# iQ-Flatlight

User Manual

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**Image Engineering GmbH & Co. KG** · Im Gleisdreieck 5 · 50169 Kerpen · Germany

T +49 2273 99 99 1-0 · F +49 2273 99 99 1-10 · www.image-engineering.com

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# 1 INTRODUCTION

Important information: Read the manual carefully before using this device.

Inappropriate utilization may cause damage to the device, to the DUT (device under test), and/or other components of your setup.

Please keep these instructions in a safe place and pass them on to any future user.

## 1.1 Conformity

We, Image Engineering GmbH & Co. KG, hereby declare that the “iQ-Flatlight” corresponds to the essential requirements of the following EC directive:

- Electromagnetic Compatibility - 2014/30/EU
- RoHS 2 - 2011/65/EU
- Low Voltage - 2014/35/EU

## 1.2 Intended use

The iQ-Flatlight is designed as a spectrally tunable source to illuminate large areas. It is based on iQ-LED technology, includes a micro-spectrometer, and is controlled with the iQ-LED control software.

- Only suitable for indoor use.
- Place your system in a dry, constant tempered environment without interfering light.
- The optimal ambient temperature range is 22 to 26 degrees Celsius. The maximum ambient temperature range is 18 to 28 degree Celsius.
- The optimal system temperature range, displayed in the software user interface, is between 35 and 50 degrees Celsius. The system has internal temperature management, if there is an error regarding the internal temperature, you will get a warning message, and the system automatically turns off to avoid any damage.

### 1.2.1 Departing from described setup

The following steps must be performed in the correct chronology to allow frictionless commissioning. Departing from the chronology may lead to an incorrect working device.

1. Install the iQ-LED software
2. Connect iQ-Flatlight to power and via USB to the PC
3. Switch iQ-Flatlight on; the system drivers will be installed
4. After drivers are installed, restart the software

### 1.2.2 USB connection

Only an appropriate USB connection allows error-free operation of iQ-Flatlight. Use delivered USB cables. If you need to extend the USB connection to longer distances, please check if powered hubs/repeaters are necessary.

## 1.3 General safety information

**WARNING!**

Some LEDs are emitting invisible light in the IR and UV near area.

**Do not** look directly into the emitted light or look through the optical LED system.
**Do not** look directly in the open sphere or light source when using high intensities or sequences with low response time.

- **Do not** open the device without instructions from the Image Engineering support team or when connected to the power supply.

# 2 GETTING STARTED

## 2.1 Scope of delivery

- Two iQ-Flatlight each with a spectrometer (calibration device) and Rolling Cart,
- 2 x power cords,
- 2 x USB cables
- Control software
- Calibration protocol

Optional equipment:

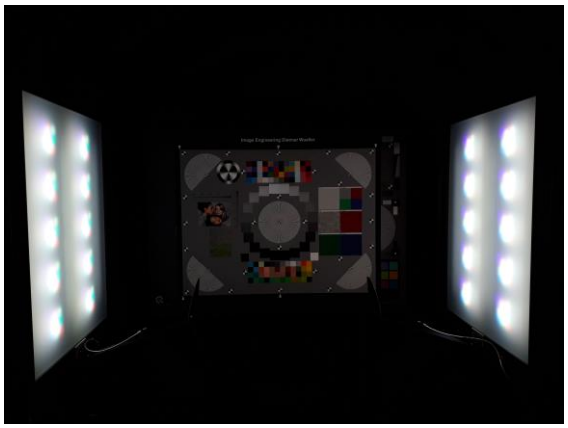
- **iQ-Trigger:** The iQ-Trigger is a mechanical finger that can press the release button within 25 ms. When working with touchscreens, exchange the solid fingertip for a touch pen tip.
- **Gossen Digipro F2**: An exposure meter for high-precision incident light measurement. Perfect for ensuring the illumination uniformity of reflective test charts.
- **PRC Krochmann Radiolux 111**: The Radiolux 111 is a high precision instrument for photometric measurements.

## 2.2 Set-up homogeneity

To get a uniform illumination on your test chart, you must find the optimal position of your flatlights beside your chart.

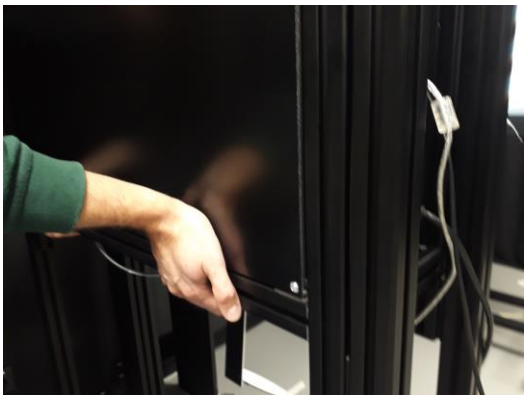
### 2.2.1 Height setting

- Start with the height setting. The iQ-Flatlights should be centered at the chart level. (see image below)

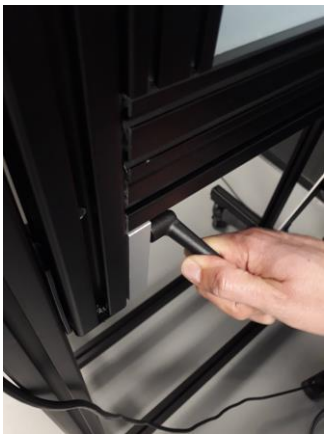


We recommend changing the height setting using two people.

- The first person holds the iQ-Flatlight (see image 1).
- The second person loosens the screws on the right and left on the inner side of the iQ-Flatlight (see image 2).
- Loosen the screws of the center brace on the backside of the iQ-Flatlight to move it closer to the other brace (see image 3).
- The first person can push the iQ-Flatlight up or down.
- If you have the correct height, tighten the screws and
- Tighten the screws of the brace.



**Hold iQ-Flatlight (image 1)**

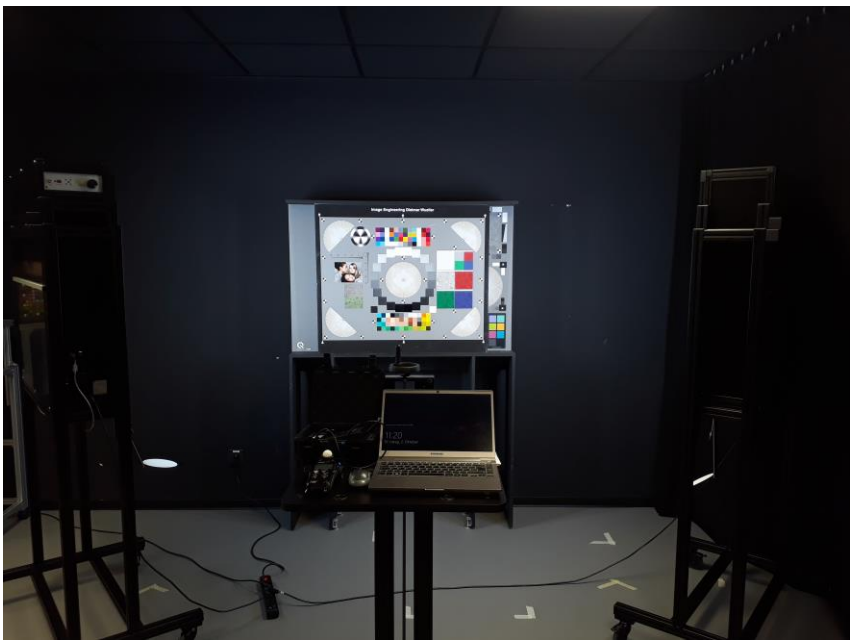


**Second person loosens the screw (image 2)**

**Loosen the screws of the center brace on the backside of the iQ-Flatlight (image 3).**

### 2.2.2 Setup around chart

Start by placing your iQ-Flatlights as close as possible to your chart (~150 cm distance from the chart center to the iQ-Flatlight) at an angle of 45 degrees, depending on your camera's optical axis. From there, begin measuring the uniformity of illumination on your test chart and adjust the position of your flatlights to best suit your test setup. We recommend using an exposure meter (see 2.1 optional equipment) to check the uniformity of the light. Measure all four corners and the center of the chart. The values shouldn't deviate 1/10 f-stop from each other.



## 2.3 Calculate and set compensation factor - chart plane

Complete the following procedure for each iQ-Flatlight with a luxmeter (see 2.1 optional equipment).

- Pull down the calibration device into the standby position.

- Open the spectrometer settings in the iQ-LED software and turn on the calibration light for the compensation factor as described in the iQ-LED software manual.
- Measure the four corners and the center of the chart with a luxmeter and calculate the average value. This value is your compensation factor for each iQ-Flatlight.
- Pull up the calibration device into the measuring position.

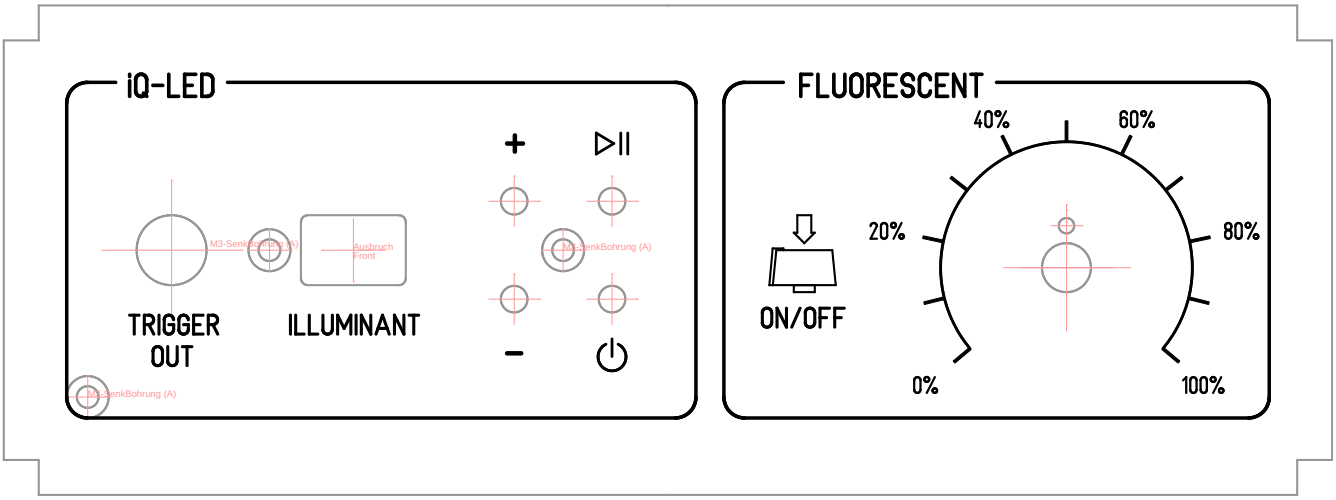
- Set the calculated compensation factor in the iQ-LED software. (see iQ-LED manual or iQ-LED quick start guide).
- Conduct a new spectral calibration (see iQ-LED manual or iQ-LED quick start guide).
- The lux intensity in the software now corresponds to the intensity on the chart plane. You can now generate new illuminants (see the iQ-LED manual or iQ-LED quick start guide).

Example: If you want 1000 lx on the chart level, set 500 lx for each iQ-Flatlight in the iQ-LED software.

# 3 OPERATING INSTRUCTIONS HARDWARE

## 3.1 Overview display and ports

- 1 x USB port for software control
- 1 x port for power adapter
- 1 x trigger output




Use the control panel to set different light settings for the iQ-LEDs and the fluorescent tubes:

iQ-LED:

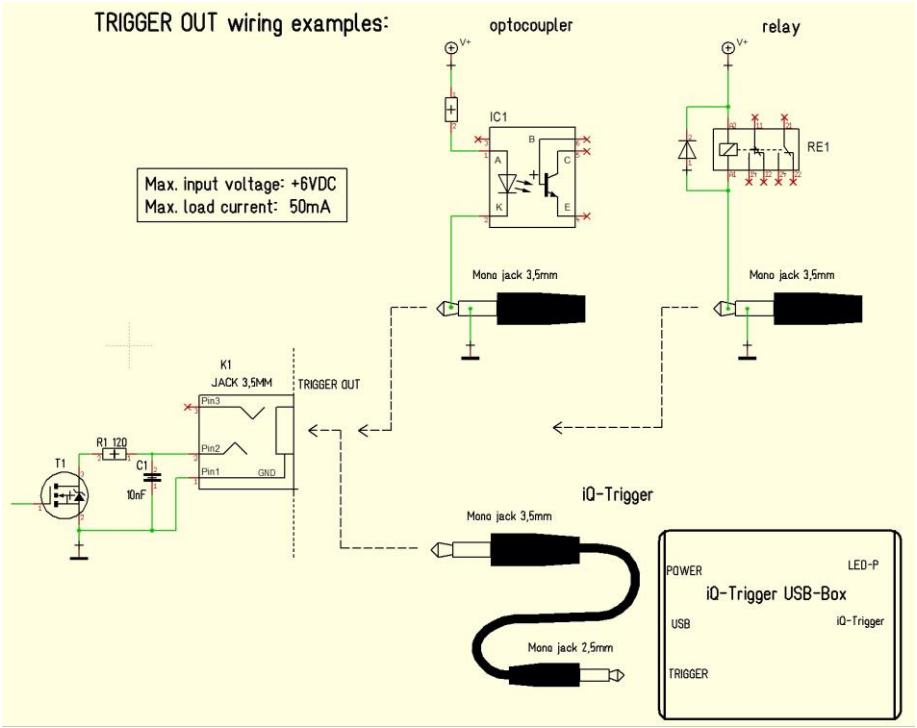
- With the “+” and “-“ buttons, you can switch between 44 saved illuminants
- Numerical display to show the storage of the illuminants
- With the play and stop button, you can start and stop a saved light sequence with different illuminants (it is possible to save one sequence on the device)
- With the power button, you can turn on and off the light
- There are three pre-stored illuminants on your device (the intensity of each illuminant is shown in the acceptance protocol of your device):
    1: illuminant A (default illuminant)
    2: illuminant D50
    3: illuminant D75

Fluorescent (only for iQ-Flatlight with Fluorescent Tubes):

- When pressing the rotary knob, you can turn on or off the fluorescent tubes.
- While turning the rotary knob, you can set the intensity from low (0%) to high (100%).

Note: To store your generated illuminants or sequences on your device, please follow the the iQ-LED SW user manual instructions.

Wiring examples for the trigger output:




**Trigger OUT wiring examples**

The default duration value for the trigger output is 500 ms. This value can be modified with the iQ-LED API. A signal is sent out to the trigger output while changing the illuminates or the intensity of LED channels. It can be used to synchronize your test setup. For example, with an iQ-Trigger (See 2.1 optional equipment).

## 3.2 Connecting the hardware

Connect the power cord to the power outlet on the side of your iQ-Flatlight. Connect the USB cable from the Flatlight to your PC and turn on the Flatlight (the power switch is next to the power outlet). Then connect the USB cable from the spectrometer calibration device to your Flatlight. The system will install the spectrometer and iQ-LED driver on your PC (this will take a few seconds). You can check the installation in your hardware manager:

*Hardware Manager: active iQ–LED devices and spectrometer*

# 4 OPERATING INSTRUCTIONS SOFTWARE

## 4.1 Requirements

- PC with Windows 7 (or higher) operating system
- One free USB port

## 4.2 Software installation

Install the iQ-LED control software before connecting the hardware. Follow the setup instructions from the iQ-LED control software manual.

## 4.3 Starting the system

Start the iQ-LED software by clicking the ‘iQ-LED.exe’ or the iQ-LED icon on your desktop.

Follow the iQ-LED software manual to control your iQ-Flatlight.

**NOTE**

The iQ-LED devices can operate with high precision only when setup and calibration are performed correctly. Consult the iQ-LED software manual for a comprehensive description, and read it carefully.

### 4.3.1 Spectrometer settings

The iQ-LED software (see iQ-LED software manual) automatically generates the best spectrometer settings for your lighting conditions after pressing the “auto-detect” button. For special applications, it is also possible to set the spectrometer settings manually. If you have further questions, please contact the Image Engineering support team.

### 4.3.2 Spectrometer calibration

Your spectrometer comes fully NIST traceable calibrated. We recommend recalibrating the spectrometer once a year, regardless of the operating hours. If a spectrometer calibration is required, please contact Image Engineering.

Note: Before removing the spectrometer, measure and note the lux value of a predefined standard illuminant.

### 4.3.3 iQ-LED calibration

The individual LED lights of the iQ-LEDs, inside the iQ-Flatlight, depend on many different types and wavelengths. Some LEDs will change their intensity level and peak wavelength slightly in the first 500-600 working hours because of a burn-in effect.

The LEDs will also degrade in intensity during their lifetime. To ensure that all measurements including the auto-generated and standard illuminants are correct, you must perform a spectral calibration regularly.

You must also consider the degradation of the LED when saving self-defined presets. Suppose you save a preset with LED channels that uses its maximum intensity. In that case, the possibility exists that this intensity cannot be reached after the burn-in time or the long-time degradation of the LED. In this case, you will get a warning message from the iQ-LED control software.

During the first 500-600 working hours, we recommend performing a spectral calibration every 50 operating hours.

After the first 500-600 operating hours, a calibration of every 150 working hours suffices.

Other factors that indicate the need for a spectral calibration include unsatisfactory illuminant generation, the aberration of the intensity values, or a spectral curve that does not fit with the predefined standard illuminants of the corresponding preset.

- The spectrometer works correctly
- The spectrometer settings are correct
- All LED channels work correctly
- The dark measurement is correct
- Your measurement environment is correct
- Your ambient temperature is correct

How to perform the spectral calibration is described in the iQ-LED control software manual.

### 4.3.4 Calibration device handling

The calibration device must be in the ‘standby position for normal usage.’ If you want to calibrate your system, generate a new illuminant or set a new intensity, and then set the calibration device to the ‘measure position’ via the folding mechanism:

*Calibration device in ‘standby position’*

*Calibration device in ‘measure position’*

Please be careful with your spectrometer, the fiber, and the measuring reflector. Avoid any force effect or contamination of the device. If you have finished your light setting or calibration via the iQ-LED control software, you can push back the calibration device to the ‘standby position.’

## 4.4 Low intensity use

When using your system with very low intensity, the spectral measurement values will start to fluctuate. The lower the intensity, the higher the fluctuation. The generated light is still stable up to a certain point. The fluctuation of the values is caused by the noise of the spectral measurement of the internal spectrometer. The lower the light intensity, the higher the noise influence. An approximate value will no longer be possible when using standard illuminants with an intensity lower than 25 lux.

# 5 ADDITIONAL INFORMATION

## 5.1 Maintenance

The spectrometer requires a recalibration once a year, regardless of the operating hours.
You can still use the stored Illuminants on the iQ-Flatlight when the spectrometer is removed.

Please contact Image Engineering for shipping details before sending the spectrometers.

## 5.2 Spectrometer removal for calibration

**Do NOT remove the fiber from the spectrometer.**
**The spectrometer must be calibrated with the fiber.**

**A spectrometer without the fiber or cap may be permanently damaged by dust.**

- Unplug the USB cable and remove the cable ties.
- Unscrew the fiber from the calibration device (place a cap on the tip of the fiber).

- Ensure both the USB cable and the fiber are dangling loosely.

- Unscrew the plate holding the spectrometer using the knurled screws.
- Pack the spectrometer in a box while it is still on the holding plate.
- Put the spectrometer in the box it was shipped in if you still have it. Alternatively, use any other box; ensure the fiber is not bent too much.
- Use cushioning (e.g., bubble wrap) to protect the spectrometer from shock.

## 5.3 Care instructions

- Do not touch, scratch, or pollute the diffusor.
- If there is any dust on the diffuser, clean it with an air blower.
- Do not remove the fiber from the spectrometer. Otherwise, the calibration is invalid, and the spectrometer must be **recalibrated**!

## 5.4 Disposal Instructions

After the service life of the iQ-Flatlight, it must be disposed of properly. Electrical and electromechanical components are included in the iQ-Flatlight. Observe your national regulations and ensure that third parties cannot use the iQ-Flatlight after disposal.

Contact Image Engineering if assistance for disposal is required.

# 6 TECHNICAL DATA SHEET

See annex for the technical data sheet. It can also be downloaded from the website of Image Engineering: https://image-engineering.de/support/downloads.