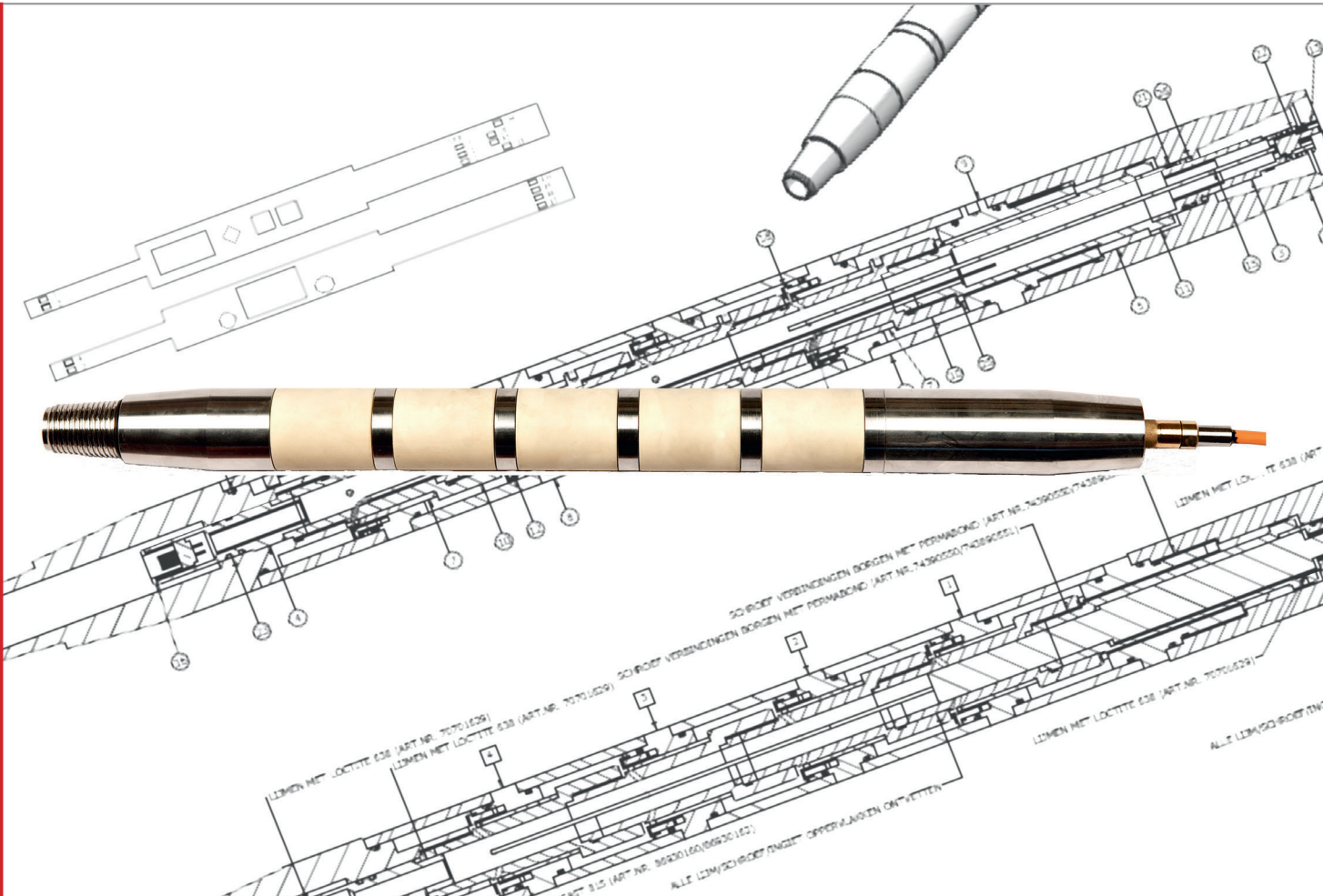# Icone Conductivity Module

easy access to additional data with a click-on module

features

- modular plug & play extension to the standard Icone system
- detection of sand/clay layers, saltwater-carrying layers & contamination
- four-electrode array for more accurate measurements
- built-in temperature sensor
- suitable for 5, 10 and 15 cm² Icones
- automatically recognized by Ifield software

PROBE THE FUTURE

Icone Conductivity Module, easy access to additional data with a click-on module

introduction

What if you have to acquire the in-situ soil properties like po-rosity and density as well as the dynamic properties like elec-trical conductivity and stress? In general these parameters re-quire separate systems (CPT and conductivity) and additional tests. Apart from being time consuming, this process may also negatively affect the accuracy of the information obtained. Our digital data acquisition system with the Icone and Icontrol data logger eliminates these drawbacks. The Icone is now ea-sily extendable with the Conductivity click-on module .

application area

The Icone Conductivity Module measures variations in the electrical conductivity in the soil. The output enables detec-tion of sand/clay layers, tracking of saltwater-carrying layers and detection of contamination. Examples:

1. quantification of salt (sea)water intrusion into fresh water aquifers
2. identification of contaminated groundwater or soil
3. determination of soil layers by deviations from the typical electrical conductance of water

Icone 10 cm²   Icone Conductivity Module
for 5, 10 and 15 cm² Icone
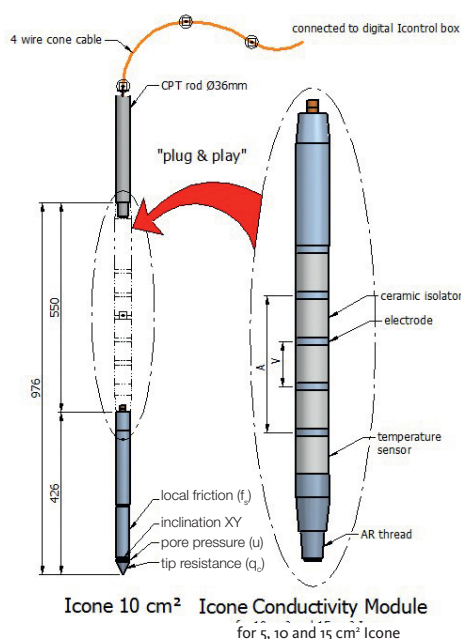
measurement method

The A.P. van den Berg Conductivity Module consists of four electrode rings, which are isolated from each other by ceramic insulators. With a controlled voltage source inside the module, a known current (I) is generated through the soil between the outer electrodes. This current causes a voltage difference (V) across the inner electrodes. The difference is held at a constant value by in- or decreasing the current.
The conductivity (K) in milliSiemens per meter is calculated using the following equation: $K = C \cdot I / V$
C in this formula is a calibration factor which is defined by di-rect calibration of the measurement module. This calibration factor makes the result of the equation independent of the in-

strumental geometry, so it can be directly compared to results from other instruments.
To prevent polarization of the soil and pollution of the electro-des, an AC current source is used. For the purpose of a correct interpretation, the soil temperature is measured simultane-ously with conductivity.
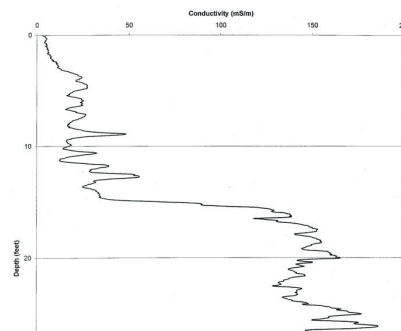
Specifications	
Module length	550 mm without Icone
Module diameter	44 mm
Module weight	3.7 kg without Icone
Sensors	Conductivity: - measuring range 50 - 1,500 mS/m - accuracy: 5% or 1 mS/m Temperature: - measuring range 0° - 50°C - accuracy: 1,5%
Data transfer options	- 4-wire Icone cable inside CPT-rods - Wireless Optical data transfer
Connector	- Quadrax swivel connector to Icone - Lemo 4-pins connector to Icontrol

modular concept (plug & play)

The standard system consists of a completely digital cone, called Icone, and a digital data logger, called Icontrol. The Ico-ne measures the four standard parameters cone tip resistance
(q_c), sleeve friction (f_s), pore water pressure (u) and inclina-tion (Ix/y). The modular set-up facilitates the application of the Conductivity Module only when it is required. In such case the Conductivity Module is simply connected directly behind the standard Icone with a small coupling piece. The Conductivity Module can also be used with just a dummy tip in case CPT-data is not required. Upon connection, the Icontrol and Ifield software for realtime data presentation will automatically re-cognize the Conductivity Module.

The figure below shows the results of a Conductivity test for measuring seawater intrusion into the main land and is drawn up in Ifield. The graph is generated by the Ifield software and shows clearly that the transition of fresh to salt water is loca-ted at a depth of 15 meter.

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