SpecWin Pro

Powerful software for the acquisition and
evaluation of spectral measurement data

We bring quality to light.

SpecWin Pro highlights

- ◢ Versatile software for all Instrument Systems spectroradiometers

- ◢ Radiometric, photometric and colorimetric analysis of spectral measurement data

- ◢ Application-oriented modules for a wide range of measurement tasks, e.g. goniometer measurements

- ◢ Integrated control of optional system components, e.g. power sources and power meters

- ◢ Integration of further devices via integrated programming interface (e.g. for TEC controller)

01 \\ Intuitive control and functional evaluation

Our SpecWin Pro software is a powerful and easy-to-use interface for high-precision spectroradiometers from Instrument Systems. It was designed for use in R&D applications and production environments, and meets the strict requirements in both areas.

The SpecWin Pro multi-window interface ensures a high degree of flexibility in use and optimum control of test results. Detailed configuration management also guarantees the reliable execution of precise and repeatable measurements outside of daily lab routines. The calibration data of the measurement accessories is easily managed, and for spectroradiometers with accessory recognition the correct assignment is automatically checked prior to measurement.

The SpecWin Pro software offers a comprehensive package of functions for a full range of support, from the configuration and control of measurements to the automated, customized generation of reports.

Software functions

- ◢ Measurement of spectrum, transmission, reflection and complex measurement sequences

- ◢ Check of self-absorption correction, test sample stabilization and ErP measurement

- ◢ Evaluation of correlated color temperature, color rendering (CRI acc. to CIE, DIN and JIS, TM-30), MacAdams ellipses (ANSI, IEC), pass/fail testing, etc.

- ◢ Control of goniometer and display test systems

- ◢ Evaluation of goniometer measurements: (partial) luminous flux, unified glare rating, integral value, angle of half intensity, wide range of visualization for luminous intensity distributions

- ◢ Instantaneous data analysis in the measuring window itself

- ◢ Integrated calculation and evaluation functions

- ◢ Export of spectral data and results tables (ASCII, CSV, Excel)

02 \\ Standards supported

In order to ensure high-quality, comparable test results, special standards and international guidelines must be adhered to in the calculation of radiometric, photometric and colorimetric parameters. SpecWin Pro supports a wide range of standards, and meets the calculation and presentation requirements defined therein.

Photometry	CIE S 010/E:2004
Colorimetry	CIE 15.2 Second Edition
CCT	CIE 15.2 Second Edition
Color coordinates	CIE 1931, CIE 1960, CIE 1976
Energy efficiency	EU: No. 1194 / No. 874
Unified glare rating	CIE 117
Blue light hazard	IEC 62471 and IEC/TR 62778
Stability tests	CIE S 025 and EN 13032-4
Color rendering	DIN 6169, CIE 13.3-95, JIS Z 8726, IES TM-30-18, TLCI-2012
Interface specifications	Zhaga interface specification
Plant ecophysiology	CIE S 017/E:2011 and DIN 5031

03 \\ Central interface in the light laboratory

As a central interface for photometric tasks, SpecWin Pro offers diverse integration options for spectrometers and accessories from Instrument Systems. In addition, devices of other manufacturers can be integrated via macros with the Basic-IDE (integrated development environment).

Array spectroradiometers	CAS 140D, CAS 140CT, CAS 125, CAS 120
Integrating spheres	ISP series
Optical probes	EOP series
Telescopic optical probes	TOP 150, TOP 200
DTS Positioning systems	DTS 500
LGS Goniometer	LEDGON, LGS series
Power sources	Keithley SMUs 24xx/26xx Vektrex SpikeSafe SMU / Performance Heiden AC/DC sources
TEC controller	Arroyo 5305
Digital multimeter	Keithley DMM 6500 / 7510 / 7512 Keysight 34465A
Power meter	Yokogawa WT310E

04 \\ Precise, repeatable LED and SSL measurements

LED-based light sources have largely replaced conventional lighting. Most products – from the cell phone display to the ceiling lamp – contain multiple LEDs that should have the same optical characteristics. Even the smallest deviations between individual LEDs have a considerable influence on the optical properties of the final light source. For this reason, LEDs are already precisely characterized on the wafer and undergo many other optical qualification tests through to the final product.

Spectroradiometers in conjunction with integrating spheres are normally used for the optical characterization of single LEDs and LED-based lighting modules. Goniophotometers are used if the spatial radiation properties of a light source are to be determined. In addition to the photometric data, in conjunction with a spectroradiometer all spectral parameters can be determined as a function of angle.

With the measuring modules **Spectral Analysis** and **Goniometer**, SpecWin Pro is an all-round tool for the precise measurement of laser diodes, LEDs and LED-based light sources.

Typical quality indicators for LED/SSL measurements:

▲ Luminous flux [lm], luminous intensity [cd] and luminous intensity distribution
▲ Color coordinates (x, y, z) and color temperature (CCT)
▲ Color rendering index (CRI)
▲ Dominant, central and peak wavelength
▲ Peak width at half-height (FWHM)

Spectral Analysis

▲ Synchronized control of spectroradiometer, voltage sources and TEC controller
▲ Step-by-step guided self-absorption correction for 2π or 4π-measurement with an integrating sphere
▲ Execution of measurement series
▲ Evaluation of color rendering via numerical and graphic representations
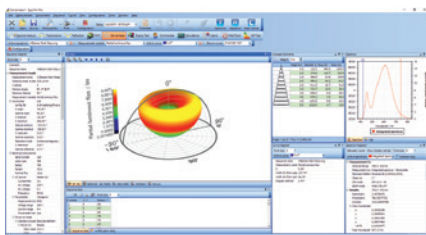
Goniometer

▲ Synchronized control of the goniometer unit, spectroradiometer and measurement accessories
▲ Determination of derived parameters (e.g. angle of half intensity) and visualization in different formats
▲ Automatic evaluation of SSL luminaires according to Zhaga and unified glare rating (UGR)
▲ File export to IES/EULUMDAT format

05 \\ LIV-testing of laser diodes

Typical specifications required for laser diode testing are supported by the Instrument Systems measurement system. Operating modes including DC, single pulse and continuous pulse are available enabling measurement repeatability testing and validation. LIV-curves, a combination of the L/I curve and the V/I curve, are used to determine the operating point and the threshold current and to identify failed laser diodes early in the test process. An LIV-curve is usually measured using a spectroradiometer in combination with an integrating sphere and an SMU for the required drive current. Within production lines photodiodes are typically used for determination of the radiant power in order to shorten measurement times.

Typical quality indicators for laser diode measurements:

▲ LIV test sweep curves
▲ Threshold current
▲ First derivative dL/dI, slope efficiency and kink analysis
▲ Temperature dependent behavior of e.g. shift of peak wavelength

Depending on the type of laser diode or application specific requirements, different types of SMUs might be necessary. SpecWin Pro supports a broad range of SMUs from Keithley and Vektrex, both in DC and pulsed mode operation. Additionally, the software supports TEC-controllers and TEC-mounts from Arroyo to apply temperatures from 15°C up to 150°C to the laser diodes.
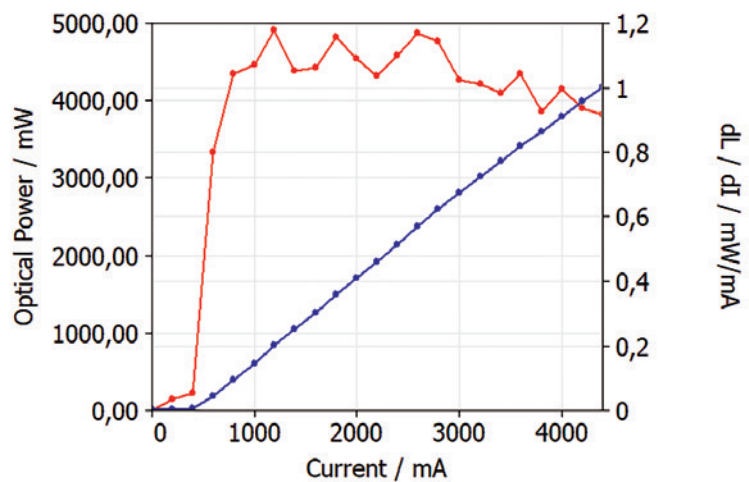
For further information, please refer to the application note "LIV-testing with SpecWin Pro".

LIV analysis

▲ Determination of the operating point and the threshold current
▲ Calculation of slope efficiency and investigation of kink phenomena
▲ Evolution of a VCSEL spectrum with increasing drive current

Pulsed mode operation

▲ Pulsed mode testing with pulse lengths down to 1 µs to eliminate temperature dependence
▲ Analysis of temporal optical behavior using photodiodes
▲ Determination of tracking ratio of monitoring photodiodes
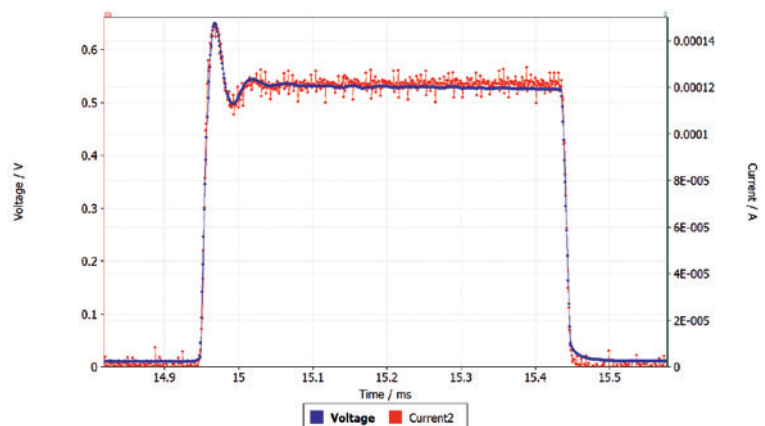
06 \\ Automatic display measurements

Illuminated symbols and displays are to be found in all areas of daily life: in smartphones and tablets, control elements in car interiors and in household appliances. Because displays are perceived by the critical human eye, a comprehensive photometric and colorimetric evaluation of these optical elements is essential in production. A special challenge is posed by the precise and stable measurement of the finest structures, frequently at low levels of luminance. Compared to 2D displays, spatially resolved measurement is not always required for symbol displays.

Telescopic optical probes are normally used in conjunction with high-grade and traceably calibrated spectroradiometers for the characterization of backlit symbols and displays. For automatic angle-dependent or positionally resolved measurements, these systems can be supplemented by positioning systems and additional goniometer units.

Typical quality indicators for display measurements:

- ◢ Luminance [cd/m²]
- ◢ Color coordinates [x, y, z]
- ◢ Homogeneity of photometric measurands
- ◢ View direction-dependent properties

With the optional available modules **Display test** and **NVIS**, SpecWin Pro offers all the necessary measuring tools in a simple and clearly arranged user interface.

Display test

- ◢ Control of DTS systems from Instrument Systems
- ◢ Determination of view direction-dependent properties
- ◢ Test of homogeneity and ISO contrast
- ◢ Precise positioning of the measurement spot with the aid of the live image display of the TOP 200 camera
- ◢ Determination of characteristic values to VESA and ISO 9241-307
- ◢ Synchronized control of measurement, 3-axis positioning system and goniometer unit
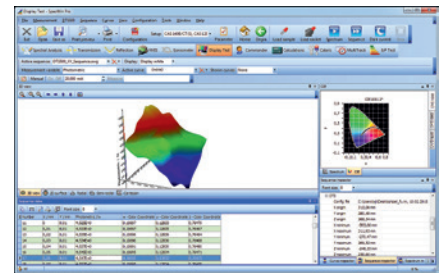
Optional available: NVIS evaluation

Test objects can be evaluated and monitored in terms of compliance with NVIS specifications to MIL-L-85762A and MIL-STD-3009 using the NVIS module.

07 \\ Further spectral measurement tasks

Transmission and reflection measurement

Transmission and reflection measurements are fundamental photometric methods for the characterization of optical materials. Typical fields of application are glass window panes in automobiles, transparent films for displays or special coated surfaces. The SpecWin Pro modules **Transmission** and **Reflection** enable comprehensive determination of the transmittive and reflective properties of optical elements and the derived parameters for a wide range of measurement geometries.

Photobiological safety

Artificial and natural optical radiation sources can emit radiation outside the visible spectrum. In addition to IR and UV radiation the critical parameter of photobiological safety is, in particular, the blue light hazard (BLH). International standard IEC 62471 contains guidelines for evaluation of the photobiological safety of lamps and luminaires. In combination with Instrument Systems' measuring equipment, SpecWin Pro supports the standard evaluation and classification of lamps.

Photosynthetically active or usable radiation

Horticultural lighting is a fast-growing field of application for LED technology. Plant characteristics such as growth rate, shape and blossoms can be selectively influenced by the spectral composition and quantity of light. Natural sunlight can be augmented or even replaced by specific LED lighting. Key parameters in this context are **photosynthetically active** radiation (PAR) and **photosynthetically usable** radiation (PUR). SpecWin Pro provides these parameters pursuant to CIE S 017/E:2011 and DIN 5031.

08 \\ Calibration of the measurement system

Light measurement systems should be re-calibrated at regular intervals to ensure correct radiometric measurements over longer periods. All array spectrometers from Instrument Systems including accessories can be calibrated with the optional **Calaris module**. Depending on the type of spectrometer or accessories used, further calibration steps may be necessary, based on the spectral, absolute and the wavelength calibration. The program provides a step-by-step guide through the calibration process and ensures correct radiometric measurement data. Downtimes and additional costs can thus be avoided.

09 \\ Wide range of software add-ons

In design and development of SpecWin Pro, Instrument Systems has placed great emphasis on ease of operation while maintaining a broad range of functions. Numerous functions support the user in the lab with changing measurement tasks, and also enable the seamless transfer from the development stage to the production environment. Fast results are thus guaranteed, and varying tasks can be easily implemented.


Commander module

The **Commander module** is used for sequence control of individually defined measurement processes. The module accesses the other measuring windows and its functionalities. Complex measurement sequences can be easily generated using, for example, a goniometer or LIV measurement curves of LEDs.

Basic IDE

The existing scope of functions of the software can be extended with the aid of **Basic IDE** (integrated development environment). By using specific macros, new functions can be implemented or additional instruments, e.g. digital multimeter or current sources, integrated into the measurement sequence.

Simultaneous acquisition

The **MultiCAS module** enables synchronized control of several array spectrometers. The individual spectra are combined and evaluated as an overall spectrum. Extending the spectral range enables the user to cover additional fields of application with his existing equipment.
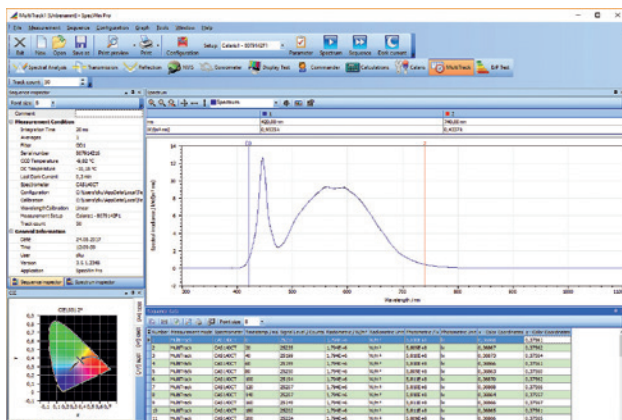
MultiTrack sequences can be acquired with all array spectrometers.
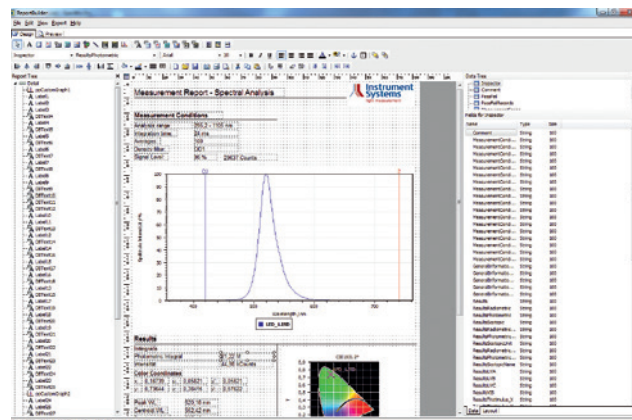
ReportBuilder supports the creation and adaptation of measurement reports.

Seamless acquisition

The **MultiTrack module** enables the seamless acquisition of successive individual measurements of spectra. Fast changing test parameters can be easily analyzed by this acquisition method.

Reporting

The **Report Builder** enables simple documentation of measurements. Ready-made templates help to get the user started and can be reconfigured for individual measurement reports. Besides measurement results and diagrams, external content such as company logos can also be inserted and flexibly arranged. Time-consuming subsequent processing of measurement data is no longer necessary.

Configurable pass/fail criteria //

Test results and measuring conditions can be defined, monitored and documented as **pass/fail criteria**. Limit values for quality assurance specified in the development process are simply integrated into the production process. The reliability of measured values is thus enhanced.

10 \\ Individual modularization

SpecWin Pro supports the execution of measurement tasks over different measuring modules. Each module is shown in a separate window. This multi-window setup enables a clearly structured graphical user interface in which only the parameters and diagrams relevant for the respective application are shown.

Standard modules	
Spectral analysis	Acquisition and analysis of spectra with spectroradiometers
Transmission	Execution of transmission measurements
Reflection	Execution of reflection measurements
Goniometer	Execution of goniometric measurements
Display test	Automatic acquisition of display and module measurements
Commander	Execution of comprehensive measurement sequences
ErP	Evaluation of lighting fixtures according to the Ecodesign directive
Optional modules	
NVIS	Check of MIL specifications
MultiTrack	Seamless acquisition of multiple measurements
MultiCAS	Synchronized acquisition of spectra with several spectrometers and evaluation as an overall spectrum
Calaris	Calibration of Instrument Systems array spectrometers

11 \\ SpecWin Light – for day-to-day use in the lab

The SpecWin Light software from Instrument Systems was developed for users who do not require the full range of functions of SpecWin Pro.

SpecWin Light supports spectrometers of the CAS 120, CAS 125, CAS 140CT and CAS 140D series. Since the focus of the light version is placed on the basic functions of measurement, evaluation and documentation, this software is particularly suitable for routine applications in the lab and in quality assurance.

SpecWin Light supports the execution of the following measurements:

◢ Acquisition and evaluation of the spectrum of light-emitting sources including all radiometric, photometric and colorimetric parameters

◢ Transmission measurements using a reference spectrum

◢ Reflection measurements using a reference spectrum

12\\ Ordering information

Order number	Description
SpecWin Pro	
SW-130	SpecWin Pro spectral software for Windows; including all modules and measurement modes
SW-130-L	SpecWin Pro spectral software for Windows; including all modules, measurement modes and language pack for Chinese and Japanese
SW-135	SpecWin Pro/Light language pack for Chinese (traditional and simplified) and Japanese
Module / Plug-in	
SW-136	Calaris calibration software for array spectrometers
SW-137	SpecWin Pro plug-in for NVIS evaluation
SW-140	SpecWin Pro plug-in for Keithley 24XX/26XX sourcemeter
SW-145	SpecWin Pro plug-in for Vektrex Spike Safe current source
SW-150	SpecWin Pro Plug-In for AC-sources W-3XX and powermeter W-410
SW-160	SpecWin Pro Multi-Track Plug-In for rapid acquisition of spectra with CAS 140B/CT/CTS/D models
SW-170	SpecWin Pro MultiCAS plug-in for simultaneous acquisition of spectra with multiple spectrometer
SW-180	SpecWin Pro plug-in for Keithley digital multimeter DMM 6500/7510/7512
SW-231	DLL driver program for CAS 120, CAS 140B/CT/CTS/D incl. colorimetric and photometric calculations; for Windows
SW-233	LabView driver software for CAS 140B/CT/CTS/D; requires SW 231 DLL
SpecWin Light	
SW-120	SpecWin Light spectral software for Windows
SW-120-L	SpecWin Light spectral software for Windows; language pack for Chinese and Japanese
SW-141	SpecWin Light plug-in for Keithley 24XX/26XX sourcemeter
SW-146	SpecWin Light plug-in for Vektrex Spike Safe current source

Instrument Systems
Systems

KONICA MINOLTA Group

We bring quality to light.