TENSIOMETERS

You will return to the contents of P1 SOIL by clicking the pictogram

The right quantity of water in the soil is of primary importance for an optimum plant growth and yield of crop. Measuring the soil moisture content (in percentages) as well as the determination of the soil suction (in hPa, mbar or cbar) in the soil therefore is one of the most important aspects of complete agricultural physical soil research.

The simplest and most commonly used method to determine the soil suction (and with that the moisture content of unsaturated soil) directly in the field uses the tensiometer.

The tensiometer is available in many types and sizes. They can be applied in normal soils but also in potting compost and other organic and anorganic substrates.

Before a tensiometer is placed in the soil or a substrate a hole needs to be drilled.

14.04 Tensiometer set

This multi-functional set can be applied to execute different research with various types of tensiometers up to a depth of 90 cm. The standard tensiometer for example is used in irrigation areas for permanent placement.

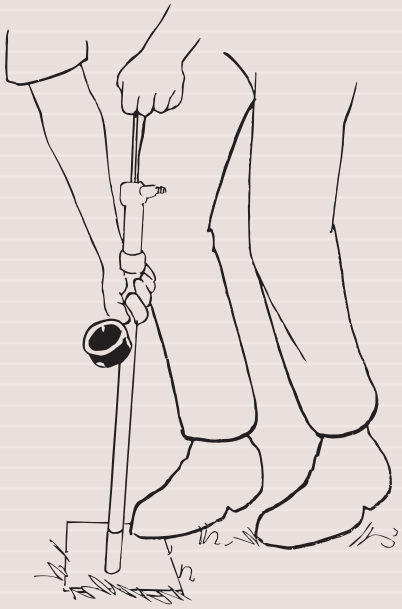
The Jet-fill tensiometer has an additional water reservoir in order to be able to continuously fill the tensiometer allowing it to be ready for use faster and more mobile.

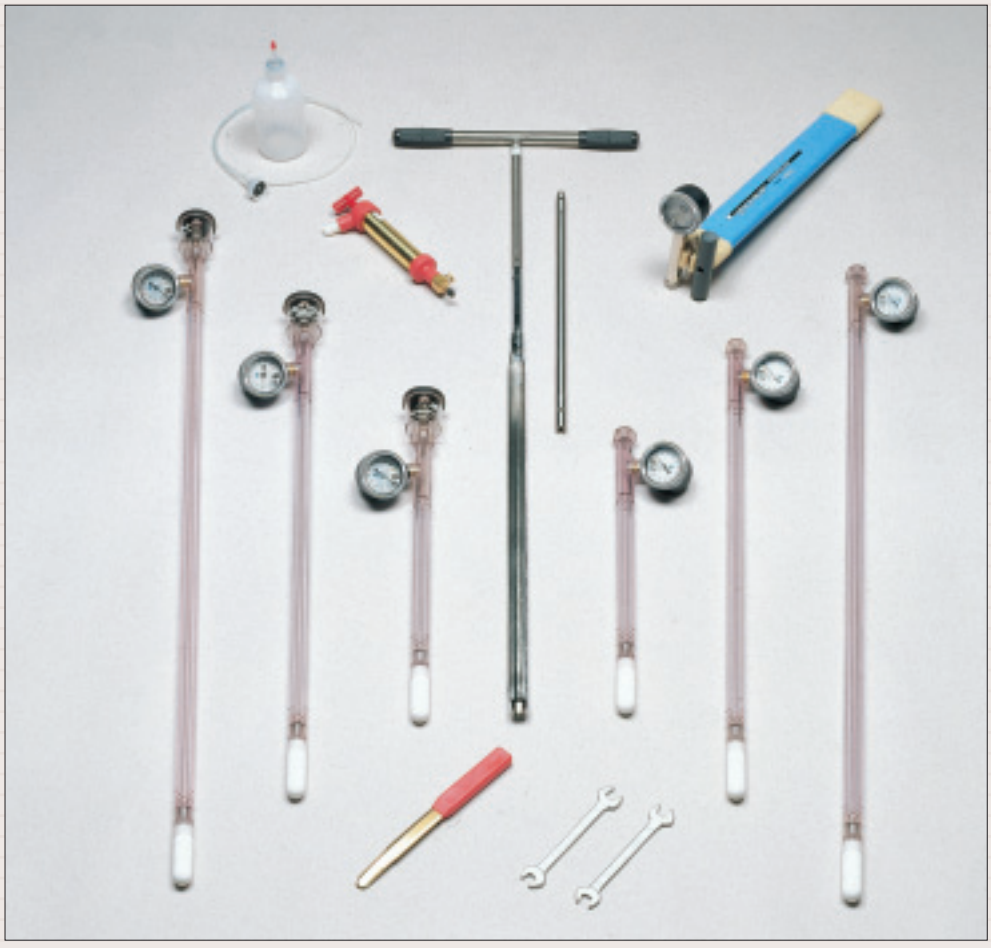
For fast measurement of soil suction (usually in small areas) the quick draw tensiometer provides measuring results within minutes.

In case of all tensiometers the measuring values are read from the manometer.

In addition to tensiometers in various lengths the set also includes a service set as well as a gouge auger (to pre-drill a hole) with extension rod and a cleaning spatula.

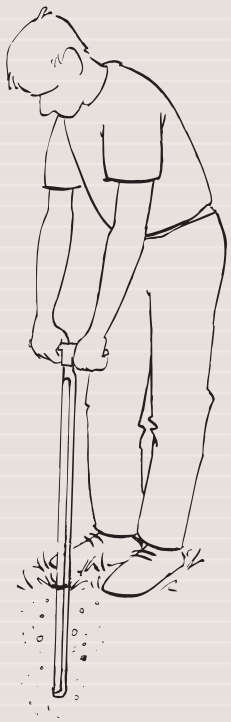
The air is sucked from the tensiometer after the meter is filled with water.





Tensiometer set, complete set

The hole for the tensiometer is pre-drilled using a gouge auger.



BENEFITS

14.04 Tensiometer set

- Direct read out of plant water stress
- Simple purely physical operating principle
- Set perfect for schools and horticulturists
- Exchangeable porous ceramic cups
- Simple installation

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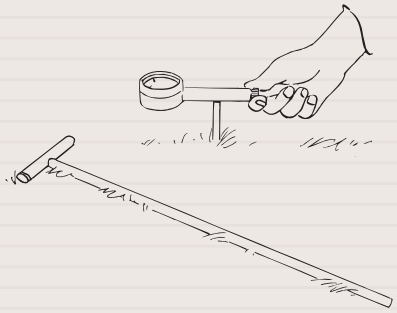
Pre-setting the tension on the quick draw tensiometer.



14.04.03 Standard tensiometers

The standard tensiometer consists of a clear transparent plastic tube with a ceramic cup at the bottom end and a manometer at the top. The standard tensiometer is delivered in various lengths allowing the execution of simultaneous measurements at various depths in the root zone. For pre-drilling special auger sets can be provided.

14.04.04 Jet-fill tensiometers

The Jet-fill tensiometer basically has the same components as the standard tensiometer but is equipped with a reservoir and a refill mechanism. At a push of the button the Jet-fill mechanism instantly injects water from the reservoir into the body of the tensiometer and removes accumulated air. This tensiometer can be provided in different lengths as well.

14.04.05 Quick draw tensiometers

The quick draw tensiometer is a small tensiometer that can easily be moved and, using the auger for pre-drilling, placed into the soil. The small diameter and the super porous ceramic cup and the possibility of pre-setting the tension, allow a measuring period of only a few minutes. After each measurement the tensiometer can be stored in a carrier cylinder in which it is kept humid allowing immediate use in case of a next measurement.

14.50 Electronic tensimeter

The electronic tensimeter is a portable pressure sensor in a bag for measurement of the moisture tension in the soil, measured through a tensiometer tube placed in the soil. The measuring device can be moved from tensiometer tube to tensiometer tube allowing an unlimited number of measurements over a short period of time. The hypodermic needle of the tensimeter is fitted on the tensiometer tube through the silicon stopper after which the moisture tension can be read. The meter has a measuring range of 0-1000 hPa with an accuracy of less than 2%. Tensiometer tubes are available in various lengths.

The tensimeter is fitted on the tensiometer tube.

Standard and Jet-fill tensiometer

Quick draw tensiometer

Electronic tensimeter

TENSIOMETERS

14.04.08 Tensior 3 with electronic pressure transducer

The Tensior 3 is a tensiometer with an electronic sensor giving a continuous measuring signal (in hPa). The measuring results are read with a read-out device or datalogger. The tensiometer can only be used in frost free periods, because the pressure sensor is located in the top end of the tensiometer. The tensiometer is fitted with an over-pressure safety and is available in various lengths. The Tensior 3 has a measuring range of -100 till +700 hPa and an output signal of -10 till +70 mV (+/- 3 mV). Power supply is 10.6 Vdc and the current consumption is 1.3 mA. The tensiometers are supplied including cable and calibration certificate.

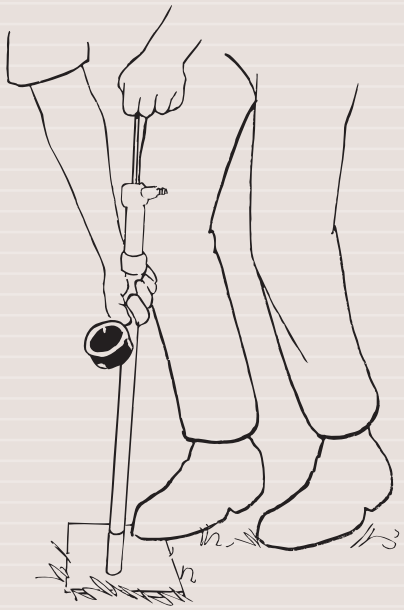
14.04.09 Tensior 4 with electronic pressure transducer

In case of the Tensior 4 the transducer is located at the bottom end of the tensiometer tube allowing it to be used also in case of frost (frost not too deep into the soil). The pressure transducer can simply be combined with another length of tensiometer tube. This allows measurement at various depths. The Tensior 4 can be used for measurements in different positions. The Tensior 4 has a measuring range of -1000 till +850 hPa and an output signal of -100 till +85 mV (+/- 3 mV). Power supply is 10.6 Vdc and current consumption 1.3 mA.

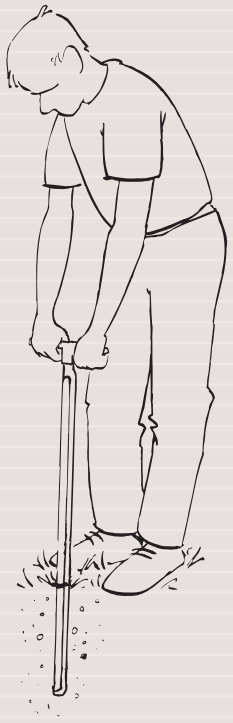
14.04.10 Tensior 5 mini tensiometer with electronic pressure transducer

The mini tensiometer Tensior 5 is characterized by its small ceramic cup (diameter 5 mm and a surface area of 0.5 cm^2) and the short length of the tube causing only minor disturbance of the soil. The mini tensio-meter is used in particular for (point) measurements in soil columns, small lysi-meters and pots. The meter yields fast and reliable measuring results and can also be used for mea-surements in different positions. The Tensior 5 has a measuring range of -1000 till +850 hPa and an output signal of -100 till +85 mV (+/- 3 mV). Power supply is 10.6 Vdc and current consumption 1.3 mA.

The air is sucked from the tensiometer after the meter is filled with water.



The hole for the tensiometer is pre-drilled using a gouge auger.



Tensiometers Tensior 3 and Tensior 4

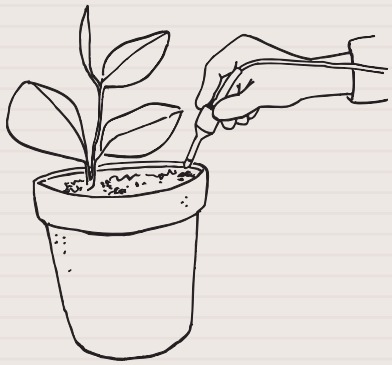
Mini tensiometer Tensior 5

Eijkelkamp Agrisearch Equipment

www.eijkelkamp.com

TENSIOMETERS

The mini tensiometer (Tensior 5) is pushed into a pot.



Date are read out and stored in the infield read-out device.

14.04.11 Tensior 8 with electronic pressure transducer

The Tensior 8 is characterised by maximum user comfort for all monitoring projects: one standard version basically equipped with external filling, fill level indicator, temperature sensor and amplifier.

The tip of the highly accurate Pt1000 temperature sensor dips directly into the Tensiometer cup's water resulting in the best possible thermal contact to the soil. Through two capillary tubes the T8 can be refilled respectively deaerated without removing it from the soil.

A few of many applications:

- Studies on drain water, ascending or lateral water and infiltration processes
- Agricultural and forest research on plant water availability and plant physiology
- Water balance and transport studies
- Layer impermeability in landfill and dumpsites
- Regulation of irrigation systems
- Control sensor for soil water extraction systems
- Monitoring studies with datalogger or fieldbus
- Lysimeter sites
- Ecological conservation of evidence

Advantages Tensiors

- Robust.
- Water tight (IP68).
- Easy to use.
- Exact, reliable measurements.
- Possibility to connect a datalogger or handheld read-out device.
- Over-pressure safety device.
- Applicable for field-, greenhouse-, and laboratory measurements.

Tensior 8

Read-out device for Tensiors

Art.no.	Description	Qty. in set
Tensiometers (P1.63)		
	For universal application we supply a number of tensiometers as a complete standard set.	
14.04	**Tensiometer set. Complete standard set for multiple measurements to a depth of 90 cm.**	
**14.04.03.02	Standard tensiometer with screwable ceramic tip and suction meter (0-100 centibar), length 30 cm.	1
**14.04.03.03	Standard tensiometer with screwable ceramic tip and suction meter (0-100 centibar), length 60 cm	1
**14.04.03.04	Standard tensiometer with screwable ceramic tip and suction meter (0-100 cbar), length 90 cm.	1
**14.04.04.02	Jet-fill tensiometer with screwable ceramic tip and suction meter (0-100 cbar), length 30 cm.	1
**14.04.04.03	Jet-fill tensiometer with screwable ceramic tip and suction meter (0-100 cbar), length 60 cm.	1
**14.04.04.04	Jet-fill tensiometer with screwable ceramic tip and suction meter (0-100 cbar), length 90 cm.	1
**14.04.03.07	Service kit for tensiometers, including vacuum hand pump, anti-algal fluid, service cap, tubing and filling bottle	1
**14.04.03.08	Ceramic tip for tensiometer	3
**04.03	Bi-partite gouge auger, model P, length 114 cm, op. length 60 cm, Ø 19 mm.	1
**04.05.01.16	Bent spatula, breadth 16 mm	1
**06.01.31	Stainless steel extension rod, Ø 15 mm, 50 cm, M-10 thr.	1
**99.50.12	Spanner 12x13 mm	2
**14.04.05.02	Quick draw tensiometer, compl. with insertion tool, spare sensing tip and storage sheath length 45 cm	1
**14.04.05.05	Sensing tip for Quick Draw tensiometer	2
14.04.03	**Standard tensiometers and accessories.**	
14.04.03.01	Standard tensiometer with screwable ceramic tip and suction meter (0-100 centibar), length 15 cm.	
14.04.03.02	Standard tensiometer with screwable ceramic tip and suction meter (0-100 centibar), length 30 cm.	
14.04.03.03	Standard tensiometer with screwable ceramic tip and suction meter (0-100 centibar), length 60 cm.	
14.04.03.04	Standard tensiometer with screwable ceramic tip and suction meter (0-100 cbar), length 90 cm.	
14.04.03.05	Standard tensiometer with screwable ceramic tip and suction meter (0-100 cbar), length 120 cm	
14.04.03.06	Standard tensiometer with screwable ceramic tip and suction meter (0-100 cbar), length 150 cm.	
14.04.03.07	Service kit for tensiometers, including vacuum hand pump, anti-algal fluid, service cap, tubing and filling bottle	
14.04.03.08	Ceramic tip for tensiometer	
14.04.03.09	Suction meter for tensiometers	
14.04.03.20	Insertion augerset for tensio-meters, standard set for normal soils, depth 150 cm	
14.04.03.20	Insertion augerset for tensio-meters, standard set for normal soils, depth 150 cm	
**04.03	Bi-partite gouge auger, model P, length 114 cm, op. length 60 cm, Ø 19 mm	1
**04.05.01.16	Bent spatula, breadth 16 mm	1
**06.01.31	Stainless steel extension rod, Ø 15 mm, 50 cm, M-10 thr.	1
**99.50.12	Spanner 12x13 mm	2
14.04.03.21	Insertion augerset for tension-meters, standard set for dry, rupture sensitive, gravelly soils, depth 150 cm	
**01.02.01.10.B	Edelman auger, bottom part, clay type, bay., Ø 10 cm	1
**01.04.00.10.B	Riverside auger, bottom part, bay., Ø 10 cm	1
**01.06.00.10.B	Auger for stony soil, bottom part, bay., Ø 10 cm	1
**01.10.17.B	Handle, normal, 60 cm, with all synthetic, detachable grip (incl. coupling sleeve), bay.	1
**01.10.06.B	Extension rod, 50 cm, (incl. coupling sleeve), bay.	1
**07.00.00	Carrying bag for field equipment with handgrip, Ø 20x77 cm	1
14.04.04	**Jett-fill tensiometer with accessories**	
14.04.04.01	Jet-fill tensiometer with screwable ceramic tip and suction meter (0-100 cbar), length 15 cm.	
14.04.04.02	Jet-fill tensiometer with screwable ceramic tip and suction meter (0-100 cbar), length 30 cm.	
14.04.04.03	Jet-fill tensiometer with screwable ceramic tip and suction meter (0-100 cbar), length 60 cm.	
14.04.04.04	Jet-fill tensiometer with screwable ceramic tip and	

Art.no.	Description	Qty. in set
	suction meter (0-100 cbar), length 90 cm.	
14.04.04.05	Jet-fill tensiometer with screwable ceramic tip and suction meter (0-100 cbar), length 120 cm.	
14.04.04.06	Jet-fill tensiometer with screwable ceramic tip and suction meter (0-100 cbar), length 150 cm.	
14.04.03.07	Service kit for tensiometers, including vacuum hand pump, anti-algal fluid, service cap, tubing and filling bottle	
14.04.03.08	Ceramic tip for tensiometer	
14.04.03.09	Suction meter for tensiometers	
14.04.03.20	Insertion augerset for tensio-meters, standard set for normal soils, depth 150 cm	
14.04.03.21	Insertion augerset for tensio-meters, standard set for dry, rupture sensitive, gravelly soils, depth 150 cm	
14.04.04.11	Jett fill reservoir	
14.04.05	**Quick draw tensiometers with accessories.**	
14.04.05.01	Quick draw tensiometer, compl. with insertion tool, spare sensing tip and storage sheath length 30 cm	
14.04.05.02	Quick draw tensiometer, compl. with insertion tool, spare sensing tip and storage sheath length 45 cm	
14.04.05.05	Sensing tip for Quick Draw tensiometer	
14.04.08	**Tensior 3 with accessories.**	
14.04.08.02	Tensior 3 for measuring soil moisture tension with electr. pressure transducer, range -100 - +700 hPa, output signal -10 - +70 mV +/- 3 mV, power supply 10.6 Vdc, current consumption 1.3 mA, length 30 cm, M12-connector, calibration. cert., silicaflour+rubber disc	
14.04.08.03	Tensior 3 for measuring soil moisture tension with electr. pressure transducer, range -100 - +700 hPa, output signal -10 - +70 mV +/- 3 mV, power supply 10.6 Vdc, current consumption 1.3 mA, length 60 cm, M12-connector, calibration cert., silicaflour+rubber disc	
14.04.09	**Tensior 4 with accessories**	
14.04.09.02	Tensior 4 with built-in pressure transducer for measuring soil moisture tension, range -1000 - +850 hPa, signal -100 - +85 mV, +/- 3 mV, power supply 10.6 Vdc, current consumption 1.3 mA, length 30 cm, M12-connector, calibration cert., silicaflour+rubber disc	
14.04.09.03	Tensior 4 with built-in pressure transducer for measuring soil moisture tension, range -1000 - +850 hPa, signal -100 - +85 mV, +/- 3 mV, power supply 10.6 Vdc, current consumption 1.3 mA, length 60 cm, M12 connector, calibration cert., silicaflour+rubber disc	
14.04.09.90	Kit for filling Tensior 4. Containing: filling adapter, manometer, Woulff bottle 500 ml, stand with clamp, all necessary tubes, stoppers and small tools (without vacuum pump)	
14.04.10	**Tensior 5 with accessories**	
14.04.10.02	Tensior 5 minitensiometer with elec. pressure transducer, range -1000 - +850 hPa, output signal -100 - +85 mV +/- 3mV, power supply 10.6 Vdc, current consumption 1.3mA, Ø Cup 5 mm, length 70 mm,Øpress. transducer 20 mm, cable 1.5 m (M12-connec.), silica + cert..	
14.04.10.90	Kit for filling tensior 5, contains manometer bottle for degassing water, all necessary tubes, stoppers and small tools (without vacuumpump)	
14.04.11	**Tensior 8 with accessories**	
14.04.11.02	Tensior T8 for measuring soil moisture tension, range –1000 till +850 hPa, temperature range -30 till +70 °C, power supply 6 Vdc, current consumption 7 mA, external refilling, filling status indicator, temperature sensor and amplifier, length 30 cm, M12/IP67 connector.	
14.04.11.03	Tensior T8 for measuring soil moisture tension, range –1000 - +850 hPa, temperature range -30 till +70 °C, power supply 6 Vdc, current consumption 7 mA, external refilling, filling status indicator, temperature sensor and amplifier, length 60 cm, M12/IP67 connector	
	Accessories for all Tensiors:	
14.04.08.98	Infield-7b meter for measuring manualy soil moisture tension with the Tensiors, digital display in hPa, incl. rechargable battery and batteryloader. Temperature registration possible when using T8. Memory for max 250 measurings.	
14.04.08.93	Extension cable for Tensiors, length 20 m, male/female	

Art.no.	Description	Qty. in set
14.04.08.95	Power supply unit for max. 15 tensiors, battery type, stabilized voltage 10.6 Vdc	
14.04.03.20	Insertion augerset for tensio-meters, standard set for normal soils, depth 150 cm.	
14.04.03.21	Insertion augerset for tensio-meters, standard set for dry, rupture sensitive, gravelly soils, depth 150 cm	
14.50	**Electronic tensimeter with accessories**	
14.50.30	Electronic tensimeter, measuring range 0-999 hPa, accuracy 2%, digital display. For tensiometer tubes with a diameter between 21.5 and 23 mm. Incl. 9V battery and measuring needle and carrying bag.	
14.50.32	Tensiometer tube with silicone stopper, length 35 cm	
14.50.33	Tensiometer tube with silicone stopper, length 55 cm	
14.50.34	Tensiometer tube with silicone stopper, length 75 cm	
14.50.35	Tensiometer tube with silicone stopper, length 95 cm	
14.50.36	Tensiometer tube with silicone stopper, length 125 cm	
14.50.37	Tensiometer tube with silicone stopper, length 145 cm	
14.50.39	Silicone stopper for tensiometer tube	
14.04.03.20	Insertion augerset for tensio-meters, standard set for normal soils, depth 150 cm	
14.04.03.21	Insertion augerset for tensio-meters, standard set for dry, rupture sensitive, gravelly soils, depth 150 cm	

Art.no.	Description	Qty. in set