

# ACS-570

## LED Calibration Standard

### Product highlights

- ▲ Reference values for luminous flux and averaged luminous intensity, traceable to PTB standards (in conformity with DIN ISO 17025)
- ▲ Statement of color coordinates, dominant wavelength and color temperature
- ▲ 0.5% photometric stability over min. 100 operating hours
- ▲ Maximum operational reliability by elimination of manual settings by use with PSU 10
- ▲ Turnkey solution with power source, temperature stabilization and software



The LED calibration standards in the ACS-570 series allow you to easily and reliably check the measuring systems supplied by Instrument Systems, and recalibrate the photometric value as necessary. The LED calibration standards are calibrated by Instrument Systems to luminous flux and averaged LED intensity according to the CIE 127: 2007 substitution method. The high level of accuracy and direct traceability to the national reference standards of the PTB (German National Metrology Institute) are guaranteed by our ISO 17025 accredited test laboratories. It is extremely versatile as a laboratory instrument and can be used to check a wide range of important photometric and colorimetric quantities. Rapid operational readiness and long service life make the ACS-570 series ideal for a multitude of laboratory applications, as well as for robust deployment in a production environment.

Optimum thermal management is necessary to guarantee the reproducible and permanently stable optical radiant power of the LED calibration standard. The LED and temperature control system are housed in an enclosure with very low heat conductivity and, therefore, not sensitive to external temperature fluctuations. Rapid temperature control and high stability for the operating current are ensured by the compact power and TEC control unit PSU 10 from Instrument Systems. Alternatively, a Keithley 24xx can be used as a current source and an Arroyo 5305 as a TEC controller.



Single ACS-570-x with different colors

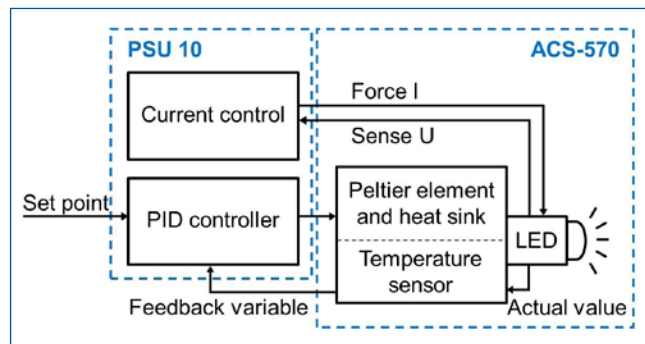
## Functionality

The LED calibration standard is equipped with a high-power LED. A glass window provides protection against dust and dirt. The connection for operation of the LED is designed in four-wire technology in order to create higher measuring accuracy. Electricity is supplied to the LED through one conductor pair and the other pair is used to measure the forward voltage of the LED.

The temperature is stabilized by the TEC controller of the PSU 10 through feedback with a Pt100 sensor near the cooling surface of the high-power LED. The operating temperature of the LED is actively stabilized with a Peltier element. The heat generated is dissipated to the surrounding environment by a heat sink. An additionally installed fan accelerates the process of dissipating heat.

The calibration values and necessary operating parameters are stored in the ACS-570-x. The system is controlled by the *LED Control 2* software supplied with the standards. The lapsed operating time is recorded and stored in the unit. The software can be used to monitor the corresponding values.

Instead of the PSU 10 a Keithley 24xx can also be used as a current source in combination with an Arroyo 5305 as a TEC controller. In this case, a connection cable ACS-570-9 will be necessary. Control is also possible via the software, but then the internal memory for calibration values and the operating time cannot be read out.



Stabilization concept

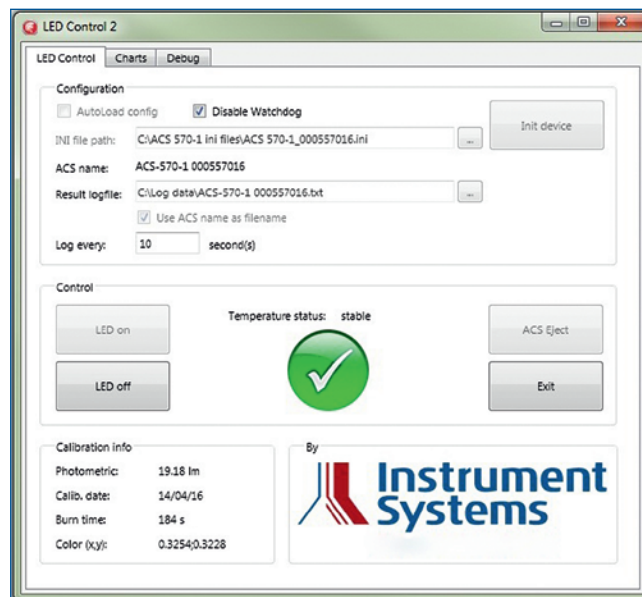
## PSU 10 – Power Supply Unit

The PSU 10 control unit provides two functionalities for controlling the LED calibration standard ACS-570. Firstly, the PSU 10 includes a power source which supplies a steady LED current of 250 mA to ensure constant optical radiant power. In addition, this module supplies power to the fan built into the ACS-570-x.



PSU 10 – Power Supply Unit

Secondly, a TEC controller ensures that the LED temperature is kept at a constant 35°C. The PSU 10 is controlled through a USB link to a computer via the *LED Control 2* software. The Windows 7/10 operating systems are supported. The corresponding program libraries are available for the Windows and OS X operating systems (.dll and .dylib) for direct control.

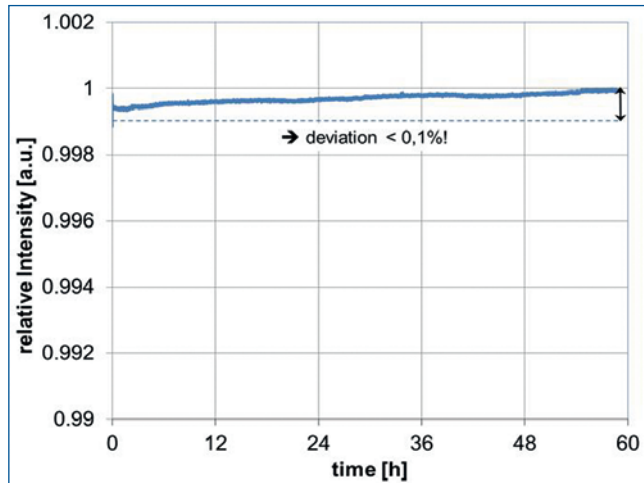


Graphical interface of the software *LED Control 2*

The PSU 10 reads the required operating parameters and calibration values directly from the internal memory of the ACS-570. The absence of manual settings eliminates malfunctions and guarantees maximum operating reliability. This makes the PSU 10 ideal as a reference source to meet the highest demands.

## Stabilization time

The stabilization time is an important criterion for simple application of the ACS-570 series in the laboratory and in production settings. A specific set of PID control parameters for each LED type is forwarded by the software to the control electronics. After completion of the short stabilization phase, the forward voltage and the temperature remain constant. The radiant power of the LED therefore remains constant over a long service life and fast operational readiness saves valuable time.

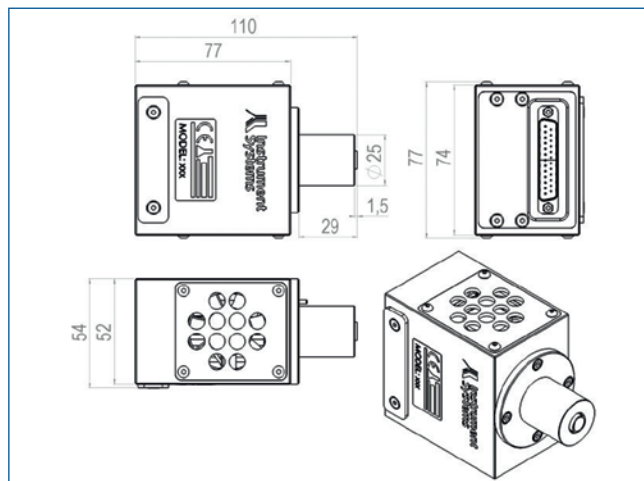


Stability test of a white LED calibration standard over 60 h

## Testing in conformity with ISO 17025

ACS-570 LED calibration standards can be calibrated for luminous flux and averaged LED intensity referred to CIE 127:2007 in the Instrument Systems DIN ISO 17025 accredited test laboratory. A test certificate included in the shipment covers traceability to German National Metrology Institute (PTB) standards and the associated uncertainties. It also includes values of the x, y color coordinates and the dominant wavelength or correlated color temperature (CCT).

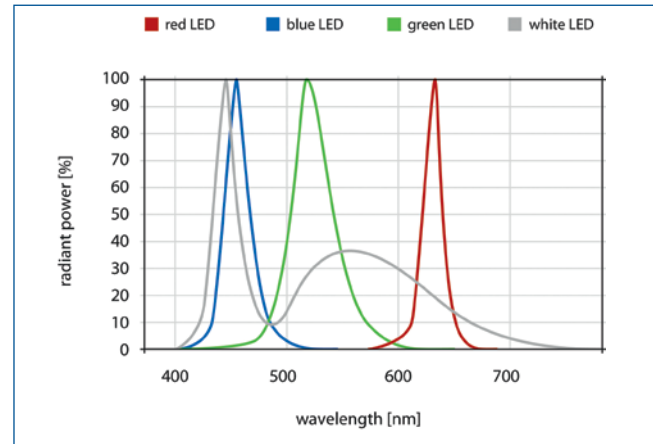
## Mechanical characteristics



Dimensions of the LED calibration standard (all details in mm)

## Optical properties

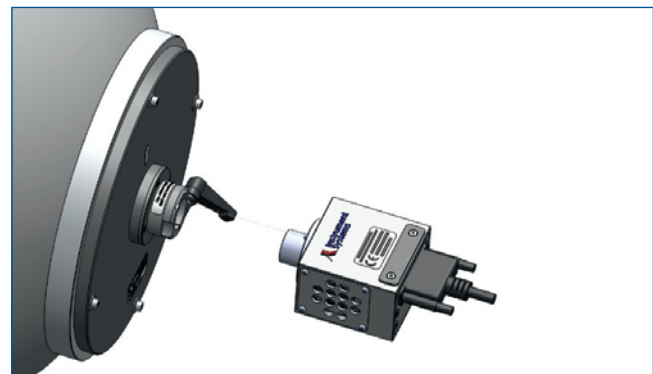
The LED luminous flux standards are supplied in the four most important colors white, blue, green and red. This covers the entire visible spectral range. For the white ACS-570-1 typical luminous flux values are ca. 20 lm and the averaged LED intensity is about 20 cd.



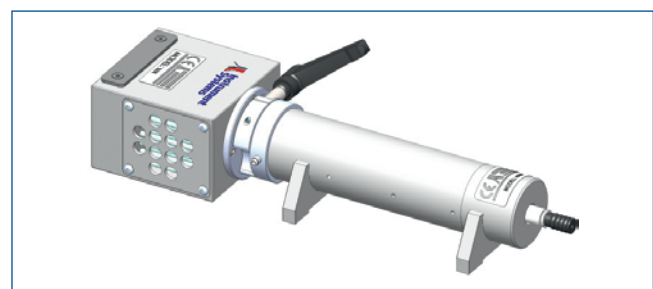
Typical spectral curves for different LED calibration standards

## ACS-570 in application

For luminous flux measurements with ACS-570 there are adapters available for all spheres manufactured by Instrument Systems. The adapters are universally applicable with all our LED test sockets. For luminous intensity measurements, the ACS-570 can be connected directly to the corresponding measurement probe to ensure fast and repeatable positioning of the ACS-570 for each measurement task.



Use of an ACS-570 on an integrating sphere (luminous flux measurement)



Use of an ACS-570 on an I-LED-B measurement probe (luminous intensity measurement)

## Technical Specifications

LED calibration standard	ACS-570-1	ACS-570-3	ACS-570-5	ACS-570-7
LED color	cool white	blue	green	red
Typical luminous flux [lm]	15 – 20	5 – 10	15 – 20	8 – 12
Typical averaged LED intensity I-LED-B [cd]	15 – 20	5 – 10	15 – 20	8 – 12
Typical dominant wavelength / Correlated color temp. CCT	5000 – 6200 K	480 nm	530 nm	622 nm
Operating current and accuracy	250 mA ± 0,1 mA			
Operating temperature at the control point and accuracy	35°C ± 0.05°C			
Ambient conditions	15–35°C; max. rel. air humidity 70 %, not condensing			
Temporal stability of the luminous flux and lum. intensity	0.2 % / 12 h and 0.5 % / 100 h			
Temporal stability of the color coordinates	0.0002 / 12 h and 0.0005 / 100 h in x and y			
Time to operational readiness	< 240 seconds			
Recommended recalibration interval	After 100 operating hours or one year after last calibration			
Temperature dependence of the luminous flux / intensity	< 0.15 % / 10 K			< 0.25 % / 10 K
Temperature dependence of the color coordinates	< 0.0001 / 10 K in x and y	< 0.0002 / 10 K in x and y		< 0.0001 / 10 K in x and y
Connections	Sub-D, 25-pole (ACS-570 to PSU 10); USB (PSU 10 to PC) Alternative with ACS-570-9 to the combination Keithley / Arroyo			

## Ordering Information

Order number	Description
ACS-570-1	White high-power LED calibration standard; socket with 25 mm Ø
ACS-570-3	Blue high-power LED calibration standard; socket with 25 mm Ø
ACS-570-5	Green high-power LED calibration standard; socket with 25 mm Ø
ACS-570-7	Red high-power LED calibration standard; socket with 25 mm Ø
ACS-570-9	Adapter cable for connecting ACS-570-x series of high-power LED calibration standards to a current source and TEC control unit (Keithley/Arroyo)
<b>Power sources and temperature controllers</b>	
PSU10-100	Combined power supply (0-18 V, 0-1000 mA) and TEC Controller (+/-19 V, +/-10 A) for LED calibration standards; incl. connector cables and control software for Windows
W-110	Keithley 2400 Sourcemeter
W-210	Arroyo Instruments TECSOURCE temperature controller, model 5305
<b>Determination of reference values</b>	
CAL-511	Test of averaged LED intensity I-LED-B of LEDs with certificate according to ISO 17025
CAL-513	Test of total luminous flux of LEDs with certificate according to ISO 17025



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