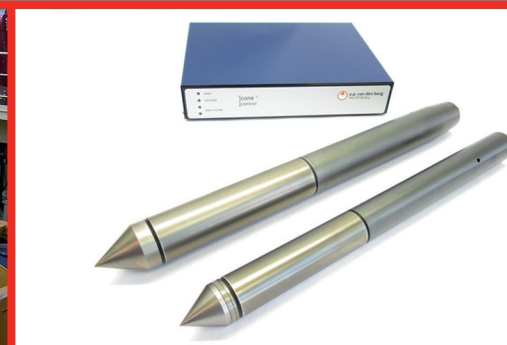


# Soil investigation equipment for shallow to ultra-deep water

Cone Penetration Test (CPT) is a scientifically proven soil testing method (conform the ISO 22476-1) that provides accurate soil data. Ever since the eighties, the engineers of A.P. van den Berg have been making CPT technology available for seabed soil investigation preceding civil works, installations for oil and gas and construction of wind farms. Various CPT systems are available, for shallow to ultra-deep water. With the continuous innovations from its own engineering & development department you are assured to get the latest technology. After engineering, manufacturing and delivering, the engineers will take care of training, installation and start-up as and where required. Subsequently A.P. van den Berg provides a full after-sales service, including fast dispatch of consumables & spares and on-site support.



## **ROSON® seabed systems** (water depths up to 1,500 m)

- deployed from a vessel with moon pool, A-frame or crane
- placed on the seabed for performing CPTs, seismic tests, vane tests and soil samples
- electrical wheel drive system pushes the string into the seabed
- comes with a self-tensioning electric winch for heave compensation with max. 1,500 m cable storage or without winch for near shore jobs at water depths up to 300 m
- various types available: variations in pushing force (50 kN or 100 kN) and dimensions
- high-quality samples with a length up to 25 m (recovery ratio higher than 95%) can be taken using the Deep Water Sampler
- available since 1982
- track-record unequalled by any company in the industry

## **WISON-APB® wire-line systems** (water depths up to 1,000 m)

- deployable from any available drill ship
- multipurpose tool enables an easy switch between CPT, vane testing, seismic testing and soil sampling
- comes with a self-tensioning electric winch for heave compensation resulting in a longer live span of the umbilical cable
- available in three versions: variations in pushing tool length (0 to 3 m), pushing force and achievable water depth (550 or 1,000 m)
- available since 1974
- the standard in wire-line CPT systems

## **Ultra deep water systems**

These systems are provided with technology to operate in harsh offshore conditions at ultra-deep water depths and are unrivalled by any company in the industry.

### **For water depths up to 4,000 m:**

- the DW ROSON seabed system for CPT, vane testing and sampling with a pushing force of 100 kN or 200 kN
- high-quality samples with a length up to 25 m (recovery ratio higher than 95%) can be taken using the Deep Water Sampler

### **For water depths up to 3,000 m:**

- the wire-line system WISON-APB-3000 for CPT, vane testing and soil sampling with a pushing force of 100 kN, a pushing tool that has an adjustable stroke from 0 to 3 m and a winch that is optimized for high travel speeds of the tool in the drill pipe

## **Icône digital data acquisition**

The WISON-APB and ROSON technologies work in conjunction with a digital data acquisition system, consisting of:

- a digital data logger 'Icontrol'
- a digital cone 'Icône' that measures the four standard parameters: cone tip resistance ( $q_c$ ), sleeve friction ( $f_s$ ), pore water pressure ( $u$ ) and inclination ( $I_{x/y}$ )
- click-on modules that can easily be connected to the Icône to measure other than the four standard parameters (seismic, vane, magneto & conductivity)

The standard Icône is suitable for water depths up to 2,000 m and a pressure compensated Icône is available for water depths from 1,000 up to 4,000 m.



## Conductivity

Icone Conductivity is used for measuring variations in the electrical conductivity of the soil. The output enables detection of sand/clay layers, tracking of saltwater-carrying layers and detection of contamination.

A.P. van den Berg's Conductivity Module has four electrode rings that are separated by ceramic insulators to ensure accurate determination of the soil conductivity. The module has a built-in temperature sensor to enhance the analysis and evaluation of the measured values for conductivity.

The modular click-on concept facilitates the application of the Conductivity Module as and when required. It can be applied with or without an Icone connected. In case CPT data is not required, the Conductivity Module is used with a dummy tip.

Icone Conductivity can be used with all onshore and offshore A.P. van den Berg equipment. The maximum water depth is 1,000 m.



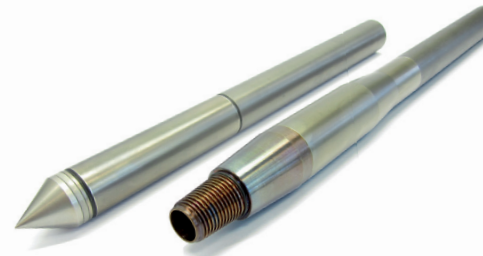
## Magneto

Icone Magneto detects objects in the soil containing magnetisable metal, e.g. unexploded ordnance (UXO), ground anchors, piping, the tip of sheet piles and foundation piles by interpreting anomalies of the earth's magnetic field.

The Magneto Module is equipped with its own inclinometer in X- and Y-direction, to allow for accurate positioning. Anomalies can be detected at a distance up to 2 m depending on the size of the object.

The standard CPT-parameters can also be measured if an Icone is mounted in front of the magneto module. To accurately respond to changes in the measured value, in particular when detecting UXO's, also the gradients of the orthogonal measured anomalies are determined. Alarm values can be set to stop pushing when one of these gradients is exceeded.

When required, Icones and CPT rods are available in non-magnetisable Nitronic metal. Icone Magneto can be used with all onshore and offshore A.P. van den Berg equipment. The maximum water depth is 1,000 m.



## Seismic

Icone Seismic is used for determining the stability of the ground, by measuring the propagation speed of sound. An Icone Seismic Module contains 3 accelerometers to receive left and right shear waves as well as compression waves.

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

To increase the speed or accuracy, 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 seismic signals from one depth can be stacked in the Ifield software, in order to improve the seismic signal by averaging out the noise.

The Icone Seismic can be used with all onshore and offshore A.P. van den Berg equipment. The maximum water depth is 1,000 m.



## Vane

Icone Vane is used for determining undrained and remoulded shear strength for the stability analysis of soft soils.

A.P. van den Berg's Icone Vane has many features that facilitate an accurate vane test:

- the torque sensor and the drive are positioned as close as possible to the vane for the most accurate measurement
- no need to rotate full CPT string
- an optional robust housing protects the vane; the vane is pushed out at the required depth and is retracted again after the test
- to prevent damage to the transmission, the drive motor is electronically limited at a torque of 100 Nm
- Icone Vane is available in a slow type (with a rotation speed of 0.1 °/s) for performing very accurate shear tests and a standard type (with a speed of 12 °/s) for fast remoulding

Icone Vane can be used with all onshore and offshore A.P. van den Berg equipment. The maximum water depth is 4,000 m.