# ELMED

Industrieelektronik   Elettronica Industriale

# Tensiometer
# TNS-03

using LoRaWan data transmission

Art. 46-46-272

# Tensiometer TNS-03

using LoRaWan data transmission

In **fruit and grape growing**, as well as in other areas of agriculture, the produce has to meet ever higher quality criteria. To ensure that **standards are continually met**, technical aids that can measure every environmental factor are being used with increasing frequency. **Optimizing irrigation systems helps to maximise yields and minimise** **costs, as a uniform level of moisture in the soil during the growing period results in optimal growth and so a better quality harvest.** Moisture levels can be measured very accurately using the **TNS-03 tensiometer**, allowing the appropriate action to be taken. The sensor is simply pushed into the ground and the suction pressure determined.

## Mode of operation

The pipe of the **tensiometer** is filled with water. Next the probe and pipe are pushed down to root depth next to the plants. The soil begins to absorb the water until an equilibrium is reached between the suction tension and the moisture in the soil.

The higher the suction pressure is, the drier the soil – and the lower the suction pressure is, the more moist the soil. Depending on the type and variety of plant, the pressure should be kept within a certain range through irrigation.

To this end, the current data, but also graphical recordings, are displayed via the Cloud on your **browser** and **smartphone**. Moreover, it is possible to have an **alarm** sent via email or app if the level falls below or exceeds the limit set by you.

## Communication

The TNS communicates via radio: a **LoRaWAN** gateway transmits the measured data into the Cloud. Its range covers several kilometres. Depending on the conditions, data may be sent over 20 km.

All readings are sent **periodically** to the Elmed cloud via the internet connection. They can be accessed via the **Elmed web interface** and **SmartMeteo** (available for Android and iOs) and are displayed in graph form.

The following additional sensors can be connected to the **TNS-03 tensiometer** by means of the **integrated plug connection**:
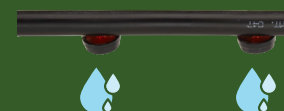· Water meter
· Pressure controller for detecting irrigation
· 2 x analogue input 4–20 mA
· 12 V digital output for switching the valve

ⓘ **What exactly is the LoRaWan Gateway?**
The LoRaWan Gateway acts as a means of access to the Internet for the LoRaWan soil moisture readings – the LoRaWan Gateway transmits the soil moisture data via a SIM card, but also, for example, at home via a network cable. The Lo(ng) Ra(nge) radio connection can connect several devices over several kilometres (dependent on conditions).
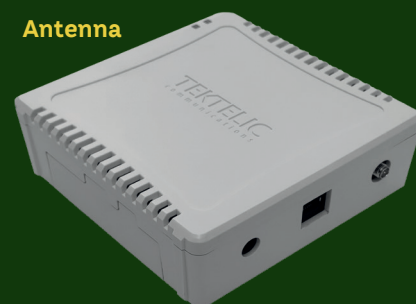
# Structure

The **TNS-03 tensiometer** consists of a cylindrical PVC tube with a porous ceramic cell and top section. The top section contains all of the electronics including the battery, solar panel, radio antenna and processor as well as the sensors.

Due to the low energy consumption and the integrated solar panel, the **tensiometer** is particularly low-maintenance.

**onnector**
**n be topped up by**
**quick connector**

# Technical data

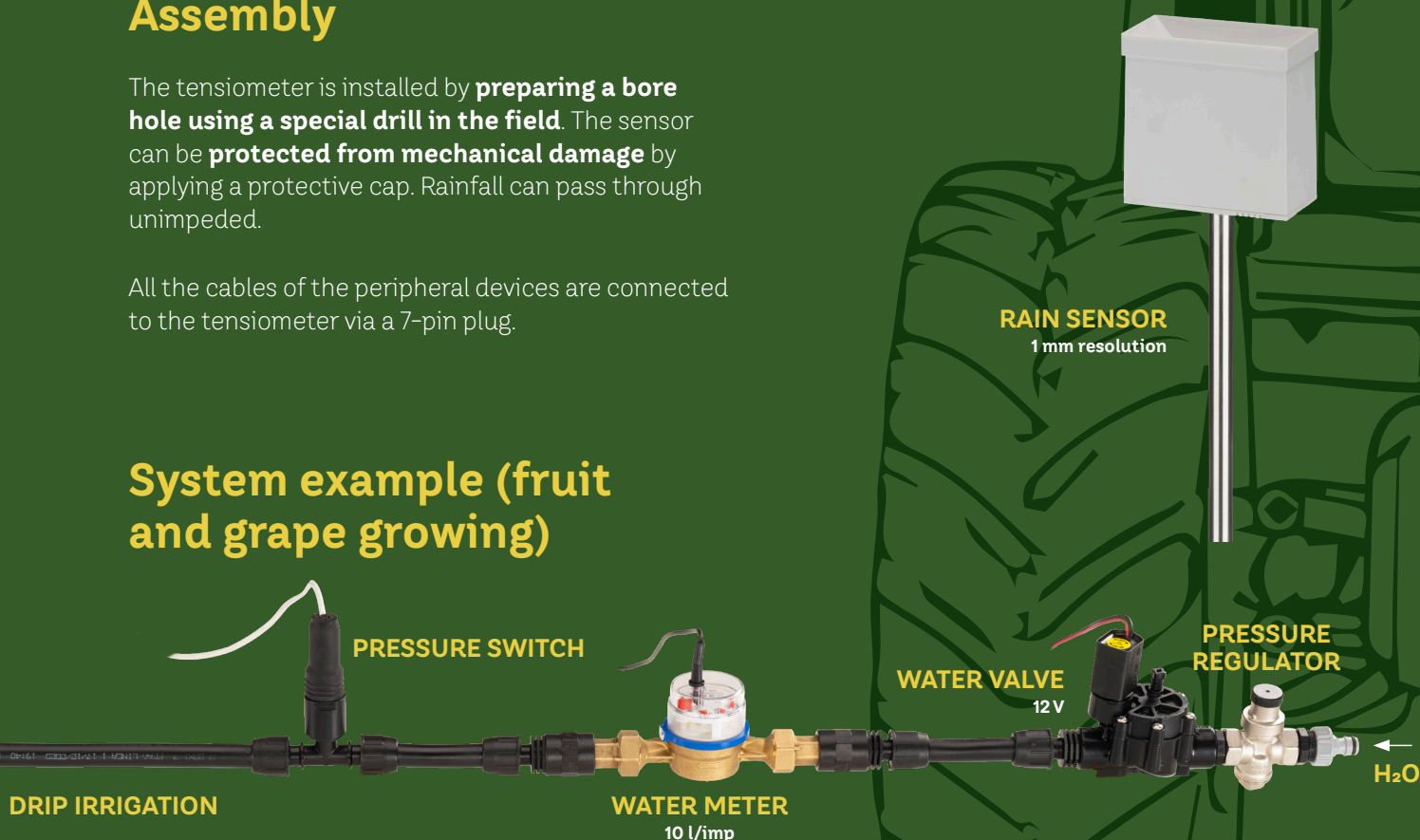| | |
|---|---|
| Measuring principle: | suction tension |
| Power supply: | 3 x AA rechargeable batteries |
| Photovoltaics: | internal 0.5 W photovoltaics |
| Measuring range of the sensor: | ± 1034 mBar (±15 psi) |
| Sensor resolution: | ± 0.25% |
| Data transmission: | LoRa 868 Mhz LoRaWAN |
| 30 cm depth: | 120 x 300 x 22 mm |
| 60 cm depth: | 120 x 600 x 22 mm |

Connections:
- Water meter
- Pressure switch for detecting the irrigation system
- 2 x analogue input 4–20 mA
- 12 V digital output for switching the valve

# Assembly

The tensiometer is installed by **preparing a bore hole using a special drill in the field**. The sensor can be **protected from mechanical damage** by applying a protective cap. Rainfall can pass through unimpeded.

All the cables of the peripheral devices are connected to the tensiometer via a 7-pin plug.

**RAIN SENSOR**
**1 mm resolution**

# System example (fruit and grape growing)

**PRESSURE SWITCH**

**WATER VALVE**
**12 V**

**PRESSURE REGULATOR**

**H₂O**

**DRIP IRRIGATION**

**WATER METER**
**10 l/imp**

# Technical variants of the TNS-01 & TNS-03

**46-46-272** | Tensiometer TNS-01 with solar and data transmission via LoRa, 30 cm, with connection for a water meter and pressure switch.

**46-46-273** | Tensiometer TNS-03 with solar & data transmission via LoRa, 30 cm, for controlling an H₂O valve with connection for a water valve, water meter, pressure switch, pressure & rain sensor.
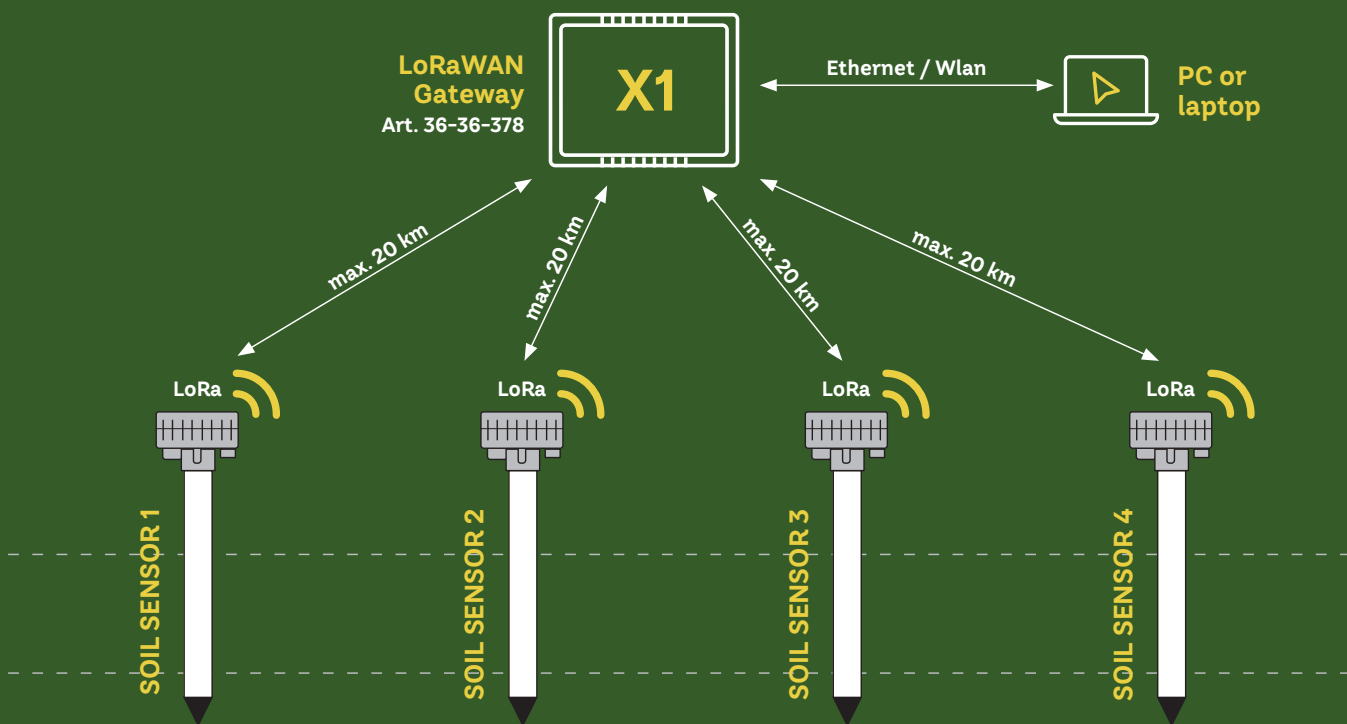
**46-46-282** | Tensiometer TNS-01 with solar and data transmission via LoRa, 60 cm, with connection for a water meter and pressure switch.

**45-46-295** | Tensiometer TNS-03 with solar & data transmission via LoRa, 60 cm, for controlling an H₂O valve with connection for a water valve, water meter, pressure switch, pressure & rain sensor.

# Overview of operations

**LoRaWAN Gateway** Art. 36-36-378

**X1**

Ethernet / Wlan

**PC or laptop**

max. 20 km | max. 20 km | max. 20 km | max. 20 km

LoRa | LoRa | LoRa | LoRa

**SOIL SENSOR 1** | **SOIL SENSOR 2** | **SOIL SENSOR 3** | **SOIL SENSOR 4**

# Tensiometer TNS-03
# App & web application

## Mobile

The measurements of the **TNS-03 tensiometer** can be viewed quickly at any time on your **smartphone** or tablet (app available in the Apple AppStore and Google PlayStore). The current values are displayed for a quick overview. Clicking on a sensor shows a graph for the day. In landscape format a longer period may also be viewed.

## PC

With a browser, you can obtain an overview in graphical form of all measurements at a glance. In addition to this, it is also possible to export the data for further evaluation.

## Alarm

You can set an upper and lower limit so that you are automatically notified (messaging via the app and/or email) if the suction pressure falls below/exceeds the set limits.