

# PF-DETERMINATION (SANDBOX METHOD)

The determination of the moisture characteristic (pF-curve) is essential when researching the quantity of water available in the soil for plants and trees.

Depending on the desired measuring range under-pressure (the so called sandboxes) or overpressure (membrane apparatus) is used.

For the determination of the moisture characteristic using the sandbox method undisturbed samples are needed. These samples are taken using stainless steel soil sample rings. Filling these rings is done using the sample ring holders (see P1.31 for additional information).

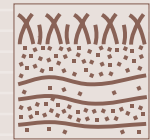
In the laboratory the samples are saturated and subsequently balanced with respect to the increasing values of the moisture tension. The moisture tensions are obtained by creating a series of under and overpressures. Weighing of the sample after each balance adjustment yields the moisture content for each moisture tension.

## 08.27 Set for pF-determination, sandbox method (pF 0 - 4.2)

For the pF-determination over the complete range from pF 0 to pF 4.2 an extensive set has been composed. The set consists of:

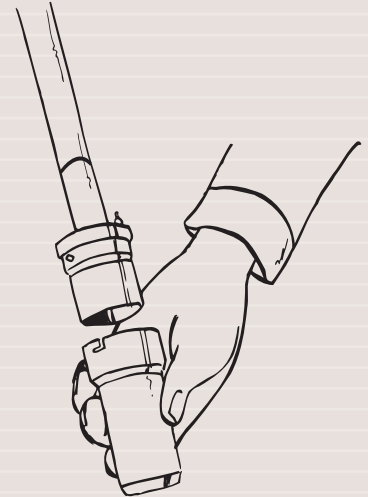
- ❑ A sandbox for pF-determination 0 - 2.0 for a max. of 40 soil sample rings.
- ❑ A sand-/kaolin box for pF-determination 2.0 - 2.7 for a max. of 40 soil sample rings.
- ❑ A membrane apparatus for pF-determination 3.0 - 4.2 for a max. of 15 soil sample rings, including compressor and accessories.
- ❑ A soil sample ring kit (with conical screw thread connection) for taking undisturbed samples to a depth of up to 2 meter.
- ❑ Cases with soil sample rings.
- ❑ Aluminium soil sample boxes for drying the soil samples in a drying oven.

The set can be supplied with soil sample rings and ring holders with a diameter of 53 mm (08.27.SA) and 60 mm (08.27.SB).



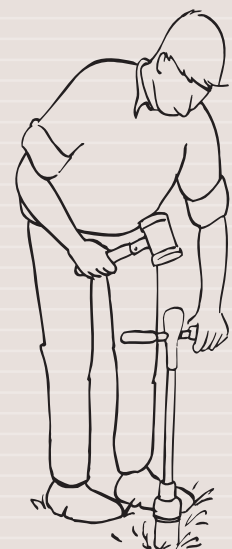
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**A soil sample ring is placed in the ring holder.**



Set for pF determination, sandbox method (pF 0 - 4.2)

**The soil sample ring holder is hammered into the soil using the impact absorbing hammer.**





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## PF-DETERMINATION (SANDBOX METHOD)

### 08.01 Sandbox for pF-determination (pF 0 - 2.0)

The standard set for pF-determination pF 0 - 2.0 (0 - 0.1 bar) consists of the sandbox with control panel, suction levelling stand, water supply bottle with stand, filter cloth (140-150 micron), a number of containers synthetic sand, grain size approximately 73 micron and various accessories.

A maximum of 40 soil sample rings can be placed on the sandbox. The samples that are measured are taken using soil sample rings.

These rings usually have a contents of 100 cc.

In addition to the standard set a soil sample ring kit must be available as well as cases with soil sample rings and aluminum soil sample boxes.

For the determination of the pF the laboratory should also be equipped with a balance and a drying oven.

The table on which the instrument is placed should be level and isolated against vibration.

Before measuring of the moisture tension can commence the different parts must be mounted and the drain must be fitted with a filter cloth.

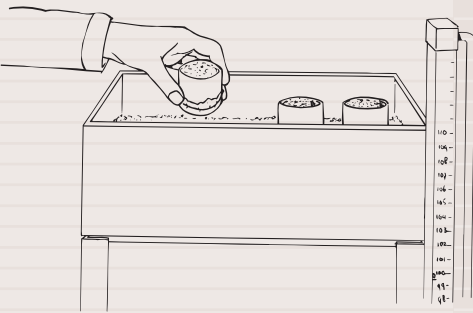
Subsequently the sandbox is filled in the proper manner with water and synthetic sand (the sand should not contain any air- or water pockets). If everything has been executed in accordance with the operating instructions the saturated samples in the soil sample rings can be placed in the sandbox and the moisture tension is determined of the completely saturated sample.

Next subsequently larger suction is applied. Weighing the sample each time after the balance is set again yields the moisture content that goes with each moisture tension.

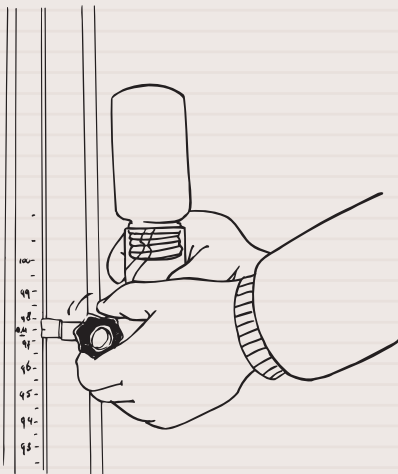
If the sandbox is inundated with water after each test it can remain in operation during several years.

A copper ring prevents algal growth.

**The soil sample ring with the saturated sample is placed on the prepared sandbox.**



**The suction is set.**



Sandbox for pF-determination (pF 0 - 2.0)

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## 08.02.SA Sand/kaolin box for pF-determination (pF 2.0 - 2.7)

The standard set for pF-determinations pF 2.0 - 2.7 (0.1 - 1 bar) consists of a sand/kaolin box with control panel, an electronic suction level control system (pressure range 0 - 600 hPa) with integrated control panel, pressure sensor and 10 l tank, containers with synthetic sand, a container with kaolin clay and various accessories.

The sand/kaolin box is suitable for a maximum of 40 soil sample rings. The pF-determinations are executed on samples in the soil sample rings. These rings generally have a 100 cc contents.

In addition to the standard set a soil sample ring kit must be available also as well as cases with soil sample rings and aluminium soil sample boxes.

A balance and a drying oven are part of the minimum equipment.

The laboratory table on which the measuring

instrument is placed should be level and isolated against vibration.

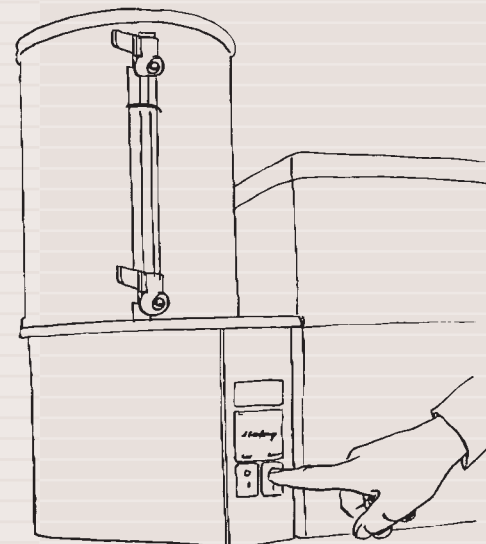
Before the measuring of the pF can be started the various parts must be mounted and the drain must be fitted with a filter cloth. Next the sand/kaolin box is filled in the proper manner with water, synthetic sand and kaolin clay (the sand/clay filling should not contain any air or water pockets). Excess drainage water is removed applying the automatic suction level control system.

The different suction on the samples is realized using the vacuum pump.

For the determination of the complete pF-range (0 - 2.7) the sand box and the sand/kaolin box can be applied in one single setup next to each other.

A filled box can be used for several years if it is inundated with water after each test. A copper ring prevents algal growth.

**The suction is adjusted to the sand/kaolin box.**



Sand/kaolinbox for pF-determination (pF 2.0 - 2.7)



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## PF-DETERMINATION (SANDBOX METHOD)

### 08.03 Membrane apparatus for pF-determination (pF 3.0 - 4.2)

In case of the membrane apparatus for pF-determination of samples in the range pF 3.0 - 4.2 (1.0 - 15.5 bar), samples cut in sample rings are not used. In this setup the semi-disturbed sample is saturated before measurement in the laboratory and placed in a synthetic ring.

The complete set consists of a pressure membrane extractor suitable for a maximum of 15 samples, a 20 bar compressor including reducing valve and manometer, an air filter, cellophane membrane, filter cloth, synthetic soil sample retaining rings and various accessories.

For the pF-determination the laboratory should at least be fitted with a balance, a drying oven and aluminum soil sample boxes with lids.

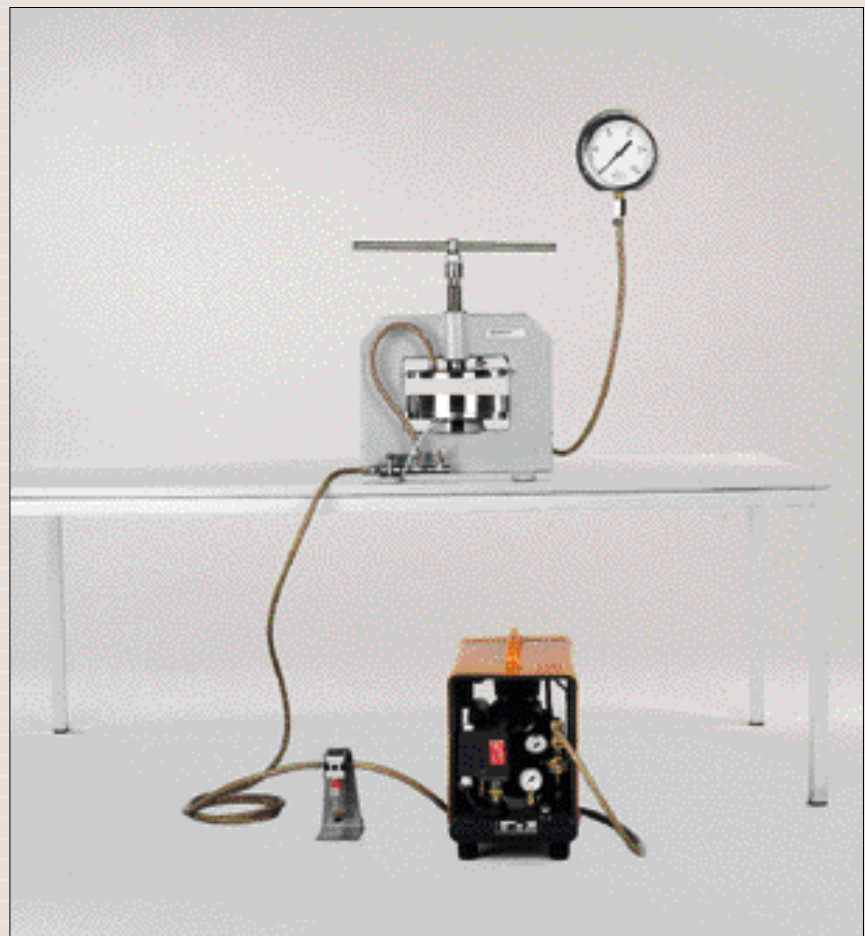
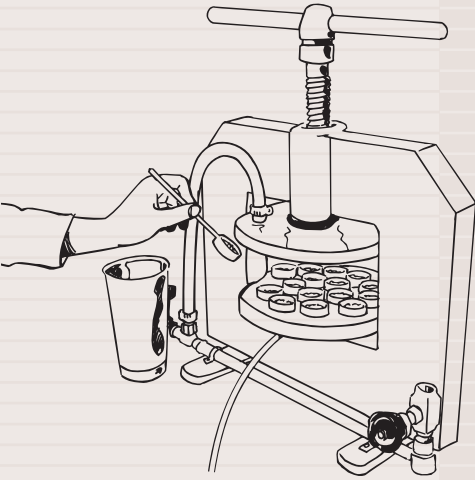
After saturation of the sample, part of this sample is placed in a synthetic retaining ring and prepared further.

After closing of the pressure membrane extractor an overpressure is realized in the pressure membrane extractor using the compressor.

On reaching the equilibrium the samples are removed, weighed, dried and weighed again.

In order to be able to measure a larger series of samples a second pressure membrane extractor can be connected to the first extractor.

**The saturated sample is scooped from the sample pot into the rings.**



Membrane apparatus for pF-determination (pF 3.0 - 4.2)