



METER  
ENVIRONMENT

## HYPROP APPLICATION NOTE: HOW TO DETERMINE THE AIR-ENTRY POINT

### 1. INTRODUCTION

The HYPROP and [HYPROP 2](#) can extend the water potential measuring range by using the air-entry value of the tensiometer ceramic cups as an additional measuring point (Schindler et al., 2010). The air-entry point is when there is a sudden pressure drop of the soil tension to zero (see Figure 1, red circles). This option is only viable if the sharp drop toward zero tension is recorded (i.e., if the measurement campaign was performed long enough).

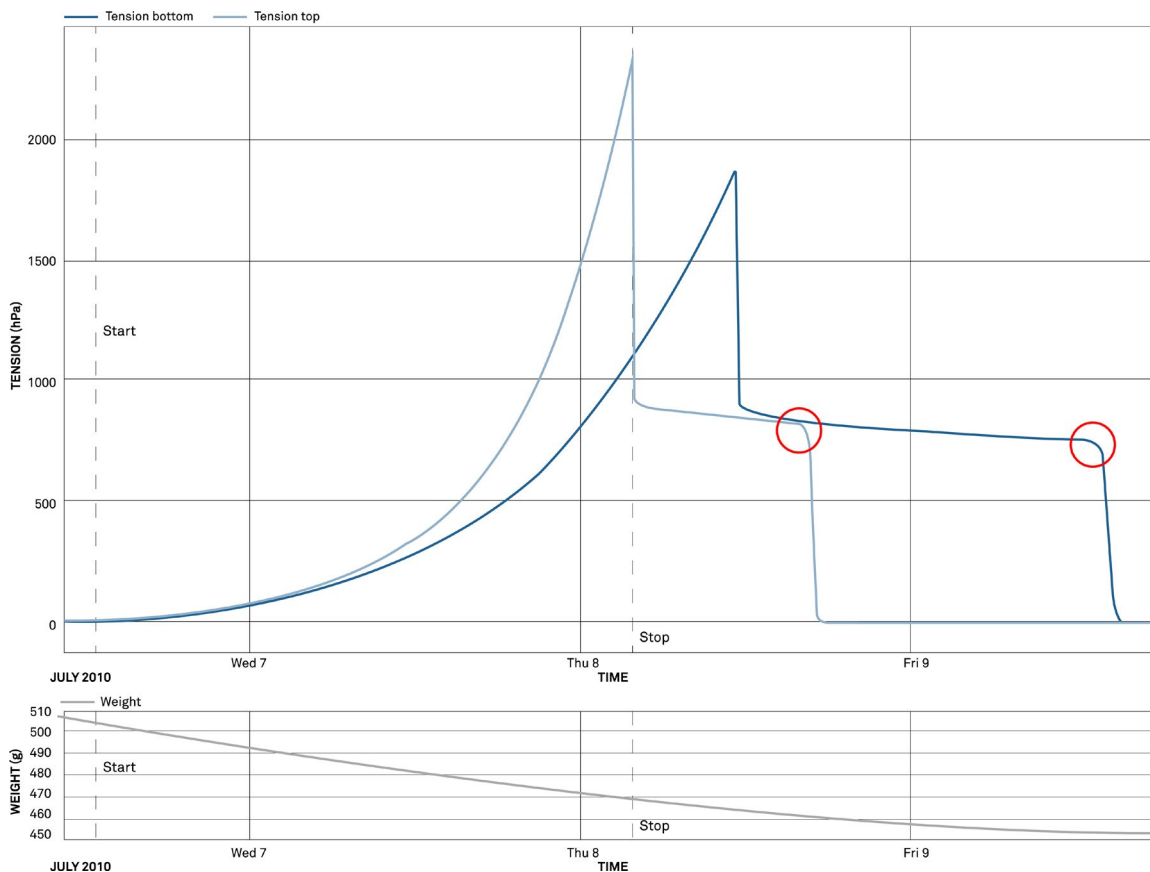


Figure 1. Air entry point shown circled in red

The default air-entry value of 8.8 bars is the statistical mean of ceramic cups used in the 2010 series of HYPROP tensiometers. This value can change with time and use. Use the following procedure to verify the air entry value for the HYPROP tensiometers.

## 2. OPERATION

The following safety information must be strictly followed:

- Read all applicable safety instructions completely and carefully. Always follow the recommended safety instructions, especially the user manual and the safety data sheet of the compressor that is used.
- Do not use any device if the electrical wire is damaged.
- Always use safety glasses when working with overpressure.
- Always check all connections before applying overpressure.

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### 2.1 SETUP FOR DETERMINING THE AIR-ENTRY POINT

1. A container filled with distilled water
2. Equipment to mount the shaft refilling adapters (see Figure 2)
3. Shaft refilling adapters including tubes (e.g., from HYPROP refill unit – Beaker Mount (part no. 020256)) (see Figure 2)
4. Compressor (capable of 7.0-bar to 12.0-bar pressure) including connection tubes and pressure gauge (resolution: 0.01 bar)
5. Safety glasses and rubber gloves
6. Timer
7. Magnifying glass

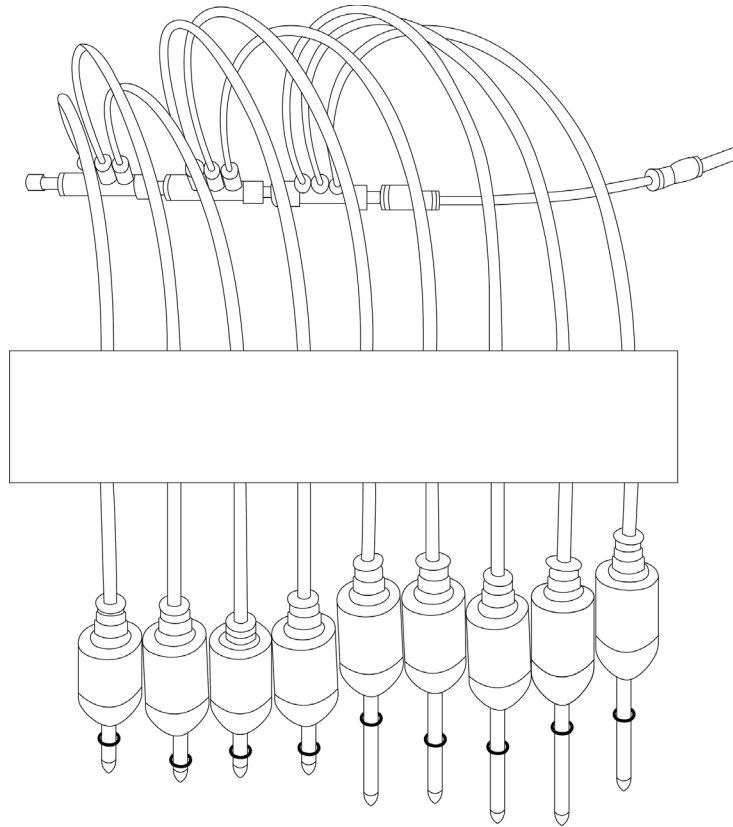


Figure 2. Apparatus with tensiometers

## 2.2 PROCEDURE FOR DETERMINING THE AIR-ENTRY VALUE

- 1 Clean the ceramic tip carefully with a brush under running water.
2. Place the tensiometer shafts you want to test in a beaker filled with distilled water for 24 hours to saturate the ceramic tip.
3. After saturation, completely empty the tensiometer shafts, screw them in the refilling adapters and place them in the water-filled container as shown in Figure 2.
4. Turn on the compressor, and slowly set the value to 7.0 bars.
5. Set the timer to two minutes. After two minutes, use the magnifying glass to check if there are any air bubbles coming out of the ceramic (Figure 3).
  - a. If not, slowly set the value to 7.5 bars and wait another two minutes.
  - b. If yes, note the current value of the applied pressure as the air-entry point of the tensiometer shaft. Note the serial number of this shaft to assign it to the respective HYPROP measurement for evaluation.

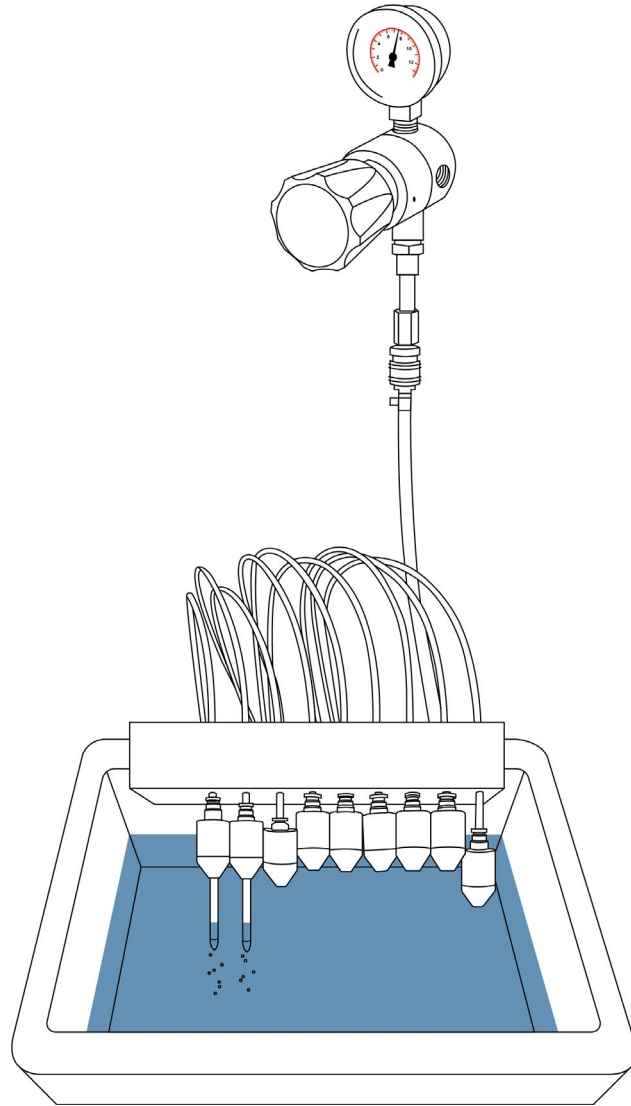


Figure 3. Air bubbles coming out of ceramic tips

6. Increase the pressure by 0.5-bar increments every two minutes until all tensiometer shafts show air bubbles.
7. If the air-entry point is higher than 12.0 bars, replace the tensiometer shaft. The pores of the ceramic have likely become clogged.
8. Release the pressure back to 0.0 bars and unscrew the tensiometer shafts, using rubber gloves.
9. Assign the measured air-entry values to the respective HYPROP measurement.
  - a. Enter the serial number of the tensiometer shaft in the HYPROP-FIT software in Register Information. This helps evaluate the HYPROP measurement more precisely.

### 3. REFERENCE

Schindler, Uwe, Wolfgang Durner, G. Von Unold, L. Mueller, and R. Wieland. "The evaporation method: Extending the measurement range of soil hydraulic properties using the air-entry pressure of the ceramic cup." *Journal of Plant Nutrition and Soil Science* 173, no. 4 (2010): 563-572. ([Article link](#))

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