SISTEMES ELECTRÒNICS PROGRÉS

Manual

Irrometer Tensiometer Sensor MLTTC-120

CODE 06140295

The **MLTTC-120 Irrometer** sensor is a device used to determine changes in soil moisture.

The sensor is designed for small recipients commonly used in greenhouses and nurseries. With a **reading range of 0 to 40 centibar**, this sensor is used in situations where tensions above 30 centibar are rarely expected.

It indicates the effort that the roots have to make to extract the moisture that the crop needs from the soil. It does not measure the moisture percentage in the soil, but acts as a true artificial root.

It is made up of **a tank** with sufficient capacity to fill the tube correctly over several irrigation cycles, **a hermetically-sealed lid** to easily replenish the liquid in the tube and a threaded **blue ceramic capsule** to facilitate its replacement if necessary.

The dry soil draws liquid from the sensor, producing a partial vacuum in the instrument that appears in its reading. The drier the soil, the higher the recorded value.

When the soil becomes wet, as a result of rain or irrigation, the sensor reabsorbs moisture from the soil, which reduces the effort and indicates that the soil has once again reached its maximum moisture retention capacity, called "field capacity."

The reading of this sensor is expressed in centibar of water tension in the soil.

Technical specifications

Power supply	
Power supply:	+10 Vdc to + 30 Vdc

Reading	
Reading range	0 – 40 cbar
Precision %	1%

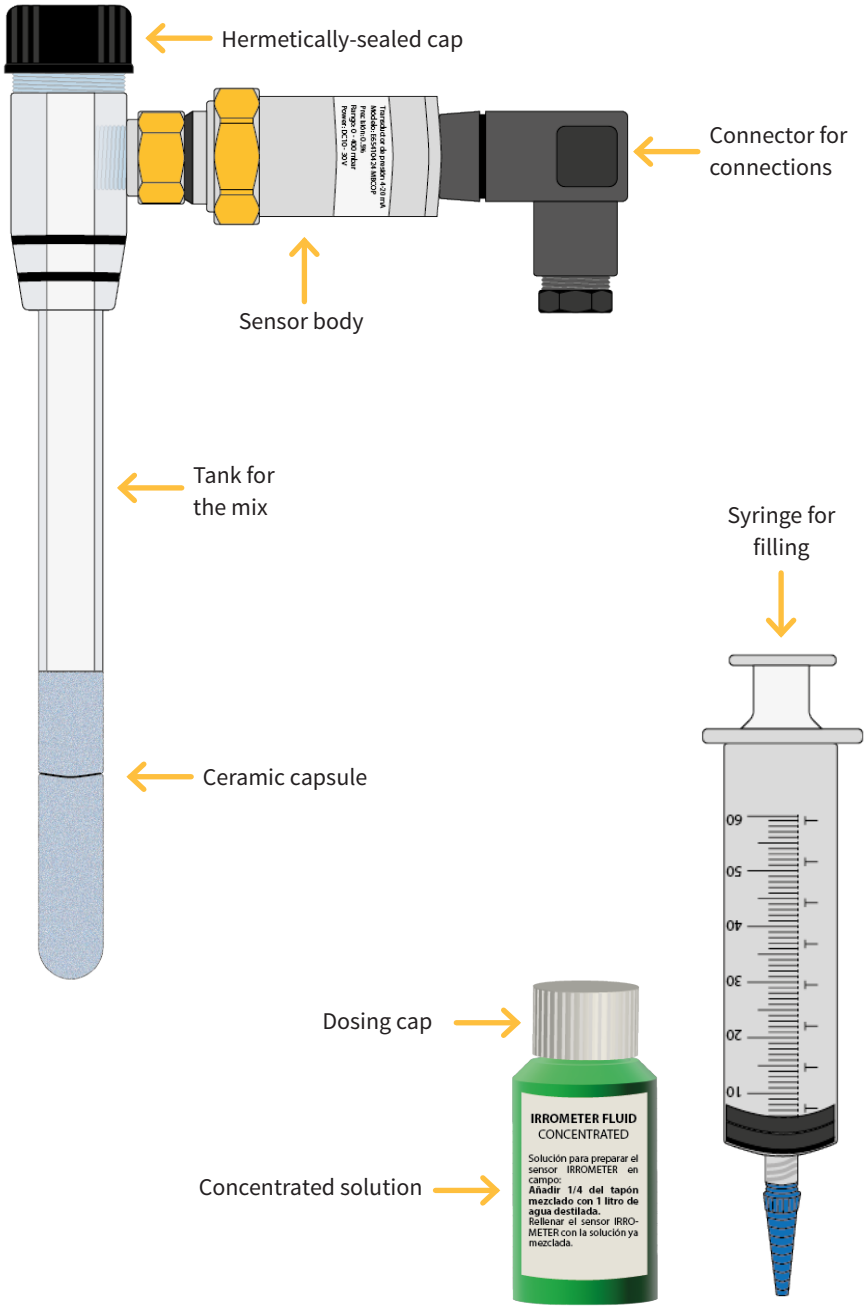
Outputs	
Output range	4 – 20 mA

Sensor dimensions	
Length	180 mm
Width	114 mm
Thickness	24 mm
Weight (approx.)	0.3 kg

Distance	
Maximum programmer-sensor distance [m]	*Minimum wire section [mm²]*
100	0.25
250	0.60
500	1.20
750	1.70
1000	2.25

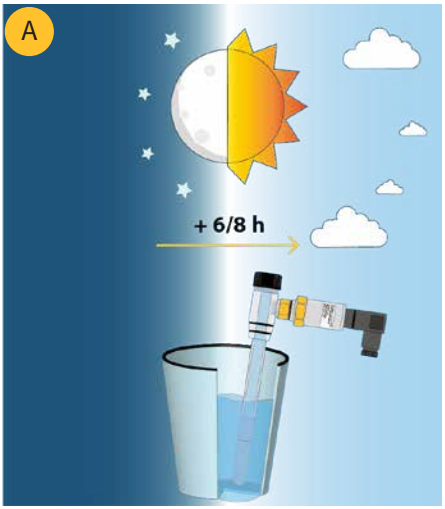
Sensor parts and other parts

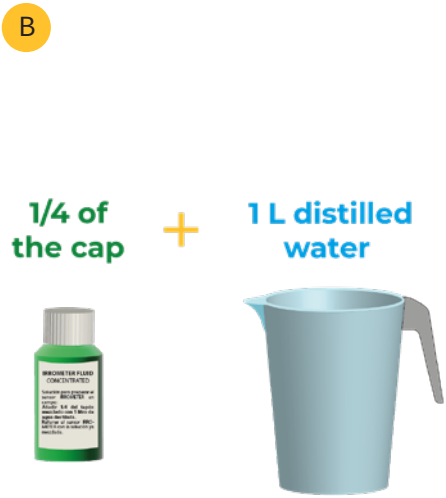
The following image shows the parts of the sensor with its accessories.

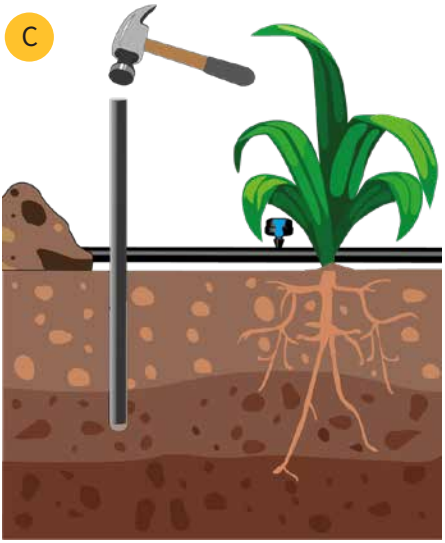


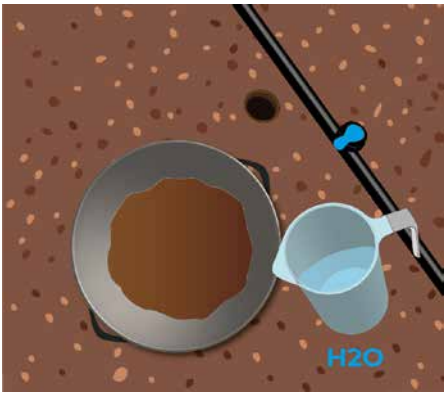
Installation

When selecting the location of the sensor, it is very important to remember that the volume of soil in contact with it has the greatest influence on the sensor reading. Any air pocket or excessive compaction around the sensor can also influence the measurements taken. Avoid creating preferential channels for water to pass between the sensor and the volume of soil in contact.









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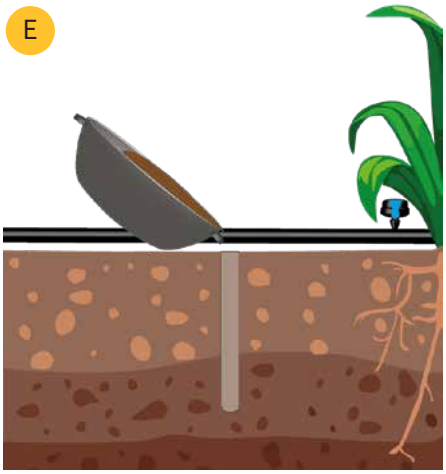

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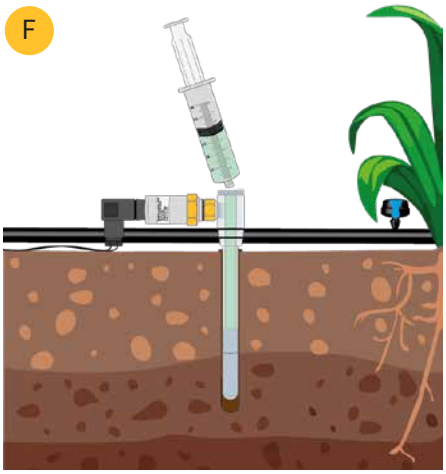


1. Remove the screw cap from the sensor, fill the tensiometer reservoir with distilled water and remove the plastic protector from the ceramic tip. **The tip must not be touched with the fingers.**
2. Without placing the screw cap, leave the sensor with the **ceramic tip submerged** overnight in a plastic container with **distilled water**, so that the water contained in the sensor comes out by gravity through the ceramic tip, leaving it completely soaked. A
3. The next day, take the sensor to the field, **again protecting the ceramic tip** from the dry air and using the plastic protection.
4. Prepare a solution with the concentrated green liquid supplied with the sensor, with the proportion: **¼ of the bottle cap** mixed in **one litre of distilled water**. B
5. Using a **22 mm diameter iron pipe**, drill a hole to the desired depth to install the sensor. The bar can be graduated in centimetres or a mark can be made at the desired installation depth. C
6. With the **soil removed without stones**, prepare a mud paste by mixing with water until a liquid texture is obtained. D
7. Pour the mixture into the hole where the sensor is to be installed. E
8. Remove the plastic that protects the tip of the sensor and **insert it until the mixture protrudes, forming a seal between the soil and the body of the sensor**, ensuring the ceramic tip has total contact with the soil.
9. Remove the screw cap from the sensor and **fill it up to the brim** with the syringe with the solution from **step 4** and close the lid well. F
10. Wet the edges of the soil where the sensor is installed or irrigate with abundant water.
11. Wait a few hours to consider the sensor measurements as representative.
12. **Frequent maintenance** should be carried out, which consists of removing the plug and refilling the liquid inside the sensor with the solution from **step 4**.

WATER RETENTION THRESHOLDS IN THE SOIL

Maximum: Field capacity

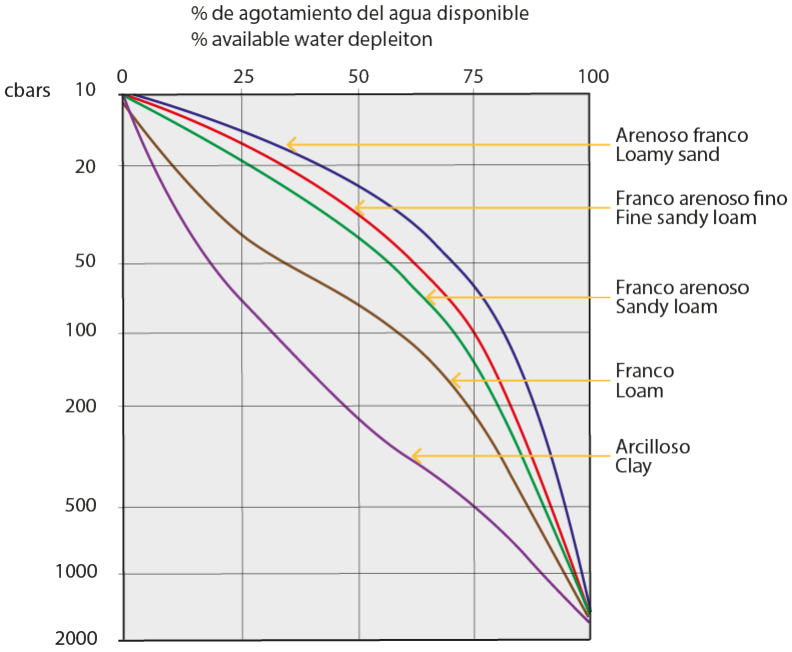
It is the water content in the saturated soil after heavy irrigation is applied and when the drainage rate changes from fast to slow. This point is achieved when all gravitational water has been drained and all spaces are filled with water. Field capacity is normally achieved two or three days after irrigation when the soil water tension is approximately 0.3 bar (30 cbar or 3 m water column) in clay soils or 0.1 bar in medium-texture soils.

Minimum: Permanent wilting point

It is the water content in the soil at which plants cannot recover and wilt even when sufficient moisture is added. This parameter can vary depending on the plant species and soil type and is determined by greenhouse experiments. This point is reached when the water tension in the soil reaches approx. 15 bar.

Available water: the water retained between the field capacity and the permanent wilting point.

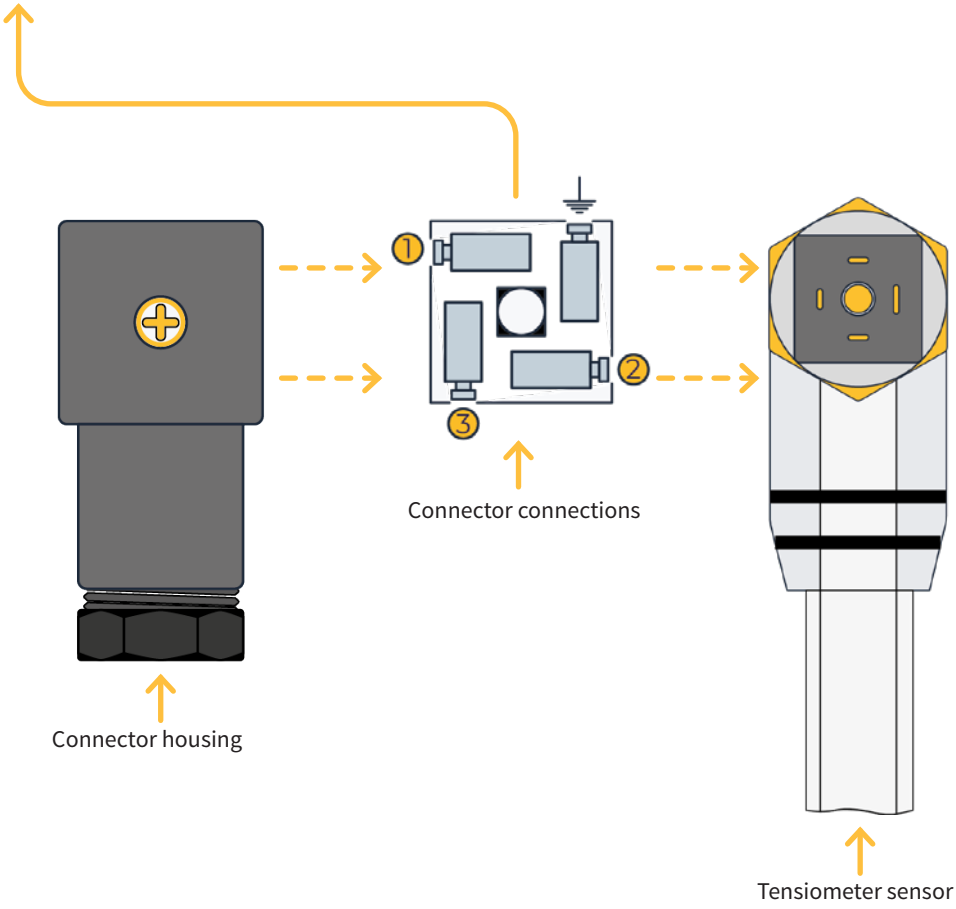
Tension curves - depletion of available water according to soil type:



Connections

The MLTTC-120 Irrometer Tensiometer Sensor can be connected to almost all of the units. A terminal/connector or a cable hose is provided for each unit that enables the different connections to be made easily with no need to access the inside of the unit. They all use the following colour legend and codes:

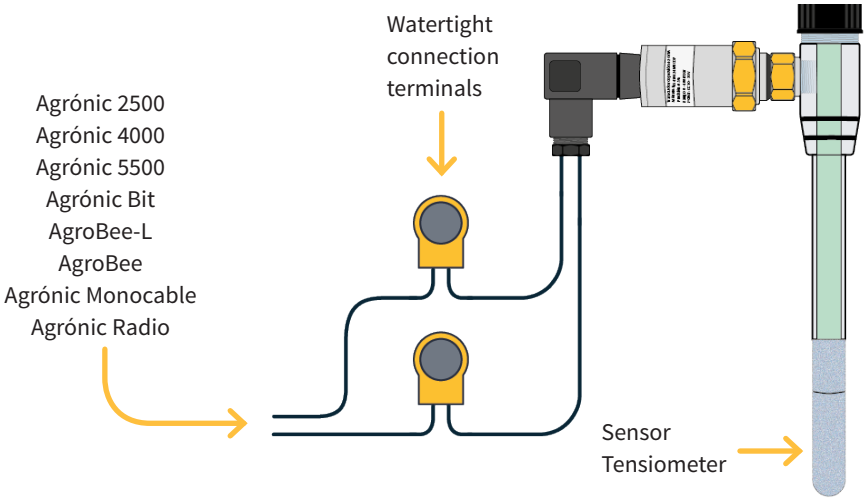
	A-2500	A4000	A-5500	A-Bit	Agrobee-L	Agrobee	A-Monocable	A-Radio
Pin 1 **(+)**	Pin 3 (2anal.input) (SDI-12)	V+	+VA (SDI-12)	VA1 o + (BIT DIN) +VA (BIT CON) +VA(BIT CAB)	V1/2/3 (3MA) +V1/2 (9SD-6SD) +V1 (2SD2ED1EA) +V1/2 (GNS 2SD1ED2EA)	V1/2/3 (3MA) V1/2 (9SD-6SD) V1 (2SD2ED1EA)	+ battery	VA1/2
Pin 2 **cbars**	Pin 4 (2anal.input) (SDI-12)	Inp.1-5 Inp.7-11	A1-A12 (SDI-12)	A1-A7(BIT DIN) A1-A3(BIT CON) A1-A2(BIT CAB)	A1/2/3 (3MA) A1/2 (9SD-6SD) A1 (2SD2ED1EA) A1/2 (GNS 2SD1ED2EA)	A1/2/3 (3MA) A1/2 (9SD-6SD) A1 (2SD2ED1EA)	A1(MAM 2/5/8-10-1) A1/2(MAM 2-22) A1/2(MAM 5/8-7/10-2)	A1-A2



NOTE It is recommended that the cables that remain loose are also connected with a spare 3M connector to avoid possible short circuits or getting wet. These connectors are supplied together with the sensor.

To ensure the water tightness of the module's hose wire connections, it is recommended to use waterproof terminals. The connection through these terminals must be made without stripping the cable wires.

As connection elements, those of the 3M Scotchlok series (www.3m.com) can be used; ES Caps from TYCO Electronics (www.tycoelectronics.com); or the Cellpack splicing and resin diversion kits (www.cellpackiberica.com).



Compatibility table

AGRÓNIC 2500	AGRÓNIC 4000	AGRÓNIC 5500	AGRÓNIC 7000	AGRÓNIC BIT
✓	✓	✓	✓	✓

AGROBEE-L	AGROBEE	A. MONOCABLE	AGRÓNIC RADIO
		+ 5 W panel + 7A battery + regulator	
✓	✓	✓	✓

Sensor configuration

The sensor acts by delivering a current or a voltage proportional to what it measures. The format indicates the sensor units and the relationship between the voltage read by the input and the sensor reading values.

A format with at least two calibration points needs to be configured for the sensor calculation and is configured from the programmer menu as follows.

Go to:

Function | Settings | Analogue Sensors | Formats (Always validate with the Enter key)

Once in the "**Formats**" menu, configure the settings as shown in the table.

- For A-2500, A-4000, A-5500 and A-Bit units, choose format 3 (cbar).
- For the A-7000 unit, choose format 13 (cbar).

Format sensor Irrometer MLTTC-120

Setting	Format 3
	Humidity [cbar]
No. of integers	2
No. of decimals	1
Sign	no
Units	cbar
Calibration Point 1	
Real value	800 mV
Logical value	00.0 cbar
Calibration Point 2	
Real value	4000 mV
Logical value	40.0 cbar

NOTE It is important to check that the logical values are correctly configured, otherwise the sensor reading will be incorrect.

Troubleshooting

THE SENSOR ALWAYS MARKS A "ZERO" VALUE

- They may mark well, but the soil is saturated either due to irrigation or rain or poor drainage.
- The sensor has no water or has lost suction due to excessively low water level in the pipe. In this case, the pipe needs to be filled.

THE SENSOR MUST BE REFILLED VERY FREQUENTLY

- Normally this is a consequence of a prolonged lack of soil moisture. In other words, infrequent irrigation.
- Sometimes it can be due to technical malfunctions such as:
  - Incorrect installation. (See page 4)
  - The soil is not in direct contact with the ceramic tip.
  - The cap is not closed (replace it if necessary).

SENSOR RESPONDS SLOWLY TO CHANGES IN MOISTURE

- This is generally due to the fact that the water infiltration rate into the soil is lower than it was thought.
- Make sure that the sensor is completely free of air and the tank is full of solution.
- The ceramic tip is partially blinded by salts.

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