

User Manual

Lightcube-Controller

Image Engineering GmbH & Co. KG

User manual – English copy

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Manufacturer and authorized representative: Image Engineering GmbH & Co. KG

P.O. Box:
Im Gleisdreieck 5
DE 50169 Kerpen
Tel. +49 2273 99 99 10
Fax +49 2273 99 99 1-10
info@image-engineering.de
https://www.image-engineering.de/

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1 About this operating manual

Before operating the Lightcube-Controller for the first time, or if you are assigned other tasks on the Arcturus, Vega or Vega IR, you must read this operating manual.

Pay particular attention to **Chapter 2**, "General Safety Regulations".

1.1 General information

These instructions are intended to simplify the use of Vega and ensure it's utilized for its intended purpose.

The operating instructions contain important information on how to operate the Lightcube-Controller safely and properly. Observing these instructions will help you to:

- Avoid hazards
- Reduce repair costs and downtime
- Increase the reliability and service life of the product

These instructions must be read and followed by anyone who is assigned to work on the Lightcube-Controller.

In addition to these operating instructions, the accident prevention and environmental protection regulations applicable in the country of use and at the place of use must also be observed.

1.2 Presentation of information

Structure of instructions

Instructions are divided into:

- Steps
- Results of the actions
- Tips for optimal use

Each piece of information is marked with a symbol:

Symbol	Meaning
1. 2. 3.	Steps: These action steps are numbered consecutively and must be carried out in the specified order from top to bottom.
✓	Result symbol: The text after this symbol describes the result or intermediate result of an action.
TIP:	Application tip: Additional information on optimal use of the product.

Table 1.1 Meaning of symbols

Structure of the warnings

Signal word	Use in ...	Possible consequences if the safety instructions are not followed:
DANGER	Personal injury (imminent danger)	Death or serious injuries!
WARNING	Personal injury (potentially dangerous situation)	Death or serious injuries!
CAUTION	Personal injury	Minor or slight injury!
NOTE	Property damage	Damage to the device and/or objects in the surrounding area!

Table 1.2 Warning levels

The warning notices are structured as follows:

- Warning sign with signal word corresponding to the warning level
- Type of hazard (description of the hazard)
- Consequences of the hazard (description of the consequences of the hazard)
- Hazard prevention (measures to prevent the hazard)



DANGER!

Type of hazard

Consequences of the hazard

1. Hazard prevention

Warning signs

Special warning notices are provided at the relevant locations. They are marked with the following symbols.



General hazard area
This sign warns of personal injury.

2 General safety regulations

2.1 Principles

The Lightcube-Controller is intended exclusively for use with Arcturus, Vega and Vega IR light sources.

Before putting the device into operation, please carry out the checks listed in **Chapter 6**. Ensure that the device:

1. is in perfect condition (visual inspection),
2. securely standing (well-balanced), and
3. the connected light sources are securely connected to the Lightcube-Controller.

The device is built in accordance with current recognized safety regulations. Nevertheless, its use may pose a risk to the life and limb of the user or third parties, or cause damage to the appliance and other property.

2.2 Intended use

The Lightcube-Controller is intended for powering and controlling the Arcturus, Vega and IR Vega light sources.

Control is via the wired USB interface using the Vega software supplied or via the Vega API (sold separately).

The device may only be operated in closed rooms.

2.3 Foreseeable misuse

Possible foreseeable misuse in combination with an Arcturus, Vega or Vega IR light source is listed below:

1. Covering the fan hood.



CAUTION!

Hazard: Blocked fan cover

Danger: Overheating or malfunction of the device

Note: Avoid blocking the fan cover or side panels. Please leave at least 5 cm of space around the ventilation holes.

2.4 Safety regulations

General information



CAUTION

Hazard: Blocked fan cover

Danger: Overheating or malfunction of the device

Note: Avoid blocking the fan cover or side panels. Please leave at least 5 cm of space around the ventilation holes.

Personal protective equipment

When using the Lightcube-Controller in combination with an Arcturus, Vega or Vega IR light source, no protective equipment is required.

During operation



CAUTION!

Hazard: Blocked fan cover

Danger: Overheating or malfunction of the device

Note: Avoid blocking the fan cover or side panels. Please leave at least 5 cm of space around the ventilation holes.

Care, maintenance, and inspection

The device is maintenance-free.

Any necessary repairs may only be carried out by specialists appointed by Image Engineering.

Waste Disposal

At the end of its service life, the Vega must be disposed of properly. Please follow the disposal instructions in **Chapter 12**.

2.5 Selection and qualification of personnel

The Lightcube-Controller may only be operated by persons who have carefully read these operating instructions.

2.6 Safety devices

To safely take the device out of service, disconnect the power cord from the socket.

2.7 Safety labels

The following warning notices are attached to the Lightcube-Controller:



Follow the instructions

Read the instructions carefully before operating the Lightcube controller.

2.8 Extension and modification

Modifications to the device are not permitted.

2.9 Fire protection

There are no special fire safety requirements as long as the following precaution is observed:

Avoid blocking or covering the outlet to prevent the surface from overheating.

2.10 Actions in an emergency

Take the device out of service. To do this, unplug the Lightcube-Controller's power cord from the socket.

Firefighting

The Lightcube-Controller, in combination with the connected Arcturus, Vega or Vega IR light source, does not require any special protective equipment for firefighting.

If the device itself catches fire:

- Use a suitable Class C fire extinguisher (for fires involving electrical equipment and installations).

- Ensure that the device is disconnected from the power supply, if this can be done safely, before starting to fight the fire.
- Avoid using water, as this could further damage the device's electronics and cause an electric shock.
- Make sure there are no flammable materials near the device that could further fuel the fire.

Expected emissions

The Lightcube-Controller does not contain any particularly hazardous substances. Therefore, no emissions are to be expected.

First aid measures

No serious injuries are to be expected, even in the event of a malfunction. In the event of minor injuries or accidents, notify a first responder or contact the nearest emergency services.

3 Scope of delivery and identification of the machine

The Lightcube-Controller is delivered fully assembled.

The following accessories are included:

- AC power cable
- Master CAN cable
- USB cable
- Acceptance report
- Vega SW
- Operating instructions

Type plate

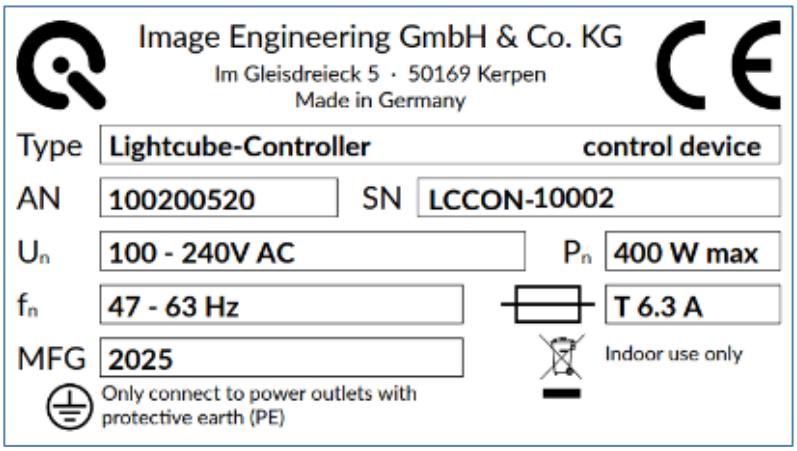


Fig. 3.1 Type plate

The following are listed:

- Manufacturer + address
- Type = Type designation
- Serial
- Nominal voltage
- MFG = Year of manufacture
- Rated power
- Nominal frequency
- Fuse used
- Note: For indoor use only

- WEEE note: Do not dispose of in household waste.

3.1 Accessories + compatibility list

The Lightcube-Controller is intended for use with Arcturus, Vega or Vega IR light sources. The use of other light sources or attachments is not permitted.

4 Design and function

4.1 Overview and assemblies

An Arcturus, Vega or Vega IR light source can be controlled via the Lightcube-Controller. The Lightcube-Controller supplies the system with up to 7 modules that can be connected to one controller. For further information and for installation of the Arcturus, Vega or Vega IR module, please refer to the corresponding operating instructions.

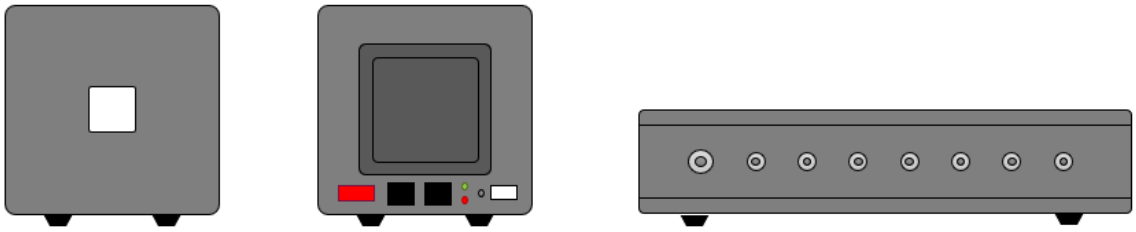


Fig. 4.1 Structure of the Arcturus light source with the Lightcube-Controller

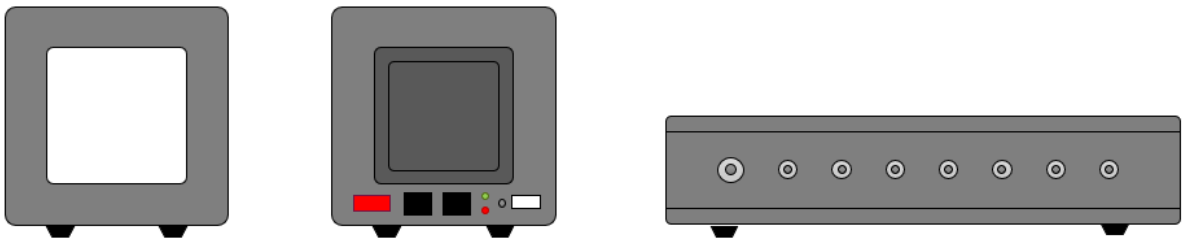


Fig. 4.2 Structure of the Vega light source with the Lightcube-Controller

4.2 Lightcube-Controller

The Lightcube-Controller is designed to supply power to and control the Arcturus, Vega or Vega IR modules. It enables communication between the modules and offers numerous safety features.

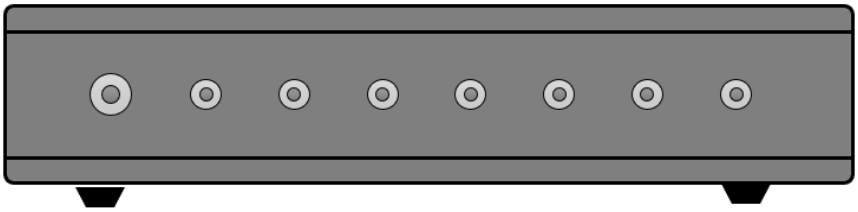


Fig. 4.3 Lightcube-Controller

4.3 Interfaces

The Lightcube-Controller is controlled via a PC using USB.

4.4 Function diagram / Function sequence

Functional sequence using the software:

1. Ensure that a USB connection is established if you want to operate the device using the software.
2. Start the Vega software.

For detailed instructions on using the software, see **Chapter 8**.

5 Transport and storage

5.1 Transport

Requirements for the installation site

The device may only be operated in enclosed spaces.

Transporting the machine

Before transport, ensure that the cables from the connected light source are disconnected from the Lightcube-Controller.

Unpacking the machine

The Lightcube-Controller is delivered in a case.

To unpack:

1. Open the case.
2. Remove the plastic bag containing the documentation and accessories.
3. Remove the controller.

5.2 Storage

Storage requirements

We recommend storing the Lightcube-Controller in its case.

- Temperature range: -10 to 45°C
- Sand- and dust-free environment.
- Humidity: 10 to 95% RH, no condensation.

6 Installation and commissioning

6.1 Installation

The device may only be operated in closed rooms.

Set up your system in a dry, constant-temperature environment without light interference.

The optimum ambient temperature for photometric measurements is between 22°C and 26°C. The permissible ambient temperature is between 18°C and 28°C.

Performing the installation

The installation includes:

1. Setting the CAN IDs,

2. Connecting the Lightcube-Controller to the lights and to the computer,

3. Installing the software on the computer.

Step 1: Setting the CAN IDs

Before connecting cables, ensure that each Arcturus, Vega or Vega IR module has a correct CAN ID. The CAN ID is set using small switches on the back of the module, known as DIP switches. These switches use binary values. Each switch has a value of 2^n, where n is the switch number.

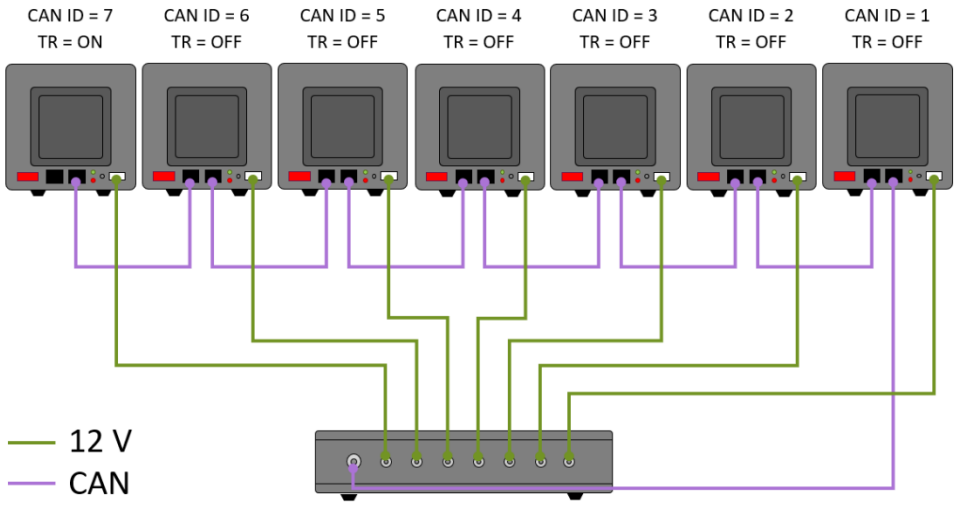


Fig. 6.1 Connection to the Lightcube-Controller

For example:

- Switch 1 (n=0) = 2^0 = 1
- Switch 2 (n=1) = 2^1 = 2
- Switch 3 (n=2) = 2^2 = 4

and so on. You calculate the CAN ID by adding the values of the switches that are turned on.

Example: If switches 1 and 3 are turned on → 1 + 4 = CAN ID 5.

Each module must have a unique CAN ID, starting with 1 and increasing (e.g., 1, 2, 3 ...). Do not use a CAN ID higher than 7 – the software will not recognize it. The last module in the CAN chain must set the TR switch (switch 8) to ON. This process is called termination.

Step 2: Connecting the hardware

Connect the CAN cable from the Lightcube controller to the module with CAN ID 1. Then connect the remaining modules in series via their CAN ports. Next, connect the power cables to each module as shown in Figure 6.1. Finally, connect the USB cable to the computer and turn on the Lightcube controller.

Step 3: Installing the software

Detailed instructions for installing and using the software can be found in Chapter 8.

Example for 7 modules:

CAN ID 1 = 10000000
CAN ID 2 = 01000000
CAN ID 3 = 11000000
…
CAN ID 7 = 11100001

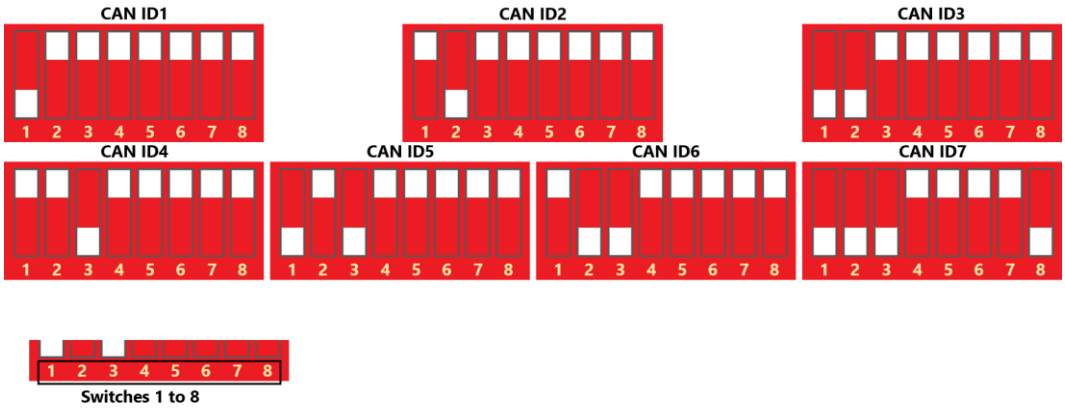


Fig. 6.2 CAN ID settings

6.2 Commissioning

Commissioning using the software:

For commissioning with the Vega software, please refer to **Chapter 8**.

7 Control and display elements

7.1 Control elements on the device

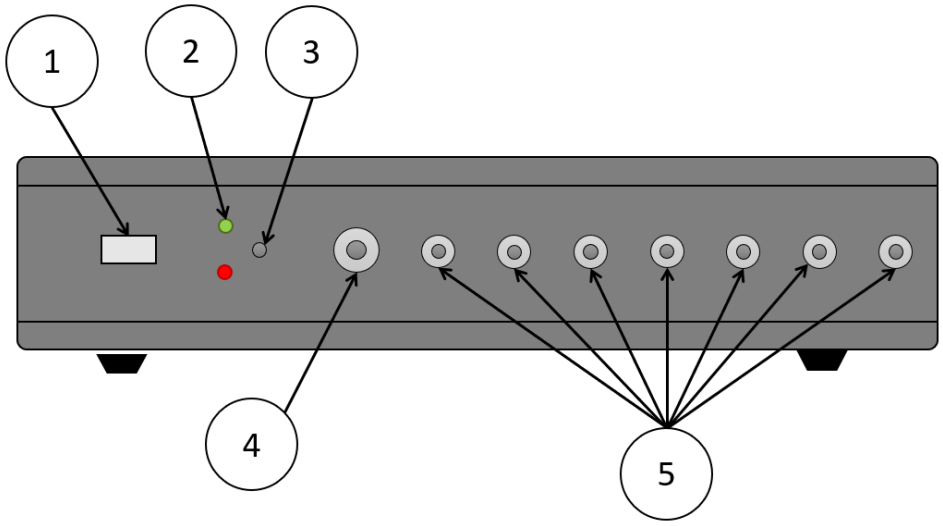


Fig. 7.1 Operating and display elements on the controller - Front

1. USB port
2. Status LEDs
3. Test button
4. CAN OUT (master)
5. 12 V power output
6. AC power connection
7. Fan cover

7.2 Function of the test button

The test button is used to check the functionality of Arcturus, Vega or Vega IR quickly:

1. Pressing once switches the device on at 2.5% intensity.
2. Pressing it again changes the intensity to 40%.
3. Pressing the button a third time changes the intensity to 10% with flicker.
4. Pressing the button a fourth time switches the device off (intensity 0% and no flicker).

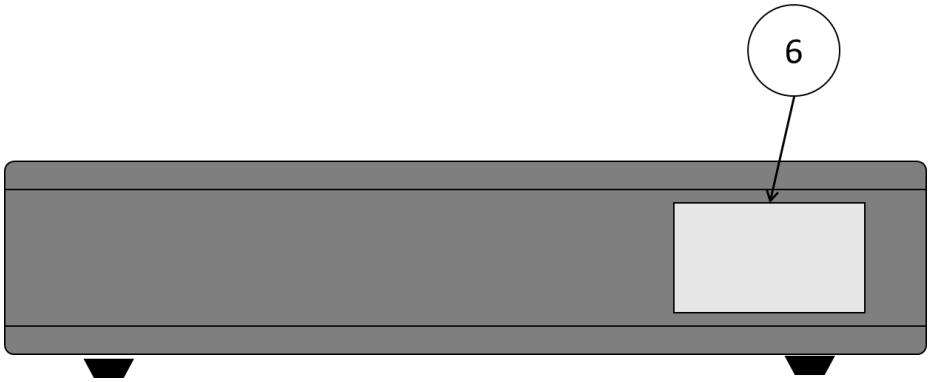


Fig. 7.2 Control and display elements on the controller – rear

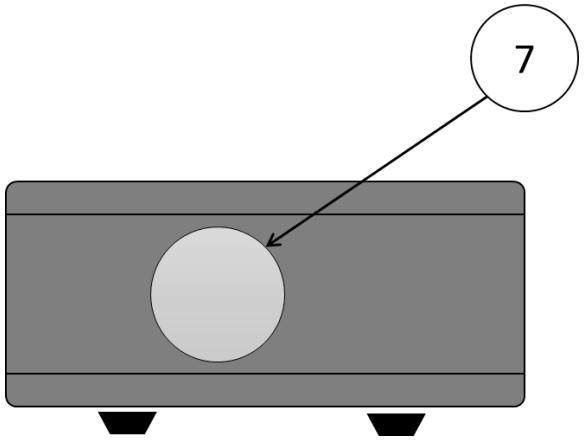


Fig. 7.3 Control and display elements on the controller – right and left side

8 Operating software

8.1 Introduction

The Vega control software is suitable for controlling the Arcturus, Vega and Vega IR modules from Image Engineering.

8.2 Minimum requirements

- Windows 10 with 32/64 bit
- USB 2.0 or higher

8.3 Software installation

The Vega control software is available for Windows, Linux and macOS.

- **Windows:** Run the installer Vega_VX.X.X_setup.exe and follow the instructions.

  Linux (Debian/Ubuntu): Install the package Vega_VX.X.X.deb by double-clicking it in the software manager, or in the terminal with:

sudo apt install Vega_VX.X.X.deb

- **macOS:** Open the file Vega-Software_VX.X.X.dmg and drag the Vega application icon into the **Applications** folder.

8.4 Software use

First start

Connect the Arcturus, Vega or Vega IR light source according to the instructions in **6 - Installation and commissioning**. Switch on the Lightcube-Controller and start the software. If no module is found, the window in Figure 8.1 appears.

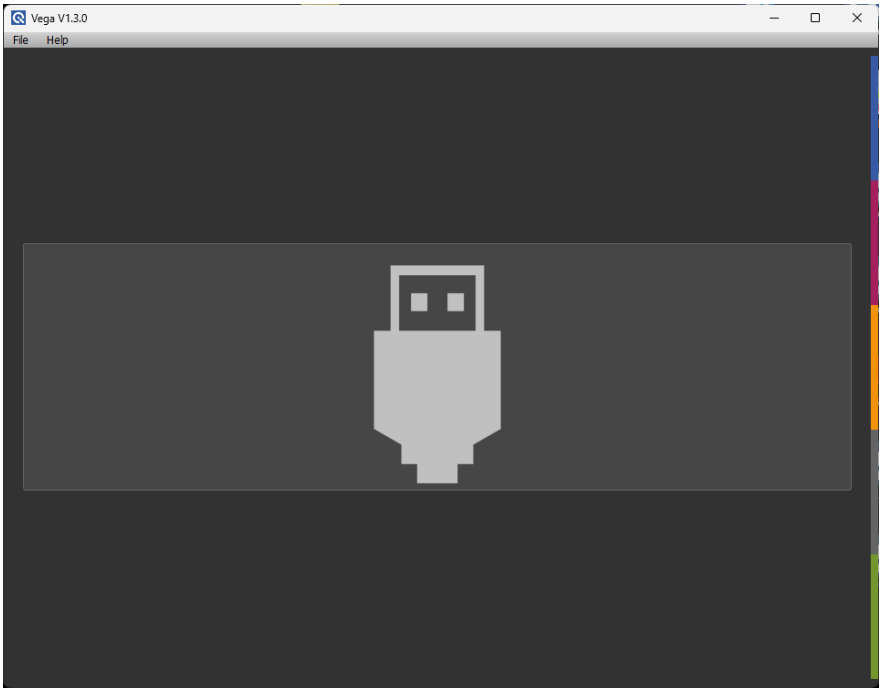


Fig. 8.1 No device connected

If the software cannot recognize the devices, you can try adding them manually. Select the "Find connected devices" option from the "Find" menu or press "Ctrl + F" to scan the USB ports and refresh the device display. When a device is found, it will appear in the device list.

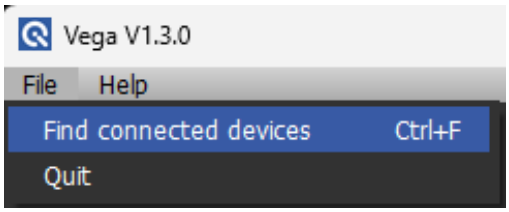


Fig. 8.2 Find connected devices

User interface

The Lightcube-Controller and modules are displayed in the device list ① (see Figure 8.3) with their corresponding serial numbers and CAN IDs. Select a device to manage it in the control panels at the bottom. The Arcturus and Vega light sources can operate in flicker or continuous mode. If you want to operate in continuous mode, set the "Flicker" slider to 0.0 Hz. If not, set the modules to the desired flicker frequency by adjusting the slider or entering the value directly.

If you are working in flicker mode with multiple modules, you can synchronize them. In this case, the master module is CAN_1. Synchronize the frequency of the modules to CAN ID 1 by checking the box next to the module. This synchronization also overwrites the previously set parameters Flicker, Duty Cycle, Angle, Period Count, and Flicker Mode with the settings of the CAN_1 module. All connected modules are set to synchronization by default.

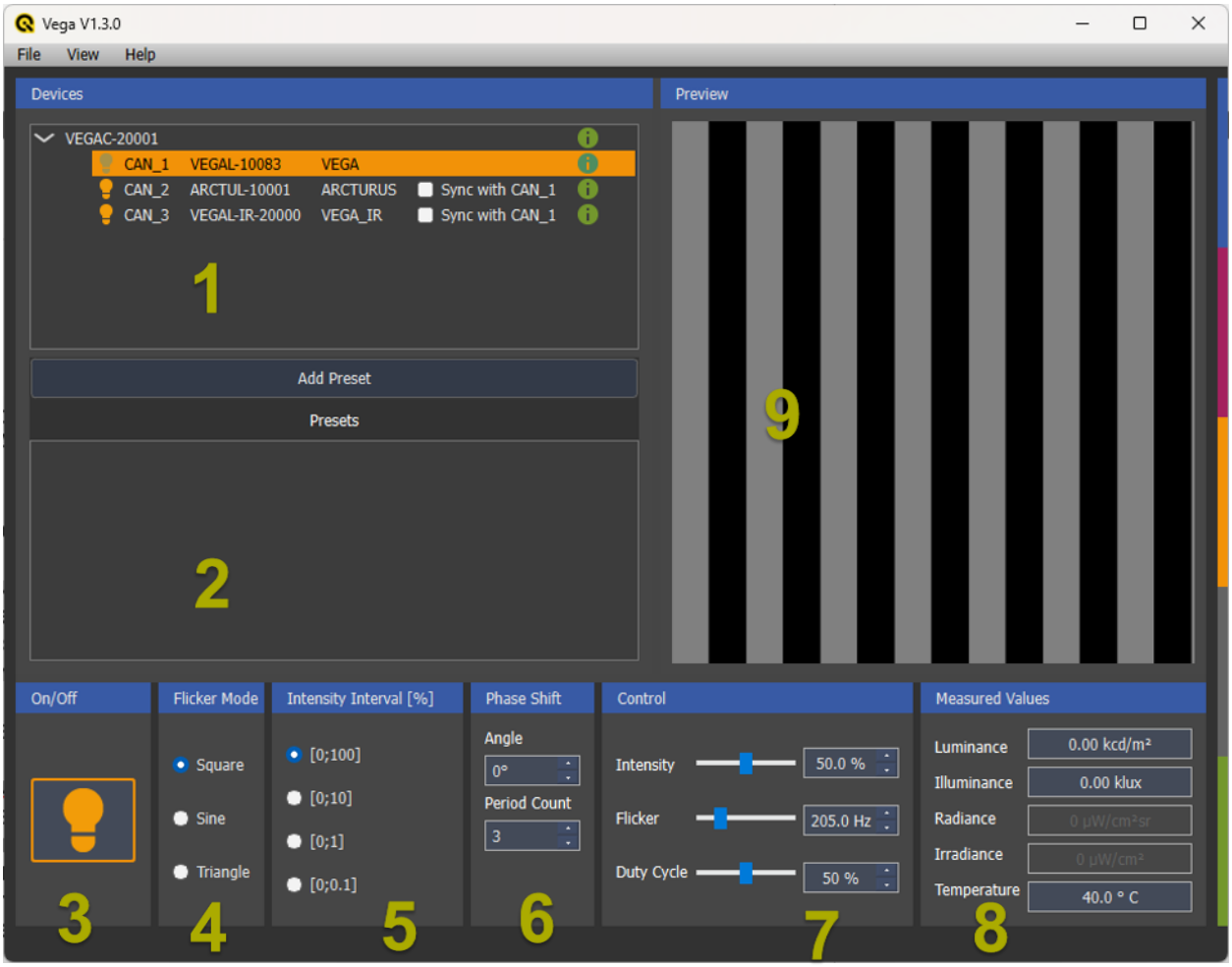


Fig. 8.3 Vega Software

Reference measurement

The Arcturus and Vega light sources have a stabilized output intensity. the system must calibrate the output feedback in cd/m² or lux. However, for the system to display the output feedback in physical units, it must be calibrated using a reference measurement: for Arcturus and Vega, in cd/m² or lux; and for Vega IR, in W/(sr·m²) or W/m².

All modules are calibrated by Image Engineering at the factory without a test chart. A recalibration is required if the position, distance, or test chart in front of the light source is changed, or if inconsistent measurement values are detected.

The system offers four types of measurement:

- **Luminance**: Luminance is a measure of the emission or reflection from a flat surface in cd/m². For the light source, the area of the test chart is measured, but when using a diffuser plate, the surface area is measured. Therefore, the emission toward the device under test (e.g., a camera system) is measured.

- **Illuminance**: Illuminance is a measure in lux of how much light illuminates a surface. In other words, it is a measure of the illuminance in the direction of the light source and is not suitable for measurement on the test chart.

- **Radiance**: Radiance is a measure of the radiant power emitted or reflected by a flat surface per solid angle and projected area, expressed in W/(sr·m²). It is the radiometric equivalent of luminance; however, it is not evaluated using the spectral luminous sensitivity curve V(λ) of the human eye and is therefore also applicable outside the visible spectral range (e.g., in the NIR). The measurement is performed in the same way as luminance calibration: with the light source on the surface of the test chart, or – when using a diffuser plate – on the surface of the diffuser plate.

- **Irradiance**: Irradiance is a measure in W/m² of how much radiant power strikes a surface. It is the radiometric equivalent of illuminance. In other words, it is a measure of the incident radiation directed toward the light source and is not suitable for measurement on the test chart.

Perform the reference measurement in a completely darkened room. Any external light will distort the measurement and lead to reference value errors.

An external measuring instrument is required to calibrate the light source. We recommend a Class L luminance/illuminance meter for luminance and illuminance, and a spectrometer for radiance and irradiance.

Open the context menu of the module you want to calibrate to start the calibration process.

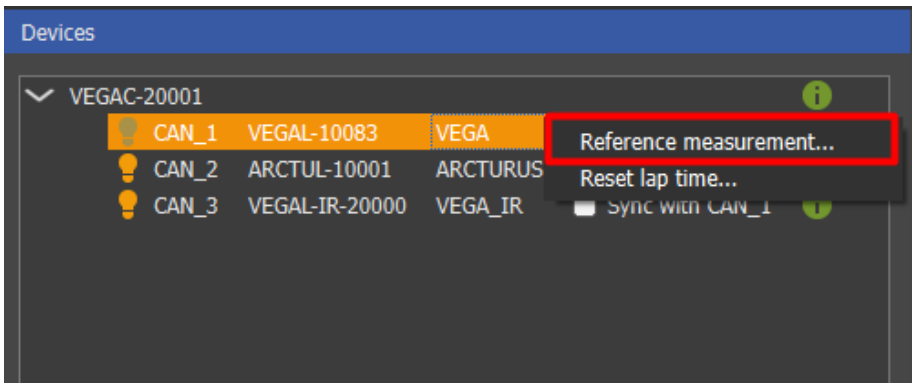


Fig. 8.4 Module context menu

The light source operates at 50% intensity during the reference measurement. Perform your reference measurement at a suitable location using your external measuring device. In the dialog box, select the measured quantity (luminance or illuminance for Arcturus and Vega; radiance or irradiance for Vega IR), enter the measured value under “Measured value,” and confirm by clicking “Apply.”

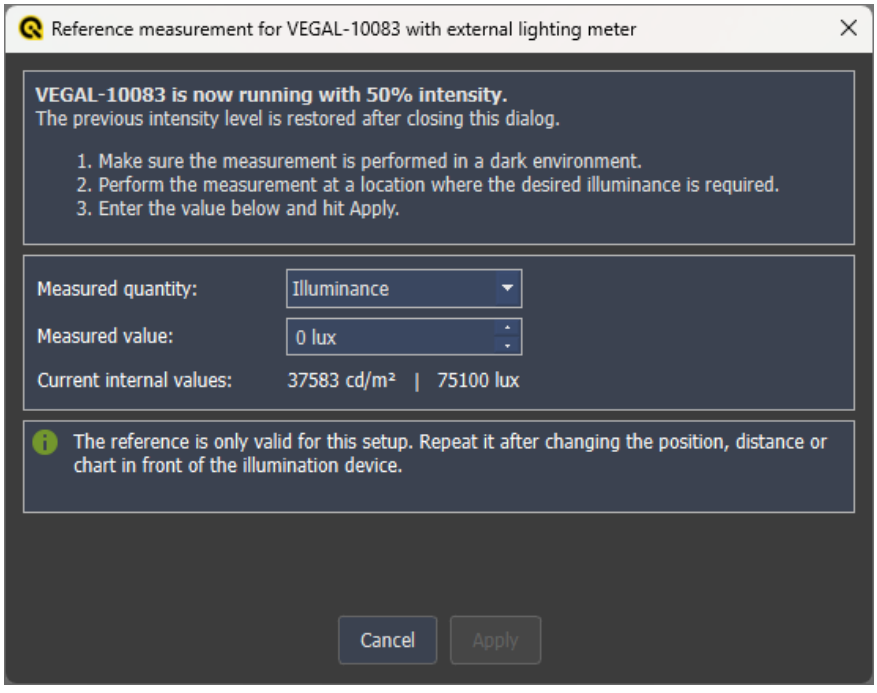


Fig. 8.5 Reference measurement

Press the “Cancel” button to abort the reference measurement and retain the current reference. Press “Apply” to confirm the reference measurement.

Note that luminance or illuminance is displayed only when “Flicker” is set to continuous mode (0.0 Hz).

Module controls

The following controls can be set individually for each module (see Figure 8.3).

- **ON/Off state**: For each module, the ON/OFF status, flicker mode, intensity interval, phase shift, intensity, flicker, and frequency can be set. To turn a module on or off, select it and click on the light bulb ③.
- **Flicker Mode**: The flicker mode can be changed in the Flicker Mode panel ④. You can choose between square, sine, and triangle waveforms.
- **Phaseshift**: To change the phase shift of the flicker, enter the angle (Δφ) and the number of periods (n) ⑥. The number of periods specifies how many periods the module normally cycles through before shifting the phase by the defined angle. This process then repeats continuously (see Figure xxx).

  For example: With Δφ = 90° and n = 5, the phase shifts by 90° every 5 periods.

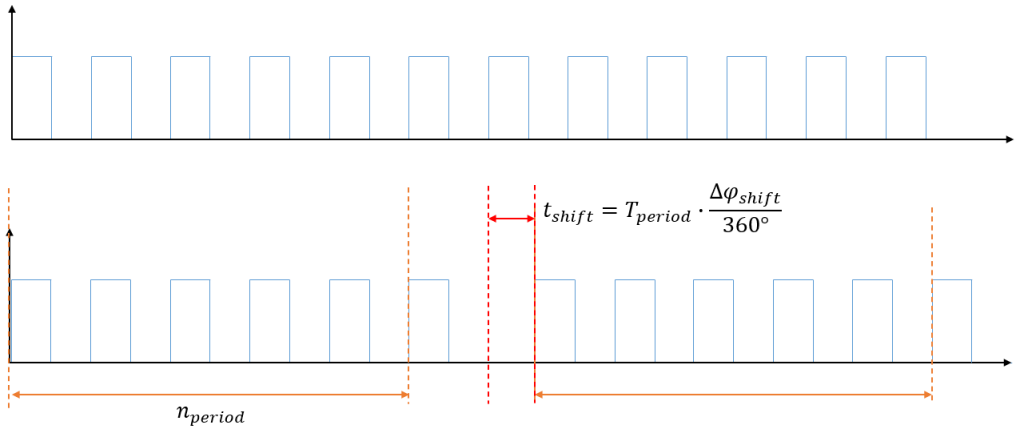


Fig. 8.6 Phaseshift

Please note that the phase shift is turned off when the intensity is changed.

- **Intensity Interval**: The intensity interval under ⑤ sets the range of the intensity slider in percent. The intensity is divided into decades to better correspond to human perception.
- **Flicker Controls**: Change the intensity, flicker frequency, or duty cycle value using the sliders, or enter the desired values in the input field ⑦. When an input field is selected, you can change the value using the up and down arrows on the keyboard. When "Flicker" is set to 0.0 Hz, the module illuminates continuously, and the "Duty Cycle" slider is inactive.

When the selected module is calibrated and in continuous mode, the current luminance/illuminance values are displayed in the source field ⑧. It also shows the temperature of the modules.

The preview window ⑨ provides a graphical representation of the current settings for intensity, flicker, and phase rotation. The width of the preview corresponds to one second.

All connected modules are saved for the current session and restored the next time the software is run.

Presets

Add the presets for all connected light sources by clicking the "Add Preset" button. The added presets are displayed in the "Presets" list ② . Clicking on the presets immediately switches to them. You can rename or delete presets using the context menu—alternatively, press "F2" to rename or the "del" key to delete a preset.

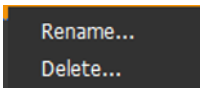


Fig. 8.7 Presets context menu

If you right-click in the free area of ②, the following options are available:

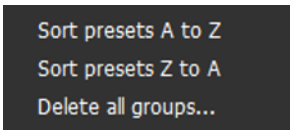


Fig. 8.8 Presets Free line context menu

Change Temperature Unit

By default, the software displays the temperature in degrees Celsius (°C). The display can be switched to degrees Fahrenheit (°F).

To do this, open the “Temperature unit” option in the “View” menu and select the desired unit (‘Celsius’ or “Fahrenheit”). The currently selected unit is marked with a check mark in the menu.

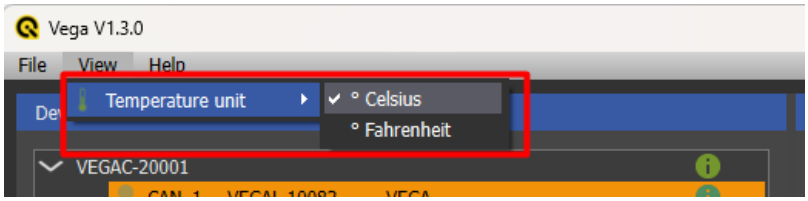


Fig. 8.9 Menu „Temperature unit“

View Device Information

Device information can be viewed for each module. To do this, position the mouse pointer over the info icon (green “i”) to the right of the module in the device list. A tooltip will then appear with the following information:

- Module firmware version: The module’s firmware version
- Lap operating time: Operating time since the last reset of the lap time
- Total operating time: Total operating time of the module
- Target temperature: Target temperature of the module
- LED power consumption: Power consumption of the LED
- LED current: LED current
- TEC voltage: Voltage of the Peltier element (TEC)
- TEC current: Current of the Peltier element (TEC)

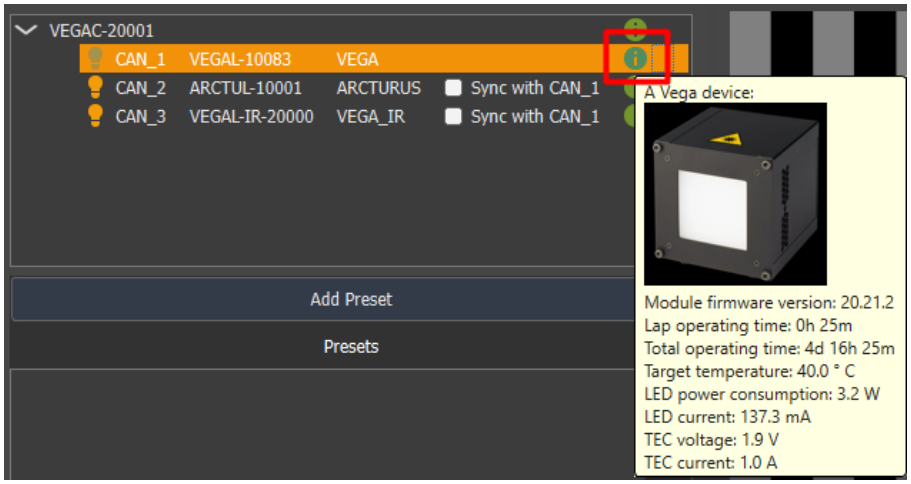


Fig. 8.10 Device Information of the module

9 Help with malfunctions

9.1 Procedure in case of malfunctions or errors

In the event of malfunctions or errors of a Lightcube-Controller, please contact Image Engineering support immediately.

9.2 Troubleshooting

Faults that cannot be rectified without opening the device may only be repaired by specialist personnel trained by Image Engineering.

10 Maintenance and inspection work for operators

10.1 General

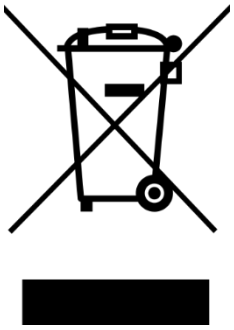
Check daily before starting work and ensure that the Lightcube-Controller is in perfect visual condition.

11 Maintenance

The Lightcube-Controller is maintenance-free.

12 Disposal and recycling

If you wish to dispose of a Lightcube controller, please contact Image Engineering Support Europe (see section 13.1) to discuss the details of the return procedure. After returning your device, Image Engineering will ensure that it is disposed of properly by a certified disposal company and will bear the disposal costs. Within the European Union, Image Engineering will also bear the costs for return transportation.



13 Appendix

13.1 Service addresses

For support inquiries, please contact:
support@image-engineering.de

Europe

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

Mon-Fri: 9:00 a.m. to 5 p.m. (CET)

Tel: +49 2273 99 99 1-0

E-Mail: info@image-engineering.de

USA

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

Mon-Fri: 8 a.m. to 6 p.m. (CT)

Phone: +1 408 386 1496

E-Mail: sales@image-engineering.us

China

Shenzhen Image Engineering Optoelectronic Equipment Co., Ltd. (IE China Subsidiary)
深圳艾宜光电设备有限公司（IE中国全资子公司）
Room 1508, Chengchi Shanhai Pingji Center,
Pingxin North Road No. 51, Pinghu Street,
Longgang District, Shenzhen City, China
深圳市龙岗区平湖街道平新北路51号城市山海平吉中心15楼1508室

Mon-Fri: 9:00 a.m. to 5 p.m. (CST)

中国子公司工作时间：每周一至周五 上午9点-下午6点

Phone: +86 158 8961 9096

E-Mail: leon.xiao@image-engineering.com



Image Engineering GmbH & Co. KG

P.O. Box:
Im Gleisdreieck 5 /DE 50169 Kerpen
Phone +49 2273 99 99 10
Fax +49 2273 99 99 1-10
Email:info@image-engineering.de
https://www.image-engineering.de/

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