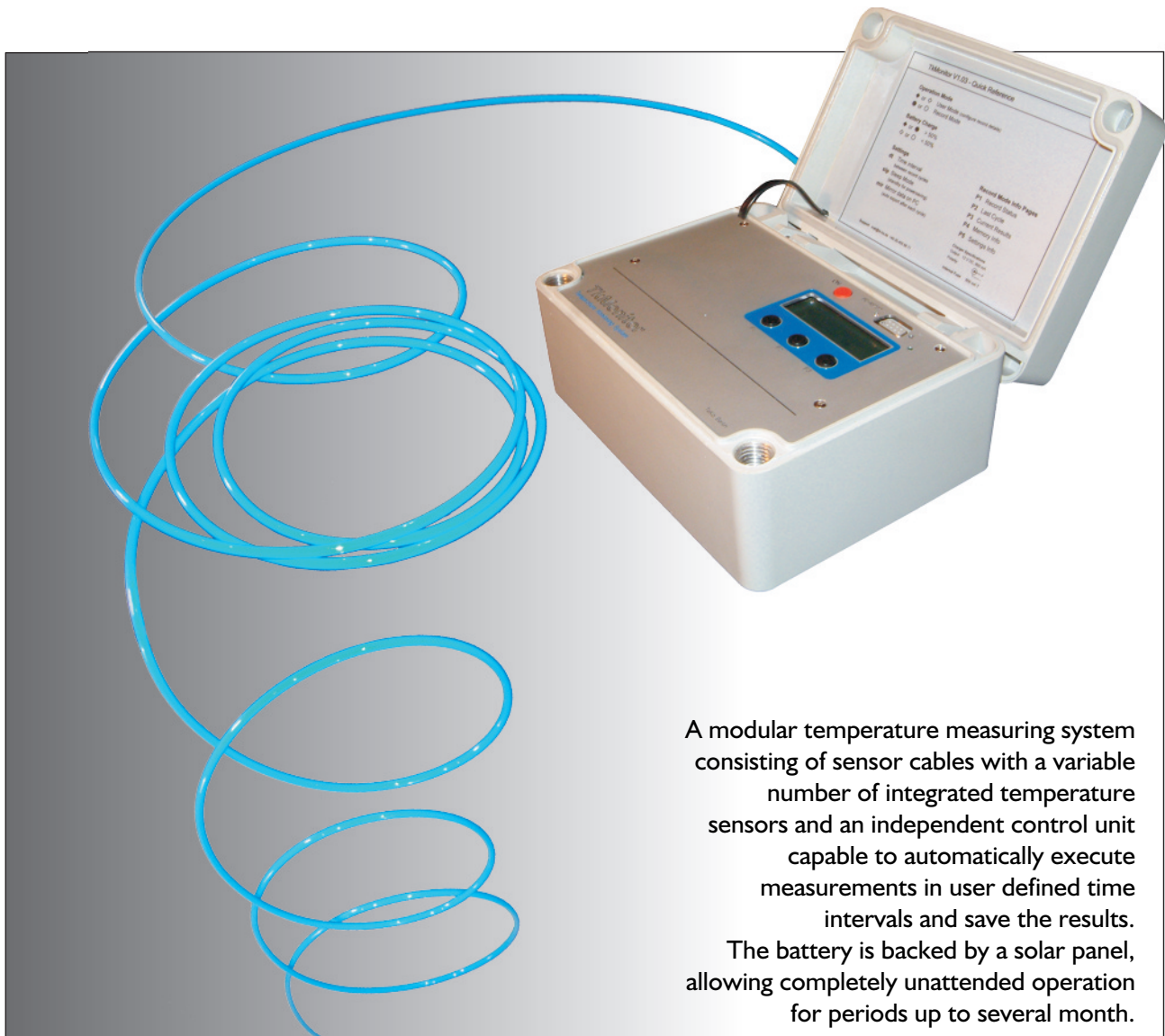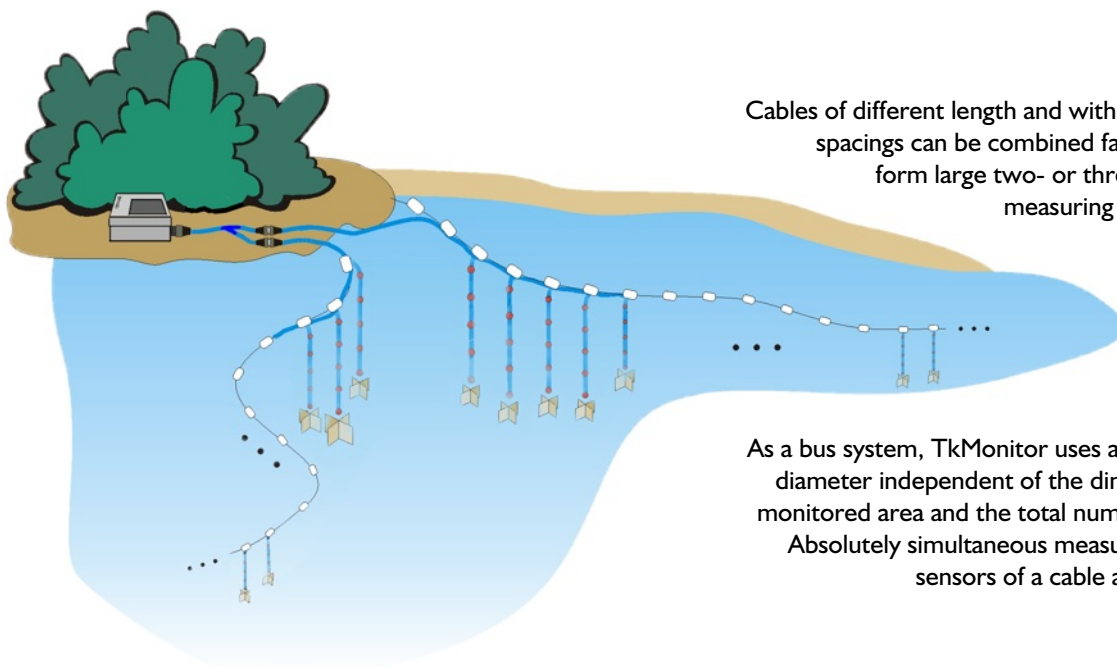# TkMonitor

Temperature Monitoring System

A modular temperature measuring system consisting of sensor cables with a variable number of integrated temperature sensors and an independent control unit capable to automatically execute measurements in user defined time intervals and save the results. The battery is backed by a solar panel, allowing completely unattended operation for periods up to several month.

Features

- Bus system for multidimensional temperature registration
- Dynamical registration of thermal states
- All sensors of a cable are measured simultaneously
- Permanent data storage
- Long-term monitoring
- Continuous data output
- Platform independent software for data transfer and analysis

Cables of different length and with distinct sensor spacings can be combined fast and easily to form large two- or three-dimensional measuring configurations.

As a bus system, TkMonitor uses a constant cable diameter independent of the dimensions of the monitored area and the total number of sensors. Absolutely simultaneous measurements for all sensors of a cable are guaranteed.

The control units are designed for cyclic long-term measurements. Data are saved permanently and can be transferred to a PC or notebook after finishing or even during a measuring job.

Technical specifications

Control Unit

Model:	TkMonitor V2.xx
Casing:	glasfibre-reinforced polyester
Protection classification:	IP 66, EN 60529 (dust entry and occasional flooding)
No. of sensor cables (max.):	different models available, at present 3 / 15 / 30 cables
No. of sensors:	up to 1000 (standard version)
Internal sensors:	2 (box, air)
Data memory:	512 Kbyte
PC interface:	RS232
Operating temperature:	- 20 to + 50 °C
Power supply:	7.2 V NiMH battery (backed by solar panel)
AC adapter:	input 100-240 V, 47-63 Hz output 12 V, 1.25 A
Size (W x D x H):	200 x 150 x 100 mm (without connection socket)
Weight:	2.500 g

Sensor cables

Measuring range of sensors:	- 55 to +125 °C (limited by cable operating temperature)
Accuracy:	$\pm$ 0.5 °C (for -10 to +85 °C) $\pm$ 2.0 °C (for -55 to -10 and +85 to +125 °C)
Resolution:	0.0625 °C
Sensor spacing:	varying, $\geq$ 10 cm
Jacket:	polyurethan (standard version)
Operating temperature:	- 30 to + 85 °C (standard version)
Cable diameter:	oval 9 x 5 mm (standard version)
Cable length:	up to 350 m (standard version)
Connectors:	IP 67 (splash-proof) optional: underwater version

PC Data transfer software

Operating system:	platform independent (Java) curr. supported: Win 9x / ME / 2000 / XP
Hardware:	200 MHz CPU, 64 MB RAM, 1 x RS232 screen resolution 1024 x 768 minimum

Continuous data output
Optionally, data can be transferred continuously to a connected PC or notebook to allow observation of the thermal state of the measuring object quasi in real-time.

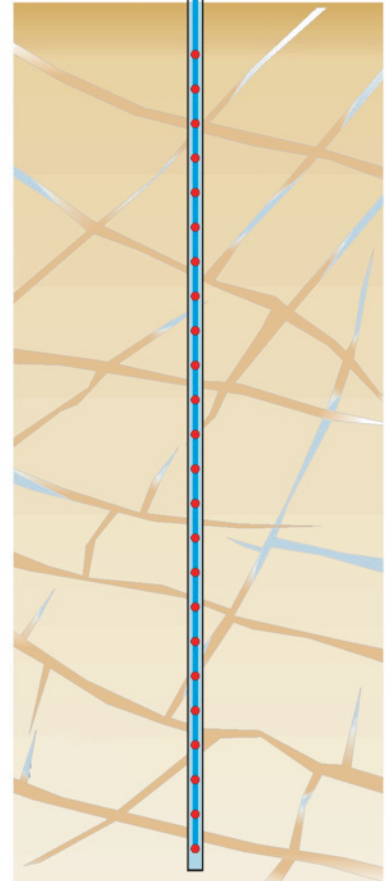### Simultaneous measurement of all sensors
A single measuring command by the control unit (master) triggers the exactly simultaneous temperature registration for a complete sensor cable, independently of its length and the total number of sensors. Even large measuring configurations can be registered in a few seconds. After receiving a request of the master, the sensors transmit their position and the stored temperature data to the control unit.

Dynamical registration of thermal states
As measurements are quasi-simultaneous, a consistent registration of the instantaneous thermal state in short time intervals is possible even in large measuring networks.
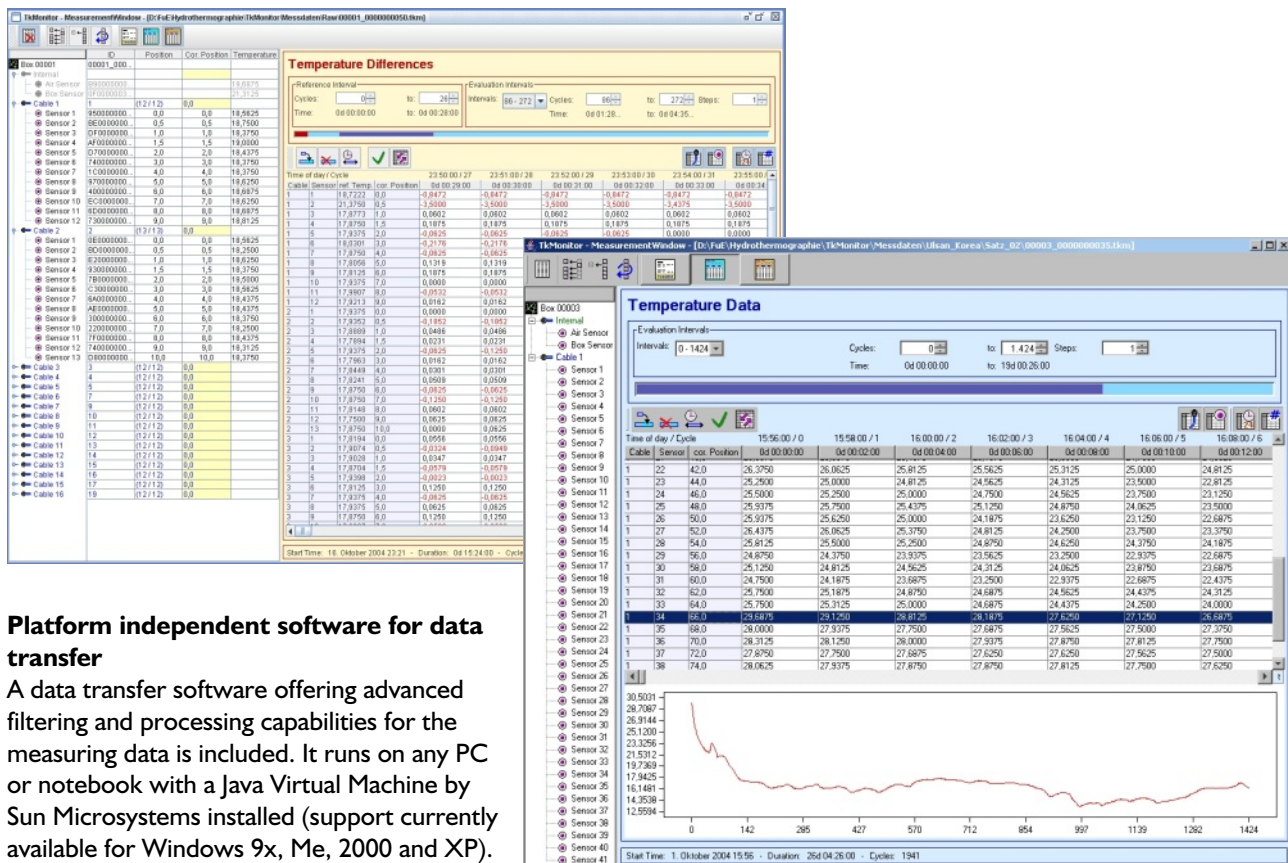
Permanent data storage
Measurements are executed in user defined time intervals and data are stored permanently in non-volatile memory whose content is preserved even in case the power supply should fail. Results can be checked and transferred to a PC or notebook at any time even during long-term observations.

Bus system for multidimensional temperature registration
The sensors are integrated into abrasion-proof bus cables which automatically register with the control unit. Depending on the measuring task, additional cable branches can be added, allowing the implementation of multidimensional measuring configurations with minimal cabling effort.

Platform independent software for data transfer

A data transfer software offering advanced filtering and processing capabilities for the measuring data is included. It runs on any PC or notebook with a Java Virtual Machine by Sun Microsystems installed (support currently available for Windows 9x, Me, 2000 and XP).

Applications

TkMonitor has a wide range of applications. Use it everywhere you wish to control temperatures, especially for detecting thermal anomalies indicating the state (or changes of state) of the monitored object. The following are just some examples:

- Leakage detection in dams or construction sites
- Storage facilities for food, fuel or other goods
- Agriculture (especially greenhouses)
- Groundwater (flow processes and contamination)
- Environmental monitoring (e.g. landfill sites or biological processes)
- Geothermal problems