Instrument Systems
KONICA MINOLTA Group

Optronik Line

STA

Stand-Alone Screen Photometer for Vehicle-based Headlamp Testing

We bring quality to light.

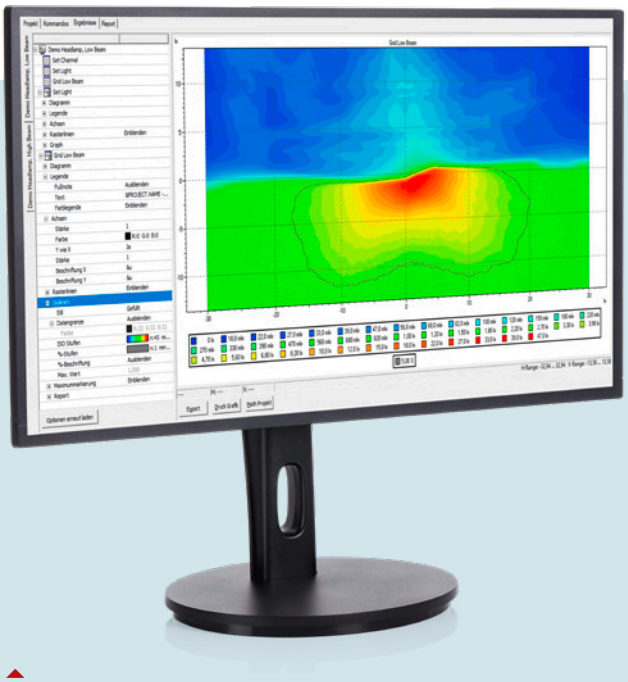
01 \\ Vehicle-Based Automotive Headlamp Testing

Development-stage evaluation of headlamps, together with the benchmarking of vehicles and headlamps – in particular for adaptive headlight functions – requires fast quantitative and qualitative comparison measurements of luminous flux and luminous intensity distribution. For these tasks, camera-based 2D measurement technology with a calibrated projection screen is indispensable. Component-based benchmarking is often no longer possible, because the vehicle electronics that control the headlight functions use different communication protocols across vehicle manufacturers. The STA Stand-Alone Screen Photometer from Instrument Systems now makes such vehicle-based measurements possible.

Compared with the traditional measurement method using a goniophotometer, which scans the light distribution in predefined increments and can take a long time at high-resolution grids (in extreme cases several hours with slow goniometers), the indirect screen photometer method determines luminous intensity and illuminance distributions and luminous flux within a few seconds, in one or a few measurements.

02 \\ STA Screen Photometer Key Features

- Very fast, high-resolution measurement of light distributions on large projection screens
- 12 MP **LumiCam 4000B Mono imaging luminance camera** for high-resolution screen measurements
- Vehicle-based testing without a goniophotometer
- **ACS 635 calibration source** for geometric and photometric screen calibration
- Calibration directly at the vehicle headlamp position
- Export to CSV and IES for simulation and analysis
- Visualization of light distributions in isocandela diagrams
- Optional regulation database (ECE, SAE, FMVSS108)
- Calculation and visualization of road illuminance
- Optional mount for component-based testing
- Expert support for light lab design and setup



Measurement result: spherical-grid representation of the light distribution

Control, evaluation, visualization and export of measurement results

Control and evaluation are handled by the STA Screen Photometer software. It supports the projection-screen calibration procedure, the measurement of luminous intensity and illuminance distributions, the evaluation of discrete measurement points, data export to standard formats (IES, CSV), the visualization of the light distribution in isocandela diagrams, and the calculation of luminous flux.

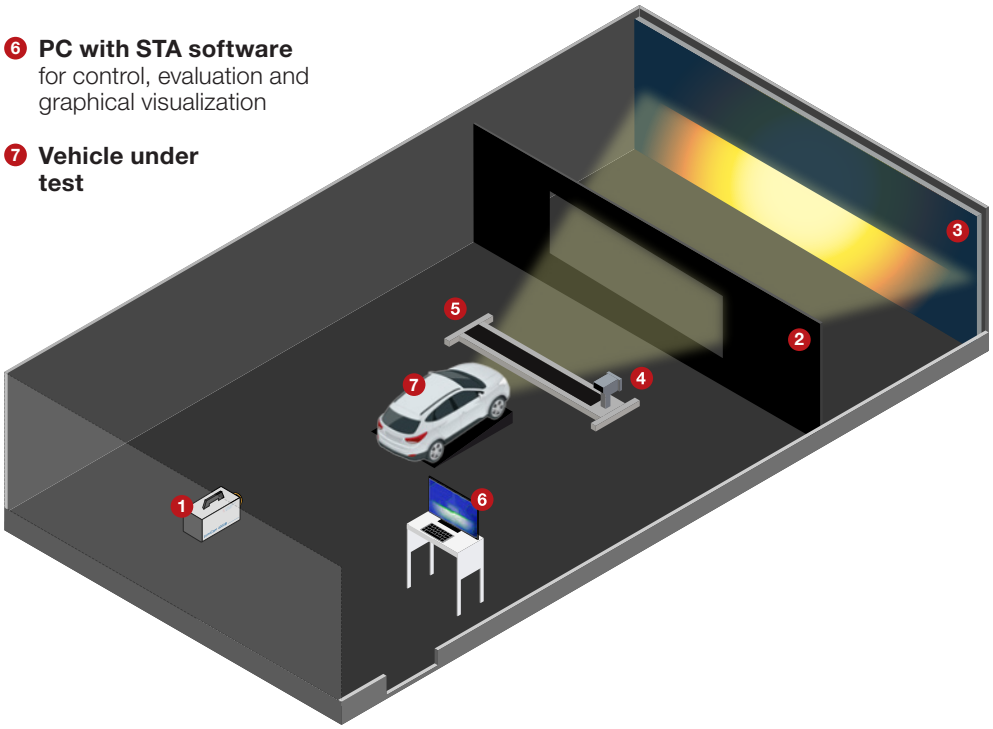
Optionally, the software can be connected to a regulation database in order to assess conformity to ECE, SAE or FMVSS108 and to generate photometric test reports.

03 \\ System Overview

The system consists of the latest generation LumiCam 4000B imaging luminance camera with 12 megapixel sensor resolution and the newly developed ACS 635 calibration source. The calibration source combines a high-intensity, homogeneous light source specifically designed for very wide projection screens with an integrated laser source for geometric calibration of the screen.

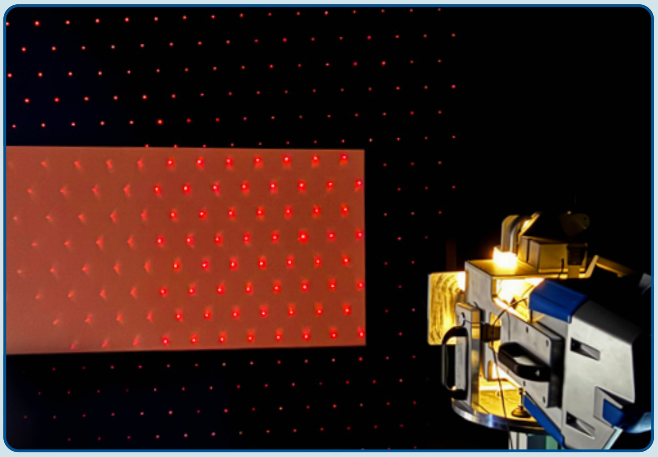
System setup of the stand-alone screen photometer

1. **LumiCam 4000B**
   2D imaging camera
2. **Baffles**
   for stray light reduction
3. **Projection screen**
   coated with a special selective scattering paint
4. **ACS 635**
   calibration source for photometric and geometric calibration
5. **Traversing system**
   for positioning the calibration source
6. **PC with STA software**
   for control, evaluation and graphical visualization
7. **Vehicle under test**



Innovative calibration method for large projection screens

The ACS 635 calibration source is aligned either on a custom-made frame with a traversing system (standard length 400 cm or 200 cm) or on a height-adjustable trolley, so that it can be positioned in front of variable points on the vehicle. It is additionally hydraulically height-adjustable. The system can be individually adapted to the user's requirements and to the installation site. An adapter extends the height range to 1400 – 1800 mm. The calibration source also features a swivel system to illuminate different horizontal sections of the projection screen. Integrated wheels allow the complete unit, including the traversing system, to be moved aside whenever the lab space is needed for other purposes.



ACS 635 with laser raster projection for geometric calibration

04 \\ System Configuration

A complete STA Stand-Alone Screen Photometer system for photometric evaluation of headlamps consists of the following components:

Imaging luminance camera – LC4000B-100

LumiCam 4000B Mono

Motorized lens adapter **12 MP CMOS** **12-bit ADC** **Gigabit Ethernet** **V(λ) correction**

Lens – LC-323-1

24 mm lens for LumiCam 4000B

Distance approx. 25 cm to infinity, aperture f/4 to f/16.

Calibration – CAL-410

Factory luminance calibration

Factory flat-field calibration and qualification according to DIN EN ISO 17025.

Mounting – PM-ST-320

Mount for LumiCam 4000B

Ceiling or wall installation of the LumiCam in the lab.

Mounting – PM-ST-700 / 701

Calibration source mount

Customer-specific mounting solution with traversing system for flexible positioning and calibration across the projection screen.

Software – SW-700

STA Screen Photometer software

Control and evaluation. CSV / IES export, isocandela visualization, optional ECE / SAE / FMVSS108 database.

Calibration module – SW-646

Screen photometer extension

Geometric and photometric calibration module for projection screens, including support for lab setup and calibration.

LumiCam 4000 B 2D imaging camera for luminance meacurements

05 \\ Service and After-Sales Support

Instrument Systems supports customers throughout the implementation of STA screen photometer systems, from laboratory planning and installation to calibration, training and long-term operation. Our extensive service portfolio features the following services:

- Support in the preparation of construction plans for a light laboratory
- Installation services on site
- User training sessions, optionally in partnership with accredited certification labs
- Conformity tests
- Re-calibrations in our own calibration laboratory or at the installation site
- Repair and hardware upgrades as well as software updates with standard support
- Maintenance contracts

Example of a light channel.

06 \\ Technical Specifications

STA Stand-Alone Screen Photometer	
System specifications	
Test object	Complete vehicle, typically up to 200 cm wide (traverse variant PM-ST-700) or < 120 cm (traverse variant PM-ST-701); optionally also component-based testing with a sample mount
Measurement distance	10 m – 25 m (10 m recommended)
Angular range (example)	Horizontal ± 28°, vertical +15° / –10° for a 13 m wide measurement screen 10 m from the vehicle, with the camera at approx. 21 m distance
Luminous flux capture at reference grid H ± 45°	97.7 %
Measurement resolution	Typically 0.01°; may deviate depending on the size of the measurement screen and the resulting field of view required by the camera
Measurement modes	Single image, averaging over several images, High Dynamic Range (several images with different integration times)
Integration time	0.01 to 10 seconds

LumiCam 4000B Mono Imaging Camera	
Effective pixel count	4096 × 3000 (12 MP)
Lens	24 mm (others on request)
Luminance measurement range	0.3 mcd/m² – 4.3 Mcd/m²
Sensor	Sony IMX304LLR CMOS sensor
Sensor pixel size	3.45 µm × 3.45 µm
A/D converter	12 bit
Exposure time	40 µs to 30 s

ACS 635 Calibration Source for Screen Photometer	
Photometric calibration source for ultra-bright, dimmable LED headlamp	
Power	400 W nominal, 500 W maximum (without laser)
White light	2000 – 20000 K continuously variable color temperature
Color temperature tolerance	3200 to 5600 K ± 100 K (nominal)
Programmable color modes	Wide color gamut; color modes: CCT, HSI, custom color, x/y coordinates, source matching and color-sensor mode
Dimmability	100 % – 0 %, continuous
Special feature	Adjustable illumination area with a sharp cut-off
Expected LED service life	approx. 50000 hours
Expected color shift over time (CCT)	± 5 %
Geometric calibration source (laser projector) for integrated diffractive optical laser element	
Number of points	221 (21 × 11 hexagonal array)
Design wavelength	660 nm
Wavelength range	600 – 730 nm
Minimum beam diameter	2–3 mm
Service life	> 10000 h
Laser type and class	Laser, red, 635 nm, 10 mW, laser class 2

07 \\ More Information

For further information about automotive lighting measurement solutions, visit the product pages below or contact our experts directly.

LumiCam 4000B Product Page

High-resolution imaging luminance camera for photometric measurements.

Scan me

AMS 6000/7000 Product Page

CIE Type A gonio-photometer for edge-to-edge front & rear lights.

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AMS Screen Imaging System Product Page

2D spatially resolved measurement of headlights with projection screen.

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Automotive Exterior Lighting Measurement

Automotive exterior lighting measurement solutions.

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Contact Us

Discuss your application with our automotive lighting experts.

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