

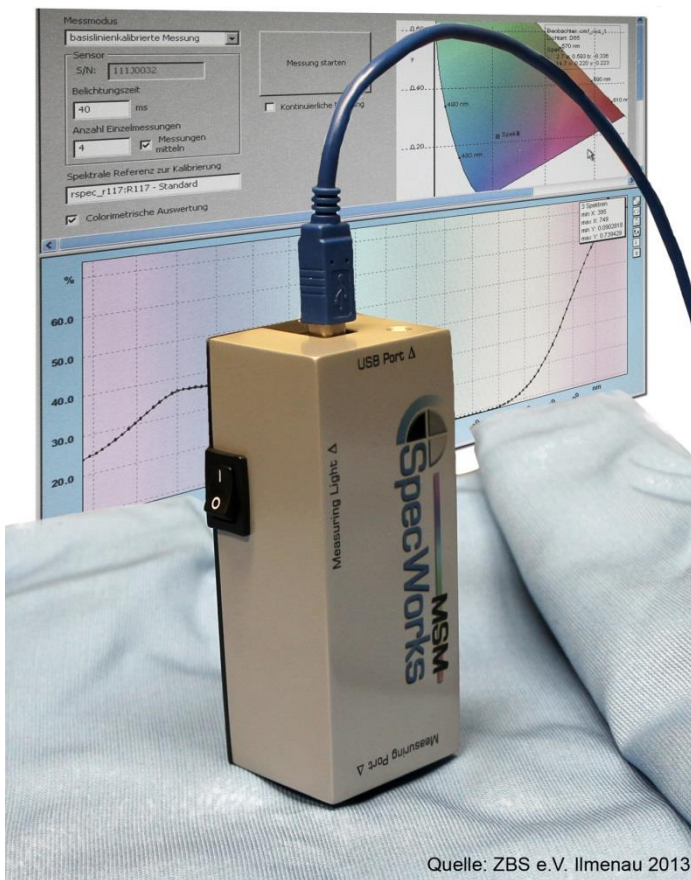


SpecWorks-MSM are miniaturized spectrometer modules for universal use in the context of industrial quality control.

In spectrophotometry spectral color stimuli are measured in narrow wavelength intervals. The measurement results of spectrophotometers are after simple correction and calibration device-independent characteristics of the colorant properties of not self-luminous objects or the spectral characteristics of light sources for the specific measuring condition. An important part of the measuring condition is the measuring geometry, which determines how the light excitation and observation of the object to be measured is defined. The results of the spectral measurement form the basis for spectral or colorimetric analysis, for example to control the color effect of a dye under certain lighting conditions. To the already employed in the industrial sector colorimetric or multispectral sensors (color sensors) allow this further data analysis only to a very limited form and with limited accuracy. Specific measuring problems can't be solved in principle due to the strong metamerism, i.e. under certain conditions equal, color stimulus recording of color sensors.

With the availability of miniaturized optoelectronic spectrometers measurement tasks that were previously reserved for laboratory equipment spectrophotometry be handled under industrial conditions. These spectrometers are useful combined with electronic components for low-level signal processing and signal transmission, and optical components for realizing a specific measuring geometry that is suitable for the measuring task to form a **SpecWorks-MSM** module. These are supplemented by extensive **SpecWorks** software tools that allow a controlled recording, processing and settlement of the spectral measurements to quality indicators of the application, for example on a standard PC.

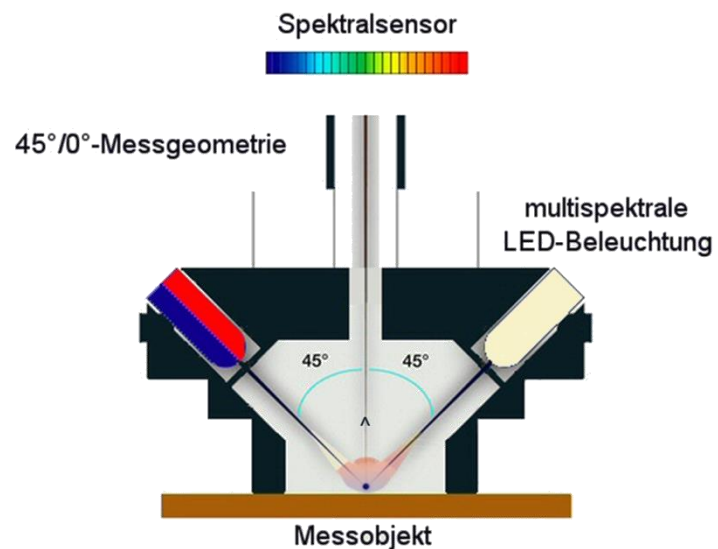
Representing only one of the solutions, that are realizable according to this principle, the handheld prototype **SpecWorks-MSM-VIS** allows spectral measurements of (not self-luminous) objects with incident lighting in the spectral range from 380 nm to 750 nm with 4 nm resolution and with cycle times of up to 200 Hz.



Quelle: ZBS e.V. Ilmenau 2013

The overall volume of the **SpecWorks-MSM-VIS** is only 12 x 4 x 4 cm. The 45°/0°- measuring geometry - measurement at 0° and lighting at 45° - corresponds to the DIN 5033 recommendation for measurements on shiny surfaces, such as on painted objects. The limited contact surface of the measuring aperture also allows measurements of free-form concave objects. The data is transferred via an integrated USB interface. Reflection measurements in spectrophotometry require measurement lights that cover the entire spectral range with sufficient spectral radiation quantity.

In **SpecWorks-MSM-VIS** a LED-based, so called **multispectral-LED-lighting**, is implemented by combining wide- and narrow-band LEDs. Due to the low power consumption of the module, the power supply of the handheld can also be done via the USB bus.



Quelle: ZBS e.V. Ilmenau 2013

The Center for Image and Signal Processing (ZBS) e.V. was founded in 1994 as a spin-out of the Technical University of Ilmenau. An important field of activity of the ZBS e.V. is working in collaborative projects and in R & D development contracts for companies in the field of signal and image processing. Since its foundation the ZBS is working hard in the fields of color and spectral technology. It

is a co-founder of the German Color Group (www.germancolorgroup.de). The skills and experience of the ZBS e.V. in this field exist in the conception and design of problem-optimal measuring systems and system components (sensor qualification, optics & lens design, implementation of spectrally-defined lighting arrangements) and in the processing of multi-channel data with a focus on colorimetry and spectral technology (signal processing, calibration, spectral reconstruction). More information about the activities and services offered on this and other work areas of the ZBS e.V. can be found at www.zbs-ilmenau.de or at www.zbs-ilmenau.de/farbe.html .

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