



a.p. van den berg
The CPT factory

Icone Seismic Module

assessing ground stability by the propagation speed of sound



features

- triaxial seismic module: shear wave left/right and compression wave
- easy to test at two or more depths simultaneously
- plug & play extension to the digital Icone data acquisition system
- automatically recognized by Ifield software and Icontrol datalogger
- can be combined with 5, 10 and 15 cm² Icones or other click-on modules

creating tools that move your business

Icone Seismic Module, assessing ground stability by the propagation speed of sound



introduction

Elastic soil properties are essential input for the prediction of ground-surface motions related to earthquake excitation and for the design of foundations for vibrating equipment, for the assessment of offshore structure behavior during wave loading and to predict deformations around excavations. To

investigate these elastic properties of the soil, seismic tests can be performed. A.P. van den Berg's Icone Seismic Module is an excellent instrument for these tests. It contains 3 accelerometers to receive left and right shear waves as well as compression waves.

measurement method Icone Seismic

Elastic soil parameters are determined by measuring the propagation speed of an applied sound wave between two known depths. The seismic module is pushed into the soil while stopping at 1 meter intervals. During the pause in penetration, a shear or compression wave is generated by a hammer at surface level and the time required for the wave to reach the seismic sensor is recorded. The time difference between two consecutive seismic tests is a measure for the elastic properties of the soil.

The following can be calculated as a function of the seismic data and the soil density (usually already known):

- small strain shear modulus & constrained modulus
- elasticity modulus
- Poisson's ratio

The Seismic Module can be applied both onshore and offshore and has a 1,000 m water depth rating.

stacking

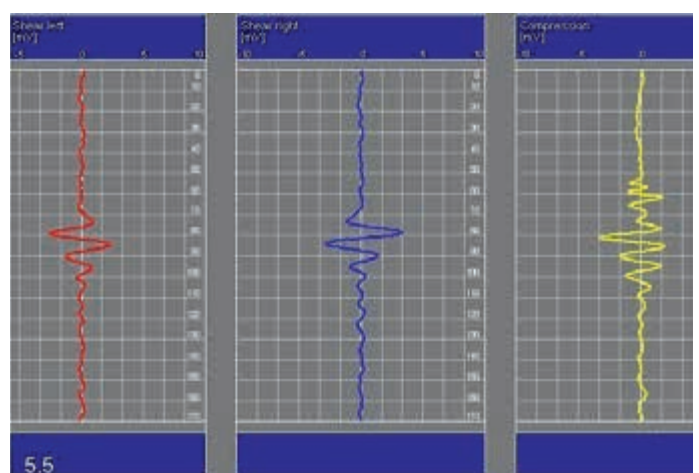
To increase speed and accuracy of seismic testing, it is possible to measure at two or even more depths simultaneously by using extra seismic modules, mounted at fixed distances of 1 or 0,5 meter. Furthermore the measurement of a vibration can be repeated in order to improve the signal to noise ratio at larger depths.

Specifications

Length	500 mm without Icone
Diameter	44 mm
Weight	3.8 kg without Icone
Resolution	16 bits
Sample frequency	5,000 Hz
Sample time	600 ms
Signal amplification	Max. 100x
Accelerometers	20 Hz - 300 Hz
Wave directions	shear wave left, right & compression wave
Data transfer	4-wire Icone cable inside rods
Connector	Quadrax swivel connector Icone Lemo 4-pins connector Icontrol
Operating temperature	0 to 60°C

modular concept (plug & play)

When required, the standard CPT-parameters can be measured simultaneously if an Icone is placed in front of the Seismic Module. These parameters are cone tip resistance (q_c), sleeve friction (f_s), pore water pressure (u) and inclination (I_x/y). Both the Icone Seismic Module as well as the Icone are part of our modular data acquisition concept that is based on fully digital data transfer. The system consists of a digital data logger, called Icontrol, and the Ifield software for realtime data presentation. Due to smart application of digital technology, multiple parameters can be retrieved by several modules, even combined in one test. Besides the Icone for standard CPT and the Icone Seismic, modules are available for magneto, vane and conductivity testing. Upon connection, the Icontrol data logger and Ifield software will automatically recognize the specific cone and/or module(s), so it is a true plug & play system!



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