Bio Instruments S.R.L.

SENSORS AND SYSTEMS
FOR MONITORING GROWING PLANTS

SD-5T-S, SD-6T-S
SD-10T-S

Stem Micro-Variation Sensors

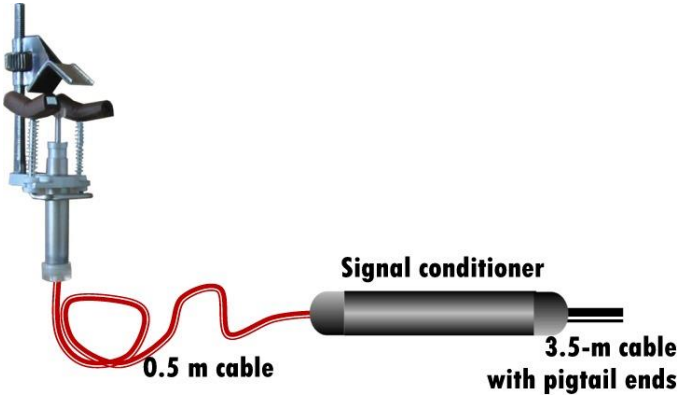
www.phyto-sensor.com

Introduction

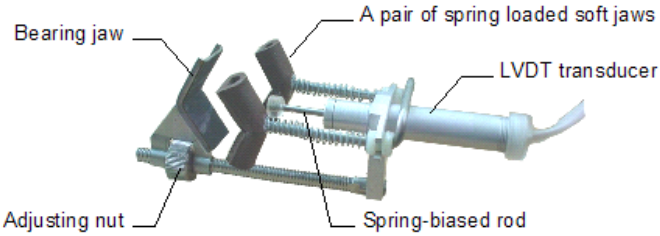
SD-type sensor is a highly precise incremental LVDT-based sensor for monitoring micro-variations of stem diameter in micron range.

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.



Installation

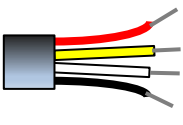


- Select an appropriate stem for sensor installation.
- Move the bearing jaw apart from LVDT transducer by rotating the adjusting nut.
- Locate the stem between the sensor's jaws.

- By rotating the adjusting nut, move the bearing jaw back until the jaws touch the stem.
- Continue rotation of the adjustment nut until then 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 connection diagram is shown below. The shield shall be grounded at the data loggers side or connected to the 'minus' contact of the power source.



Red: +Power 2.8 to 12 Vdc or 5 to 16 Vdc
Yellow: UART TTL Output
White: Ground
Black: Shield

Data reading

Digital outputs have data format: UART TTL, Baud Rate = 9600, 8N1.
Decimal data format: X.XXX (mm).
In a basic version, the UART-TTL operates as following:
1. After power is on, the sensor takes the first measurement within 300 ms approximately, and, then, sends the measured value in ASCII code. For instance, if the measured value is 0.456 mm, the string looks like
0.456<CR><LF>, where **<CR>** - Carriage Return **<LF>** - Line Feed.
2. Then the sensor takes new measurement and sends the new reading every 5 second while power is on.
Upon customer's request, the factory basic protocol can be modified with another (a) the string content (to add header, CRC, etc.), (b) Baud rate, (c) sampling time (any value from 1 s and more).

Power

The SD-sensors are to be powered from an external regulated power supply with 2.8 to 12 Vdc output voltage (S1 modification) or 5 to 16 Vdc (S2 modification).

Specifications

Model	**SD-5T-S**	**SD-6T-S**	**SD-10T-S**
Measurement linear range	0 to 5 mm		0 to 10 mm
Stem diameter range	5 to 25 mm	20 to 70 mm	
Resolution	< 0.002 mm		
Operating temperature	0 to 50°C		
Temperature effect	<0.02% total stroke/°C		
Output	UART TTL		
Supply voltage	S1: 2.8 to 12 Vdc@16 mA max.		
	S2: 5 to 16 Vdc@16 mA max.		
Output auto update time	5 s		
Excitation time	0.3 s		
Protection index	IP 64		
Cable length	Customized (4 m total length standard)		

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.

Phyto-Sensor Group

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