SOIL LAB INSTRUMENTS FOR HYDRAULIC PROPERTIES

Lots of instruments and procedures are available to measure and determine the hydraulic properties of soil samples. It is a challenge transmitting data from small samples to the field scale. Especially for saturated conductivity the sample size influences results due to structure and texture of the soil and the open/closed path situation. Generally speaking, the data you receive from lab instruments are depending on the function principle, the way samples were taken, transported and stored and the individual skills of the operator. The artificial measure process in the lab delivers artificial data. The HYPROP® evaporation principle i.e. follows the field evaporation, so this principle works close to the field situation. How to interprete those data and how to transfer them to field scale will remain soil scientist's task.

This catalog chapter bundles carefully selected products to take samples in the field, to transport them to the lab and to measure key hydraulic properties. The data you receive can be processed and integrated with our software "HYPROP-FIT". This software is a powerful tool to monitor, visualize and model data. You can input data points measured with your equipment and compare them with Ksat or HYPROP® data, WP4, VAPOR SORPTION ANALYSER, pressure chambers and so on. It is now pretty easy receiving complete retention curves and conductivity curves and to see deviations from standard models or your own models.

Finally, we offer measurements of your soil samples in our soil lab as well.

THE PRODUCT FAMILY

THE DECAGON WP4

THE UMS HYPROP®

THE UMS KSAT

KSAT - Saturated hydraulic conductivity

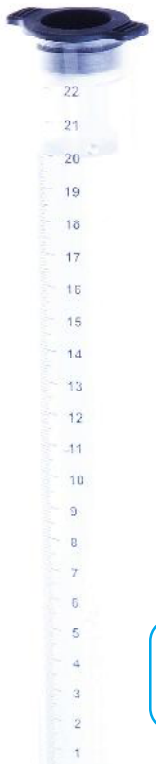
The UMS KSAT System is designed for determination of saturated hydraulic conductivity on 250 cm³ soil samples by constant-head and falling-head experiments. The methodology follows the standards DIN 19683-9 and DIN 18130-1 and is based on the inversion of the Darcy law. The proportionality factor of the amount of water flow through a defined area and the hydraulic gradient is stated as saturated hydraulic conductivity (Ks). This gives our new product the name KSAT

Benefits

- Measuring the saturated conductivity, Ks, according to DIN ISO 19683-9 and DIN ISO 18130-1 (constant-head mode and falling-head mode)
- Highly precise system, usable for conductivities from 10000 cm/d (takes seconds) down to 0.1 cm/d (takes a day)
- Fully automated measurement
- Real-time visualization, evaluation and storage of the data
- Convenient and robust software KsVIEW1.0© with GUI for data visualization and immediate calculation of saturated conductivity
- Integrated recalculation of Ks to desired reference temperature according to the temperature-dependence of the viscosity of water
- Repeated measurements for the same soil sample for long-time monitoring studies are easily done
- No evaporation losses, even with long-time measurements

KSAT	
Measuring range	10000 ... 0.1 cm/d
Interface	USB
Dimensions	270 x 200 x 40 cm

Item	Art. No.
KSAT	KSAT



HYPROP® - Hydraulic properties of soils

Use HYPROP® to determine detailed moisture release curves and unsaturated conductivity curves within a few days. The new Software HYPROP-FIT generates moisture release curves and unsaturated conductivity curves based on Van Genuchten models and others.
Just take your undisturbed sample, insert the measurement head, put it on the balance, and within a few days you have a detailed moisture release curve and unsaturated conductivity curve.

Execute a measurement

When a sample unit is placed on the scale the software automatically starts the weighing menu. If more than one sample is tested at a time each sample is placed on the scale in turn, for example twice a day. The software automatically recognizes each sample unit and stores the weight in correlation to this sample. A maximum of 20 samples can be tested simultaneously.
Independent from the weighing the soil water tensions are automatically measured. Pressure transducers and electronics are housed in the sensor unit, and all sensor units are linked with the tensioLINK bus to your PC for continuous logging of the soil water tension.

Benefits

- Simple and flexible handling
- Low time and cost expenditure
- Expandable
- Small size for easy transportation
- Moisture release curve even close to saturation and unsaturated conductivity determined with high quality
- The hydraulic functions are reliably assured by the large number of taken readings
- Measures precisely from pF 0 up to pF 3.0
- Models pF 0 … pF 5
- Allows to apply manual data points e.g. bubble point detection or known parameters
- Use the software for receiving van Genuchten parameters for your own data sets

Content of supply

All three sets come in a carrying case with all items needed, software included:

HYPROP®-S

This starter set includes a sensor unit with Tensiometer shafts, software, connecting cables, USB converter and a HYPROP® service set.

Please order separately soil sampling rings SZ250 and hammering grip SZA250!

HYPROP®-SW

This set includes the same items as the HYPROP-S plus a laboratory balance.

HYPROP®-E

The extension set includes a sensor unit with tensiometer shafts and connecting cables.

HYPROP®	
Measuring range	pF 0 ... pF 3.0
Fitting range	pF 0 ... pF 5.0
Range	+ 2 kPa ... -120 kPa / -250 kPa
Resolution	0.01 kPa
Accuracy	±1.5 kPa

Optional Lab scale specs	
Measuring range	0 to 2200 g
Resolution	0.01 g
Interface	RS232

Item	Art. No.
HYPROP Starter Set	HYPROP-S
HYPROP Starter-Set incl. balance	HYPROP-SW
HYPROP Extension-Set	HYPROP-E

WP4C - Essential water potential data

The Decagon WP4C measures water potential by determining the relative humidity of the air above a sample in a closed chamber (an AOAC-approved method; also conforms to ASTM 6836). Once the sample comes into equilibrium with the vapor in WP4C's sealed chamber, the instrument finds relative humidity using the chilled mirror method. A tiny mirror in the chamber is chilled until dew just starts to form on it. At the dewpoint, the WP4C measures mirror and sample temperature with 0.001°C accuracy.

This allows the WP4C to deliver water potential readings with unparalleled accuracy in the -0.1 MPa to -300 MPa* range.

Applications

- Soil moisture characteristics
- Root zone water potential profiles
- Leaf water potential
- Seed water relations
- Expansive soil characterization

Benefits

- Precise Mode - verifies full equilibrium before displaying a final reading
- Speedy Equilibration - new hydrophobic teflon impregnated nickel alloy sample chamber coating reduces equilibration time
- Finely-Tuned Adjustments - new algorithms allow precision calibration and ±0.05 MPa (or better) accuracy
- Better range and accuracy - resolves temperatures to a thousandth of a degree to push the functionalrange to -0.1 MPa
- Data points can be add to the HYPROP-FIT Software

Limits

- -0.1 MPa is probably the practical limit for good accuracy
- Below -0.1 MPa use special methods
- At high water potentials, the temperature differences between saturated vapor pressure and the vapor pressure inside the sample chamber become vanishingly small

DECAGON DEVICES

**Note: WP4C will read to 0 MPA, but readings of samples wetter than -0.1 MPa will have an increasing, and typically unacceptable, percentage of error. Some usersmay be able to make useful measurements in samples wetter than -0.1 MPa using special techniques. For more information see the WPAC User Manaul or contact our Support Team.*

WP4C	
Measuring range	0 ... -300 Mpa
Resolution	±0,01 MPa
Accuracy	±0,05 MPa (-5 MPa); ±1% (-5 ... -300 MPa)
Temperature control	15 ... 40°C, ±0.2 °C
Operating environment	5 ... 43 °C
Read time	Typically 5 to 10 minutes
Interface	RS232, serial

Item	Art. No.
Water potential meter	WP4C
Sample cups (500 cups & lids)	WP4C-CUP

HYPROP-FIT - Fits for all your water potential data

HYPROP-FIT - the new software for moisture release curves and unsaturated conductivity curves makes it easy to use the HYPROP together with the new WP4C to generate a complete moisture release curve and parameters for use in modeling.

The new HYPROP-FIT software takes data generated by the HYPROP, the WP4C, Tensiometer, or any other water potential instrument to create a moisture release curve. The generated curve fits to the models of van Genuchten, van Genuchten bimodal (Durner), Brooks and Corey, and others.

HYPROP-FIT finds the optimal parameter sets without initial parameter guesses.

Benefits

- HYPROP-FIT comes for free
- Add data points to your HYPROP measurement e.g. WP4, pressure plate
- Use a wide variety of selectable standard models, e.g. van Genuchten Mualem bimodal van Genuchten/Mualem or Brooks and Corey and others
- Supports for a lot of output formats like csv, xls and HYDRUS table file format
- Use the HYPROP-FIT Software for other lab methodes

Software Download

The new software for evaluation of HYPROP measurements can be downloaded here:

http://www.ums-muc.de/static/HYPROP-FIT.zip

SOIL SAMPLERS
SZ 100 / SZ 250

UMS soil samplers 100 ml and 250 ml, which are used to take soil samples for HYPROP® or BaPS or other purposes of soil lab measurements. They are made of stainless steel with polished surfaces, laser imprinted serial number and weight.

Benefits

- Smooth, polished surfaces for low friction, minimum soil compaction, easy cleaning
- Laser imprinted serial number from 000001 up to 999999 for professional soil lab use
- Imprinted weight for any soil lab measurements where soil weight is an issue
- Inner and outer surface machined for best tolerances and surfaces

Comes with two caps made of PE.

Optinally with transport box to protect your samples.

Item	Art. No.
Volume 250	SZ250
Inner diameter	80 mm
Outer diameter	84 mm
Height	50 mm

Item	Art. No.
Volume 100	SZ100
Inner diameter	56 mm
Outer diameter	60 mm
Height	40 mm

Item	Art. No.
Transport Box	TP SZ

SZA 100 / SZA 250

Soil samples can be taken carefully by using the hammering adaptors SZA100 or SZA250. The soil surface is always visible. Further the soil sample can pass the sample ring and the hammering adaptor. The sample is no more compacted due to over hammering. Furthermore the sample ring is free movable inside the hammering adaptor. The hammering adaptors are light weight, which gives you a better feedback on the soil constitution. They are solid and made of stainless steel as well.

Item	Art. No.
Volume 250	SZA250
Inner diameter	80 mm
Weight	1000 g
Length	280 mm

Item	Art. No.
Volume 100	SZA100
Inner diameter	56 mm
Weight	570 g
Length	280 mm