iQ-LED Technology

Generate custom spectra with the all-in-one light source

iQ-LED technology* recreates other light sources in a controlled lab environment. This technology, in its second generation (V2), can be found in many of our illumination devices and can replicate almost any light source for a more accurate camera characterization and calibration.

Main Features

- Spectrally tunable light source
- 20 individual spectral channels
- High frequency PWM with up to 128 kHz
- Wavelength range of 380 – 820 nm
- Direct device management without a PC
- Connect multiple iQ-LED devices
- Long term stability via temperature control
- Short term high intensity and spectral stability via temperature control

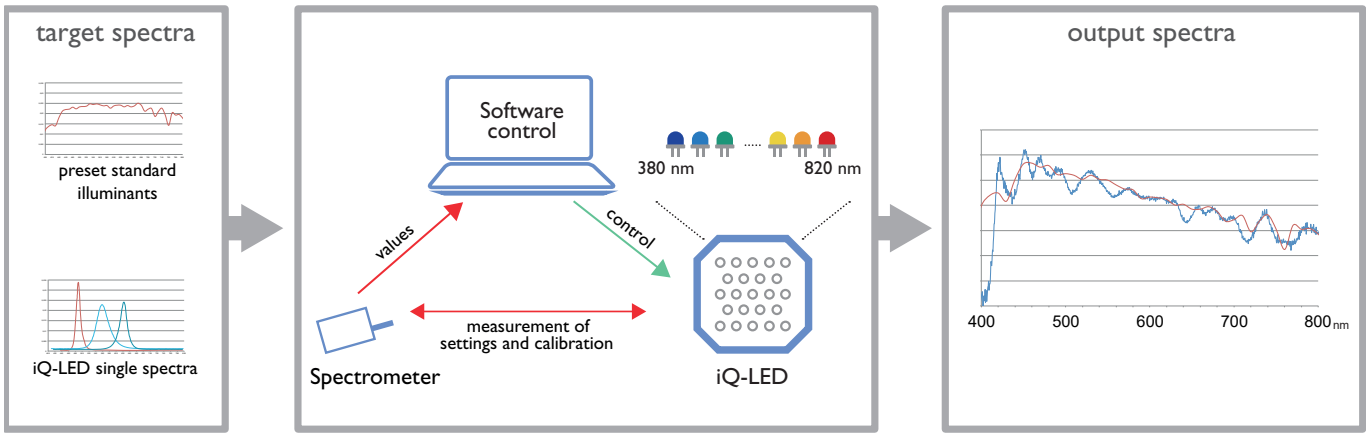
iQ-LED TECHNOLOGY

Software INCLUDED

API AVAILABLE

The iQ-LED device workflow

Each of our iQ-LED illumination devices has iQ-LED control software and a spectrometer to ensure you have proper illumination over the entire lifetime of the device. iQ-LED can recreate various spectra, including everything from standard light sources to different color patches.



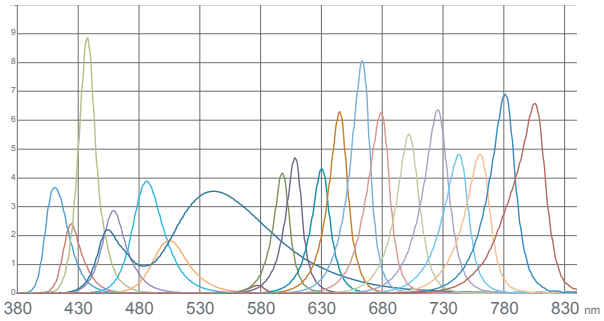
iQ-LED workflow

*The full overview described in the first two pages applies to all of our iQ-LED devices. Information on the devices themselves can be found on the respective product page.

Advanced image quality testing

iQ-LED technology* can generate custom spectra by the optical mixing of emitted radiation from spectrally different LEDs. The standard module consists of 20 different channels generated from 41 high-power SMD LEDs on a 10 x 10 cm board.

iQ-LED technology uses a NIST traceable calibrated spectrometer and iQ-LED control software to calibrate and correctly generate the spectra. Once correctly calibrated, the illuminant can be stored on the device and used without a PC. Up to 44 illuminants and one sequence can be stored on the device.



20 individual spectral channels

iQ-LED software main screen with 20 spectral channels

At a Glance	iQ-LED V2
Principle	High-power SMD-LED based spectral broadband light module used in our iQ-LED devices
Light sources	41 SMD high-power LEDs / separated in 20 color channels / spectral range: 380 – 820 nm / intensity controlled via 4000 steps per channel and 32 kHz PWM switchable to (1000 steps with 128 kHz)
Spectral measurement	Closed loop functionality with calibrated mini spectrometer via control software Spectral Range: 305 – 1100 nm / Resolution: 2048 pixel / FWHM: 2.5 nm
Control system	Software-based control system via USB (included with all iQ-LED devices), API Storage of up to 44 different illuminants, one sequence, and default light source, controllable via microswitch controller (without connected PC)
Included reference illuminants	D50, D55, D65, D75, A, B, C, E / Planckian spectral curve by selected temperature (1900 - 18000 K) / The iQ-LED technology is optimized for the best spectral match and allows CRI values up to 99, depending on illuminant and intensity
Illumination stability	± 1% when stabilized (2% after switching D illuminants during the first 5 s) for most applications
Response time	< 50 ms (switch illuminant)
Production line integration feature	Operation hour counter Self-diagnosis
Software requirements	PC with Windows 7 operating system (or higher) and USB port
Additional functions	• Auto-generation of standard illuminants or externally measured spectra • Save and load function of self-defined spectral arrangements or intensities • Storage of illuminants/sequences on device • Creation of test sequences • Real-time display of spectral measurement • Real-time calculation of CCT, CRI, curve fit and illumination level

*iQ-LED technology is used in many of our illumination devices but is not sold as a standalone product. If you have specific requests or require customization, please contact sales@image-engineering.de to discuss your requirements.

LE 7

Transparent test chart illumination with the LE7 lightbox

The LE7 is a uniform lightbox that uses iQ-LED technology to increase the effectiveness of image quality camera testing with transparent test charts. With five different product variations, the LE7 can generate an extensive range of light intensities for more comprehensive camera testing.

Main Features

- Includes all features from iQ-LED
- Uniformity of > 97% in active chart area
- Available with two, four, or six iQ-LED modules
- Control single modules to expand intensity range*
- Acurate low-light testing with LE7-6x-E

iQ-LED TECHNOLOGY

API AVAILABLE

LE7 VIS-IR, LE7-E and camSPECS plate

The **LE7 VIS-IR** uses two normal iQ-LED modules and four iQ-LED VIS-IR elements to extend the spectral range from 380 – 1050 nm.

The LE7-E is capable of creating a dynamic range of up to 1:100,000. Such a wide dynamic range expands the testing possibilities, especially low-light testing.

Using the camSPECS plate (TE292) with the LE7 creates an iQ-LED solution for spectral sensitivity measurements and camera color calibration.

At a Glance	LE7-2x / LE7-4x / LE7-6x / LE7 VIS-IR / LE7-E
Principle	An integrating sphere to illuminate transparent test charts based on iQ-LED technology (includes micro-spectrometer) / 500 mm diameter integrating sphere
Output window	290 x 220 mm output window / dual slot for D280 sized test charts
Light source	**LE7-2x:** 2 x iQ-LED V2: 82 SMD high-power LEDs **LE7-4x:** 4 x iQ-LED V2: 164 SMD high-power LEDs **LE7 VIS-IR:** 2 x iQ-LED V2 plus 4 x iQ-LED VIS-IR: 82 SMD high-power LEDs / 320 THT LEDs **LE7-6x:** 6 x iQ-LED V2: 246 SMD high-power LEDs **LE7-E:** 5 x iQ-LED V2 plus 1 x iQ-LED V2 with 1.8 ND filter: 246 SMD high-power LEDs
Uniformity	> 97% for active chart area, 280.0 x 157.5 mm (for standard D illuminants) > 96% for full chart area, 290.0 x 220.0 mm (for standard D illuminants)
Maximum / Minimum illumination level	**LE7-2x /LE7 VIS-IR:** 25 lx up to 8000 lx **LE7-4x:** 100 lx up to 16000 lx **LE7-6x:** 25 lx up to 24000 lx **LE7-E:** 0.25 lx up to 20000 lx For standard illuminant D55 (illuminating a TE291 D calibration chart)

*iQ-LED software version 3.2.0 or higher required for single module control.

iQ-Flatlight

The most advanced light source for reflective test chart illumination

Powered by iQ-LED technology, the iQ-Flatlight uses ten iQ-LED elements to recreate almost any light source for test chart or scene illumination. This all-in-one light source greatly expands the capabilities of a test lab.

Main Features

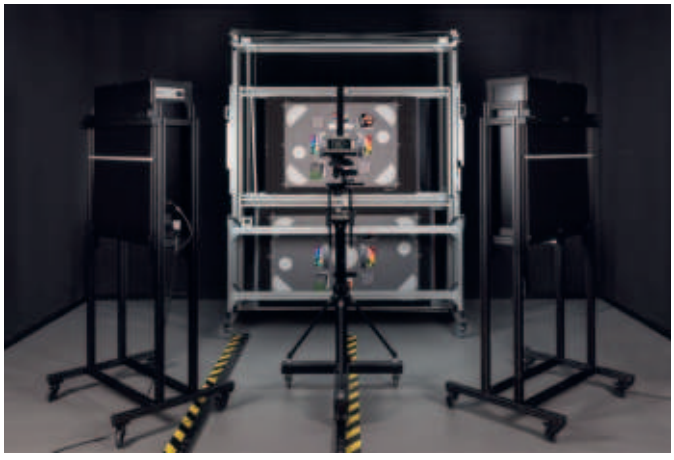
- Includes all features from iQ-LED
- Spectrally tunable light source for camera tests
- Used for illuminating the VCX test setup
- Uniformity of a large test chart > 90% (sample setup)

iQ-LED TECHNOLOGY

API AVAILABLE

Sample setup

The iQ-Flatlight is always sold as a pair of two to ensure illumination uniformity of the test chart or test scene. A sample test setup normally positions each light 1.5 m from the test chart, as seen in the image below.



Sample setup

At a Glance	iQ-Flatlight
Principle	Diffuse light panel for illuminating reflective test charts and surfaces
Light area	620 x 780 mm
Light source	10 x iQ-LED V2: 410 SMD high-power LEDs
Uniformity on plane	Up to 90% (with two iQ-Flatlights in ≈ 1.5 m distance, depending on test setup)
Maximum / Minimum illumination level	Single iQ-Flatlight / 400 mm distance: 25 lx up to 7800 lx Two iQ-Flatlights / in ≈ 1.5 m distance, 10 lx up to 2000 lx depending on test setup (for standard D illuminants)

iQ-Chart Box

Uniform illumination of reflective test charts

The iQ-Chart Box has a compact design with eight built-in iQ-LED elements for illuminating reflective test charts in size A460 and under. Each light is aligned and fixed to ensure test charts are always homogeneously illuminated.

Main Features

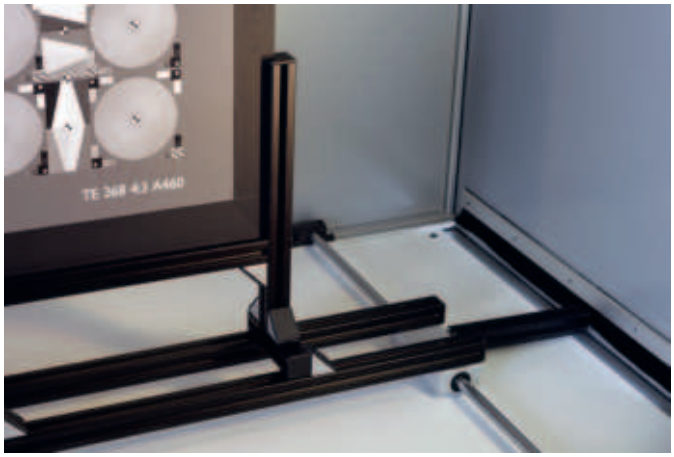
- Includes all features from iQ-LED
- Uniformity > 95% (chart size A280)
- Size A460 and A280 reflective test charts
- Designed for labs with limited space

iQ-LED TECHNOLOGY

API AVAILABLE

Designed for smaller test labs

The iQ-Chart Box is designed for smaller test labs where the iQ-Flatlight is less convenient. Now, instead of having a full chart mount and two or more free-standing lights to illuminate the test chart, you can have all of the same illumination features in a practical size that can be placed anywhere in your lab.



Easily switch test charts

At a Glance	iQ-Chart Box
Principle	Compact device to illuminate reflective test charts based on iQ-LED technology
Front opening	820 mm x 530 mm
Light source	8 x iQ-LED V2: 328 SMD high-power LEDs
Uniformity on chart plane	> 95% (A280 picture size) > 90% (A460 picture size)* illuminance on chart plane for selected standard illuminant (D50) at 400 lx
Maximum / Minimum illumination level	25 lx up to 2000 lx (for standard D illuminants) / depending on illuminant and required curve fit / CRI / with ND filters down to 1.5 lx

*measured at center of A460 sized chart

EX2-VIS

A convenient way to measure different spectra

The EX2 is an external measuring device for measuring and then generating custom spectra through our various iQ-LED devices.

Main Features

- Small compact design
- Spectral range of 350 – 870 nm
- Spectral resolution of 2.4 nm
- NIST traceable calibrated

API AVAILABLE

EX-VIS-IR

The EX2-VIS-IR version includes all of the same features but has an expanded spectral range of 380 – 1100 nm as well a better resolution at 2.35 nm for measuring spectra in the infrared range.

EX2-VIS set

At a Glance	EX2-VIS
Principle	Direct measuring via optical fiber opening (≈ 25° FOV), or cosine corrector add-on (≈ 180° FOV)
Spectral range VIS Spectral range VIS-IR	350 – 870 nm 380 – 1100 nm
Resolution VIS Resolution VIS-IR	Sensor: 2024 pixel/ FWHM 2.4 nm Sensor: 2024 pixel/ FWHM 2.35 nm
Integration Time	1.05 µs – 10 min
Control System	Software based control (iQ-LED software, iQ-LED API, or camSPECS express control software)

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