Manual

SIC 20

Pore water sampler (suction cup)

Art.Nr. SG25-…
Revision: 3.0
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Letzte Änderung: 05.02.2007

Content

1 Caution

- Caution! Use only implosion-proof sampling bottles. Danger of injury!
- Excessive load by impacts, bending or pressure load can lead to the break.
- Never touch the porous cup. Grease, oil or sweat will disturb the quality.

2 Overview

2.1 General Information

Suction cups were developed to extract soil water from saturated and non saturated soils. To extract a soil water solution, a negative pressure has to be applied. The cups are made of a special ceramic with constant and defined pore distribution with small chemical activity and adsorption.

2.2 Rinsing

Before the first use rinse the cup with 0.5 litres distilled water. Tests have shown, that after rinsing the usual amount of organic and inorganic material washed out is so little it cannot be detected.

- We do not recommend to rinse the cup with hydrochloric acid, as suggested in some literature, as this might destruct the cup. This will breach the warranty!

3 Installation

Prevent preferential flow along the shaft! Therefore we recommend to install the cups in an ancle of at least 20° to perpendicular. The prefect way would be horizontal with a distance of about one meter to the wall.

- Insert the shaft without using force. Do not hammer on the end of the shaft.

Pull the rubber disc over the top end of the shaft to prevent surface water from running down the shaft.

- Before the first use, collect some solution to rinse the system. The soil solution extracted first should be rejected.

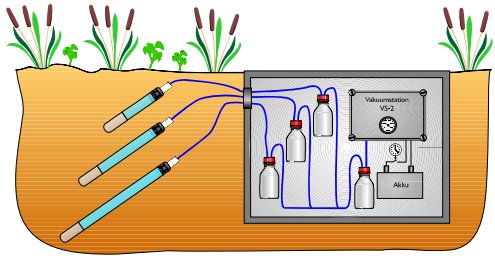
4 Operation

4.1 Extracting soil solution

The extraction tube usually is connected to a sampling bottle, in which a negative pressure is generated, for example by a vacuum pump.
In contrast to the soil matrix the pores of the cup and all tubes are completely filled with water. If the vacuum pressure is too large, the soil surrounding the cup might be drained, which could reduce the cup's capability to conduct water in sandy soils.
In general it is sufficient to apply a vacuum pressure which is about 50 hPa higher than the expected matrix tension.

4.2 Positioning the sampling bottles

The sampling bottles should be set up in a buried box, so the storage temperature is identical to the soil temperature and the samples are protected against sunlight (alga growth). Further, the level of the porous cup and the end of the pipe inside the sampling bottle shuold be identical. If the bottle is higher, as higher vacuum (lower pressure potential) is applied, as the water must sucked higher. 1 cm is about 1 hPa (0.1 kPa).
Sampling bottles additionally serve as a pressure buffer and prevent water from running into the vacuum pump.



Take care that the entire pressure system is tight and has no leaks.

4.3 Positioning the suction pipes

The protected suction pipes should be burried at least 10 cm below soil surface to protect them from heating up and sun light. If the samplers should work also in winter time they are burried below the soils frost zone.

4.4 Emptying the cups

If suction cups should remain installed during periods with temperatures below freezing point, they must be emptied to prevent frost damage. Please note, that in times free of snow but with air temperatures below 0°C, the area of frost declines from the soil surface into upper soil horizons.
As soon as water inside the extraction tube is frozen, the suction cup cannot be emptied anymore. The ceramic cup might be damaged by the frozen water.
Required tools for emptying: One retaining tube clamp for each suction cup,
a syringe (50 ml) and a vacuum pump.

4.4.1 How to proceed

- With the vacuum pump, completely extract the water left in the suction cup.
- Attach the syringe to the extraction tube. Press 20 ml of air into the cup to achieve a positive pressure of approx. 100 hPa.
- Lock the extraction tube with a tube clamp to keep up the overpressure.

5 Maintenance and storage

For cleaning, wipe of the shaft with a moist cloth. The suction cups should be stored in a position where a deformation of the shaft is avoided.

5.1 Technical Specifications

Material and Dimensions	
Shaft	Acrylic, ∅ 20 mm
Extraction Tube	Gastight Teflon FEP, Ø i 1,58 mm, Ø o 3,2 mm
Protection Tube	Optional PVC reinforced fabric , ∅ 11 x 5 mm
Cup Type	SIC silicon carbide
Cup size	Length 60 mm ± 0,8 mm, diameter 20 mm ± 0,5mm,
Active Surface	34 cm^2 ± 1 cm
Filling Volume	2 ml
Cup porosity	45% ± 2%
Pore Size	1 µm ± 0,1 µm
Chemical compound	
SIC	Silicon carbide 99%
Physical characteristics	
Hardness (Mohs)	7 MH
Flexural strength	60 N/mm^2 ± 0,5
Compressive strength	240 N/mm^2 ± 10
Coeefizient of elongation	5.8 x 10^{-6} ± 3
Bubble point	100 kPa

Ask for a free copy of the UMS handbook "Soil water extraction" by sending an email or fax!

5.3 Accessories

Sampling bottles , Storing box (SF-Box) , vacuum tanks, vacuum units (VS, VS-pro)

5.2 Technical Support

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