

## BAT-system

# Groundwater Monitoring

Pore pressures have a strong influence on the soil behaviour, whereby small changes can have considerable consequences, especially in soils with low permeability. With the BAT-groundwater monitoring system you can reliably monitor the pore pressure particularly in low permeable soils. The BAT-system enables both direct read-out of pore pressures as well as the option to accurately track fluctuations in the pore pressure remotely. With an additional permeability set the BAT-system offers the extra possibility to determine the permeability of the soil and/or to collect accurate groundwater samples.

### Efficient installation



The BAT-system consists of a filter tip and a sensor. It is easy to install the filter tip since the tip neither contains any sensitive elements nor is connected to an electrical cable or tubing during installation. The filter tip is connected to an extension pipe, for example a standard one-inch gas pipe, and pushed down to the desired installation depth.

Next the BAT-sensor is lowered down the pipe. As soon as the sensor connects with the filter tip, the pore pressure measurements will start. Due to the quick connect system, function control of both the BAT-sensor and the BAT-filter tip can be made at any time. After finishing the measurements the sensor can be retrieved easily and used again at another site.

The BAT-sensor without BAT-filter tip can also be used in standpipes, which add extra flexibility to the system. With its diameter of 22 mm the sensor is very compact.

### Accurate monitoring

Based on the Profound's Intelligent Sensor (IS) technology, the communication with the BAT-sensor is fully digital. The sensor immediately displays the measured pressure in the engineering unit kPa (mH<sub>2</sub>O). The BAT-system measures the absolute pressure, which guarantees stability, especially during long-term measurements. The internal air pressure sensor in the robust IS-field unit or in the IS-module allow for automatic barometric compensation and checking of the validity of the readings.

In addition, the BAT-sensor can be disconnected and retrieved at any time to check its proper function or to calibrate. It is also possible to determine the exact depth of the filter tip at any time by comparing original top level of the installation pipe with the current level. This is of paramount importance during consolidation, which can alter the depth of the BAT-system.

### Flexible network options

Depending on the project requirements the BAT-system can be installed in different set-ups, such as single, clustered and part of a large monitoring network.



A single BAT-sensor can be equipped with a battery holder and allows for the storage of measurement data for a period up to 8 months. Used as a single data logger in the field, the BAT-system is programmed with a robust hand-held IS-field unit to start measurements and later on to download the data.

You can integrate the BAT-system in a digital Profound IS-network, which allows remote monitoring of the project's progress. One up to 25 BAT-sensors can be combined with an IS-module. This internet solar module is a fully digital unit offering you the possibility to monitor remotely and/or directly in the field. With the IS-module in combination with the IS-field unit you can directly display a measurement in the field or set, log and download measurements. The IS-module is a combined power supply, data logger, GPRS/4G modem and provides a data backup.



### Wireless data transfer

Using a wireless, built-in GPRS/4G-connection the IS-module directly uploads measurement data to a server for online monitoring or sends the data at a preset interval via email to a pc for further processing.

### Proven technology

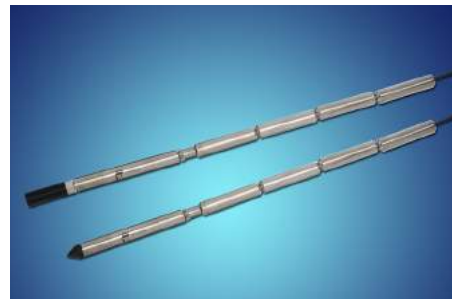
The patented BAT®-groundwater monitoring system represents an innovative and proven technology for groundwater monitoring and testing. For over thirty years the system has been successfully used in a great number of groundwater monitoring projects worldwide.

# BAT-system

## Specifications BAT-system

### BAT-sensor

Standard pressure range	: 0...5 bar (absolute) 0...50 mH <sub>2</sub> O (absolute)
Burst pressure	: 16 bar
Material housing	: Stainless steel 316
Protection	: IP 68
Temperature range	: - 20 °C to + 80 °C
Weight and dimensions	: 224 gram, ø 22 mm x 170 mm
Standard cable length	: 10 m or 20 m
Measurement duration	: Network configuration dependent
Application	: With BAT-filter tip or in standpipe



### BAT®-filter tip MkIII

Standard pressure range	: 0...16 bar (absolute) 0...160 mH <sub>2</sub> O (absolute)
Number of couplings	: » 500
Weight and dimensions	: 122 gram, ø 31 mm, length 209 mm
Material filter tips	: POM with porous HDPE filter (standard) Stainless steel with porous HDPE filter POM with fine porous ceramic filter



Accessories	: BAT-starter kit, BAT-permeability set, IS-battery holder, IS-field unit, IS-module
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## Key advantages

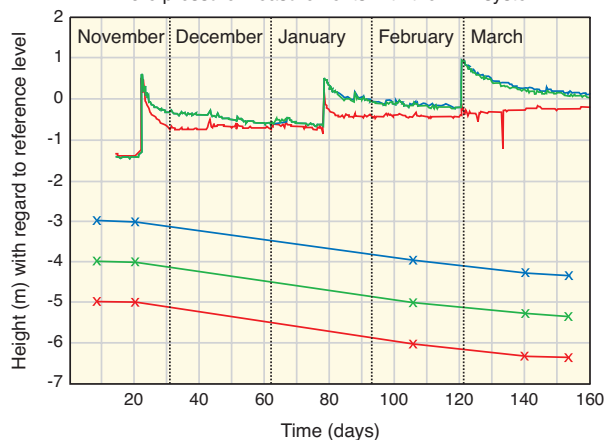
### BAT-system

- Accurate groundwater measurements in engineering units: kPa (mH<sub>2</sub>O) and °C
- Retrievable sensors
- Used with the last generation of BAT-filter tip Mk III or in standpipes
- Flexible usage: stand-alone, with an IS-module in a network
- In-situ permeability measurements and sampling

### IS-module

- Flexible and efficient energy harvesting via integrated solar panel, battery or 230V
- Equipped with air pressure and temperature sensor
- Up to 25 BAT- or different IS-sensors on an IS-module
- Simple and easy to connect
- Independently adjustable measurement and transmission interval
- Intelligent transmission of data via built-in GPRS/4G with fallback options

Pore pressure measurements with the BAT-system



Legend:

— BAT-sensor PA9111	—x— Filter level of sensor PA9111
— BAT-sensor PA9112	—x— Filter level of sensor PA9112
— BAT-sensor PA9114	—x— Filter level of sensor PA9114

## FOR FURTHER INFORMATION

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