

CAS 140D-IR

Array spectrometer for high accuracy
infrared light measurement



We bring quality to light.



Key features at a glance

- ▲ Wavelength range: 780 nm – 1700 nm
- ▲ High-performance InGaAs linear image sensor with wide dynamic range
- ▲ Spectrograph design optimized for NIR/SWIR wavelength applications and high-sensitivity performance
- ▲ Thermoelectric cooling to -10 °C for low dark current and enhanced stability
- ▲ Extensive range of accessories for different measurement challenges

01 \ CAS 140D-IR spectrometer – Benchmark for accuracy

The CAS 140D-IR from Instrument Systems is a high-performance array spectrometer that has been optimized to fulfill the requirements for wavelength measurement in the near-infrared (NIR) to short-wave infrared (SWIR) spectral range.

With the cooled InGaAs line sensor of the CAS 140D-IR, a wavelength range of 780 nm to 1700 nm can be covered. The sensor is thermoelectrically cooled to -10 °C, ensuring low noise and excellent long-term stability.

At the heart of the CAS 140D-IR is a crossed Czerny-Turner spectrograph. The entire optical setup is optimized for the infrared wavelength range and guarantees high optical throughput together with high signal dynamics

and low stray light. The integrated neutral density filter wheel extends the measurable intensity range, enabling either extremely low or high light intensities to be measured without manual intervention in the measurement setup.

An additional shutter with position detection permits automatic dark current measurement. This is particularly beneficial for critical measurement tasks and complex production processes.

A wide selection of measurement adapters can be easily connected via optical fibers. In this way, the spectrometer can be upgraded to a complete system for a wide range of spectroradiometric measurement tasks.

The instrument is equipped with a USB interface. The accessory recognition integrated into the CAS 140D-IR enables safe operation with several measurement adapters.

The CAS 140D-IR from Instrument Systems offers a unique combination of high measurement accuracy with ruggedness and reliability. Even in continuous operation in the production environment, the CAS 140D-IR is a guarantee for precise readings and long-term stability.

02 \ Extended wavelength range

Special applications require that a wide wavelength range from UV to infrared can be covered within a single measurement. Using our CAS 140D-IR a spectral range from 200 nm to 1700 nm can be covered. A parallel measurement with CAS 140D in other wavelength ranges can be performed in order to simultaneously record the UV and VIS range.

MultiCAS add-on

The MultiCAS add-on for the software application SpecWin Pro permits the combination of various CAS 140D spectrometers to a cluster, e.g. in order to cover a wavelength range of 200 nm – 1700 nm in one measurement procedure. The additional MultiCAS hardware trigger box ensures that the spectrometers are activated synchronously.

The software application SpecWin Pro automatically combines the individual spectra into a total spectrum. An additional step within the factory calibration of the complete setup guarantees precise measurement results.

Example MultiCAS measurement setup showing three CAS 140D and the MultiCAS hardware trigger box.



03 \ Software solutions for analysis and documentation

A broad palette of software solutions is available for controlling the models of the CAS 140D (UV, VIS and IR models) and analyzing readings. All programs provide highly reliable routines that have been validated by experts for radiometric, photometric and colorimetric calculations.

SpecWin Pro and SpecWin Light with an extended range of functions

The SpecWin Pro and SpecWin Light software programs are available for diverse laboratory tasks. SpecWin Light embraces all the basic functions for measurement analysis and documentation.

SpecWin Pro additionally offers plug-in modules for a greatly extended range of functions. These include, for example, the integration and control of various source-measure units from manufacturers such as Keithley or Vektrex, as well as the storage and analysis of fast measurement sequences in burst mode.

For easy and intuitive operation, SpecWin Pro and SpecWin Light feature application-specific modules with dedicated user interfaces. The Reflectance/Transmittance module enables fast

measurement of reflective or transmissive properties. With the Goniometer module, a goniometer system (e.g., LEDGON) can be controlled. The Commander module is a programming interface that allows measurement sequences to be created with just a few clicks.



SpecWin Pro spectral analysis software.

Software development kit with DLL and LabVIEW driver

A software development kit (SDK) is available for custom programming or integration into production sequences. In addition to a DLL library, the SDK incorporates valuable sample programs and

programming aids. The DLL already contains all colorimetric calculations, for easy integration in customized measurement systems and evaluation of readings. In addition, a driver for programming measurement processes in LabVIEW is available for laboratory use of the CAS 140D-IR.

MultiTrack

To store a sequence of very fast measurements in burst mode as described above, the MultiTrack add-on for SpecWin Pro has been developed to extend the software features.

04 \\\ Solutions for further spectral measurement tasks

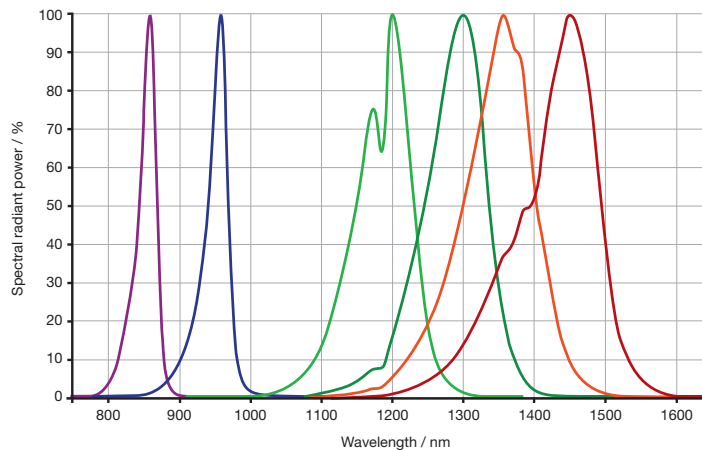
The CAS 140D-IR spectrometer is ideally suited for all requirements in spectral measurement.

The versatile fiber connector, a broad range of accessories and balanced software functions enable a wide range of system solutions that cover all regular measurement tasks.

Spectroradiometry

The optical probes of the EOP series are exceptionally well-suited to the precise measurement of spectroradiometric magnitudes. They can be easily connected via optical fiber to the CAS 140D-IR for reliable measurement of irradiance (plug & play accessory identification). The PLG series of optical adapters ensures a reliable and reproducible mechanical connection between the optical fiber and the spectrometer. Variations in the measurement results can thus be minimized when accessories have to be changed frequently.

Instrument Systems offers optical probes with primarily directional response characteristics and high light throughput, or models with excellent cosine correction but lower light throughput.



Normalized spectra of different IR-LEDs with peak wavelengths at 860, 950, 1200, 1300, 1360 and 1450 nm measured with CAS 140D and integrating spheres at Instrument Systems.

NIR/SWIR measurements

Near-infrared (NIR) light typically spans wavelengths from 780 nm to 1400 nm, while short-wavelength infrared (SWIR) generally covers the range from around 1400 nm to 3 μm . The CAS 140D-IR spectroradiometer captures the full NIR range and extends into the lower portion of the SWIR spectrum, covering wavelengths from 780 nm to 1700 nm.

The use of light in this spectral range has grown significantly in recent years. NIR and SWIR enable applications that are difficult or

impossible with visible light, thanks to its ability to penetrate materials and reveal additional information. SWIR is widely used in fields such as eye tracking, wearable devices, food inspection, pharmaceutical research and medical diagnostics.

The industry is continuously working to increase the optical output power and efficiency of SWIR LEDs to enable further fields of application. A broad selection of accessories is also available for diverse measurement tasks. The high-sensitivity option enables precise measurement of low optical power light sources.

Transmission and reflection measurements

Due to its high stability and stray light suppression, the CAS 140D-IR is also optimally suited for transmission and reflection measurements. Combined with the appropriate measurement adapter, it forms the ideal measurement system for a wide range of applications.

In addition to measurement tasks involving directional transmission, such as the examination of optical filters and lenses, the CAS 140D-IR also enables the analysis of diffuse transmission and reflection from scattering samples and solar cells.

Calibration equipment

Instrument Systems offers a broad range of audit equipment, enabling customers to verify the validity of their measurement device calibrations.

Our ISO 17025 accredited test laboratories ensure the highest accuracy and direct traceability to the reference standards of national institutes.



ACS-570 series of LED calibration standards. The compact power supply and TEC-control unit ACU ensures fast temperature regulation, as well as high stability of the supply current.

05 \ Our test laboratories – Accredited quality

As a leading manufacturer of light measurement equipment we strive to ensure that you are able to place the greatest possible trust in our instruments. Our customers enjoy significantly greater certainty and guaranteed comparability of readings with the accreditation of our test labs according to DIN EN ISO / IEC 17025 with flexible scope of application of category III. This enables our

customers to demonstrate the quality of measurements to any third party and ensures a long-term investment. Besides test procedures for photometric quantities, the company's test labs are also accredited to ISO 11664 for the measurement of colorimetric quantities.

All standards used are directly traceable to the reference standard of the national laboratories PTB (Germany) or NIST (USA). The test certificates included with our measuring instruments depict details of the traceability chain.



EOP optical probes with different light throughput and angular response characteristic.

06 \\ Service and support

We at Instrument Systems are setting a benchmark not only with our products. Our services secure the long-term value of your investment and guarantee optimum productivity over the entire period of use.

Our service offerings include the following:

- ▲ Engineering services
- ▲ Technical advice, also post-sales
- ▲ Re-calibration with certificate
- ▲ Instrument repair and hardware upgrade
- ▲ Software updates

07 \\ Technical specifications

CAS 140D-IR array spectrometer for infrared measurement	
Spectral range	780 – 1700 nm
Detector	InGaAs
Pixel number	512
Cooling	-10 °C
Spectral resolution ¹⁾	9 nm
Data point interval	2.1 nm
Wavelength accuracy ²⁾	±0.5 nm
Integration time	1 ms – 3 s
Shortest duration SOT to EOT	9 ms
Dynamic range ³⁾	9000:1
Non-linearity	±1 %
Stray light	
Broadband for Illuminant A ⁴⁾	0.08 %
For LED ⁵⁾	0.03 %
For Laser ⁶⁾	0.015 %
Sensitivity	
Irradiance ⁷⁾	$1 \times 10^{-6} - 1.5 \times 10^3 \text{ W/m}^2\text{nm}$
Radiant flux ⁸⁾	$5 \times 10^{-6} - 4 \times 10^3 \text{ W}$
Spectrophotometry	
Baseline noise ⁹⁾	±0.05 %
Transmission measuring accuracy ¹⁰⁾	±0.2 % T
Baseline drift ¹¹⁾	0.1 counts/h
Spectrograph	
Focal length, grating	Approx. 120 mm, f/3.5, plane ruled grating
Slit	100 µm, 50 µm
Filter wheel	Max. 7 slots for density filters OD 0.5 to OD 3.5; position monitoring with encoder
Electrical data	
AD converter	24 Bit resolution, Chip 16 Bit
PC interface	USB 2.0
Triggering	1 TTL input with ascending slope; 2 software-controlled TTL outputs; 1 TTL output with flash pulse

CAS 140D-IR array spectrometer for infrared measurement	
Other	
Dimensions (H, W, D)	144 mm x 341 mm x 359 mm
Power supply	Wide-range input 100 – 240 VAC 50/60 Hz
Power consumption	Max. 70 VA
Ambient temperature	15 – 35 °C; relative humidity 0 – 70 %, non-condensing
Weight	Approx. 9 kg
Applicable standards	In conformity with EN 60721-4-7 Class 7M2, EN 60721-4-7 Class 2M2, EN 61326:2004-05 and EN 61010-2002-08
Measurement uncertainty	
Accuracy ^{2), 12)}	
Radiant Flux	5.0 %
Irradiance	5.0 %
Instrument precision ¹⁾	
Radiometric integral	0.2%

¹⁾ Approximate values for 100 µm (IR1) and 250 µm (IR2) standard slit.

²⁾ For IR1 High-Gain, only valid for the spectral range 780 nm – 1650 nm.

³⁾ For a single acquisition with 10ms integration time.

⁴⁾ Measured with long pass filter FELH1100 at 900 nm, relative to peak intensity of unweighted spectral data.

⁵⁾ Measured 400 nm left to the peak wavelength, relative to peak intensity of unweighted spectral data.

⁶⁾ Measured 150 nm left to the peak wavelength, relative to peak intensity of unweighted spectral data.

⁷⁾ Measured with optical probe EOP-120 and OFG-414 fiber bundle at 1200 nm and signal/noise ratio of 10:1, without averaging.

⁸⁾ Applies to a signal-to-noise ratio of 10:1. Measured with integrating sphere ISP 150L.

⁹⁾ With shortest integration time, without averaging and with 50 % modulation.

This value improves with appropriate averaging (e.g. 9-fold averaging results in a 3-fold reduction of noise).

¹⁰⁾ Applies to optimum spectral range; with 10 % transmission and immediately after recording an averaged baseline.

¹¹⁾ Typical value. Applies with LS100-130 light source after 1-hour warm-up.

¹²⁾ Expanded measurement uncertainty (k=2), immediately after calibration, determined for spectra of LED type ACS570-44 at 1300 nm.

08 \ Ordering information

Order number	Description				
Spectrometer	Model	Detector	Spectral range	Spectral resolution	Data point interval
CAS140D171U1A	IR1	InGaAs diode array	780 – 1700 nm	9 nm	2.1 nm
Software					
SW-120	SpecWin Light spectral software for Windows. Features emission-, transmission-, reflexion- and LED/display-measurements				
SW-130	SpecWin Pro spectral software for Windows. Including all modules and measurement modes				
SW-135	SpecWin Pro/Light language pack for Chinese (traditional und simplified) and Japanese				
SW-140	SpecWin Pro plug-in for Keithley 24xx/26xx sourcemeter				
SW-141	SpecWin Light plug-in for Keithley 24xx/26xx sourcemeter				
SW-150	SpecWin Pro plug-in for AC-sources and powermeter				
SW-160	SpecWin Pro MultiTrack plug-in for fast acquisition of spectra				
SW-180	SpecWin Pro plug-in for Keithley digital multimeter DMM6500/7510/7512				
SW-231	Software development kit (SDK); DLL software for customized programs				
SW-233	LabVIEW driver software; requires SW-231				

Instrument Systems is continually working on the further development of its products. Technical changes, errors and misprints do not justify claims for damages. For all other purposes, our Terms and Conditions of Business shall be applicable.



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