Mechanical Tensiometers operation instructions

Tensiometer's construction

The tensiometer consists of 3 main parts:

a) Main body, made of a plastic tube, with a transparent part ("Window") at the upper part

b) A Ceramic cap attached to the bottom edge. In the standard model, the ceramic cap is replaceable and screwed to the main pipe.

c) A Mechanical Vacuum gauge. (The standard range is 0-100 cb. but sometimes we also supply gauges for 0-60 cb, 0-250Mb, or 100 Mb.)

When filled with water, the Tensiometer must be hermetically closed to keep the vacuum inside.

Operation principal:

When the Tensiometer is in the soil, the soil water is linked to the Tensiometer's internal water, through the porous ceramic cap and the vacuum created is displayed by the gauge on top. The dryer the soil, the bigger is the vacuum value.

Preparation for operation:

1. Dip the device vertically in free water, for 1-2 hours. The water level should be just a little higher than the ceramic cap. The Ceramic cap will absorb the water to release captured air.
2. Fill the pipe with clean water about 1 cm below the edge.
3. Add a few drops of Home Chlorine solution into the device in order to prevent algae development.
4. Alternatively, it is possible to cover the upper part by an opague to light, material, such as aluminum foil, to block sun light from the transparent part.
5. Add water up to the edge of the pipe.
6. Screw the vacuum sensor on top and close firmly. The closure should be done manually without mechanical tools.

Hold only the plastic adaptor below the gauge and not the gauge itself.

7. After filling water it is helpful to leave the Tensiometer in open air, for a while until the vacuum starts to build-up. This will help us to ensure that the device is well sealed with no air penetration.
8. Now dip the filled Tensiometer vertically in free water (just a little over the ceramic cap) and read the vacuum value. The obtained value is called the "Zero Value". We advise to mark this Zero value by a marker on the gauge cover. The Zero Value should be deducted from the readings at the future. (Mechanical gauge for low tension, have a special calibration screw to deduct the zero value).

The Tensiometer is ready now for installation in field.

Installation in the soil:

1. **location:** Select a healthy plant/ row of plants, that represents most of the tested field. Not too close to the field's edge. The location near the plant should be where we expect good roots development. Not right under a drip emitter. We recommend to drill a hole in a distance of about 10-15 cm. from the emitter.
2. **Depth of installation:** It generally depends on the type of plant (if its roots are shallow or deep) or type of soil. Normally it is recommended to install Tensiometers in 2-3 depths at each test point in order to follow water capacity in different layers.
3. **Insertion in the soil:** Drill a hole of about 20 mm diameter, best recommended by our manual drill. Drill about 5 cm deeper than the desired measuring depth.
4. Pour a small amount of water to the hole and add some loose soil in it to create a soft, muddy environment at the bottom of the hole.
5. Insert the Tensiometer carefully into the hole to the desired depth (until the depth sticker reaches the land surface). The ceramic cap should be pushed into the muddy bottom to create a perfect touch with the surrounding soil.

Special note: Do not insert the device with force, or shake it horizontally in order to prevent breakage of the ceramic cap.

6. Fill the spaces around the device with loose soil and tighten it as much as possible, leaving no air pockets around the device.
7. Your Tensiometer is now working. Wait about an hour to start reading the soil moisture.

Data Interpretation:

After irrigation or rain the values shall be low, about 1-5 Cb, above the zero point. As the plant starts to uptake water, the soil moisture drops and the soil-water tension will increase. The correlation between soil-water tension to water quantity is of a parabolic nature. As a result, at some point during the drying process, The increase rate of water tension becomes very high. (the vacuum rises quickly in a short time). **At this point, or slightly before, we know it is time for irrigation.**

Please note that in sandy soil the drying rate of the soil is faster and so are the readings of the device. In heavy soil the process is much slower.

Commonly the farmers decide of a set-point, over which they should open irrigation. This set-point may be very different for various crops, growth stages and various soil types. Consult your agronomist for the preferred set-point.

If we have more than one device in a check point, we can use the deeper one to decide to decrease or increase water quantity per cycle.

Anyway, for mechanical devices it is important to have a daily check at approximately the same hour, for a better understanding of soil moisture changes.

Remember: The Tensiometer is, first of all an informative tool for decision support. The final decisions are yours.

Maintenance:

It is important to keep the Tensiometer sealed and full of water. Along the season it is likely that some air will accumulate at the upper part. It is recommended to add water when the water level is below 2/3 of the window. In case the device is losing water quickly (every few days or less) check the Rubber seals on top or bottom, by unscrewing the vacuum gauge/sensor or the ceramic cap. If necessary we can supply replacement seals from our store.

In clay soil it is possible that the ceramic cap will gradually lose its permeability. You can take it out once in 1-2 years and wash it, or, after more years, replace it**.**

Important: in cold climate areas, where there is freezing danger, the ceramic cap or the pipe may get cracked if there is water inside. It is useful to add an Anti-Freeze solution to the Tensiometer or, simply, empty the device before the winter.

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