AP SENSING
advanced photonic

GeoDTS

Distributed Temperature Sensing Solution Package

- Enhanced Geothermal Response Tests - Geothermic
- Seepage Monitoring - Dykes & Dams
- Leakage Detection - Geo-techniques

Intelligent Solutions

You are looking for a trusted partner?

AP Sensing is your global solution provider for distributed temperature monitoring. The heart of AP Sensing's temperature monitoring solution is a unique fiber optical Distributed Temperature Sensing DTS system.

With a passive optical fiber acting as temperature sensor, you can monitor exact temperature profiles along the optical fiber where other solutions fail to provide you the solution you need.

The distributed temperature monitoring market we are constantly optimizing our solution package to provide a robust and reliable solution that fits your very specific needs.

AP Sensing´s GeoDTS has been developed in co-operation with GTC Kappelmeyer the well known and highly recognized consulting and engineering company for geothermic, geotechniques, hydrogeology and environmental technology.

You need an integrated solution for enhanced heat response tests?

The traditional geothermal response test GRT is an accepted field method to determine the effective thermal conductance of the ground. But with the enhanced geothermal response test EGRT the geothermal parameter are evaluated in-situ as a function of the entire depth or length of the embedded borehole heat exchanger. Using AP Sensing`s GeoDTS Technology the termperature along the heat exchanger pipes can be determined at any point and any time which allows the evaluation of a number of thermal parameters in dependency of the location.

The AP Sensing´s GeoDTS offers you a comprehensive solution right at your fingertips for executing spatially resolved, heat response measurements like geothermal reponse tests or the determination of spillages and natural groundwater streams.

The AP Sensing´s GeoDTS performs measurements down to 1 meter spatial resolution with less than 0.1 °C temperature resolution providing hundreds of measurement points in a single trace capture.

Our solution is based on AP Sensing`s high performing DTS technology with its patented code-correlation measurement concept.
With a compact solution and the unique solution package AP Sensing's GeoDTS offers an easy and flexible way to get vital thermal parameters.

All components are designed and chosen thoroughly to ensure maximum quality with the lowest failure rate in the industry.

You want an intelligent solution package?

AP Sensing's GeoDTS automatically applies current on the electrical conductor of the hybrid cable and thus a defined heating power is dissipated along the cable in the ground. The resulting change in temperature along the optical fiber is measured and recorded simultaneously by the GeoDTS.

The entire heat and measurement process is controlled by the GeoDTS – just start the measurement program! The GeoDTS independently manages the measurement setup, the heat program. Furthermore the GeoDTS monitores voltage and current applied to heat up the fiber optic hybrid cable and can handle two external electrical temperature sensors
AP Sensing's GeoDTS enclosure perfectly suits your ambitious demands. The GeoDTS comes in a easy to carry housing suitable for outdoor applications (IP54), with a secure stand even on loose or slippery ground and without attracting unwanted attention.

Geothermics

- Calculating thermal parameters in conjunction with different geological layers
- Identification of aquifers and ground water streams
- Monitoring of cement hardening by measurement of hydration heat
- Inspection of appropriate annulus backfilling

Geo-technique

- Detection of subsurface flow
- Leakage detection at deep excavation pits
- Detection of subsurface flow

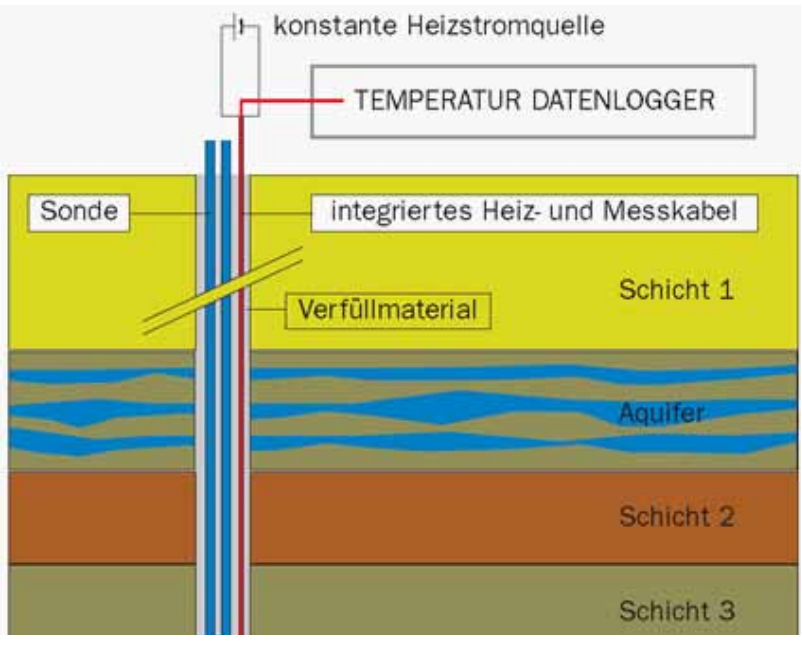
Hydrolic Engineering

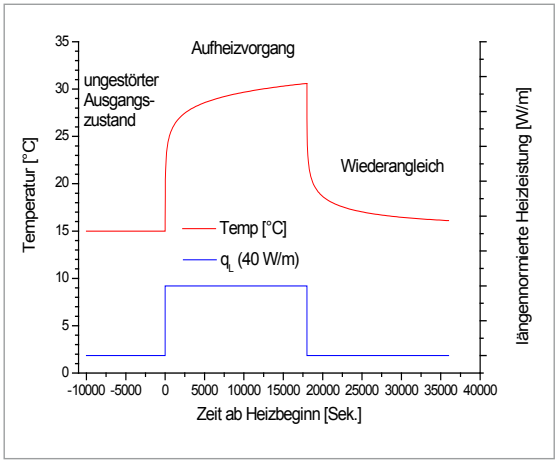
- Seepage monitoring
- Detection of internal erosion
- Estimation of thermal parameters

Easiest data logging and analysis of your measurement data

Each instrument of AP Sensing's GeoDTS series comes with your version of a PC based configuration and evaluation software. This powerful easy-to-use package not only allows you to configure and visualize your measurement but also to calculate crucial thermal parameters like ground conductivity as a result of the executed measurement.

All your measurement data is automatically stored on a SD card once you have started the measurement cycle. After finishing the measurement campaign just plug the SD card into your Labtop and you get a comprehensive analysis after a few clicks.

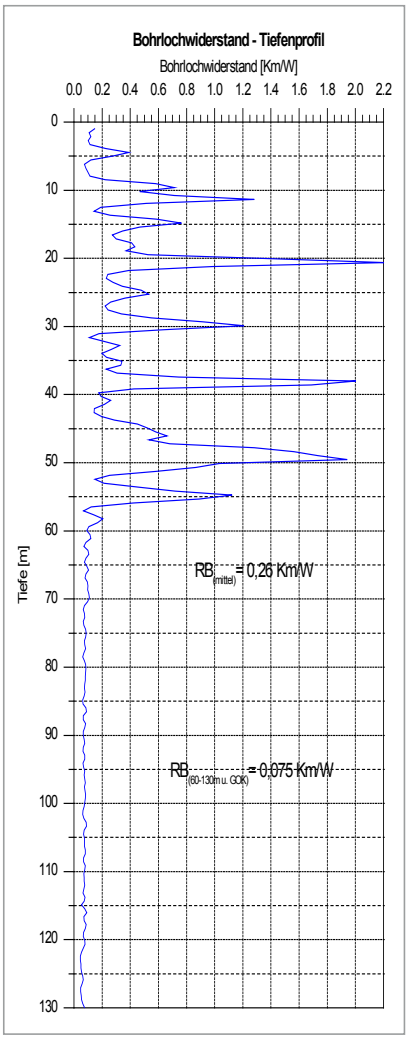


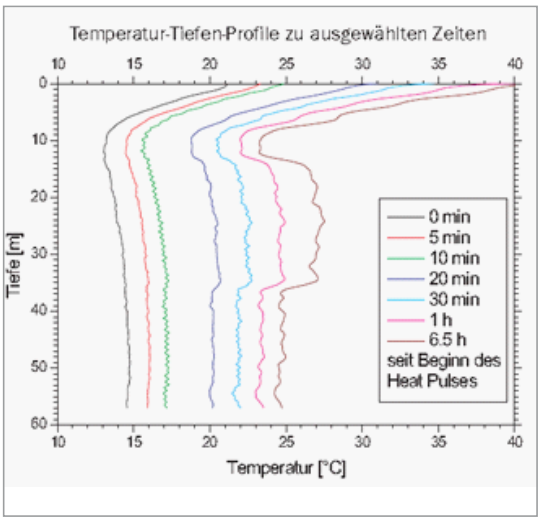


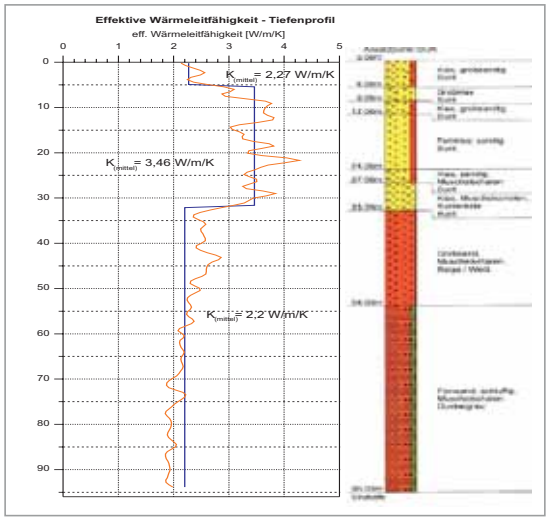
AP Sensing's „GeoDTS" – perfect for your mission

No doubt, AP Sensing's GeoDTS suits your monitoring demands and provides you a temperature measurement solution where others fall short.

Features	Benefits
Accurate and reliable temperature sensing	Constant reliable and real time temperature sensing
Industry leading technology, quality and life-time	Reduced service and support costs
Field proofed outdoor housing (IP54)	Robust, easy-to-carry, does not attract attention
Wide Operating Temperature	Works in the field
Comprehensive Solution Package	Switches voltage and current to heat up the cable and to control the entire measurement and logging of all parameters
Smart Data Logging	Utilize easy-to-handle SD card memory
Smart Data Analysis	Comprehensive software package for configuration & analysis of the measurement campaign







Key Features of Analysis Software:

- Visualization of measurement data
- Calculation of effective conductivity, spatially resolved along the entire embedded borehole heat exchanger
- Calculation of the borehole thermal resistance as a function of the bore hole depth
- Display of the undisturbed soil temperature
- Display of the disturbed (heated) soil temperature at selected time to indentify aquifers
- Report generation

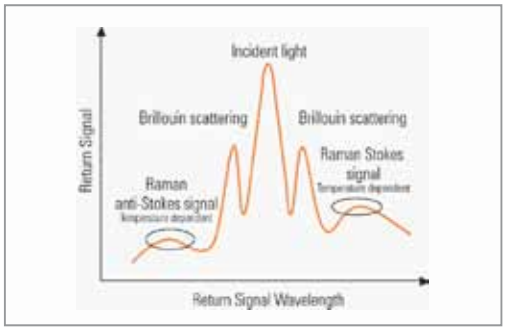
How does a fiber optic Distributed Temperature Sensing System work?

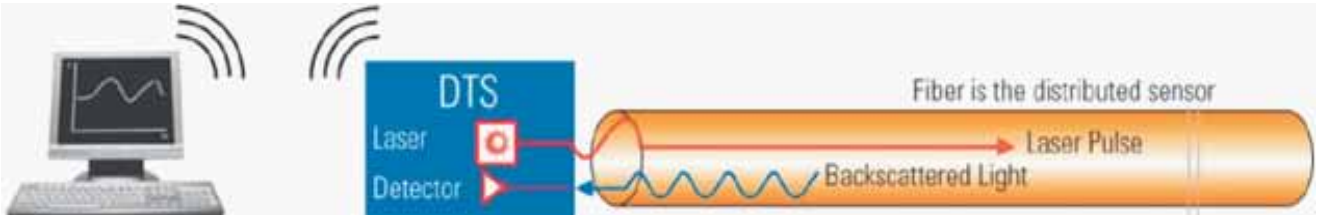
The AP Sensing GeoDTS performs measurements down to 1 meter spatial resolution with less than 0.1°C temperature resolution providing thousands of measurement points in a single trace capture.

Our solution is based on the quantum mechanical Raman effect and a patented code-correlation measurement concept.

Laser light interacts with the lattice oscillation of the glass fiber structure and generates temperature depending Raman lines in the backscattered spectrum. By measuring these lines with a pulse –echo process a DTS measures an accurate temperature profile.

With its highest level of integration and unique optical assembly technology, AP Sensing offers temperature measurement solutions, which can be deployed in areas were other solutions cannot All components are designed and chosen thoroughly to ensure maximum quality with the lowest failure rate in the industry.





Hybrid cable and required accessories ...

A robust and ready to use hybrid cable is part of the EGRT solution. The embedded cooper wires, are used for the defined heat dissipation into the ground, while at the same time the embedded fiber cable is monitoring the full heat cycle as well as the cooling process. The weight of the watertight hybrid cable is with only 10 to 15 kg for a length of 100m especially light, while the tensile strength ensures stability in harsh environment.
The used materials are neutral to the ground and drinking water.

For applications where the heating functionality is not required AP Sensing is also providing the specialized sensor cables, which are robust, light weight and fast responding to thermal changes. All cables have an expected life time of 30 years and are maintenance free even under harsh environmental conditions.

You are looking for a reliable solution?

AP Sensing inherits more than 20 years of OTDR (Optical Time Domain Reflectometry) expertise. The instrument is based on key technologies and IP from Agilent Technologies (former Hewlett Packard), the global leader in optical measurement and innovator in optical assembly techniques.

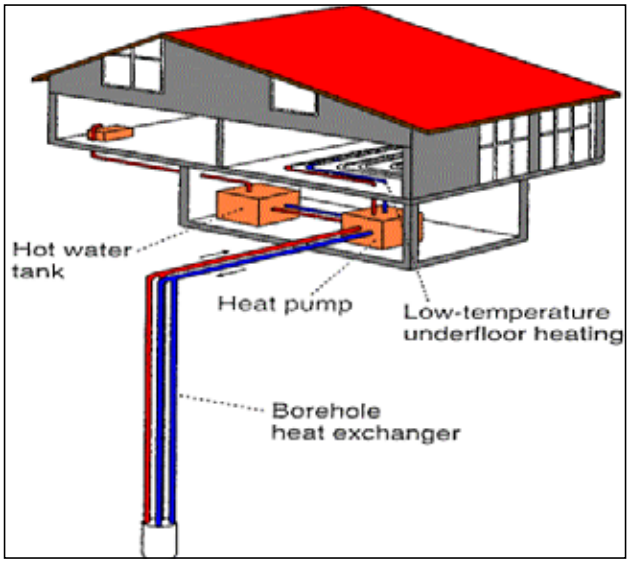
AP Sensing is ISO 9001 certified.

- Proven field realibility with industry´s lowest maintance and warranty cost
- Industry leading robustness against vibration and shock
- Incorporates a hermetically sealed optical block for long life operation
- Highest measurement repeatability throughout the entire operating temperature range
- Lowest laser output power - inherently safe inoperation

Lifetime and quality relies on decades of OTDR experience, proven ICs and solid manufacturing processes with industries lowest failure rates in photonic test & measurement.
The components in the heart of the instrument are surrounded by inert gas in a hermetically sealed block, protecting against condensation, dust or moisture – insuring long term operation, independent of ambient changes.

Accurate Measurements in any situations

With the dual ended operation mode the system automatically corrects for changes in the Anti-Stokes/Stokes ratio which could result from environmental or mechanical effects (i.e. stress, fiber bends, fusion splices, hydrogen darkening, etc.). This insures accurate temperature measurements over the life of the installed fiber.



Quality & Support

AP Sensing's leadership in quality is based on intelligent design, proven components and decades of experience

The instrument design is based on a low power semiconductor laser with lowest optical output power (Laser Class 1M) for maximum life time and a proprietary code correlation concept enabling the longest measurement range on the market. Additionally, AP Sensing's „GeoDTS" patented single receiver design ensures long lasting measurement stability by eliminating drift effects well-known with dual receiver concepts. This unique design avoids the need for system recalibration.

Furthermore, with the lowest optical output power AP Sensing's "GeoDTS" is inherently safe in use and operation. It will not harm in case of a fiber break like other DTS instruments do and can also be deployed in areas with explosive atmospheres without additional safety measures.

Solid instrument design with key components specified at

- Calculated overall system MTBF value is 33 years
- Semiconductor laser: 60 years at used pulse method
- Switch: tested for 100 M cycles, which is equivalent to 63 years

GTC Kappelmeyer is the innovator and leader in the use of hybrid cables for measuring geothermal parameters in soil.

With decades of experience in geothermics, geotechniques and hydrolic engineering the engineering and consulting firm GTC Kappelmeyer is best positioned to feature well proven and tested algorithms in the supplied analysis software.

G · T · C

Service and Support

Our reputation is based on the industry's lowest failure rate and best application fit.
AP Sensing offers global service & support with a wide range of additional services and extended warranty. Every instrument and system we sell comes with a global warranty.

AP Sensing is your strategic business partner for success.

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