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# DL18 BLE Data Logger



## User Manual

Version 2022

## 1. Introduction

Thank you for purchasing our ECOMATIK DL18 BLE data logger set. This BLE-enabled (Bluetooth Low Energy) data logger is an outstanding choice to be used in combination with ECOMATIK dendrometers (all models), temperature sensors (leaf: LAT-B2; air, surface, tissue, soil: T-Surface/-Tissue/-Soil), air temperature and humidity sensor (T/RH-Sens), soil moisture sensor (EM 35) or light sensors (PAR: EM 20, Pyranometer: EM 25). Using the four channels of the DL18 BLE you can operate up to 4 dendrometers, or other sensor combinations. The DL18 BLE can be conveniently configured and the logged data read out via mobile devices (Andriod, iOS) or PC (Windows10).The logger is powered by two user replaceable batteries. In standard use the batteries will last more than one year.

## 2. Components

After unpacking you should have following items:

- 1 dendrometer logger with two AAA alkaline batteries already inserted
- 1 weather box for using the logger under outdoor conditions
- 1 bag of desiccant (dry silica gel)
- 2 two wood screws for mounting the logger box



Fig. 1: Dendrometer Data Logger (DL18 BLE)

## 3. Safety information and Maintenance

For the functionality it is very important to protect the logger against moisture. Screw the cable gland firmly and replace the silica gel when necessary. In tropical regions the protection from moisture is particularly important.

In normal use the battery lasts for more than a year. But remember, some batteries have poor quality. Therefore, it is useful to log the battery voltage. Check the battery indicator at data download. If you are planning a long measurement period under low temperature, you should use Lithium batteries instead of provided alkaline batteries. Lithium battery has much better properties at low temperature.

## 4. Connecting dendrometers to the logger

As the fig. 3 shows, you can connect up to 4 dendrometers to the logger.

It is very important to protect the logger against moisture. Insert the sensor cable until the thicker black cable insulation is positioned in the cable gland (see Fig. 2). Tighten the cable gland firmly, and never remove the rubber plug from the unused cable glands.

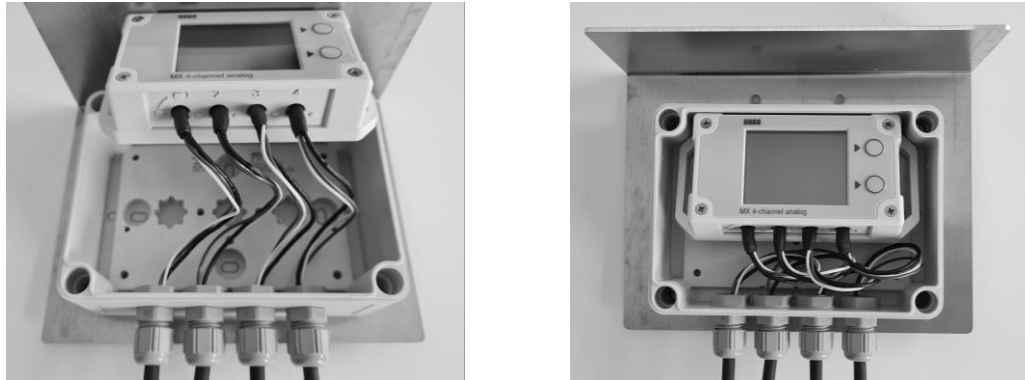


Fig. 2 Connecting sensor cables to the logger

## 5. Installing the software

The DL18 BLE can be conveniently configured and logged data read out via mobile devices (Android, iOS) and PC (Windows10) using the free software HOBObconnect: <https://www.onsetcomp.com/products/software/hoboconnect/>

## 6. Configuring the logger

The software has many useful features. However, for dendrometers you mainly need only the main functions as described in the following:

### 1) Find and connect to Bluetooth Logger

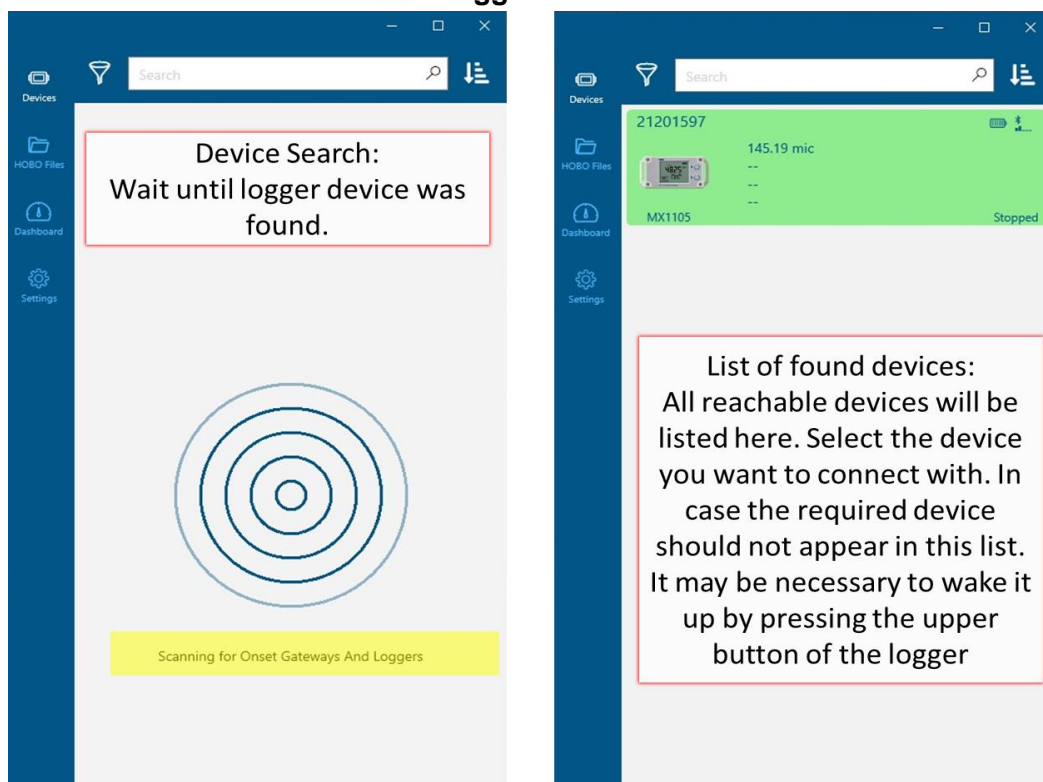
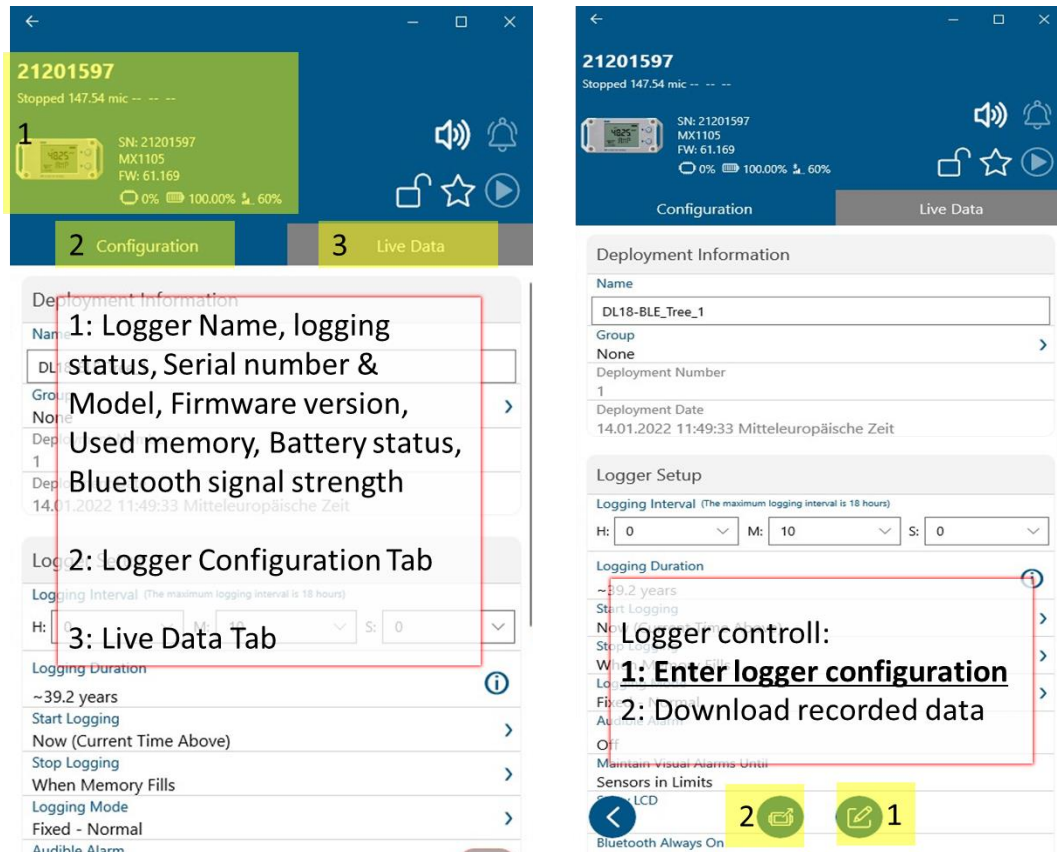
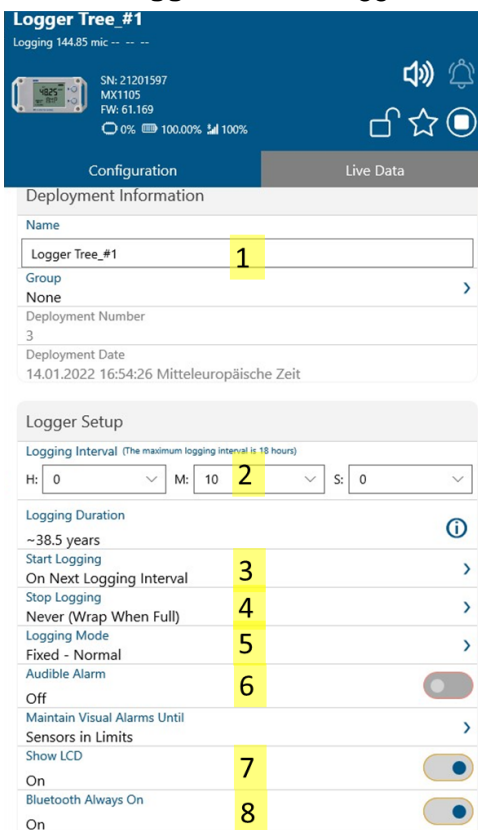


Fig. 3: Search screen and Device list

## 2) Logger Status overview, Data download & Enter Configuration mode



## 3) Launch Logger: Launch logger and configure Channel and Sensor.



Deployment information:  
1: enter here the name of the selected logger.

Logger Setup:  
2: Choose the desired logging interval. A 10 minute interval is sufficient for most dendrometer applications.  
3: Select start mode. Most recommended modes are „On Next Logging Interval“ or „On Date/Time“  
4: “Never (Wrap When Full)” is recommended  
5: Logging mode “Fixed – Normal” is suitable. Additional statistics may also be selected here  
6: Audible alarm off  
7: LCD on or off to save some power  
8: BT always on to access the logger inside the box from distance without the need to open the box and wake it up by pressing the upper button

Fig. 4: Deployment information and Logger Setup (Logging interval, Start mode)

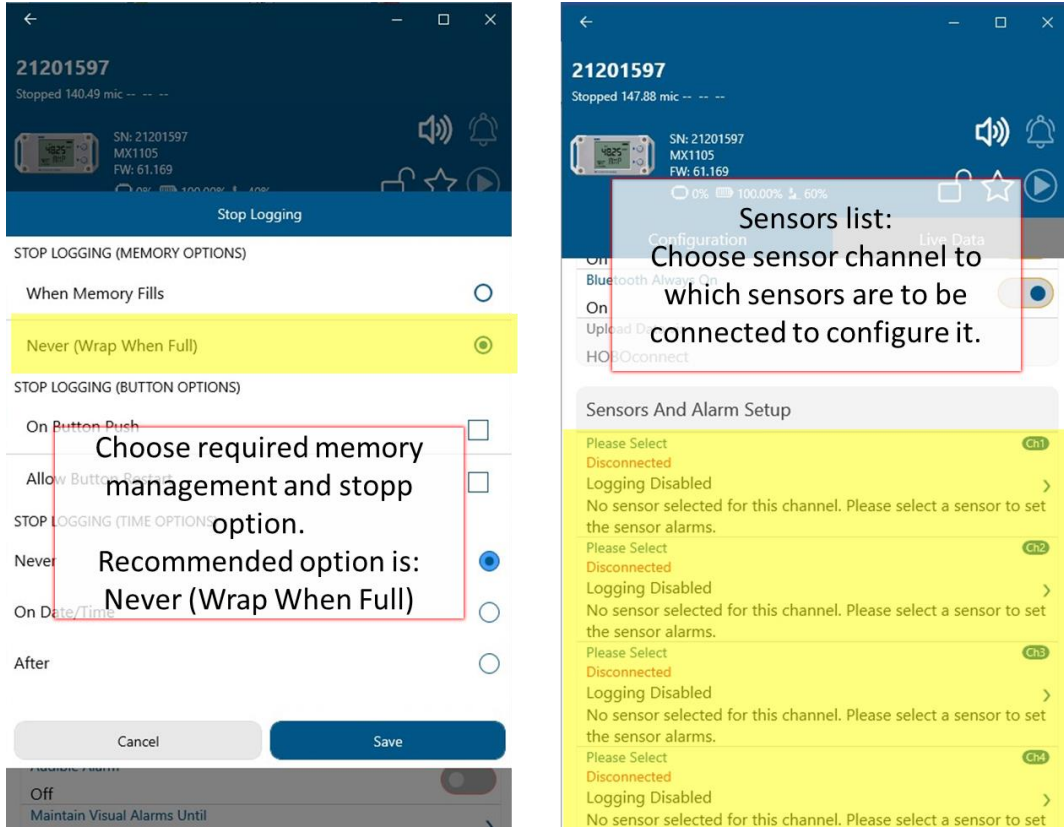


Fig. 5: Logger Setup (Stop mode) and Logger channels list

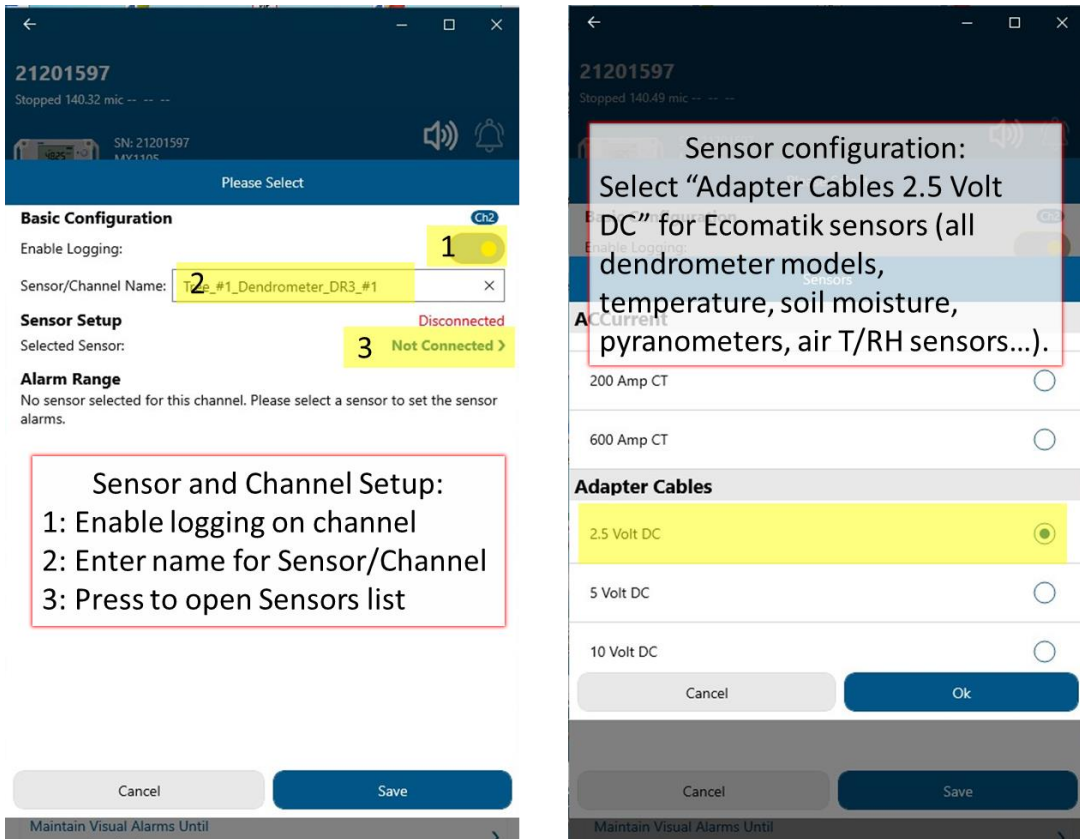


Fig. 6: Sensor and Channel setup

#### 4) Raw Data conversion & Linear scaling

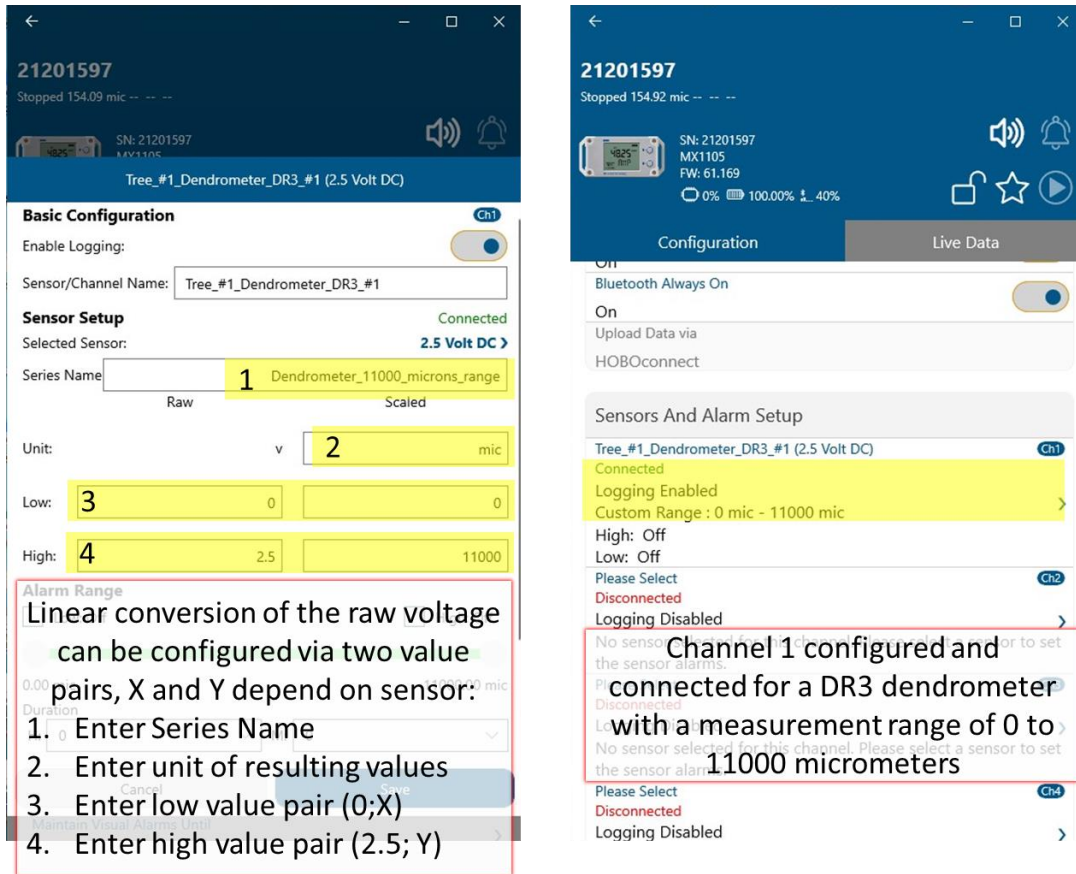


Fig. 7: Linear scaling function

#### On-logger linear data conversion:

If configured as “Adapter Cable, Cable-2.5-Stereo (0-2.5 Volts DC)”, the raw measured data is in units of volts, ranging between 0 and 2.5 VDC. In case of a linear relationship between raw sensor output voltage and the parameter measured by the sensor, the linear scaling function can be configured to convert raw voltage signals directly on the logger (see Fig. 7). This is possible for all dendrometers except for the models DC3 and DC4, the air temperature and humidity sensor (T/RH-Sens), soil moisture sensor (EM 35), and light sensors (PAR: EM 20, Pyranometer: EM 25). The on-Logger linear scaling is configured via two value pairs (e.g. 0 VDC / X and 2.5 VDC / Y). The parameters X and Y are sensor dependent and in case of dendrometers X is always 0 (i.e. 0 VDC corresponds to 0 micrometer), whereas Y differs depending on the dendrometer model the different Y factors are.

**Change the value in this field as follows. Other 3 data fields remain unchanged.**

- 11,000.0000 for DR1, DR3, DD-L1, DD-S1, DD-S2, DRO, DRW, DDW, DC1, DV, DF1
- 25,400.0000 for DC3, DD-L2, DR2, DF2
- 50,800.0000 for DC4, DD-L3, DF3
- 150,000.0000 for DF4

Fig. 8 Enter linearization data

For example for 11000 micrometer range sensors (e.g. DD-S2, DR3, DD-L1,...) the correct configuration is: 0 VDC / 0 micrometers and 2.5 VDC / 11000 micrometers.

**Post-hoc data conversion:**

Another option is to measure and store raw values in Volts on the logger and perform the conversion after data download to the computer.

This option is also required, if the relationship between raw voltage output of the connected sensor and the measured parameter is not linear (e.g. LAT & T temperature sensor series). Raw dendrometer data from the logger has the unit Volt and can be converted to micrometer values by using the following formulas:

**Dendrometer types DR1, DR3, DR3W, DD-L1, DD-L1W, DD-S1, DD-S2, DD-S2W, DD-RO, DR1W, DC1, DV, DF1**

$$\text{Micrometer} = \text{raw data (V)} \times 4400$$

**Dendrometer type DC3, DD-L2, DR2, DF2**

$$\text{Micrometer} = \text{raw data (V)} \times 10160$$

**Dendrometer type DC4, DD-L3, DF3**

$$\text{Micrometer} = \text{raw data (V)} \times 20320$$

**For Dendrometer type DF4**

$$\text{Micrometer} = \text{raw data (V)} \times 60000$$

For other sensor types, e.g. leaf temperature (LAT-B2), surface, tissue or soil temperature (T-Surface/-Tissue/-Soil), air temperature/humidity (T/RH-Sens) or soil moisture, raw sensor signal will also be recorded in volts. Due to the complex conversion functions of these sensor types, raw sensor values have to be converted manually after data download to your personal computer. For conversion, please use the conversion functions as given in the user's manual of the respective sensor (Excel programs for data conversion are available on request).

**5) Download, view and export data**

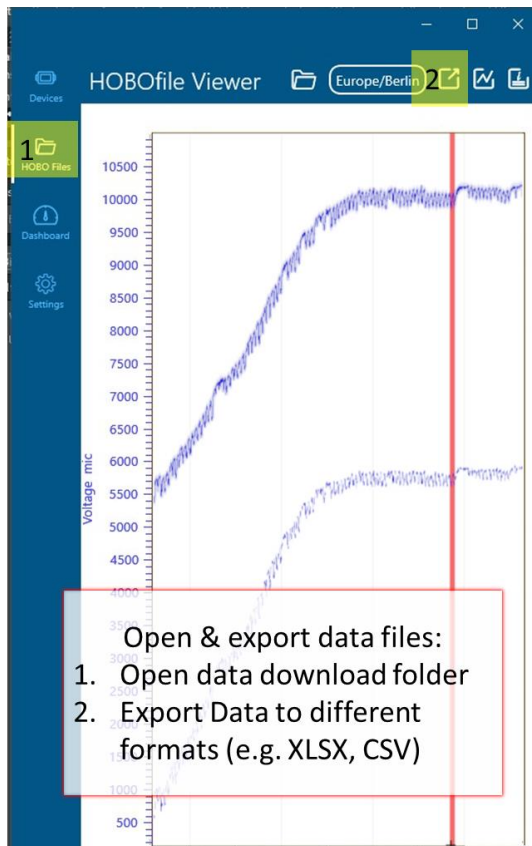
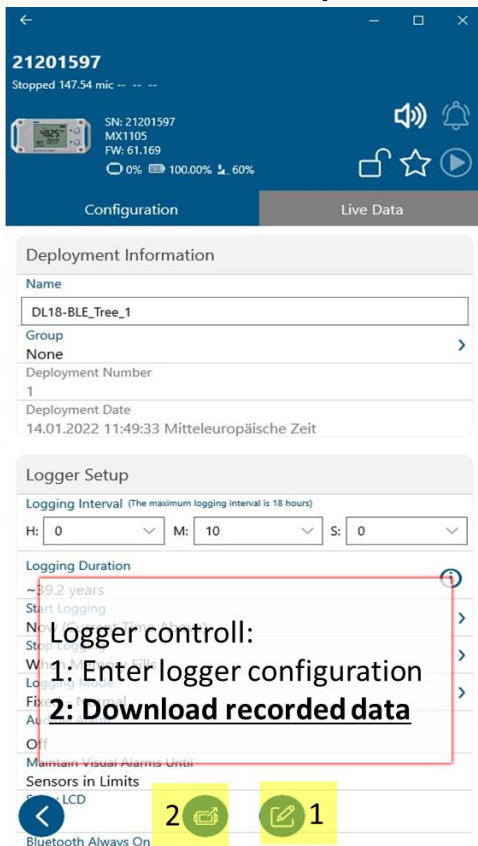


Fig. 9: Download data from Logger and export data to file

## 7. Technical Specifications

|                                      |  |
|--------------------------------------|--|
| <b>Memory</b>                        | 1 900 000 readings<br>If you connect 4 dendrometers, and collect data every 30 minutes, the memory will store data of 7900 days  |
| <b>Resolution</b>                    | 0.2 $\mu\text{m}$ for Dendrometer types:<br>DR1, DR3, DD-L1, DD-S1, DD-S2, DRO, DRW, DDW, DC1, DV<br>0.3 $\mu\text{m}$ for Dendrometer types:<br>DC2, DF1<br>0.5 $\mu\text{m}$ for Dendrometer type:<br>DC3, DD-L2, DR2, DF2<br>1.0 $\mu\text{m}$ for Dendrometer type:<br>DC4, DD-L3, DF3 |
| <b>Accuracy</b>                      | $\pm 0.1\%$ of reading   |
| <b>Interface</b>                     | Bluetooth Low Energy to Mobile devices or PC:<br>iOS 11, 12 and 13<br>Android 7, 8, 9 and 10<br>Windows 10<br>Bluetooth 4.X and up   |
| <b>Channel</b>                       | 4, for connecting up to 4 dendrometers   |
| <b>Logging Interval</b>              | 1 sec. to 18 hours, user selectable  |
| <b>Battery Life</b>                  | 1 year typical with logging rate of 1 minute and sampling interval of 15 seconds or greater, user replaceable 2 AAA battery  |
| <b>Environment</b>                   | Logging $-20^{\circ}$ to $70^{\circ}\text{C}$ ( $-4$ to $158^{\circ}\text{F}$ ); 0 to 95% RH (non-condensing)  |
| <b>Other compatible Sensor types</b> | <ul style="list-style-type: none"> <li>- soil moisture (EM 35)</li> <li>- leaf temperature (LAT-B2)</li> <li>- surface, tissue or soil temperature (T-Surface/-Tissue/-Soil)</li> <li>- air temperature/humidity (T/RH-Sens)</li> <li>- light (PAR: EM 20, Pyranometer: EM 25)</li> </ul>  |