device can have a different timing. Go forward to configure and start the capture.

## Configure logging

Capturing requires a disk path where to store the binary data. Set it using the button with the blue disk symbol right of the 'Start' button. The application shows you if the selected path is large enough to hold all the data and what the maximum duration based on the current setup is. External triggered inputs are ignored for this calculation. Click on the 'Duration' button to set up the time you want capture data for.

If the 'Auto Export' flag below is selected, data is automatically exported using the current export settings after a capture is completed or canceled. The export must be configured correctly, otherwise you will get an error.

The 'Overwrite' flag signals if a logging overwrites the data from the previous capture. This can be very handy in some scenarios. If this is disabled, for each capture process, a new directory with starting date and time is created, which you have to delete by hand (The upcoming version will allow the export of older data).

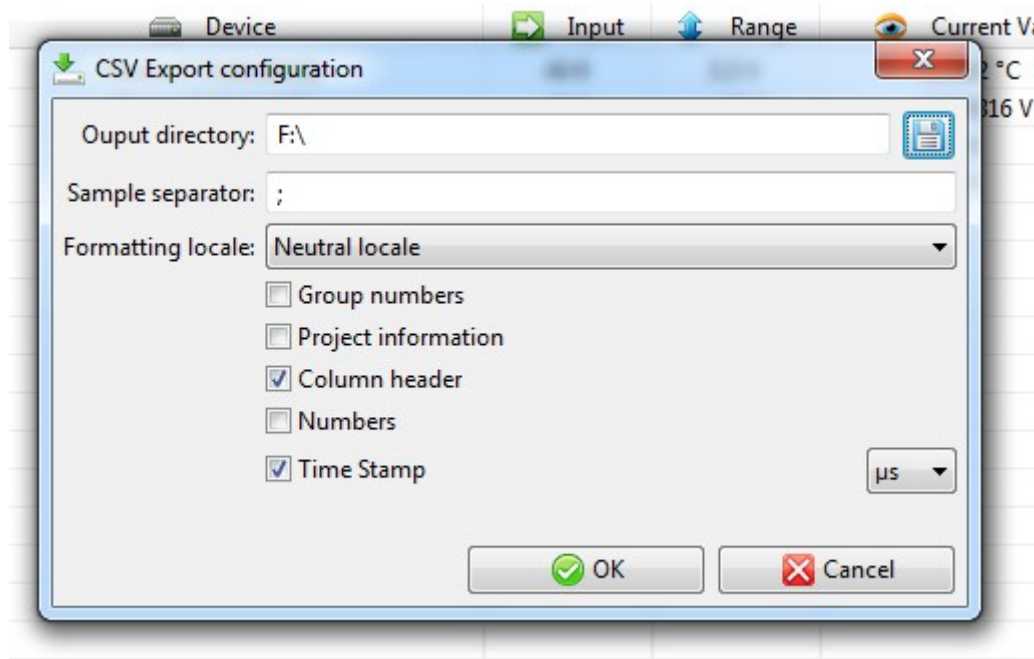
After all options are set, click on 'Start' to do the capture. All controls in the application are disabled during capture except the 'Start' button, which transforms to a 'Stop' button. Clicking it will stop the process immediately.

## **Export data**

Data is logged to an unusable binary format, so exporting it is necessary to work with it. CeboMultiLogger currently exports to CSV files. Future versions may support different formats as well.

## **CSV Export**

The CSV export has several options, below a screenshot of the configuration dialog.



- Output directory: The place where the CSV - Files are stored. Each file gets a name built from date and time when the logging process has been started.
- Sample separator: The Symbols placed between the values.
- Formatting locale: Either use the locale of your system or the neutral one (the latter uses a dot as fraction separator and a comma for grouping (if enabled)).
- Group numbers: Places a group separator every 3 digits for better readability.
- Project information: Write various information about the capture to the header of the generated file.
- Column header: Every column gets 2 level of headers if enabled. The upper one is the name of the respective source, the lower displays the resulting unit.
- Numbers: Generates a counting data column in the generated file.
- Time Stamp: Adds a column with the time stamp since logging start. You can select either milliseconds, microseconds or nanoseconds as resolution for this column.



## Example project

This part contains the steps on how to setup a project which does the following: Capture AI-0, AI-1 and DP-0 from a connected CEBO-LC at 2000 Hz. AI-0 should measure in range  $\pm 1V$ . A PT-1000 is connected to AI-1, so this input should transform the incoming voltage to Kelvin. Data is captured 2 minutes. The values are then exported as .CSV-File and imported to OpenOffice.

### Preparing inputs

Start up **CeboMultiLogger**. You can now optionally add a project remark above the table, which is directly forwarded to the resulting .CSV file.

Right click on the main table and choose **Configure devices**. If your CEBO-LC is already connected and not used in any other application, it should be listed in the left table. Choose it and click **Add** below the table to add it to the project.

Now select this device in the right table. A click on column **Name** allows to change the name. Click on **Configure Device** below the table to bring up the device configuration dialog. Enter 2000 in the frequency field and close the dialog by clicking on **OK**. Close the device configuration dialog too.

Right click in the main table and hover above the device entry in the upcoming menu. This opens a sub menu, which shows all inputs of your device. Select **AI-0** to add this input for the capture process. Repeat this process for inputs **AI-1** and **DP-0**.

Right click on the **range** column of **AI-0**, select  **$\pm 1V$** . The input range of AI-0 is now as required by the project.

To transform the voltage value of AI-1 to Kelvin measured using a PT-1000, we have to add a value processing. Right click the **processing** column of **AI-1** and select **PT-1000** from the **Analog conversion** menu. The **current value** displays the temperature in °C now. Right click again on the **processing** column of **AI-1** and select **Configure plugin**, which brings up a dialog to configure the transformation. Choose **Kelvin** in the **Target unit** list, verify the **Reference current** value and close the dialog by clicking on **OK**.

Inputs are now completely configured.

## Configure the data acquisition

Click on the **blue disk symbol** right of the **start button**. Choose an **empty folder** which will be used to store the capture data. After selection, the information right of **Duration** is updated. The **Rate** is calculated from the selected inputs (3 inputs à 16 bit = 6 byte per sample, at 2000 Hz = 18 kB/s). The **Max duration** shows how long data could be acquired, calculation based on the current free space of the selected drive. (Please note that other applications may change the free space in parallel, so this value should not be interpreted too accurate.)

Click on **Duration** to set the time how long the capture should last. Set the duration to 2 minutes and close the duration dialog.

Checking **Auto Export** is a good choice if capturing multiple times, as this automatically creates the .CSV files after the duration has been reached or the capture has been interrupted.

Click on **Configure** in the **Export section** to bring up the .CSV export settings dialog. Choose an output directory for the .CSV files (file names are build from date / time). If you choose a folder on the same drive as the capture folder, understand that this counters against the maximum duration time.

Leave the other options as they are. Close the export dialog by clicking **OK**.

The project is now completely set up, save it using the **project menu**.

## Capture and import to OpenOffice

Click on **Start** in the lower left area of the window. This will capture your data to a temporary storage. After the 2 minutes are elapsed or you click on **Stop**, data is exported to .CSV if **Auto Export** is checked, otherwise you have to click on **Export**.

Open **OpenOffice** (LibreOffice, Excel, ...) and select the .CSV file from the folder you've chosen in the **Export dialog**. Files are named by the date and time the capture has been started. If multiple devices were involved in the process, multiple .CSV files are created.

Choose the correct settings (locale and separator are very important) and OpenOffice will import your data as expected.

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## Revision history

v1.0	July, 07 2014	Initial release.

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