



Bio Instruments S.R.L.

SENSORS AND SYSTEMS
FOR MONITORING GROWING PLANTS

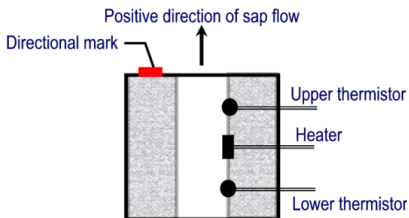
SF-4P, SF-5P

Sap Flow Sensors



Introduction

The SF-4P and SF-5P sensors are 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 heat-insulating 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. Standard cable length between signal conditioner and monitor is 4 meters.

Connection

Plug the sensor into any analog input of the PM-11 Phytomonitor or the PTM-48A Photosynthesis Monitor. In the PC program, specify the input number where the sensor is connected to.

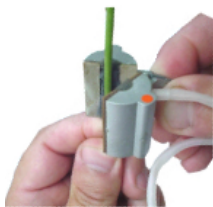
If you use the SF-4P or the SF-5P sensor for the first time, please make the appropriate record in the Sensors Database (see page 7) as described on page 5 of the PM-11 Phytomonitor Terminal Emulator software Guide or on page 11 of the PTM-48A Photosynthesis Monitor User's Guide.

Specifications

	SF-4P	SF-5P
Measurement range	Not specified	
	<i>Approximate range of 12 ml/h was determined on a stem simulator – a fiber-filled PVC hose with 5 mm in diameter.</i>	
Output signal zero offset	0.5 V approx.	
Accuracy	Not specified	
Suitable stem diameter, mm	1 to 5	4 to 8
Operating temperature	0 to 50 °C	
Overall dimensions, mm	30 × 30 × 40	30 × 35 × 40
Cable length between probe and signal conditioner	1 m	
Output cable length	4 m	

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.



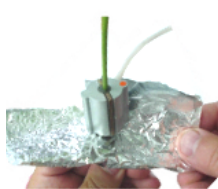
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- Make sure that the sensor is firmly placed and cannot slide or twist with application of gentle force.

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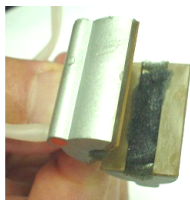
- To provide the firm positioning of a sensor on stems with diameter below 4 mm for SF-4P and 8 mm for SF-5P, insert a foam-rubber bar into the internal empty part of a sensor as it is shown below



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Zeroing mode

While working with the Sensors database, you may find a special feature named as Measurement Mode (see a screenshot below). There are two modes at the user's option:

Zeroing, i.e. zero offset (recommended in most of cases)

In general, the SF-type sensors are powered during five minutes before taking the reading. This is necessary for warming up a heated probe of the sensor. In Zeroing mode, a data logger measures and memorize the sensor's initial reading as the sensor is powered. Then, after five minutes, the data logger takes another reading and calculates a signal increment relatively to the initial reading. Thus, the data logger provides zero offset.

Zeroing mode may be used only when the measurement time interval is 10 minutes or more that is enough for warming and further cooling of the sensor's probe. If the time interval is shorter than 10 minutes, the measurement mode is automatically switched to the Normal.

Normal

In this mode, the data logger takes only the finite reading of the SF sensor as it was in older models of our data loggers and appropriate software.

This mode may be helpful if the SF probe may be occasionally heated or cooled by changing environment during those five minutes of warming up. In such conditions, the normal mode makes less signal surges than zeroing mode.

HOW TO SWITCH BETWEEN MODES

Open the Sensors Database, select any SF sensor, click 'Modify' button and choose the required mode in the appropriate field.

Sensor data

Type: SF-4P

ID: #xxx

Description: Sap Flow

Units: Rel

Format: #.###

Measurement mode: Normal

Measurement ranges:

Minimum: -2.500 Rel

Maximum: 2.500 Rel

Max Volts: 2.5 V

Coefficients

Standard

#	Coefficient
C0	0.00000e+000
C1	1.00000e+000
C2	0.00000e+000
C3	0.00000e+000
C4	0.00000e+000
C5	0.00000e+000

Edit

Defaults

Sensors Database Window in PM-11 / PTM-48A



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