Engineer's Office for Applied Spectroscopy

Dipl.-Ing. (FH) Thomas Fuchs

TranSpec® – DSP

16 Bits High-Speed Photodiode Array Spectrometer

TranSpec-DSP instruments are photodiode array spectrometers, which combine most innovative optoelectronics with powerful analog/digital electronics and the newest computer technology based on digital signal processors. With the use of flexible optical fibers, TranSpec's application area ranges from standard routine laboratory analysis to special tasks in the in-line process measurement technique.

Innovative Optical Components

The TranSpec-DSP instruments exclusively use spectrometer modules of Carl Zeiss, Germany. With these modules, the entrance slit is imaged on a photodiode array by means of a holographic created, concave diffraction grating. All components of the spectrometer module are firmly mounted together in one unit and permanently adjusted to each other, which means that there are no mechanically moveable parts at all.

Powerful Analog/Digital Electronics

For the scanning of the photodiode array and the A/D-conversion of measured spectra, TranSpec-DSP spectrometers use a fast and highly linear A/D-converter. Due to the extremely short scanning time of the photodiode array (approx. 256 microseconds for an array of 256 photodiodes) the TranSpec-DSP instruments can be described as real simultaneous spectrometers. The high linearity of the A/D-converter permits reliable, reproducible photometric measurements over the entire useable signal dynamic range. TranSpec's effectively useable dynamic range of 16 bits has been achieved by the careful selection of high-quality electronic components.

Integrated Computer Electronics

The spectrometer systems are equipped with a high performance computer system based on digital signal processors (DSP), so that the instrument can utilize the very short scanning time for a continuous and loss-free spectra scanning. Due to this integrated computer system, the spectra scanning and data preparation is performed independently by the TranSpec-DSP spectrometers, i.e. without the participation of an external computer (the PC). This ensures a constantly high measuring rate, which is independent of the performance of the front-end computer system. Furthermore, TranSpec-DSP spectrometers have a generously dimensioned spectra memory (up to 14,400 spectra for a photodiode array with 256 pixels), which serves as an intermediate real-time memory for continuous and loss-free spectra scanning.

Technical specifications on next page ►

ZIP & City: 73430 Aalen, Germany
Street: Bischof-Fischer-Str. 108
Fon: +49 - 7361 - 97 53 28 0
Fax: +49 - 7361 - 97 53 28 5
Web: www.applied-spectroscopy.com
Email: sales@applied-spectroscopy.com

Engineer's Office for Applied Spectroscopy

Dipl.-Ing. (FH) Thomas Fuchs

TranSpec-DSP • Technical Specifications

October 2007, all information without guarantee and subject to changes

Mechanical Construction

- Standard 19" chassis with 4 HU, CE certificate
- Dimensions: approximately 180 x 435 x 310 mm (H x W x D)
- Weight: approximately 10 kg

Optical Components

- Spectrometer modules of Carl Zeiss Germany with industry standard FSMA fiber optics connector
- Holographic created concave diffraction grating
- Photodiode arrays with 256, 512 or 1024 pixel, no cooling required
- Permanently adjusted modules, no mechanically moveable parts, free of maintenance
- Module specific wavelength ranges: 200 - 1100 nm
- Module specific spectral resolution: 3 - 10 nm
- Module specific spectral pixel interval: approx. 0.8 - 3.3 nm
- Absolute wavelength accuracy: ≤ 0.3 nm
- Temperature drift: typically < 0.005 nm / Kelvin

Analog/Digital Electronics

- 1 MHz 16 bits AD-converter DATEL ADS 931 with sample & hold
- Spurious-free dynamic range, no missing codes at 16 bits (!)
- Effectively useable conversion rate: 1 µs / pixel

Integrated System Electronics

- 32 bits Texas Instruments Digital Signal Processor TMS320C44 with 60 MHz
- 2 Mbytes (optionally 8 Mbytes) SRAM for real-time spectra recorder, 3,600 (optionally 14,400) spectra at 256 pixel
- 7-channel TTL trigger input and output, typical 1 µs
- TTL shutter control for DSL-1 deuterium and HSL-2 halogen spectral lamp
- TTL bulb burn control for HSL-2 halogen spectral lamp
- Optionally 4-channel D/A-output, 14 bits at 60 kHz
- RS-422 interface adapter and cable for the PC included in the scope of delivery

Spectra Scanning

- Shortest integration time: 0.4 ms at 256 pixel – 0.7 ms at 512 pixel – 1.2 ms at 1024 pixel
- Longest integration time: 5 seconds, selectable in steps of 0.1 ms
- Absolute accuracy of the integration time: ≤ 1 µs
- Response time to interrupt the integration (TTL trigger): < 1 ms, controlled by software
- Raw data averaging, selectable between 2-100
- Total system noise (standard deviation, dark current at 10 ms): 5 Counts/no averaging, 1 Count/25 measurements
- Real-date and -time stamping of all measured spectra with a resolution of 1 µs
- Repetition rate, loss-free at continuous scanning, including possible dark current correction and/or averaging:
  - PDA with 256 pixel: 2,500 spectra/second (corresponding to 0.4 ms integration time)
  - PDA with 512 pixel: 1,428 spectra/second (corresponding to 0.7 ms integration time)
  - PDA with 1024 pixel: 833 spectra/second (corresponding to 1.2 ms integration time)

Available Software

- TranSpec 2000 : software for standard spectroscopy, plasma monitoring and film thickness measurement
- FTM-ProVis 2000 : software for fully automated and coordinate controlled film thickness measurement
- TranSpec++ and FTM-Lite++: comfortable C/C++ class libraries for developing your own applications
- Development of customized software, especially for process controlling tasks and in-line systems

ZIP & City: 73430 Aalen, Germany | Fon: +49 - 7361 - 97 53 28 0 | Web: www.applied-spectroscopy.com
Street: Bischof-Fischer-Str. 108 | Fax: +49 - 7361 - 97 53 28 5 | Email: sales@applied-spectroscopy.com