



*Bio Instruments S.R.L.*

SENSORS AND SYSTEMS  
FOR MONITORING GROWING PLANTS

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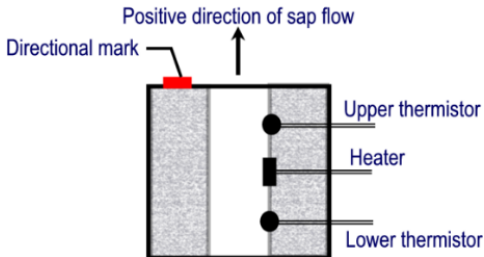
**SF-xT-485M**  
**(SF-4T-485M, SF-5T-485M)**  
Sap Flow Sensors  
Quick Start Guide



[phyto-sensor.com](http://phyto-sensor.com)

# Introduction

The SF sensors is designed for monitoring relative variations of sap flow rate in a leaf petiole or small shoot. The sensor's probe is made as a hollow collapsible heatinsulating cylinder.



A spring loaded heater and a pair of bead thermistors are located inside the cylinder.

A signal conditioner provides powering of the heater and conditioning of the output signal.

All SF-type sensors are tested on the water filled hose within the approximate measurement range of 12 ml/h.

Standard output cable length is 4 meters.

*Optional: Desired cable length may be specified in the order.*

*Interface: RS-485.*

*Protocol: Modbus RTU.*

# Installation

- Choose an appropriate part of stem for installing the sensor. Make sure that sap flow rate in the stem does not exceed 12 ml/h. The rough estimation may be done assuming the average transpiration rate equal to 1.5 ml/h per square decimeter of leaf surface.
- Open the sensor wide enough to place it on the stem. Make sure that the red directional mark corresponds to upward flow.



- Make sure that the sensor is firmly placed and cannot slide or twist with application of gentle force.
- Carefully cover the sensor with two or three layers of aluminum foil in order to protect the sensor from external heat effects. It is absolutely necessary for reliable measurements.



- To provide the firm positioning of a sensor on stems with diameter below 4 mm for SF-4M and 8 mm for SF-5M, insert a foam-rubber bar into the internal empty part of a sensor as it is shown below.



## Connection

**The sequence and correctness of the connection must be observed!** The shield shall be grounded at the data loggers side or connected to the 'minus' contact of the power source.

### Connection order

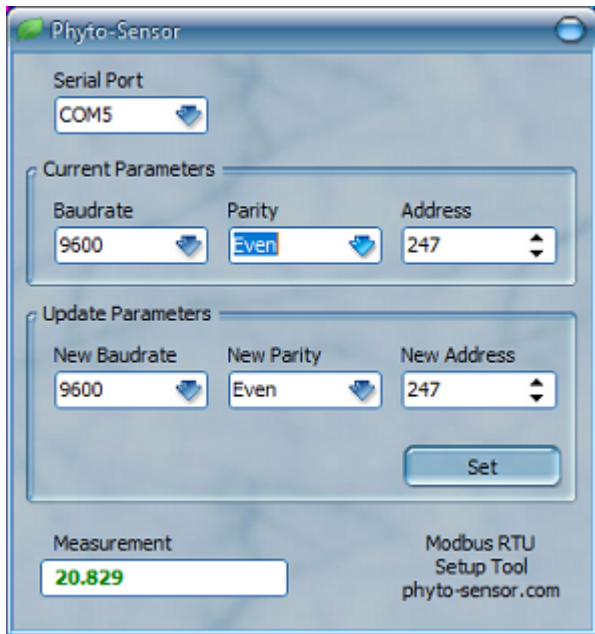
1	Black	Ground
2	Yellow	Output RS485-B
3	White	Output RS485-A
4	Red	Power 5 to 24 Vdc

### 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. The ground wires of all devices connected to RS-485 bus must be interconnected together for proper functioning. 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](http://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 0x00	UINT16 r	<b>Measured value</b> Value is stored with a scaling of 1:1000 (e.g.: 420 is equivalent to 0.420 relative units)	N/A

Register address	Modbus function Protocol address	Type Access	Parameter	Default
30101	3 0x64	FLOAT r	<p><b>Measured value</b></p> <p>Ordering the bytes in a "C D A B" sequence known as a "word swap" (e.g.: <i>the number 0.420 [3D 0A D7 3E] represented as [D7 3E 3D 0A]</i>)</p>	N/A
40001	4 0x0000	UINT16 r/w	<b>Slave-ID</b>	247



Register address	Modbus function Protocol address	Type Access	Parameter	Default
40002	4 0x0001	UINT16 r/w	<b>Baudrate</b> 0: 1200bps 1: 2400bps 2: 4800bps 3: 9600bps 4: 19200bps 5: 38400bps	3
40003	4 0x0002	UINT16 r/w	<b>Parity</b> 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 @ 10 mA output voltage.

Output require at least 15 minutes excitation time for producing stable output signal.

# Specifications

Measurement range		Not specified *
Output		RS-485 Modbus
Output signal zero offset		0.4 Relative units approx.
Output signal range		0 to 2 Relative units
Suitable stem diam.	<i>SF-4</i>	1 to 5 mm
	<i>SF-5</i>	4 to 8 mm
Operating temperature		0 to 50°C
Warm-up time of the probe		15 min
Overall dimensions	<i>SF-4</i>	30 × 30 × 40 mm
	<i>SF-5</i>	30 × 35 × 40 mm
Power supply		from 5 to 24 Vdc @ 10 mA
Cable length		4 m

\* Approximate range of 12 ml/h was determined on a stem simulator – a fiber-filled PVC hose with 5 mm in diameter.

# 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](mailto: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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