

Measuring devices for hydraulic conductivity



Double ring infiltrometer

141100 complete set



Set consisting of:

- 6 pieces of infiltration rings for synchronic measuring threefold
- driving plate for hammering in infiltration rings
- 3 pcs. measuring bridges
- 4 pcs. floats
- 2 pull-out hook
- stopwatch, digital
- steel hammer with nylon

Field measuring device for determining the rate of infiltration of water into the soil.

Measuring principle:

Infiltration from the circular source surface of an infiltration chamber into the adjacent semi-infinite space of the examined soil.

The rate of infiltration is determined as the amount of water per surface area and time unit, that penetrates the soil. This rate can be calculated on the basis of the measuring results and the Law of Darcy.

Hood – Infiltrometer

142000 Set - complete
consisting of infiltration vessel, U-tube-manometer, 2 hoods, cover bag



Field measuring device for soil hydraulic conductivity

Measuring principle:

The infiltration is done by placing a circular shaped hood filled with water directly on the soil surface. Thus, no contact layer on the soil surface is necessary.

The pressure head in the water filled hood is regulated by a "Mariotte" -water supply.

The effective pressure head at the soil surface can be adjusted between zero and any negative pressure up to the bubble point of the soil.

The pressure head and the bubble point can be measured directly via an U-pipe manometer and the stand pipe of the hood. For calculation of the hydraulic conductivity after WOODING's equation (steady state infiltration) two hoods are used with a ratio of 2 : 1 in terms of the covered infiltration area at the soil surface.

Additionally accessories:

- Tension chamber

Technical parameters:

Tension range:	0 ... water pressure 0 ... 60 hPa
Tension of measurement:	Resolution 0.1 hPa
Infiltration rate:	min. 0.01 ml/min ... max. 20 ml/min
Measuring range:	ca. 1000 cm/d ... 0.01 cm/d
Water consumption:	ca. 0.1 ... 0.5l per infiltration step

Hood-Permeameter by Hartge

142500 complete

Consisting of: probe tub with U-tube manometer and weighing table, laboratory balance and permeameter hood with sealing and hose connection



Permeameter - total view



Permeameter - hood

Laboratory permeameter for determination of the saturated hydraulic conductivity of soil samples (k_f – value).

A sample ring filled with soil will be flows trough by water by a defined pressure difference. The quantity of water flowing trough the sample is realized by a balance. The hydraulic conductivity k_f is computed by the Darcy law on the basis of the effective pressure gradient and the quantity of water flowing trough per time unit.

Advantages:

- Vibrationless installation of the measuring hood over the saturated soil sample in the water tub
- Measurement of the flow rate on very small pressure gradient
- Chose of an optimal flow rate for each soil sample
- Measured value regulation at 10 sample rings with 250 ccm volume

ku-pF Apparatus

143000

ku-pF-Apparatus



Apparatus measuring ten ring samples for automatic determination of unsaturated hydraulic conductivity (k_u) as a function of water content and tension, and of the pF curve.

Measuring principle:

- Flow process through soil water evaporation on a free surface of initially saturated soil samples;
- Flow rate recording through periodic weighing of samples;
- Recording of the gradient of water movement with two tensiometers along the flow line;
- Test run with ten soil samples simultaneously through computer-controlled sample cycling for weighing and tension measurement;
- PC program for analysis of measured data.

Technical parameters:

Number of samples	max. 10	Measuring range k_u -value	< 10 cm/d
Sampling ring volume	250 cm ³	Weight of apparatus	ca. 40 kg
Cross-sectional area of sampling cylinders	41 cm ²	Size	ca. 100x70x40 cm
Time interval of individual measurement	min. 15 min	Power consumption	220V/ 1A
Weighing resolution	0,01 g	PC connections	COM 1
Tension range	0...700 cm WS (pF 2,8)	Test duration	2 - 10 days (depending on soil type)

Set for pF determination

145000 Sandbox method



PL-100

With the Sandbox method measurements in the pF -range 0– 4,2 in three sections (pF 0 - 2), (pF 2- 2,7) and (pF 3 - 4,2) were resolved.

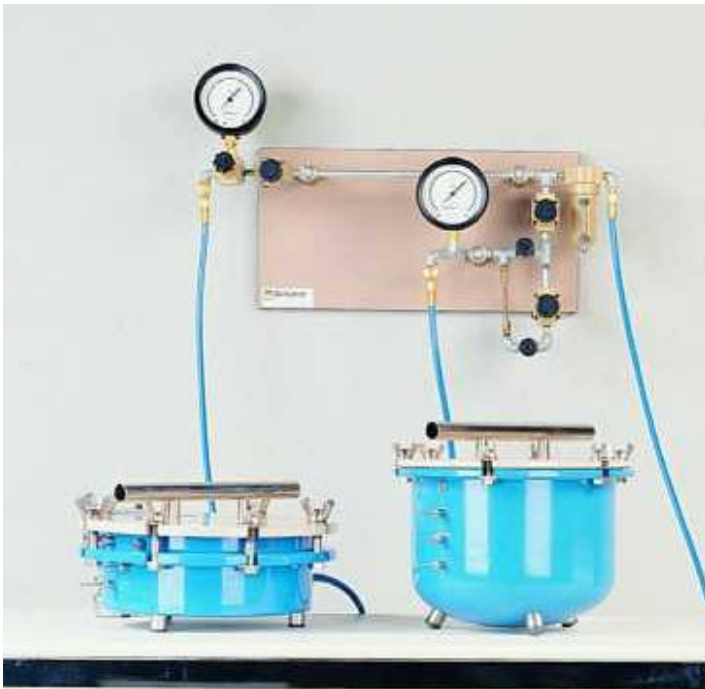
For the first two sections two different sand box devices with negative pressure, for the third section a diaphragm press with positive pressure are used.

Consisting of:

- Sandbox for pF determination 0 ... 2,0 for a max. of 40 soil sample rings ;
- Sand-/ kaolin box for pF determination 2,0 ... 2,7 for a max. of 40 soil sample rings ;
- Membran apparatus for pF determination 3,0 ... 4,2 for a max. of 15 soil sample rings, including compressor and accessories.

Set for pF determination

146000 Set for pF-determination with ceramic plates



The apparatus is suitable for determination of pF-curves in the range pF 2.0– 4.2 with ceramic plates.

The measurement takes place in two ranges (pF 2,0-3,7 and pF 3,7-4,2).

The portion of the water pressed due to positive pressure from the soil sample is determined and set in relationship to the height of the effective pressure (pF value).

From this result the pairs of the pF WG curve, which can be adapted to a soil-specific mathematical function, e.g. with the help of Van Genuchten – Approximation.



15 bar – extractor

5 bar - extractor

PL measuring devices

147000	PL- 300	147010	TDR –moisture probe
		147020	PL-tensiometer (0-5V)
		147030	Calibration throat
		147040	PL-sampling ring adapter
		147050	PL-surface chamber
		147060	PL- DARCY- chamber



PL- 300

Field measuring device to record the air permeability of soils with two-stage throat (extended range of measurement). Additional connections to electronic soil tensiometer and moisture probe. Integrated microcomputer for input of calibration data of different measuring chambers, for test site description, and for storing the data measured with the connected sensors.

Measuring principle:

A suitable measuring chamber produces a defined air flow in the test soil volume. Its flow rate is determined from the pressure gradient over a calibrated throat in the PL device. The pressure difference over the soil volume that has been passed by the flow is recorded by another pressure sensor and provides the pressure gradient of that flow.

Air permeability (PL) characterises the water-free pore space of the soil. It is a function of the water content. It is derived from the test parameters according to DARCY's equation and displayed by the measuring device.

Different measuring chambers are available to match specific site requirements:

- PL measuring chamber for homogeneous flow acc. to DARCY with integrated pressure probe
- PL surface chamber for inhomogeneous flow in undisturbed soil volume
- PL sampling ring adapter for measurement of ring samples

Technical parameters	PL-100	PL-300
Measuring range of air permeability ca.	0,006 ... 2 cm/s	0,003 ... 3 cm/s
Measuring pressure	1 ... 3 hPa	1 ... 3 hPa
Stabilization time	ca. 2s	ca. 2s
Chamber diameter	72 mm	72 mm
Tension measuring range	-	0 ... 800 hPa
Soil water measuring range	-	0 ... 60 Vol. %
Data memory	-	ca. 1000 measurements