

# Mobile VIS/NIR-Spectrometer for Agriculture, Ecology, Horticulture and Remote Sensing



The spectral sensor system HandySpec Field is specifically designed for the measurement of diffuse reflection/emission characteristics of plants and soil. It enables measurements even under difficult environmental conditions. Measurements with HandySpec field are independent from atmospheric influences, achieved by means of permanent referencing of the ambient light, Especially for measurements of plants (or plant cultures) during the growth stage, non-destructive in-situ-measurements are very feasible. Moreover, any change of the spectral characteristics caused by transportation is avoided.

## Application Areas

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In remote sensing the spectral data from ground measurements are used for comparison and referencing the satellite data (ground truthing).

In ecology, agriculture and horticulture the recorded spectra are evaluated to make statements about nitrogen needs, degree of ripeness, water content, and condition of vegetation of various plants. It is also possible to provide info on biomass and the leaf area index of a crop.



Multifarious applications already exist, but still the possibilities of HandySpec Field are not yet tapped completely. Many more applications are awaiting to be discovered and explored.

## Spectrometer Systems

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There are two types of HandySpec Field for the wavelength range between 400 and 1100nm. The classic version is should-strapped. The sensor head including a button to activate a measurement is connected to the system via a flexible fiber-optic light guide. As an alternative, the CT model is carried in front of the body. The sensor head is directly attached to the instrument and enables measurements of high standing crops without using a tripod. The optical design matches that of the Yara N-Sensor. A 60° geometry is used for bidirectional measurements; therefore, the measured soil rate especially for rear crops is very low. For the extended VIS/NIR range of 400-1690 nm (or 2150 nm), there is a special backpack version of HandySpec Field, which offers high carrying comfort even in pathless areas.

Depending on the application, the sensor head of the instruments can be replaced by special probes such as fruit-measurement-probes. Custom-tailored modifications of the systems in terms of design and wavelength range are possible.

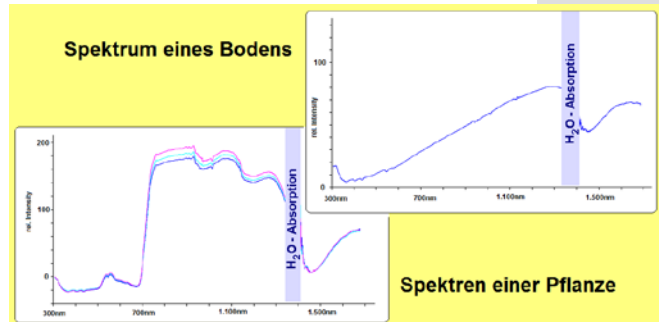




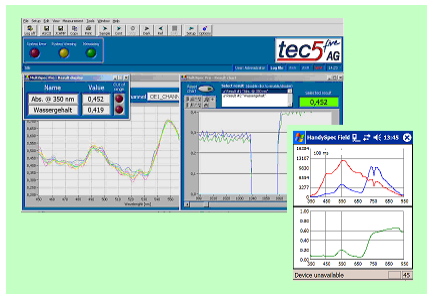
- Spectrometer Systems
- Instrument Design and Development
- OEM Electronic Components

## Spectra

The figures to the right show characteristic spectra of a soil type and of plants. The intensity of the soil spectrum increases nearly linearly from blue to NIR, whereas for the plant spectra the chlorophyll band is clearly shaped.



## Software



For the systems up to 1100nm, there is an easy to use software run on a pocket PC under Win CE or Win mobile. The integration time is adjusted automatically to the light conditions. Reflection spectra as well as raw data are displayed graphically. The data are stored automatically to a pre-chosen directory. Alternatively all the devices can be operated with a standard laptop and the software packages described below. The NIR-wavelength extended systems are all operated by a standard laptop too. For laptops various software packages are available such as MultiSpec Pro.

Spectra can be recorded and stored (ASCII or JCAMP format) as well as medial and integral values over a selected spectral range. In remote sensing, this enables a fast and simple comparison with the satellite data. The programming tool SDPROC32 allows easy operation of the spectrometer via standard MS Office applications, such as Word and Excel. It can also be embedded into all programming languages with COM support.

## Referenzen

HandySpec Field is successfully used by different research establishments. You can find further information under:

- [http://www.pflanzenbau.uni-kiel.de/forschung/2004\\_johnen\\_dfg/](http://www.pflanzenbau.uni-kiel.de/forschung/2004_johnen_dfg/)
- <http://www.wzw.tum.de/oekolandbau/>
- FB Geography, University of Marburg: [www.bergregenwald.de](http://www.bergregenwald.de)  
DFG research group 402, project 1c

## Your Partner

Since 1993 **tec5** has specialized in the development of fiber-optic spectrometer systems based on modern detector array technology and acquired a wide horizon of experience with numerous applications. In agriculture, the company is well known as partner of Yara GmbH & Co.KG, Dülmen, for the development and production of the Yara N-Sensor, the tractor based system for site-specific N-fertilization.

Ask us for more information and make an appointment for a demonstration today! We are looking forward to receiving your phone call.

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