



*Bio Instruments S.R.L.*

SENSORS AND SYSTEMS  
FOR MONITORING GROWING PLANTS

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# **LT-xT-485M**

## **Leaf Temperature Sensors**

### **Quick Start Guide**



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

# Introduction

The LT-1T, LT-12T, LT-2T and LT-4T leaf temperature sensors contain a subminiature touch probe that measures absolute temperature of a leaf or air. The lightweight stainless-steel wire clip holds a high precision glass encapsulated thermistor, which is about a millimeter in diameter. Small size of the probe and its special design provide almost negligible disturbance of the natural leaf temperature. The thermistor is connected to the clip by thin 0.15 mm leads to minimize heat conduction and response time. All conductors are proofed to avoid corrosion under the wet operating conditions.

The probe is connected by a standard 0.5-meter cable to the waterproof in-cable signal conditioner. The output cable standard length is 3.5 m, and it is customizable at ordering. Every sensor is tuned and calibrated within the measurement range. The tolerance range is  $\pm 0.08$  °C.

- **LT-1** – a single probe sensor.
- **LT-12** – a single probe sensor with a lightweight openwork holder for suspension of another standard LT-1 probe at a certain distance below the LT-12 probe. When installed on a plant leaf, the LT-12 probe measures the leaf temperature, and the LT-1T probe, which is suspended below, measures the air temperature outside the boundary layer near the measurement point on the leaf. That realizes a remarkable possibility to measure correctly the temperature difference between the leaf and air in a close vicinity.

- **LT-2** – a two-probe sensor: LT-12 (probe 1) and LT-1 (probe 2) sensors in one.
- **LT-4** – a four-probe sensor.

*Interface:* RS-485.

*Protocol:* Modbus RTU.

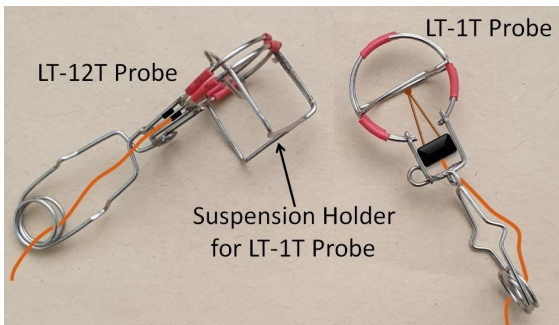
## Installation

Open the clip and attach the sensor to a leaf. Thermistor should be placed at the lower shady side of the leaf.

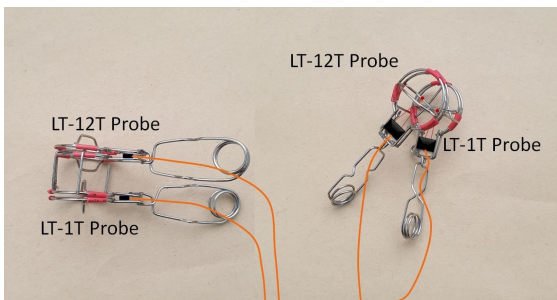
**IMPORTANT!** Secure the sensor's cable on plant stem with adhesive band in order to prevent occasional movement of the sensor.

### LT-12 and LT-2 sensors

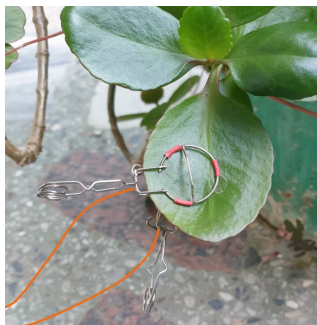
The outline of the LT-1 and LT-12 probes is illustrated in the Figures below.



*Fig.1. LT-12T and LT-1T Probes*



*Fig.2. The coupled LT-12T and LT-1T Probes*



*Fig.3. The coupled probes on a leaf*

# Connection

**The sequence and correctness of the connection must be observed!**

## Connection order

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

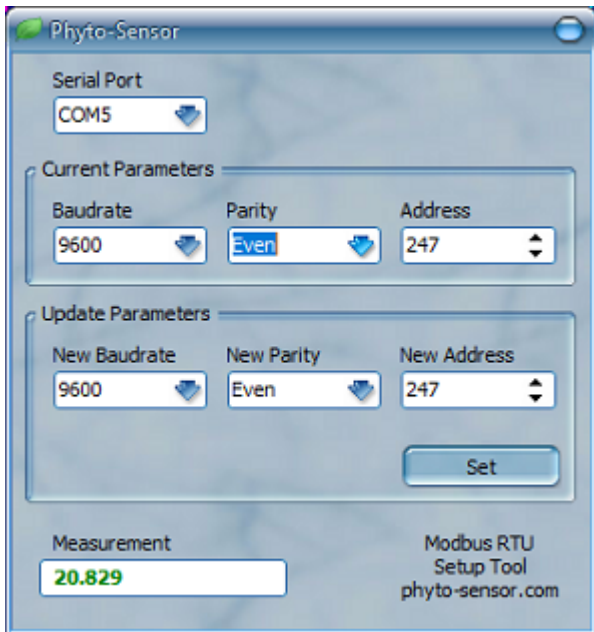
## Important notes:

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

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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 1:10 (e.g.: 245 is equivalent to 24.5°C)	N/A
30002 (LT-2)	3 0x01	UINT16 r	<b>Measured value of probe 2 (air or 2nd leaf)</b> Value is stored with a scaling of 1:10	N/A
30003 (LT-2)	3 0x02	UINT16 r	<b>Probe 1 and probe 2 difference</b> Value is stored with a scaling of 1:10	N/A

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Register address	Modbus function Protocol address	Type Access	Parameter	Default
30101	3 0x64	FLOAT r	<b>Measured value</b> Ordering the bytes in a "C D A B" sequence known as a "word swap" (e.g.: the number 24.5 [00 00 c4 41] represented as [c4 41 00 00])	N/A
30103 (LT-2)	3 0x66	FLOAT r	<b>Measured value of probe 2 (air or 2nd leaf)</b>	N/A
30105 (LT-2)	3 0x68	FLOAT r	<b>Probe 1 and probe 2 difference</b>	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 @ 6 mA output voltage.

## 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.

# Specifications

Measurement range	0 to 50°C
Output	RS-485 Modbus
Instrumental accuracy	< 0.15°C
Output auto update time	5 s
Excitation time	150 ms
Supply voltage	5 to 24 Vdc
Current consumption	2 mA typ. 6 mA max.
Number of probes	<i>LT-1</i> 1
	<i>LT-12</i> 1
	<i>LT-2</i> 2
	<i>LT-4</i> 4
Probe weight	1.6 g
Contact area of thermistor	About 1 mm <sup>2</sup>
Probe dimensions	50 × 20 × 10 mm
Protection index	IP64
Cable length	4 m

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