Irrigas sensors are available in critical water tensions:

>Irrigas Pro 10/1: 10 Kpa sensors for water sensitive crops, mainly in sandy soils;
>Irrigas Pro 25/1: 25 Kpa sensors for water sensitive crops (eg.: vegetables);
>Irrigas Pro 40/1: 40 Kpa sensors for less water sensitive crops (eg.: grains, some fruits) mainly for clay solis).

Waranty

The HIDROSENSE Comércio de Sistemas para Irrigação Ltda. warrants this equipament against project defects, manufacturing defects for the period of one year, from the date of acquisition, provided all the instructions in this manual have been followed. In case of defect, during the warranty period, Hidrosense responsibility is restricted to repairing or substituting the equipament of its own manufacturing. The repairing or substitution do not enlarge the period of guarantee.
This warranty does not cover product damages caused by assidentes and inappropriate handling and usage.

SENSORS	READING	
ROOT	DRY > WATER	MOIST > DO NOT WATER
THRESHOLD	DRY > IDEAL	MOIST > WATER IN EXCESS

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Fitting and Usage Manual

The product you have just acquired has been previously tested and approved by Embrapa and is manufactured with materials and components adequate to both agricultural and home use, providing quality and durability. Irrigas is a patented soil water tension sensor that works with pressurized gas in its porous cup cavity. Each Irrigas sensor has a critical water tension in which it became porous to gases.

Please read this manual and follow the instructions and recommendations closely.

Important: Each soil, climate, plant, watering system and crop handling is different and needs specific irrigation management procedures, therefore, always look for professional advice when irrigating (watering).

1) How many sensors are necessary?

The sensors should detect the water availability to the plants, which is highly variable and depends on factors such as rooting patterns, soil variability, environment, topography and irrigation system.

To avoid representativeness failure place at least three kits (pairs) of IRRIGAS Pro per hectare of an uniform cropped area. These kits may be installed in a small representatitve area to make the an Irrigation Station.

Each ı “root sensor” (green label) used to indicate the time to irrigate and a “threshold sensor” (red label) to settle the correct irrigation amount in terms of depth of water or watering period.

2) Where the sensors should be installed?

Choose typical areas in which plants are healthly and crop development is normal. Avoid lowland, subjected to flooding, and areas near leaking tubes.

Place de sensors on the plating lines, at a horizontal distance from the plant of approximately equal to one-third of the rooting depths.
For furrow or drip irrigations, install de sensors horizontally, parallel to, or aligned to, the planting line. The horizontal distance between the sensor and the irrigation source (drip line

or furrow) should also be about 1/3 of the plant root depth. Notice that the distance between sensor and plant and between sensor and irrigation source be about equal.

3) How deep should the sensors be installed?

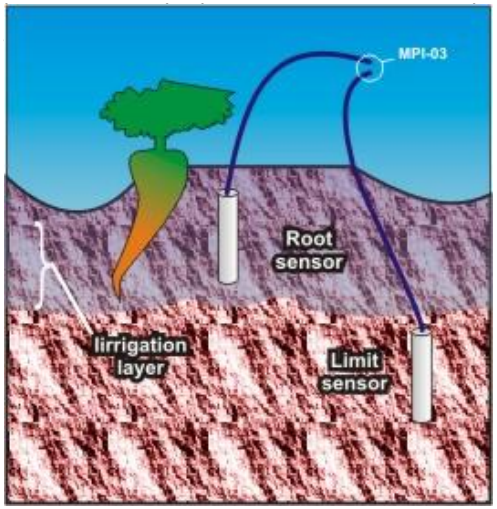
First of all, sure you know the plant root depth. It is usual to obtain this value by inspection, while digging the needed holes with, depth equal to or a little deeper than the plant effective root depth. The position of these holes is that specified in the previous item (2) for the IRRIGAS Pro sensors. Holes can be open with small digging tools such as a shovel or an auger digger.

Next, place the "threshold sensor" (red label) at the bottom of the hole, horizontally or vertically, pressing the soil around it to guarantee that the sensor surface is completely surrounded by soil. Return part of the soil to the hole, trying to mimic the original soil structure. Then, install the "root sensor" (green label) in the same hole and in the same way. Typically, the "threshold IRRIGAS Pro sensors" installed at a depth of 2 to 3 times the "root sensor" depth.

Finally, place a stake next to the sensor kit and fit the tags to identify precisely the sensors.

In the case of use of plastic mulching, IRRIGAS Pro should be placed before the film application. If the mulch is already in place, then cut the film, install IRRIGAS Pro as recommended and seal the plastic cutting completely. The sensors tubes should pass through the plant hole in the plastic film.

Start taking Irrigas Pro readings in the next day, after the sensor installatin. This period of time assures the necessary tension equilibration



4) How is the reading of the sensors done?

Fit the IRRIGAS Pro "root sensor" tube into the MPI-03 reader outlet (left side). Turn the reader on by pressing the button (right side) for a few seconds. If the soil is moist the green lights ("moist") turns on after pressing the button for a few seconds. On the contrary, if the soil is not moist ("dry") the red light remains on. Repeat the procedure for the threshold sensor.

Readings should be done every morning. In case of sensitive or fragile crops or sandy soils, readings should be done least a twice a day.

For future reference and evaluation keep reading records as in the Record Form attached.

5) When should irrigation be carried out?

Irrigation should be applied when more than half of the "root sensors" (green label) yield "dry" reading. Irrigation should be applied, even when all the threshold sensors yield "moist" readings.

It is important to note that the farmer should continuously evaluate the conditions of the crops and use IRRIGAS sensors monitoring as a tool for helping the decision of watering or not.

For recently seeded for transplanted fields keep the soil moist, as oriented by your agronomist (agriculturist). That is, Keep the soil wet enough for their development without using the Irrigas Pro sensor. Monitoring starts after the crop reaches minimum root development.

6) How munch water should be applied?

The amount of irrigation is usually controlled according to the watering duration. Consequently, the watering duration should be sufficient to allow soil water storage in the rooting system layer. IRRIGAS Pro "threshold sensors" (red label) monitoring is the tool the farmer uses to check the applied amount of water, or whether the irrigation duration is enough.

The physical characteristics of each soil determine how much water it can store. Sandy soils normally store much less water than clay soils and consequently requires higher irrigation frequency and smaller amounts.

The correct irrigation quantity is the largest quantity (water depth or time) that yield "dry" readings in about half of the "threshold sensors". Adjust the irrigation amount frequently, as for example, at each four cycles. This adjustment is necessary as the root system develops continuously.

By trial an error, "threshold sensors" observations allow rapid irrigation quantity adjustment in terms of irrigation time or water depth. Such irrigation amount induces a wet front which reaches all the "root sensors" in a few hours. The wetting movement proceeds and should reach less than half of the "threshold sensors". For this reason the majority of the "threshold sensors" should remain yielding "dry" readings most of the time.

On the other hand, when most of the "threshold sensors" yield "moist" readings, the soil has excess of water below the rooting zone due to rain or over watering. Soil drying at these depths is usually slow and it may take some days before the "threshold sensors" yield "dry" readings again.

As monitoring practice builds up, a near ideal irrigation management is achieved, in which evapotranspiration is balanced by the application of appropriate irrigation depths, with frequencies that increase with the evaporative demand and with the crop development.

7) Recommendations

After use in a crop Irrigas Pro sensors should be thoroughly washed using only water and a sponge. Additionally, before a new use, Irrigas sensors need a check for damages caused by animals, accidents and mis handling. For this purpose a leaking test should be performed. To do this, soak the Irrigas porous cup in water for half a minute and perform a reading. If the reading is "moist", then IRRIGAS Pro is presumed to be in good condition.

As plants grow and deepen their rooting system, deeper Irrigas Pro reinstallation may be needed

when crop have reached 35% to 40% of its phonological cycle.

Irrigas Pro