



HOW TO...

INSTALL A TENSIO-METER

A guide to the correct procedure to install a Tensiometer
By Mike de Villiers

Although older technology, tensiometers are still an inexpensive means of monitoring soil water content for irrigation scheduling and are widely used on irrigation farms and in gardens. The tensiometer is a probe that is inserted into the soil to provide a direct measurement of soil water tension - the effort required by the root system to extract water stored in the soil. The wetter the soil, the lower the force required to extract the water.



Tensiometers are widely used in agricultural and landscape applications

The tensiometer consists of a sealed tube filled with water, a porous ceramic tip and a vacuum gauge. As the soil dries out, water is sucked out of the tensiometer through the porous ceramic tip. This creates a partial vacuum in the tube which registers on the vacuum gauge. When the soil is watered the converse happens. Water is sucked back into the instrument which in turn reduces the vacuum and therefore the reading on the gauge. No calibration is required.



STEP 1

Remove the plastic wrapper from the probe and do not handle the ceramic tip



STEP 2

Fill the Tensiometer with fresh water and without replacing the cap, place the unit into a container of clean water deep enough to cover the tip and leave overnight. When ready to install fill the container up so that only the gauge of the instrument is above the water level, this allows all air to be removed from the instrument and then top up the reservoir and replace the cap, giving it only a $\frac{1}{4}$ turn once the rubber touches the bottom of the reservoir.



STEP 3

The instrument is now ready to install, but the tip must be protected from drying out with wet paper towels or a plastic bag, while transporting to the site. Carefully select the position for each unit that is representative of the soil moisture content that is required as an input to the correct Irrigation scheduling. Also determine the correct depth to install the sensor tube, usually the center of the root zone.





STEP 4

Use a piece of 1/2" (15mm) galvanized tube, pre-marked with the correct depth and drive it into the soil up to the mark in order to create a close-fit hole for the instrument. Do not make the hole too deep as the ceramic bulb must be seated at the bottom of the hole after installation.



STEP 5

Remove the pipe and pour a small amount of water down the hole in order to make a slurry at the bottom of the hole.





STEP 6

Insert the instrument into the hole after removing the paper towel. Push downwards on the reservoir and be careful not to apply any force to the vacuum gauge. Ensure that the tube is firmly seated at the bottom of the hole and the vacuum gauge is at least 40mm above ground level.



An alternative installation method should be followed in the case of permanent crops with developed root systems or if the soil contains rocks or gravel. A hole should be dug about 300mm away from the point where, and to the same depth, at which the tensiometer is to be installed. From this hole, dig a narrow vertical trench to the desired location of installation, with as little disturbance to the roots as possible. The ceramic tip can again be covered by a slurry before inserting it into the soil at the end of the trench. The trench and the hole should then be refilled and the soil compacted.

STEP 7

Top-up the reservoir and replace the cap giving it only a ¼ turn once the rubber touches the bottom of the reservoir. The Tensiometers are now correctly installed and ready for use.





TENSIOMETER PLACEMENT

It cannot be stressed enough that the positioning and number of instruments installed should be carefully determined so as to be representative of the entire irrigation block, otherwise inefficiencies will occur. Soils can vary in one irrigation block and the placement of the tensiometer relative to the irrigation emitters should be done carefully. The following installation information serves as a guideline only and the final choice should be done in consultation with your Irrigation Consultant.

POSITIONING

- **Tree crops:**
Place in the active root zone on the north-west side, adjacent to the drip line
- **Row crops:**
Place in the crop row
- **Young Plants:**
Place in the root zone irrespective of the irrigation type

Furrow Irrigation:

Place the instrument next to the furrow and about two-thirds down from the start of the furrow. Place the instrument at a slight angle with the ceramic tip under the furrow

Sprinkler Irrigation:

Place the instrument in the active root zone where it will be subject to the normal wetting supplied by the irrigation system

Drip or Micro-Irrigation:

Place the instrument in the active root zone representative of the normal wetting supplied by the irrigation system. With drip systems, place the instrument some 300 to 450mm from the emitter and with micro systems, some 600 to 900mm from the jet.

DEPTH OF THE INSTRUMENT

Tensiometers are manufactured in different lengths. By installing instruments at two or more depths, the amount of irrigation water to be applied may be determined, ie if the shallow sensor shows a rapidly increasing reading and the deep sensor shows adequate moisture, you can run a short irrigation cycle to replenish the shallow root profile. If the deep sensor also shows a dry reading, a longer irrigation cycle will be needed to fully re-wet the entire root zone.

The shallow tensiometer should be installed in the upper half of the root zone on the northern side of the crop row, if applicable. *Note that 70% of the plant's water requirements are taken up in the upper half of the root zone.*

