Liquid Scanner
QUICK GUIDE

SPECTRAL ENGINES

It makes sense.

Table of Contents

Liquid Scanner

Thank you for purchasing a Liquid Scanner.

Spectral Engines' Liquid Scanner uses patented Micro Electro Mechanical System (MEMS) Fabry-Perot Interferometer enabling fast and reliable measurements. Liquid Scanner works at the true near infrared (NIR) spectral range (standard) from 1550 to 1950 nm, which means better sensitivity and specificity in material sensing applications. Other wavelengths are available.

You can control the Liquid Scanner through a PC with our user-friendly SensorControl software.

The case includes:
· Liquid Scanner
· USB-C cable
· Reference cuvette
· Glass cuvettes (for first tests)
· 3 x Distance adapters
  (for 1, 2 or 5mm cuvettes)
· Microfiber cloth
· Quick Guide

Downloadable software:
· SensorControl software for
  Windows
· NIRONE Scanner Mobile
  App

To start using Liquid Scanner, please see and follow the instructions: www.spectralengines.com/support

⚠ **Important!**

The intended use of Liquid Scanner is to measure spectra from various liquid materials. Do not use the device for anything other than its intended use. You can control the Liquid Scanner through a PC with our user-friendly SensorControl software.

Safety Information

Conventions

⚠️ Hazard
Death or serious injury will occur when the stated precautions are not taken.

⚠️ Warning
Death or serious injury may occur when the stated precautions are not taken. Serious device damage may occur.

⚠️ Caution
Slight injury or device damage may occur when the stated precautions are not taken.

ℹ️ Notice
Indicates important information for using the product.

Intended use

The Liquid Scanner is a mobile material scanner designed for near infrared spectroscopic transmission analysis of liquid samples in closed cuvettes, e.g. liquid cannabis extracts, liquid pharmacies, oils, parfums, whisky samples.

The device can be used for laboratory and industrial indoor applications and for mobile applications inside a vehicle on a stable, flat and horizontal surface.

The device is not intended:

- to be used as hand-held device,
- to be immersed inliquids,
- to be used on vehicles while driving,
- to be mounted to/into other equipment, machines orvehicles.

Safety Notes

⚠️ Warning!
This device does not implement protection measures against hazards resulting from sample liquids used with this device.

Read safety datasheets of all sample liquids.

Before using a hazardous sample liquid with this device, a risk assessment in accordance with local safety regulations must be carried out and protective measures for users and the device must be implemented.

Please consider these points in the risk assessment amongst others:

- The device is rated IP67 acc. EN 60529 for protection against ingress of solid foreign objects and water.
- The device enclosure may not be resistant to your sample liquid. Use only cuvette cells that are approved by the manufacturer for your sample liquid.

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- Use only securely closed or locked cuvette cells to avoid spilling onto the device.
- Keep potential ignition sources away from the device.
- *For flammable sample liquids:*
  Parts of the enclosure and the cuvette holder can heat up to 5°C above ambient temperature. Keep potential ignition sources away from the device.

⚠️ Warning!

Use device only with Li-ion rechargeable battery of type 16340 / 3.7 V / 700 mAh tested acc. IEC 62133.

Don't use non-rechargeable batteries.

⚠️ Caution!

Samples from food and pharmaceutical products may be contaminated after the measurement. Make sure that these samples do not get back into the production process. Mark and dispose of the samples properly.

⚠️ Caution!

Do not put your fingers into the cuvette holder (e.g. for cleaning). Your fingers may become trapped and suffer minor injuries.

⚠️ Caution!

Damaged housing parts may cause minor injuries. Inspect the housing and the glass windows in the cuvette holder before use.

Only use the device if all parts are undamaged.

Only use specified rectangular cuvettes with width 12.5mm and length 3.5mm, 4.5mm, 7.5mm or 12.5mm. If necessary, use the distance adapters from the accessories. Other cuvette types may damage the glass windows.

⚠️ ESD protection!

This device contains electrostatic sensible components.

Observe precautions for handling electrostatic sensitive devices.

ℹ️ Notice!

Use USB-C cable with length <3m only for interconnection to computers or chargers to prevent electromagnetic interferences.

ℹ️ Notice!

Use USB 2.0 compatible charger with protection class II for charging the battery.
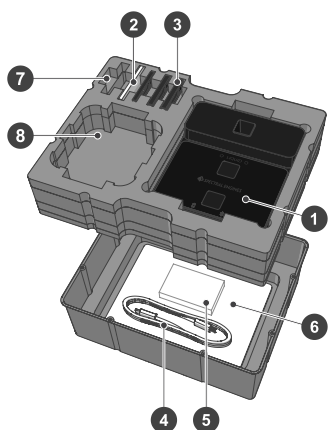
ℹ️ Notice!

Place the device on a flat and solid surface.

Only operate the device in a vibration-free environment.

Contents of the case

1. Liquid Scanner
2. Reference cuvette
3. Distance adapters (for 1, 2 or 5 mm cuvettes)
4. USB-C cable
5. Glass cuvettes (for first tests)
6. Quick Guide
7. Empty space for an optional White Reference
8. Empty space for an optional Scanner Device

Main parts

1. USB-C connector
2. LED indicator for power and battery charging
3. LED indicator for Bluetooth
4. Power / Bluetooth button
5. Future use button
6. LED indicator for measuring
7. Cuvette holder
8. Distance adapter for cuvette
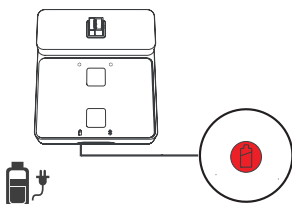9. Sample cuvette
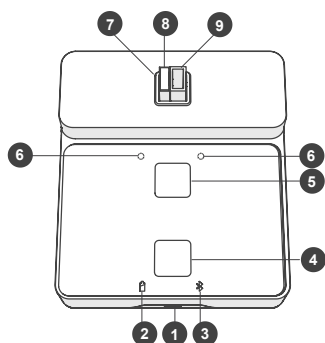
1. Sensor
2. Sensor window
3. Light source window
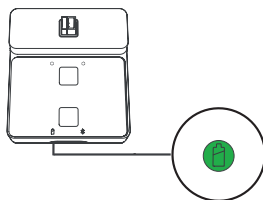4. Light source
5. Cuvette clamping
6. Insertion limiter
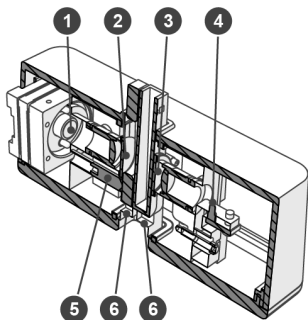
Charging

When battery is low the power LED will start blinking red. Connect USB cable to the Liquid Scanner to recharge the battery. LED indicator for battery blinks green while charging.

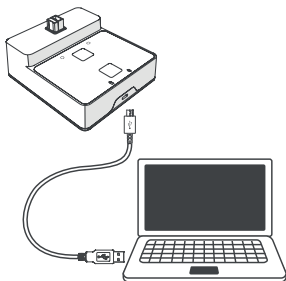After the battery is fully charged the battery indicator will turn green.

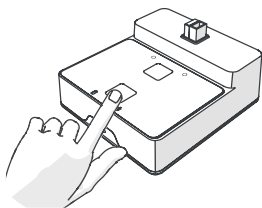*All LED functions at page 9

Getting Started - PC

1. Install the SensorControl software from https://spectralengines.com /software

2. Connect Liquid Scanner to your computer.

3. Turn the power of the Liquid Scanner on.

Measuring the Reference Signal

Always measure the reference signal at the start of a new set of measurements.

1. Connect the Liquid Scanner with SensorControl software.
2. Select Settings in the SensorControl software and set the desired Measurement settings.
3. Set the Lamp intensity to 0%.
4. To measure dark reference push the **Dark** push button. Optionally user can select to use **Auto Lamp** with dark subtraction mode from settings page.
5. Set the lamp intensity **20%**.
6. Insert the empty cuvette with the correct **distance adapter** in the holder. The cuvette is on the right side of the device where the lamp is (look at mark).
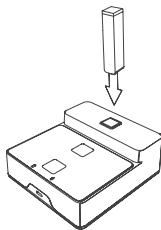
7. On SensorControl, select **Reference**.

Measuring a Sample

1. Place the sample cuvette with the correct **distance adapter** (in case of 10mm cuvettes not necessary) in Liquid scanner cuvette holder.
2. Perform and save measurements through SensorControl software.

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Getting Started - Mobile App

Get the Mobile App

Download NIRONE Scanner App from App Store or Play Store by searching "Spectral Engines".

Sign in to the App

Contact your administrator for credentials.

Switching ON the Device

To switch the device ON press for 5s the next to the USB connector at the back side of the Liquid Scanner.

Pair Your Mobile App and the Device

After signing in the app, you have to pair your mobile app and device.

Check that Bluetooth is ON in your mobile device and allow the app to use your location. Note that the NIRONE Scanner mobile app requires an internet connection.

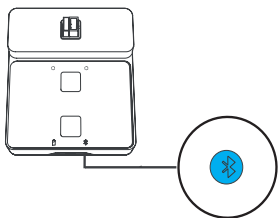1. On the device: Press the Power/Bluetooth button for 10s, untill the Bluetooth LED will flash red. Then release the button and the Bluetooth LED will start flashing fast in blue untill the pairing was successfully completed (but max. 60s).
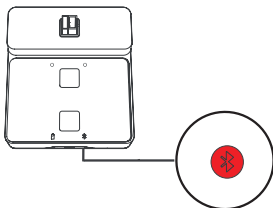
2. In the Mobile App: Go to My Devices. Select your device from the list (tap the switch next to your device serial number to pair the device). Then please select the application (modell) for the Liquid scanner (for example: DataGatherer20LS).

3. When the device is paired successfully to the mobile app, the Bluetooth LED stops flashing fast in blue. The Bluetooth LED now flashes every 10s in blue or red. In the Mobile App the Device will be shown as connected.

Switching OFF the Device

To switch the device off, press for 5s the Power/Bluetooth button, untill the Power LED will flash red and release the button.
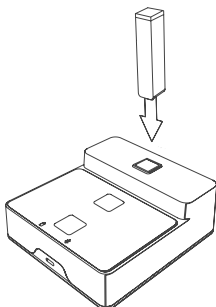
Measuring the Reference Signal

Always measure the reference signal at the start of a new set of measurements.

1. Insert an empty cuvette or cuvette with buffer liquid into cuvette holder and close the lid.
2. In the NIRONE Scanner mobile app, click measure reference.
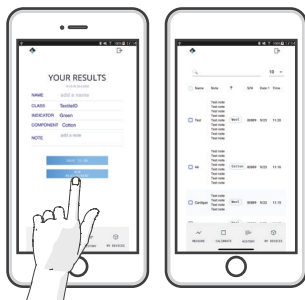
Measuring a Sample

1. Place the sample cuvette into the Liquid Scanner cuvette holder.

2. In the NIRONE Scanner mobile app, click "Measure" then "Measure Now".
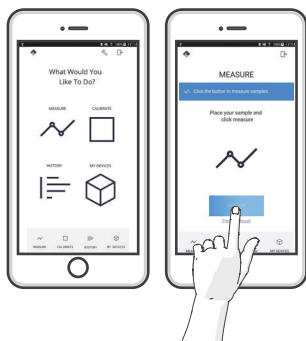
3. Save the results.

Getting the Results

A couple seconds after pressing "Measure Now", the app will display the results. All saved measurements will be available in the NIRONE Scanner app's "History" page.

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Technical Specifications

Environmental Conditions

SPECIFICATION	VALUE
Operation temperature range	+10 to +40°C (non-condensing) +50 to +104°F (non-condensing)
Charging temperature range	+10 to +35°C (non-condensing) +50 to +95°F (non-condensing)
Storage temperature range	-5 °C to +60 °C (non-condensing) +23 to +140°F (non-condensing)
Relative humidity	80 % for temperatures up to 31 °C (88 °F) decreasing linearly to 50 % relative humidity at 40 °C (104 °F)
Height a.s.l.	up to 2000 m up to 6560 ft
Pollution degree	2
Range of application	For indoor use only

Mechanical Specifications

SPECIFICATION	VALUE
Dimensions	115mm (W) x 125 mm (L) x 47 mm (H) 4.53 in (W) x 4.92 in (L) x 1.85 in (H)
Weight	500 g 1.1 lbs
Degree of Protection	IP67 (IEC 60529)

Electrical Specification

SPECIFICATION	VALUE
Electrical interface	USB-C connector, USB2.0 communication
Power rating (USB)	5 VDC, max. 500 mA
Battery type	Li-ion rechargeable battery, type 16340, 3.7V, 700mAH, tested acc. IEC 62133

SPECIFICATION	VALUE
Battery charging current	max. 320 mA
Wireless connectivity	Bluetooth Low Energy BLE 4.3

Optical Specification

SPECIFICATION	VALUE
Wavelength range	1.35 - 1.65 µm (S1.7) 1.55 - 1.95 µm (S2.0) standard 1.75 – 2.15 µm (S2.2) 2.00 - 2.45 µm (S2.5)
Wavelength resolution (typical, FWHM)	13 – 17 nm (S1.7) 15 – 21 nm (S2.0) 16 – 22 nm (S2.2) 18 – 28 nm (S2.5)
Wavelength accuracy	< 2 nm (+/- 1 nm)
Wavelength repeatability	< 1 nm (+/- 0.5 nm)
Wavelength temperature response (max)	0.1 nm / °C
SNR (typical)	11'000 (S1.7) 7'500 (S2.0) standard 7'500 (S2.2) 1'500 (S2.5)
Glass windows	Gorilla-3
Illumination source	Tungsten vacuum lamp
Lamp lifetime	> 40,000 hrs
Optical interface	Transmission measurement with a collimated light beam

Maximum Electrical Power Input
Charge only with USB 2.0 compatible charger. Use only chargers with a maximum output power of 15 W.

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Maximum Radio Power Output

In the European Union, the NIRONE Scanner may operate within the frequency band 2.4 GHz. Maximum power output by design is indicated in parentheses: Bluetooth® (6 dBm).

Environment Conditions

Intended environment with max pollution degree 2.

LED Functions

LED indicators			Description
🔋	∦	◌	
●	●	●	Liquid Scanner off / Not charging / No cable / No power
≡●≡ (green)	●	●	Liquid Scanner off/ Charging/Cable connected
● (green)	●	●	Liquid Scanner off/ Charged full/ Cable connected
≡●≡[1] (green)	≡●≡[2] (red)	●	Liquid Scanner on/ Charged full/ No cable
●[3] (red)	≡●≡[4] (blue)	●	Liquid Scanner on / Bluetooth Pairing activated (for 60s)
≡●≡[5] (green)	≡●≡[6] (blue)	●	Liquid Scanner on / charged full / Bluetooth Pairing with Mobile Device
●	●	● (yellow)	Liquid Scanner on / charged full / Bluetooth Paired / Measurement active
≡●≡ (red)	●	●	Liquid Scanner off / charged full or low / No cable

1. Blinking green once per 10s
2. Blinking red once per 10s
3. Off for 2s on for 3s red off again
4. Off for 5s blinking blue once per 0.5s
5. Blinking green once per 10s
6. Blinking blue once per 0.5s stops blinking when paired blinking blue or red once per 10s

Maintenance

Handle your Liquid Scanner and sample cuvettes with care. The following suggestions help you keep your device operational.

- Keep the scanner dry. Humidity and all types of liquids or moisture can contain minerals that corrode electronic circuits.
- Do not use or store the scanner in dusty or dirty areas.
- Do not store the scanner in high temperatures. High temperatures may damage the scanner.
- Do not store the scanner in cold temperatures. When the scanner warms to its normal temperature, moisture can form inside the scanner and damage it.
- Do not attempt to disassemble the scanner. The warranty is not valid, if the scanner has been disassembled.
- Unauthorized modifications may damage the scanner.
- Do not drop, knock, or shake the scanner. Rough handling can break it.
- Only use the delivered cleaning cloth or a soft, clean, dry cloth to wipe the surface of the scanner.
- Keep the scanner away from magnets or magnetic fields.
- Use only cuvettes in good condition. Replace cuvettes with new ones if the old ones are dirty, scratched or otherwise damaged.

Cleaning the Liquid Scanner

Make sure that the device measurements windows are clean.

When you want to wipe the windows (sensor window and light source window) to remove greasy stains, use isopropanol alcohol window cleaner fluid.
Proceed as follows:
1. Tip a small amount of isopropanol alcohol on a non-linting cloth.
2. Wipe the windows to remove the dirt.

Keep the measurement windows clean.

Change of Battery

1. Preparations:
- Turn device off.
- Disconnect the USB cabel.
- Remove cuvette from cuvette holder.
- Take measures to have an ESD safe environment.
- It is strictly recommended to use only Li-Ion rechargeable battery of type 16340 / 3.7 V / 700 mAh tested acc. IEC 62133. To ensure the IP67 protection class,

it is recommended to use new gaskets. A new Li-Ion battery and new gaskets can be ordered from your distributor.

2. Remove the six screws and six bonded seals from bottom side of the device with a Torx screwdriver.

3. The plastic housing is connected to the base plate with a flat cable. A silicone rubber seal is fixed on the base plate. Carefully lift the plastic housing without putting any strain on the flat cable and without damaging the seal. It is not needed to disconnect the flat cable

4. The battery is placed in the battery holder on the printed circuit board. Remove the battery without touching any of the electronic parts on the printed circuit board.

5. Insert the new battery into the battery holder and ensure the polarity is correct.

6. Carefully place the housing back on the base plate without bending the flat cable. Push the housing over the seal with even pressure on all four corners.

7. Turn around the device and place the six bondage seals into the holes.

8. Mount the six screws with the screwdriver

hand tight.

9. Connect the device to the USB charger and wait until the battery LED indicates a fully charged battery.

10. Now you can turn on your device.

☒ **Disposal**

This device may not be disposed of in domestic waste according to European Directive 2012/19/EU on Waste Electrical and Electronic Equipment (WEEE).
Please dispose of this device and the battery in accordance with local regulations at collection points for electrical and electronic equipment.

Storage and Transport

For storage and transport of the device please follow these notes.

1. Turn off the device.
2. Disconnect cables and remove cuvettes from cuvette holder.
3. Place the device and accessories in the cutouts provided in the original case.
4. Secure the case when transporting it in vehicles.
5. Observe the specified environmental conditions for transport and storage.

Warranty

This product is covered by a limited warranty. To obtain warranty service, please

contact your authorized dealer or distributor from whom you purchased the product. Please confirm the warranty terms and the applicable return policies prior to returning the product.

Do not attempt to disassemble the scanner. The warranty is not valid, if the scanner has been disassembled.

Warranty information: https://support. spectralengines.com/legal-warranty

Disclaimer

⚠️ **Important!**

Sensors, software, documentation, and other products offered by Spectral Engines GmbH, hereinafter referred to as the "Products", are not designed to be fault-tolerant and therefore they are not intended to be used for the purposes of life-critical or hazardous environments that require fail-safe performance.

To the maximum extent permitted by law, Spectral Engines GmbH disclaims any and all warranties, whether expressed or implied, including without limitation any implied warranties of title, merchantability, or fitness for any particular purpose, regarding the Products. Without limiting the foregoing, Spectral Engines GmbH expressly does not warrant that:

• the Products will meet your requirements or expectations;

• the Products will be freeof bugs, errors, viruses, or other defects;
• any results, output, or data provided through or generated by the Products will be accurate, up-to-date, complete, or reliable;
• the Products will be compatible with any third party software or products;
• any errors in the Products will be corrected.

To the maximum extent permitted by law, neither Spectral Engines GmbH nor its suppliers will be liable for any damage or losses relating to the use of the Products, including without limitation direct, indirect, special, consequential, punitive or incidental damages, or losses of revenue, profit, or data. In any case the maximum liability of Spectral Engines GmbH will be equal to the purchase price of the Products.

If you have duly acquired a license to software, you shall have a limited, non-exclusive right to install the software and operate the software but solely in connection with the Products according to relevant specifications and user guides. Save for your limited license, title and all intellectual property rights to the Products belong exclusively to Spectral Engines GmbH and its suppliers. Your limited license to the software will be governed by the substantive laws of Germany.

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The Declarations of Conformity (DoC) are available at:
https://support:spectralengines.com/legal-warranty

$C\!\in$

Declaration of Conformity
Hereby, Spectral Engines GmbH declares that the radio
equipment type NIRONE is in compliance with Directives
2014/53/EU and 2011/65/EU.

UKCA

Declaration of Conformity
Hereby, Spectral Engines GmbH declares that the radio
equipment type NIRONE is in compliance with The Radio
Equipment Regulations 2017 & RoHS Regulations 2012.

FC

Supplier's Declaration of Conformity
47 CFR § 2.1077 Compliance Information

This device complies with Part 15 of the FCC Rules. Operation is
subject to the following two conditions:
1. This device may not cause harmful interference, and
2. This device must accept any interference received,
     including interference that may cause undesired operation

Supplier's Declaration of Conformity
47 CFR § 2.1077 Compliance Information

NIRONE Scanner - U.S. Contact Information
tec5USA Inc.
Thiebaud Schneider
Phone: +1 (516) 661-8746
Email: support@spectralengines.com
120 Terminal Drive
Plainview, NY 11803
USA

ISED

IC compliance
This device complies with Industry Canada license-exempt RSS standard(s).

Operation is subject to the following two conditions:
1. This device may not cause interference, and
2. This device must accept any interference, including interference that may cause undesired operation of the device.

Under Industry Canada regulations, this radio transmitter may only operate using an antenna of a type and maximum (or lesser) gain approved for the transmitter by Industry Canada. To reduce potential radio interference to other users, the antenna type and its gain should be chosen in such a way that the equivalent isotropically radiated power (e.i.r.p.) is not more than that is necessary for successful communication.

This equipment complies with IC RSS-102 radiation exposure limits set forth for an uncontrolled environment. It should be installed and operated with maintaining a minimum distance of 20 cm between the radiator and your body.

Conformité aux norms d´IC Cet appareil est conforme à la(aux) norme(s) RSS sans licence d'Industry Canada.

Son utilisation est soumise aux deux conditions suivantes:
1. Cet appareil ne doit pas causer d'interférences et
2. il doit accepter toutes interférences reçues, y compris celles susceptibles d'avoir des effets indésirables sur son fonctionnement.

Conformément aux réglementations d'Industry Canada, cet émetteur radio ne peut fonctionner qu'à l'aide d'une antenne dont le type et le gain maximal (ou minimal) ont été approuvés pour cet émetteur par Industry Canada. Pour réduire le risque d'interférences avec d'autres utilisateurs, il faut choisir le type d'antenne et son gain de telle sorte que la puissance isotrope rayonnée équivalente (p.i.r.e) ne soit pas supérieure à celle requise pour obtenir une communication satisfaisante.
Cet équipement respecte les limites d'exposition aux rayonnements IC RSS-102 définies pour un environnement non contrôlé. Il doit être installé et utilisé en maintenant une distance minimum de 20 cm entre le radiateur et votre corps.

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| This device contains | FCC ID: XPYNINAB1 |
| | ISED: 8595A-NINAB1 |

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