

IN SITU HYDRAULIC CONDUCTIVITY TESTS

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



P1.60

Determination of the water permeability, also called hydraulic conductivity, is important for agricultural- as well as for environmental soil research.

On the basis of the permeability factor (K-factor) irrigation- and drainage systems are designed. Also with respect to the extend of the spreading of possible pollution the permeability factor of the soil is of great importance. The permeability of the soil can be determined in the laboratory (see P1.87) as well as directly in the field.

09.01.SA Hydraulic conductivity test kit, model Hooghoudt (standard set)

09.01.SB Hydraulic conductivity test kit, model Hooghoudt (extendable set)

In case of direct measurement in the field the auger hole method according to Hooghoudt can be applied. Following this method the determination of the permeability to water of a soil takes little time (by comparison to other methods), requires a limited number of instruments.

The principle of this method is quite simple. A hole is bored in the ground to a certain depth below the groundwater level and after a time the water in the hole will rise to the said water level. The water is consequently bailed out and the time it takes for a new water level to establish itself is recorded. With the help of formulae and/or nomogrammes this rate of water rise can be translated to the average water permeability factor of the different strata of soil.

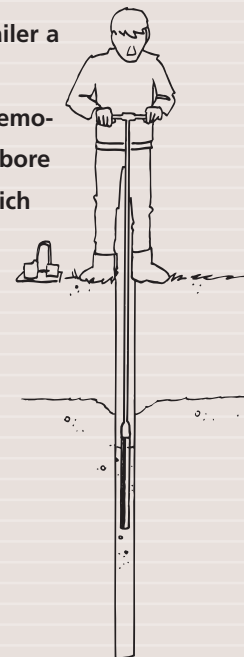
The depth of the bore hole is dependent upon the groundwater level and the thickness and the permeability of the successive layers in the ground profile.

The standard set (09.01.SA) is suitable for measurements to a depth of 2 meter. Basically it contains: an Edelman- and a Riverside auger with an upper part and an extension rod, a bailer, measuring tape with holder and float, a filter and a stopwatch.



Hydraulic conductivity test kit, model Hooghoudt (09.01.SA)

Applying a bailer a portion of the water is removed from the bore hole after which measurement can commence.

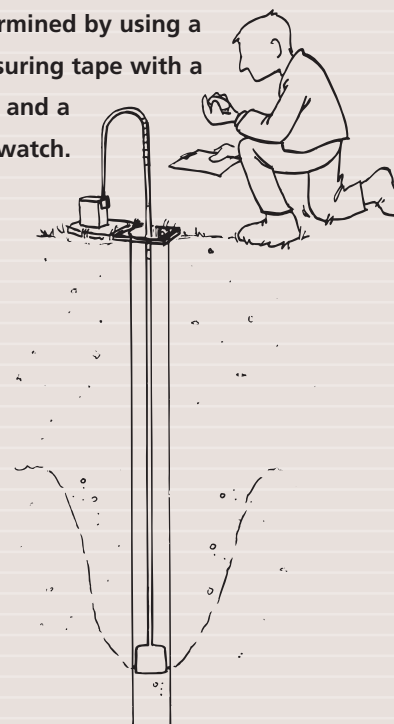


BENEFITS

09.01 Hooghoudt test kits

- The ideal tool to determine drain spacings
- Can be used to distinguish up till two layers
- Casing to stabilize sand below water table

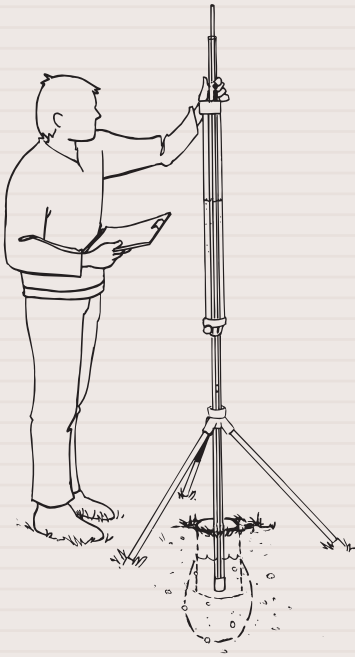
The rise rate of the groundwater is determined by using a measuring tape with a float and a stopwatch.



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BENEFITS

09.07 Guelph permeameter

- Determines permeability in root zone
- Meant for above the groundwater table
- Steady state principle for optimum accuracy
- Simple operation

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The extendable set (09.01.SB) is suitable for measurements to a depth of 5 meter. This set includes the same items as the standard set, however the 1 meter long filter has been replaced by an extendable filter with a total length up to 5 meter (also including extension rods for the auger).

09.07 Guelph constant head permeameter

The Guelph permeameter is a 'constant head' permeameter that operates in accordance with the principle of the Mariotte bottle. After boring a hole the Guelph permeameter is placed. The water from the permeameter slowly flows into the auger hole and penetrates into the soil. At a certain moment a saturated 'bulb' is formed and the out-flow of water from the storage cylinder reaches a constant value (that is measured).

These measuring data together with the diameter of the auger hole and the level of the water in the auger hole, are used to determine the (saturated) hydraulic conductivity of the soil.

The complete standard set, for measurement up to a depth of 75 cm, fits in a carrying bag and, among other items, contains: the Guelph permeameter, a tripod, drill bits, a vacuumtest manual pump, a fold-up jerry can and various accessories.



Extendable filter (for 09.01.SB)



Guelph constant head permeameter

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09.11 Ksat constant head permeameter

The Ksat constant head permeameter is an instrument that provides the means to collect data for determining in situ saturated hydraulic conductivity of the vadose (unsaturated) zone easily and conveniently. The measuring procedure is known as constant head well permeameter technique, shallow well pump-in method or borehole infiltration test. Before the equipment is used a hole is augered (the bottom of the hole must be plane (use the Riverside auger).

The main unit is used for measuring hydraulic conductivity to a depth of 2 m. The depth of measurement can be easily increased to 4 m by attaching a set of constant head tubes to the main unit. To measure below 4 m depths, a special flow measuring reservoir and a pressure transducer (available as optionals) are required.

The standard set (for a depth of 2 m) contains: the compact constant head permeameter and augers for installation.

Advantages

- ❑ Compact, portable and versatile.
- ❑ No field assembly is required.
- ❑ 5 Liter useful water capacity allows measurement of hydraulic conductivity in most soils.
- ❑ Large opening for quick filling and refilling of the reservoirs.
- ❑ Can be used on any landscape position without an external support.
- ❑ Can be easily transported as a back pack for measurement in remote locations.
- ❑ Constructed of durable PVC and polycarbonate to withstand field use.

Applications

- ❑ In situ permeability tests for drainage and/or irrigation.
- ❑ Determination of hydraulic conductivity of the unsaturated zone for septic system design, land-fill design, and retention pond construction.

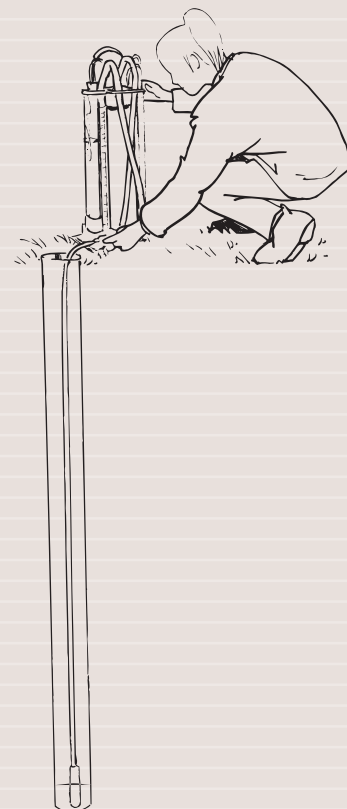


Ksat constant head permeameter



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By using an extension kit hydraulic conductivity can be measured below 4 m.



BENEFITS

09.11 Ksat permeameter

- Determines permeability in any layer < 2 m
- Meant for above the groundwater table
- Stable compact and versatile instrument
- Steady state principle for optimum accuracy



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09.06 Rainfall simulator

The extent to which the soil is sensitive to erosion is determined largely by the composition of the soil. Knowledge of the sensitivity to erosion is important for the development of a certain plot.

The sensitivity to erosion is hard to measure. Absolute values can not be obtained. It is, however, possible to obtain a reasonable indication by means of a relative measurement. For such a measurement a rainfall simulator can be applied.

The simulator allows erosion to take place on a small section of the plot. With the apparatus rainfall is simulated on a slanting surface. Through small capillaries in the plate under the water filled cylinder, the drops fall down on the slanting surface.

Once fallen to the surface of the soil, the droplet loosens soil particles. These particles jump up and fall down again, slightly lower, on the slope. At the

bottom of the slope, water and soil particles are collected in a reservoir.

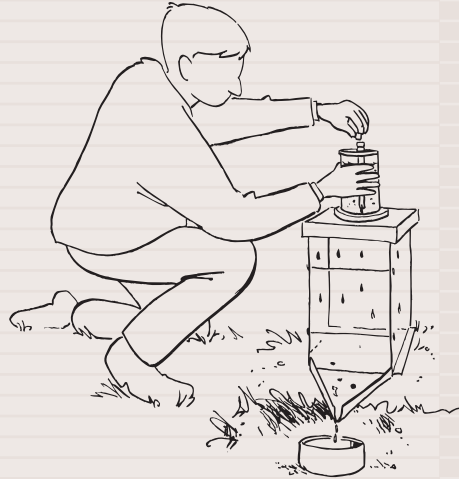
Through research in the laboratory of the soil particles collected, an indication can be derived concerning the composition and the sensitivity to erosion of the soil under research.

By comparing the measuring results to other measuring results, the researcher may set up a scale for sensitivity to erosion of the researched soil.

To be able to obtain reliable results it is important to keep the factors influencing the process (such as for instance the temperature of the water) as constant as possible.

It is also recommended to gather information concerning the history of the use of the soil. This may then be taken into account when translating the measuring results.

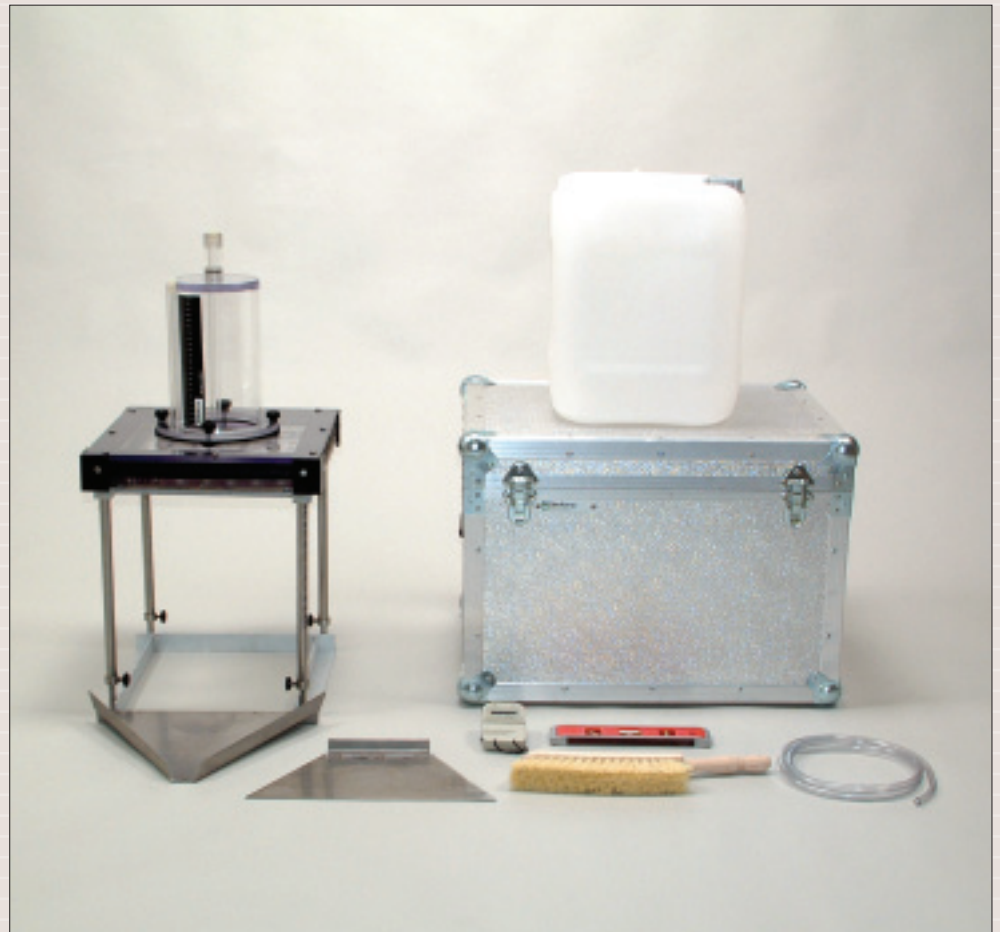
By pulling the plug, the measurement is started. At the bottom of the slope, water and soil particles are collected in a reservoir.



BENEFITS

09.06 Rainfall simulator

- Supplies rain storm for comparative research
- Small weight; no trucks needed
- Calibrated glass nozzles will last forever



Rainfall simulator



Art.no.	Description	Qty. in set	Art.no.	Description	Qty. in set
In situ hydraulic conductivity tests (P1.60)					
	The equipment for in-situ hydraulic conductivity measurements is supplied in four different standard sets		**09.01.05	measurement Float	2
			**09.01.09	Stopwatch, digital, measuring range 10 hours, incl. 1.5 Volt Penlite (AA) battery	1
			**09.01.14	Bi-partite galvanized steel 1 filter, Ø 76 mm, length 200 cm, incl. 2 pvc filter containers	1
09.01.SA	Hydraulic conductivity test kit, model Hooghoudt, standard set for measurements to a depth of 2 metres		**09.01.15	Intermediate filter for bi-partite filter, Ø 76 mm, length 100 cm, incl. pvc filter container	3
**01.10.17.B	Handle, normal, 60 cm, with all synthetic, detachable grip (incl. coupling sleeve), bay.	1	**09.01.16.B	Spatula for bi-partite filter, bay.	1
**01.02.02.08.B	Edelman auger, bottom part, comb.type, bay., Ø 8 cm	1	**01.10.09.B	Coupling sleeve	1
**01.04.00.07.B	Riverside auger, bottom part, bay., Ø 7 cm	1	**09.01.10	Carrying bag for field equipment, Ø 15x120 cm	1
**01.10.07.B	Extension rod, 100 cm (incl. coupling sleeve) bay.	1	**09.01.10.01	Bag for float	1
**01.12.07.01.B	Bailer, Ø 63 mm, stainless steel, with bailer shoe (stain- less steel valve), operational length 75 cm, bayonet	1	09.07	Guelph constant head permea- meter for measurements to a depth of 15-75 cm, compl. with field tripod, augers, well brush, water container, vacuum test handpump, etc. in carrying case	
**01.12.07.02	Bailer shoe with steel valve, Ø 63 mm	1		To be used optionally with 09.07 set	
**09.01.03	Measuring tape, 5 metres, steel enameled	2	09.07.01	Extension set for Guelph in-situ permeameter, length 80 cm	
**09.01.04	Measuring tape holder for hydraulic conductivity measurement	1	09.11	Ksat constant head permea- meter for measurements to a depth of 200 cm. Complete standard set, incl. soil augers and accessories	
**09.01.05	Float	2			
*09.01.09	Stopwatch, digital, measuring range 10 hours, incl. 1.5 Volt Penlite (AA) battery	1	**09.11.01	Ksat permeameter, complete with shoulder straps for transport in the field	1
**09.01.06	Filter galvanised steel, Ø 76 mm, length 100 cm, with pvc filter container	1	**01.10.17.B	Handle, normal, 60 cm, with all synthetic, detachable grip (incl. coupling sleeve), bay.	1
**09.01.08.B	Spatula for filter, bay.	1	**01.02.02.07.B	Edelman auger, bottom part, comb.type, bay., Ø 7 cm	1
**01.10.09.B	Coupling sleeve	1	**01.04.00.07.B	Riverside auger, bottom part, bay., Ø 7 cm	1
**09.01.10	Carrying bag for field equipment, Ø 15x120 cm	1	**01.10.07.B	Extension rod, 100 cm (incl. coupling sleeve) bay.	1
**09.01.10.01	Bag for float	1	**09.01.10	Carrying bag for field equipment, Ø 15x120 cm.	1
09.01.SB	Hydraulic conductivity test kit, model Hooghoudt, extensible set for measurements to a depth of 5 metres			A special permeability test-kit is the rainfall simulator developed for erosion studies:	
**01.10.17.B	Handle, normal, 60 cm, with all synthetic, detachable grip (incl. coupling sleeve), bay.	1	09.06	Mini rainfall simulator for erosion tests, type LUW, standard set for field use	
**01.02.02.08.B	Edelman auger, bottom part, comb.type, bay., Ø 8 cm	1			
**01.04.00.07.B	Riverside auger, bottom part, bay., Ø 7 cm	1	**09.06.01	Rainfall simulator for erosion tests, consisting of a sprinkler with a built-in pressure regulator, a support for the sprinkler and a stainless steel bottom frame with gutter	1
**01.10.07.B	Extension rod, 100 cm (incl. coupling sleeve) bay.	4	**09.06.11	Soil wetting jar	1
**01.12.07.01.B	Bailer, Ø 63 mm, stainless steel, with bailer shoe (stainless steel valve), operational length 75 cm, bayonet	1	**09.06.21	Water storage tank, contents	1
**01.12.07.02	Bailer shoe with steel valve, Ø 63 mm	1			
**09.01.03	Measuring tape, 5 metres, steel enameled	2			
**09.01.04	Measuring tape holder for hydraulic conductivity	1			



PARTS LIST

Art.no.	Description	Qty. in set	Art.no.	Description	Qty. in set
**09.06.31	20 liter, incl. siphon hose Sample collection box, contents 2 liter	1			
**09.06.32	Sample box with lid, contents 1.2 liter	1			
**09.06.41	Aluminium transport case, dim. 160x48x40 cm (outside)	1			
**08.15.02	Pocket knife, heavy design, knife length 9 cm	1			
**08.09.08 F	Flat brush, length 35 cm	1			
**09.01.09	Stopwatch, digital, measuring range 10 hours, incl. 1.5 Volt Penlite (AA) battery	1			
**09.06.35	Scraper	1			
**01.11.02.01	Padlock	1			