Bio Instruments S.R.L.

SENSORS AND SYSTEMS
FOR MONITORING GROWING PLANTS

DE-1M
Dendrometer
Quick Start Guide

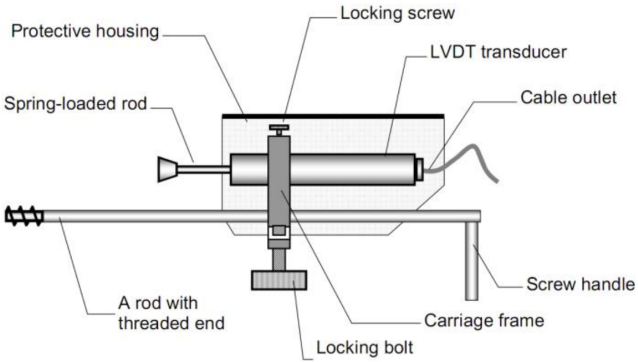
phyto-sensor.com

Series 5000

Introduction

The DE-1 Dendrometer is a highly precise incremental LVDT-based sensor for monitoring micro-variations of trunk radius in micron range.

The sensor includes a linear displacement transducer (LVDT) mounted on a special rod with threaded end. When the rod is anchored inside the trunk, the LVDT rod follows movement of the trunk surface. The output signal follows the variation of distance between trunk surface and the anchored end of the rod.



The probe is connected by a standard 1-meter cable to the waterproof box with the signal conditioner inside. A signal conditioner provides excitation of the LVDT and production of standard linear output signal.

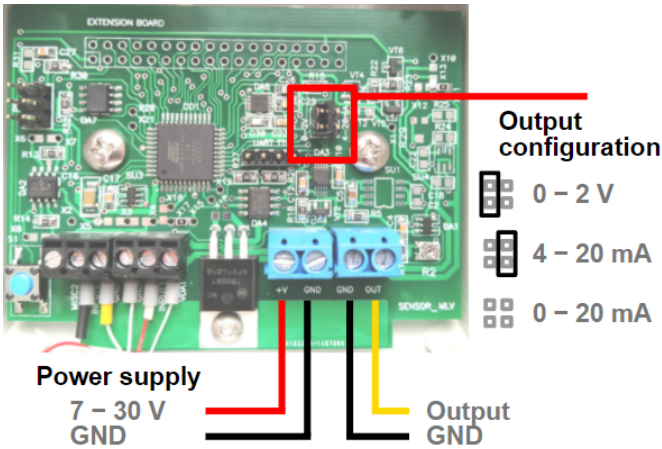
Installation

- In trees with rough bark over the cambium, rasp it away and pare down carefully an area of about 6 L × 5 W cm^2. In caulis and species with smooth bark, no preparation may be needed.
- Drill the hole with the 3.3 — 3.5 mm bits. It is recommended to drill slowly using a wood drill set to a low torque to prevent excessive tearing of wood fibers along the length of hole. The depth of hole must be 3 cm min. and 9 cm max.
- Free the locking bolt and remove the rod from the carriage frame.
- Carefully screw the rod into the tree. If there is difficulty in insertion, clear the hole carefully with the drill bit.
- Once the rod is implanted, set the sensor on the rod and adjust its position until the butt of spring-loaded rod touches the trunk.
- Readjust the sensor when its readings become close to 0 or 10 mm.

Connection

Please use a four-core cable with 3 to 6 mm outer diameter.

The connection diagram is shown in the picture below (modification of the output is determined by appropriate jumpers):



First, please choose a right output cable for connecting the sensor to a datalogger. The cable must be round with four wires. The maximal diameter of the cable is 6.5 mm. The cable length shall not exceed 10 m for 0 to 2 Vdc output (model DE-1M) and with about 1 km maximal length for 4 to 20 mA or 0 to 20 mA output (model DE-1Mi).

Power supply

The 7 to 30 Vdc @ 30 mA (+20 mA for current output) regulated power supply may be used.

When using analog outputs, all possible measures for reducing instrumental errors shall be undertaken:

- Screened cables.
- Cables with low impedance.
- Filtration of the signal with low cutoff frequency.
- Digital filtration of the signal.

Calibration table

U, Volts	I, mA 4 to 20	I, mA 0 to 20	mm
0.0	4.0	0.0	0.000
0.5	8.0	5.0	2.500
1.0	12.0	10.0	5.000
1.5	16.0	15.0	7.500
2.0	20.0	20.0	10.000

Calibration equations

0 to 2 Vdc Output:

$$\Delta R = 5.0 \ \times U$$

4 to 20 mA Output:

$$\Delta R = 0.625 \times I - 2.5$$

0 to 20 mA Output:

$$\Delta R = 0.5 \ \times I$$

where:
ΔR — measured trunk radius variations, mm
U — output voltage, V
I — output current, mA

Specifications

Measurement range	0 to 10 mm
Trunk diameter range	Above 6 mm
Temperature effect	< 0.02% total stroke/°C
Outputs	0 to 2 Vdc 4 to 20 mA, 0 to 20 mA
Output auto update time	5 s
Excitation time	200 ms
Supply voltage	7 to 30 Vdc
Current consumption	< 30 mA (+20 mA for current output)
Operating temperature	5 to 50°C
Protection index	IP64
Cable length between probe and signal conditioner	1 m

Customer Support

If you ever need assistance with your sensor, or if you just have questions or feedback, please e-mail at support@phyto-sensor.com. Please include as part of your message your name, address, phone, and fax number along with a description of your problem.

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