



**QALIF SPECTRO**

# USER MANUAL

Version 6.0 - 27/04/2023

Designed and manufactured in France by



**QALIF SOLUTIONS**

Main worldwide distributor



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## Document Revision History

Date	Revision history	Comment
02/06/2017	1.0	Document release
08/13/2018	2.0	Pictures Update
22/06/2022	3.0	Update of the doc for QSv3
04/10/2022	4.0	Update for CB certification
24/03/2023	5.0	Add zoom and WRGB
27/04/2023	6.0	Major release, section updates and style

## Versions

The following instructions refers to the following hardware and software version.

Hardware version      **3.x**

Software version      **2.2.0**

## Support and information requests

Please contact our sales representative or send an email to [qalif@harkness-screens.com](mailto:qalif@harkness-screens.com)

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**QALIF SOLUTIONS**


# Safety, environmental and Regulatory Information


## Safety notice

Read and follow this important safety information. Failure to do so, or use of controls, adjustments, procedures, connections, or signal types other than those specified in this documentation, can result in personal injury or death, and damage to the equipment.

## Safety legend

 **NOTE:** A NOTE indicates important information that helps to make better usage of the Qalif Spectro.

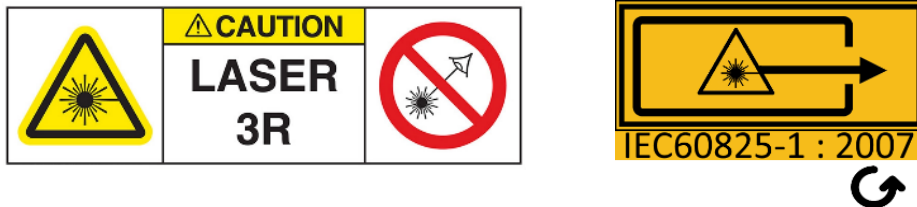
 **CAUTION:** A CAUTION indicates potential damage to hardware or loss of data if instructions are not followed.


 **WARNING:** A WARNING indicates a potential for property damage, personal injury, or death.

## Laser pointer

The Qalif Spectro uses a laser pointer to target the zone to be measured. The laser emitting point is indicated by the following stickers on the unit.

As such, all precautions relative to laser device use must be respected.



 **WARNING:** Do not stare directly at the laser beam and do not point the laser into someone else eyes.

## Specifications:

- Class: Class 3R,
- Power: 5mW,
- Wavelength: 650nm (red)

## General Safety

 **WARNING:** OBSERVE THE FOLLOWING INSTRUCTIONS TO HELP PREVENT POTENTIAL FOR PROPERTY DAMAGE, PERSONAL INJURY, OR DEATH:


- To move the equipment safely, always carry the Spectro by the handle.
- The power supply provided with the system may produce high voltages and energy hazards. Opening or removing covers that are marked with the triangle symbol with a lightning bolt may expose you to a risk of electric shock. Components inside these compartments should be serviced only by a trained service technician.
- Do not operate the equipment with any cover(s) removed.
- Do not use damaged equipment, including exposed, frayed, or damaged power cords.
- Do not use the equipment where it can get wet. Protect equipment from liquid intrusion. If the equipment gets wet, turn it off and disconnect power to the equipment and to any attached devices. Contact an experienced electrical technician for further help.
- Do not push any objects into the air vents or openings of the equipment. Doing so can cause fire or electric shock.


 **CAUTION:** OBSERVE THE FOLLOWING INSTRUCTIONS TO HELP PREVENT DAMAGE TO HARDWARE OR LOSS OF DATA:


- Do not attempt to service the equipment yourself.
- If the power supply has a voltage selection switch, be sure to set it for the voltage that most closely matches the AC power available at your location.
- Operate the equipment only from the type of external power source indicated on the electrical ratings label.
- To avoid possible damage to the system board, wait 30 seconds after turning off the equipment before removing a component from the system board or disconnecting a peripheral device from the equipment.
- Ensure that nothing rests on the equipment's cables.
- Move equipment with care. Avoid sudden stop and uneven surface.
- Keep the unit away from radiators and heat sources.
- Keep the equipment away from extremely hot or cold temperatures to ensure that it is used within the specified operating range.
- Use only approved power cable(s) rated for the equipment. The voltage and current rating of the cable should be greater than the ratings marked on the equipment.
- Observe extension cable and power strip ratings. Ensure that the total ampere rating of all equipment plugged into the extension cable or power strip does not exceed 80 percent of the ampere ratings limit for the extension cable or power strip.
- To help protect the equipment from fluctuations in electrical power, use a surge suppressor, line conditioner, or uninterruptible power supply (UPS).
- Do not spill food or liquids on your equipment.
- Before cleaning the equipment, disconnect it from the electrical outlet. Clean the unit with a soft cloth. Do not use liquids or aerosol cleaners, which may contain flammable substances.
- If the equipment does not operate normally - in particular, if there are any unusual sounds or smells coming from it - unplug it immediately and contact an authorized dealer or service center.

### AC adapter safety

The Qalif Spectro is provided with a 5V 2.54A (measured 3.0A) AC adapter and a USB-A to USB-C cable that has been designed with the unit. This adapter should be used to charge the unit.

 **CAUTION:** The AC adapter may become hot during normal operation of the equipment. Ensure adequate ventilation and use care when handling the adapter during or immediately after operation. Do not cover the AC adapter with papers or other items that will reduce cooling; also, do not use the AC adapter inside a carrying case.

 **WARNING:** If the AC adapter does not operate normally unplug it immediately from the unit and from the main line. Use of another AC adapter may increase the risk of a fire or explosion.

 **NOTE:** The output amperage of 3A at 5v DC should be respected. A minimum of 7mm length USB-C connector should be used.


### Ergonomic Instructions

Prolonged use of a Qalif Spectro can lead to frequent muscle aches and nerve pain if not done correctly unless a few guidelines are followed.

- The wrists should be in a neutral or straight position when holding the unit or the stylus.

 **CAUTION:** Improper or prolonged stylus use may result in injury

- Take breaks. These breaks can be brief and should include stretches for optimal results.
- Rest your eyes by refocusing on distant objects intermittently when working.

 **CAUTION:** Viewing a display or external monitor screen for extended periods of time may result in eye strain.

### Wireless adapter safety

The Qalif Spectro can be provided with an USB WLAN / 802.11b Wi-Fi adapter. To ensure the safe operation of the device and its users, please read and act in accordance with the following safety instructions.

- The wireless adapter is designed for indoor use only; do not place the wireless adapter outdoors.
- Do not place the wireless adapter in or near hot/humid places, such as a kitchen or bathroom.
- The wireless adapter contains small parts that are a danger to small children under 3 years old. Please keep the wireless adapter out of reach of children.
- Do not place the wireless adapter on paper, cloth, or other flammable materials. The wireless adapter will become hot during use.
- There are no user-serviceable parts inside the wireless adapter. If you experience problems with the wireless adapter, please contact your dealer of purchase and ask for help.
- The wireless adapter is an electrical device and as such, if it becomes wet for any reason, stop using it immediately. Contact an experienced electrical technician for further help.

### Regulatory Information:

Qalif Solutions is not responsible for any radio or television interference caused by unauthorized modification of the Wireless WLAN devices, or the substitution or attachment of connecting cables and equipment other than that installed by Qalif Solutions. The correction of interference caused by such unauthorized modification, substitution or attachment is the responsibility of the user. Qalif Solutions and its authorized resellers or distributors are not liable for any damage or violation of government regulations that may arise from the user failing to comply with these guidelines.



## Disposal and Recycling Information



Qalif Solutions recommends that customers dispose of their used equipment in an environmentally sound manner. Potential methods include reuse of parts or whole products and recycling of products, components, and/or materials.



This marking on the product, accessories or literature indicates that the product and its electronic accessories (e.g. charger, USB-cable) should not be disposed of with other household waste. To prevent possible harm to the environment or human health from uncontrolled waste disposal, please separate these items from other types of waste and recycle them responsibly to promote the sustainable reuse of material resources. Business users should contact their supplier and check the terms and conditions of the purchase contract. This product and its electronic accessories should not be mixed with other commercial wastes for disposal.

### Take-back solution

The product can be shipped back to Qalif Solutions at any time for the correct disposal, ensure that on the packing there is clearly noted “end-of-life disposal”.

### Disposable packing

Carton/cardboard, including packing material:

Total Weight: **550g**      97/129/EC classification: **PAP20**

Plastics included in the box used for packing, wrapping or protection (in grams): Total Weight: **0g**

Any paper included in the box, including manuals, etc. (in grams):

Total Weight: **550g**      97/129/EC classification: **PAP22**

### European Waste Codes (EWC)

To help the correct management of the unit and the accessories we list the EWC Codes for each component. An EWC Code is a six-digit code used to identify waste as listed in the European Waste Catalogue. It is formatted as three pairs of numbers, for example 12 34 56. It identifies and classifies waste into categories according to how these wastes have been produced. It adequately describes the waste being transported, handled, or treated.

Item	EWC Code	Description
Cardboard box	15.01.06	mixed packaging
Suitcase	07.02.13	waste plastic
Bag	15.01.06	mixed packaging
Bag Foam	07.02.13	waste plastic
Manual	20.01.01	paper and cardboard
Neoprene Bag	15.01.06	mixed packaging
USB Charger	16.02.14	discarded equipment
USB Cable	16.02.14	discarded equipment
Magnetic holders	15.01.06	mixed packaging
Touch screen pen	15.01.06	mixed packaging
Qalif Spectro	16.02.14	discarded equipment

## Battery

The marking on the battery, manual or packaging indicates that the battery in this product should not be disposed of with other household waste.



Substances in batteries can have a potential negative impact on health and environment and you have a role in recycling waste batteries thus contributing to the protection, a, preservation, and improvement of the quality of the environment. You should contact your local authority or retailer for details of the collection and recycling schemes available.

Where marked, the chemical symbols Hg, Cd or Pb indicate that the battery contains mercury, cadmium, or lead above the reference levels in EC Directive 2006/66.

Contact the manufacturer for replacement information.

**⚠ WARNING:** Do not disassemble, break, or puncture the battery or attempt to dispose of it in fire. If you intend to dispose of the product, the waste collection center will apply the appropriate measures for recycling and treatment of the product, including the battery.

The Qalif Spectro units contain a Li-ion battery composed by 3 cells of 9.62Wh each for a combined total of 28.86Wh.

## Composition

Chemical Name	Concentration range (%)	CAS Number
Lithium Cobalt Oxide	35-38	12190-79-3
Graphite	20-22	7782-42-5
Copper	9-10	7440-50-8
Aluminum	5-6	7429-90-5
Ethylene carbonate	14-16	96-49-1
Polypropylene	5-6	9003-07-0
Carbonate methyl ethyl	4-5	623-53-0
Phosphate (1-), hexafluoro-lithium	5-6	21324-40-3

**📄 NOTE:** Addition information about the battery can be found at the end of this document. ([Battery MSDS](#))

**⚠ WARNING:** Do not dismantle, open or shred the battery; ingredient contained within, or their ingredients products could be harmful. The battery is not dangerous with normal use.

**⚠ WARNING:** In case of battery fire, toxic fumes, gases, or vapors may evolve on burning. The combustion produces carbon monoxide, carbon dioxide, lithium oxide fumes and so on.

## End-of-Life disassembly

The disassembly of the unit should be performed by qualified technician only, with the right tools only and under Qalif Solutions approval.

Before working on the equipment, make sure the equipment is not damaged or burned. Make sure this operation is done in good condition and in a ventilated area.

- Discharge the battery below 25%. A charged lithium-ion battery can catch fire and/or explode if accidentally punctured.
- Always power off and unplug completely the unit from the AC adapter before working on it.
- Plan the work carefully, try to anticipate potential hazards, and take steps to avoid them. Ensure to work on a hard and stable surface.
- Be careful when disassembling, components are fragile and can be sharp, parts may fall off and injure or cause death.



**CAUTION:** Disassembly of the unit will void the warranty.

#### Working inside of the unit



**WARNING:** Hazardous moving parts. Keep away from the moving fan blades or servo.

- Disconnect the battery and wait 10 minutes before touching the electronic boards.
- To prevent electrostatic discharge (ESD) from damaging the system, be aware of the precautions to consider when setting up the system or handling parts. A discharge of static electricity from a finger or other conductor may damage system boards or other static-sensitive devices.
- Avoid touching pins, leads, or circuitry.
- Always be properly grounded when touching a static-sensitive component or assembly.
- Check the voltage rating before connecting the equipment to an electrical outlet to ensure that the required voltage and frequency match the available power source.

## Introduction

The Qalif Spectro is a fast and portable spectroradiometer, that allies performance and ease of use. Originally designed for cinema environments like screening rooms, post production laboratories and system integrators; where it is important to get quick and recurrent measures.

Qalif Spectro is provided with a Rough Box Hard Cases that protect the unit during transportation or shipping and a Soft Bag to permit to reduce size and weight when necessary.

The unit could quickly be aligned to the measurement area thanks to the automatic laser pointer and the measurement data can be easily transferred using an USB drive or an SFTP client.

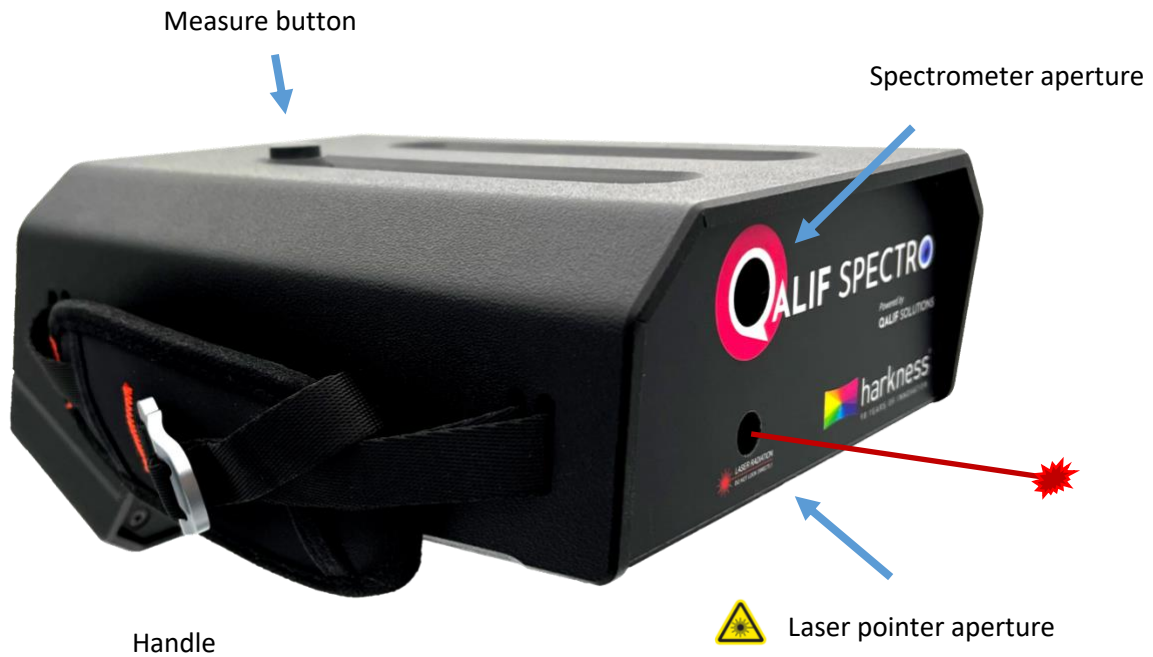
## Package content

- Hard Suitcase
- Soft Bag with personalized foam
- Qalif Spectro
- Quick start guide
- Calibration Certificate
- Accessory bag
  - Power supply
  - International plugs
  - USB-C to USB-A cable
  - Capacitive Stylus Pen
  - Magnetic filter holder (polarized 3D or diffusing filter)
  - Diffusing filter
  - Magnetic light integration tube for direct contact measurement

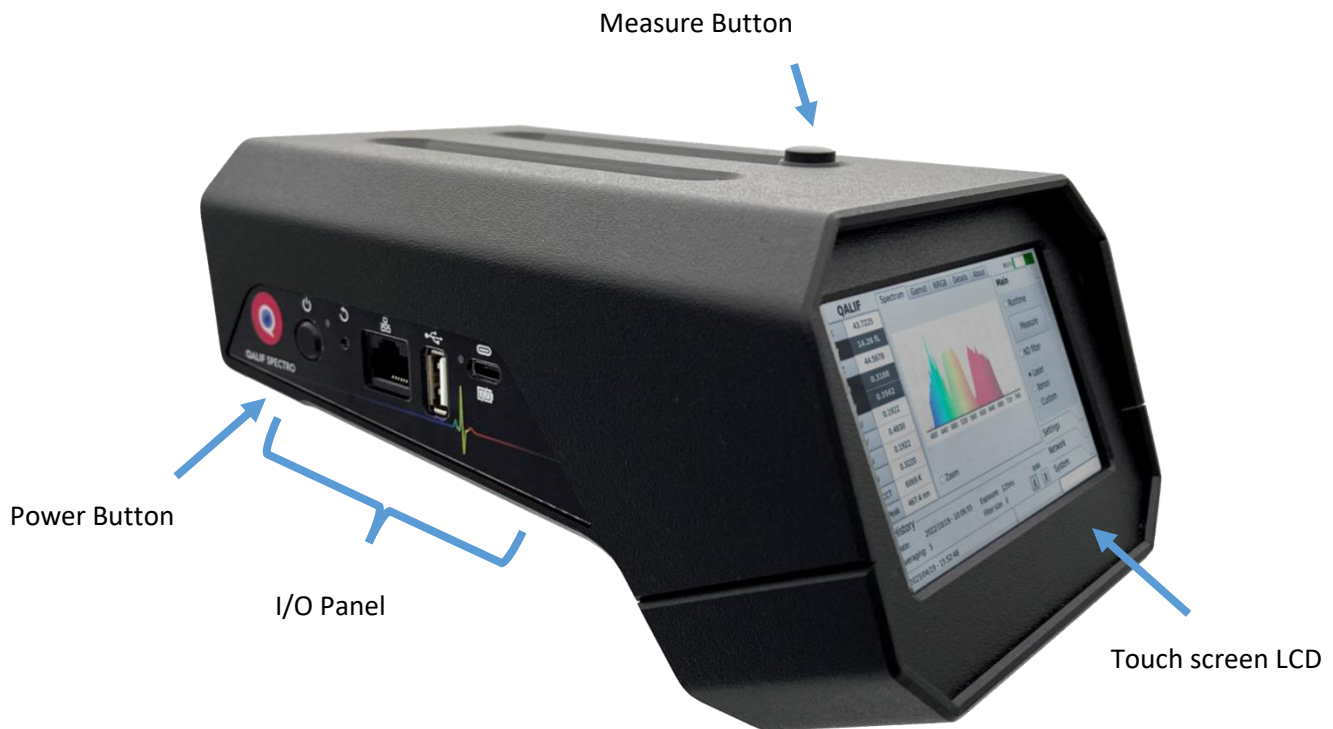


## Unit photos and details

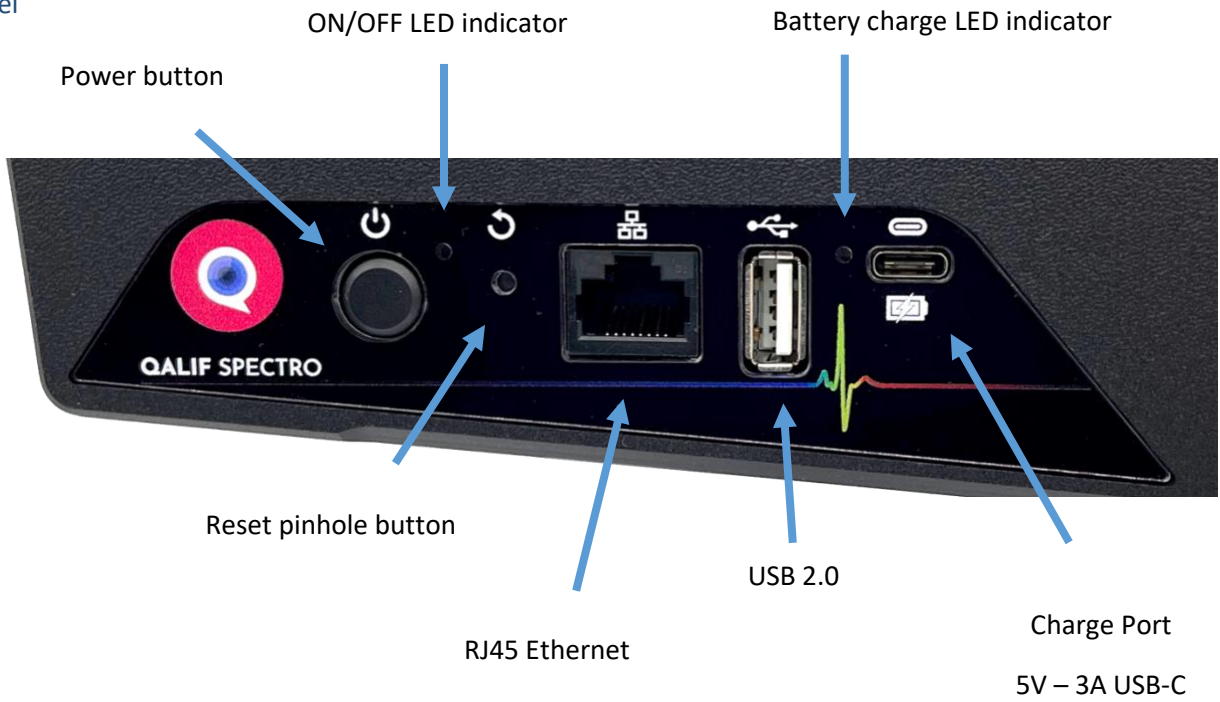
### Front view



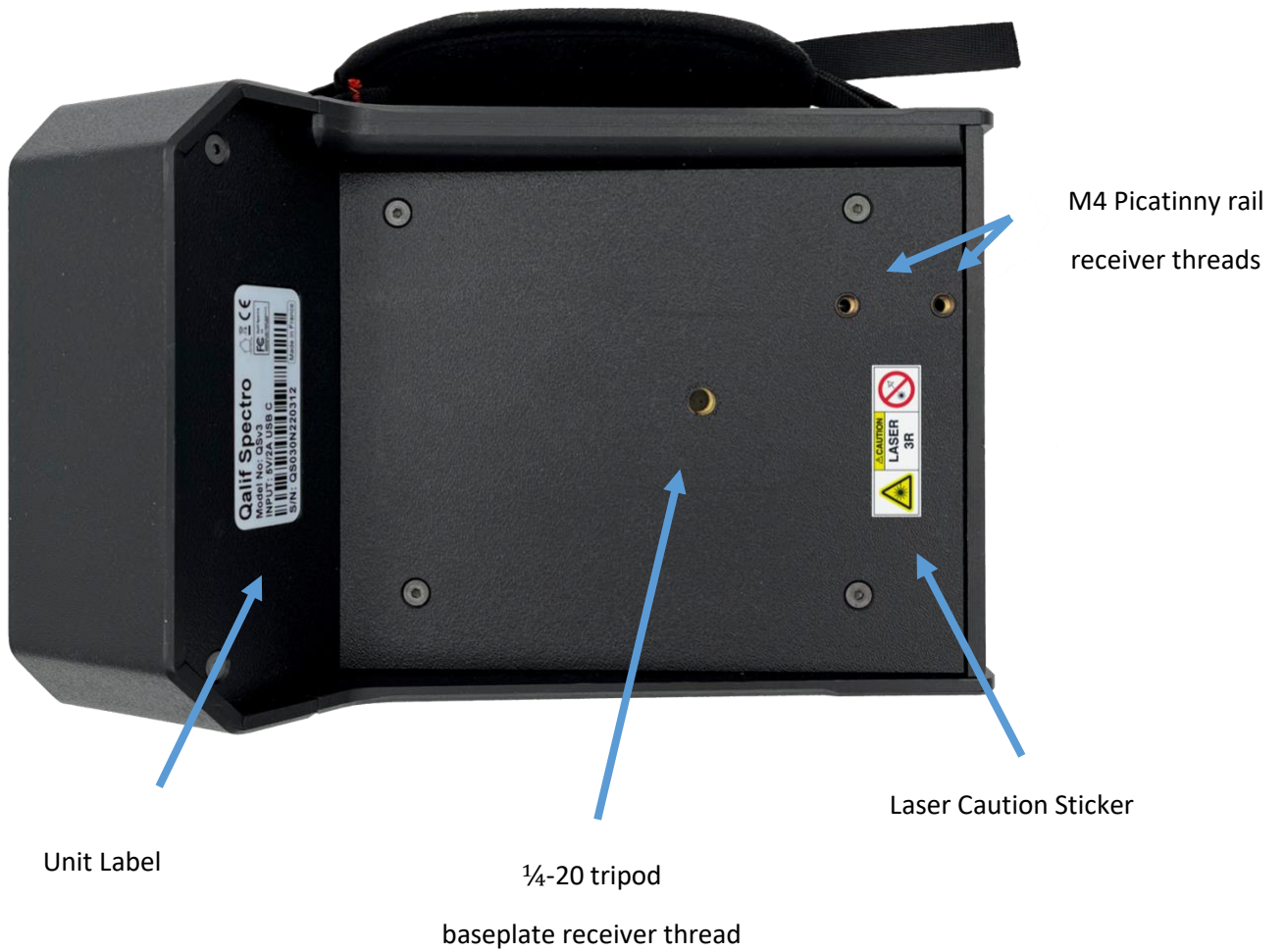
### Rear View



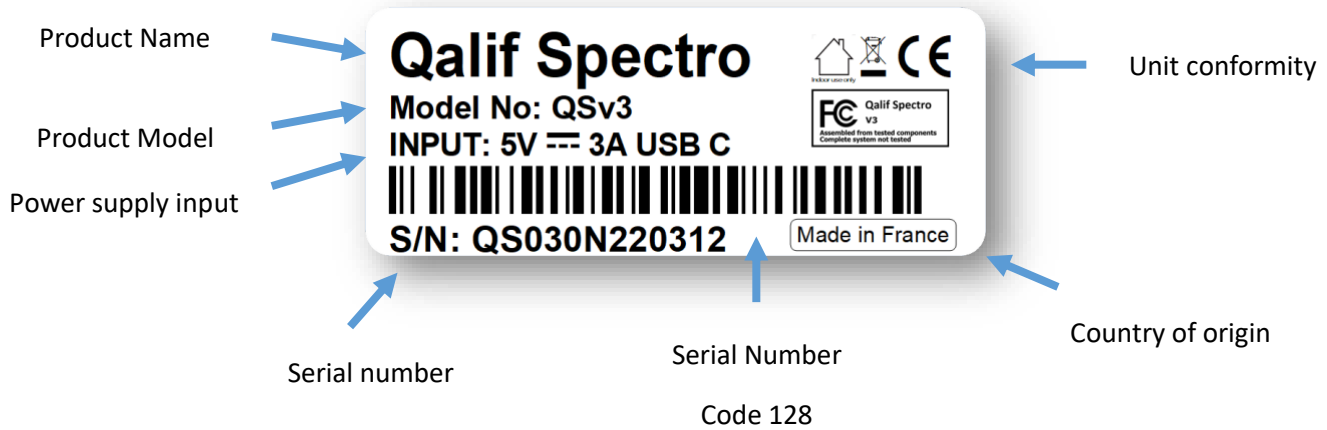
I/O Panel



Bottom View



## Product Label



## Technical Specifications

Photometric CIE values spectral range	380 nm to 780 nm (200 nm to 850 nm on request)
Spectral Bandwidth FWHM	2 nm (1 nm on request)
Pixel Resolution	0.3 nm/pixel
Detector	2048 pixels
Color Accuracy*	$\pm 0.0015$ for CIE 1931 xy
Luminance Accuracy*	$\pm 1\%$
Luminance Range	0.01 cd/m <sup>2</sup> up to 100 000 cd/m <sup>2</sup> 0.003 fL up to ~29 000 fL
Luminance with the Neutral Density Filter (ND Filter)	more than 200 000 cd/m <sup>2</sup> more than 58 000 fL
Measuring Values	cd/m <sup>2</sup> or fL CCT/xy/u'v'/wavelength peak/dominant color
Measuring Aperture	2° (FOV)
Size	229 x 109 x 103 mm ~ 9 x 4.3 x 4 inches
Weight	1.2 kg ~2.646 lb
Display Type	Color LCD with capacitive touch screen
Display Resolution & Sample rate	800x480 px – 60Hz
Battery Type & Capacity	Rechargeable Li-ion 3.7 V / 7800 mAh / 28.86 Wh
Battery controls	Protection Circuit Module (PCM) Battery Management System (BMS)
Battery life	up to 4 hours
Unit input power	DC 5 V, 3 A, USB-C-Type socket
Power supply input	AC 100 – 240 V, 50/60Hz, 0.3 A
Power supply output	DC 5 V, 3 A, USB A-type socket
Allowed mains supply voltage fluctuations	$\pm 10\%$
IEC Overvoltage Category	Category II

\*For A illuminant and against NIST Luminance standard

## Environmental Specifications

Usage	Only for indoor use
Altitude	< 2 000 m above sea level < 6 600 ft above sea level
Operating Temperature	non-condensing 5 °C to 35 °C (41 °F to 95 °F)
Storage Temperature	-25 °C to 60 °C (-13 °F to 140 °F)
Relative Humidity	20 - 80 %
Pollution Degree of the intended environment (IEC 60947-1)	Degree 2: Normally, only non-conductive pollution occurs. Occasionally, however, a temporary conductivity caused by condensation may be expected.

## Access & Passwords

Ethernet Address	Assigned by DHCP
WiFi Hotspot (with USB dongle)	SSID: <UnitSerialNumber>-Hotspot Password: oblivion
VNC (Virtual Network Computing)	Password: veeone
sFTP (File Transport Protocol)	User: qalif Password: qalif Port: 22
SSH (Secure Shell)	User: sysadmin Password: veeone Port: 22

## Control Interfaces

The unit is based on a stand-alone Linux system with preinstalled Qalif software. This allows control of the unit locally from the touch screen LCD or from any system capable of using VNC or API commands, no specific software installation is required. There are several connection options described below.

### Touch Screen LCD

Qalif Spectro could be controlled from the built-in capacitive touch screen LCD. The measurement could be quickly taken by pressing the measure button on the top of the unit but for changing settings and browse history data we suggest using the provided screen pen for have a better accuracy on the operations.




### VNC

A standard VNC (Virtual Network Computing) client software can be used to connect to the Qalif and access to the main interface using the configured IP address.





 **NOTE:** There are two ways to connect over network with the equipment one is via Ethernet the other via the local Wi-Fi hotspot using the USB dongle (on demand). More details are available in the [APPENDIX](#) section of this document.

Examples of VNC Clients on different Operating System:

- Windows: UltraVNC Viewer, RealVNC Viewer, VNC Viewer
- Mac OSX: Screen sharing, Chicken of the VNC, RealVNC Viewer
- Linux: RealVNC Viewer, gtk-vnc, TigerVNC

#### API


All Qalif Units share the same API system that allow to remote connection and control the unit via Ethernet. Please contact your account sales representative for more info.


#### Power on the unit

To power on the unit press the power button for 2-3 seconds.

A blue LED will turn on and the LCD will turn on display the boot process. The boot process is complete when the Qalif application is displayed.



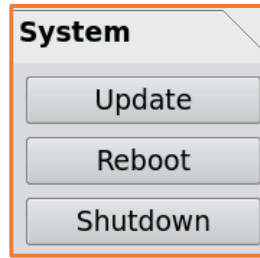
 **NOTE:** If is the first time that the unit is turned on, please ensure to update it to the last software version. The update process is described in the [APPENDIX](#) section of this document.

 **CAUTION:** If the unit does not start, it could be due by low battery power, please connect to a power source and test again.

#### Power off the unit

To power off the unit two options are available:

- a. Press shutdown button that could be found in **Control Panel > System > Shutdown**



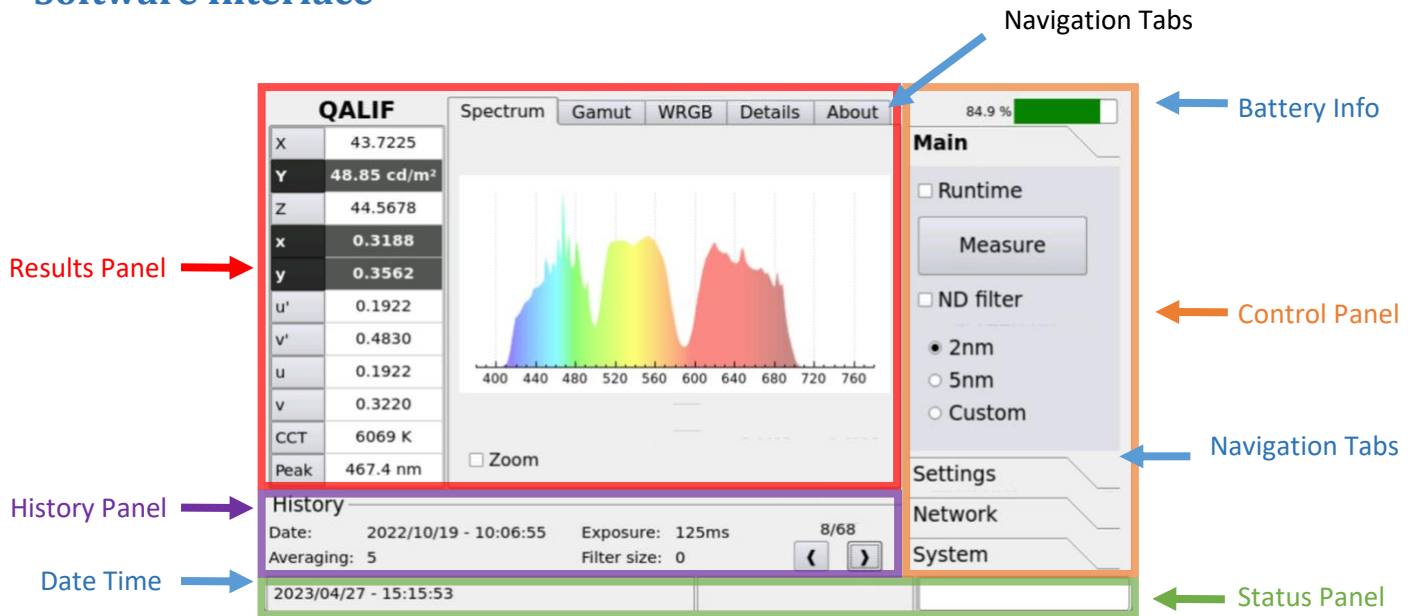
When Restart or Shutdown are clicked, a confirmation pop-up window appears.



- b. Press the power button for 2-3 seconds, the unit will “beep twice” when the shutdown process starts.

Once the Power LED is off the unit is correctly shutdown.

# Software Interface



## Results Panel

The Result Panel will show by default the last measurement taken with the unit.

The left side consist of a quick overview of the computed colorimetric data. The luminance **Y** and the colorimetric coordinates **x** and **y** are highlighted.

On the top side, there are 6 selectable tabs: Spectrum, Gamut, WRGB, Details, About and the hidden Log. More details on those tabs can be found in the [Result Panel](#) Section.

## History Pane

The history panel allows the user to navigate through the measurement history. The full measurement detail will be displayed in the Result Panel. More details can be found in the [History Panel](#) Section.

## Control Panel

The Control Panel contains the Spectro action buttons and the unit configuration setup. More details can be found in the [Control Panel](#) Section.

## Status Panel

The Status Panel contains information about the current date time and the unit status. More details can be found in the [Status Panel](#) Section.

## Control Panel

In this document section are the details of the Control Panel section, the battery status and the sub-menus that allows the user to take actions and change unit configuration settings.

### Battery Status

Located on top right the battery info displays the battery state. A text percentage and a colored bar indicate the current charge level as follow:

- **Normal:** battery above 30%



- **Low:** battery between 20% and 30%



- **Very Low:** battery below 20%





Once under 20% the unit will still have 30 min battery (depending on battery life). Once 1% is achieved the following popup will appear before the unit make a secure shutdown.



When the unit is in charge the colored bar will animate:



When the battery is fully charged, the bar will stop oscillating and the charge percentage will indicate 100%.

 **NOTE:** If a warning icon  appears near the battery status the battery need to be recalibrated. Please follow the instruction described in the [APPENDIX](#) section of this document to reset the battery calibration.

### LED charge indicator

A LED located near the USB-C charging port will also indicate the charging status, this is particularly useful when the unit is powered off. The LED has two status indicators while the USB-C cable is connected. The LED will go off when the USB cable is disconnected.

**Red:** the unit is in charge



**Green:** the unit is fully charged



## Main sub-menu

Simple sub-menu which gives access to the main functionality of the Qalif Spectro, i.e., taking a measure.

When **Runtime** is checked it enables the continuous measurement mode, when is not checked the One-shot mode will be used for the next measurement, please refer to the [Take a Measure](#) section for more details.


When checked the **ND filter** mode enables the ND filter for measurements while checked, please refer to the [Neutral Filter](#) section for more details.

The main sub-menu also gives a quick access to switch between registered filters. This allows to perform measures with different smoothing filters very easily, without having to constantly redefining the filter.

## Settings sub-menu

This sub-menu contains most of the setting parameters concern the measurement parameters and will affect the measure results.

The **Laser On / Off** button allows to switch the laser pointer on or off. When switching on the laser while taking a runtime measure (does not work in One Shot mode), the laser wavelength will appear in the spectrum.

 **NOTE:** This function could be used to check the alignment between the laser and the spectrometer.

The **Shutter** button allows to open/close the internal spectrometer shutter. This button should never be used and especially during a measure. This function is present only for mechanical testing purposes.

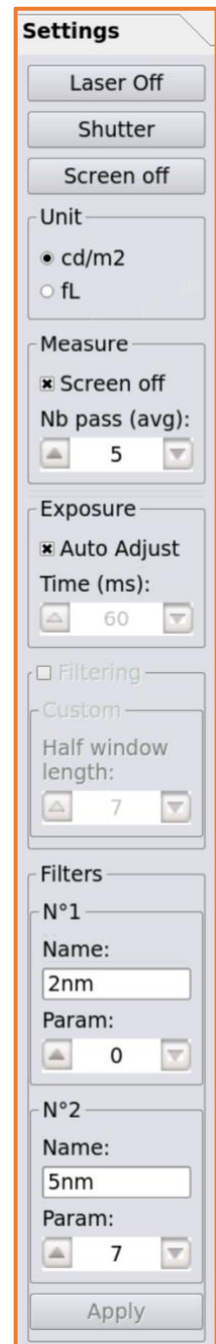
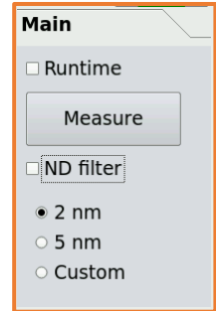
**Screen off** button allow to turn off the screen if the unit is used remotely.

**Unit** sub-section changes the displayed unit for the Y in the Result Panel between  $\text{cd}/\text{m}^2$  to fL.

**Measure** sub-section allows to setup how the Qalif perform measurements. The **Screen off** checked allows the Qalif Spectro screen to be automatically switched off during an acquisition and switched back on when the acquisition is terminated. It is used to ensure that the light emitted from the screen does not disturb the measure. This is useful when performing acquisitions in low light environment where every light source must be switched off. The **Nb pass (avg)** or averaging parameter is the number of measures taken and averaged to give one final resulting measure. An averaging of one is no average, the taken measure is the result. With an averaging parameter of N, N measures are taken, summed, and divided by N resulting in one averaged measure. Averaging acquisitions allows reducing the noise of the measure and thus reducing the results uncertainty. Averaging parameter range: [1 to 20]

**Exposure** or Integration-time parameter is the duration while photoelectric information gathered from the light sensor are accumulated (integrated). Measure integration-time can be set following two modes:

- Auto-adjust mode: the Qalif Spectro automatically adjusts the integration-time to get the best acquisition exposure.



- Manual mode: the user can define manually the integration-time of the measure. This is useful to obtain measures with a fixed integration-time and to compare measures with the same integration-time.  
Integration-time range: [1 to 65000] (in ms)



**NOTE:** The Exposure should be kept in Auto-adjust in normal usage.

**Filtering** is used to smooth the spectrum curve and then remove some details; this allows to reduce the resolution of the measurements. The Qalif Spectro is using only one filtering type which is the box filter (square filter or also called simple moving average). This filter has only one parameter which is the filter half-length. This parameter refers to the group of considered pixel on each side of a central pixel to "reduce" the spectral resolution (not the bandwidth). [0 to 512]



**NOTE:** A filter value of 0 correspond at the maximum spectral resolution of the unit.

*For example, a value of 7 will take a central pixel plus 7 pixels left hand plus 7 pixels right hand and average the readings of those pixels.*

$$7 + 1 + 7 = 15$$

*This group of 15 points multiplied by the px per nm of the Qalif Spectro that is 0,3nm equals to a simulated resolution of 4,5nm.*

$$15 \times 0.3nm = 4.5nm$$



**NOTE:** Filtering can be applied only if custom is selected in main sub-menu of the Control Panel.

Besides the Custom filter, the Qalif Spectro possesses two registered **Filters** which names can be modified by the user. The configured name parameter is the filter name as it will appear in the main sub-menu (filters quick access).



**NOTE:** To modify the registered filters, the user needs to modify the values in the interface and then click on the Apply button, otherwise the modifications are not considered. If a new measure is requested while there are registered filters pending modifications, those later are lost.

## Network sub-menu

The network sub-menu lists all the network interfaces available. Along each network interface, the corresponding IP address is displayed. This sub-menu is useful when connecting the Qalif Spectro to an Ethernet LAN to retrieve the IP address allocated by the DHCP.



## System sub-menu

The system sub-menu gives access to the Qalif Spectro system capabilities.

**Update** button allow to open the update panel. Please refer to [APPENDIX](#) section for more information.

**Reboot** button reboots the unit. A confirmation via a popup will be requested.


**Shutdown** button, starts the unit shutdown. A confirmation via a popup will be requested.

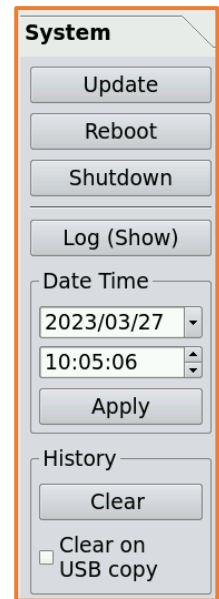
**Log (show/hide)** display or hide the log tab of the central panel for interface log browsing. More details on this tab can be found in the [Result Panel](#) Section.

**Date Time** sub-panel allows change the date and system time. The changes need to be confirmed by clicking on Apply button.

**History** sub-panel contains the button to clear all measure history content from the unit.

When a fat formatted USB drive is plugged to the unit the Qalif software will copy some data on the USB. Few seconds after the connection an overlay message in the upper right corner of the user interface will confirm that data transferring.

 **CAUTION:** If the **Clear on USB copy** is enabled Qalif will then clear the local history file after the export is successful.

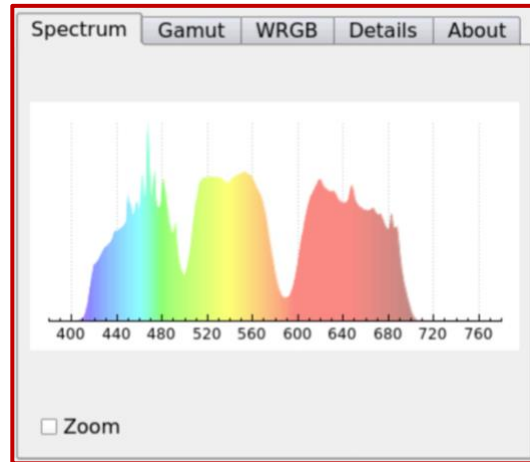


## Result Panel

In the Result Panel, there are 6 tabs, Spectrum, Gamut, WRGB Offset and Details tabs contains different representation of the measurements, About and the Log (that should be enabled in the settings to be visible) contains unit information.

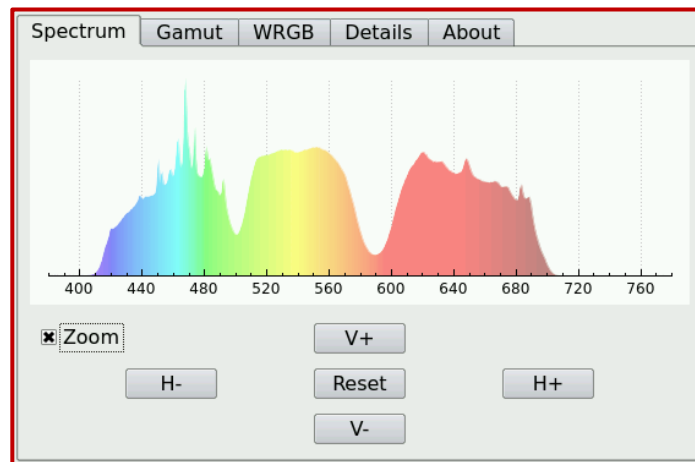
### Spectrum Tab

It displays the measure calibrated spectrum.



### Zoom

When zoom is activated,  Zoom the spectrum will expand on the screen and hide the side panels.



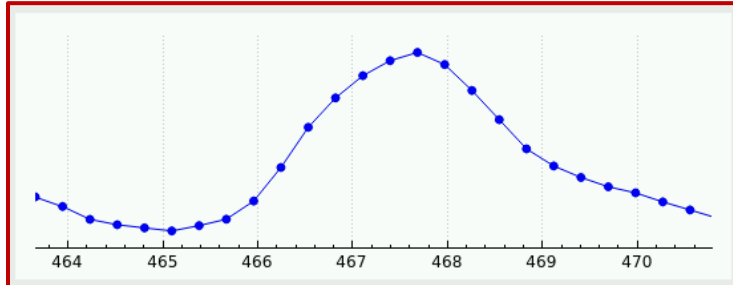
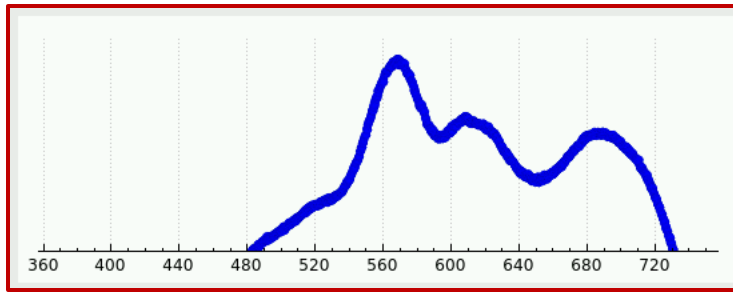
The buttons allow to zoom into the spectrum.

and  for vertical zooming


and  for horizontal zooming

When zoomed, the curve turns blue, and the filling colors disappear. The blue dots are the representation of all points measured by the spectrometer.






The spectrum can be moved up/down and left/right. Touch and hold in the spectrum area to move it.

The navigation buttons of the History tab  allow to quickly switch from one measurement to another.

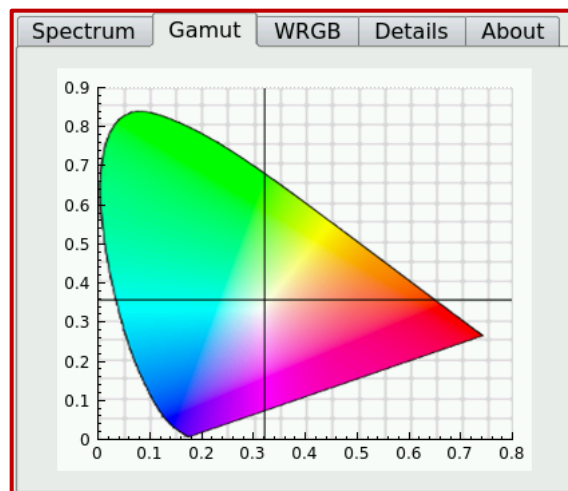
The reset button  will restore the default view.

Uncheck the zoom button to go back to the normal screen.

 **NOTE:** When using a VNC connection, a mouse can be used to move and zoom the graph.

## Gamut Tab

The Gamut tab shows the visualization of the measure chromacity coordinates on a gamut. It both eases the verification that it really corresponds to what was measured and the perception of the measured color.



## WRGB Tab

Introduced with the software version 2.2.0 the WRGB tab allows to summarize the last 4 measurement and in the professional projection market it gives the possibility to automatically apply an Offset to the White / Red / Green / Blue measures for special calibration purposes.



**CAUTION:** When enabled, the offset calculates and shows in this tab different values from the ones that are measured and should be used only by professional technicians that have complete consciousness of what they are doing.



### Automatic mode

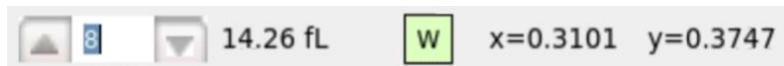
With this selected mode  Auto, the 4 last measurements are sorted in the tab with the older measurement on top and the last one on the bottom of the list.

- First line: last measure -3
- Second line: last measure -2
- Third line: last measure -1
- Fourth line: last measure

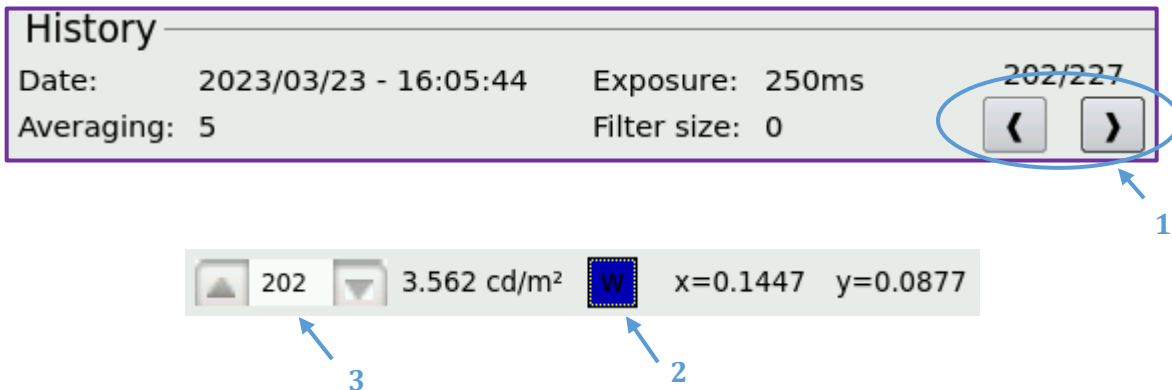
When a new measure is taken the lines will shift up and the last value will be displayed in the bottom line.

### Manual mode

Disabling the Auto mode  Auto allows the manual reorganization of the measure using the up  and down  buttons. When remotely connected to the unit via VNC the number of the measure can be entered.



Another way is to use the navigation buttons of the History tab (1) and click on a color square (2) to automatically apply this measure id to this line (3).




Each color square (2) displays the similar color information relative to the selected measure to help the choice and the verification.

When the Auto mode is enabled, a click on a color square will deactivate it.

### Offset

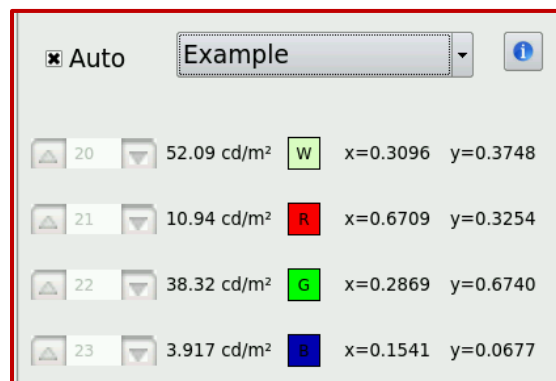
In some cases, is necessary to apply an offset to the result of the measure. The ability to configure and apply an automatic offset calculation decrease the probability of human errors. The offset can be selected with both Auto mode enabled and disabled.


 **NOTE:** In the professional projection sector along with the usage of different light sources (Xenon Lamps, RB Laser, RGB Laser, High-pressure mercury Lamps, LED, ...) and technologies (3 Chip DLP's, Single DLP Chip, LCD, ...) sometimes is required to shift the measured value so that once the projector is configured with those values different target color are displayed. The key reason to perform those shifted calibrations is to reduce the different white point perception between the different technologies.

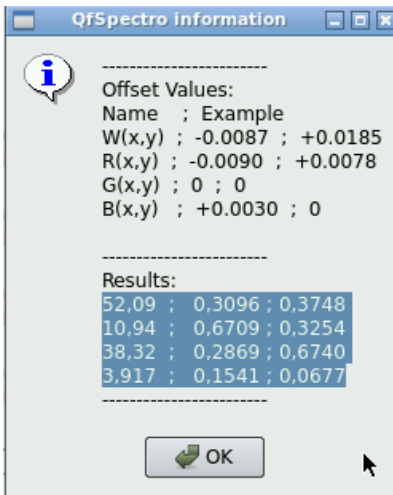
With a selected offset, values are automatically displayed, only in this tab, with the calculated offset for each color. For this reason, it's mandatory to respect the WRGB order:

- First line: White
- Second line: Red
- Third line: Green
- Fourth line: Blue

When the offset is enabled WRGB letters will appear in the interface to help the user to verify that the color has been taken in the right order (White, Red, Green, and Blue)



The info  button open a popup window containing the details of the offset values and the calculated results. When remotely connected to the unit via VNC, those values can be easily selected and copied.



**CAUTION:** The WRGB color positions should be respected for the correct offset calculation.

### Configuration

Multiple custom offset files can be configured on the unit according to the user need. The unit is provided by default by a default Example.

The custom offset files are located on the unit in the `/opt/qalif/run/env/WRGB_xy_Offset/` folder.

### Example

Example.txt				
Name	;	Example		
W(x,y)	;	-0.0087	;	+0.0185
R(x,y)	;	-0.0090	;	+0.0078
G(x,y)	;	0	;	0
B(x,y)	;	+0.0030	;	0

The values in **Blue** are the value that are customizable.

The file name (Example.csv) is the name displayed in the drop-down list of the GUI.

The Name (Example) configured in the file content will appears in Info.

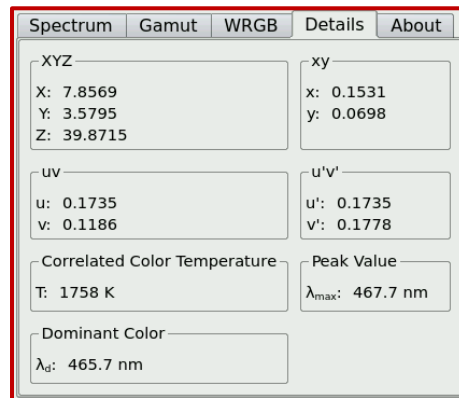
### Use case


A non-exhaustive list of use case for the offset:

- Trick the Digital Projector color calibration to have the same white point color perception with different technologies (Xenon, Laser, ...)
- Compensate for UV Filter aging or misalignment of a primary color and always apply the same compensation at every calibration.
- For Festival, Premieres, Post-Production, Home Cinema or other places where there is a need to obtain a different look but always with the same offset from the measured values.

## Details Tab

The Details tab gives information about all the data computed from the measure calibrated spectrum. Apart from the Peak value, the data are all based on CIE standards.




 **NOTE:** The Dominant Color box that is showed in the picture above could change the name depending on the measure chromacity coordinates, the name can be:

- Dominant Color,
- Complementary Color
- Achromatic Color (in the case of a pure white color of coordinates (0.33,0.33))

## About Tab

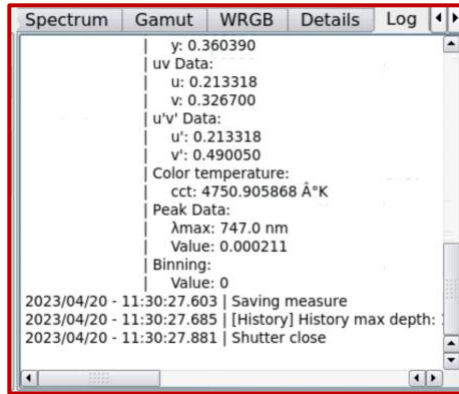
The About tab contains information relative to the Qalif Spectro unit like the model, the serial number, and the current version.





 **NOTE:** The information contained in the About panel must always be provided when contacting the Support team.

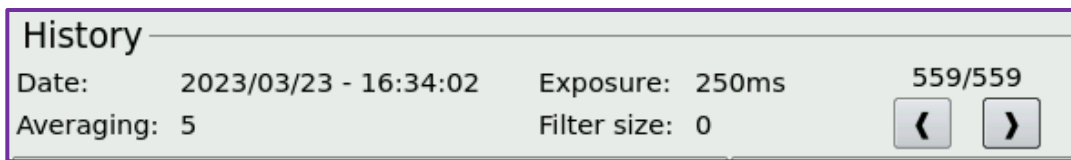
## Log Tab

Enabling the Log in the System sub-menu will show a new Tab in the Result Panel that contains the log of the activity of the software and the operations of the spectrometer during the measurements.




## History Panel


The History Panel allow to browse the measures history by pressing on the navigation buttons  and .



It also displays relevant measure information's: **Date, Averaging, Exposure, Filter size** of the time of the measurement.

The History mechanism is automatic and there is no need to explicitly press a save button. All measures taken in One-shot mode are then saved in the history for future retrieval. No measurements taken in Runtime mode are saved to the Spectro memory or recorded.

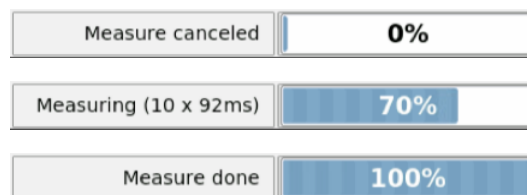
 **NOTE:** More details about One-shot and Runtime measurements could be found in [Take a Measure](#) section of this document.

 **CAUTION:** The history memory contains one thousand measure slots. When the history memory is full and another measure is taken, the oldest one is replaced by the new one. To clean up the memory please refer to [Control Panel > System](#) section in this document.

## Status Panel

The Status Panel show the current date time on the left and on the right, it indicates what operation the Qalif Spectro is performing and its actual progression. This gives information about the waiting time before the operation terminates and is particularly useful when requesting a measure with a high integration-time.

Some examples of the displayed information's:



## Take a Measure

Take a measure with the Qalif Spectro is simple and it is almost the same as taking a picture with a two-steps photo camera button.

Correct measure procedure:

- **Press** (and keep pressed) the measure button.
  - The laser pointer will turn on.
- **Target** or verify the measuring target using the laser pointer.
- **Release** the measure button:
  - The laser pointer will turn off.
  - The measure will be taken.

For a detailed list of actions and calculations that the Qalif Spectro does during a measure please refer to the [APPENDIX](#) section.



**NOTE:**

The Qalif Spectro have two measure buttons, a physical button on the top of the unit and a software button. Both buttons behave the same, but the software button can be used to start a measure remotely via remote access.



**WARNING:**

When the measure button is pressed the laser pointer will turn on, particular attention should be used when the measure is started remotely.

Qalif Spectro have three main measurement modes: One-shot, Runtime and ND-Filter.

### One-shot Measure

One shot mode is when only one measure is taken when the measure action is requested. At the end of the measure the Qalif Spectro returns to an idle state.



**NOTE:**

When the integration-time is in auto-adjust if the target to measure is too dark or too bright, the measure will not be taken, and an error message will be displayed indicating the details of the problem and the possible solution.

### Runtime Measure

In Runtime mode, when the measure action is requested, the Qalif Spectro will continuously take measures and the interface will be regularly updated with new data from the continuous acquisition. In this mode, no measure is registered in the history. Runtime acquisition is stopped either by pressing the measure button or by changing the acquisition mode back to one-shot.

Low light and saturation are checked only during the first measurement. Afterward, no control is performed to avoid stopping the runtime acquisition.



**CAUTION:**

No control is performed during the runtime acquisition and the measure results can be biased and as much as the measure conditions varies over time.



**NOTE:**

When a very low integration-time is used, not all the measures are displayed to prevent interface overwhelming and lagging. The interface cannot be refreshed at a rate of one measure per millisecond, which is the minimum integration-time applicable.



**NOTE:** This mode can be used to verify that the laser is still aligned with the spectrometer. During the runtime measurement the laser can be activated in the settings, and if the targeted luminance is not too high, the laser ray peak will be visible @650nm.

## Neutral Filter

The Qalif Spectro is provided with an internal calibrated Neutral Density Filter (ND Filter) that can be used to decrease the light that will go to the spectrometer that permit to reach very high Luminance values and/or increase the measurement time.



**NOTE:** When the ND Filter is enabled the Qalif Spectro changes the optical path mechanically and the software uses the ND Filter specific radiometric calibration.

### Use case

Non exhaustive list of possible usage of the ND Filter:

- High Luminance light source to measure that saturate the spectrometer,
- Unstable light that needs a longer integration time to have stable result,
- Home Cinema Projectors that uses a 1 Chip and a color wheel that need an increased integration time due to the hi-speed of the Qalif Spectro,
- Some non-cinema Phosphor projectors.

## Measure parameters

In the following table are listed the configurable parameters that affect the result of the measure and that could be setup on the Qalif Spectro. For a detailed description on those parameters refer to the section [Control Panel > Settings](#) section of this document.

Parameter	Possible values
<b>Averaging parameter or Nb pass (avg)</b>	[1 to 100] pass
<b>Exposure</b>	[1 to 65000] milliseconds or Auto Adjust
<b>Filtering</b>	[0 to 512] (e.g., 0 is 2nm bandwidth, 7 is 5nm bandwidth)

## Cancel a Measure

A running measure can always be cancelled but measure aborting is not instantaneous and is depending on the integration time of the current measure.



**NOTE:** The maximum aborting time is defined by the maximum integration time available on the Qalif Spectro that is set to 65s.



## Calibration

Calibration is an important process during which the unit biases are evaluated. The biases compensation data are computed and stored as a calibration file. These compensation data are then used each time a measure is requested to give the best reality fitting results.



**NOTE:** Each Qalif Spectro is calibrated before shipment. However, spectrometers physical parameters drift over time. The Qalif Spectro then needs to be re-calibrated periodically.

## APPENDIX

### Connect to the unit

To connect on Qalif Spectro both Ethernet or Wi-Fi could be used.

#### Ethernet

The unit can be connected to the network via Ethernet by plugging a RJ45 cable in the RJ45 Ethernet port.

The Qalif Spectro is configured in DHCP mode. It then requires to be placed in a network with a DHCP. No network interface configuration is provided; it is hence impossible to modify the network connection behavior.

#### Wi-Fi Hotspot (on demand)

Qalif Spectro can be provided an on-demand Wi-Fi hotspot to allow access to the unit for wireless device such as Computer, Tablet or Phones. The Qalif Spectro does not embed Wi-Fi capabilities on its own, but the feature is offered by using a Wi-Fi dongle that can be purchased with the unit.



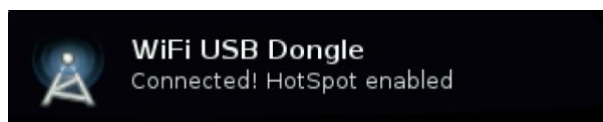
**CAUTION:** Please use only the provided and certified Wi-Fi USB dongle.

To enable the Wi-Fi hotspot, connect the Wi-Fi USB dongle to one USB port on the side of the Qalif Spectro.



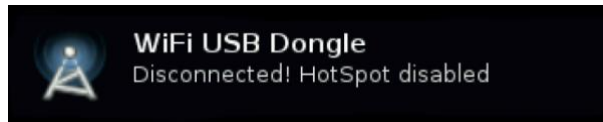
Wi-Fi USB dongle

Few seconds after the connection an overlay message in the upper right corner of the user interface will confirm that the Wi-Fi hotspot is enabled.



When enabled the hotspot is named **<UnitSerial>-Hotspot** (e.g. qs030n210251-HotSpot) to be unique for each Qalif. The password for the connection is **oblivion**.

To deactivate the hotspot, unplug the Wi-Fi USB Dongle an overlay message indicating that the Hotspot is down is displayed in the upper right corner of the interface.



## Find Qalif IP


Via touch Screen LCD

Click on **Control Panel > Network**. The IP addresses of the current network interfaces will be listed.



Eth0 is the IP address via ethernet (wired) connection.


Wlan0 is the IP address via wireless network connection

 **NOTE:** When nothing is connected to the Qalif, no ethernet cable or USB wifi dongle, the Network tab is empty.

Via USB

If the IP is unknown, click on the Reset button in the Network Tab and wait a few minutes. Pressing the Reset button will force the Operating system to reconfigure all the interfaces and request again the IP's to the DHCP server of the eth0.

Plugging an FAT formatted USB memory stick into the USB 2.0 port of the unit will launch a procedure that will create a file (**ifconfig.txt**) that contains the IP configuration for all the devices.

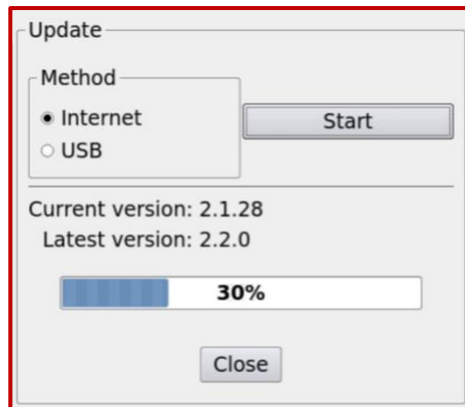
 **NOTE:** Please be sure that the Ethernet cable is connected before this operation.

```
ifconfig.txt
eth0      Link encap:Ethernet  HWaddr 00:1e:06:12:1e:31
          inet addr:192.168.1.97  Bcast:192.168.1.255  Mask:255.255.255.0
          inet6 addr: fe80::21e:6ff:fe12:1e31/64 Scope:Link
          inet6 addr: fd38:ca53:7c92:490e:21e:6ff:fe12:1e31/64 Scope:Global
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:1027 errors:0 dropped:0 overruns:0 frame:0
          TX packets:915 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:150579 (150.5 KB)  TX bytes:226931 (226.9 KB)
          Interrupt:40
lo        Link encap:Local Loopback
```

```
inet addr:127.0.0.1 Mask:255.0.0.0
inet6 addr: ::1/128 Scope:Host
UP LOOPBACK RUNNING MTU:65536 Metric:1
RX packets:30 errors:0 dropped:0 overruns:0 frame:0
TX packets:30 errors:0 dropped:0 overruns:0 carrier:0
collisions:0 txqueuelen:0
RX bytes:2028 (2.0 KB) TX bytes:2028 (2.0 KB)
```


## Update Qalif

The update panel is in **Control Panel > System > Update**




### By Internet (default)


1. Connect the unit to a RJ45 Network that have DHCP server and internet access.
2. From the **Control Panel** select **System > Update**.
3. Select Internet method.
4. Click on Start button.
5. The unit will install the update and reboot automatically.

 **NOTE:** Qalif uses TCP communication port 443, please ensure with your system administrator that is open on your network.

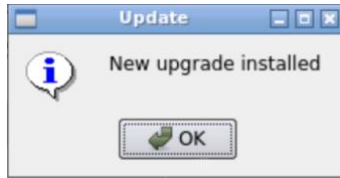
### By USB

1. Take a USB Drive formatted (FAT Filesystem) and empty.
2. Copy the *.deb* package on the root directory of the USB Drive.
3. From the **Control Panel** select **System > Update**.
4. Select USB method .
5. Click on Start button.
6. The unit will install the update and reboot automatically.

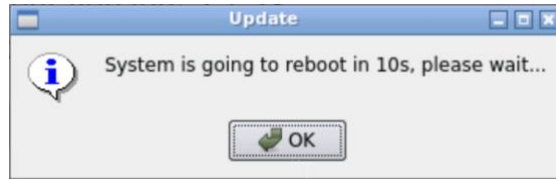
 **NOTE:** Contact the Qalif support to get the latest package available.

 **CAUTION:** Plugging a USB Drive to the Qalif will launch the copy process, please refer to the specific section of the [USB Memory Stick](#) section for more details.


The completion of the update process is confirmed by a popup.



Once Ok is clicked the system will be rebooted withing 10 seconds.



## Reset the Battery Calibration

Every battery is calibrated in Qalif facility but if a warning icon  appears near the battery status the battery need to be recalibrated. In such case, please follow the reset procedure:

1. Fully charge the battery with the unit turned on.
2. Unplug the power adapter from the Qalif Spectro and wait the complete discharge.

 **NOTE:** While discharging, the unit **MUST NOT** be switched off.

3. Once discharged the Qalif Spectro can be plugged to the power to charge the Qalif Spectro again.

After this operation, the battery will be recalibrated, and the warning icon must disappear.

 **CAUTION:** If the problem persists, please contact the Qalif support team.


## Measurement Process Detailed

When a measure is requested, the Qalif Spectro software sequentially goes through the following steps.

### Exposure Auto-Adjust

To auto-adjust the integration-time the Qalif Spectro opens the shutter and takes a series of measures at different integration-time. The integration-time selected is the one that gives the best signal to noise ratio and avoids saturation and non-linearity of too strong signals.

The retained integration-time is used both for the Dark measure and for the measure itself to have a consistent dark correction.

 **NOTE:** The auto-adjust step is performed only when the auto-adjust mode is enabled in [Control Panel > Settings > Exposure](#). Otherwise, the step is skipped, and the measure process uses the manually set integration-time.

### Measure

The measure step is the effective measure taken while the Qalif Spectro has the mechanical shutter open. Depending on Average number Qalif Spectro will take N measures and then calculates the average. Once performed, the dark measure is subtracted from that calculated result giving the sensor noise free signal. On this signal the unit will apply his own calibration curve to adjust the spectrum removing biases and drifts. The resulting signal then tightly corresponds to true target spectrum.

## Dark Measure

The Dark measure is a measure performed with the Qalif Spectro mechanical shutter closed. It allows measuring the sensor noise, the dark noise, i.e. what it sees when there is no signal. This dark measure will be subtracted from the effective measure as it is noise and not an effective signal.

## Filtering

If filtering is enabled, with a custom filter or with a registered filter, the signal is then filtered to smooth the spectrum.

## Result Panel Refresh

After the filtering the interface of the unit will be updated with the new result information. History will also be updated, and new measurements result file created in case of one-shot measurement.

## Measurement Result

### Spectrum

The primary result obtained from a measure is the spectrum. It represents the irradiance of the target for each wavelength in the visible domain. Apart from “purifying” the signal, the spectrum does not result from any processing. It represents the core result before any deeper analysis.

The spectrum corresponds to the spectrometer feature of the Qalif Spectro.

### XYZ Tristimulus and Derived Values

XYZ and its derivatives correspond to the colorimeter feature of the Qalif Spectro. All the computations provide information about the color of the target.

XYZ and its derivatives refer to the CIE Standard. There are various versions of the standard, ratified or not. All the computation performed in the Qalif Spectro are based on the CIE Standard referred as CIE 1931 2°, i.e. the XYZ curves established in 1931 with 2° viewing angle from the observer.

The XYZ Tristimulus results from the integration of the spectrum over the XYZ curves.

- X is the red stimulus.
- Y is the green stimulus.
- Z is the blue stimulus.

The XYZ Tristimulus is not of really use on its own apart from the Y stimulus which corresponds to the target luminance.

From the XYZ Tristimulus is computed the (x,y) pair, which is the chromacity coordinates.

The main information for color analysis is obtained using: the Yxy data, the luminance and the chromacity coordinates.

From these data, other values are computed:

- uv coordinates
- u'v' coordinates
- Dominant/Complementary/Achromatic color

The wavelength corresponding to the spectrum maximum is also provided.

## Measure File Format

Qalif Spectro uses CSV files to store each measure. This plain text file format avoids restrictive proprietary format to allow easiest analysis by human and/or software.

### Naming Convention

Measure file naming convention is **Measure\_YYYY\_MM\_DD-hh\_mm\_ss-zzz.csv** where:

- YYYY is the year
- MM is the month
- DD is the day
- hh is the hour
- mm are the minutes
- ss are the seconds
- zzz are the milliseconds

### File Structure

Inside the CSV measure file, the data are semicolon delimited. Most of them are key-value pairs where the first column is the key and the second one is the value. There are three exceptions which are Wavelengths, Spectrum and Calibration. As they are lengthy vectors, they are the last values and are arranged in table like format with *Wavelengths;Spectrum;Calibration;* header vector values are stored in column.



**NOTE:** The stored XYZ values are not calibrated. To get the effective XYZ Tristimulus, each component must be multiplied by its corresponding *CalibrationXYZ* component.  $EffectiveY = Y * CalibrationY$

Values are stored using units of the International System:

- Wavelengths: nm (nanometers)
- Y:  $cd/m^2$  (candela per square meter)
- Integration time: ms (milliseconds)

### Measure Plain Text Example

Measure_2023_02_02-11_30_43-352.csv
<pre>DateTime;2023/02/02 - 11:30:43.350; Valid;Yes; Size;2048; CalibrationX;682.886; CalibrationY;683.097; CalibrationZ;683.095; IntegrationTime;15625; Average;5; FilterParam;0; LambdaMax;461.018;  CIE Curve;Default CIE 1931 1nm 2°; X;45.5541; Y;48.0612; Z;52.8698;  x;0.310981; y;0.328096; cct;6606.75; ColorType;Dominant; LambdaD/C;490.293;  u;0.196973;</pre>

```

v;0.311721;

u';0.196973;
v';0.467581;

Wavelengths;Spectrum;Calibration;
332.311 ; 0 ; 0;
332.607 ; 0 ; 0;
332.902 ; 0 ; 0;
333.198 ; 0 ; 0;
333.494 ; 0 ; 0;
333.79 ; 0 ; 0;
[...]
491.533 ; 3.02942e-05 ; 4.90014e-09;
491.82 ; 2.33569e-05 ; 4.91378e-09;
492.107 ; 2.60912e-05 ; 5.00204e-09;
492.394 ; 2.73078e-05 ; 5.0381e-09;
492.68 ; 3.37026e-05 ; 5.12439e-09;
492.967 ; 3.68764e-05 ; 5.14897e-09;
[...]
894.043 ; 0 ; 0;
894.29 ; 0 ; 0;
894.538 ; 0 ; 0;
894.786 ; 0 ; 0;
895.033 ; 0 ; 0;
895.281 ; 0 ; 0;

```

Files can be downloaded directly from the Qalif using a terminal or FTP software. The files are located in the folder **/opt/QALIF/run/env/Measures/**

### ActiveServices Network Rules

To enable the usage of the active services, and be able to update the Qalif Spectro via internet, the firewall should be configured with the following rule.

**ALLOW: TCP port 443 OUT** direction to hostname **qalif.provisioning.active.ht**



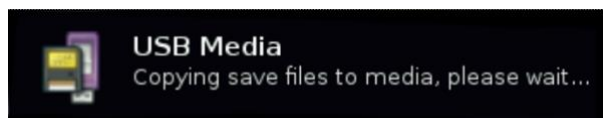
**NOTE:** This rule will not affect the site security as Qalif does not need any open incoming connections.

### USB Memory Stick

The Qalif Spectro offers convenient features when an USB Drive is plugged-in. The copy feature is automatically launched when the USB drive is plugged in.

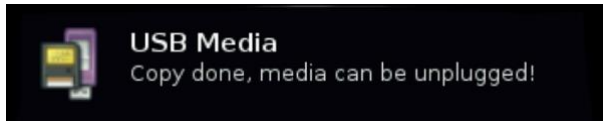
#### Copy

When the USB drive is plugged in, the system automatically detects it and launches the Copy feature. This is indicated with an overlay message in the upper right corner of the user interface:



At the end of the process the Qalif will display another overlay message confirming that the USB drive can be unplugged.





**NOTE:**

The process could take up to 5 minutes depending on the amount of history and log to copy.

```
Example of USB tree after file copy

\.\
├─ ifconfig.txt
├─ ipaddr.txt
├─ macaddr.txt
└─ QfSpectro
   └─ Log
      ├── qalif.log
      ├── qalif.log.1
      ├── QfAPI.log
      ├── QfSpectro.log
      ├── QfSpectro.log.1
      ├── remote-backup.log
      └── upgrade.log
   └─ Saves
      ├── Measure_2023_02_02-11_30_43-352.csv
      ├── Measure_2023_02_16-18_53_10-186.csv
      ├── Measure_2023_02_17-11_00_17-778.csv
      ├── Measure_2023_02_17-11_04_54-721.csv
      ├── Measure_2023_04_14-14_48_06-453.csv
      └── Measure_2023_04_14-14_48_43-384.csv
```



**CAUTION:**

Do not unplug the USB drive during the copy process, as this will cause a corruption with the data on the USB Drive.

All the data copied are in a folder named **QfSpectro** on the USB Drive root directory. Inside, there are two other folders, one for the measures called **Saves** and one for the logs called **Log**.

**Measurement Reports**

The unit will create a directory **QfSpectro/Saves** on the USB Drive and copy the unit measurement history with the format and the naming convention described in Measure File Format section of this document.



**NOTE:**

If in **Control Panel > System > History sub-panel** the settings **Clear on USB copy** is enable the Qalif will automatically cleanup the unit history once it will be copied on the USB.

**Logs**

The unit will create a directory named **QfSpectro/Log** and copy the unit log files in it.

## Reset

In case of booting or freeze problem, the pinhole reset button located in the I/O panel should be pressed.



This action cuts off the power, after pressing the pinhole reset button, the power button should be pressed to turn on the unit.

March 1, 2016

**LETTER of COMPLIANCE RoHS Qalif Spectro**

This letter is to confirm compliance with Directive 2002/95/EC of the European Council on the Restriction of Hazardous Substances in electrical and electronic equipment.

We hereby certify that the materials found in this component meet the acceptable levels as stated by the RoHS directive confirming compliance.

Listed below are the Part numbers covered by this letter:

**Part #'s: QALIF Spectro (code CA-QS)**

**Part #'s: QALIF Spectro AV (code CA-QS-AV)**

Highlands Technologies Solutions

By: Patrick ZUCCHETTA  
*President par délégation*

Highlands Technologies Solutions (SAS)  
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RCS 789 721 115  
TVA FR 45 789 721 115

Patrick ZUCCHETTA  
President



March 1st, 2016

### CE COMPLIANCE NOTICE FOR QALIF SPECTRO

Marking by the symbol  $\text{CE}$  indicates compliance of the device to the EMC (Electromagnetic Compatibility) directive and to the Low Voltage directive of the European Community. Such marking is indicative that this device meets or exceeds the following technical standard:

- EN 55022 "Limits and Methods of Measurement of Radio Interface Characteristics of Information Technology Equipment."

A "Declaration of Conformity" in accordance with the above standard has been made and is on file at Highlands Technologies Solutions, Sophia Antipolis, France.

Listed below are the Part numbers covered by this compliance notice:

**Part #'s: QALIF Spectro (code CA-QS)**

**Part #'s: QALIF Spectro-AV (code CA-QS-AV)**

Highlands Technologies Solutions

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President par délégation

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Tél.: +33 (0)492 954 290  
RCS 789 721 115  
TVA FR 45 789 721 115

This message is to acknowledge receipt of your **Product Report** , which was filed pursuant to the regulations for the administration and enforcement of the Radiation Control for Health and Safety Act of 1968 (Title 21, Code of Federal Regulations, Subchapter J) as they pertain to the submission information description below. If your submission is a report, it has been filed according to reporting requirements in Title 21, Code of Federal Regulations (CFR), Part 1002. Your submission has been assigned an informal subject title below after "Purpose:" . Your submission has been assigned an **ACCESSION NUMBER** which can be used by you and FDA to identify your submission.

**WARNING:**

THE **ACCESSION NUMBER** ASSIGNED TO YOUR SUBMISSION DOES NOT IMPLY, CONVEY OR CONSTITUTE FDA APPROVAL OF ANY REPORT, APPLICATION FOR VARIANCE OR EXEMPTION, NOTIFICATION, OR ANY OTHER SUBMISSION OR ITS CONTENTS. THE **ACCESSION NUMBER** IS ONLY AN ACKNOWLEDGMENT THAT FDA HAS RECEIVED YOUR SUBMISSION. IT MAY BE REVOKED BY FDA. ITS DISCLOSURE IS YOUR RESPONSIBILITY. IT IDENTIFIES YOUR SUBMISSION FOR PRODUCTS OR PRODUCT FAMILIES IDENTIFIED IN THIS MESSAGE.

Be advised that failure to comply with FDA regulations may result in notification of affected persons and corrective actions at no cost to the purchaser, pursuant to 21 CFR Part 1003 -- Discovery of Defect or Failure to Comply and 21 CFR Part 1004 -- Repurchase, Repairs, or Replacement of Electronic Products.

----- DOCUMENT RECEIVED, FILED, & ACKNOWLEDGED -----

This automated notification from the CeSub Submission Process contains general information about the aforementioned submission:

Accession Number: **0820048-029**  
Date Loaded: **10/21/2013**  
Document Date: **10/7/2013**  
Establishment Name: **QUARTON INC.**  
Purpose: **This submission is a(n) Product Report supplement. These Surveying, Leveling, Alignment Laser Products include designated VLM-650-01 LPA.**

Submitter: **Gordon Lien**  
Email: [gordon\\_lien@mail.quarton.com.tw](mailto:gordon_lien@mail.quarton.com.tw)  
Reporting Official: **Gordon Lien**  
Email: [gordon\\_lien@mail.quarton.com.tw](mailto:gordon_lien@mail.quarton.com.tw)

Please note that your firm is required to submit an Annual Report to CDRH every year by September 1. If you meet all other applicable FDA requirements, you may market the product(s) reported. Please be aware that additional electronic product radiation control or medical device regulations may apply to your product, such as:

- 21 CFR 1002.11, requiring report supplements under certain circumstances following the same reporting forms as used for product reports on your products
- 21 CFR 1002.13, requiring annual reports to be submitted each year by September 1 using the appropriate reporting form for annual reports
- 21 CFR 1010 - 1050, requiring certification to FDA radiation safety performance standards



# Material Safety Data Sheet

## 化学品安全技术说明书

### Section 1- Chemical Product & Company Identification

#### 第一部分 化学品及企业标识

**Product Name:** Li-ion Battery

产品名称: 锂离子电池

**Manufacture:** SHENZHEN PKCELL BATTERY CO., LTD.

制造商: 深圳市比苛电池有限公司

**Address:** 2nd Floor, 4th Building, Meitai Technology Park, No.1231, Guanguang Road, Osmanthus Community, Guanlan Town, Longhua New Area, Shenzhen

地址: 深圳市龙华新区观澜街道桂花社区观光路 1231 号美泰科技园肆号厂房贰楼

**Contact Person** 联系人: Ms. Yi

**Tel** 电话: +86-755-86670643

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**Emergency Tel** 应急电话: +86-755-86670643

**E-mail** 邮箱: 2355701539@qq.com

**Item Code** 项目号: NCT20047404XM1-1

### Section 2- Hazards Identification

#### 第二部分 危险性概述

<b>Hazard Description</b> 危险性描述	Not dangerous with normal use. Do not dismantle, open or shred the battery ingredients contained within or their ingredients products could be harmful. 正常使用没有危险, 不能拆解、打开或分解电池, 里面的材料或成分是有毒的。
<b>Primary</b>	Inhalation, Ingestion, Skin contact and Eye contact.

<b>Route(s) of Exposure</b> 接触途径	吸入、食入、皮肤接触、眼睛接触。
<b>Potential Health Effects</b> 潜在健康影响	<p><b>Inhalation:</b> Vapors or mists from a ruptured battery may cause respiratory irritation. 吸入：破裂的电池散发出来的气雾会引起呼吸道刺激。</p> <p><b>Ingestion:</b> The battery ingredients contained within or their ingredients products can cause serious chemical burns of mouth, esophagus, and gastrointestinal tract. 食入：电池的组成成分或原料可以导致嘴，食道和胃肠道的严重化学烧伤。</p> <p><b>Skin:</b> Skin contact with contents of an open battery can cause severe irritation or burns to the skin. 皮肤：皮肤接触到电池的內部化学材料可能会导致严重的刺激或烧伤皮肤。</p> <p><b>Eye:</b> Eye contact with contents of an open battery can cause severe irritation or burns to the eye. 眼睛：眼睛接触到电池的內部化学材料可能会导致严重的刺激或烧伤眼睛。</p>

### Section 3- Composition/Information on Ingredients

#### 第三部分 成分/组成信息

<b>Chemical Name</b> 化学名称	<b>Concentration or concentration ranges (%)</b> 浓度或浓度范围(%)	<b>CAS Number</b> CAS 号 (化学文摘索引登记号)
Lithium Cobalt Oxide 钴酸锂	35-38	12190-79-3
Graphite 石墨	20-22	7782-42-5
Copper 铜	9-10	7440-50-8
Aluminum 铝	5-6	7429-90-5
Ethylene carbonate 碳酸乙烯酯	14-16	96-49-1
Polypropylene 聚丙烯	5-6	9003-07-0
Carbonate, methyl ethyl 碳酸甲乙酯	4-5	623-53-0
Phosphate(1-), hexafluoro-, lithium 六氟磷酸锂	5-6	21324-40-3

Note: CAS number is Chemical Abstract Service Registry Number.

注意：CAS 号是化学文摘服务注册号。

N/A=Not apply.

N/A =不适用。



## Section 4- First Aid Measures

### 第四部分 急救措施

<b>Inhalation</b> 吸入	Remove source of contamination or move victim to fresh air. Obtain medical advice. 移除污染源或者将受害者移至新鲜空气处。寻求医生建议。
<b>Ingestion</b> 食入	Please rinse mouth thoroughly with water. Induce vomiting under the guidance of professional personage. Please seek medical treatment in time. 立即用清水漱口，在专业人士的指导下催吐，速就医。
<b>Skin contact</b> 皮肤接触	Remove contaminated clothes and rinse skin with plenty of water or shower for 15 minutes. Get medical aid. 脱下已污染衣服，用大量的水冲洗至少 15 分钟，速就医。
<b>Eye contact</b> 眼睛接触	Irrigate with flowing water for 15 minutes. If irritation persists, consult a physician. 用流动水冲洗 15 分钟，如刺激持续发生，请求助于医生。

## Section 5- Fire Fighting Measures

### 第五部分 消防措施

<b>Characteristics of Hazard</b> 危险特性	Toxic fumes, gases or vapors may evolve on burning. 火灾时可释放有害浓烟、气体或者蒸汽。
<b>Hazardous Combustion Products</b> 燃烧产生的危险物品	Carbon monoxide, carbon dioxide, lithium oxide fumes and so on. 一氧化碳，二氧化碳，锂氧化物烟气等。
<b>Fire-extinguishing Methods and Extinguishing Media</b> 灭火方法及灭火剂	Please use dry powder fire extinguisher and other proper fire extinguishing media. 请使用干粉灭火器等合适的灭火介质。
<b>Attention in Fire-extinguishing</b> 灭火注意事项	The firemen should put on antigas masks and full fire-fighting suits. 消防人员须佩戴防毒面具、穿全身消防服。

## Section 6- Accidental Release Measures

### 第六部分 泄露应急处理

<p><b>Personal Precautions, protective equipment, and emergency procedures</b> 个人预防措施、防护装备和应急程序</p>	<p>Restrict access to area until completion of clean-up. Do not touch the spilled material. Wear adequate personal protective equipment as indicated in Section 8. 限制区域，直到完成清理工作。请勿触摸泄漏的材料。穿戴适当的个人防护设备，如第 8 部分所示。</p>
<p><b>Environmental Precautions</b> 环境保护措施</p>	<p>Prevent material from contaminating soil and from entering sewers or waterways. 防止物质污染土壤和进入下水道或水道。</p>
<p><b>Methods and materials for Containment</b> 方法和材料控制</p>	<p>Stop the leak if safe to do so. Contain the spilled liquid with dry sand or earth. Clean up spills immediately. 出于安全，阻止泄漏，可以用干砂或沙土来遏制液体泄露，立即清理泄漏。</p>
<p><b>Methods and materials for cleaning up</b> 清理的方法和材料</p>	<p>Absorb spilled material with an inert absorbent (dry sand or earth). Scoop contaminated absorbent into an acceptable waste container. Collect all contaminated absorbent and dispose of according to directions in Section 13. Scrub the area with detergent and water; collect all contaminated wash water for proper disposal. 用惰性吸收剂(干砂或沙土)吸收溢出的材料。污染物转移到可吸收废物的容器。收集所有受污染的吸收剂和根据第 13 部分的指令处置。用洗涤剂和水清洁污染区域,收集所有受污染的洗涤水进行适当处置。</p>

## Section 7- Handling and Storage

### 第七部分 操作处置与储存

<p><b>Handling</b> 操作</p>	<p>Don't handling the batteries in manner that allows terminals to short circuit. Do not open, disassemble, crush or burn battery. 不要以让接头短路的方式对电池进行操作。不要打开，分解，挤压或燃烧电池。</p>
<p><b>Storage</b> 储存</p>	<p>If the battery is subject to storage for such a long term as more than 3 months, it is recommended to recharge the battery periodically. 如果电池长期存放超过 3 个月，建议定期对电池充电。 Long period storage: -10℃~35℃, 60±25%R.H 长期存储: -10℃~35℃, 相对湿度 60±25% Do not storage the battery haphazardly in a box or drawer where they may short-circuit each other or be short-circuited by other metal objects. 不要将电池随意丢在盒子或抽屉里，以免电池之间或电池与其他金属物质发生短路。</p>

	<p>Keep out of reach of children. 储存在小孩接触不到的地方。</p> <p>Do not expose the battery to heat or fire. Avoid storage in direct sunlight. 不要将电池暴露在火源和热源附近，避免在阳光直射下存储。</p> <p>Do not store together with oxidizing and acidic materials. 不要与氧化和酸性物质存储在一起。</p>
--	--

## Section 8 - Exposure Controls/Personal Protection

### 第八部分 接触控制和个体防护

<p><b>Engineering Controls</b> 工程控制</p>	<p>No engineering controls are required for handling batteries that have not been damaged. Personal protective equipments for damaged batteries should include chemical resistant gloves and safety glasses. 操作未破损的电池，没有工程控制要求。对于破损的电池，个人防护用品应包括化学品防护手套和安全眼镜。</p>
<p><b>Personal Protective Equipment</b> 个人防护设备</p>	<p><b>Respiratory Protection:</b> In case of battery venting, provide as much ventilation as possible. Avoid confined areas with venting cell cores. Respiratory Protection is not necessary under conditions of normal use. Not necessary under conditions of normal use. 呼吸保护：当电池排气阀打开时，应尽量使通风设备开至最大，避免将打开排气阀的电芯局限在某一狭窄空间内。正常操作条件下，呼吸保护是不必要的。正常使用条件下不必考虑。</p> <p><b>Protective Gloves:</b> Not necessary under conditions of normal use. 防护手套：正常使用条件下不必考虑。</p> <p><b>Other Protective Clothing or Equipment:</b> Not necessary under conditions of normal use. 其他防护服装或设备：正常使用条件下不必考虑。</p> <p>Personal Protection is recommended for venting battery: Respiratory Protection, Protective Gloves, Protective Clothing and safety glass with side shields. 当电池排气阀打开时，应做好个人防护：呼吸防护，防护手套，防护服装和有护边的安全玻璃罩都是要准备的。</p>

## Section 9- Physical and Chemical Properties

### 第九部分 理化特性

<p><b>Physical State</b> 物理状态</p>	<p>Form: Solid 形态：固体</p> <p>Color: Blue 颜色：蓝色</p>
---------------------------------------	---

	Odour: Odorless 气味: 无气味
<b>Change in condition</b> 变化条件:	
<b>pH, with indication of the concentration</b> pH, 有浓度指示	Not applicable. 不适用
<b>Melting point/freezing point</b> 熔点/凝固点	Not applicable. 不适用
<b>Boiling Point, initial boiling point</b> 沸点, 初沸点	Not applicable. 不适用
<b>Flash Point</b> 闪点	Not applicable. 不适用
<b>Upper/lower flammability or explosive limits</b> 上/下燃烧或爆炸限值	Not applicable. 不适用
<b>Vapor Pressure</b> 蒸汽压	Not applicable. 不适用
<b>Vapor Density: (Air = 1)</b> 蒸汽密度: (空气= 1)	Not applicable. 不适用
<b>Density/relative density</b> 密度/相对密度	Not applicable. 不适用
<b>Solubility in Water</b> 水溶性	Insoluble 不能溶解
<b>n-octanol/water partition coefficient</b> 正辛醇/水分配系数	Not applicable. 不适用
<b>Auto-ignition temperature</b> 自燃温度	Not applicable. 不适用
<b>Decomposition temperature</b> 分解温度	Not applicable. 不适用
<b>Odour threshold</b> 嗅阈	Not applicable. 不适用
<b>Evaporation rate</b>	Not applicable.

蒸发速率	不适用
<b>Flammability (soil, gas)</b> 易燃性 (土壤, 气体)	Not applicable. 不适用
<b>Viscosity</b> 粘度	Not applicable. 不适用

## Section 10 – Stability and Reactivity

### 第十部分 稳定性和反应性

<b>Stability</b> 稳定性	Stable under normal temperatures and pressures. 常温常压下稳定。
<b>Conditions to Avoid</b> 应避免的条件	Heat above 70°C or Incinerate, Deform, Mutilate, Crush, Disassemble, Overcharge, Short circuit, Expose over a long period to humid conditions. 加热 70°C 以上或焚烧、变形、毁坏、粉碎、拆卸、过充电、短路, 长时间暴露在潮湿的条件下。
<b>Hazardous Decomposition Products</b> 危害分解物	Toxic Fumes, and may form peroxides. 有毒烟雾, 并可能形成过氧化物。
<b>Possibility of Hazardous Reaction</b> 危险反应的可能性	If leaked, forbidden to contact with strong oxidizers, mineral acids, strong alkalis, halogenated hydrocarbons. 如果发生泄露, 避免与强氧化剂, 无机酸, 强碱, 卤代烃接触。

## Section 11 – Toxicological Information

### 第十一部分 毒理学信息

<b>Irritation</b> 刺激	In the event of exposure to internal contents, vapor fumes may be very irritating to the eyes and skin. 内部物质暴露的情况下, 蒸汽烟雾可能对眼睛和皮肤产生刺激性。
<b>Sensitization</b> 致敏	Not applicable. 不适用
<b>Reproductive Toxicity</b> 再生毒性	Not applicable. 不适用
<b>Toxicologically Synergistic Materials</b> 协同材料毒理学	Not applicable. 不适用

## Section 12-Ecological Information

### 第十二部分 生态学信息

<b>General note</b> 通用信息	Do not allow undiluted product or large quantities of it to reach ground water, water course or sewage system. 不允许未稀释或大量的产品到达地下水、水道或污水系统。
<b>Anticipated behavior of a chemical product in environment/possible environmental impact/ecotoxicity</b> 化学产品在环境/可能的环境预期的行为的一种生态毒性	Not applicable. 不适用
<b>Mobility in soil</b> 土壤中移动性	Not applicable. 不适用
<b>Persistence and Degradability</b> 持久性和降解性	Not applicable. 不适用

## Section 13 – Disposal Considerations

### 第十三部分 废弃处置

<b>Waste Treatment</b> 废弃处置方法	Recycle or dispose of in accordance with government, state & local regulations. 建议遵照国家和地方法规处置或再利用。
<b>Attention for Waste Treatment</b> 废弃注意事项	Deserted batteries couldn't be treated as ordinary trash. Couldn't be thrown into fire or placed in high temperature. Couldn't be dissected, pierced, crushed or treated similarly. Best way is recycling. 废电池不能被当做普通垃圾。不能扔进火中或置于高温下。不能解体，刺穿，破碎或类似的处理。最好的办法是回收利用。

## Section 14 – Transport Information

### 第十四部分 运输信息

This report applies to by sea, by air and by land;  
本报告适用于海运，空运和陆运

The Li-ion Battery (model: ICR18650 6600mAh 3.7V ) tested according to the requirements of the UNITED NATIONS "Recommendations on the Transport of Dangerous Goods, Manual of Tests and Criteria" Part III, subsection 38.3;

该锂离子电池（型号：ICR18650 6600mAh 3.7V ）经过测试符合联合国《关于危险货物运输的建议书 实验和标准手册》第三部分，第 38.3 章节的要求。

The Li-ion Battery was protected so as to prevent short circuits. This includes protection against contact with conductive materials within the same packaging that could lead to short circuit;

该锂离子电池做了防短路保护。包括防止与同一封装内的导电材料接触可能导致的短路。

The packaging shall be adequate to avoid mechanical damage during transport, handling and stacking.

包装应足以避免在运输，处理和堆放期间的机械损坏。

The package must be handled with care and that a flammability hazard exists if the package is damaged.

包装必须小心处理，如果包装损坏，存在易燃危险。

The Li-ion Battery can be shipped by air in according to Section II/Section IB of PACKING INSTRUCTION 965, or Section II of PACKING INSTRUCTION 966~967 of the 2021 IATA Dangerous Goods regulations 62<sup>nd</sup> Edition.

该锂离子电池可以根据 2021 年 IATA 危险物品规则第 62 版包装指令 965 第 II 部分/第 IB 部分或包装指令 966 ~967 第 II 部分运输。

With regard to transport, the following regulations are cited and considered:

关于运输，引用和考虑了以下法规：

- The International Civil Aviation Organization (ICAO) Technical Instructions.

- 国际民用航空组织（ICAO）技术细则。

- The International Air transport Association (IATA) Dangerous Goods Regulations.

- 国际航空运输协会（IATA）危险物品规则。

UN number of lithium battery: UN3480 or UN3481;

锂电池的 UN 编号：UN3480 或 UN3481;

UN Proper shipping name/Description (technical name): Lithium ion batteries or Lithium ion batteries contained in equipment or Lithium ion batteries packed with equipment;

UN 合适的运输名称/描述（技术名称）：锂离子电池，锂离子电池内置于设备中或锂离子电池与设备包装在一起；

UN Classification (Transport hazard class): Class 9 (PI965 Section IB) or N/A (PI965~967 Section II)

UN 分类（运输危险类别）：9 类危险品（包装指令 965 第 IB 部分）或者 不适用（包装指令 965~967 第 II 部分）

- The International Maritime Dangerous Goods (IMDG) Code.

- 国际海运危险货物（IMDG）规则。

UN number of lithium battery: UN3480 or UN3481;

锂电池的 UN 编号：UN3480 或 UN3481;

UN Proper shipping name/Description (technical name): Lithium ion batteries or Lithium ion batteries contained in equipment or Lithium ion batteries packed with equipment;

UN 合适的运输名称/描述（技术名称）：锂离子电池，锂离子电池内置于设备中或锂离子电池与设备包装在一起；

UN Classification (Transport hazard class): N/A

UN 分类（运输危险类别）：不适用

Marine pollutant(Y/N): N

海洋污染物 (Y/N): N

The battery is not restricted according to IMO IMDG Code (inc Amdt 39-18).

海运按照 IMO IMDG Code (inc Amdt 39-18) 可按普通货物条件办理。

Need to meet the Special Provision: International maritime dangerous goods code (IMDG) 188, 230, 310, 348, 360, 376, 377;

需要符合这些特殊条款: 国际海运危险货物规则 (IMDG) 188, 230, 310, 348, 360, 376, 377;

## Section 15 – Regulatory Information

### 第十五部分 法规信息

《Dangerous Goods Regulations》  
《危险物品规则》  
《Recommendations on the Transport of Dangerous Goods Model Regulations》  
《危险货物运输的建议模型规定》  
《International Maritime Dangerous Goods》  
《国际海上危险货物运输》  
《Technical Instructions for the Safe Transport of Dangerous Goods》  
《危险货物安全运输技术指南》  
《Classification and code of dangerous goods》  
《危险货物分类与代码》  
《Occupational Safety and Health Act》(OSHA)  
《职业安全与健康法案》(OSHA)  
《Toxic Substance Control Act》(TSCA)  
《有毒物质控制法》(TSCA)  
《Consumer Product Safety Act》(CPSA)  
《消费者产品安全法案》(CPSA)  
《Federal Environmental Pollution Control Act》(FEPCA)  
《联邦环境污染控制法》(FEPCA)  
《The Oil Pollution Act》(OPA)  
《石油污染法》(OPA)  
《Superfund Amendments and Reauthorization Act TitleIII(302/311/312/313)》(SARA)  
《超级基金修正案和再授权法案 TitleIII(302/311/312/313)》(SARA)  
《Resource Conservation and Recovery Act》(RCRA)  
《资源保护和恢复法案》(RCRA)  
《Safety Drinking Water Act》(CWA)  
《安全饮用水法》(CWA)  
《California Proposition 65》  
《加州 65 号提案》



《Code of Federal Regulations》(CFR)

《联邦条例》(CFR)

EU Battery Directive (2006/66/EC, 2013/56/EU)

欧盟电池指令(2006/66/EC, 2013/56/EU)

Regulation (EC) No. 1907/2006 on the Registration, Evaluation, Authorization and Restriction of Chemicals (REACH)

关于化学品的注册、评估、授权和限制(EC)第 1907/2006 号规例

In accordance with all Federal, State and local laws.

符合所有联邦、州和地方法律。

## Section 16 – Additional Information

### 第十六部分 其他信息

The information above is believed to be accurate and represents the best information currently available to us. However, we makes no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes. Although reasonable precautions have been taken in the preparation of the data contained herein, it is offered solely for your information, consideration and investigation. This material safety data sheet provides guidelines for the safe handling and use of this product; it does not and cannot advise on all possible situations, therefore, your specific use of this product should be evaluated to determine if additional precautions are required.

The data/information contained herein has been reviewed and approved for general release on the basis that this document contains no export controlled information.

在我们看来上面的信息是准确的，这是我们目前能提供的最佳的信息。但是，对于这些信息，我们不对商品的性能做任何明示的或者暗示的保证，我们也不对使用这些信息造成的后果担负任何责任。用户应当自己调查研究后决定这些信息是否适用于他们的特定用途。尽管在该文档里提出了合理的预警，但是这仅仅只是给您做参考，考量和调查。这份化学品安全技术说明书提供了安全处理和使用该产品的指南，但是它没有，也不能对所有可能发生的情景提出建议，所以您需要根据您对该产品的特定使用情况来决定是否需要其他的预防措施。

此处所包含的数据/信息作为普通版本已经审核并批准，但是本文档不包含出口控制信息。

**\*\*\*\*\*End of report 报告结束\*\*\*\*\***

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