

# Soil Tension Sensor

## User Manual

### TR04-\*



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## 1. Product introduction

### 1.1product description

The growth of plants requires a certain amount of soil water, and the content of soil water has an important impact on the growth and development of plants. With the development of agriculture, the requirements for crop yield and quality are getting higher and higher, so it is necessary to know the precise irrigation cycle of plants and give them an irrigation time point. Soil tension sensors can give such an irrigation point. It can clearly inform the grower whether the plant is short of water, how long it will be short of water, and how often to irrigate, thereby improving the product quality of the crop.

In modern agriculture, the role of soil tension sensor is very significant. After the soil tension sensor collects the data of the soil moisture content of the planted crops, more precise irrigation measures are carried out according to the changes in the growth of the crops, which can not only record the soil tension change data, but also help the growers to continuously replenish the soil of the crop types. Environmental data is of great significance for improving crop varieties, improving crop quality and yield.

The product adopts transparent PVC plastic pipe, which can clearly see the amount of water remaining in the equipment, which is convenient for adding water. The product is suitable for places where soil moisture and drought information need to be detected, and it is mostly used in agricultural crop planting to monitor whether crops are short of water, so as to better water crops.

### 1.2Features

- The product shell is made of transparent PVC plastic pipe, which can visually observe the water level, respond quickly, and effectively sense the soil environment.
- Stainless steel mechanical vacuum gauge can be used outdoors for a long time.
- High-quality clay head is selected, which is fast and airtight, and has high sensitivity.
- Not affected by salt ions in the soil, agricultural activities such as fertilizers, pesticides, and irrigation will not affect the measurement results, and the data is accurate.
- The product adopts -100-0kpa vacuum gauge, which is convenient for users to view the data clearly.

### 1.3technical parameter

|                       |           |
|-----------------------|-----------|
| Measuring range       | -100-0kpa |
| Vacuum gauge accuracy | Level 2.5 |
| Operating temperature | 0℃-60℃    |
| Resolution            | 1kpa      |

|                  |                                                                   |
|------------------|-------------------------------------------------------------------|
| Shell material   | Transparent PVC plastic tube, stainless steel<br>mechanical watch |
| Protection class | IP67                                                              |

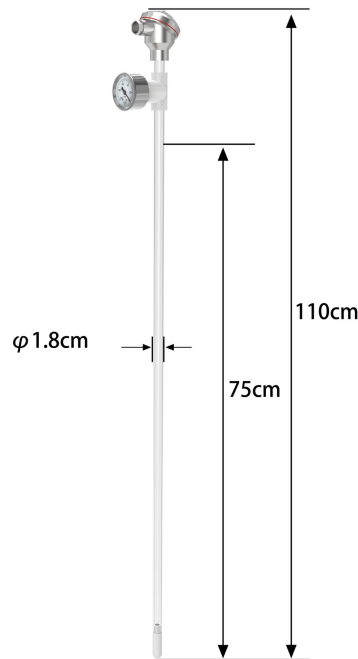
## 1.4product model

|       |      |    |     |                                                                              |
|-------|------|----|-----|------------------------------------------------------------------------------|
| TR04- |      |    |     | Soil Tension Sensor                                                          |
|       | ZKB- |    |     | Vacuum type (local display,<br>no signal output and data<br>upload function) |
|       |      | 1- |     | Soil Tension Sensor Housing                                                  |
|       |      |    | 15  | Measuring depth 15cm                                                         |
|       |      |    | 30  | Measuring depth 30cm                                                         |
|       |      |    | 45  | Measuring depth 45cm                                                         |
|       |      |    | 60  | Measuring depth 60cm                                                         |
|       |      |    | 75  | Measuring depth 75cm                                                         |
|       |      |    | 90  | Measuring depth 90cm                                                         |
|       |      |    | 105 | Measuring depth 105cm                                                        |
|       |      |    | 120 | Measuring depth 120cm                                                        |

## 2.Equipment installation instructions

### 2.1Device size and detection height

The product adopts the bottom monitoring structure, insert the bottom of the device into the soil at the depth to be monitored, and monitor the soil tension at this depth (for example, monitor the depth of 75cm). As shown below:



## 2.2 Equipment pre-installation inspection

### 2.2.1 Equipment List

One soil tension sensor

Certificate of Qualification, Warranty Card, etc.

Earth drill (optional)

Prepare your own checklist

Water, paper towel, bucket, gloves, earth drill (choose according to individual needs)

### 2.2.2 How to use the device

1. 1. Prepare cold boiled water (no air in the water), boil the tap water for 20 minutes, and let it cool down for later use.
2. 2. Exhaust the clay head, unscrew the cover of the top end cap, unplug the silicone plug, tilt the device and slowly pour cold water into it, fill it up, stand the instrument upright for 10 minutes (do not add the silicone plug), and see that the water leaks from the clay The surface of the head drips out, then plug the silicone plug, wrap the clay head with a paper towel to absorb water, and gently shake the device to exhaust as much as possible, and see that there are air bubbles rising, so that the soil tension reaches -15kpa or higher, this process can be repeated 2- 3 times. (Especially pay attention not to be too hasty every time you remove the plug, let the vacuum gauge slowly return to zero to prevent damage to the vacuum gauge)
3. 3. Fill the device with cold boiled water, add a silicone plug to seal it, stand the device upright, and let the clay head evaporate in the air for about half an hour. During the process,

you will find air bubbles on the tube wall. Tap the device lightly to make the bubbles rise.

4. Submerge the clay head into the water, wait for the soil tension to return to within -10kpa, add water to fill it up again, plug the silicone plug, screw on the cap of the top end cap, and keep the clay head fully immersed in water, ready for use.



### 2.2.3 Installation location selection

- Equipment installation after crop sowing;
- The installation location needs to be flat;
- Under the condition of comprehensive irrigation, the area with less water is preferentially selected as the monitoring location; under the condition of partial irrigation, the wet area is selected as the monitoring location;
- Choose a position where the crop growth is balanced and can represent the growth of most crops;

Know the root distribution of the monitored crops, and generally choose a location close to the water-absorbing roots of the crops.

**Note:** The installation site of the equipment should be selected at a relatively high terrain to prevent rainwater from pouring into the interior of the equipment and causing damage to the equipment.

### 2.3 Installation method

**Step 1:** Use a soil drill to drill holes in the right places

1. Place the 20mm diameter soil drill vertically on the ground, hold the handle firmly with both hands, press down and rotate slowly clockwise. (Note: Don't use too much force, be sure to turn a few more turns at a slow speed to prevent the drill from deviating to the hole and making it crooked)
2. Take the earth drill out of the hole and put it into a bucket to collect the soil from the earth drill into the bucket for the next step and mud.
3. Repeat the above drilling and soil extraction, and try to put the sensor lightly into the hole during this process (do not force the device to bottom) to test whether the depth of the hole is appropriate; Use soil drill to correct to ensure that the sensor can be put in and taken out smoothly; until the hole depth is flush with the installation position marked by the sensor, the drilling is completed.



### Step 2: Make the Mud

1. Pick out impurities in the soil, stones, grass roots, clods that are not easy to dissolve, etc. Grind the soil finely in order to mix with the mud.
2. Pour in an appropriate amount of water and stir well until it becomes thick; the loam mud is generally not thicker than "sesame paste"; and the mud is completed.



### Step 3: Grouting Installation

1. Slowly pour the mud into the hole, about 1/2 of the hole; it can be increased or decreased according to the actual situation.
2. Slowly put the sensor into the hole, slowly turn it in one direction and press down, too fast may cause the air bubbles not to be completely discharged. (Note: During the process of turning and pressing down, do not pull up the sensor to prevent the gas from being sucked into the hole again)
3. When the sensor is installed to the correct depth (the zero scale line is flush with the ground), some mud will overflow around the device and the grouting is complete. (Note: Remove the excess mud beyond 3CM around the sensor to prevent caking from affecting water infiltration)



**Step 4: Installation is complete**



#### 1. Main points of sand installation

Sand installation is the same as the loam standard installation procedure, but it should be noted that sufficient water needs to be prepared. Before grouting, pour water into the hole and wet the entire wall until there is excess water at the bottom of the hole. Then follow the steps to slowly pour the mud into the hole, about 1/2 of the hole. The rest of the installation steps can refer to the installation of loam soil.

#### 2. Clay installation points

The installation of the clay is done after drilling the holes to collect the soil, and after cleaning the impurities, soak the clay in water for more than 4 hours to soften the clay and make it easier to live into a relatively uniform slurry. After soaking, stir until it becomes thick and grouting. The rest of the installation steps can refer to the installation of loam soil.

## 1. Precautions:

1. The clay head must not be oily, so as not to block the micropores and cause the instrument to malfunction.
2. The measuring range of the instrument is -100-0kpa. When this limit is exceeded, the instrument will leak due to the rupture of the tube wall of the clay head, which will make the instrument useless.
3. Slowly open the silicone plug to avoid malfunction of the vacuum gauge.
4. Regularly check, fill the sensor with cold boiled water, about half a month to a month, and do not loosen the sensor during the filling process.

5. Before the temperature drops to 0° C, the outdoor instrument should be withdrawn to avoid freezing.