



*Bio Instruments S.R.L.*

SENSORS AND SYSTEMS  
FOR MONITORING GROWING PLANTS

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# **SF-xM** **(SF-4M, SF-5M)** Sap Flow Sensors Quick Start Guide

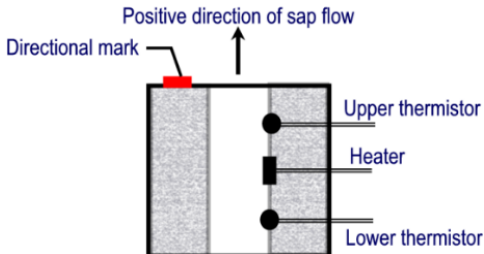


[phyto-sensor.com](http://phyto-sensor.com)

Series 2000 v.2.0

# 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.

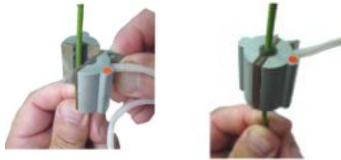
The probe is connected by a standard 1-meter cable to the waterproof box with the signal conditioner inside.

The output cable length should be specified in the order if required.

*Output:* Analog linear output 0 to 2 Vdc, 4 to 20 mA.

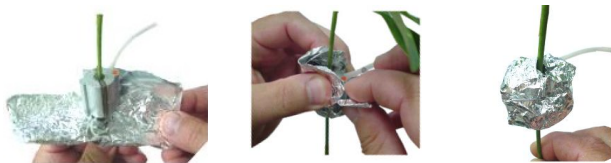
# Installation

- 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.
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- 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.
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# Connection

## SF-xM series 2000 v.2 Connection Diagram

### Power supply

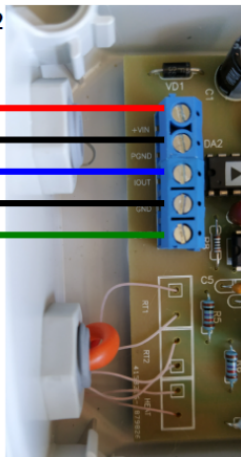
7 – 30 V

GND

### Output 4 – 20 mA

GND

### Output 0 – 2 V



## Power supply

The 7 to 30 Vdc @ 15 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:

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.

# Data reading

## Calibration table

<b>U, Volts</b>	<b>I, mA</b>	<b>Sap flow relative units</b>
0.0	4.0	0.000
0.5	8.0	0.500
1.0	12.0	1.000
1.5	16.0	1.500
2.0	20.0	2.000

## Calibration equations

0 to 2 Vdc Output	$SF = U$
4 to 20 mA Output	$SF = 0.125 \times I - 0.5$

where:

$SF$  — relative variations of sap flow, relative units

$U$  — output voltage, V

$I$  — output current, mA

# Specifications

Measurement range		Not specified *
Analog linear output (selectable)		0 to 2 Vdc, 4 to 20 mA
Output signal zero offset		0.4 Relative units aprox.
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
Supply voltage		7 to 30 Vdc
Current consumption		< 15 mA (+20 mA for current output)
Cable length between probe and signal conditioner		1 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.

## **Bio Instruments S.R.L.**

20 Padurii St., Chisinau MD-2002

REPUBLIC OF MOLDOVA

Tel.: +373-22-550026

[info@phyto-sensor.com](mailto:info@phyto-sensor.com)

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