Bio Instruments S.R.L.

**SENSORS AND SYSTEMS
FOR MONITORING GROWING PLANTS**

DE-1T-485M
Dendrometer

Quick Start Guide

phyto-sensor.com
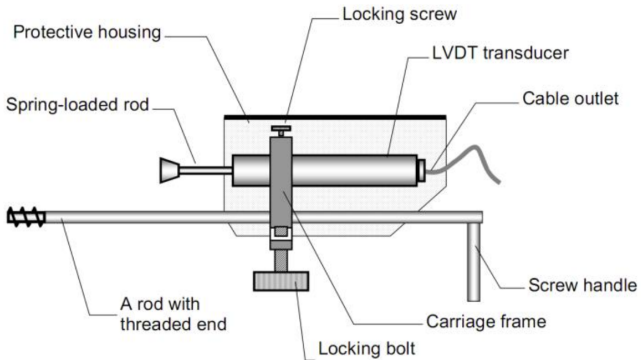
Introduction

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 0.5-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.

Interface: RS-485.
Protocol: Modbus RTU.

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

The sequence and correctness of the connection must be observed!

Connection order

1	White	Ground
2	Yellow	Output RS485-B
3	White	Output RS485-A
4	Red	Power 5 to 24 Vdc

Important notes:

1. The sensors interface meets the requirements of the EIA RS-485 (TIA-485) standard, and shall be connected accordingly. It is important to note that the termination resistor is not internally installed in the sensor.

2. The EIA RS-485 Specification labels the data terminals as "A" and "B", but many manufacturers label their terminals as "+" and "-". It is commonly accepted that the "-" terminal should be connected to the "A" line, and the "+" terminal to the "B" line. Reversing the polarity will not damage a 485 device, but it will not communicate.

3. For proper functioning ground wires of all devices connected to RS-485 bus must be interconnected together. In case of using a separate power supply, its ground ("minus") terminal must be connected to the ground line of the bus.

4. Please connect ground wires before all other connections.

Set Modbus RTU address
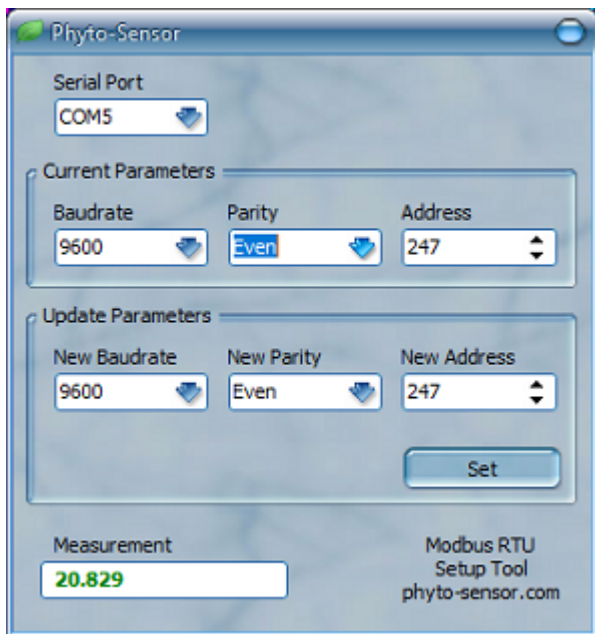
phyto-sensor.com/download/MbRTU_DAST

1. Download, extract and run the Modbus RTU Device Address Set Tool by using the above-mentioned link.

2. Connect the sensor to the PC via RS-485 adapter.

3. Power the sensor on.

4. Specify the RS-485 adapter's serial port.

5. Enter a desired address in 'New Address' field and press 'Set' button. The factory default address is 247.

6. The sensor will start to measure.

7. Power off the sensor.

Data reading

Baud Rate = 9600, 8 bit, parity: Even, 1 stop bit (default settings).
Protocol : Modbus RTU.

Modbus register map

Register address	Modbus function Protocol address	Type Access	Parameter	Default
30001	3 0x0000	UINT16 r	**Measured value** Value is stored in micrometers	N/A
30101	3 0x0064	FLOAT r	**Measured value** Ordering the bytes in a "C D A B" sequence known as a "word swap" *(e.g.: the number 3500 [00 C0 5A 45] represented as [5A 45 00 C0])*	N/A

Register address	Modbus function Protocol address	Type Access	Parameter	Default
40001	4 0x0000	UINT16 r/w	**Slave-ID**	247
40002	4 0x0001	UINT16 r/w	**Baudrate** 0: 1200bps 1: 2400bps 2: 4800bps 3: 9600bps 4: 19200bps 5: 38400bps	3
40003	4 0x0002	UINT16 r/w	**Parity** 0: No parity bit 1: Even parity 2: Odd parity	1

Power supply

The sensor is to be powered from an external regulated power supply with 5 to 24 Vdc @ 60 mA output voltage.

Specifications

Measurement range	0 to 10 mm
Trunk diameter range	Above 6 mm
Temperature effect	< 0.02% total stroke/°C
Resolution	mm < 0.002
Output	485M
Auto update time	5 s
Excitation time	200 ms
Power supply	5 to 24 Vdc
Current consumption	6 mA max
Max. current	20 mA (no bus load) 60 mA (60 Ohm bus load)
Operating temperature	0 to 50°C
Overall dimensions	90 W × 60 H × 23 D mm
Carrying rod	160 L × 4 ⌀ mm
Threaded end	10 L × 5 ⌀ mm
Protection index	IP64
Cable length	4 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.