Dendrometer

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Diameter Dendrometer (Type DD)

For measuring changes in diameter of tree stems/branches

User Manual

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1. Introduction

Thank you for purchasing an Ecomatik Dendrometer type DD. This is a highly precise sensor for continuous measurements of diameter changes of tree stems/braches under both indoor and outdoor conditions.

This manual is written to help you install and operate your DD 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.

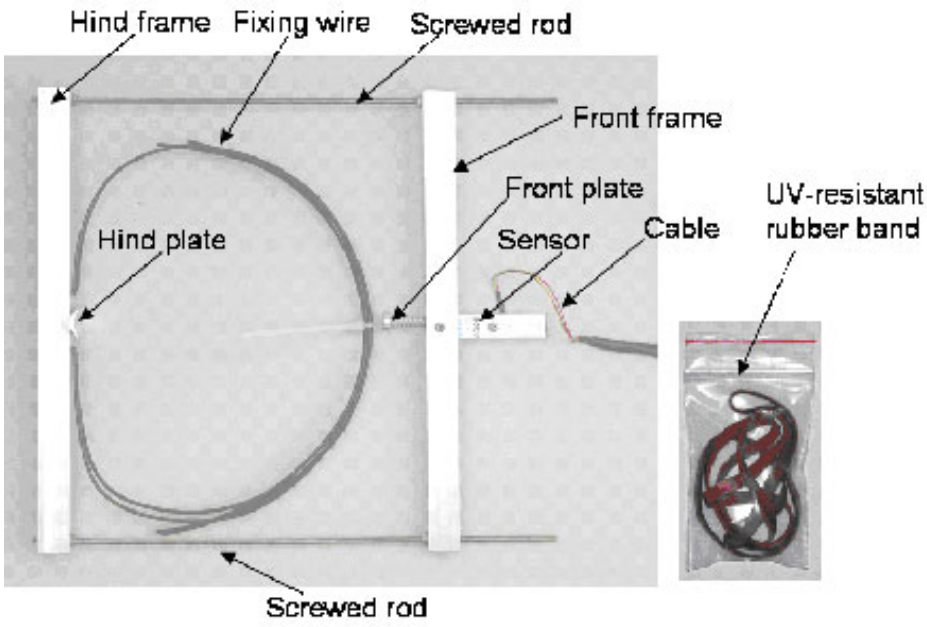
The dendrometer is the sensor part of a measuring system. This means that the dendrometer must be installed onto the experimental tree stems/branches, and connected to a data logger for continuous data recording or to a simple voltmeter for discrete data display. The dendrometer is compatible with the most data logger types. At Ecomatik a low-cost, special for dendrometers developed ulogger is available.

2. Product Description

As shown below, the DD dendrometer consists of:

1 Sensor with 2 m cable. The cable length is extendable to 100 m
1 Frame for fixing the sensor onto the stem/branch
1 Piece UV-resistant rubber band

Please contact your dealer should you miss any of these items



Diameter Dendrometer

3. Safety Information

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

To reduce tension on the sensor, the cable component of the sensor is isolated. Please never pull the cable from the sensor and avoid any tension between the cable and sensor during handling and operation.

Pay attention to written instructions. Wrong connections will give wrong results.

4. Installation

4.1 Adjustment of Frame

The DD dendrometer measures tree diameter changes smaller than 20 cm. To adapt the instrument to smaller stems/branches the frames and the screwed rods can be shortened by cutting.

4.2 Cable Extension

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

4.3 Required tools for installation and for operation

Data logger: One Dendrometer requires one or two single-ended channel(s) that can measure resistance between 0 and 50 kohm range.

Tools: Cable strap, spanner (M3), screw driver, knife, and voltmeter.

4.4 Mounting

4.4.1 Detach the front frame of the dendrometer to allow you fix the stem/branch to be measured

4.4.2 Insert the stem/branch carefully between the fixing wires until it rests onto the hind plate.

4.4.3 Curve the fixing wires accordingly so as to fit the shape of the stem/branch. Ensure that the stem/branch rests on the hind plate. Fix the wires on the stem/branch using a rubber band so that the stem/branch is firmly held between the fixing wires and the hind plate. Replace the front part of the frame and fix it with screws.

4.4.4 Turn the screws slowly to achieve an electrical resistance between the yellow and green cable of approx. 10 kohm for installations before or in frost seasons and of approx. 2 kohm for installations in or before growth seasons.

4.4.5 Fix the cable onto the tree stem/branch so 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 the suspension rope/strap is not so tight as to interfere with normal tree growth and expansion during the entire measurement period. Also, there should be no tension between the sensor and cable.

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

5 Wiring and Logger Configuration

One dendromerter requires one or two single-ended channels that can measure resistance between 0 and 50 kohm. With two channels temperature influences can be compensated and a higher precision is achieved (see technical specification). **If you use ulogger for data recording, only one channel measurement can be configured.**

The dendrometer is connected to both channels for measuring resistance as follows:

Wire color	Connect to	Data Logger One-channel measurement	Data Logger Two-channel measurement	Voltmeter
Green		-	- Channel 1	-
Yellow		+	+ Channel 1	+
White		Not connected	- Channel 2	-
Brown			+ Channel 2	+

Configure both channels of data logger to measure resistance from 0 to 50 kohm (e.g. 0–100 kohm). An interval 0.5-hour for data collection can reveal the diurnal course of diameter changes very well.

6 Data Calculation

The changes of diameter are given:

If measuring with two channels:

$$\text{Changes of diameter in µm} = \frac{\text{Values of Channel 1 in Ohm}}{\text{Values of Channel 2 in Ohm}} \times 11\,000$$

If measuring with one channel:

Changes of diameter in µm = Values of Channel 1 in Ohm × CF-Value

The CF-Value is printed on the sensor.

7. Adjustment and maintenance

The measuring range of the sensor is up to 11 mm. Depending on the growth rate of the tree, the sensor should be reset after some months or years of measurements. **If the outputs of channel 1 (between green and yellow wires) exceed 45 kohm, a reset must be carried out.**

For resetting the sensor relax the screws slowly to achieve an electrical resistance between the yellow and green cable of approx.10 kohm for resetting before or in frost seasons and of approx. 2 kohm for resetting in and before growth seasons.

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

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

8 Technical Specification

Type:	Diameter dendrometer (DD)
Use area:	For measuring changes in diameter of tree stems/branches
Diameter of stem/branch:	0-20 cm (>20 cm on request)
Range of the senor:	11 mm
Accuracy of the sensor:	±2 µm (measurement with two channels)
Temperature coefficient of the sensor:	Measurement with two channels<0.1 µm/K
	Measurement with one channel <0.04 %/K of the values measured
Environment:	Outdoor condition: -30 to 40°C air temperature, 0 to 100% relative air humidity
Weight of the sensor:	13 g without cable
Output:	Analog output, 0-50 kohm
Power supply:	No power consumption
Material:	Stainless steel and Aluminum
Cable length:	2 m, extendable up to 100 m