SD-xM
(SD-5M, SD-6M, SD-10M)
Stem Microvariations Sensors
Quick Start Guide

www.phyto-sensor.com

Series 5000

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
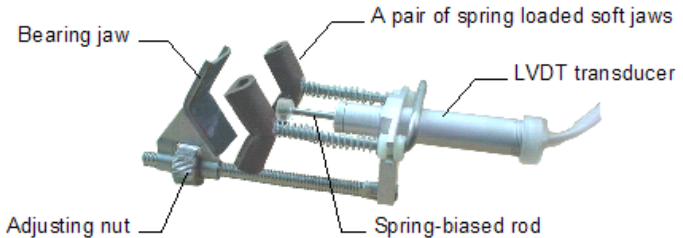
- Select an appropriate stem for sensor installation.
- Move the bearing jaw apart from LVDT transducer by rotating the adjusting nut.
- Locate the stem between the sensor's jaws.
- By rotating the adjusting nut, move the bearing jaw back until the jaws touch the stem.
- Continue rotation of the adjustment 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

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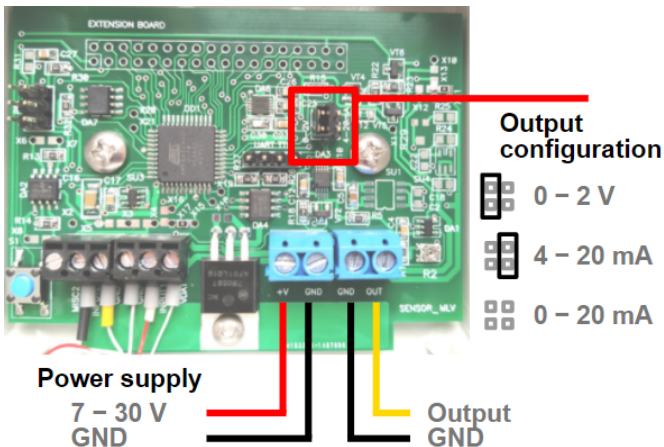
First, please choose a right output cable for connecting the sensor to a datalogger. The cable must be round with four wires. The maximal diameter of the cable is 6.5 mm. The cable length shall not exceed 10 m for 0 to 2 Vdc output (model SD-xM) and with about 1 km maximal length for 4 to 20 mA or 0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

Power supply

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

In case of using the intermittent power supply, please respect the following recommendations:

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	SD-5M, SD-6M, mm	SD-10M, mm
0.0	4.0	0.0	0.000	0.000
0.5	8.0	5.0	1.250	2.500
1.0	12.0	10.0	2.500	5.000
1.5	16.0	15.0	3.750	7.500
2.0	20.0	20.0	5.000	10.000

Calibration equations

0 to 2 Vdc Output:

$$\Delta D = 2.5 \times U \text{ (SD-5M, SD-6M)}$$

$$\Delta D = 5.0 \times U \text{ (SD-10M)}$$

4 to 20 mA Output:

$$\Delta D = 0.3125 \times I - 1.25 \text{ (SD-5M, SD-6M)}$$

$$\Delta D = 0.625 \times I - 2.5 \text{ (SD-10M)}$$

0 to 20 mA Output:

$$\Delta D = 0.25 \times I \text{ (SD-5M, SD-6M)}$$

$$\Delta D = 0.5 \times I \text{ (SD-10M)}$$

where:
ΔD — measured diameter variations, mm
U — output voltage, V
I — output current, mA

Specifications

Measurement range	*SD-5M*	0 to 5 mm
	SD-6M	0 to 5 mm
	SD-10M	0 to 10 mm
Stem diameter range	*SD-5M*	5 to 25 mm
	SD-6M	20 to 70 mm
	SD-10M	20 to 70 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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