Dendrometer

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Diameter Dendrometer (Type DD-L1)

For measuring changes in diameter of tree stems/branches

User Manual

Version 2.0

1. Introduction

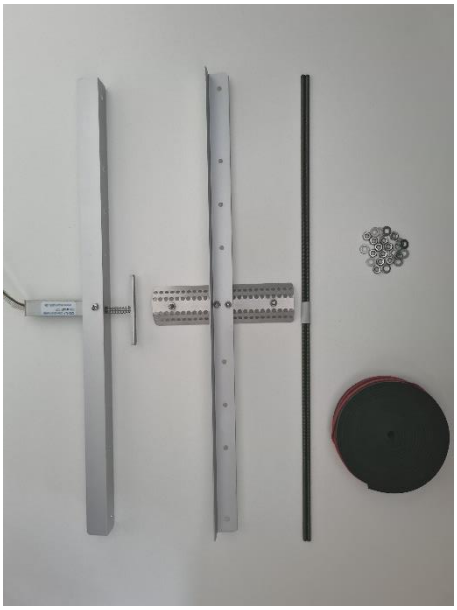
Thank you for purchasing an Ecomatik Dendrometer type DD-L1. This is a highly precise sensor for continuous measurements of diameter changes of tree stems/ branches under outdoor conditions.

This manual is written to help you install and operate your DD-L1 dendrometer with least difficulty and for desirable results. Please read it carefully before installing the sensor, and refer to it if you should have any difficulty with the sensor in the future.

The dendrometer is the sensor part of a measuring system. This means that the dendrometer should be connected to a data logger for continuous data recording. The dendrometer is compatible with the most data logger types. At Ecomatik a low-cost, special for dendrometers developed DL18 logger is available

2. Product Description

As shown below, the DD-L1 dendrometer consists of:
1 Sensor with 5 m cable. The cable length is extendable to 100 m
1 Frame for fixing the sensor onto the stem/branch
1 Piece UV-resistant perforated rubber belt
Please contact us should you miss anything of these items.



DD-L1 Dendrometer

The standard cable length is 5 m. if you ordered cable extension, the cable length is the ordered extension + 5 m.

To meet the requirements of different loggers, there are 2 different types of cables: **cable with plug** and **cable without plug**. Cable with plug can only be connected to Dendrometer Logger DL18. Cable without plug can be connected to other loggers.

3. Safety Information

The sensor is protected from rain water, but it is not waterproof. Please do not immerse the sensor in water.

Avoid any tension between the cable and sensor during handling and operation.

Pay attention to connections to data logger. Wrong connections will provide wrong readings.

4. Installation

4.1 Cable Extension

The standard version is delivered with 5 m cable. It can be extended up to 100 m. Cable type 4×0.25 mm^2 with shield is recommended for extensions.

4.2 Required tools for installation and for operation

A spanner (M3), a pair of scissors.

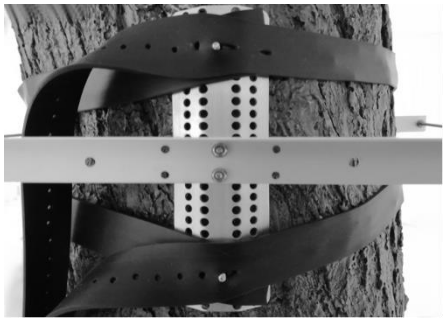
4.3 Mounting

4.3.1 Attach the two perforated rubber belts with the single-hole-end to the two fixation bolts at the back-side bar of the mounting frame.

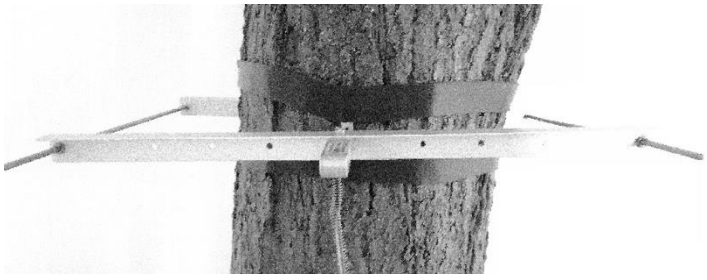
4.3.2 Firmly fix the frame at the stem/branch, by tightly wrapping the rubber belts around the stem/branch and locking them again by slipping the desired holes of the belts on the corresponding bolts at the back-side bar.

4.3.3 Mount the two threaded rods in the suitable spaced holes of the back plate of the frame, by using the enclosed screws and washers and tighten them using the enclosed socket wrench.

Front side



Back side



4.3.4 Place the front part of the frame and fix it with the screws. Place the screws for the front plate such that the sensor rod is pushed in by about 2-3 mm. When the

installation is taking place shortly before frost period, the sensor rod should be pushed in by 5 mm. At frosts the stem diameter can shrink considerably.

4.3.5 Re-tighten all screws firmly.

4.3.6 Fix the cable onto the tree stem/branch by using a cord, such that the sensor is protected from any accidental pull/drag on the entire cable length. This can be done using a rope or cable straps. Ensure there is no tension between the sensor and cable.

4.3.7 Ensure that no rain water can run along the cable into the sensor casing.

5. Wiring and Logger Configuration

The dendrometer is compatible with most data loggers. In the following we describe the connection with Dendrometer Logger (DL18), Campbell Logger (CR1000). Please contact us if your logger is not described here.

Dendrometer Data Logger (DL18)

The DL18 is a battery powered, waterproof logger for connecting 4 dendrometers. It is a very effective data logger for dendrometer measurement under outdoor conditions. For details please see the user manual of the DL18.

Campbell Data Logger (CR1000)

The dendrometer can be measured both in single-ended voltage as well as differential voltage mode. Differential voltage mode provides better accuracy. But single-ended mode requires half as many channels as differential mode. One CR1000 can include 16 dendrometers in single-ended mode, but only 8 dendrometers in differential mode.

Single-ended Voltage Mode (2 dendrometers)

Connection		
Cable Color		Input Port
1st dendrometer	Yellow	1H
	Green	Ground
	Brown	Vx1
	White	Ground
2nd dendrometer	Yellow	1L
	Green	Ground
	Brown	Vx1
	White	Ground
Program Syntax *ExciteV (Vx1,2500,0)* *VoltSe(SEVolt(),2,mV2500,1,True,0,_50Hz,Mult(),Offs())* If Multiplier=4.4, Offset=0, the results are measured in microns.		

Differential Voltage Mode (2 dendrometers)

Connection		
Cable Color		Input Port
1st dendrometer	Yellow	1H
	Green	1L
	Brown	Vx1
	White	Ground
2nd dendrometer	Yellow	2H
	Green	2L
	Brown	Vx1
	White	Ground
Program Syntax *ExciteV (Vx1,2500,0)* *VoltDiff(DiffVolt(),2,mV2500,1,True,0,_50Hz,Mult(),Offs())* If Multiplier=4.4, Offset=0, the results are measured in microns.		

An interval 0.5-hour for data collection can reveal the diurnal course of diameter changes very well.

6. Adjustment and maintenance

Ensure that no falling branches, fruits or snow land on the sensor. The sensor is protected against water droplets but is not waterproof.

When the sensor is correctly installed, it will function under outdoor conditions without the need for further maintenance.

Depending on the growth rate of the tree, the sensor should be reset after some months or years of measurements. When the output approaches 11 mm, the sensor needs to be reset.

Relax the screw slowly so that the sensor rod is pushed in by about 2-3 mm. When the reset is taking place shortly before frost period, the sensor rod should be pushed in by 5 mm. At frosts the stem diameter can shrink considerably.

Tighten all screws firmly.

7. Technical Specifications

Name of the Sensor	Diameter dendrometer large Type DD-L1
Use area	For measuring diameter growth of trees
Suitable for plant size	Diameter 3-30 cm
Range of the senor	11 mm
Resolution	The resolution of the sensor itself is infinite. The resolution of readings is determined by connected data logger, e.g. CR1000: 1.5 µm Dendrometer logger DL18: 0.2 µm
Accuracy	Dendrometer dependent: Max. ± 4.5% of reading (stable offset) Dependent on the connected data logger, e.g.: CR1000:±(0.04% of reading+4.4µm) Dendrometer logger DL18: ±0.1%
Temperature coefficient of the sensor	<0.2 µm in the whole range
Linearity	<1%
Environment	Outdoor condition: -25 to 70°C air temperature, 0 to 100% relative air humidity
Weight of the sensor	13 g without cable
Power supply	Stabilized Vex 0.5 – 10 VDC, power consumption practically zero
Material	Stainless steel and Aluminium
Cable length	5 m, extendable up to 100 m