



Bio Instruments S.R.L.

SENSORS AND SYSTEMS
FOR MONITORING GROWING PLANTS

SD-xT-485M
(SD-5T-485M, SD-6T-485M,
SD-10T-485M)
Stem Microvariations Sensors
Quick Start Guide



phyto-sensor.com

Introduction

SD-type sensor is a highly precise incremental LVDT-based sensor for monitoring micro-variations of stem diameter in micron range.

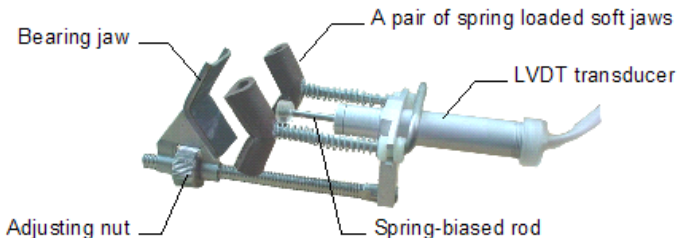
Plant growth and water balance affect diurnal behavior of stem diameter. The growth rate depends on a vegetation stage and environmental conditions. The diurnal variations represent mostly fluctuations of water content in plants. Two diameter-based indices are commonly used for evaluating plant water status: daily contraction amplitude and trend of daily maxima. The SD-type sensor allows investigating effects of irrigation rate and other environmental factors on water balance and growth of plants.

The SD-type sensor consists of an LVDT probe mounted in special fixing brackets, and a DC powered signal conditioner.

Interface: RS-485.

Protocol: Modbus RTU.

Installation



- Select an appropriate stem for sensor installation.
- Move the bearing jaw apart from LVDT transducer by rotating the adjusting nut.
- Locate the stem between the sensor's jaws.
- By rotating the adjusting nut, move the bearing jaw back until the jaws touch the stem.
- Continue rotation of the adjustment nut until the rod takes necessary position. If the stem is supposed to grow, the rational position is somewhere in the beginning of the rod's stroke. If the stem is supposed to shrink, choose a point somewhere at the end of the stroke.
- In other cases, leave the sensor somewhere in the middle between those two positions.
- Secure the sensor's cable on a stem to prevent occasional movement of the sensor.
- Readjust the sensor when its readings become close to 0 or 5 (10) mm

Connection

The sequence and correctness of the connection must be observed!

Connection order

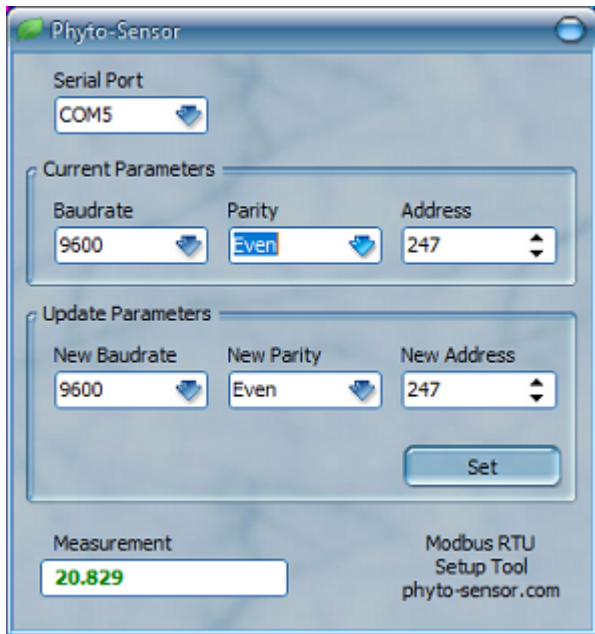
1	Black	Ground
2	Yellow	Output RS485-B
3	White	Output RS485-A
4	Red	Power 5 to 24 Vdc

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.: <i>the number 3500 [00 C0 5A 45] represented as [5A 45 00 C0]</i>)	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

Model	<i>SD-5</i>	<i>SD-6</i>	<i>SD-10</i>
Measurement range, mm	0 to 5	0 to 5	0 to 10
Stem diameter range	5 to 25	20 to 70	20 to 70
Temperature effect	< 0.02% total stroke/°C		
Resolution	mm < 0.002		
Output	RS-485 Modbus		
Auto update time	5 s		
Excitation time	200 ms		
Supply voltage	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		
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.

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