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# iQ-Multispectral

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User Manual

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# 1 INTRODUCTION

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

Inappropriate utilization may cause damages 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-Multispectral” corresponds to the essential requirements of the following EC directives:

- **Electromagnetic Compatibility - 2014/30/EU**
- **RoHS 2 - 2011/65/EU**
- **Low Voltage - 2014/35/EU**
- **Photobiological safety of lamps and lamp systems – IEC 62471-2:2009**

## 1.2 Intended Use

The iQ-Multispectral is designed as a spectrally tunable light source to illuminate areas with sizes up to DIN A2. It is based on iQ-LED technology, includes a micro-spectrometer, and it is controlled with the iQ-LED control software.

- **Only suitable for indoor use.**
- **Place your system in a dry and constant tempered environment without any 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

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

1. **Connect the two iQ-Multispectral lamp units using the USB cable**
2. **Install the iQ-LED software**



3. Connect the iQ-Multispectral to a suitable power outlet and connect the micro-spectrometer via USB to the PC
4. Switch iQ-Multispectral on; the system drivers will be installed
5. After the drivers are installed, restart the software

### 1.2.2 USB Connection

Only appropriate USB connection allows error-free operation of iQ-Multispectral. 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!**

According to “**IEC 62471-2:2009 - Photobiological safety of lamps and lamp systems**” the **iQ-Multispectral** is classified as **Risk Group 3**, due to some LEDs emitting invisible light in the “IR” as well as the “UV” region of optical radiation.

#### RISK GROUP 3



- **WARNING. UV emitted from this product. Possibly hazardous optical radiation emitted from this product. Do not look at operating lamp. Eye injury may result.**
- **WARNING. IR emitted from this product. Do not look at operating lamp.**

- Use safety goggles when operating with UV and IR modules.
- After 15 minutes, the UV light will automatically turn off, due to the invisible light emitting in the UV region of optical radiation.
- Leave the workroom when using the UV component for an extended length of time (>15min).
- UV radiation within an illuminant can only be activated by the software. Stored illuminants on the device won't activate the UV component. The UV channel can be toggled (100% / 0%) by a switch on the device.



- Do not look directly into the emitted light when using high intensities or sequences with low response time.
- Do not open the device without proper instructions from the Image Engineering support team, or when the device is connected to the power supply.
- Secure the workroom with the proper security signs.

## 2 GETTING STARTED

### 2.1 Scope of Delivery

- 2 x iQ-Multispectral lamps
- 1 x micro-spectrometer (calibration device)
- 2 x power cords
- 2 x USB cables
- Control software
- Calibration protocol

#### 2.1.1 Optional equipment:

- **iQ-Trigger:** The iQ-Trigger is a mechanical finger that can press the release button on a camera 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 measurements. 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.
- **Kaiser stand:** A2 plate with two arms for supporting the lamps.



## 2.2 Set-up Homogeneity

To ensure a uniform illumination on the test chart, you have to find the optimal position of the iQ-Multispectral lamps above your chart. For a stable alignment, we recommend to attach the lamps to:

- A matching Kaiser setup (also part of our portfolio)
- Conventional tripods - with angled adapters

### 2.2.1 Height Setting

Start with the height setting. The iQ-Multispectral lamp units should be centered to the chart level.





To achieve this, loosen the wheel of the holding device while securing the arm that carries the lamp unit and then adjust the height.



Bring the lamps into a 45° position and lift them to the same height of about 40cm. As a reference point for determining the height, you can also use the lower corner of the lamp.



If you have reached the right height, tighten the wheel.





## 2.2.2 Positioning of Calibration Device

The calibration device comes with a cosine corrector with a 180° viewing angle.



Set up the device in an upright (0°) position, as shown in the image above, so that it 'looks' into the illuminated scene.

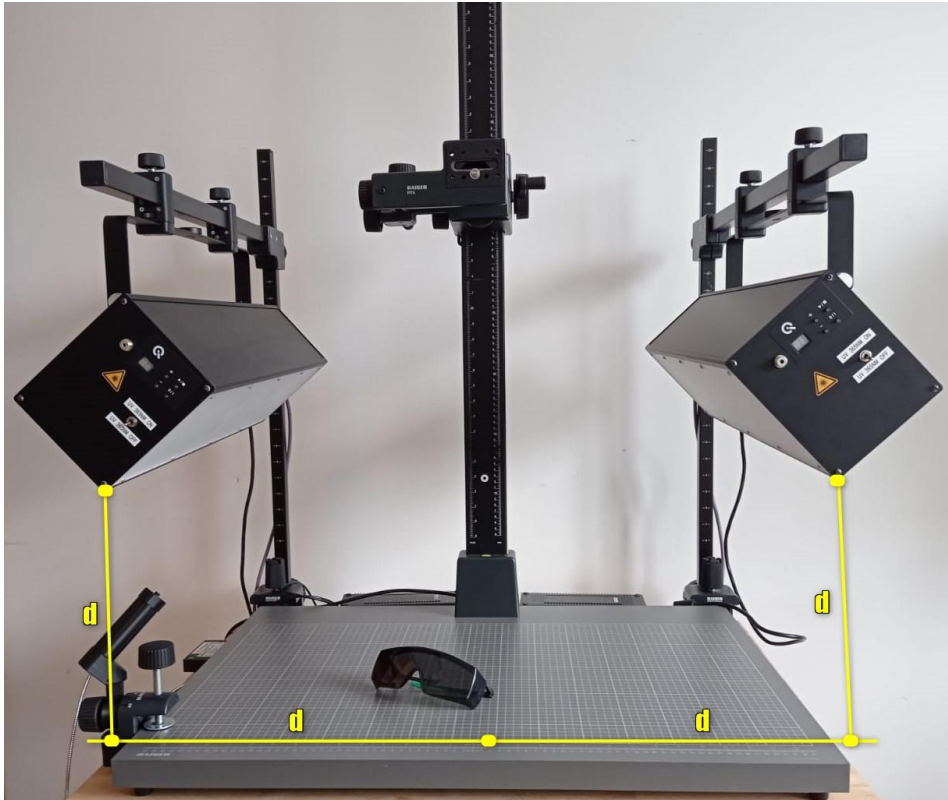


When the spectral calibration is complete, it is imperative that the position of the lamps and the calibration device does not change.



### 2.2.3 Set-up Around Chart

Start by placing your iQ-Multispectral lamp units equidistant from the middle of the table and at the same height. To illuminate an area of A3 start with equal distances  $d$  of about 40cm. To achieve this, adjust angle, height and distance from the center line symmetrically with both units.





Once the positioning is correct, begin measuring the uniformity of illumination on your test chart and adjust the position of your lamp units to best suit your test setup. We recommend to use 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 10% from each other.



### Calculation of the Homogeneity in the example:

Add up the 5 values

$$1134 \text{ lx} + 1156 \text{ lx} + 1207 \text{ lx} + 1118 \text{ lx} + 1097 \text{ lx} = 5712$$

Calculate the average

$$5712 \text{ lx} / 5 = 1142 \text{ lx}$$

Calculate difference to max/min value in percent

$$1207 \text{ lx} / 1142 \text{ lx} = 105,7\% \rightarrow D_{\text{max}} = 6\%$$

$$1118 \text{ lx} / 1142 \text{ lx} = 97,9\% \rightarrow D_{\text{min}} = 2\%$$

$$D_{\text{min/max}} = 6\% + 2\% \rightarrow 8\% \rightarrow \text{Homogeneity } 92\%$$



## 2.3 Calculate and Set Compensation Factor in regards to the Chart Plane

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

- Set up the spectrometer in its stand in the middle of the reproduction table.
- 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-Multispectral.
- 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 iQ-LED manual or iQ-LED quick start guide).

## 3 VARIOUS WAYS TO SET-UP THE LAMPS

You can implement the installation with the Kaiser setup that we offer as an option:





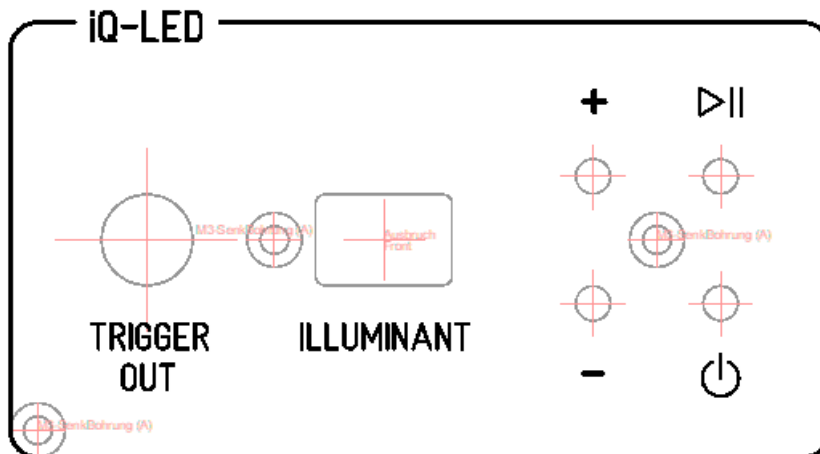
Another option is to set up the lamp units on conventional tripods with an angled adapter.



## 4 OPERATING INSTRUCTIONS HARDWARE

### 4.1 Overview of the Display and Ports

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



#### iQ-LED:

- With the “+” and “-“ buttons you can switch between 44 saved illuminants
- A numerical display will show the storage of the illuminants



- With the play/pause 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):
  - *Illuminant A (default illuminant)*
  - *Illuminant D50*
  - *Illuminant D75*
- **The UV-channel can NOT BE STORED directly on the device.**

### UV:

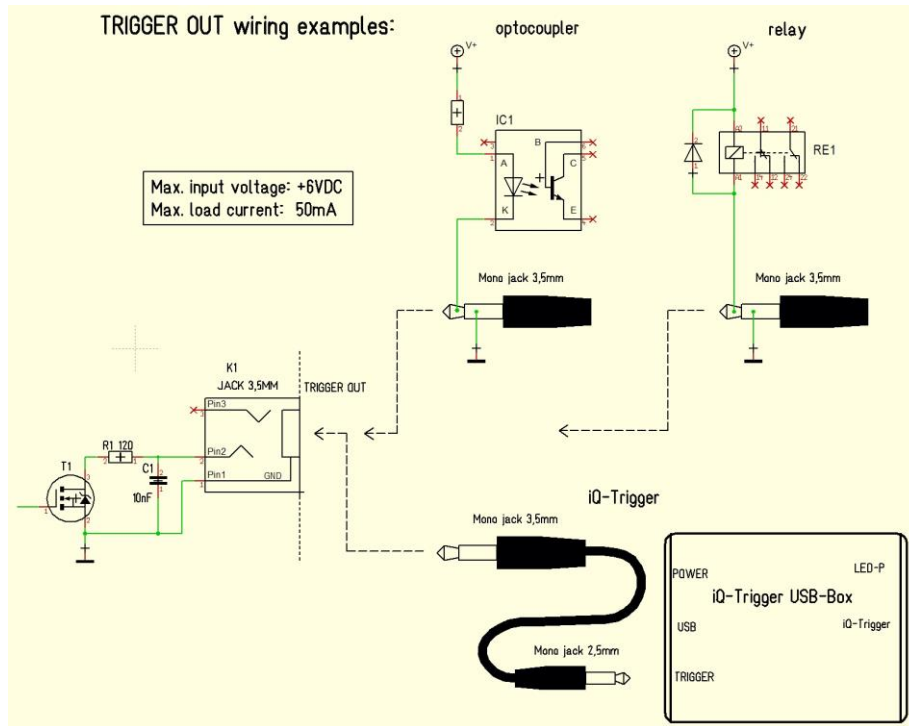
A switch on the device toggles UV channel 0% / 100%





## iQ-Trigger:

Wiring examples for the trigger output:



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 illuminats 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)

## 4.2 Connecting the Hardware

Connect the power cord to the power outlet on the side of your iQ-Multispectral. Connect the USB cable from the iQ-Multispectral to your PC and turn on the iQ-Multispectral (the power switch is located next to the power outlet). Then connect the USB cable from the spectrometer calibration device to your iQ-Multispectral. 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



## 5 OPERATING INSTRUCTION SOFTWARE

### 5.1 Requirements

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

### 5.2 Software Installation

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

### 5.3 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-Multispectral.

#### **NOTICE**

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

#### 5.3.1 Spectrometer Settings

The iQ-LED software (see iQ-LED software manual) automatically generates the best spectrometer settings for you lighting conditions once you press 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.

#### 5.3.2 Spectrometer Calibration

Your spectrometer comes fully NIST traceable calibrated. We recommend to recalibrate 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.

#### 5.3.3 iQ-LED Calibration

The individual LED lights of the iQ-LEDs inside the iQ-Multispectral 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 make sure that all measurements including the auto-generated illuminants and the standard illuminants are correct, you have to regularly perform a spectral calibration.

You must also consider the degradation of the LED when saving self-defined presets. If you save a preset with LED channels that uses its maximum intensity, there is the possibility 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: 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.

## 5.4 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.



## 6 ADDITIONAL INFORMATION

### 6.1 Maintenance

The spectrometer requires a recalibration once a year, regardless of the operating hours. If a spectrometer calibration is necessary, please contact Image Engineering.

### 6.2 Care Instructions

- **Do not touch, scratch or pollute the diffuser.**
- **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 has to be recalibrated!**

### 6.3 Disposal Instructions

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

Contact Image Engineering if assistance for disposal is required.

## 7 TECHNICAL DATA SHEET

See annex for the technical data sheet. It can also be downloaded from the website of Image Engineering:

[www.image-engineering.com](http://www.image-engineering.com).