SERSTECH

Serstech 100 Indicator
User manual

Content

1. Introduction to the Serstech 100 Indicator

Raman spectroscopy is a spectroscopy technique which can be used for rapid identifications of chemicals. The Raman effect occurs when a light (e.g. from a laser) interacts with the sample molecules. Light scattered from the molecules gives rise to a spectrum that typically consists of a series sharp lines and constitutes molecules fingerprint.

The Serstech 100 Indicator is a hand-held Raman spectrometer which can be used without formal training in spectroscopy to obtain chemical identity of substances as well as verify the quality of known substances in order to be able to make immediate action decisions in the field. It also includes a function to screen for regulated substances. The Indicator is a standalone instrument that operates without need for other components. However, the instrument relies on access to libraries stored in the instrument and/ or ability to create and update these libraries externally. Basic computer knowledge is required for administrating the libraries and the users. Laser training is needed for all users since the instrument includes class 3B invisible laser.

This manual describes the basic functions of the Indicator as well as the connection to the software ChemDash 2.0. Functions may be different depending on the hardware and/ or software version in the device. The manual covers Indicators with embedded software functionality version 5.3.0 or later.

The software version is shown in the “About” window. The serial number of the instrument is printed on the back of the instrument (S/N) and is also shown in the “About” window for software.

Please NOTE that you can access ChemDash 2.0 only if your instrument is running software version 4.0.1 or later. If your instrument is running an older version, please upgrade the firmware first by following the instructions in the Firmware Upgrade Guide on serstech.com

1.1.Instrument safety

This is intended for Laser Safety Officers, administrators and users of the SERSTECH Indicator handheld Raman spectrometer instrument. Please read through this section carefully before using the SERSTECH product. Keep the document for further reference.

1.2.Liability

Every care has been taken in the preparation of this document. Please inform your local reseller or SERSTECH AB of any inaccuracies or omissions. SERSTECH AB is not responsible for any technical or typographical errors and reserves the right to make changes to the product and man-

uals without prior notice. SERSTECH AB makes no warranty of any kind regarding the material contained within this document, including, but not limited to, the implied warranties of merchantability and fitness for a particular purpose. SERSTECH AB shall not be liable nor responsible for incidental or consequential damages in connection with the furnishing, performance or use of this material. This product is only to be used for its intended purpose.

1.3.Handling

For a safe handling Serstech AB recommends Users to do as following:

- Store the product in a dry and ventilated environment.
- Do not attempt to repair the product by yourself, contact SERSTECH or your SERSTECH reseller for service matters.
- This product shall be used in compliance with local laws and regulations.
- Always follow your organization's procedure and regulations for the handling of unknown substances.
- Always use small sample sizes to limit possible hazards.
- Dark substances can sometimes absorb the energy from the laser and could possibly ignite, or, if the substance is explosive, it could be detonated. If you are in doubt, we recommend starting scanning with the laser power set to "Low" and use the "Start delay" function, so that you have time to safely move away from the sample before measurement is initiated.

The warranty is void if the product has been damaged by accident, unreasonable use, neglect or if the unit has been opened or tampered with or other causes not arising from defects in material or workmanship. This product is not designed to be intrinsically safe and the user should take the necessary precautions when using the unit.

The product is designed to be used in an everyday field environment and is therefore considerably more rugged than a laboratory unit. But it is important for the user to recognize that it is a precision instrument and should be treated with care. Abuse and mistreatment may lead to a degradation of performance or premature failure.

1.4.Battery Operation and Charging

The unit is specified for indoor and outdoor usage (-20°C to +40°C, 5 % to 90% relative humidity-RH). However, the Power Supply Unit (PSU) is designed for indoor use only and charging shall therefore always be performed indoors (0°C to +40°C, 8% to 90% relative humidity-RH).

1.5.Intellectual Property Rights

SERSTECH AB has intellectual property rights relating to technology embodied in the product described in this document. In particular, and without limitation, these intellectual property rights may include patents or pending patent applications in the US and other countries. This product contains third-party software.

1.6.Equipment Modifications

This equipment must be installed and used in strict accordance with the instructions given in the user documentation. This equipment contains no user-serviceable components. Unauthorized equipment changes or modifications will invalidate all applicable regulatory certifications and approvals

1.7.Trademark Acknowledgments

SERSTECH is a trademark of SERSTECH AB. All other company names and products are trademarks or registered trademarks of their respective companies. Ethernet, Internet Explorer, Linux, Microsoft, Mozilla, UNIX, Windows and WWW are registered trademarks of the respective holders. Java and all Java-based trademarks and logos are trademarks or registered trademarks of Oracle and/ or its affiliates. UPnP ™ is a certification mark of the UPnP ™ Implementers Corporation. SD, SDHC, SDXC, miniSD, microSD, miniSDHC, microSDHC and microSDXC are trademarks or registered trademarks of SD-3C, LLC in the United States, other countries or both.

1.8. Support

In case you should require technical assistance, please send an e-mail to helpdesk@serstech.com or contact the SERSTECH reseller.

1.9.Contact Information

The contact information of the company is as following:

SERSTECH AB

Åldermansgatan 13

SE-227 64 Lund, SWEDEN

e-mail: info@serstech.com

2. Invisible laser Safety Considerations

This operation manual includes information and warnings which must be observed by the user. It contains information NOTEs as well as information of importance to safety of personnel and property. The important symbols are:

This is a **Class 3B laser** product and complies with “Classified according to standard EN 60825-1:2014”.

Class 3B requirements:

A class 3B device shall have a warning signal, audible or visible when the invisible laser is active. A red LED in a yellow warning label placed adjacent to the display solves this requirement. According to the standard, there shall be a yellow label with a black border, the recommended wording is:

WARNING – INVISIBLE LASER RADIATION

AVOID EXPOSURE TO BEAM

CLASS 3B LASER PRODUCT

The backside label on the Serstech 100 Indicator solves this requirement. Also, the front side label has the word WARNING according to standard requirements. Another requirement is that the laser aperture is labelled, there is thus a yellow pictogram label besides the nozzle. The only source for dangerous laser exposure is from the nozzle; the protective casing is designed not to leak laser emission in any other place. With intended use, there is no raised danger for laser exposure when accessing the display controls. A remote interlock connector is not required for handheld instruments. There are no service panels, viewing optics or scanning elements; requirements for these objects are thus not applicable. There shall be a mechanical attenuator/beam stop available to make it possible to block the beam from the nozzle temporarily. The stop is released with the instrument enclosed Calibration Unit, which also makes double duty as a dust cap. Class 3B is one of the most severe classes; meaning that it is easy to permanently harm the eye when the product is not used properly. A class 3B product is not suited as a consumer product since the operator needs to be trained to use proper procedures to avoid eye damage. A safety interlock is needed to ensure that only trained operators use the instrument. A software requirement solves this; the operator needs to login with a PIN number to use the instrument. The software

	also turns the instrument off when inactive and a new login with PIN number is required. Ensure the beam is always terminated at a suitable non-specular (i.e. non-mirror- like) surface. Do not direct the beam at other people or into areas where other people unconnected with the laser work may be present. Refer to the International standard EN 60825-14 users' guide for guidance on identifying and controlling hazards associated with laser use.

	Always ensure the invisible laser is turned off when changing measuring accessories, e.g. from point-and-shoot adaptor to the vial holder.
	**WARNING:** Exposure to levels of invisible laser energy above the MPE can be harmful to the eye. The minimum safety distance (Nominal Ocular Hazard Distance, NOHD) is 100 cm from the invisible laser aperture to avoid exposure to levels above the MPE. The output power is 300 mW at 785 nm. Always avoid exposure to the beam. Use administrative controls, engineering controls, and/ or laser safety glasses to avoid exposure to invisible laser radiation within the 100 cm hazard zone. Use invisible laser safety eyewear of an optical density (OD) greater than 3.
	**WARNING**: Scanning a thermally sensitive material may cause burning of the target. If the sample is contained in a tightly sealed vessel (e.g. a capped vial), pressure may build up during the scan, causing subsequent explosion of the vessel.

3. Serstech 100 Indicator Peli case

The Serstech Indicator 100 instrument with the Accessories is delivered in a crush proof, dust proof and water resistant Peli case.

	This is the Peli case.

4. Accessories

There are different accessories for different sample applications:

1. Sample vial
2. Vial holder
3. Vial holder insert
4. Strap attachment
5. Calibration cap
6. Angled probe tip
7. Mounting tools/wrenches
8. Bottle adaptor
9. Point and shoot adaptor
10. Probe tip

So as to know what the most suitable accessory for your measurement is, please see the Table 1 and its explanation below:

Table 1: List of accessories according to their use

Sample substance	**Sample holder**	**Holder wall thickness (mm)**	**Accessory: Probe tip together with**	**Laser point distance inside the sample (mm)**
≥ 2.0 ml liquids or powders	Standard vial	1.3	Vial holder	0.1-0.9 (from the sample holder interior wall)
	Bottles	1.0-1.5	Bottle adapter	
	Containers	1.5-4.0	-	
≤ 2.0 ml liquids or powders	Standard vial	1.3	Vial holder + insert	
Solids or powders	Plastic bags	-	Point and shoot	0.2

The purpose of the different adaptors is to keep the sample at the proper distance from the laser focus point. If the laser focus ends up too far inside the sample, the Raman signal will be attenuated and result to a low quality or unusable spectrum. On the other hand, e.g. if a container wall is thicker than 4 mm, the focus point will end up on the container wall and you will sample the container material instead of its content.

1. If the User measures through a glass or plastic container with 1.5-4.0 mm thick walls use probe tip (10. in the picture above) without any adaptor mounted. The laser focus will then be located 4.5-5.0 mm from the tip and therefore will end up inside the sample.
2. If the User measures through the standard sample vial with 14.8 mm outer diameter and 1.3 ±0.2 mm thickness, the laser will point 0.1-0.9 mm from the vial interior wall and 14 mm from the bottom of the vial inside the vial holder. Therefore, the vial must be filled up to 2 mL at least so that the laser focus ends up inside the sample and not in the air.
3. If the sample is less than 2 mL use the insert to raise up the vial inside the vial holder. The laser focus will point 0.1-0.9 mm from the vial interior wall and 2 mm from the vial bottom. Minimum sample volume is approximately 0.4 mL.
4. With the point and shoot adaptor the focus will point approximately 0.2 mm from the adaptor tip. That's why the point and shoot adaptor is appropriate to use when measuring though a thin plastic bags or flush to a solid surface of the sample.
5. If the container has 1.0-1.5 mm thick walls use the bottle adaptor.

NOTE: It is very important to reduce stray light from entering the instrument as much as possible, e.g. by covering the container with a black cloth unless the User uses the vial holder adaptor.

It is also recommended to use the auto-exposure mode. The amber glass vessels and fogged plastic material will reduce the quality of the signal and thus the obtained spectrum. The signal quality may be also reduced for the opaque samples, e.g. powders because of the sample depth (affected by factors as the grain size), fluorescence, sample actual Raman response etc. However, for transparent, non- fluorescent liquid samples there are a much wider margin.

4.1. Vial holder

The vial holder is used for analysis of liquid samples in vials. One sample vial is shipped with the instrument. Generally, the vial holder can be used with both probe tip and angled probe tip. In this example we will use it with the straight probe tip.

	The holder accepts 4 ml standard vials with 14.8 mm outer diameter and 1.3 (±0.2) mm thickness.
	To mount the vial holder simply snap it to the probe tip.
	Add the sample into the vial.
	WARNING: Scanning a thermally sensitive material may cause burning of the target. If the sample is contained in a tightly sealed vessel (e.g. a capped vial), pressure may build up during the scan, causing subsequent explosion of the vial.

	Place the vial into the vial holder.
	Screw the cap on and start the measurement.
	**Vial holder inserter** The insert serves as a support for the vials filled with a sample up to 0.4 mL.

4.2.Point and shoot adaptor

The point and shoot adaptor have a conical shape for easy measurement of any size and shape of samples. This will ensure optimal versatility and measurement results. Generally, the point and shoot adaptor can be used with both straight probe tip and angled probe tip.

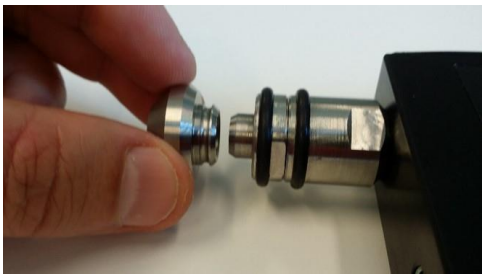
	To attach the point and shoot adaptor please follow the steps bellow:

	1. Align bezels of adaptor to corresponding notches on the probe tip. 2. Align the adaptor into position. 3. Slightly pull and rotate when removing the adaptor.
	With the point and shoot adaptor the measurements can be made e.g. through transparent plastic bags by gently pressing the adaptor against the bag. **NOTE**: The laser focus is typically under 20µm (0.02 mm).
	**WARNING:** Keep the sample pressed against the adaptor until the red diode, indicating invisible laser activity, is turned off.

4.3.Bottle adaptor

The bottle adaptor looks similar to the point and shoot adaptor and is used when measuring through a transparent container with a thickness of 1.0 -1.5 mm. Generally, the bottle adaptor can be used with both probe tip and the angled probe tip. In this example we will use it with the straight probe tip.

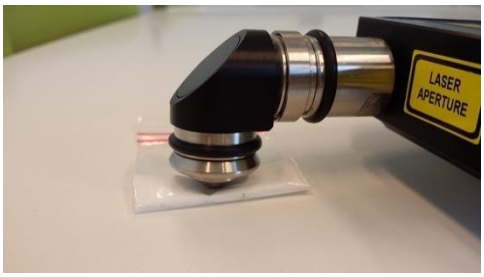
	To attach the bottle adaptor please follow the steps bellow:

	1. Align bezels of adaptor to corresponding notches on probe tip 2. Align the adaptor into position 3. Slightly pull and rotate when removing the adaptor
	Measure without an adaptor if your container is 1.5- 4.0 mm thick. Place the container flush to the instrument probe tip and start the measurement.

4.4.Angled probe tip

The angled probe tip is used for analysis of solid samples. It can be used for measurements of e.g. powders through a plastic bag when sampling potentially explosive substances.

	The angled probe tip.
	**WARNING:** Before mounting the angled probe tip make sure that the Indicator is turned off. Exposure to the beam can result in serious eye damage!

	To mount the angled probe tip first remove the current probe tip from the instrument. Use two specially designed wrenches supplied with the instrument. Place one wrench in the notch on the probe tip next to the instruments main body and the other in the similar notch between the two rubber rings.
	Hold the wrench next to the instruments main body still and turn the wrench on the probe tip counterclockwise to remove it.
	Attach the angled probe tip by gently inserting the threaded part and screw it in place by hand. Use the wrenches to tighten. Make sure that the tip is securely fastened, but do not overtighten. The angled probe tip accepts the point and shoot adaptor, the bottle adaptor, the vial holder and the calibration cap.
	**NOTE:** Make sure not to damage the invisible laser shutter when mounting the angled probe tip. The invisible laser shutter prevents any accidental exposure to the collimated laser beam.
	Put the instrument on a flat surface with the adaptor in contact with the sample and start the measurement. Since it will take some time before the invisible laser is turned on the operator can move away from the instrument to a safe area.

4.5.Calibration cap

	The calibration cap contains a polystyrene target and is used for the calibration control of the instrument. It is also protecting the optics inside the probe tip.

4.6.USB Cable

	The supplied USB cable is the connection cable between the Indicator and a PC, used to access ChemDash ONE.
	The USB cable is also used to connect the optional USB charger to the Indicator.

4.7. Indicator

All the Indicator functions are controlled through the Keypad.

	On the front side of the Indicator there is a clearly visible **laser warning label** with a red indicator LED that is lit when the invisible laser is operating.

	On the backside of the instrument it can be found: ▪ **Product ID** ▪ **Invisible laser safety information** ▪ **Serial number** ▪ **QR code**

Important NOTE: Analysis of strongly reflecting samples, e. g. mirrors, must be avoided since this can harm the instrument and void the warranty.

NOTE: Be aware of that any measurement is sensitive to stray light entering the instrument through the probe tip. Stray light will not damage the instrument but may cause corruption of the measurement. Daylight usually contains a substantial amount of near infrared radiation in the same spectral range as the Raman bands, making it difficult to filter out without simultaneously reducing instrument detection sensitivity. When doing a scan outside in bright sunlight, it is recommended to scan the sample using the capped vial holder, if possible. When scanning solid materials, e.g. in plastic bags, you should limit the amount of stray light as much as possible, e.g. by doing the measurements in a shaded area and cover the front lens aperture.Also, please note that dark substances can sometimes absorb the energy from the laser and could possibly ignite, or, if the substance is explosive, it could be detonated. If you are in doubt, we recommend starting scanning with the laser power set to “Low” and use the “Start delay” function, so that you have time to safely move away from the sample before measurement is initiated.

4.8.Keypad

1. **Power**

   Start the instrument by pressing the power button and shut it down by keeping the power button pressed for 5 seconds.

2. **Quick Menu button**

   - **Back**- Returns to the previous menu
   - **Home**- Main menu
   - **USB**- USB
   - **Calibrate**-Calibration
   - **Settings**-Main menu Settings

3. **Arrows**

   Use the up and down arrow buttons to move between the different items in the menus.

4. **Arrows**

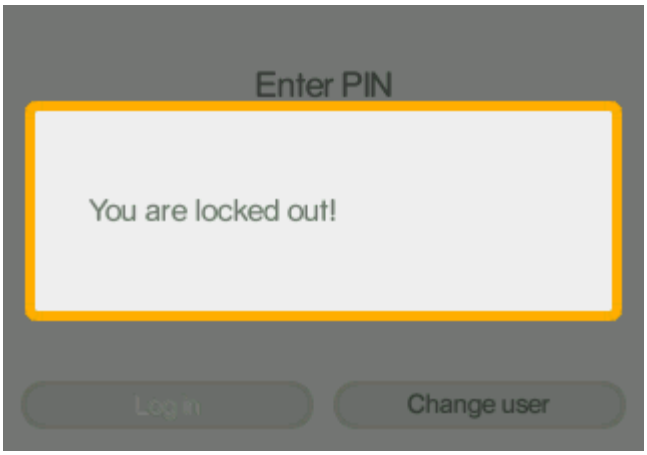
   Use the tab button to move between the different fields in the menus.

5. **OK button**

   Execute choices by pressing the OK button.

4.9. Log in

In order to log in the Serstech 100 Indicator, please follow all steps described below:



- Start the instrument by pressing the ⏻ button
- Select your identity from the list in the window:

If the instrument is started for the first time, there are two predefined users that may be used to access the instrument:

Default, Admin

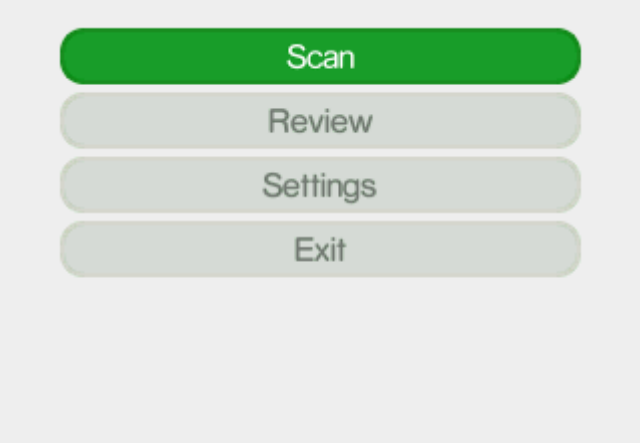
Default, User

- Scroll with the arrow keys between the alternatives.
- Press the OK button to select a user
- Enter your four-digit personal code that your local Indicator administrator has supplied you with.
- Move between the four different digits with the [Tab] key.
- Use the up and down arrows to change the value for each of the four digits. The value can be set to 0-9.
- Press the OK button.
- The Main menu will be displayed after a successful log-in.
- After 3 unsuccessful attempts typing the wrong PIN code, the User will automatically be locked out. To change the PIN code please use ChemDash software/Devices section/the specific device/specific User.
- **NOTE:** When the instrument is

	started for the first time the PIN code (supplied with the instrument) is 0000. It is up to the User to change its PIN code on the device through ChemDash 2.0.

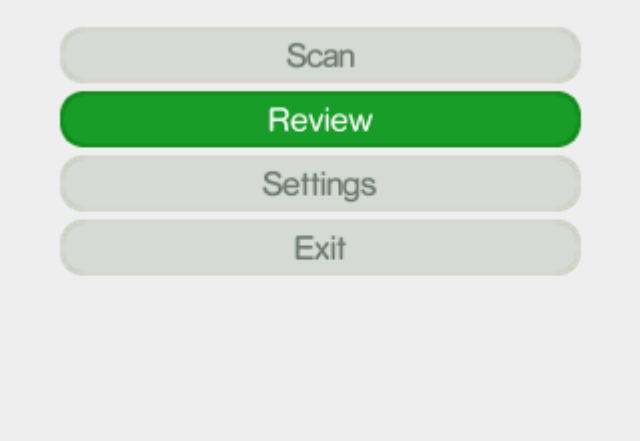
5. Main menu

Features of the Main menu are Scan, Review, Settings and Exit. You can quick access the Main menu by using the Quick Menu button and select Home.



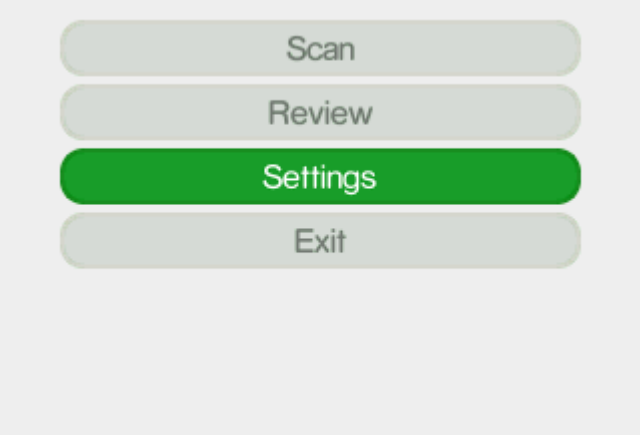
Select **Scan** if you want to**:**

- Screen to scan a substance(s)
- Identify an unknown substance(s)
- Verify a known substance(s)
- Add new substance (s)
- Scan settings:
  - Settings Screen
  - Settings Verify
  - Settings Calibration



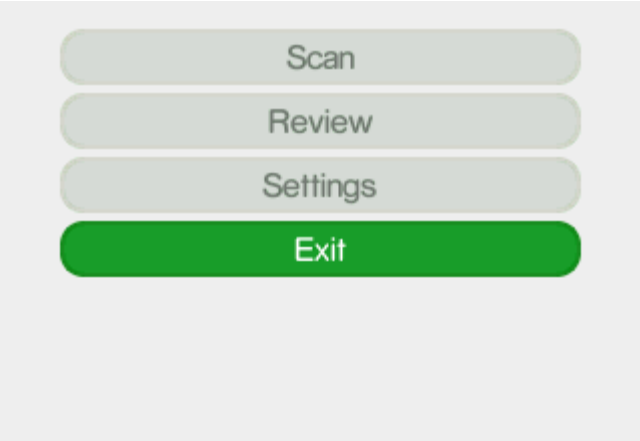
Select **Review** if you want to see the history of your measurements:

- Screen Review
- Identify Review
- Verify Review
- Add substance Review



Select **Settings** to access the options:

- About
- Time and Date
- Display properties
- Administration:
  - Calibrate
  - USB
  - Language
  - Factory Reset



Select **Exit** if you want to:

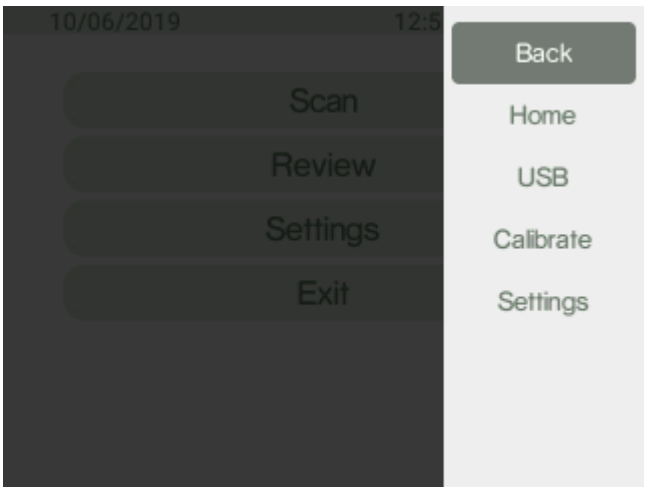
- Log of from the Indicator
- Restart the Indicator
- Shut down the Indicator
- Go back to the Main menu

6. Quick menu

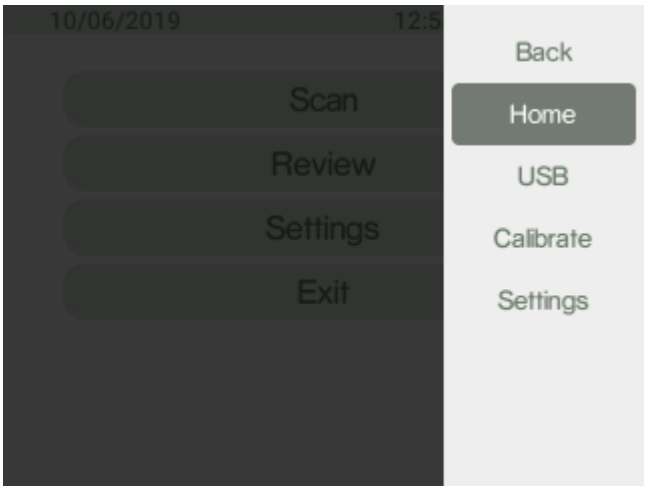
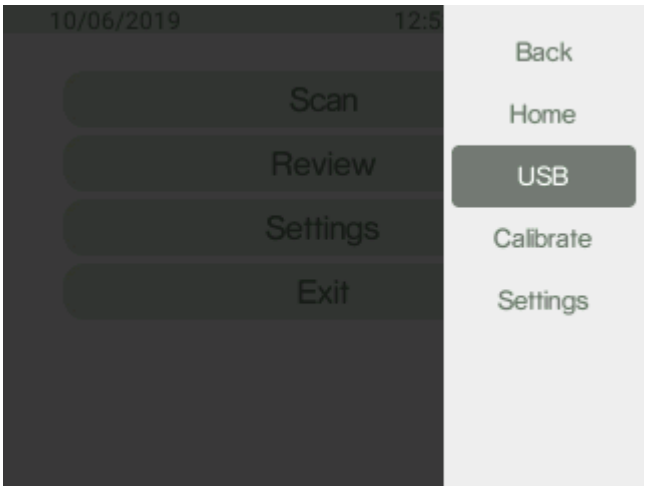
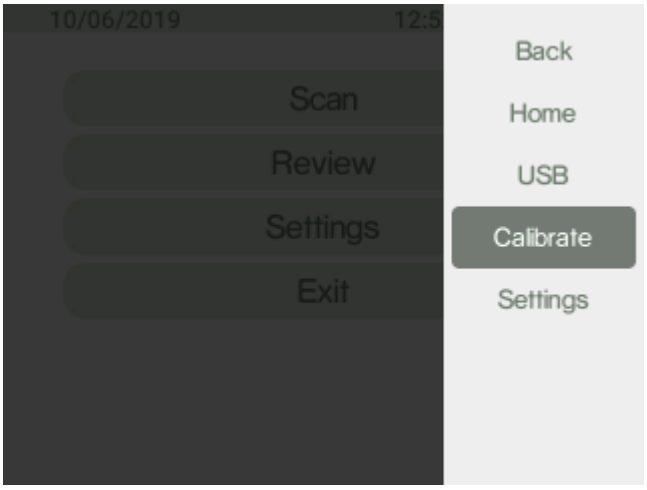
The Quick Menu is opened when the **Quick Menu** button is pressed.

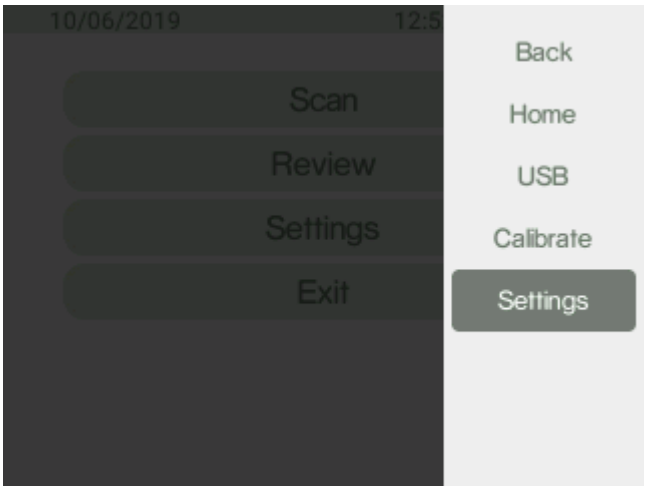
Features of the Quick menu are **Back**, **Home**, **USB**, **Calibrate** and **Settings**.

- Use the up and down arrows to move between the different menu items.
- The Quick menu is closed by pressing the Quick Menu button 



Select **Back** to return to the previous menu.

	Select **Home** to go to the Main menu.
	Select **USB** to activate the USB port.
	Select **Calibrate** to go to Calibration.

	Select **Settings** to go to Main menu Settings.

-

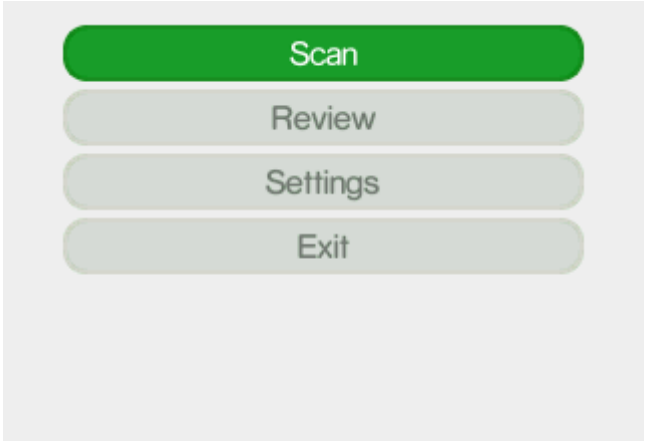
7. Scan

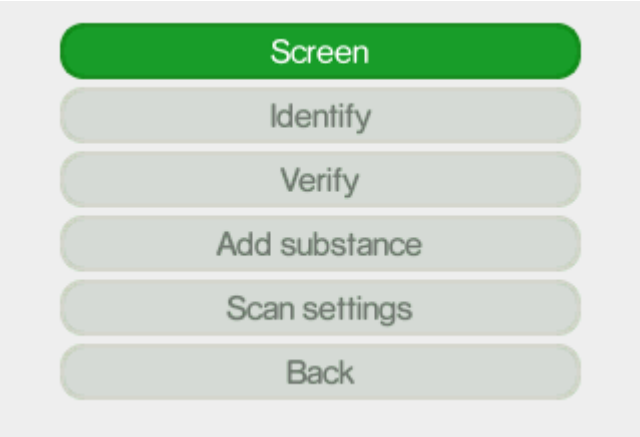
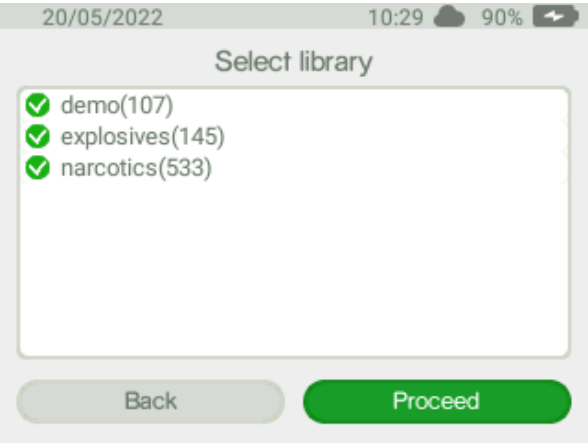
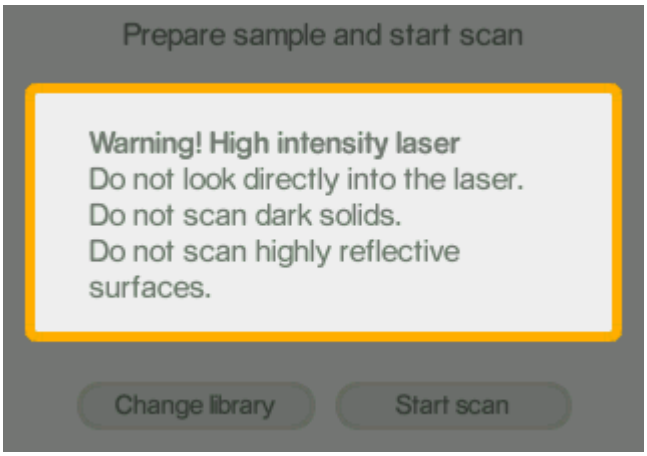
7.1.Screen

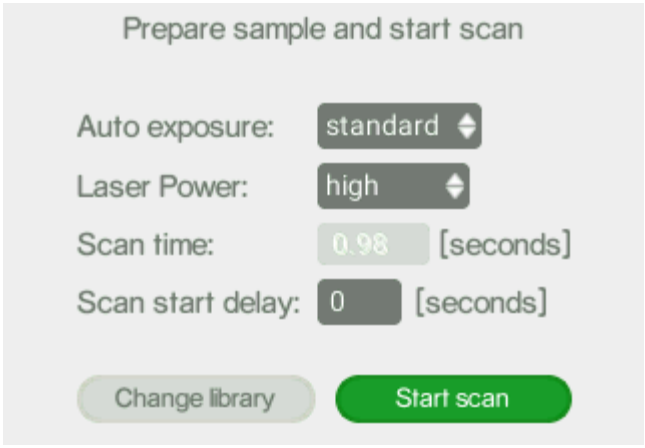
This method is used for screening a list of restricted chemicals for the presence of a regulated substance(s) in the sample, e.g. narcotics and explosives.

Narcotics and explosives are two screen categories of the instrument. Each substance of these two categories has its "Regulatory Type" settings in the reference library depending on the severity. The regulatory types are listed under Screen analysis result:

- Select the appropriate accessory for the analysis
- Log in to the Indicator

	Select **Scan** from the Main menu.

	Select **Screen**.
	Select one or several libraries you will use for the analysis by pressing OK button when the needed library is selected.
	A **laser warning** pop-up message is given before the preparation can be finished and the scan started. Press **OK** to proceed.



How to set the exposure parameters:

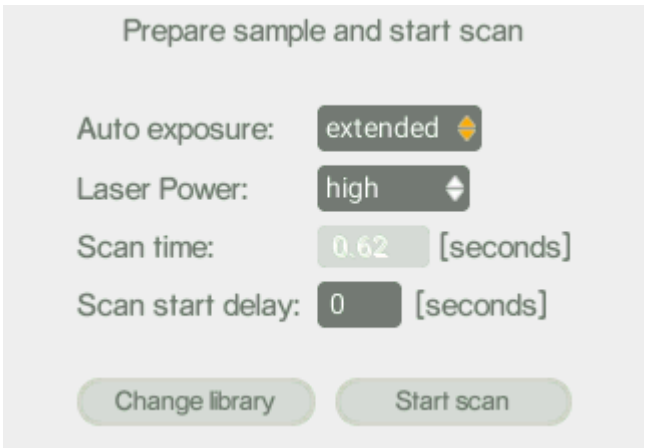
The **Auto exposure** mode can be set to the values standard, extended or off with the up and down arrows.

NOTE: To obtain best spectral quality the Auto exposure modes standard or extended should be used.

You can move between the options by using the tab button.

The invisible laser power can be set to the values low, medium or high with the up and down arrows. The output power is 300 mW at 785 nm.

The **Scan start delay**; delays the start of the of the invisible laser. Use Scan start delay whenever there is any risk that the substance to be analyzed can burn or explode. The Scan start delay can be set for 0-999 seconds, giving the user time to move away from the instrument before the invisible laser is activated. Start scan by pressing **OK**.



NOTE:

Auto exposure mode set to extended.

- In extended mode the indicator makes additional exposures to improve the signal quality.
- The signal improvement may take some time.

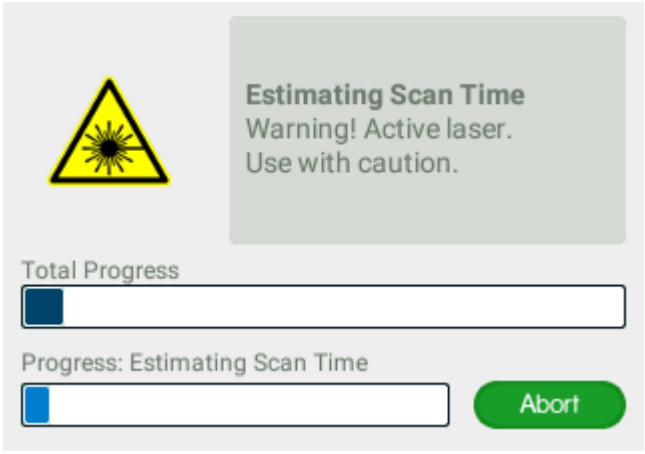
NOTE:

If **Auto exposure** is off the Scan time must be set.

Set the **Scan time** with the up & down arrow keys.

NOTE: In Auto-exposure standard and extended mode the Indicator will analyze the sample and try to calculate the ideal exposure time needed to get optimal signal-to-noise ratio in the measured spectrum, i.e. maximize the quality of the spectrum. The calculated exposure can be in the range of 0.02 – 32 seconds, depending on compound and sampling conditions. In extended mode additional exposures will be made to improve the signal quality. When using these modes, the total process time will be about 3 seconds longer compared to manual mode since several trial exposures and signal improvement will be made in addition to the final measurement. The total accumulated invisible laser exposure on the sample will also increase compared to manual exposure mode. Until the actual analysis starts there is always the option to abort the measurement.

Follow the different steps in the sample analysis**:**

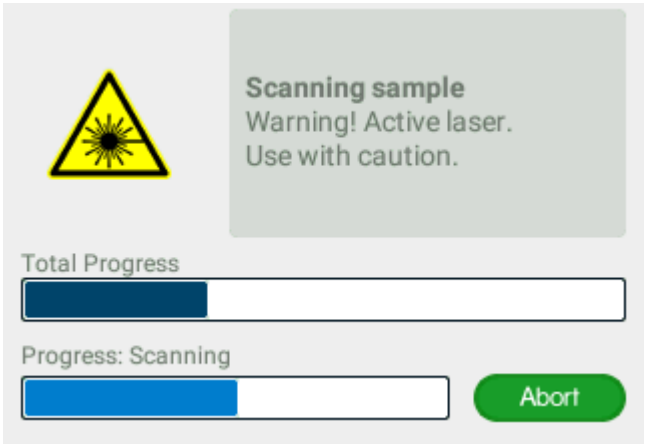
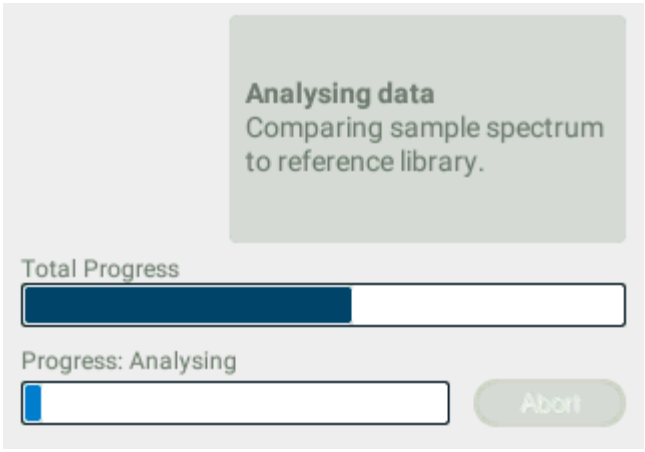
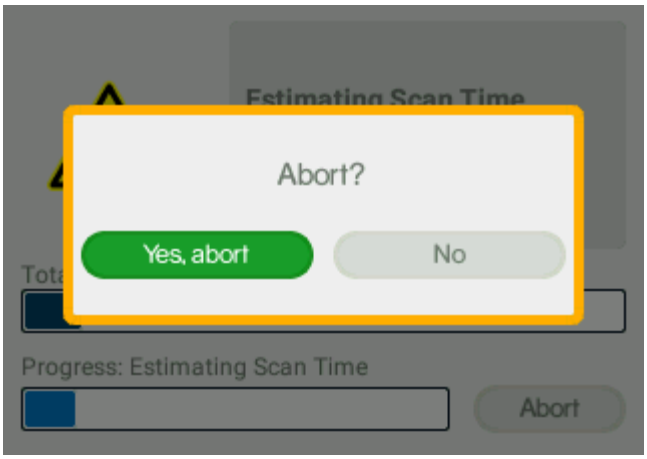


Estimating Scan Time: The ideal exposure time is calculated.

The **upper progress bar** shows the progress of the total scan process.

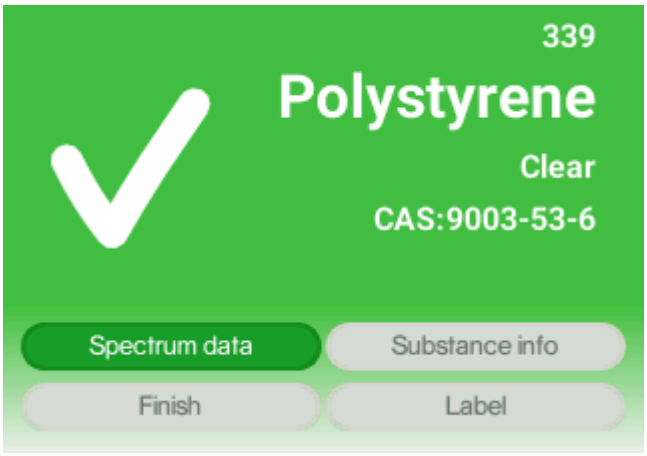
The **lower progress** bar shows the progress of the current part of the scan process (scanning or analysis).

The scan can be aborted by pressing **OK**. You will return to the previous menu.

	**Scanning sample**: Collecting Raman spectrum. If Auto exposure extended mode is used the signal improvement may take some time. The scan can be aborted by pressing OK. You will return to the previous menu.
	**Analyzing**: Analyzing Raman spectrum and compare to the chosen library. The scan can no longer be aborted.
	If the scan is aborted, a pop-up dialogue window is displayed where the user has to confirm the abortion. **Aborting scan**: a pop-up dialogue window is displayed Confirm the abortion by pressing **OK**. You will return to the previous menu

8.1.1 Screen analysis result

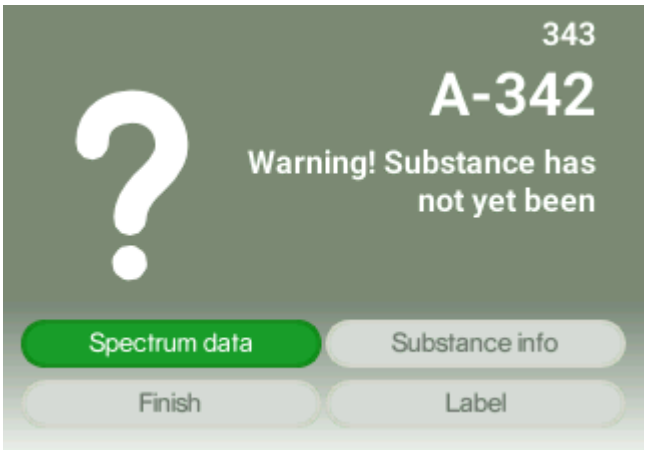
These are the possible outcomes of the Screen scan in the Screen category used for measurements:



Clear: The substance found is classified as not regulated.

- **Sequential number** in the upper right corner, here the number 339, is the number of measurements done with the instrument.

Regulated substance: The substance found is classified as a regulated substance e.g. a narcotic or explosive substance that is listed as illegal.



Not yet Categorized: The substance found comes from the local library is classified as not yet been categorized. You can categorize the substance from ChemDash.

Select **Label** to label the measurement.

In case you want to write either a note or a name or CAS number to the analyzed substance you can click on Label and select characters. Once you are done, please click on Save.

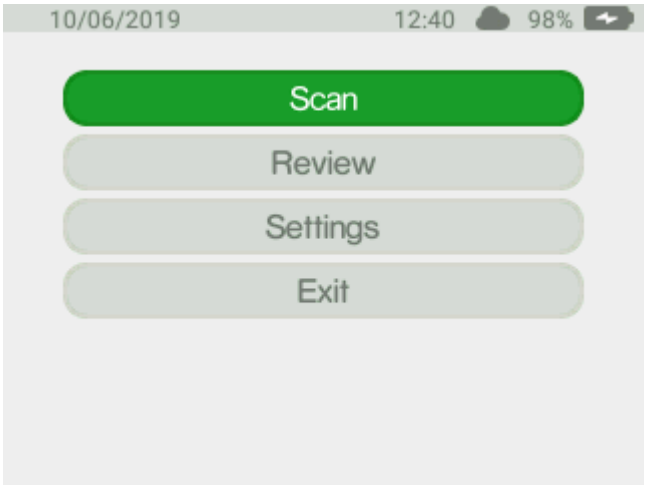
Inconclusive Result: There is no spectrum in the libraries that matches the sample spectrum.

You may want to re-test the sample while paying close attention to that the sample is correctly positioned at the instruments focal point and the instrument is not exposed to strong ambient light.

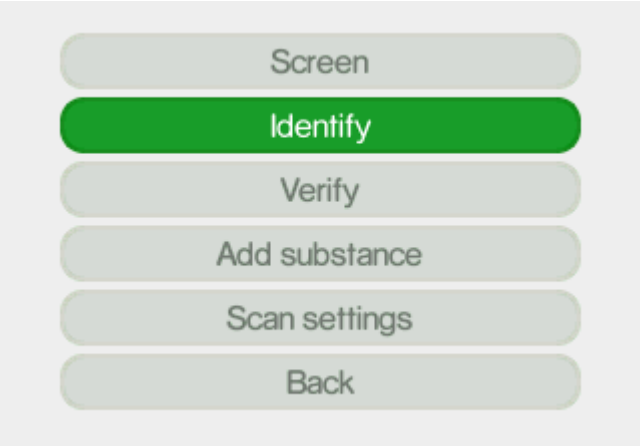
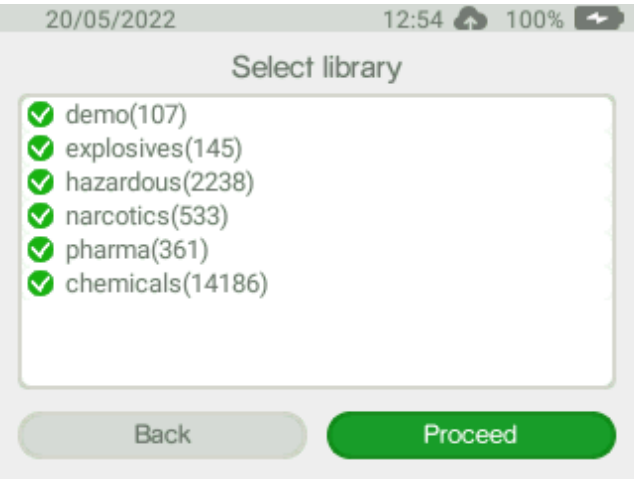
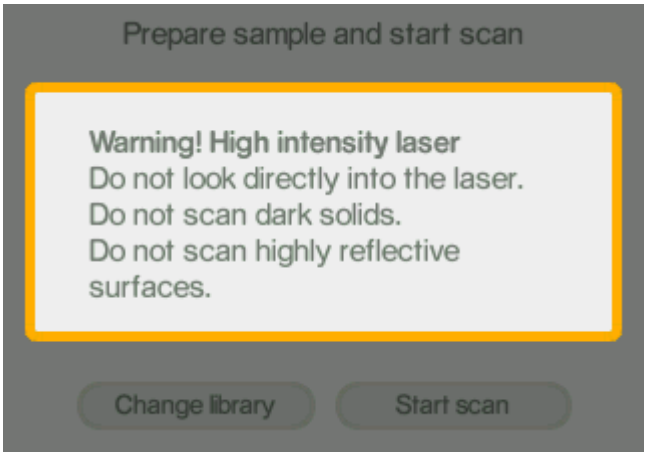
7.2.Identify

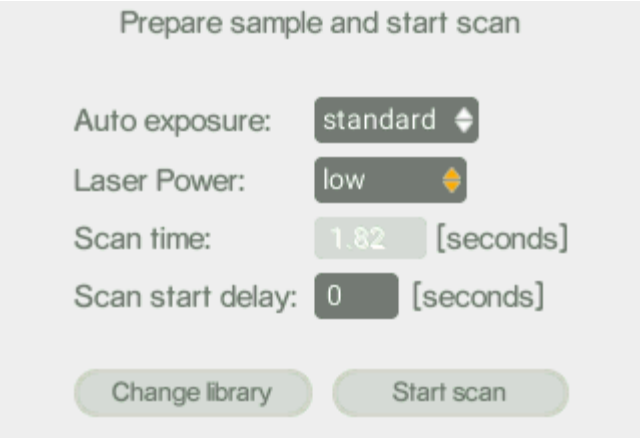
The Identify method is used to identify an unknown substance in a sample. The Indicator matches the unknown chemical to the chosen library. All substances that match the sample will be listed and you can access specific substance (chemical safety) information for all matches found.

This is not category matching like that used in the Screen method described above. The analysis is based on molecular spectral data only, regardless the category.



Select **Scan** from the Main menu.

	Select **Identify.**
	Select one or several libraries you will use for the analysis.
	An invisible laser warning pop-up message is given before the preparation can be finished and the scan started. Press **OK** to proceed.



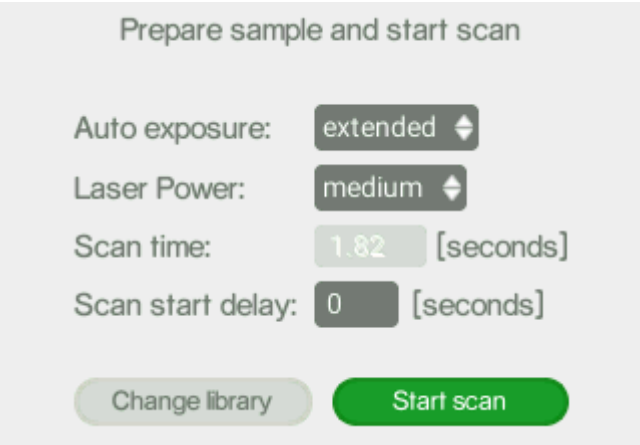
Set exposure parameters**:**

The Auto exposure mode can be set to the values standard, extended or off.

NOTE: To obtain best spectral quality the Auto exposure modes standard or extended are recommended.

The invisible laser power can be set to the values **low**, **medium** or **high**.

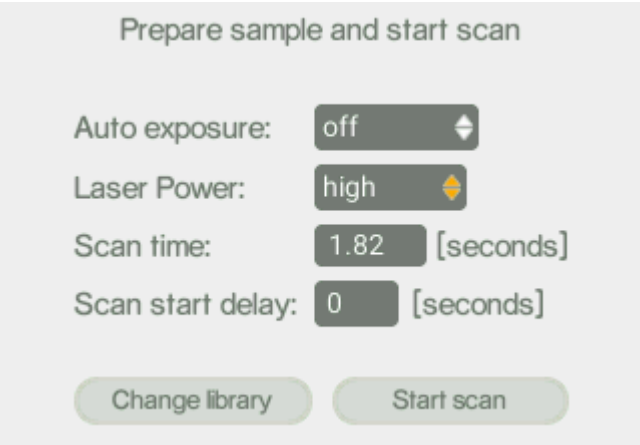
The **Scan start delay** postpones the start of the scan and thus the activation of the invisible laser. Use Scan start delay whenever you think you have to deal with possibly explosive/flammable substances.



If there is any risk that the substance to be analyzed can burn or explode, the Scan start delay can be set for 0-999 seconds giving the user time to move away from the instrument before the invisible laser is activated.

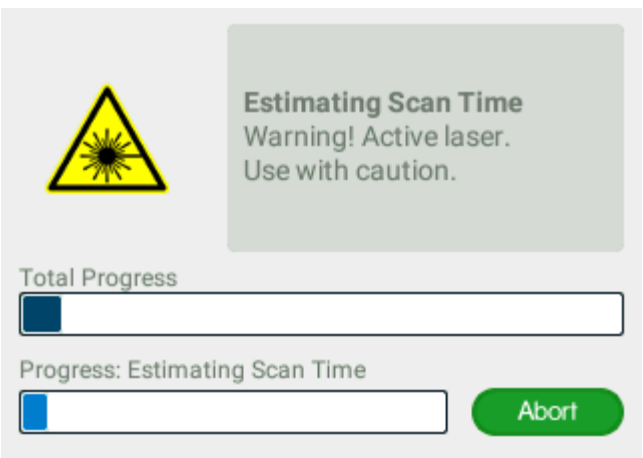
Start scan by pressing **OK**.

Auto exposure mode set to extended. In extended mode the indicator makes additional exposures to improve the signal quality. The signal improvement may take some time.



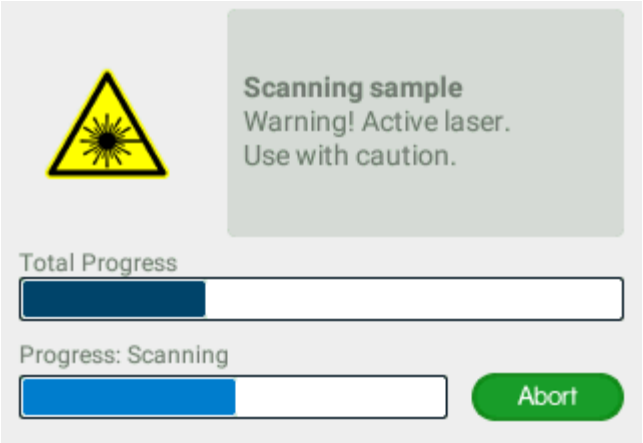
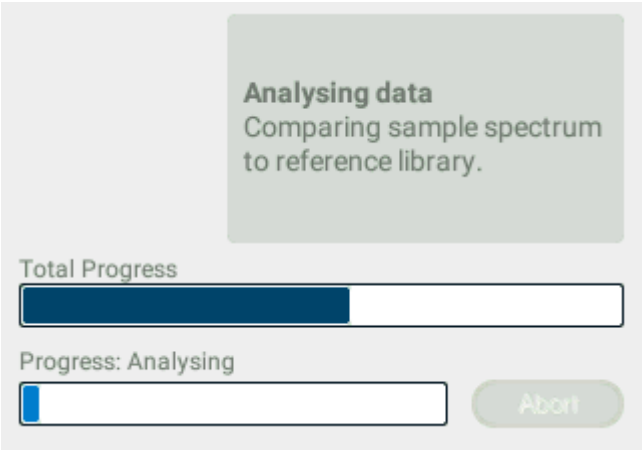
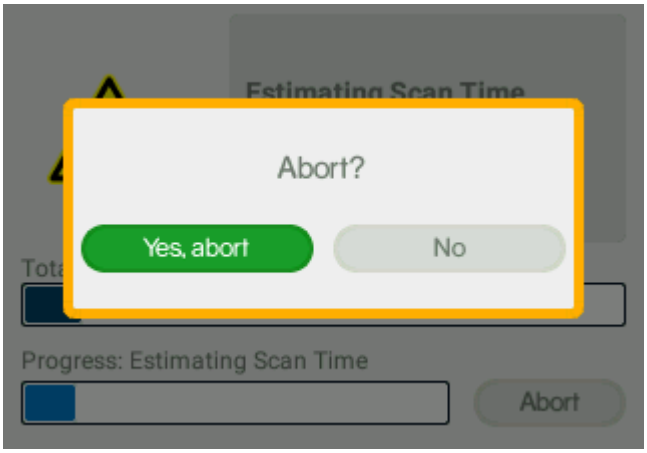
If Auto exposure is OFF the Scan time must be set. **NOTE:** In Auto-exposure standard and extended mode the Indicator will analyze the sample and try to calculate the ideal exposure time needed to get optimal signal-to-noise ratio in the measured spectrum, i.e. maximize the quality of the spectrum. The calculated exposure can be in the range of 0.02 – 65.5 seconds, depending on compound and sampling conditions. In extended mode additional exposures will be made to improve the signal quality. When using these modes, the total process time will be at least 3 seconds longer compared to manual mode since several trial exposures and signal improvement will be made in addition to the final measurement. The total accumulated invisible laser exposure on the sample will also increase compared to manual exposure mode. Until the actual analysis starts there is always the option to abort the measurement.

Follow the different steps in the sample analysis:



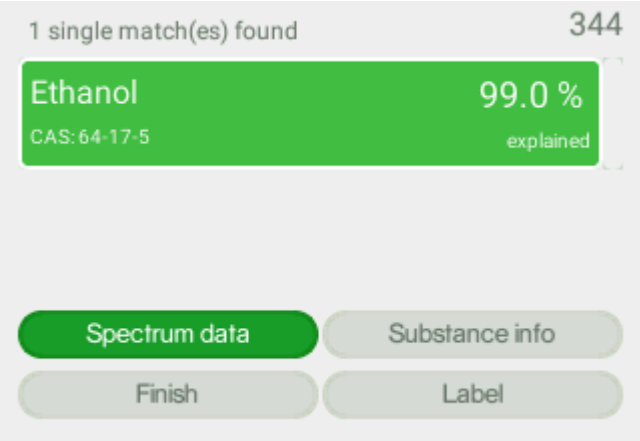
Estimating Scan Time:

The ideal exposure time is calculated. The upper progress bar shows the progress of the total scan process. The lower progress bar shows the progress of the current part of the scan process. The scan can be aborted by pressing OK. You will return to the previous menu.

	**Scanning sample:** Collecting Raman spectrum If Auto exposure extended mode is used the signal improvement may take some time. The scan can be aborted by pressing OK. You will return to the previous menu.
	**Analyzing:** Analyzing Raman spectrum and compare to the chosen library. The scan can no longer be aborted.
	If the scan is aborted a pop-up dialogue window is displayed where the user has to confirm the abortion. **Aborting scan:** a pop-up dialogue window is displayed. Confirm the abortion by pressing OK. You will return to the previous menu.

8.2.1 Identify analysis result

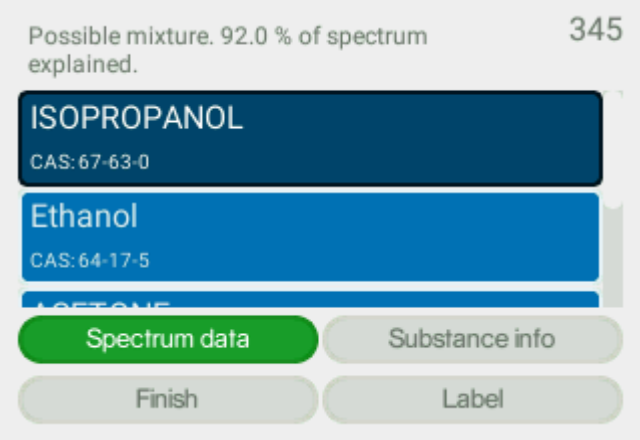
There are three possible outcomes from the Identify scan:



One single match found: A match between the sample spectrum and a single reference spectrum in the library has been found.

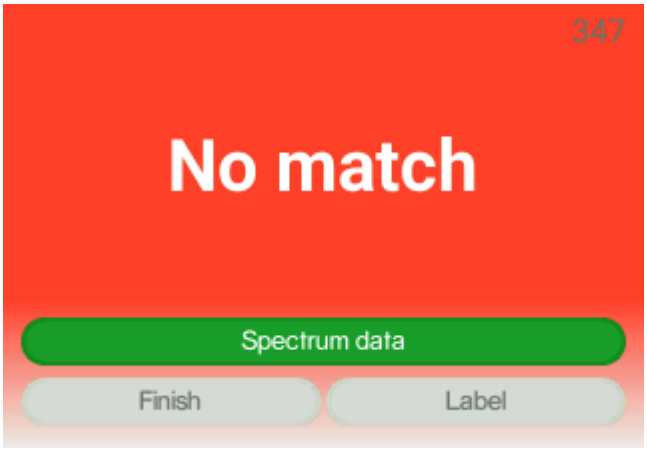
The numerical value given in conjunction to the substance name, here 99.0%, is a score factor describing how well the reference spectrum describes the sample. Thus, a high number indicates that it is very likely that the sample contains the suggested substance.

Sequential number in the upper right corner, here 344, is the number of measurements done with the instrument.



Possible mixture 92.0% of spectrum explained: The obtained spectrum cannot be explained by one single library reference but by a mixture of library items.

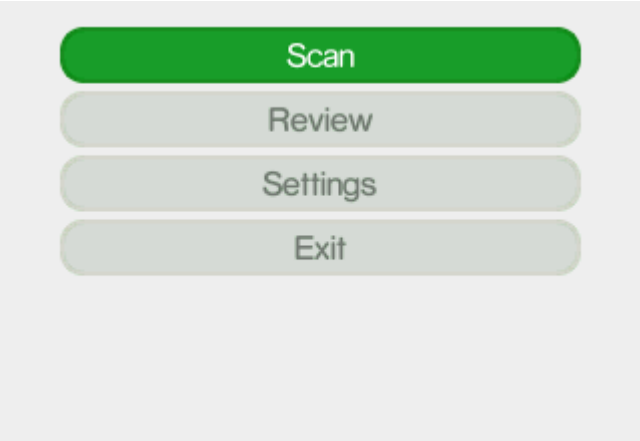
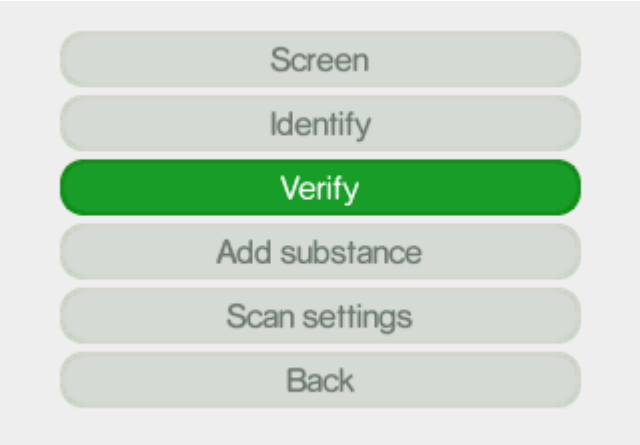
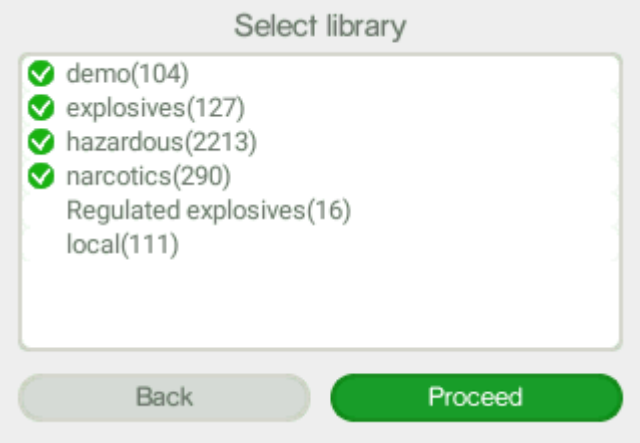
Here Isopropanol is the library reference that has the best correlation with the sample spectrum and thus presented on the top of the list. Three listed library references together explain the sample spectrum to 92.0% and the mixture thus has a score factor of 92.0%. Sequential number in the upper right corner, here 345, is the number of measurements done with the instrument.

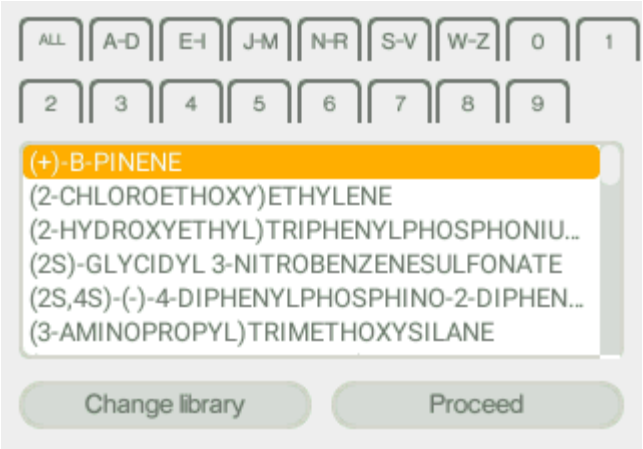
	**No match**: This result can indicate that the measured spectrum is of sufficient quality for analysis but any correlation with spectra in the active libraries is too low. NOTE: No match result may also be due to too low spectrum signal to noise ratio if the data quality is too bad for meaningful analysis. In this case no processed spectrum is stored in the instrument. It is possible to go back and review the spectrum later.
	Select Label to label the measurement. In case you want to write either a note or a name or CAS number to the analyzed substance you can click on Label and select characters. Once you are done, please click on Save.

7.3.Verify

Verify method is similar to the Screen in the sense that you know what you are searching for, but in case with Verify you only search for a match to one specific substance rather than several. Verify is used when you want to confirm that the sample is of the correct identity.

Before the measurement you will choose a reference substance from the spectra libraries. The Indicator will analyze the sample and compare it with the chosen reference. The result is binary, either Pass (OK) if the sample is similar to the reference spectrum or Fail (not OK) if the sample is different.

	Select **Scan** from the Main menu. Select the appropriate accessory for the analysis.
	Select **Verify**.
	Select one or several libraries you will use for the analysis.

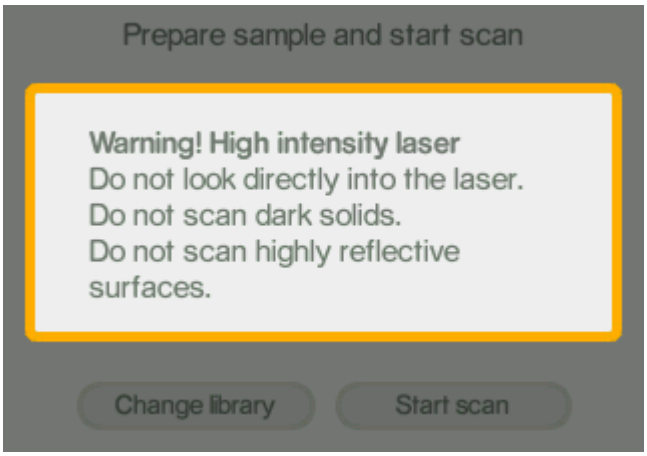


Select the substance you want to verify.

If you have many reference substances it may be useful to sort the list. This is done with the labels at the top of the window. By selecting a suitable label, you can sort the list on numbers or alphabetically. You can go from one tab to another

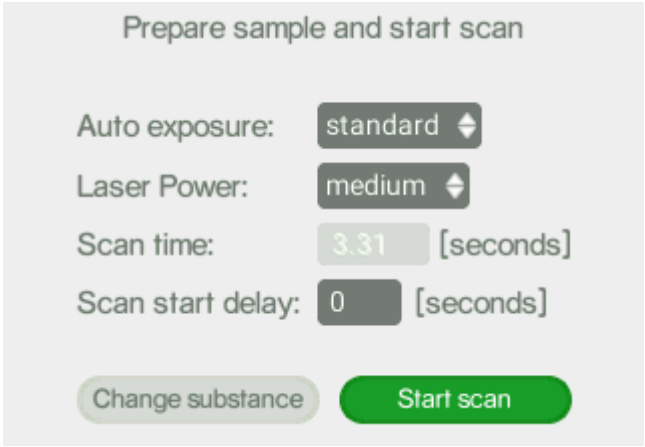
Highlight the appropriate substance and the press OK.

NOTE: if substances have names with non-ASCII characters these substances will all appear under the label ALL.



An invisible laser warning pop-up message is given before the preparation can be finished and the scan started.

Press OK to proceed.

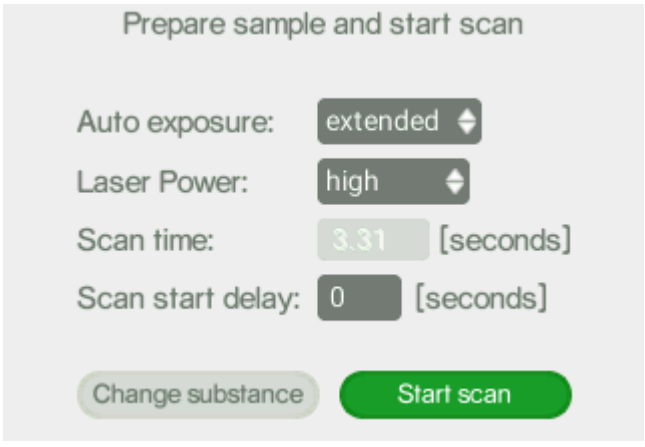


Set exposure parameters.

The Auto exposure mode can be set to the values standard, extended or off with.

NOTE: To obtain best spectral quality the Auto exposure-standard or extended modes should be used. The invisible Laser power can be set to the values low, medium or high with. The Scan start delay delays the start of the scan and thus the activation of the invisible laser. Use Scan start delay whenever there is any risk that the substance to be analyzed could burn or explode. The Scan start delay can be set for 0-999 seconds with, giving the user time to move away from the instrument before the invisible laser is activated.

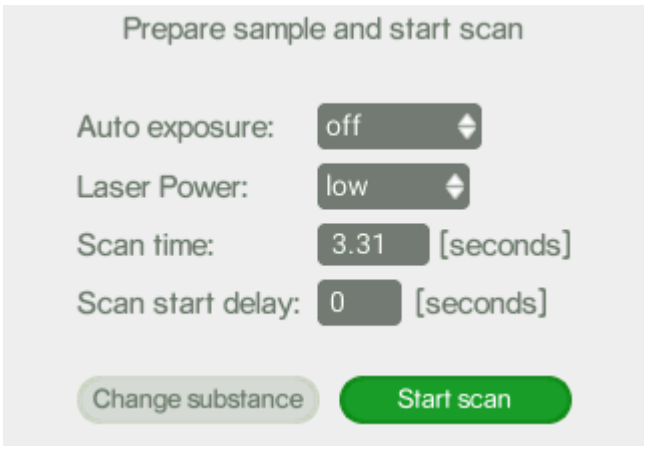
Start scan by pressing OK.



Auto exposure mode set to extended.

In extended mode the indicator makes additional exposures to improve the signal quality.

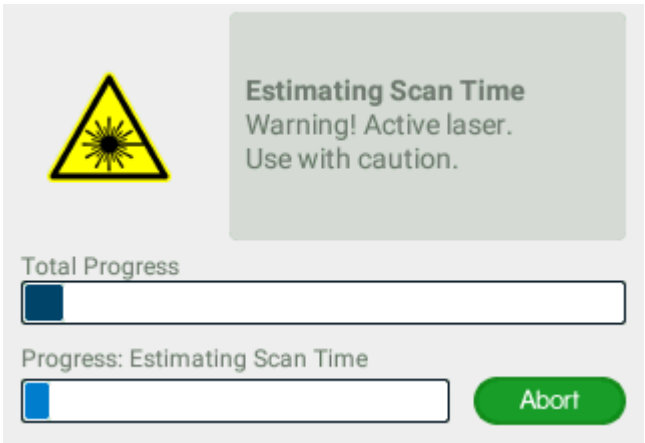
The signal improvement may take some time.



If Auto exposure is OFF the Scan time must be set.

NOTE: In Auto-exposure standard and extended mode the Indicator will analyze the sample and try to calculate the ideal exposure time needed to get optimal signal-to-noise ratio in the measured spectrum, i.e. maximize the quality of the spectrum. The calculated exposure can be in the range of 0.02 – 65.5 seconds, depending on compound and sampling conditions. In extended mode additional exposures will be made to improve the signal quality. When using these modes, the total process time will be 3 seconds longer compared to manual mode, since several trial exposures and signal improvement will be made in addition to the final measurement. The total accumulated invisible laser exposure on the sample will also increase compared to manual exposure mode. Until the actual analysis starts there is always the option to abort the measurement.

Follow the different steps in the sample analysis:

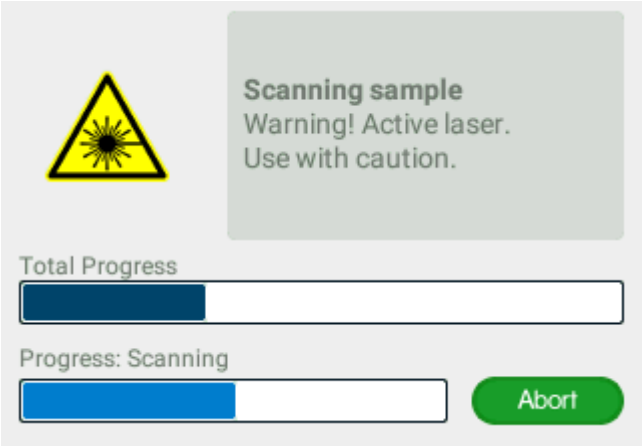
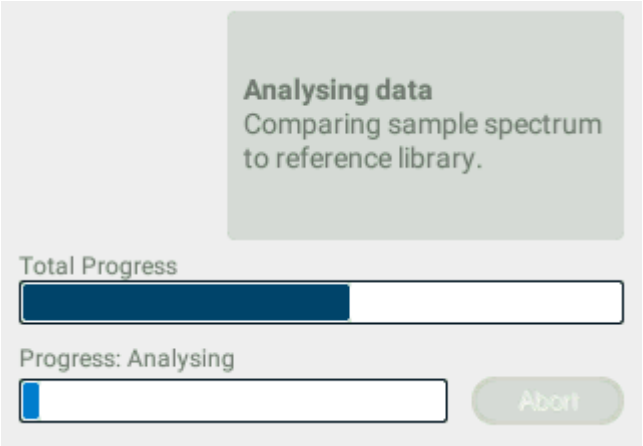
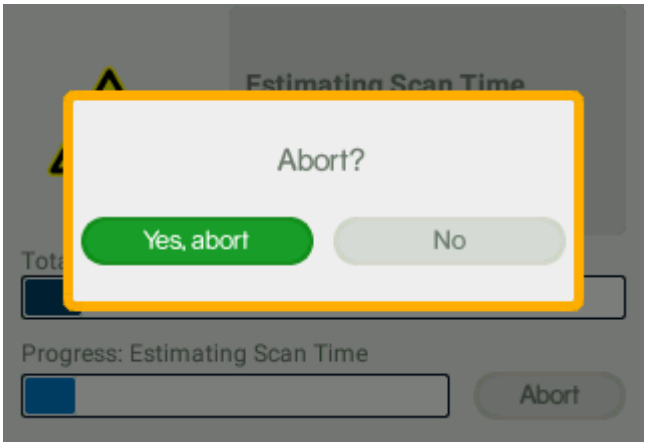


Estimating Scan Time: The ideal exposure time is calculated.

The **upper progress bar** shows the progress of the total scan process.

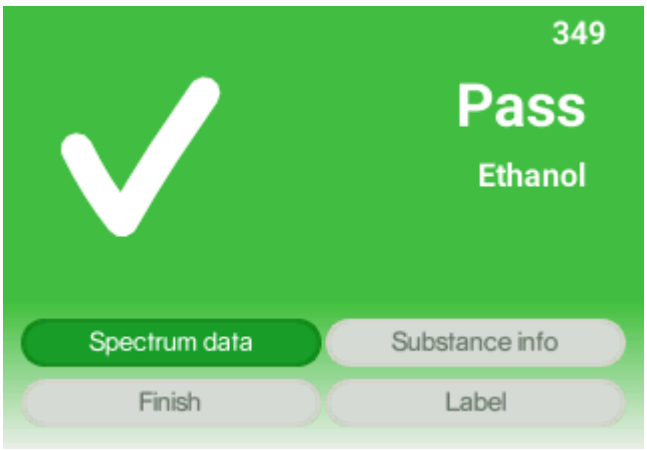
The **lower progress bar** shows the progress of the current part of the scan process.

The scan can be aborted by pressing OK. You will return to the previous menu.

	**Scanning sample:** Collecting Raman spectrum If Auto exposure extended mode is used the signal improvement may take some time. The scan can be aborted by pressing OK You will return to the previous menu.
	**Analyzing:** Analyzing Raman spectrum and compare to the chosen libraries. The scan can no longer be aborted.
	If the scan is aborted a pop-up dialogue window is displayed where the user has to confirm the abortion. Aborting scan: a pop-up dialogue window is displayed. Confirm the abortion by pressing OK. You will return to the previous menu.

8.3.1 Verify analysis result

There are two possible outcomes from the Verify scan, either Pass (OK) if the sample is like the reference spectrum or Fail (not OK) if the sample is different.



Pass screen is displayed if the analyzed substance spectrum has sufficient correlation with the reference spectrum, i.e. equal to or over the Verify Threshold limit.

The sequential number in the upper right corner, here 349, is the number of measurements done with the instrument.

Select **Label** to label the measurement.

In case you want to write either a note or a name or CAS number to the analyzed substance you can click on Label and select characters. Once you are done, please click on Save.

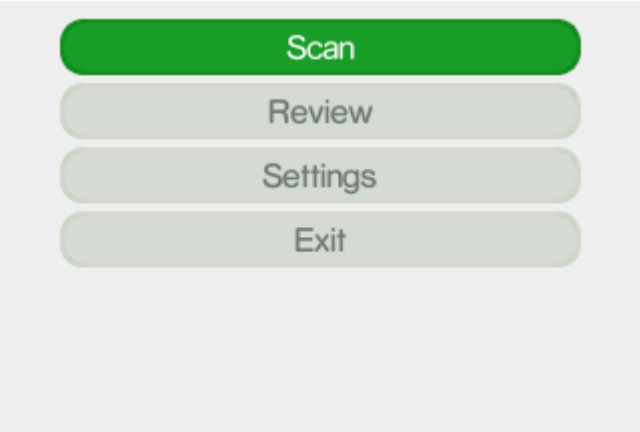
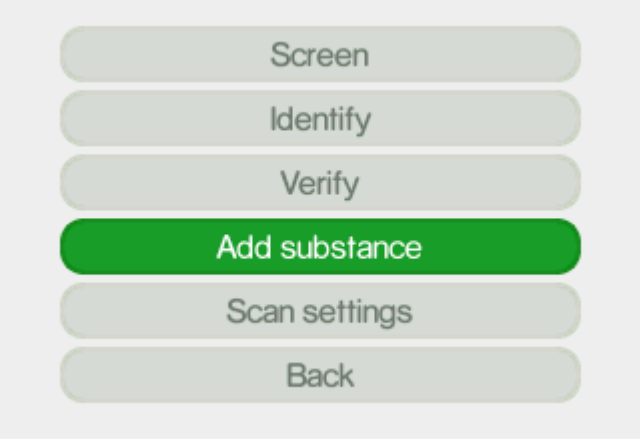
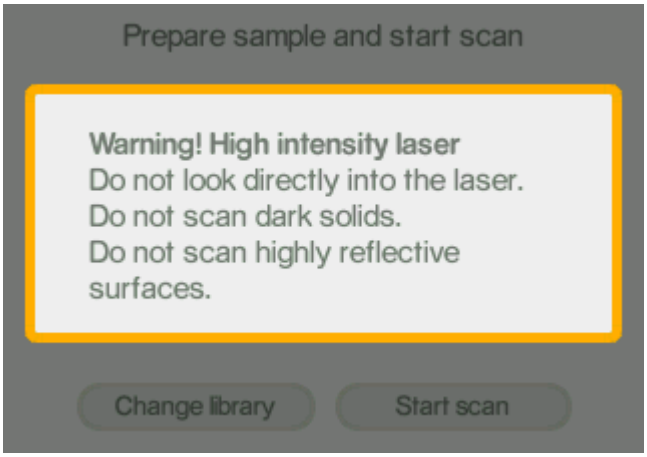
Fail screen is displayed if the analyzed substance spectrum doesn't have sufficient correlation with the reference spectrum, i.e. equal to or over the Verify Threshold limit.

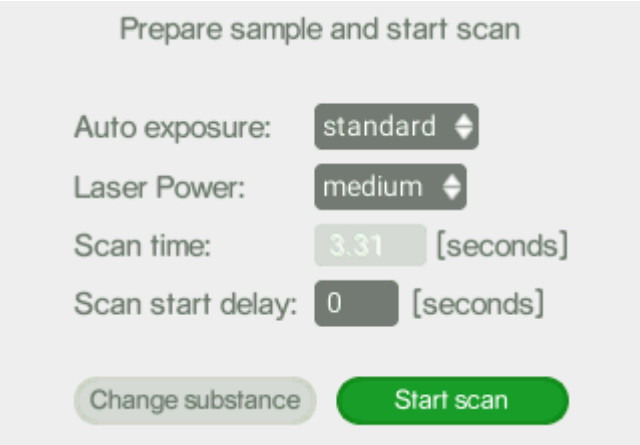
The sequential number in the upper right corner, here 20, is the number of measurements done with the instrument.

You can check the spectrum,

7.4.Add substance

With the Indicator 100 you can create your own library and use your own substances as a reference. All new substances will be stored in the library called "local". You can follow this workflow beginning with a normal Scan.

	Select **Scan** from the Main menu.
	Select **Add substance**.
	An invisible laser warning pop-up message is given before the preparation can be finished and the scan started. Press OK to proceed.



Set exposure parameters.

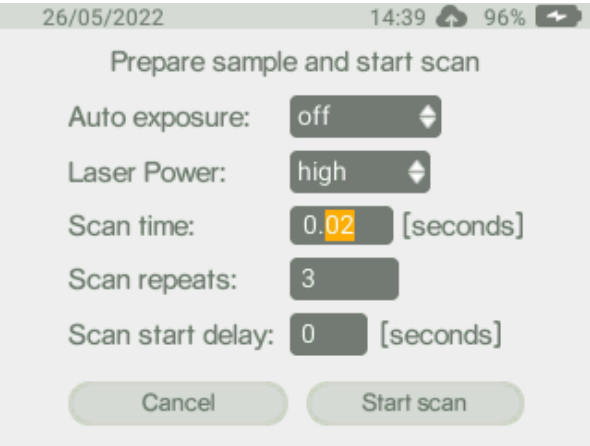
The Auto exposure mode can be set to the values standard or off with.

NOTE: To obtain best spectral quality the Auto exposure mode standard should be used.

The Laser power can be set to the values low, medium or high with.

Use Scan start delay whenever there is any risk that the substance to be analyzed can burn or explode. The Scan start delay can be set for 0-999 seconds with, giving the user time to move away from the instrument before the invisible laser is activated.

Start scan by pressing OK

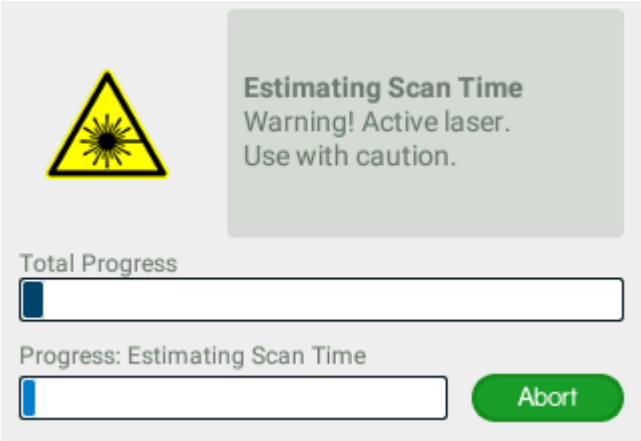
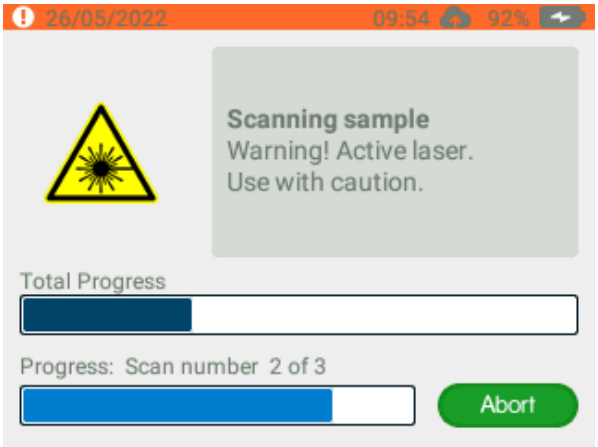
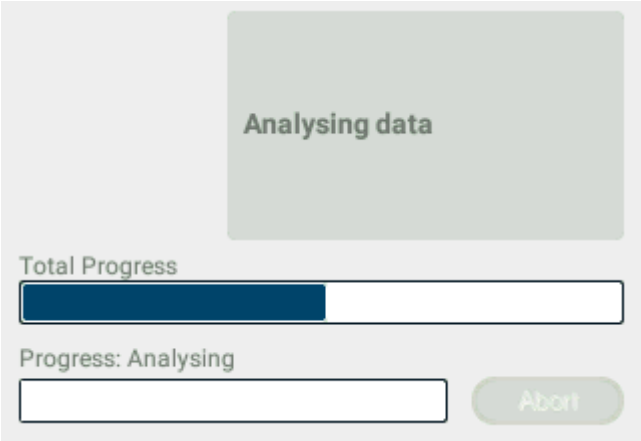


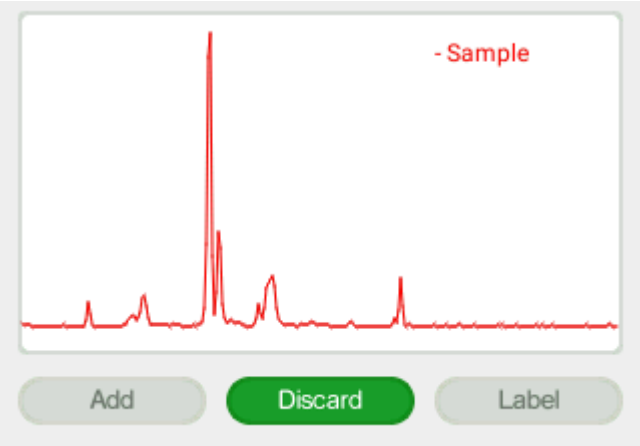
If Auto exposure is OFF, the Scan time must be set; it can have any value between 0.02 s and 65.5 s. Set number of scan repeats to create the reference spectrum; the minimum is 3.

NOTE: In **Auto-exposure** standard mode the Indicator will analyze the sample and try to calculate the ideal exposure time needed to get optimal signal-to-noise ratio in the measured spectrum, i.e. maximize the quality of the spectrum. The calculated exposure can be in the range of 0.02 – 65.5 seconds, depending on compound and sampling conditions. When using this mode, the total

process time will be at least 3 seconds longer compared to manual mode since several trial exposures and signal improvement will be made in addition to the final measurement. The total accumulated invisible laser exposure on the sample will also increase compared to manual exposure mode. Until the actual analysis starts there is always the option to abort the measurement. The **scan-repeats** function must be at least 3, with the maximum of 99, meaning that the sample will be measured at least 3 times, in order to obtain the best spectrum that will be added to the local library.

Follow the different steps in the sample analysis:

	**Estimating Scan Time:** The ideal exposure time is calculated. The upper progress bar shows the progress of the total scan process. The lower progress bar shows the progress of the current part of the scan process. The scan can be aborted by pressing OK. You will return to the previous menu.
	**Scanning sample:** Collecting Raman spectrum. Current repeat is shown above the lower progress bar. The sample is scanned the number of repeats set, the minimum being 3 and maximum 99. The scan can be aborted by pressing OK. You will return to the previous menu.
	**Analyzing data:** Analyzing and processing Raman spectra into a reference spectrum. The scan can no longer be aborted.



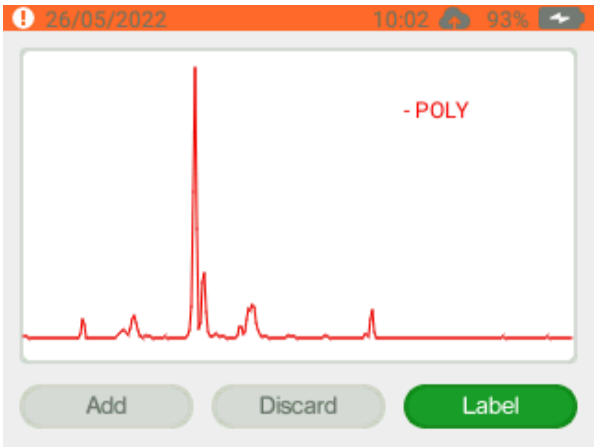
The **Spectrum data** of the measured substance is viewed.

Select **Add** to store the new substance in the local library.

Select **Discard** to discard the measurement.

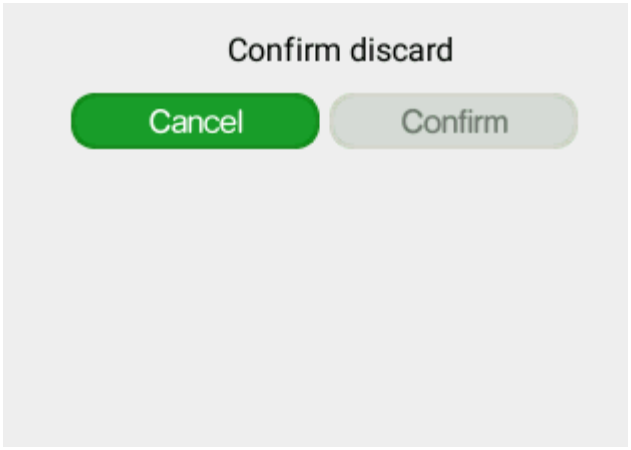
Select **Label** to label the measurement.

In case you want to write either a note or a name or CAS number to the analyzed substance you can click on Label and select characters. Once you are done, please click on Save.



The notes you added will be displayed in the Indicator as well as in ChemDash on the section Label.

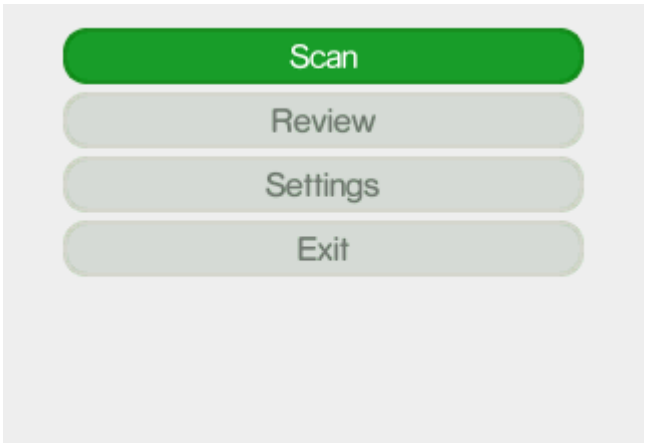
If you do **not** want to **add** the sample **to the local library**:

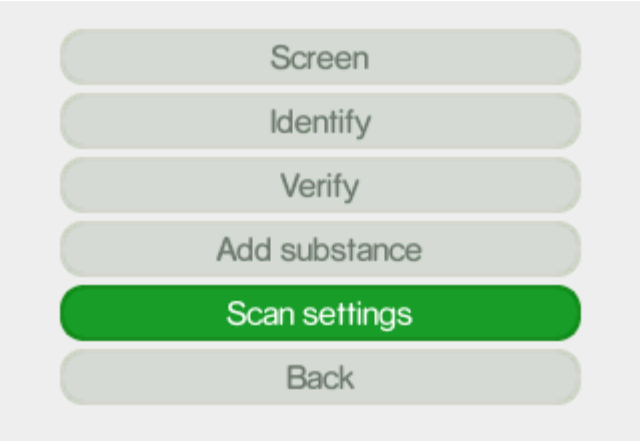
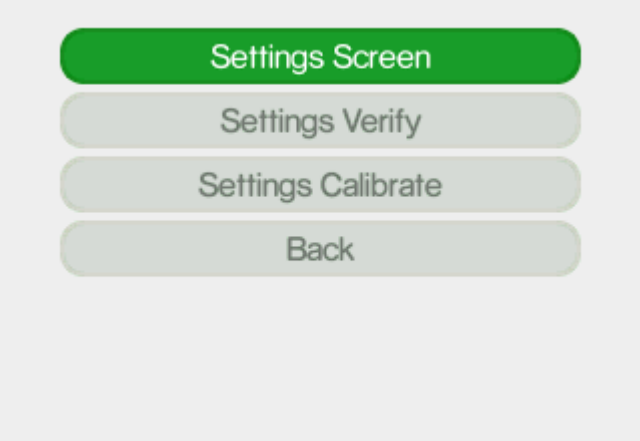
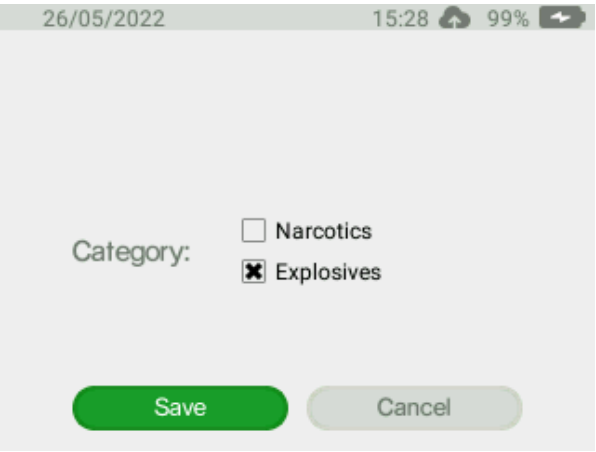
	Select **Discard** if you do NOT want to store the new substance in the local library. Confirm your choice to discard the substance.

7.5. Scan settings

8.5.1 Settings screen

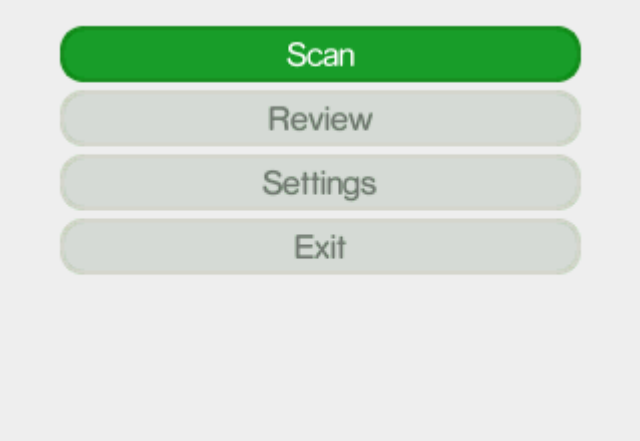
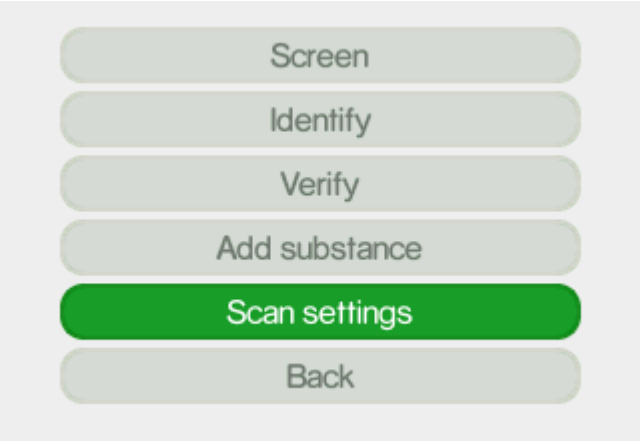
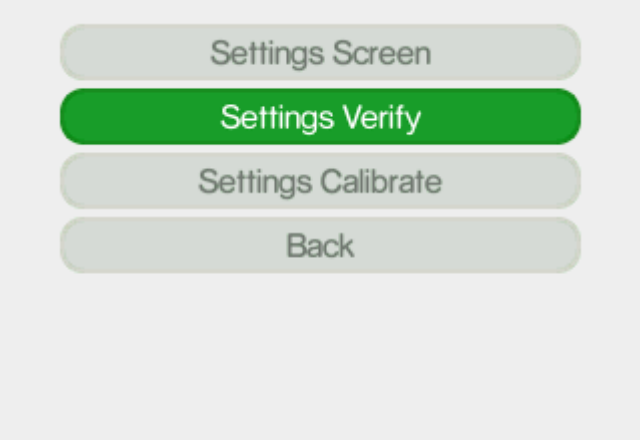
Here you can select the Screen category that you want to use for your measurement.

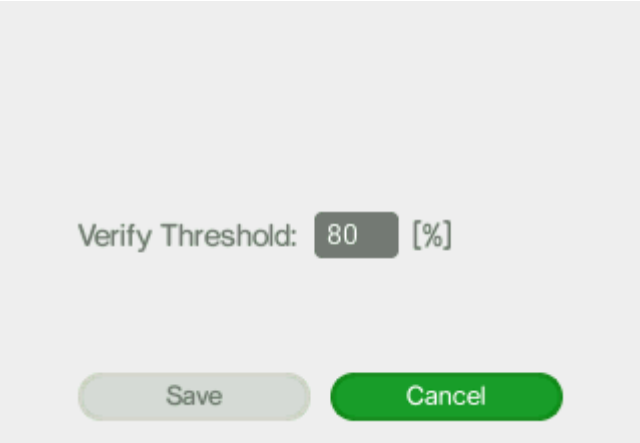
	Select **Scan** from the Main menu.

	Select **Scan settings**.
	Select **Settings screen**.
	Select the category you want and click **Save**.

8.5.2 Settings Verify

Here you can check the Threshold and can modify it according to your needs.

	Select **Scan** from the Main menu.
	Select **Scan settings.**
	Select **Settings Verify**.



Set the **Verify Threshold** parameter.

The default value is 80% which means that there must be 80% or higher correlation between the sample spectrum and reference spectrum in order to indicate a Pass result.

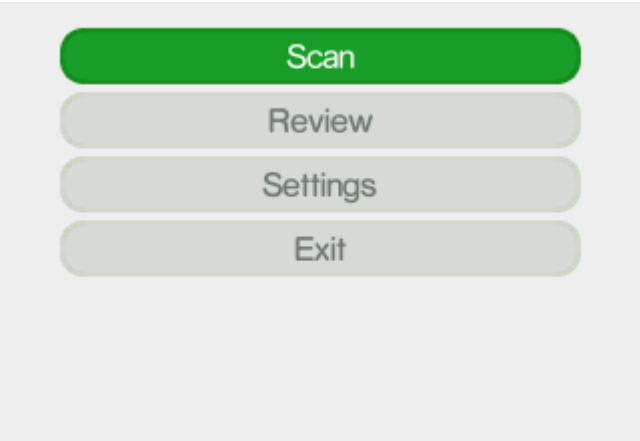
Expert users may modify this to suit a particular application, but we strongly recommend that it is left unchanged. Use tab to move between the options.

Use arrows to change the values.

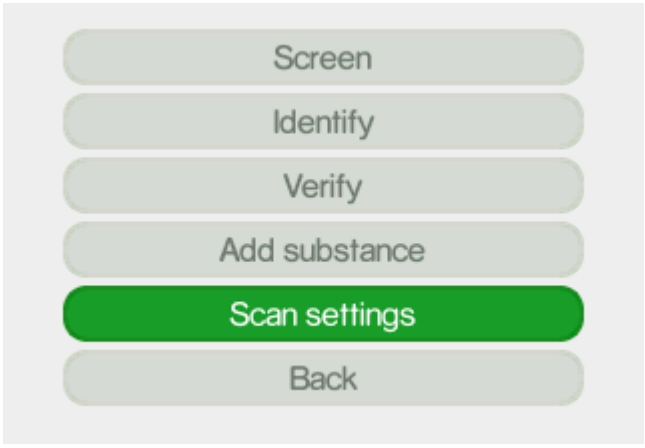
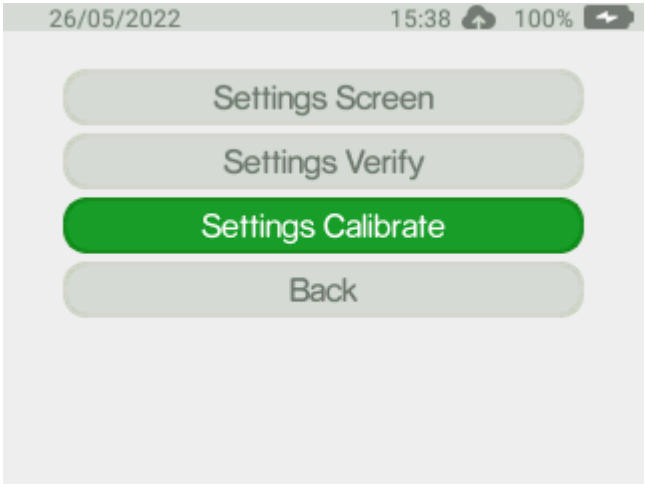
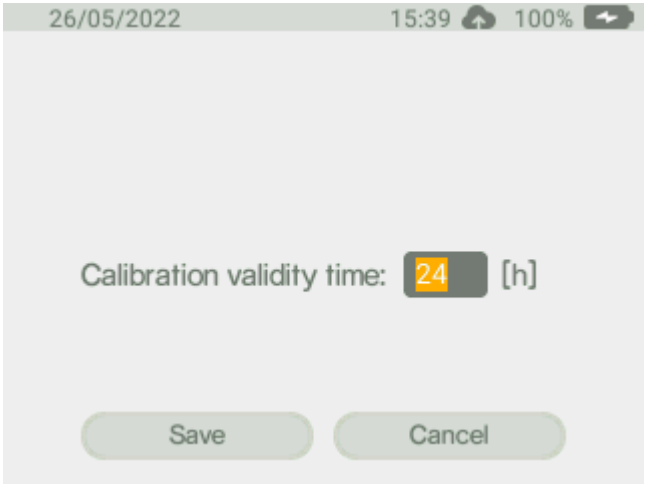
Press OK to Save.

8.5.3 Settings Calibrate

Here you can adjust the calibration validity time as per your specific needs.



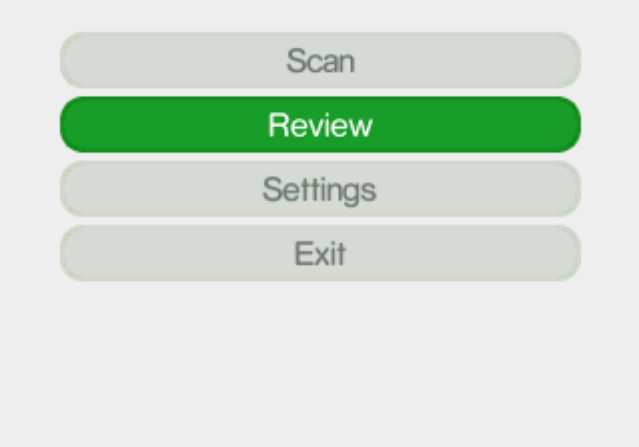
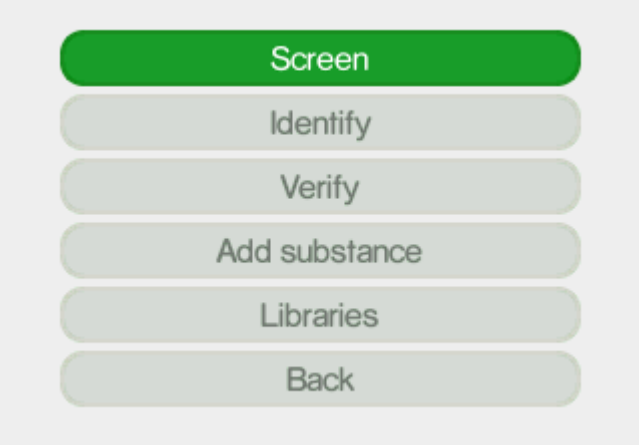
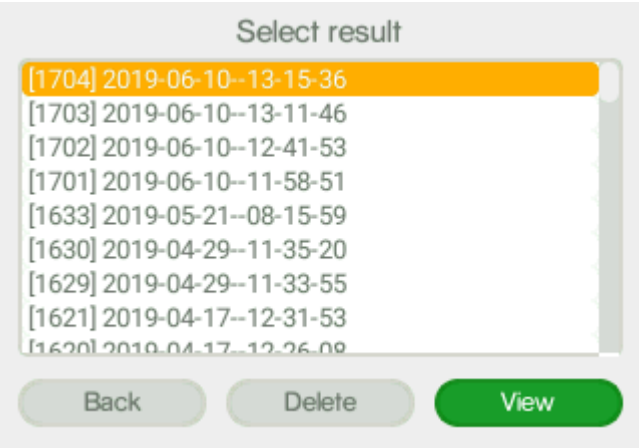
Select **Scan** from the Main menu.

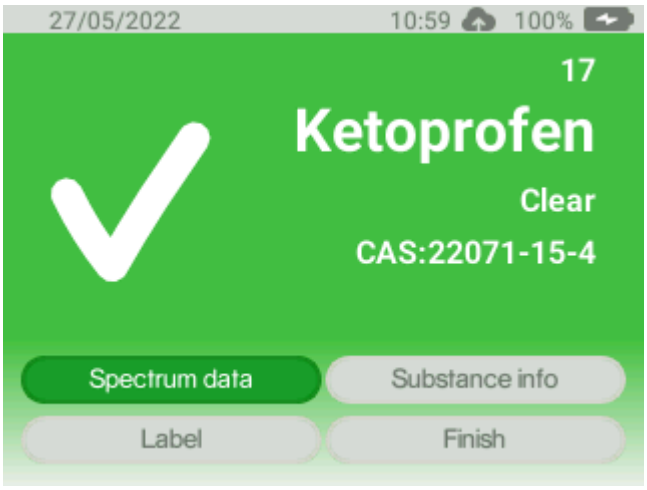
	Select **Scan settings.**
	Select **Settings Calibrate**.
	Use up/down arrow to select the desired **calibration validity time**. It can be any value between 0-200 hrs. Choose Save after setting the number. This setup can be done from Chemdash also.

8. Review

The Review function allows you to examine the history of the measurements made with the instrument. The measurements will be displayed by different type of scanning they were made with.

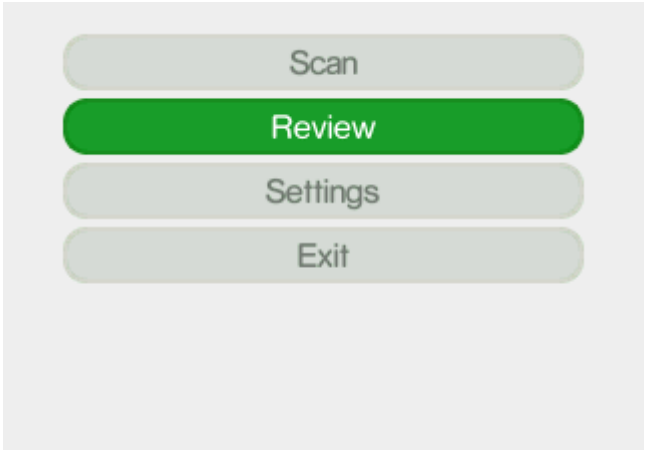
8.1.Screen

	Select **Review** from the Main menu.
	Select **Screen**.
	Choose the specific measurement you want to review. The measurements are named [sequential number] year-month-day- hour-minute- seconds. Scroll using the arrow keys in the Select result window. Highlight the **View** button with the tab key and press OK.

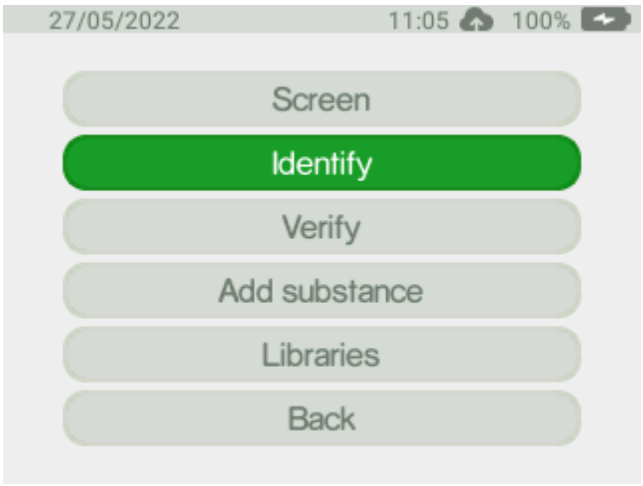


In this screen you can see the substance name, the regulatory type, CAS number, spectrum and substance info; you can also add a label that would help recognizing some details afterwards.

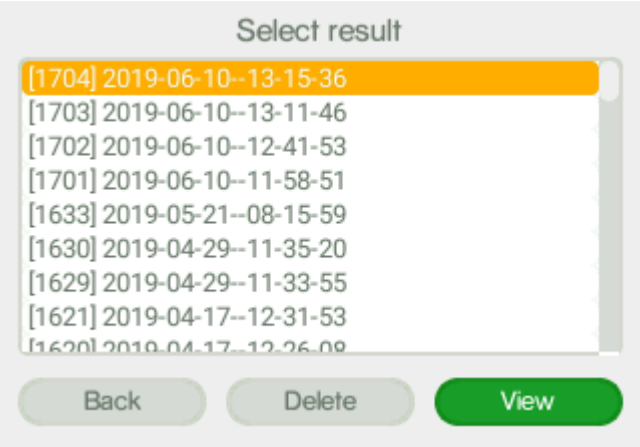
8.2. Identify



Select **Review** from the Main menu.



Select **Identify**.



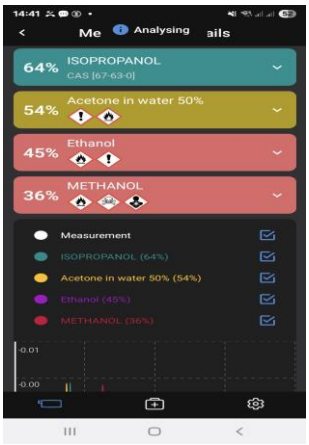
Choose the specific measurement you want to review from the list.

The measurements are named [sequential number] year-month-day- hour-minute- seconds.

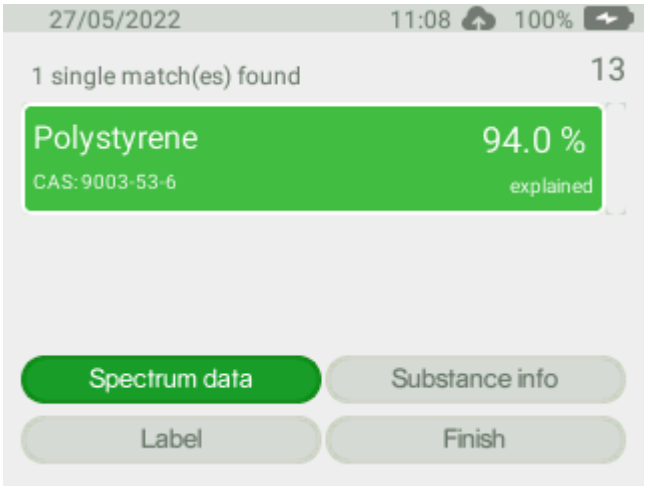
Scroll using the arrow keys in the Select result window.

Highlight the **View** button with the tab key and press OK.

See Screen analysis result for this specific measurement.



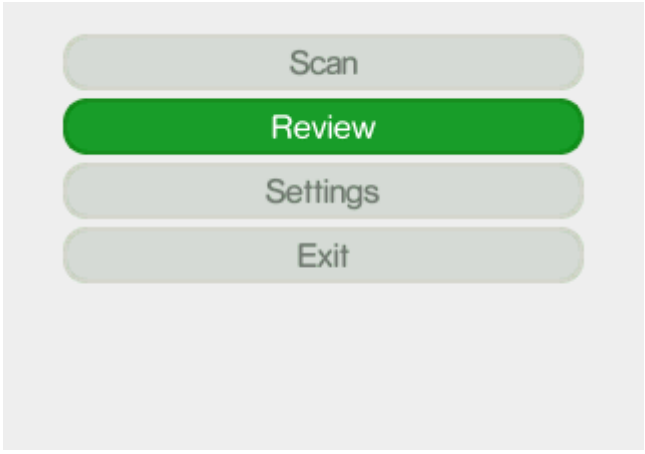
(mobile)



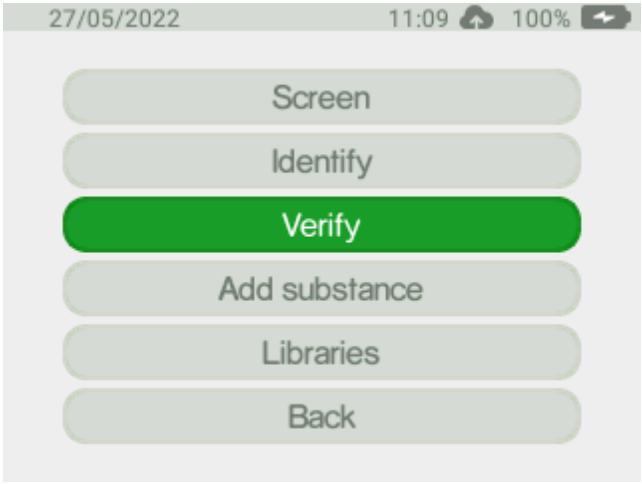
(desktop version)

In this screen you can see the substance name, the regulatory type, CAS number, spectrum and substance info; you can also add a label that would help recognizing some details afterwards. (These two images are showcasing the user interface **please disregard the results**)

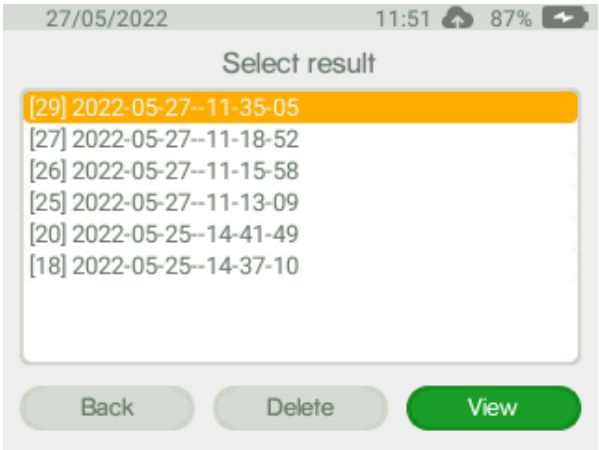
8.3.Verify



Select **Review** from the Main menu.



Select **Verify**.



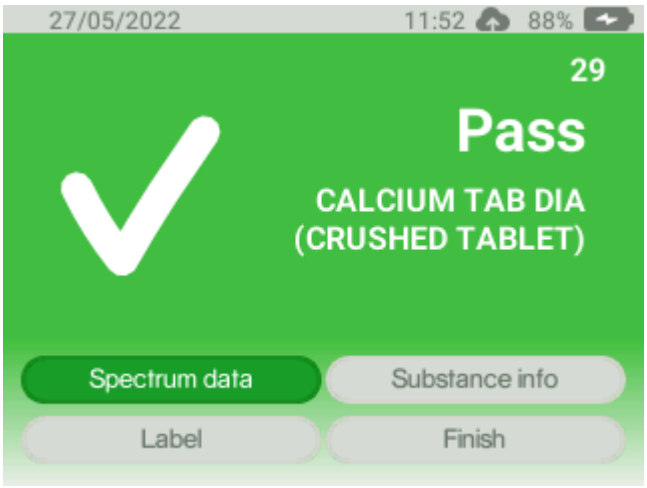
Choose the specific measurement you want to review from the list.

The measurements are named [sequential number] year-month-day- hour-minute- seconds.

Scroll using the arrow keys in the Select result window.

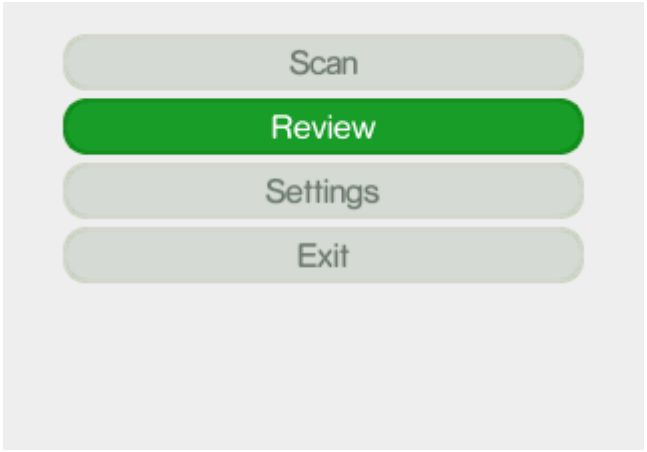
Highlight the **View** button with the tab key and press OK.

See Screen analysis result for this specific measurement.

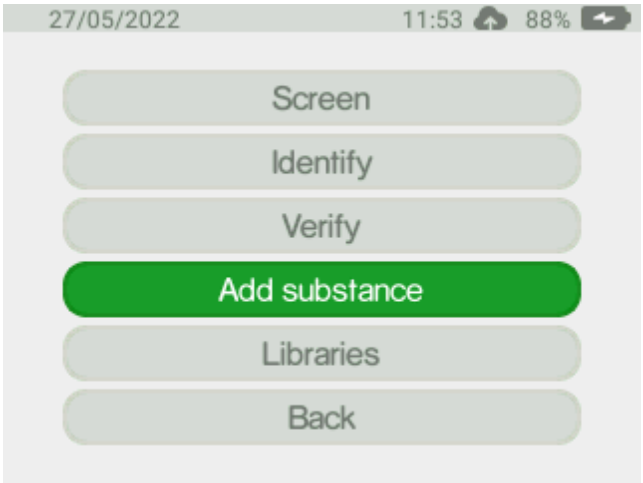


In this screen you can see the substance name, the regulatory type, CAS number, spectrum and substance info; you can also add a label that would help recognizing some details afterwards.

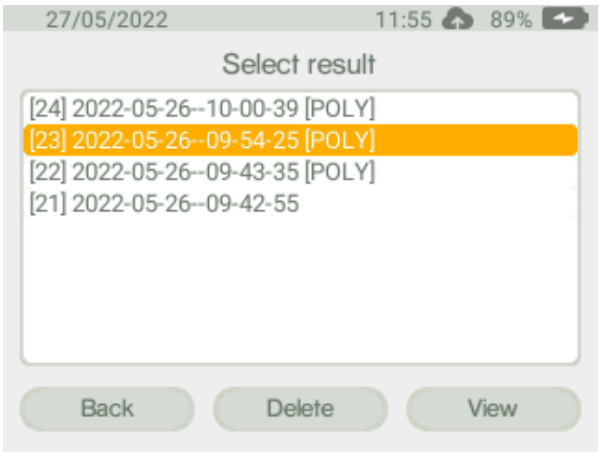
8.4.Add substance



Select **Review** from the Main menu.



Select **Add substance**.



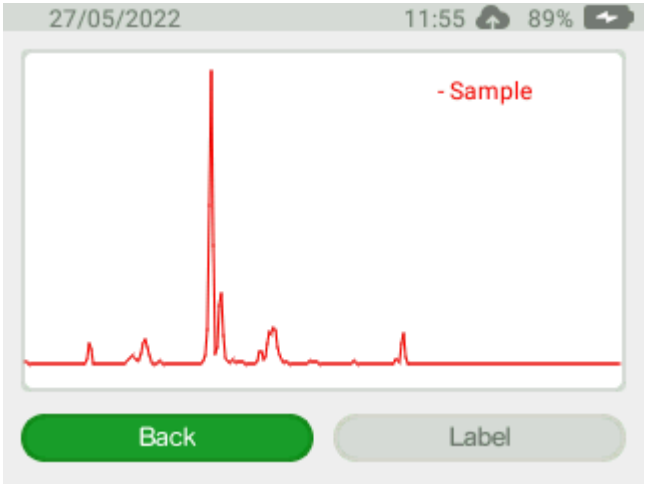
Choose the specific measurement you want to review from the list.

The measurements are named [sequential number] year-month-day- hour-minute- seconds.

Scroll using the arrow keys in the Select result window.

Highlight the **View** button with the tab key and press OK.

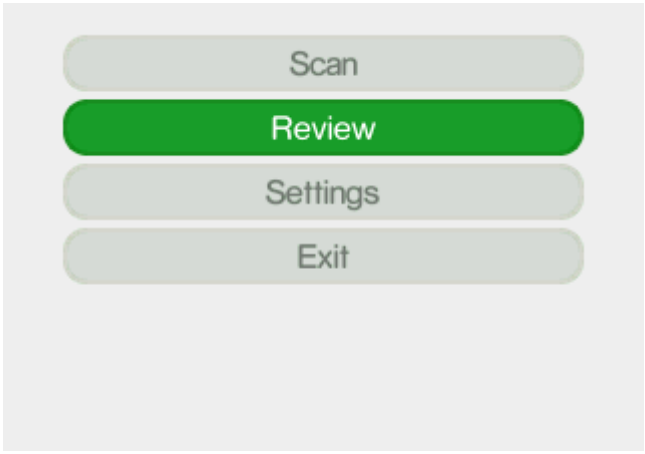
See Screen analysis result for this specific measurement.



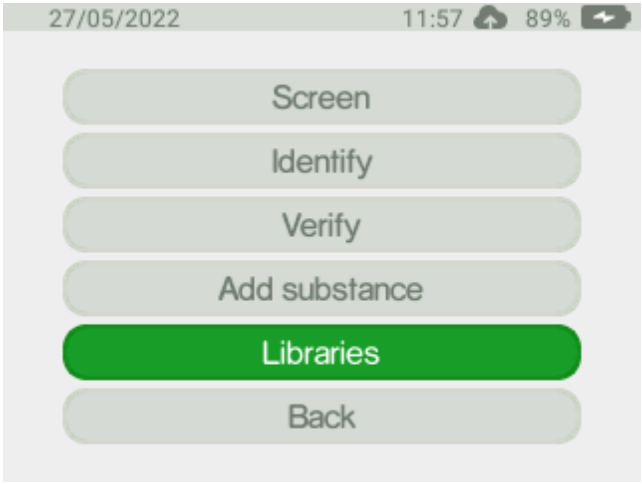
In this screen you can see the spectrum of the measured substance and you can add a label (any desired information) that can help in identifying later that specific substance.

8.5. Libraries

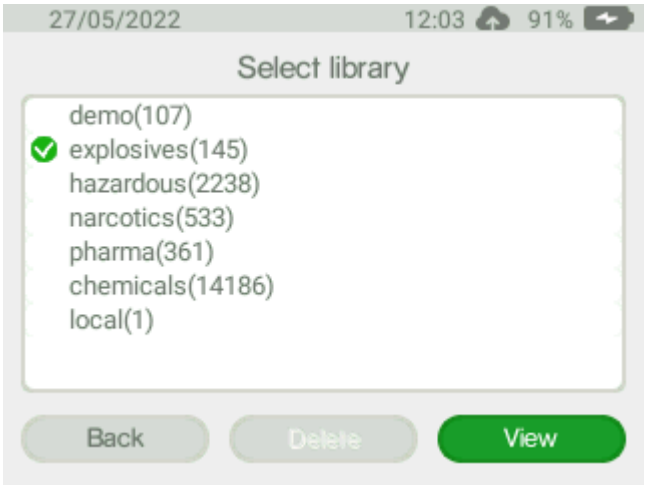
In this screen all available libraries are displayed together with all contained substances.



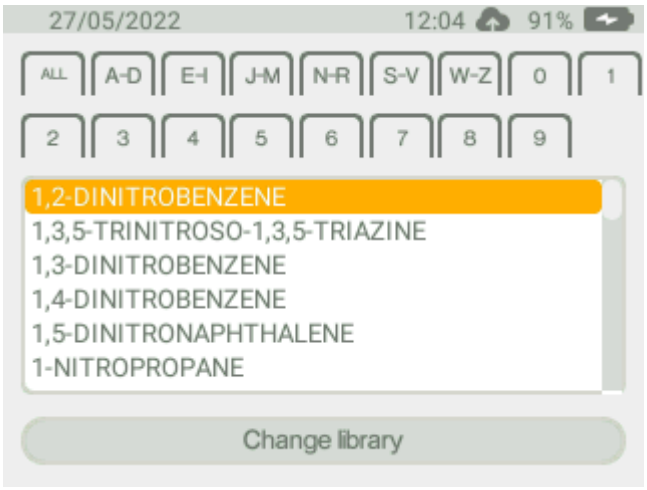
Select **Review** from the Main menu.



Select **Libraries**.



All available libraries will be displayed as a list. The number in brackets represents the number of substances that are in that specific library. You can select which content to see by using the Up/Down arrow to scroll and when the desired library is highlighted, use OK button then select **View** and press **OK** again.



All the substances in the library are listed.

If you have many reference substances it may be useful to sort the list. This is done with the labels at the top of the window. By selecting a suitable label, you can sort the list on numbers or alphabetically. Highlight the appropriate pressing OK.

NOTE: if substances have names with non-ASCII characters these substances will all appear under the label ALL.

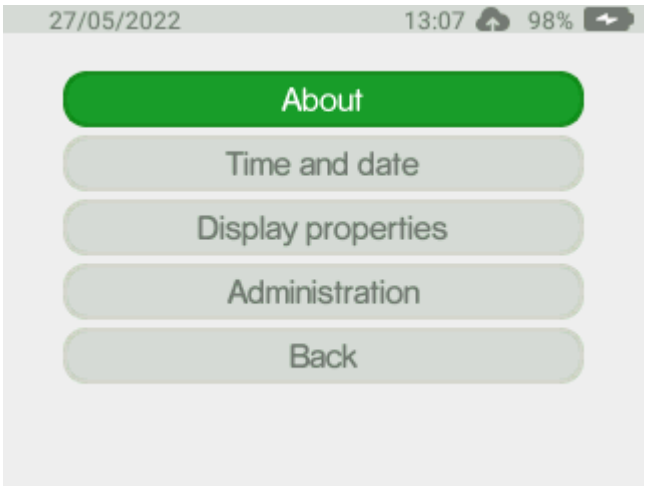
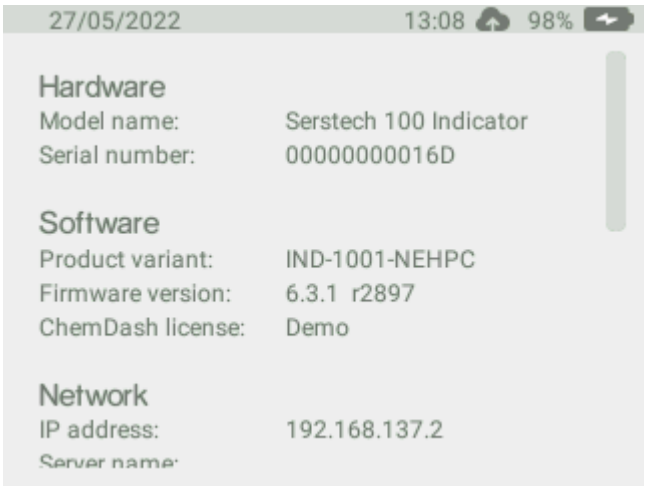
9. Settings

This is the section where all the device settings are displayed and can be modified.

9.1. About

In the About screen the Indicator settings for firmware and hardware are displayed.

Select **Settings** in the Main menu.

	Select **About** tab by pressing OK button when highlighted.
	The Indicator settings for firmware and hardware are displayed. Scroll using to view the information on the instrument: model name, serial number, software and firmware version, license available, network details, storage, instrument status, battery percentage, etc. This information cannot be edited by the user.

9.2.Time and date

In the Time and date screen the Indicator time and date can be set.

	Select **Settings** from the Main menu

	Select **Time and Date**.
	The date, time and time zone are displayed and can manually be set by using the Up/Down arrow when highlighted and tab to move from a section to another. The time and date can also be synced from ChemDash.
	If you want to change the **Timezone**, press the down-arrow when Timezone is selected and a list containing all available countries will open, offering the possibility to select the desired one.

9.3.Display properties

	Select **Settings** from the Main menu.

	Select **Display properties**.
	The Display properties can be changed to conserve battery time. **Screen save delay** will turn off the display after the set number of minutes after the dimming. **Shutdown delay** will shut down the Indicator after 60 min of inactivity. Display **brightness** with 50% will enter the dimmed brightness with 30% after 60 sec of inactivity. **NOTE:** The display brightness settings strongly impact the battery life. It is recommended to use as low settings as possible for default and dimmed brightness to maximize battery life. It is also recommended to use as short shutdown delay time as possible for the same reason.

10. Administration

	Select **Settings** from the Main menu.
	Select **Administration**.

11.

11.1. Calibration

To ensure the performance of the instrument it should be checked its calibration regularly, e.g. daily check. To pass the calibration stage, the measured spectrum must correspond to 90% the reference spectrum of calibration substance Polystyrene of the Calibration cap. The default setting for Calibration validity time is 8 hours. When the time is expired a pop-up, message appears on the display. You can cancel the pop-up message by setting the calibration validity time to 0 in the Calibration setting.

Make sure that the Calibration cap is in position and repeat the calibration procedure. Recurrent failure indicates instrument error.

	Use the shortcut to Calibrate from Keypad by pressing the **Quick Menu** button**.** You can also access Calibration through Main menu - Setting Administration. Select **Calibrate**. An invisible laser warning pop-up message is given before the preparation can be finished and the scan started. Press OK to proceed.

Another way to begin calibration is from the main menu, Settings – Administration – Calibrate:

	Select **Calibrate**.
	A warning message will be displayed on the screen. To move forward, press OK button.
	Put calibration cap on and pay attention as the laser is going to start. A normal scanning flow is following.

	Estimating Scan Time: The ideal exposure time is calculated. The upper progress bar shows the progress of the total scan process. The lower progress bar shows the progress of the current part of the scan process. The scan can be aborted by pressing OK. If so, you will return to the previous menu.
	Scanning sample: Collecting Raman spectrum. The scan can be aborted by pressing OK. If so, you will return to the previous menu. **Analyzing:** Analyzing Raman spectrum and compare spectrum to the reference spectrum of the calibration cap.

11.2. USB

To activate the USB port use either of the short-cut to **USB** from Keypad **Quick Menu** button or the **Main menu** → **Settings** → **Administration** → **USB**.

	Select **Settings** from the Main menu.
	Select **Administration**.
	Select **USB**.
	Select **Activate USB**.
	Select **USB Off** to deactivate the USB port.

11.3. Language

	Select **Settings** from the Main menu.
	Select **Administration**.
	Select **Language**.
	A warning pop-up message is given that changing the language will cause the instrument to restart. Press OK to accept a restart after the language has been changed
	Select language. Highlight the **Save** button with and press OK. The instrument will now restart.

11.4. Factory reset

Through the factory reset the instrument can be set to its original configuration.

Warning! All data and user configurations will be deleted as factory reset is activated.

Factory reset affects the following parameters:

1. **Users and user privileges**

The default users will be restored, with original privileges

All other user information is deleted.

2. **Language**

Language is set to English.

3. **Local library**

All information in the local library is deleted.

4. **ChemDash libraries**

All downloaded libraries will be deleted from the Indicator, but they are still available inpage69

Chemdash.

5. **Factory library**

Factory library is not affected by factory reset.

6. **Log file**

Logfile is reset.

7. **Measurements**

All measurement data are deleted from the Indicator. Any measurements previously stored in ChemDash will be retained there.

8. **Calibration**

All results from calibration tests performed with the instrument are deleted.

9. **Settings**

Scan settings reset to default values

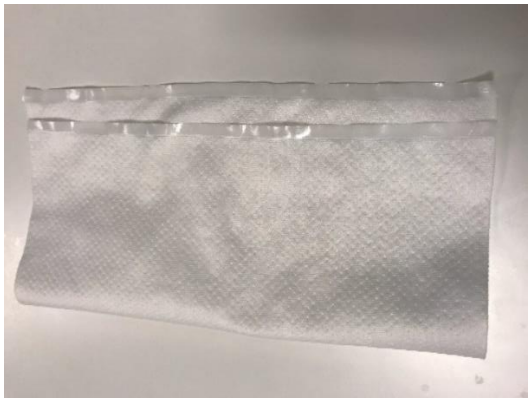
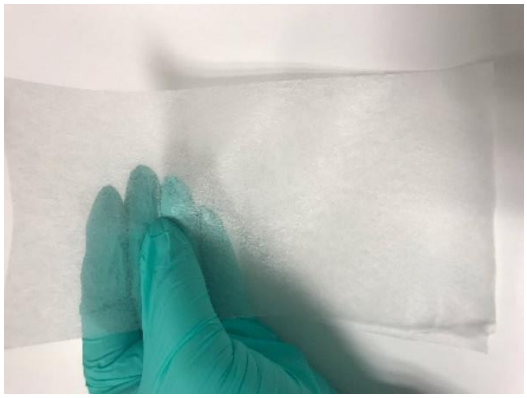
Display properties.

To perform a Factory reset, go to Settings – Administration – Factory reset

	Select **Settings** from the Main menu.
	Select **Administration**.
	Select **Factory Reset**.
	A message is given that all data and user configurations will be deleted if factory reset is activated. Press OK to proceed.
	A warning pop-up message is given where the user has to confirm the Factory reset. Press **OK** to accept.

11. Serstech 100 Indicator maintenance instructions

The Serstech 100 Indicator as mentioned previously, is classified according to IP67, meaning it has a degree of resistance to water and dust. However, the spectrometer is a delicate instrument and it is important to handle it with care. In order to keep it clean from fat and excess dirt, please follow the instructions described below.

Presentation of the instrument and its accessories that can be used for cleaning	
Lint-free cloth for instrument and accessories. It can be used to clean only the surfaces.	
Special tissue for lenses. It should be used only for the lenses.	

11.1. Standard method of cleaning (removing fat from the surfaces)

	The standard way to clean the instrument is to moist with Isopropanol a lint-free cloth.
	Before starting cleaning the instrument, make sure to turn off the device and remove all accessories from it.
	Wipe gentle the screen of the indicator. Make sure to not remove any of the labels on the back part of the instrument while cleaning. **NOTE!!!** Be careful not to scratch or damage the display while wiping Using solvents stronger than Isopropanol can damage or resolve the labels on the back of the instrument Clean the rubber side parts and all corners from the device thoroughly.

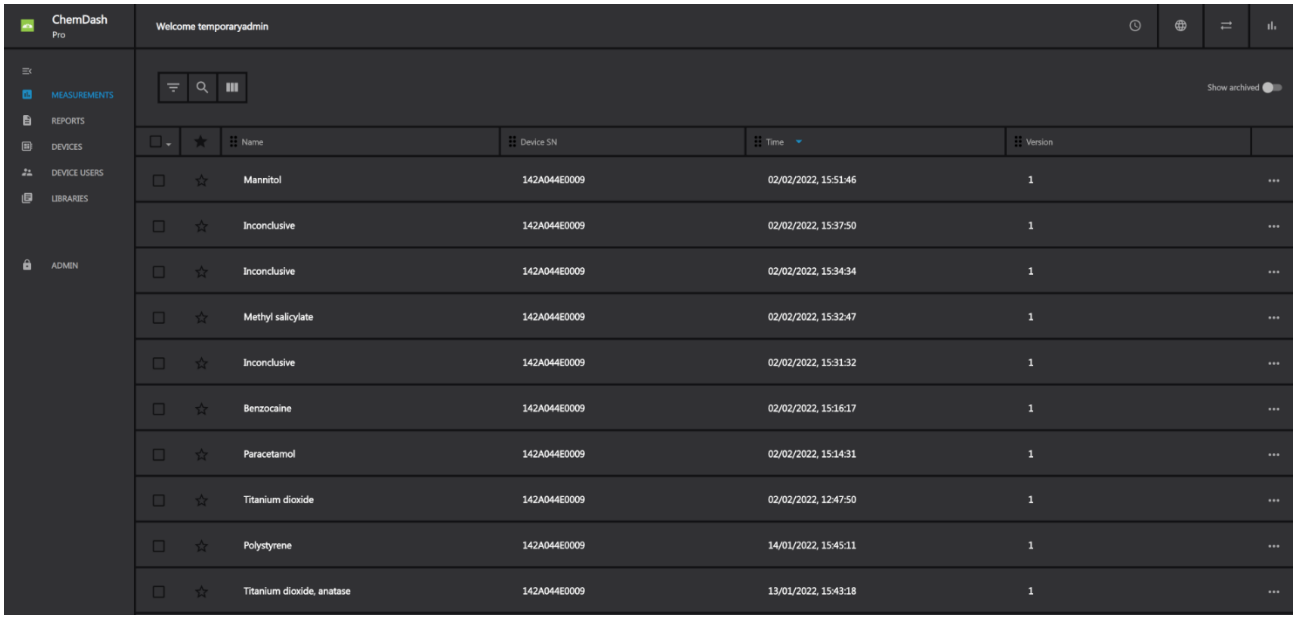
11.2. Cleaning of excess dirt

If the instrument has be subjected to contamination or has excess dirt in its surfaces (for example soil/rock remnants), you need to follow a different method.

1. First, use a dry lint-free cloth to remove the excess dirt.
2. Second step is to wet a lint-free cloth using a non-abrasive, solvent free neutral soap and clean very gently only the instruments' surfaces (please do not clean the lenses with any kind of soap).
3. Third step is to remove any excess of the solvent free-neutral soap by wiping with a dry lint-free cloth.
4. Fourth step is to use a wet lint-free cloth with Isopropanol to wipe the surfaces and the instrument's accessories.
5. Last step is to use a dry lint-free cloth to dry the instrument's surfaces.
6. Again, if you need to clean excess dirt from the lenses please wet the special lens wipe with isopropanol and follow the steps mentioned before.

12. ChemDash

ChemDash is a software developed by SERSTECH. The ChemDash system will integrate with the Indicator 100 spectrometers towards a powerful solution for Chemical Intelligence. ChemDash 2.0 is the perfect tool for managing intelligence, evidence and substance libraries. The User can gather and share information about substances and update one or many instruments either on PC or in the cloud.



The ChemDash system consist of the application of ChemDash 2.0 which is the stand-alone version of ChemDash. This is the right software choice when the User is offline or have restrictions for sharing data through a cloud system.

Start Serstech ChemDash 2.0 on your computer.

Wait until the arrow  appears on the cloud symbol of device. It may take a while.

The connected device can now be found by its serial number on the Device Management menu with the green connected status  .