SERSTECH

Arx mkII

USER MANUAL.

V2.8

CONTENTS

1. GENERAL SAFETY INFORMATION

- Please read all instructions and safety notes in this manual carefully before operating the Handheld Raman Spectrometer Serstech Arx MkII. Retain this manual for future reference and ensure it is readily accessible at all times.
- Always follow the instructions and safety notes provided in this manual. Failure to do so may result in serious personal injury and/or property damage. Ignoring these instructions and safety notes also constitutes misuse of the Handheld Raman Spectrometer Serstech Arx MkII. This manual contains important safety information; refer to sections 6.3 for detailed safety considerations regarding the use of invisible lasers.
- This product shall be used in compliance with local laws and regulations.

- Always follow your organization's procedures 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 it is an explosive, be detonated by the laser. If you are in doubt - we recommend starting with low laser power and work your way up in strength if necessary and use the "delay start" function - to have time to safely move away from the sample before the measurement is initiated.
- Ensure the safe use and storage of flammable liquids that could possibly ignite by conducting thorough risk assessments, using appropriate PPE (gloves, goggles, and flame-resistant clothing), storing in well-ventilated areas, employing non-sparking tools, and maintaining clear emergency procedures. Provide regular training and maintain documentation to ensure compliance and safety.

2. INTRODUCTION TO THE ARX MKII INSTRUMENT

Raman spectroscopy is a spectroscopy technique which can be used for rapid identifications of chemicals. The Raman effect occurs when a light (f.eg. 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 line and can be considered to constitute molecules fingerprint of the analysed substance.

The Arx mkII instrument 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. The Arx mkII is a standalone instrument that operates without need for other components. However, generating measurement reports, user management and management of user defined libraries is performed using the PC software ChemDash. The use of the ChemDash software requires basic PC knowledge. Laser training is needed for all users since the instrument includes class 3B invisible laser.

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.

This manual describes the basic functions of the instrument. The manual covers Arx mk II Lite and Arx mkII Pro devices with embedded software functionality version 7.0.1 or later.

Please NOTE that all Arx mkII needs to run with firmware version starting with 7.0.1 and above only. Due to the new processor, the earlier firmware versions called 6.X.X are not applicable for our new instruments. If you are unsure what version your instrument is, do not hesitate to contact our support and they will guide you through what firmware version is the correct one for your specific instrument.

2.1. 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 manuals 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.

2.2. INTENDED USE

The Handheld Raman Spectrometer Serstech Arx MkII is designed for the identification and analysis of chemical substances in various settings, including laboratories, field environments, and industrial applications.
It is not intended for Quantitative analysis or medical diagnosis or treatment purposes.

- Environmental recommendations find in technical specifications paragraph 16.
- Make sure to always keep the instrument in environments that is line with the storage temperature of the instruments (-30 to +50°C). Storing device outside this range may cause thermal damage to batteries.
- Make sure to only run the instrument within the stated temperature range of operation (-20 to +50°C). Note that the battery performance will be significantly lower towards the end points of this range. In the upper temperature range issues with thermal noise may hamper the performance and reduce the ability to identify weak Raman scatterers.

2.3. HANDLING

For safe handling and optimal performance, Serstech AB recommends users to follow these guidelines:

- 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.
- Only use accessories included with Serstech products or those purchased from Serstech that meet manufacturer specifications and are designed for the Arx mkII.

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.

2.4. TRANSPORTATION

When transporting the Serstech's product, use the original packaging or equivalent to prevent damage to the product.

2.5. CLEANING INSTRUCTIONS

Lens – Keeping the lens clean is essential. Regularly inspect the lens for any dust or scratches. To clean the surface of the lens, use a lens pen, a swab stick, or a cotton swab with a small amount of alcohol (e.g., isopropanol).

Calibration Cap– Inspect the inside of the cap to ensure a spotless surface, free from dust, scratches, or loose components. To maintain the cap's quality, use a lens pen, a swab stick, or isopropanol on the interior surface.

Serstech Arx mkII - Clean the instrument by removing any dust or dirt with an alcohol-free screen cleaner applied to a cloth.

3. CASING

The Arx mkII instrument with the Accessories is delivered in a crush proof, dust proof and water resistant Peli case.

	**The Peli case, outer view.**
	**The Peli case, interior view.**

4. ACCESSORIES

There are different accessories for different sample applications:

1. Vial holder
2. Vial
3. Vial holder rise
4. Strap attachment
5. Small-amount adapter
6. Calibration cap

4.1. VIAL HOLDER

Vials can readily be analysed without any adapter. However, there is always a risk that stray light may enter the spectrometer and disturb the measurement. In addition, the analysing laser beam travels through the vial and thus laser safety must be considered. Using the vial holder both a beam block that ascertain laser safety and effective protection from stray light is obtained.

	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 in position on the probe tip.
	Place the vial into the vial holder.

	When the vial is in position start the analysis.
	**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.

For small volumes, down to 400 µl, the vial rise should be used to position the analysing laser beam at the bottom of the vial.

	**Vial holder insert** The insert serves as a support for the vials filled with a sample up to 0.4 ml.

	The insert is placed at the bottom of the vial holder to allow the analysing laser beam to be focused onto the lower region of the vial.
	First, place the vial insert in the bottom of the vial holder.
	Then place the vial on top of the vial insert.

	When the vial is in position a part of the vial will be raised above the vial holder and it is not possible to screw on the cap of the vial holder. Start the analysis.

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 vial holder adaptor is used. 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.

4.2. SMALL SAMPLE ADAPTER

Any type of solid sample can be analysed using the Arx mkII instrument without any adapter. However, it may be hard to focus the analysing beam onto very small samples. The small-amount adaptor has a conical shape and a small aperture. This makes it easier to point the analysing beam towards small samples. With this adapter it is possible to analyse samples of about 3-5 mg.

	To attach the small-amount adaptor please follow the steps bellow:
	1. Slide the adapter over the probe tip of the adapter. 2. Snap into position.

Point the aperture of small amount adapter to the sample to be analysed.

WARNING: Keep the sample pressed against the adaptor throughout the analysis process.

4.3. 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.

4.4. USB CABLE

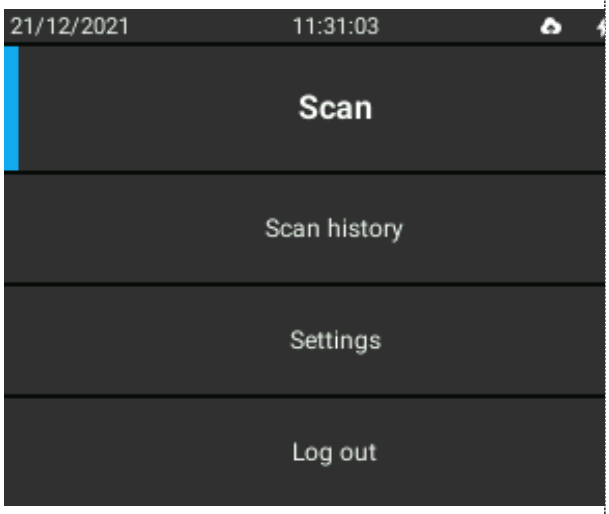
The supplied USB cable is the connection cable between the Arx mkII and a PC, used to access ChemDash 2.0.

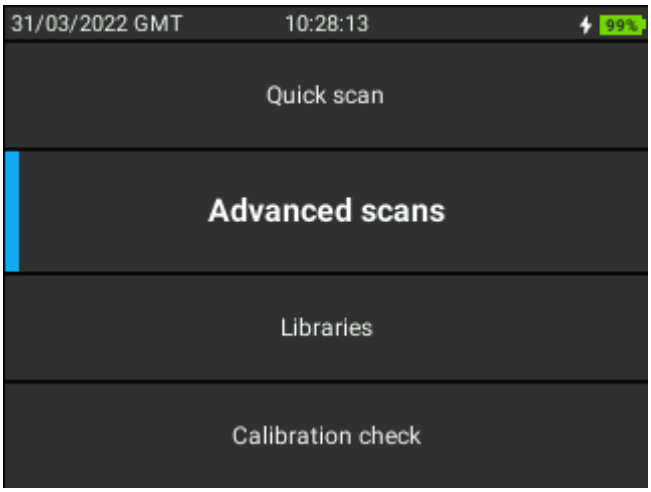
The USB cable is also used to connect the optional USB charger to the instrument.

5. BARCODE READER

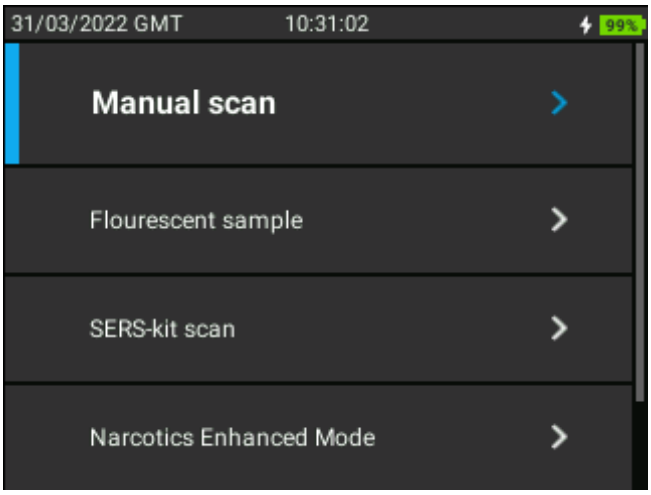
For samples that contain a barcode the built-in barcode reader can be used to append this information to the measurement. The barcode reader is located on the back side of the instrument and is run from the Advanced scan.

Warning: Laser class 2. Refer to the specification in section 6.2 for details.

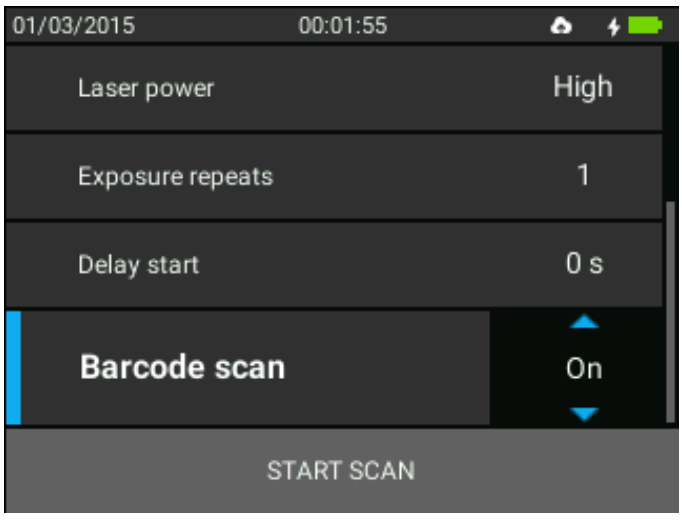
	The barcode reader is located in the upper left corner on the instrument`s backside.
	Enter the Main menu on Arx mkII, **Scan** section.



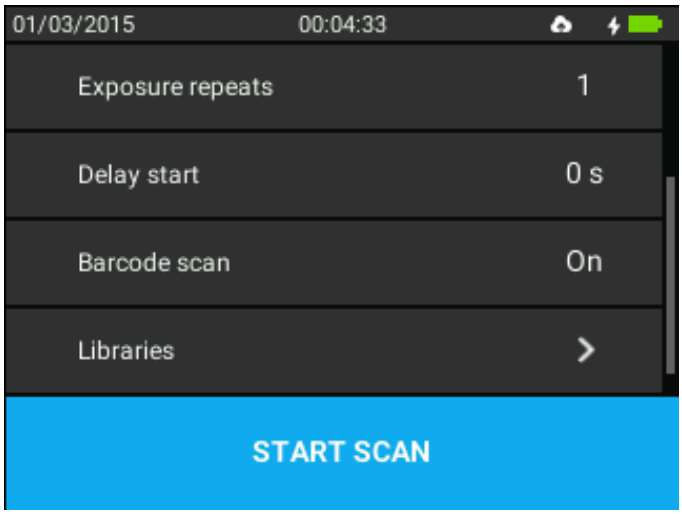
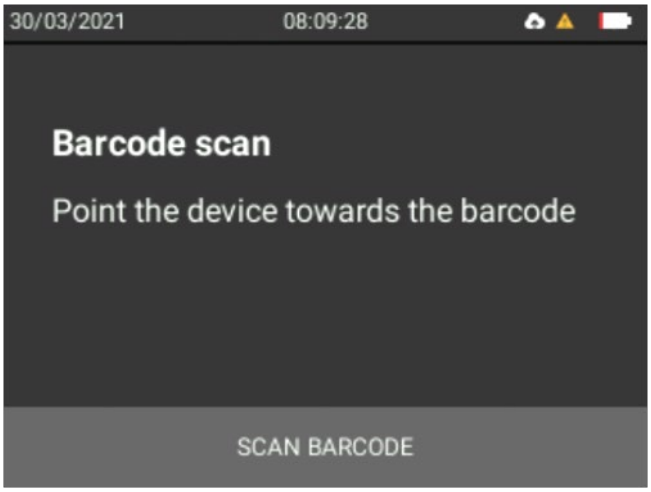
The barcode reader is available when running the **Advanced scan**.

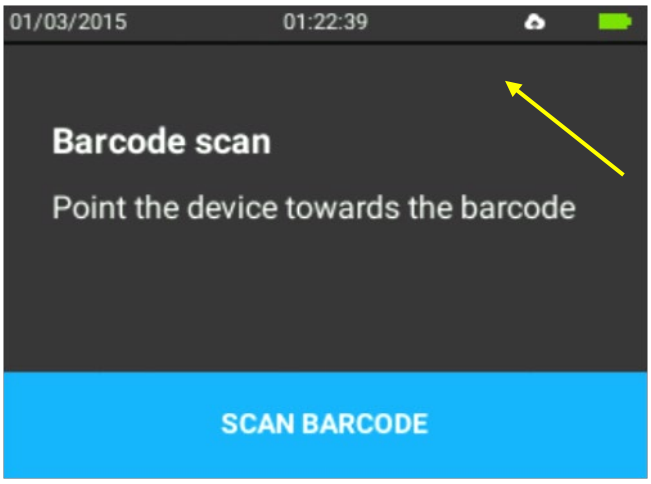


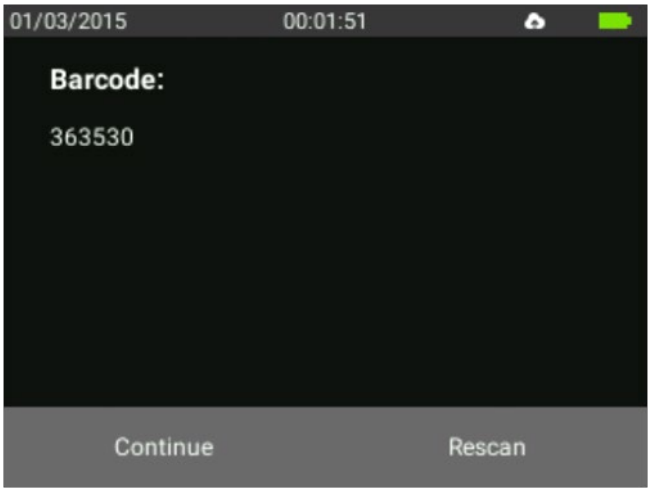
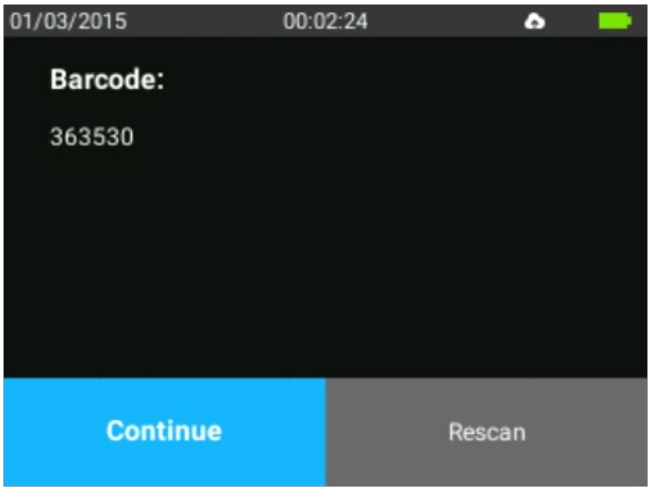
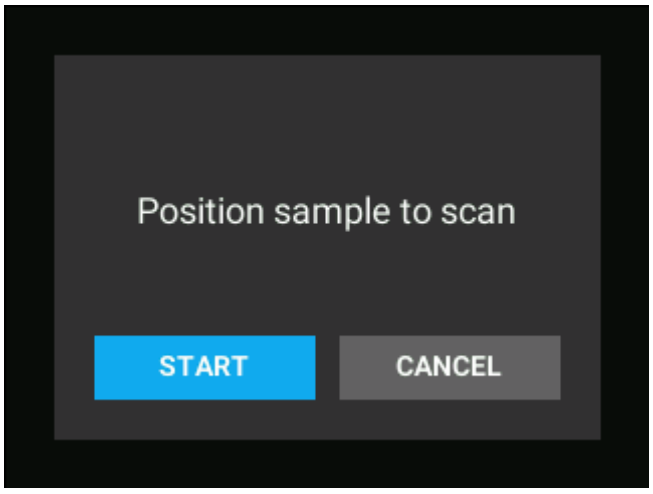
Enter the **Manual Scan** tab.



To activate **Barcode scan**, Scroll down to Barcode option. Press OK to activate options. Use up and down arrows to select between On and Off. Press OK to confirm choice.

	Scroll down to Start scan and press **OK**.
	Press OK to highlight **SCAN BARCODE** option.

	Point the barcode reader, on the instrument´s backside, towards the barcode of the sample.
	Aim the barcode reader toward the sample's barcode, aiming to align the crosshair with the sample's barcode.

	When the barcode is scanned the barcode can be viewed, in numeric form, on the instrument´s screen. Press OK to activate option to **Continue**.
	Aim the instruments probe against the substance to be analysed and press OK to go to continue and the laser starts working. If barcode needs to be re-scanned use arrow to select **Rescan**.
	After confirming the barcode read, you must position the sample to be scanned and press **START**. After that, the normal scanning and analysing process will take place.

6. ARX MKII INSTRUMENT

6.1. INSTRUMENT SAFETY

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

The Serstech Handheld Raman Spectrometer has a beam divergence of 3.4 and 6.6 degrees in X and Y axis respectively.. The laser output power is user-adjustable up to a maximum of 300mW. Ensure all users are familiar with these specifications and follow the recommended safety guidelines.

6.2. BARCODE SCANNER SAFETY

The barcode scanner has a Class 2 650nm laser.

LASER RADIATION
DO NOT STARE INTO BEAM
CLASS 2 LASER

6.3. INVISIBLE LASER SAFETY

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:

a. Backside label

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. Users must wear laser safety glasses when operating the device. Refer to the specification in section 6.4 for details. According to the standard, there shall be a yellow label with a black border, the recommended wording is:

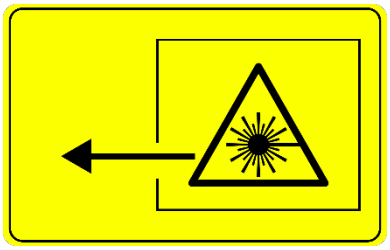
WARNING – INVISIBLE LASER RADIATION

AVOID EXPOSURE TO BEAM

CLASS 3B LASER PRODUCT

The backside label **(a.)** on the Arx mkII instrument solves this requirement. Also, the frontside label**(b.)** 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**(c.)**. The only source for dangerous laser exposure is

b.Frontside label



c. Label besides the nozzle

d. The nozzle

from the nozzle**(d.)**; 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, f.eg. from small amount adapter to the vial holder.

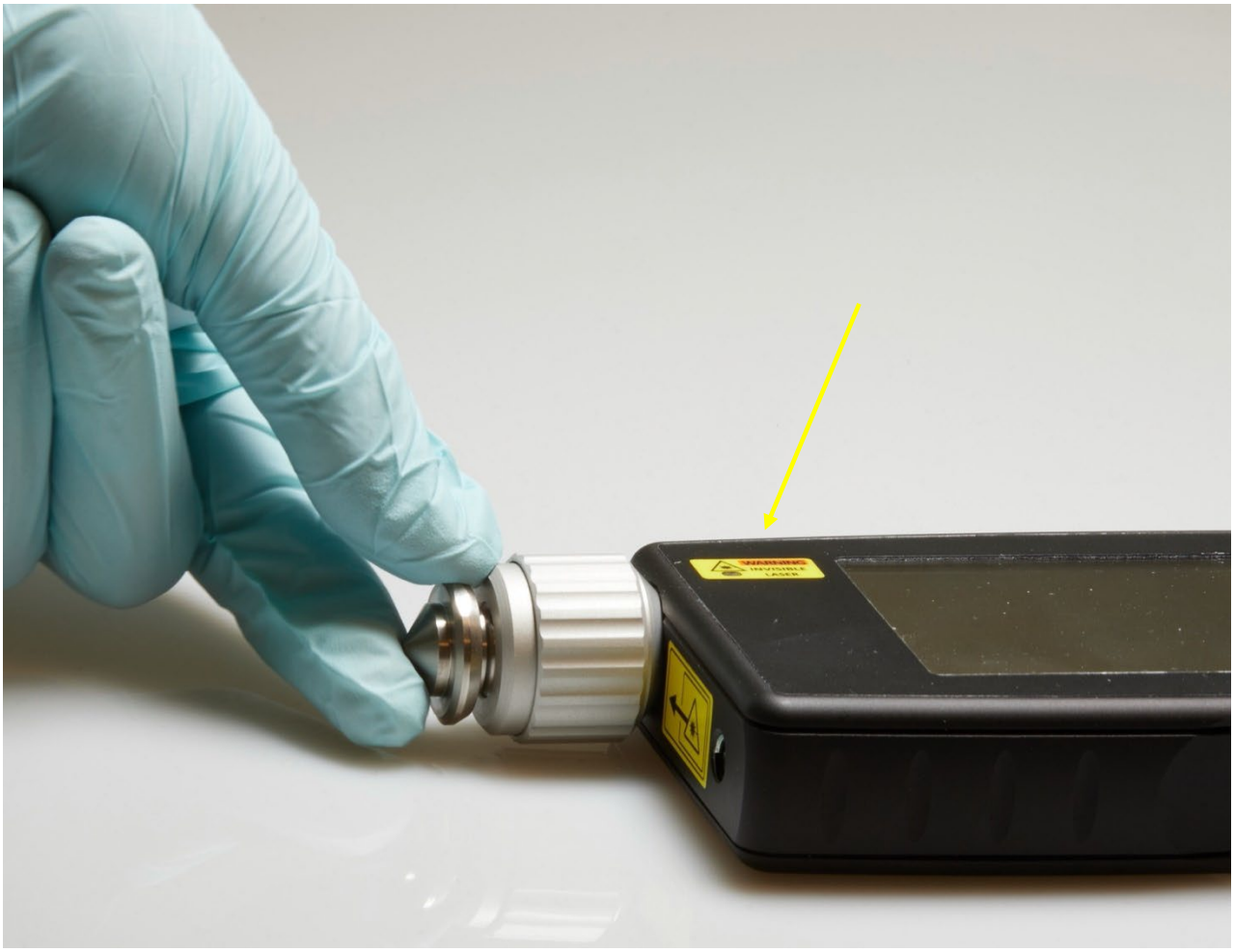
	**WARNING:** Exposure to levels of invisible laser energy above the MPE can be harmful to the eye. In this case, the MPE is 0.577 mW. The minimum safety distance (Nominal Ocular Hazard Distance, NOHD) is 180 cm from the invisible laser aperture to avoid exposure to levels above the MPE. The output power 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 180 cm hazard zone.

6.4. SAFETY RECOMMENDATIONS AND WARNINGS

	It is required to use safety glasses and/or laser safety glasses to avoid exposure to invisible laser radiation within the 180 cm hazard zone. Use laser safety eyewear of an optical density (OD) greater than 3 in the wavelength range 750 nm to 820 nm. Maximum irradiance is 1.1 W/cm^2.

	**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.

6.5. INSTRUMENT LABELS PLACEMENT



	On the front side of the instrument 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**

6.7. INSTRUMENT KEYPAD

1. **Quick Scan button**

Performs a Quick Scan if pressed; the user needs to confirm the choice.

2. **Up-arrow**

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

3. **Back button**

Use this button to return to the previous screen.

4. **OK button**

Use this button to confirm your choice on the screen and execute the command.

5. **Power button**

Use this button if you want to:

- Shutdown the device
- Restart the device
- Log out of the device

6. **Down-arrow**

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

6.8. USB-C PORT

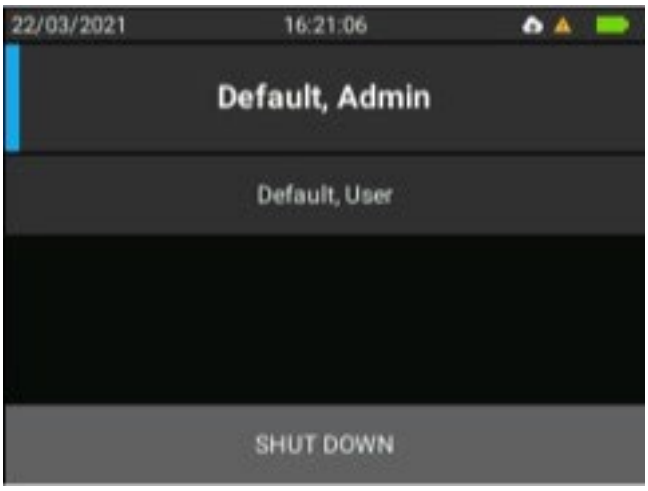
Charging: Use the supplied USB charger and cable to charge the device. Connect the USB -C cable to the port on the Arx MkII and plug the charger into a suitable power outlet.

PC Connection: Use the supplied USB-C cable to connect the Arx MkII to a PC. This connection allows access to the ChemDash software for generating measurement reports, user management, and managing user-defined libraries. Ensure the PC meets the necessary requirements for running ChemDash software.

Precautions: Do not force the USB connector into the port. Ensure it is aligned correctly before insertion.

7. ARX MKII LOG IN

To log in the Arx mkII instrument, please follow all steps described below:

<table>
<tr>
<td> 
</td>
<td>

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

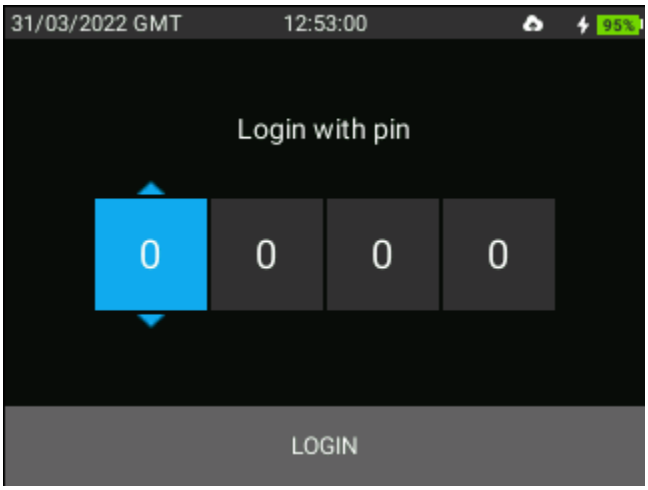
If the instrument is started for the first time, there are two predefined users that may be used to access the instrument:
Default, Admin
Default, User
Instrument users can be added, removed and configured through ChemDash software.

Scroll with the arrow keys between the alternatives.
Press the OK button to select a user.

</td>
</tr>
<tr>
<td></td>
<td>Enter your four-digit personal code that your local instrument administrator has supplied you with.

Move to the next digit by pressing the [OK] key.

</td>
</tr>
</table>

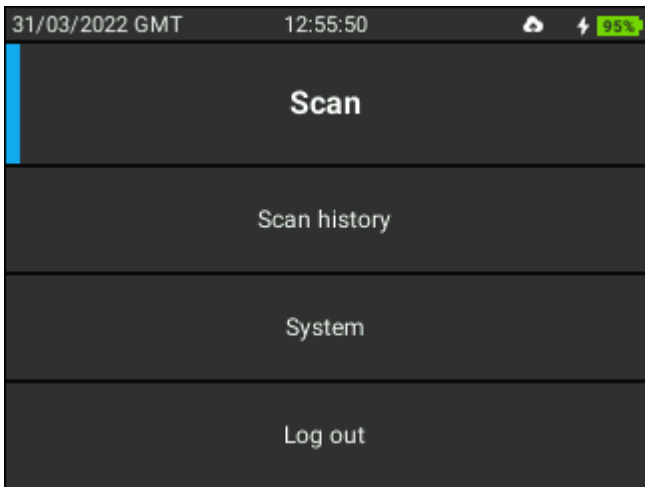
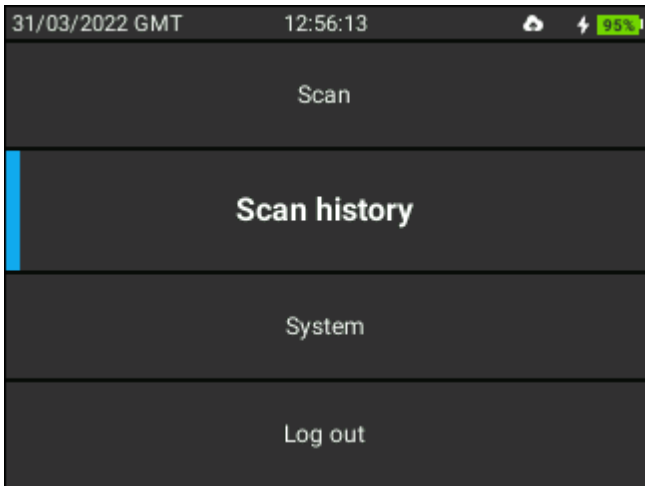
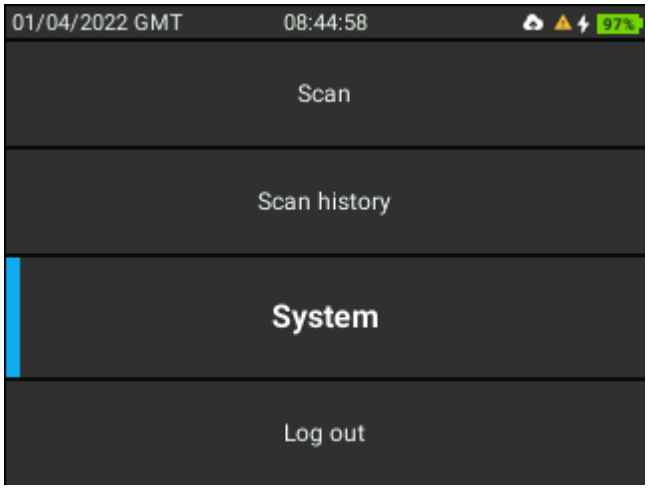


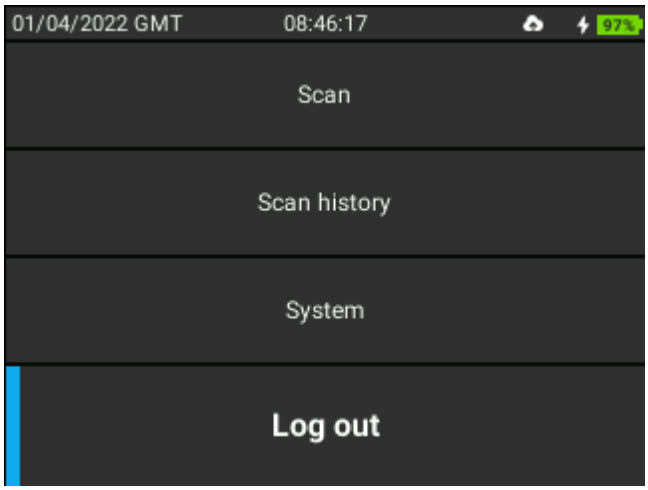
- Use the up and down arrows to change the value for each of the four digits. The value can be set to 0-9.
- Press the OK button.
- The Main menu will be displayed after a successful log-in.

NOTE: When the instrument is started for the **first** time the **PIN** code (supplied with the instrument) is **0000**.

8. MAIN MENU

Features of the Main menu is **Scan**, **Scan History**, **System** and **Log out**.

	Select **Scan** if you want to**:** ▪ Make a **Quick scan** of a substance (uses high laser power, take caution with dark and/or explosive substances) ▪ Make an **Advanced Scan** of a substance ▪ Check the available **Libraries** ▪ Check the **Calibration** status of the device.
	Select **Scan history** if you want to see the history of your measurements and their details.
	Select **System** to access the options: ▪ Settings ▪ About ▪ Libraries ▪ System info

	Select **Log out** if you want to log of the device.

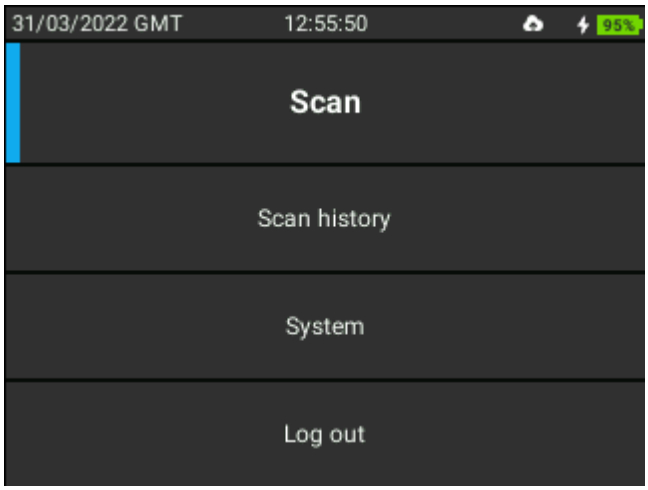
9. SCAN

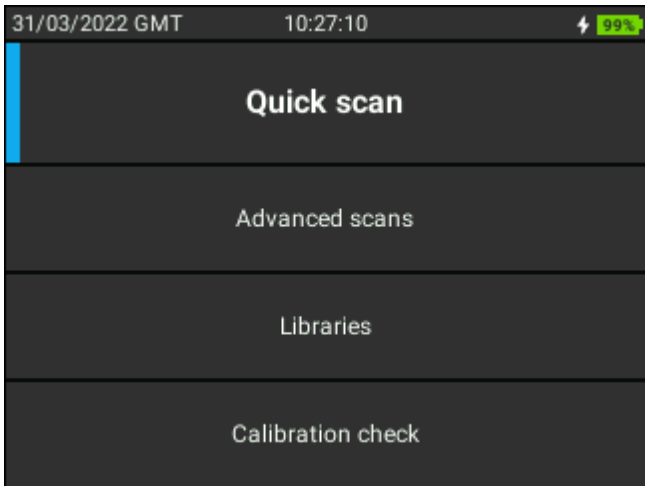
9.1. QUICK SCAN

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

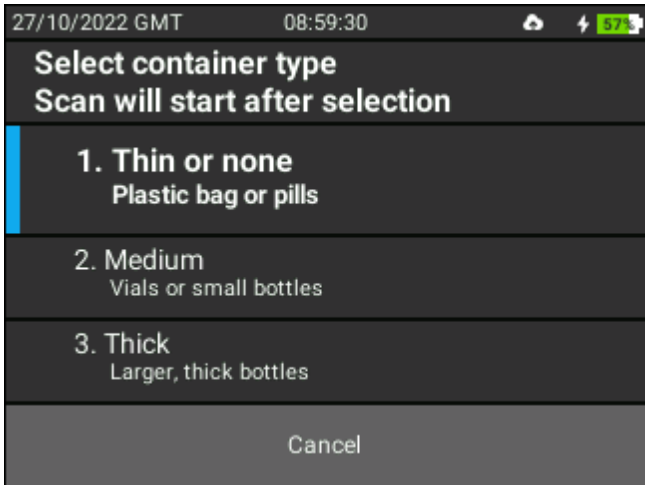
Each substance of these two categories has its “Regulatory Type” settings in the reference library depending on the severity. The regulatory types are listed under Screen analysis result:

- Select the appropriate accessory for the analysis
- Log in to the instrument
- Follow the below listed steps:

	Select **Scan** from the Main menu.



Select **Quick Scan**.



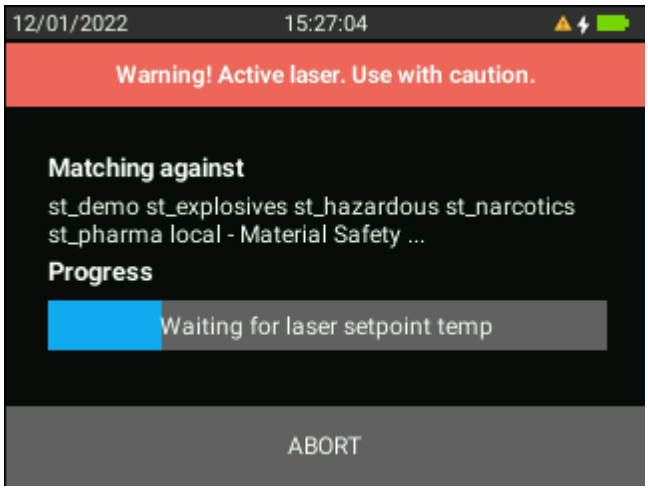
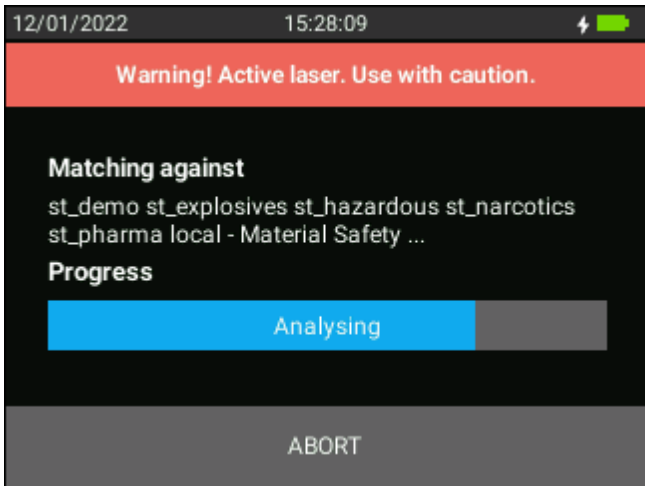
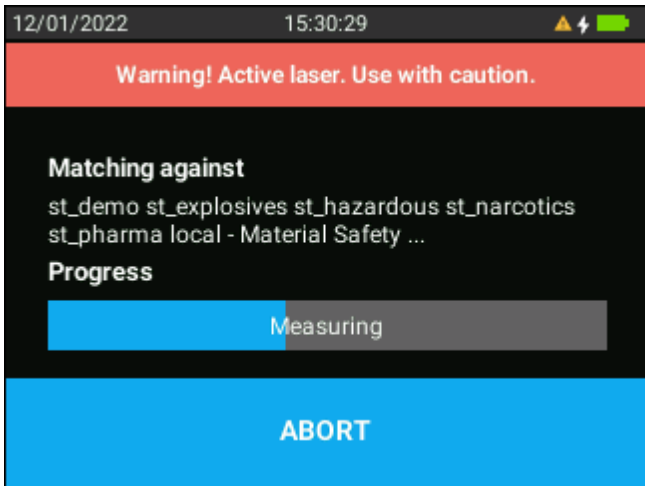
Based on the **Container type**, a selection has to be made.

1. **Thin or none** – is to be chosen when the substance to be analysed is a pill or in no container at all.
2. **Medium** – needs to be selected when the substance is in small bottles or vials.
3. **Thick** – is the right choice for substances that are in thicker and larger bottles.

The auto-focus is self-adjusting based on the selection, giving the best scan position and analyse time.

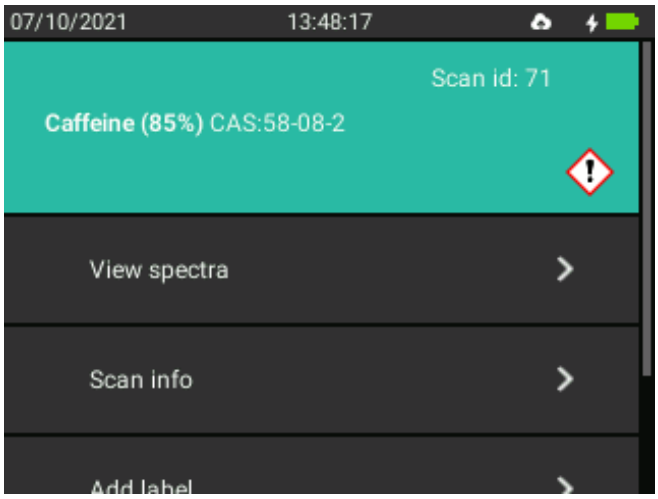
By pressing OK button, the selection is confirmed, and the scanning process begins.

N.B. Pay attention to the laser beam and do not look into it!

	A **laser warning** pop-up message is given on the same screen where the user can see the progress of the measurement. On the progress bar there will be a message letting the user know that the laser is brought to the optimal temperature.
	**Analysing**: Analysing Raman spectrum and compare to all selected libraries.
	Abort option is to be used if the user doesn't want to continue with the measurement; in this case, the **Abort** button is to be selected. This action can be done by using the down arrow until Abort option is reached; the action needs to be confirmed by using the OK button.

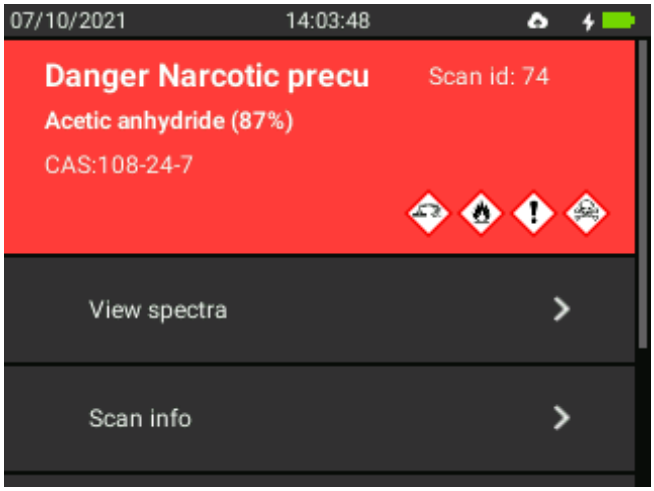
9.2. SCAN ANALYSIS RESULT

These are the possible results screens after a Scan:



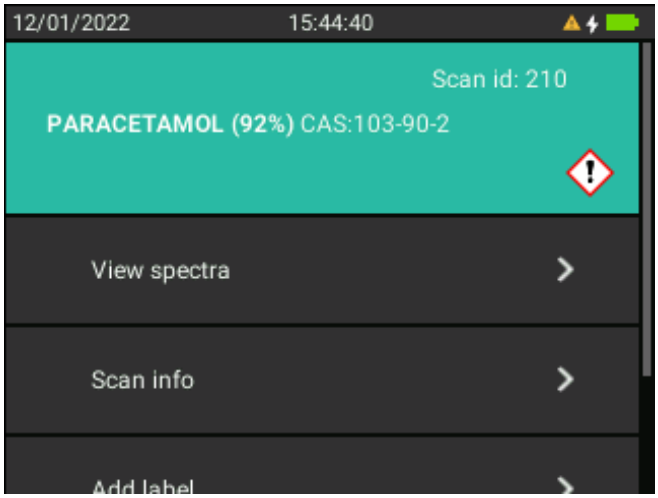
Green: The substance found is classified as not regulated.

- **Scan id** in the upper right corner, here the number 71, is the number of measurements done with the instrument.

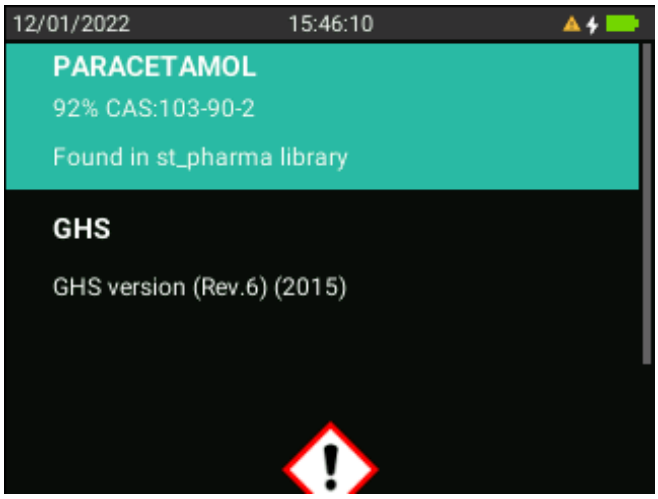
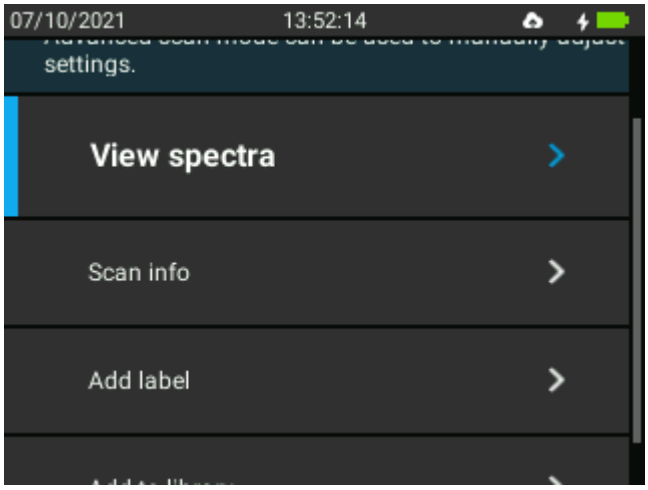
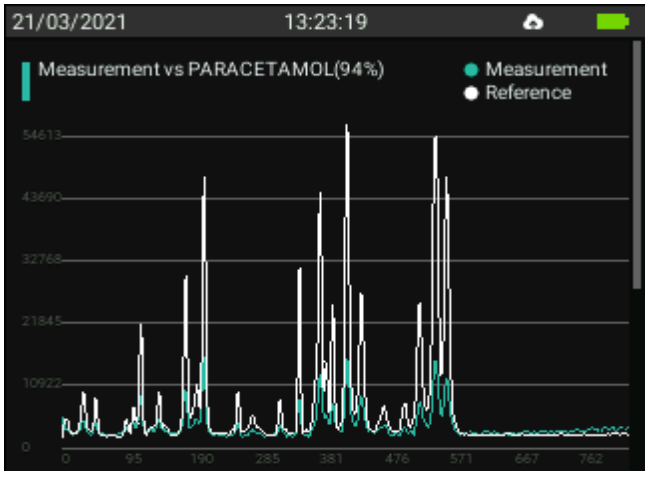


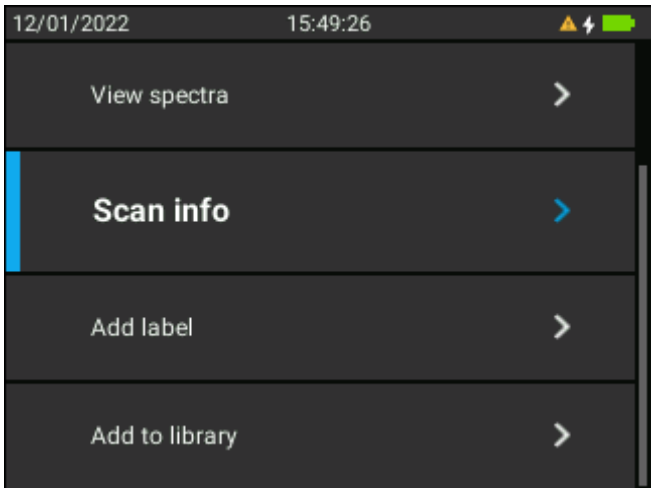
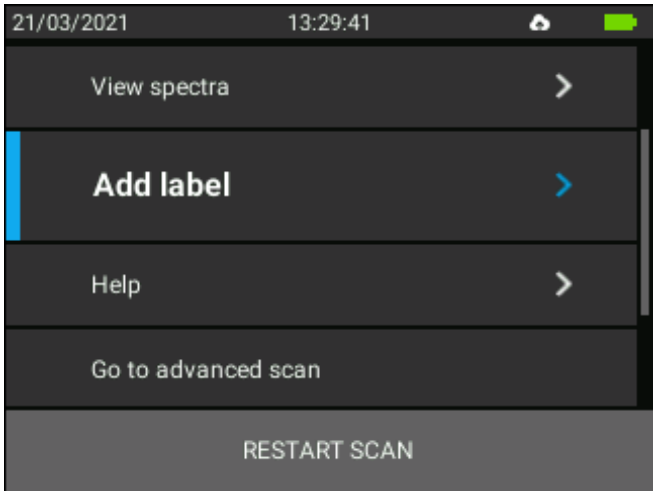
Red: Table 1 narcotics precursor according to UN.

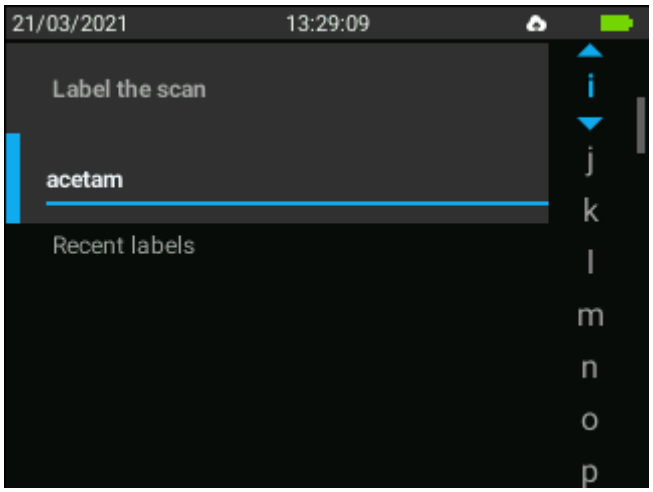
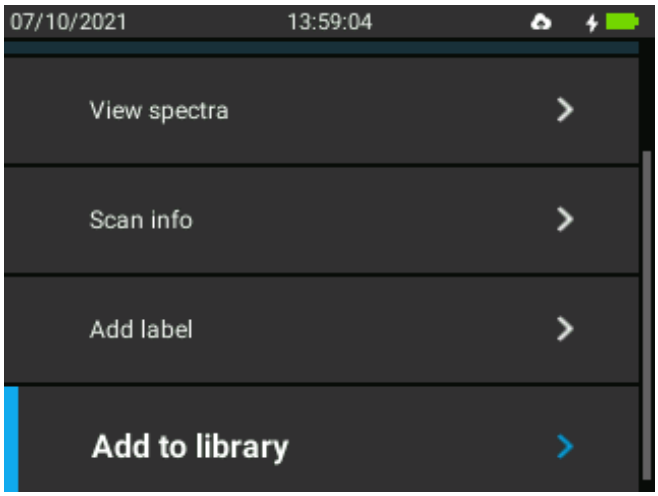
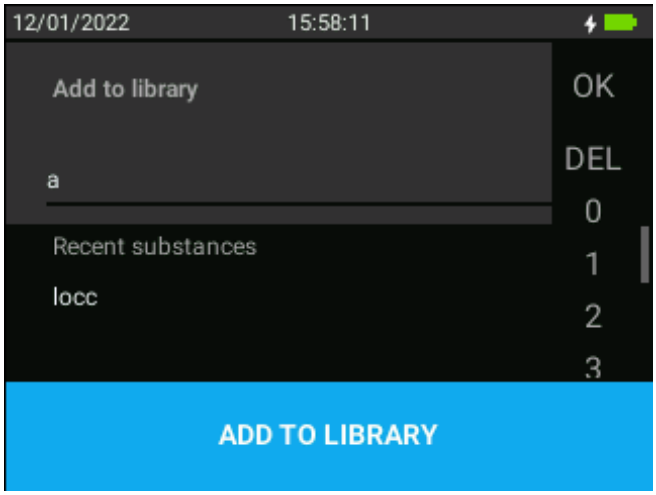
- Acetic anhydride
- **Scan id** in the upper right corner, here the number 74, is the number of measurements done with the instrument.

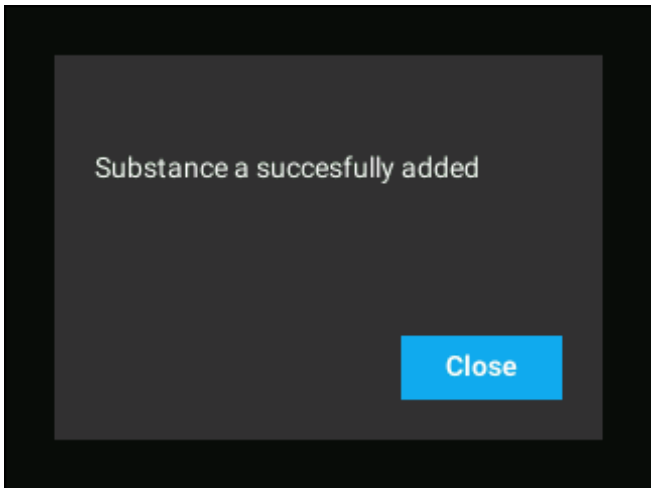


After the scan is done, the name identified substance will be displayed. If you want to see details about that substance, you must click OK twice and then the GHS information will be displayed.

	By scrolling down, you can see the GHS available details and the hazard pictograms for that substance. After seeing all these details, you must press the Back button until you reach the measurement menu.
	The user has the option to view the spectrum of the recently measured substance(s) by selecting the **View Spectra option.**
	The spectrum will be displayed together with the reference against which the match was made.

	Some details about the scanning process can be visible by accessing the **Scan Info** field.
	The details visible are: ▪ **Exposure** – the time the sample is exposed to the analysing laser ▪ **Analysis time** – time it takes for the obtained spectrum to be matched against the selected libraries. ▪ **Focus position** – the lens position used by the autofocus for the analysis.
	The user has the possibility to **add a label** to the measured substance.

	The Label name can be selected by moving up/down with the help of the arrows and selecting the desired letter by clicking OK button.
	There is also the option of **Adding to a local library** the newly measured substance. After selecting this, the user must give a name to the substance using the keyboard on the screen, moving up/down with the arrows and choosing OK after the desired name it's typed.
	After the name of the substance was selected, you must select **Add to library** option.

	The success of the operation will be displayed.

9.3. ADVANCED SCANS

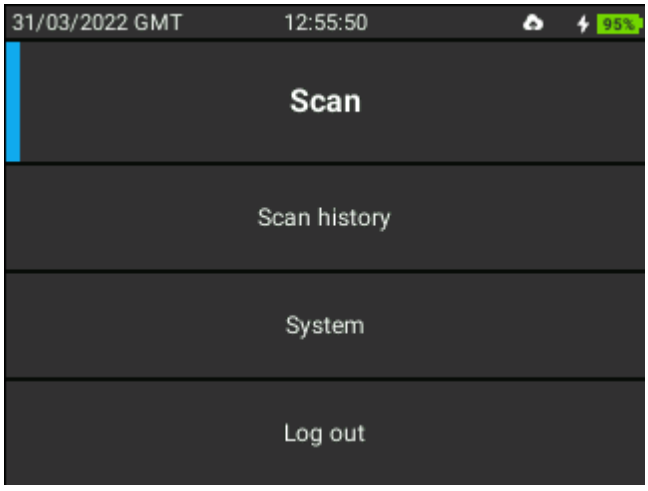
This method is used for screening a list of restricted chemicals for the presence of a regulated substance(s) in the sample, f.eg. narcotics and explosives. It offers the possibility to manually adjust the scan settings, to scan using the SERS-kit or to verify a certain substance.

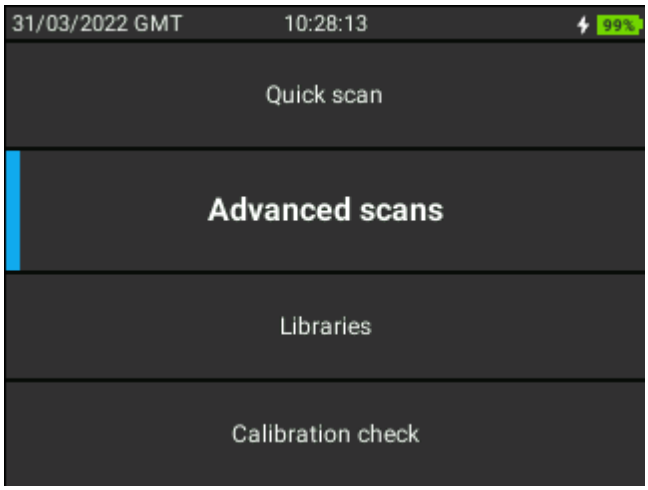
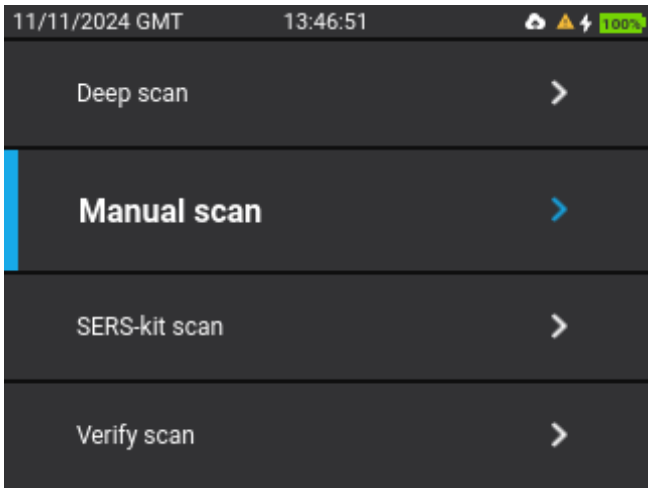
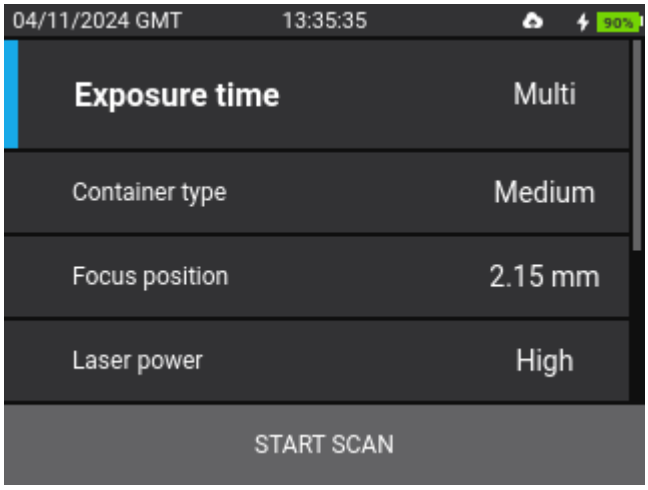
The extra benefit of this option is that the user has the possibility to adjust the scanning settings and procedure according to the needs.

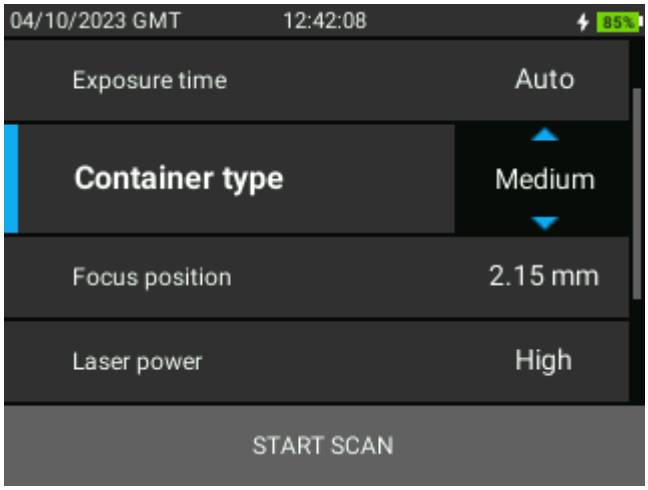
9.4. MANUAL SCAN

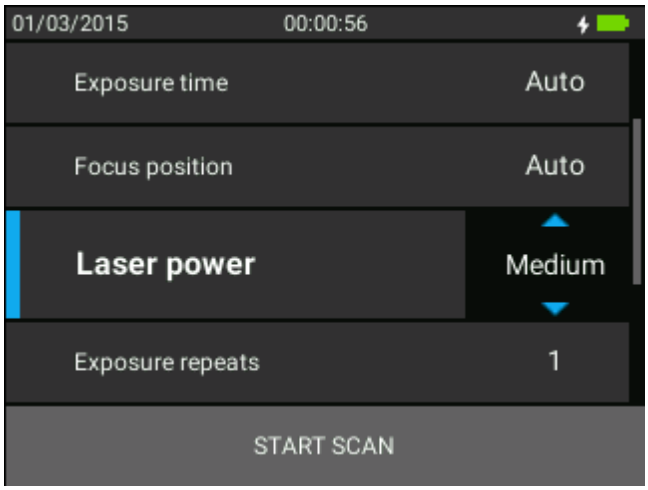
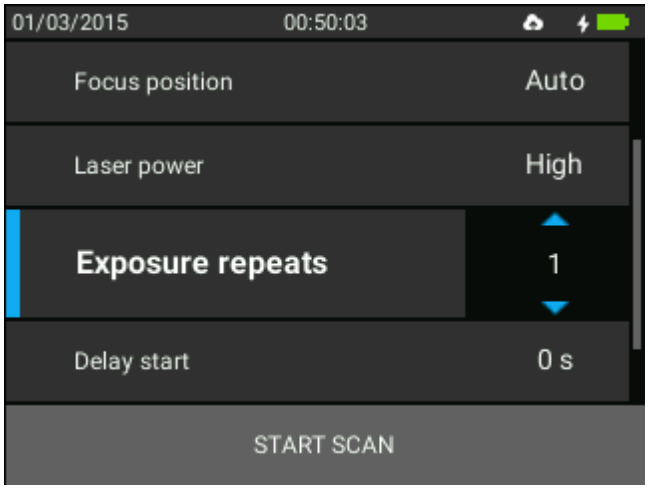
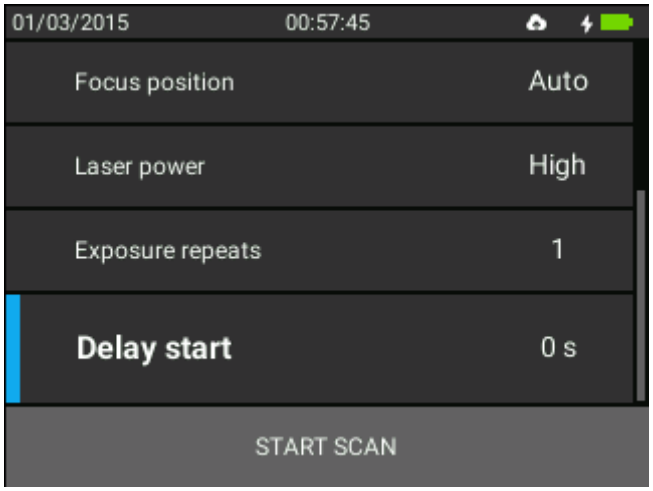
The steps to be followed are listed below:

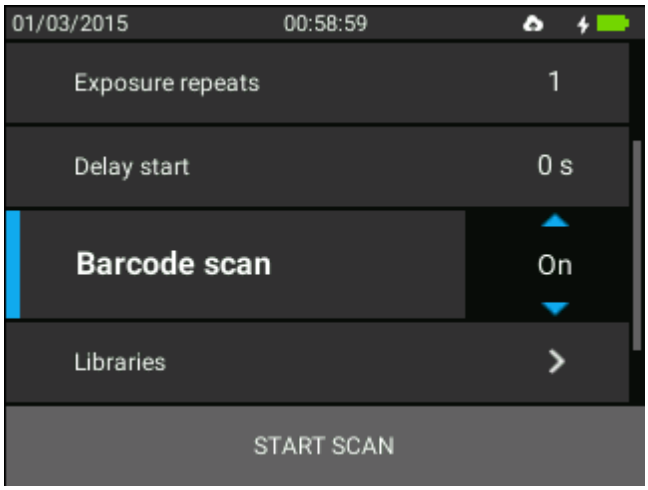
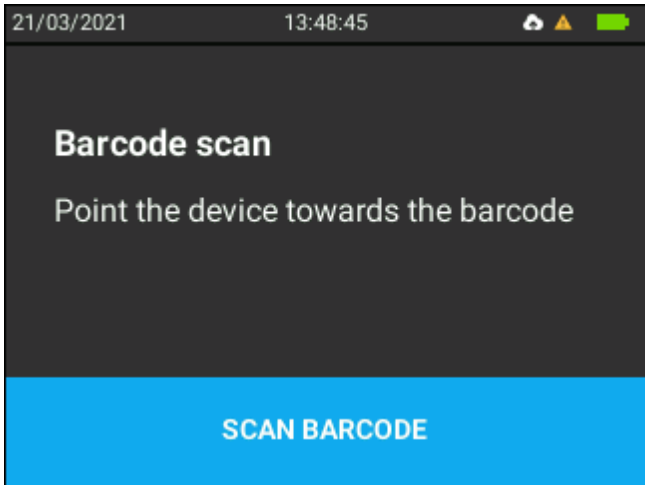
- Select the appropriate accessory for the analysis
- Log in to the instrument
- Follow the below listed steps:

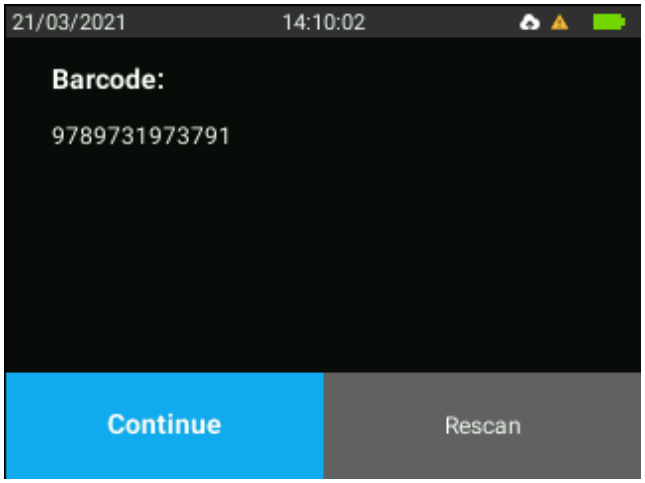
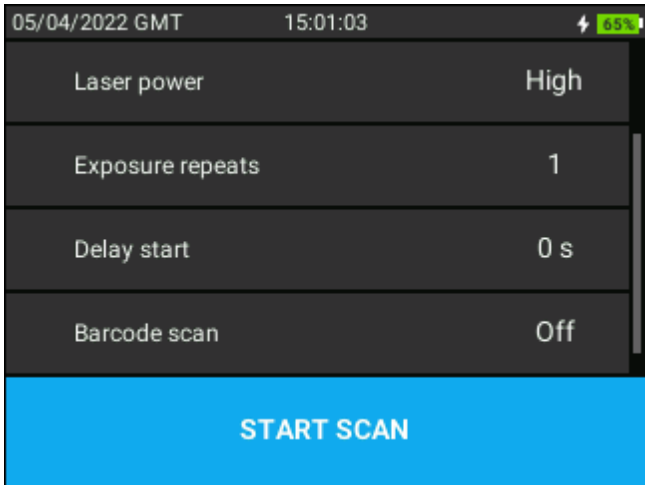
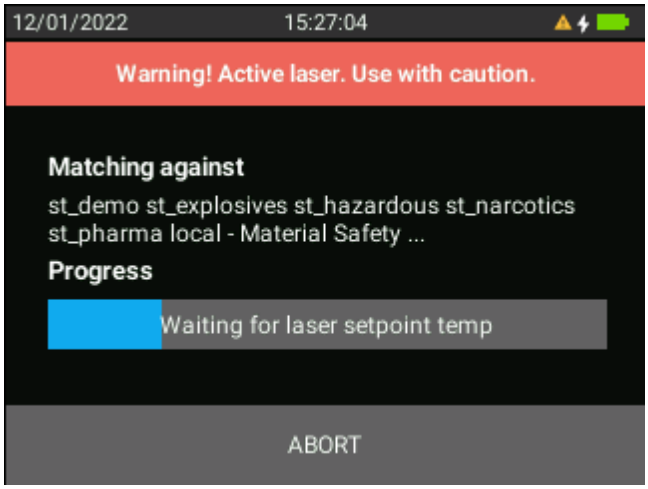
	Select **Scan** from the Main menu.

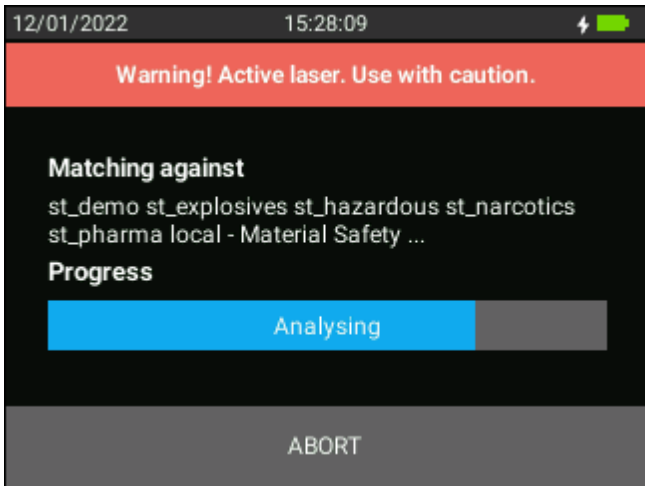
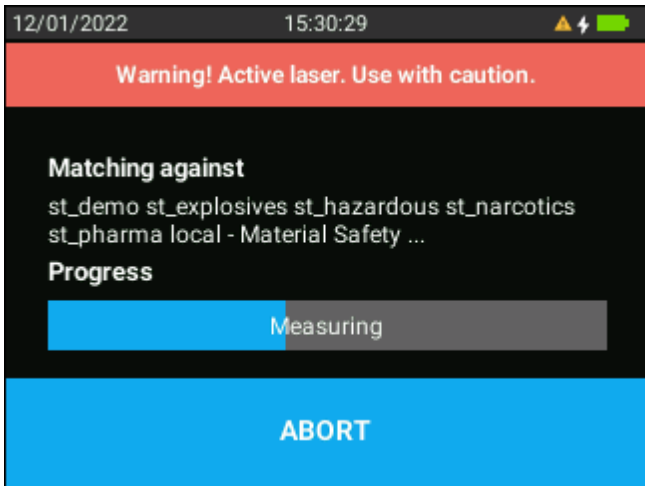
	Select **Advanced scans.**
	Select **Manual scan** in order to be able to manually adjust the settings.
	Adjust the **Exposure** by pressing the **OK** button, then use the arrow keys to select the desired option or number of seconds. Confirm your choice by pressing the **OK** button again. The available options are: • **Auto Exposure:** Automatically adjusts exposure. • **Multi Exposure**: The preset option for deep scans.

	• **Manual Exposure**: Allows you to set a specific exposure time in seconds.
	Select the **Container type** between the tailored alternatives labelled Thin, Medium and Thick. This setting operates in the same manner as the Quick Scan functionality and helps you choose the correct and prearranged focus position for your container of use. Use up/down with the arrows on the keyboard. Confirm the choice by clicking the OK button again.
	Select **Focus position** by clicking the OK button and then choose between **Auto** or manually select the value with the help of up/down arrows; then confirm the choice by clicking on OK again.

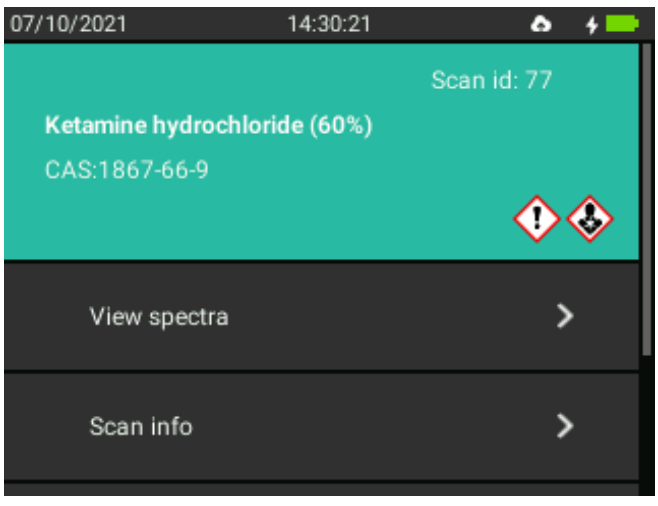
	Select **Laser power** by clicking the OK button and then choose between the options: • High • Medium • Low Confirm the choice by clicking on OK again.
	You can choose how many times you want to expose the sample; the number can be selected between 1-30 times. After deciding the best option, you must confirm the choice by clicking the OK button again.
	If you suppose you are around any dangerous substances that you want to scan, you can select this option; it will allow you to turn the scan on with a certain delay, in seconds. This will permit you to leave the area where the possibly dangerous substance is. After selecting the desired number of seconds, confirm your choice by pressing OK again.

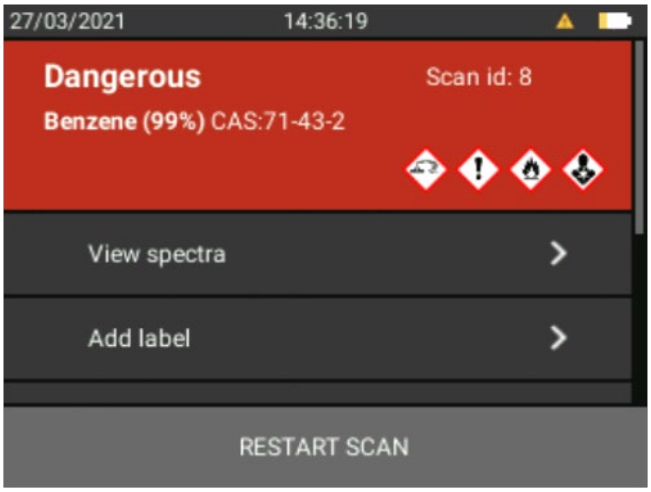
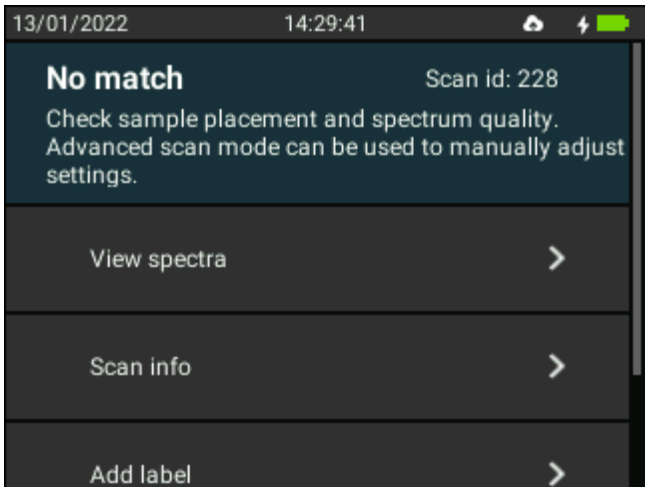
	Select **Barcode scan** by clicking the OK button and then choose between ON/OFF. Confirm the choice by clicking on OK again.
	If the Barcode scan was set to On, the user must pay attention and position the barcode to be scanned in front of the barcode scanner which is on the back of the device.
	There is another warning saying that the barcode should be put in position. After the setup is made, the user must confirm the start of the action by clicking OK button when Scan Barcode option is selected.

	The result of this scanning will be a string of numbers. **NOTE:** If the user clicks Continue, the substance to be associated with the scanned barcode needs to be prepared and placed in front of the laser, as this is going to start immediately. The flow will be as for the normal scan.
	After finishing the configuration for the Advanced scan, you must confirm the **Start Scan** action by pressing the OK button.
	A **laser warning** pop-up message is given on the same screen where the user can see the progress of the measurement. On the progress bar there will be a message letting the user know that the laser is brought to the optimal temperature.

	**Analysing**: Analysing Raman spectrum and compare to all libraries.
	Abort option is to be used if the user doesn't want to continue with the measurement; in this case, the **Abort** button is to be selected.

These are the possible result screens after an Advanced Scan with Manual settings:

	**Green** Ketamine HCl, locally regulated drug in many countries. Not regulated according to UN and thus not identified as a regulated substance.

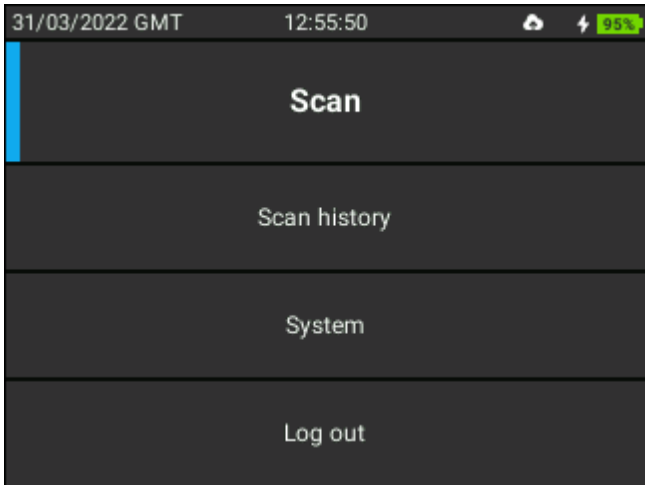
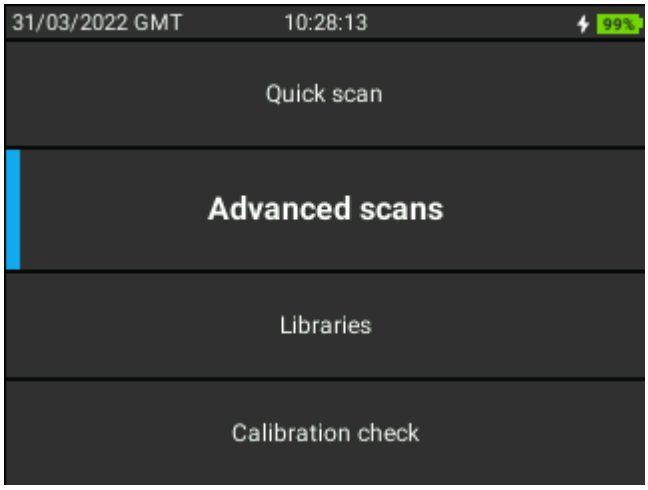
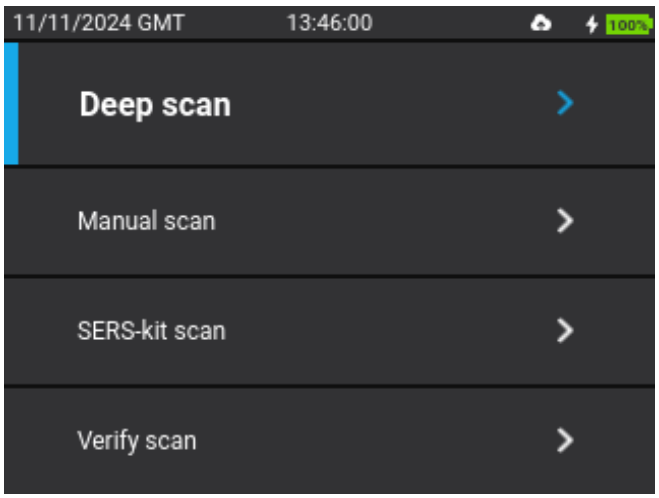
	Hazardous substance, not identified as a regulated substance.
	**No match Result:** There is no spectrum in the libraries that matches the sample spectrum. You may want to re-test the sample while paying close attention to position the sample as close to the probe tip as possible, in a straight line towards the sample. Ensure the instrument is not exposed to strong ambient light. Additionally, consider adjusting the settings for the Advanced Scan or exploring different libraries for a more accurate match.

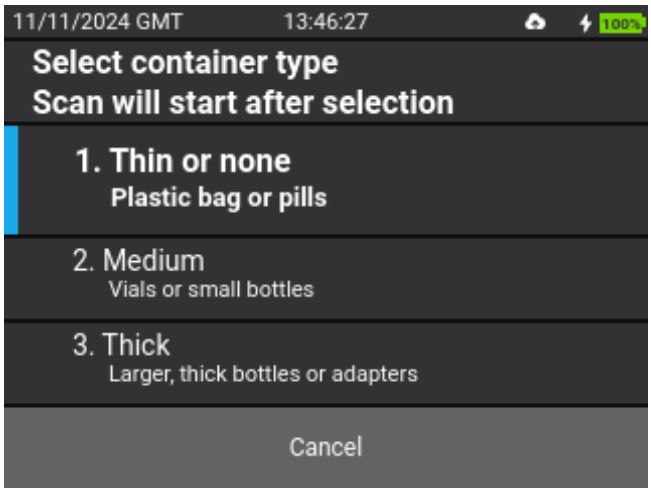
9.5. DEEP SCAN

This method can be used when small quantities in a complex mixture is suspected. The Scanning is slightly longer and gives more detailed information of the about the sample.

Select the appropriate accessory for the analysis

- Log in on the instrument
- Place the sample next to the probe tip or in correlation for the adapter.
- Follow the below listed steps:

	Select **Scan** from the Main menu.
	Select **Advanced scans.**
	Select **Deep scan** by pressing the OK button.



Based on the **Container type**, a selection has to be made.

1 **Thin or none** – is to be chosen when the substance to be analysed is a pill or in no container at all.

2 **Medium** – needs to be selected when the substance is in small bottles or vials.

3 **Thick** – is the right choice for substances that are in thicker and larger bottles or adapters.

The auto-focus is self-adjusting based on the selection, giving the best scan position and analyse time.

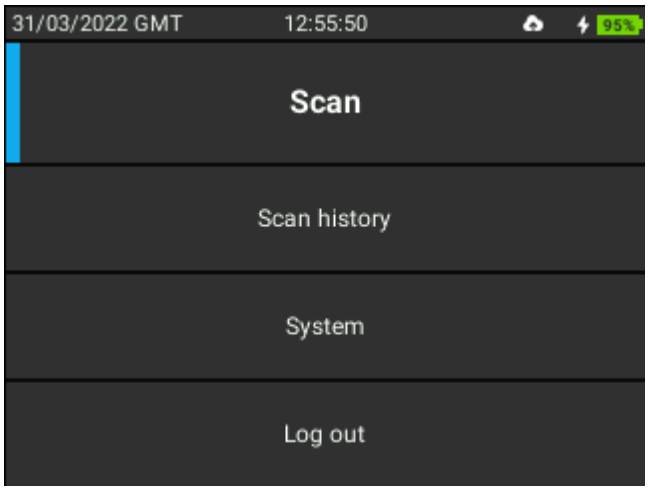
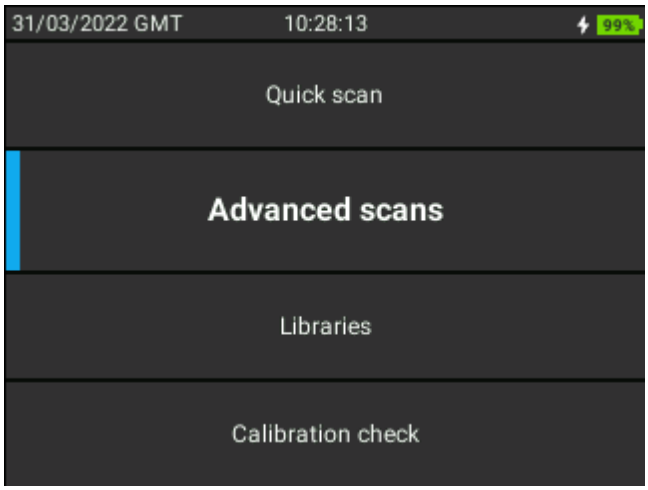
By pressing OK button, the selection is confirmed, and the scanning process begins.

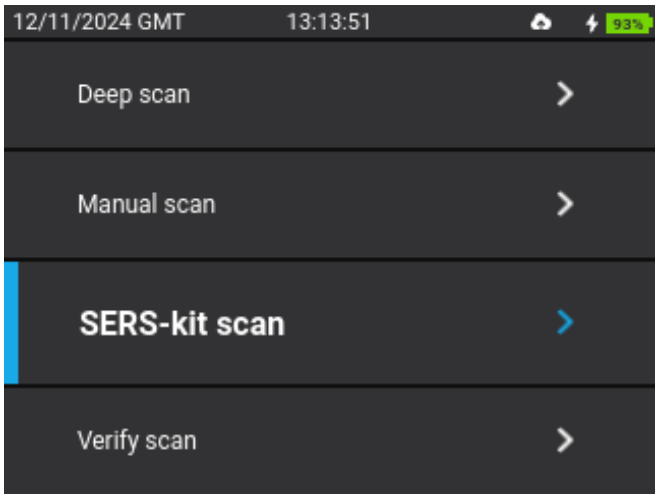
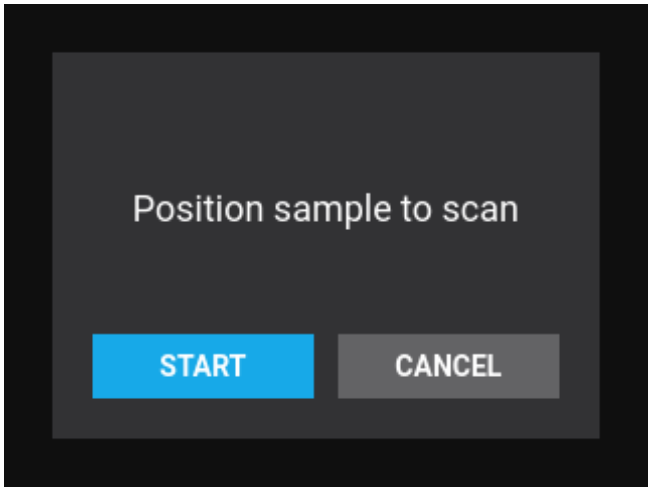
N.B. Pay attention to the laser beam and do not look into it!

9.6. SERS-KIT SCAN

This method is used for exceptionally difficult samples with the optional Serstech SERS Kit. The adapter attaches to the probe for sample placement, and the SERS Scan function is used to perform optimal scanning for the adapter and SERS scanning method. For detailed steps, refer to the **SERS Kit Manual**.

- Follow the detailed steps in the **SERS Kit Manual**

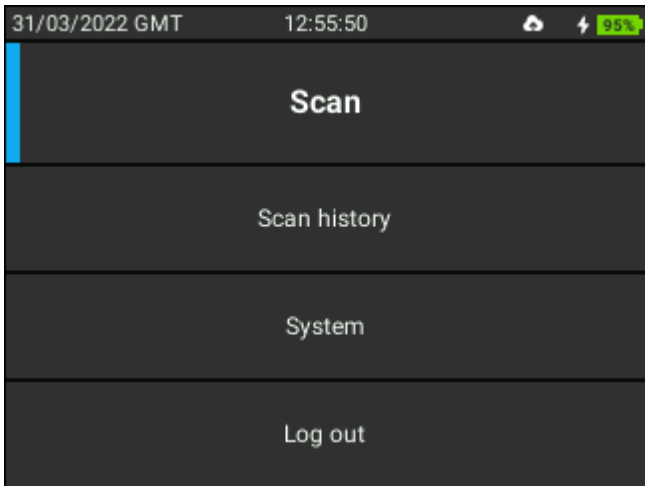
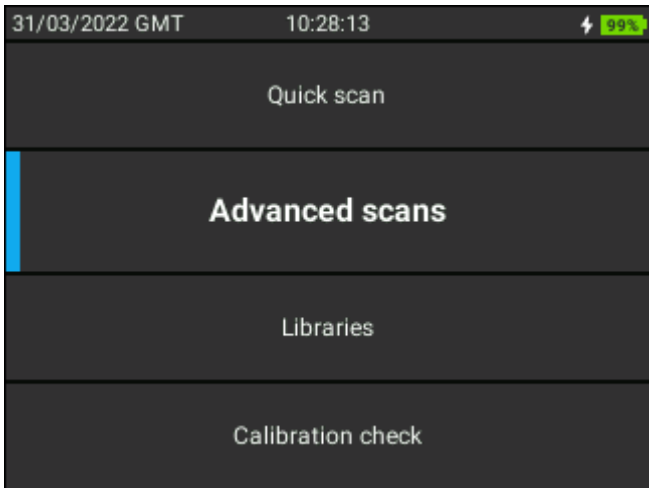
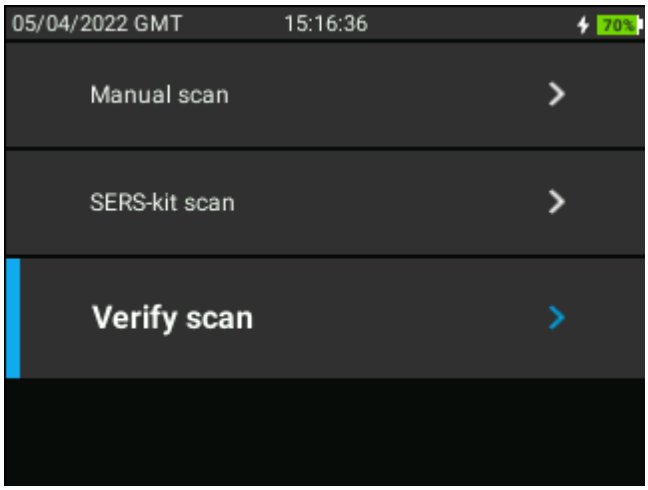
	Select **Scan** from the Main menu.
	Select **Advanced scans.**

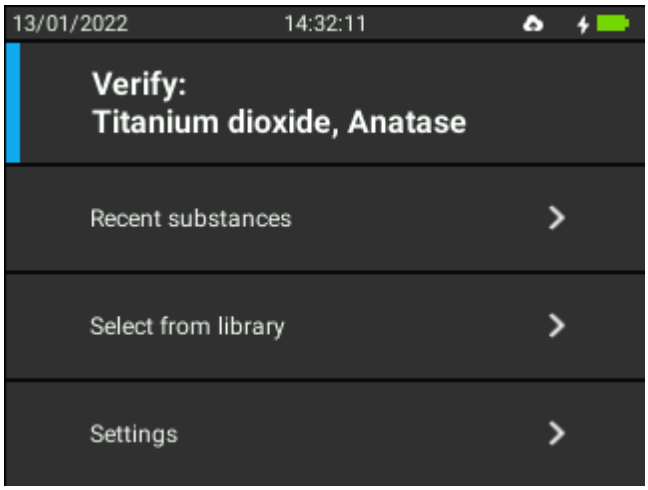
	Select **SERS-kit Scan** by pressing the OK button.
	Start Scan by pressing OK button.

9.7. VERIFY SCAN

Verify method is similar to the Screen meaning that you know what you are searching for, but in this case, 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.

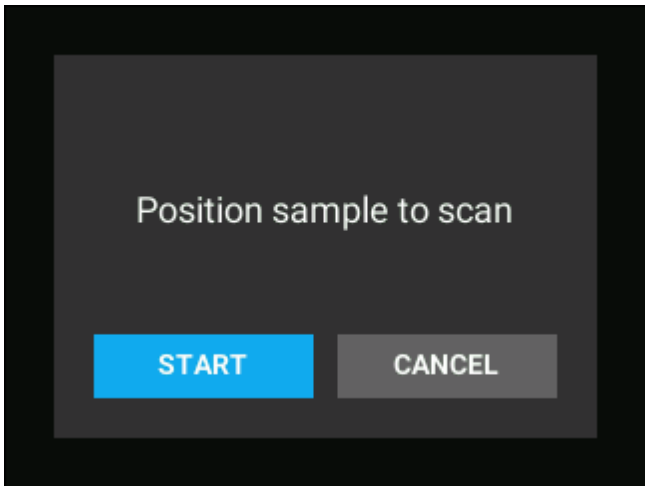
Before the measurement you will choose a reference substance from the spectra libraries. The Arx mkII instrument will analyse the sample and compare it with the chosen reference. The result is binary, either Pass (OK) if the sample is similar to the reference spectrum or Fail (not OK) if the sample is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

	Select **Scan** from the Main menu. Select the appropriate accessory for the analysis.
	Select **Advanced scans.**
	Select **Verify scan**.



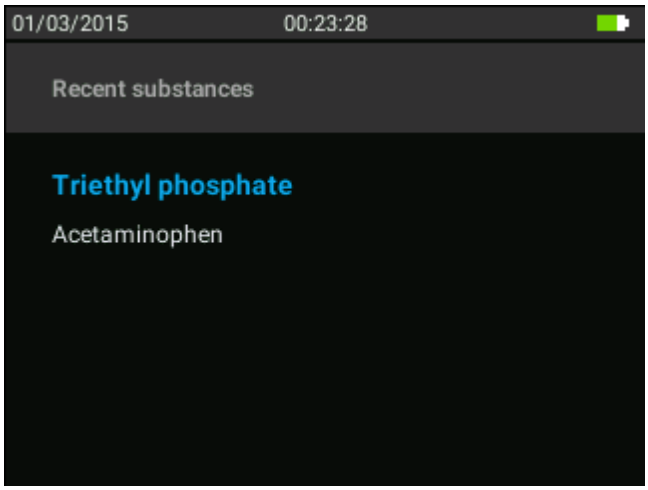
The last substance verified will be displayed as option to be scanned again, f.eg. Titanium dioxide, in this case.

If you confirm this choice by clicking OK, you will get to the next screen.

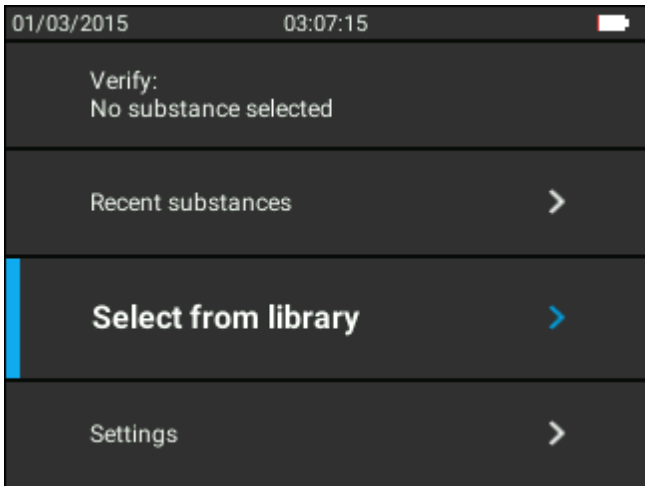
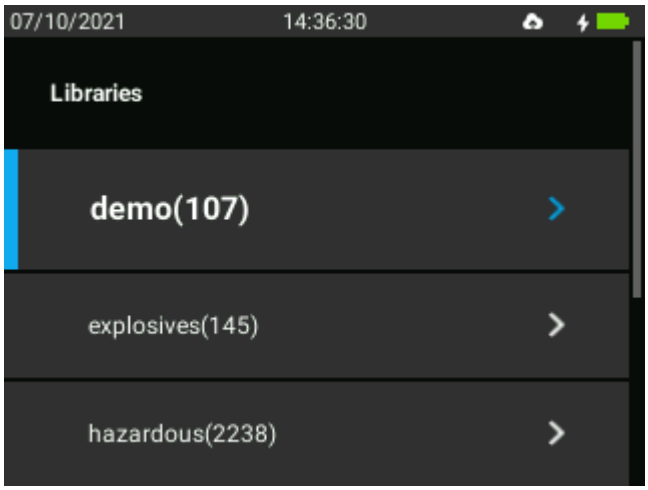
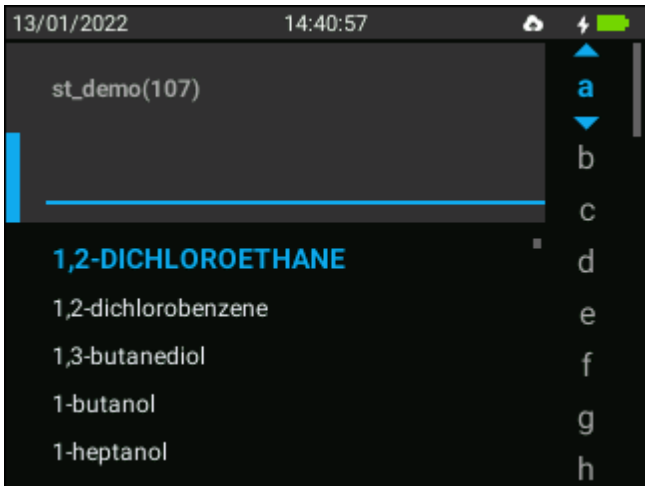


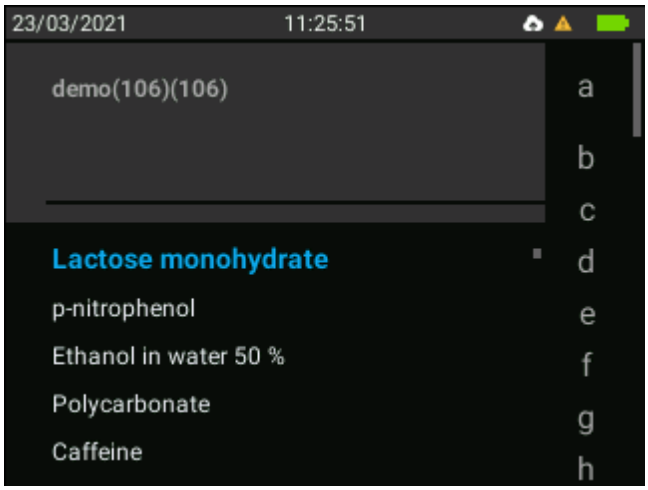
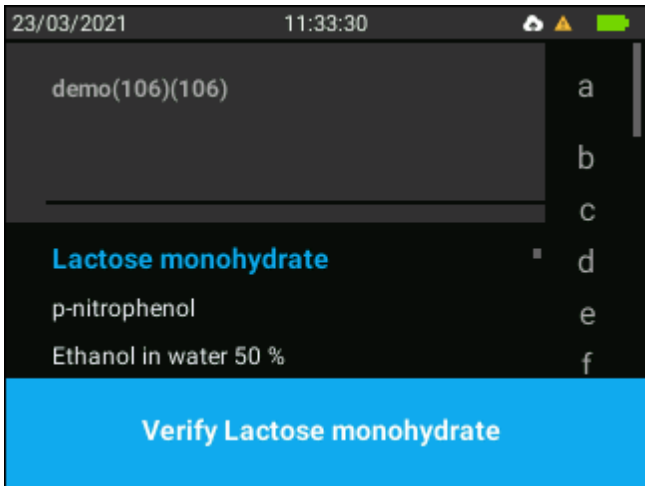
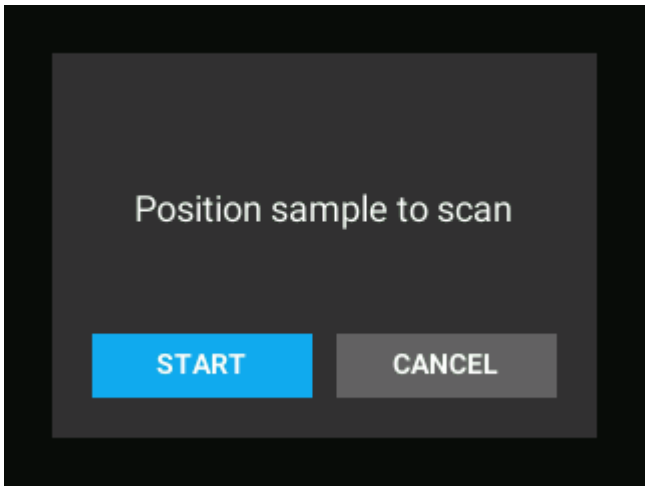
You must position the sample to be verified and press OK on the start option.

The usual scanning screens will follow.

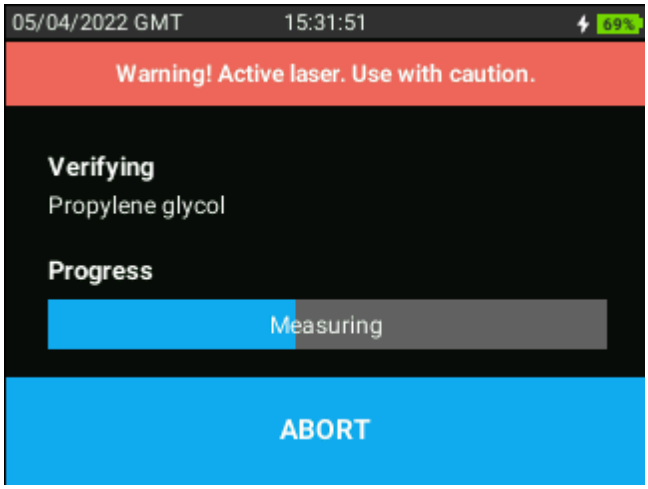


Select one of the substances that you have already identified and is stored in the device by clicking **Recent Substances**.

	Select one or several libraries you will use for the analysis. These can be from the recent substances you have worked with or from the pre-existing libraries.
	Select one of the libraries available on the device.
	Select the substance you want to verify by writing its name with the help of the keyboard on the right of the screen (you scroll up and down and if you want to select that specific letter, you click OK)

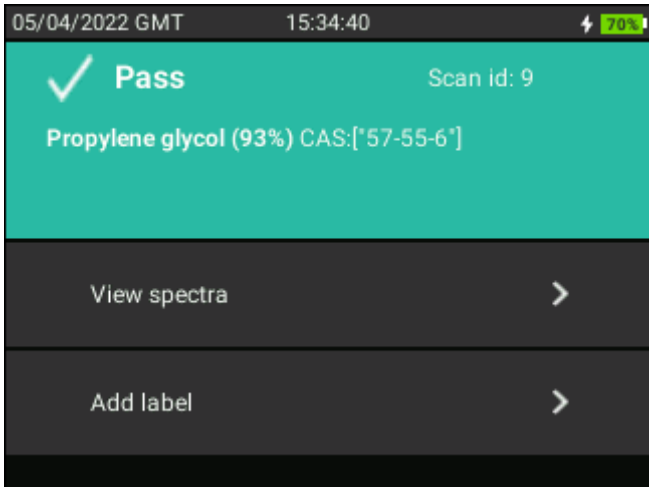
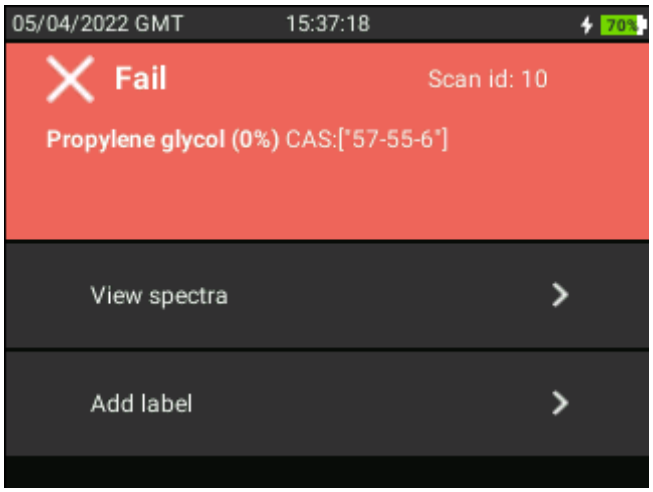
	One can also select the substance directly, by pressing the **Up arrow** until you reach the first **a** letter in the list and like this you will switch the "window" where you scroll; now you can select the desired substance. The **Down arrow** must be used to go down the list and find the desired substance.
	Once the desired substance is selected, the user must click on the lower button "Verify [substance name]".
	Position the sample to be scanned and then press **START**.

Follow the different steps in the sample analysis:

	There is a warning regarding the laser activity. The lower progress bar shows the progress of the current part of the scan process, beginning with the setting the laser temperature. The scan can be aborted by pressing OK. You will return to the previous menu.
	If the scan is aborted, the measurement will stop and no result will be shown.

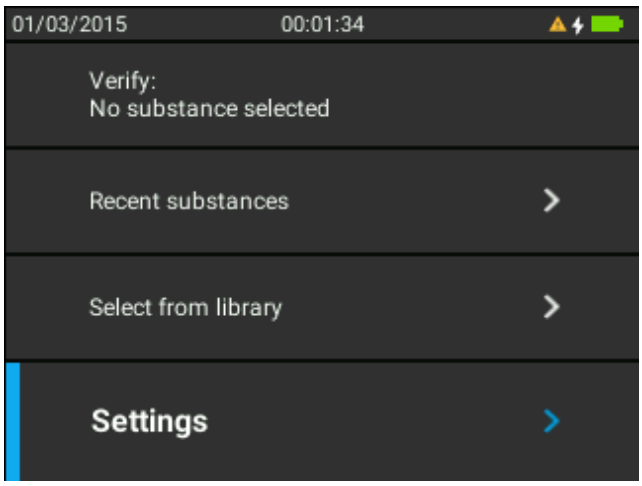
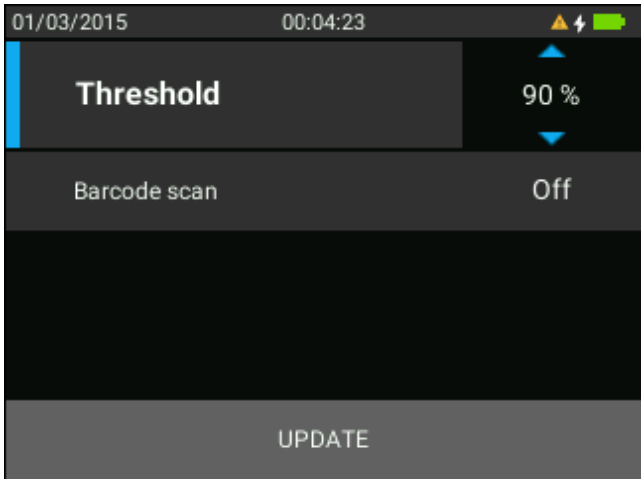
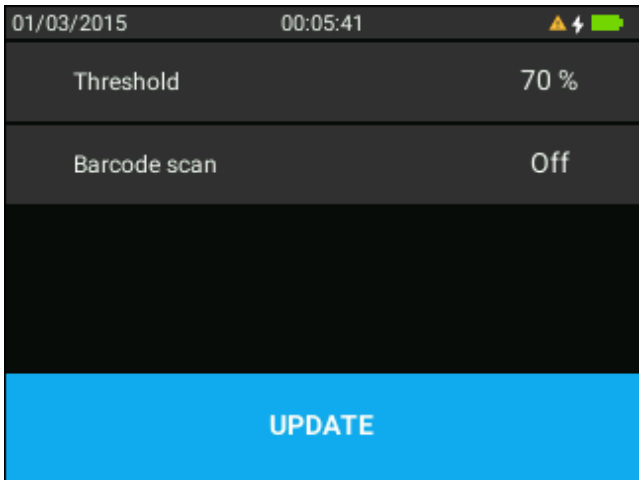
9.8. VERIFY ANALYSIS RESULT

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.

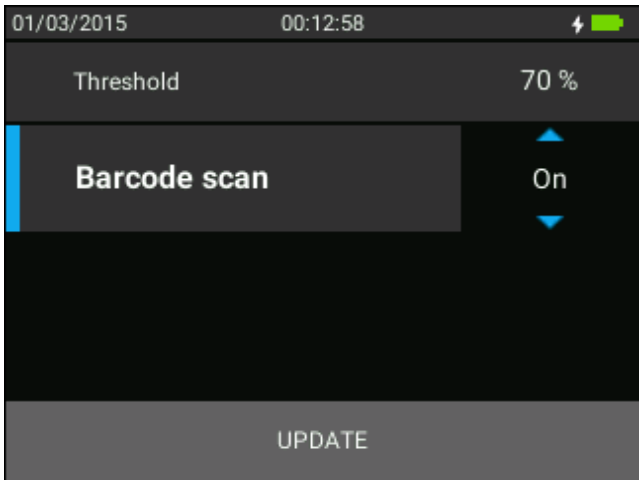
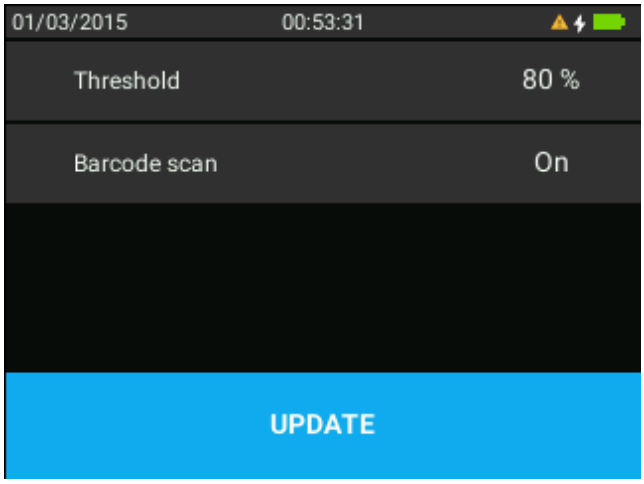
	**Pass** screen is displayed if the analysed substance spectrum has sufficient correlation with the reference spectrum, f.eg. equal to or over the Verify Threshold limit. The sequential number in the upper right corner, here 9, is the number of measurements done with the instrument.
	**Fail** screen is displayed if the analysed substance spectrum has a correlation with the reference spectrum which is below the Verify Threshold limit. The sequential number in the upper right corner, here 10, is the number of measurements done with the instrument.

9.9. THRESHOLD

The user has the option to set a matching percentage under this section.

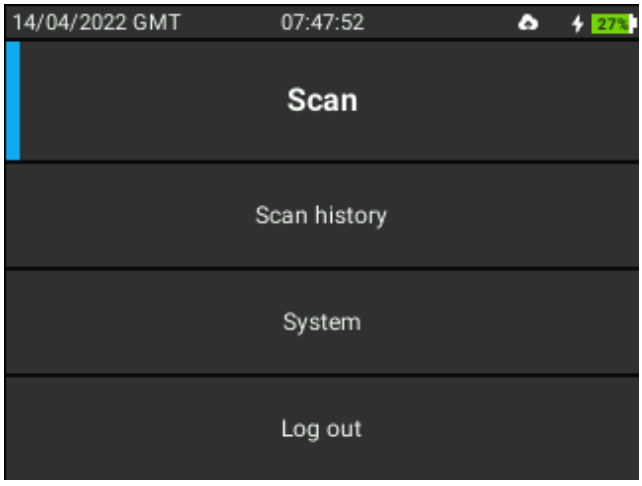
	From **Verify** menu, select **Settings.**
	Select **Threshold** by clicking OK and select the desired matching percentage by using up/down arrow. The default is set to 80%.
	Confirm your choice by clicking OK and then select **UPDATE**.

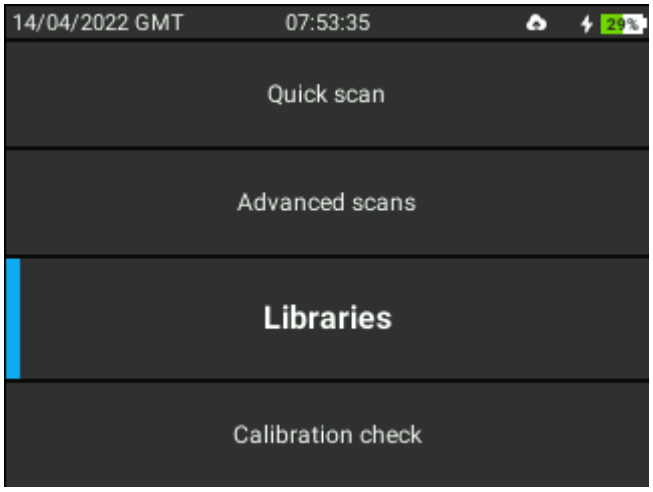
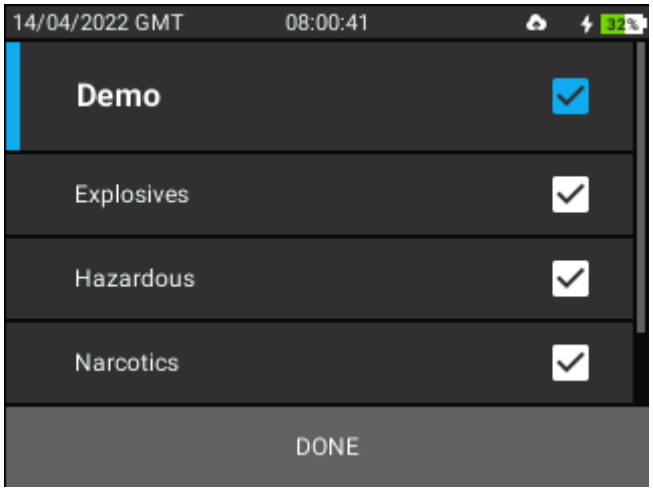
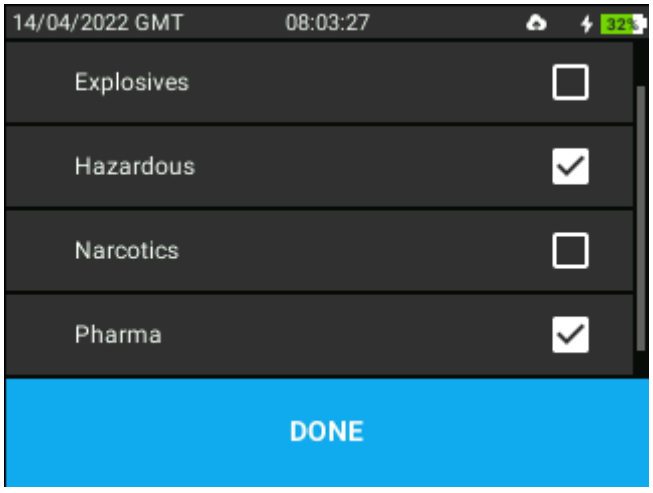
9.10. BARCODE SCAN

	For the Verify flow the user can add the option of **Barcode Scanning**. Use the up/down arrow to change from On to Off and then confirm the choice with the **OK** button.
	Select **UPDATE** option by moving down with the arrow and confirm your choice by clicking OK.

9.11. LIBRARIES

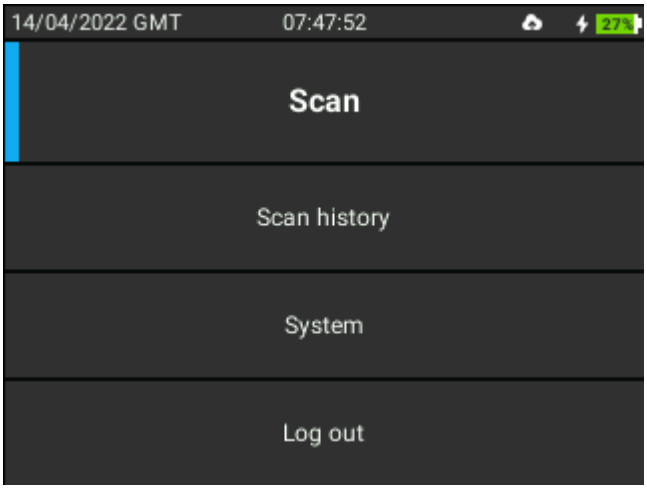
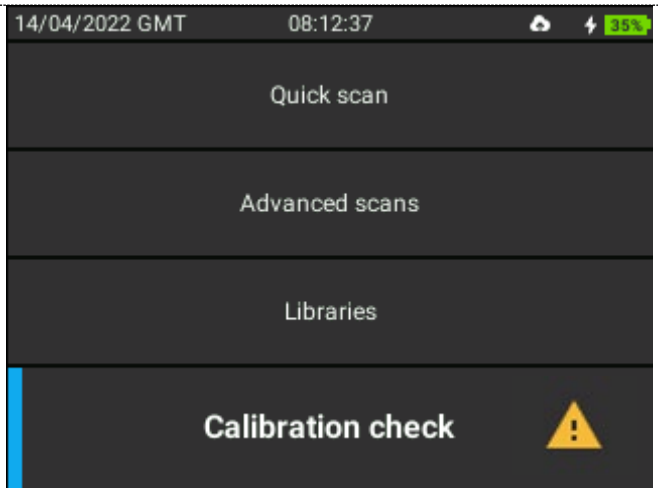
The user has the possibility to see all the available Libraries and also to select the ones to be used for the next scans.

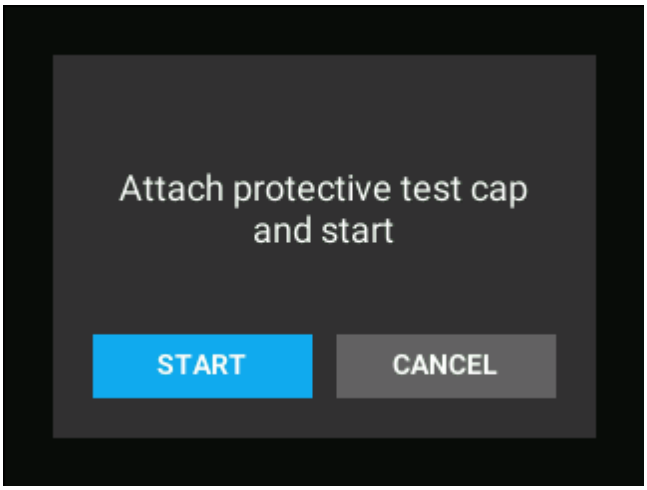
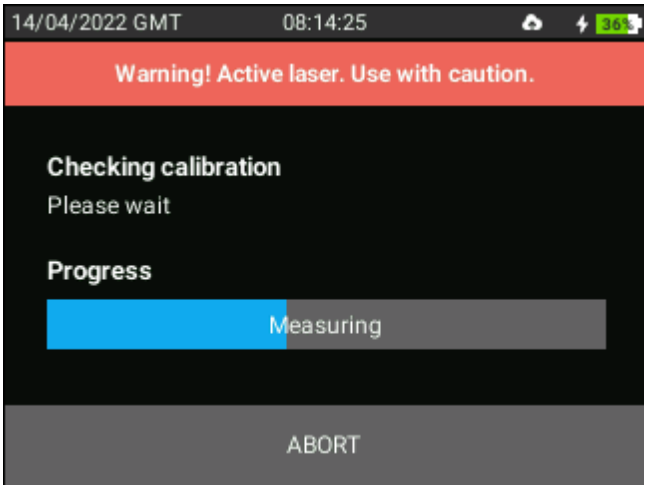
	Select **Scan** from the Main menu.

	Scroll down and select **Libraries.**
	You can select/ unselect the desired libraries by scrolling up/down and using OK button.
	After making all desired selection, you must scroll down and select **Done**. The update will be done automatically.

9.12. CALIBRATION CHECK

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 set the calibration validity from ChemDash (Devices, your device, System and then edit the Calibration Validity Time (h): field). You can set the expiration time to never, but we recommend having the instrument calibrated from time to time.

	Select **Scan** from the main menu.
	Select **Calibration Check**. A warning sign will appear next to the tab and also on the main screen letting the user know that the calibration expired.

	Prepare the calibration. **Put the calibration cap on!** To mount the calibration cap, simply snap it in position on the probe tip. Start the calibration by pressing OK when Start option selected.
	The calibration looks like any other scanning, the progress bar showing the advancement of the action.

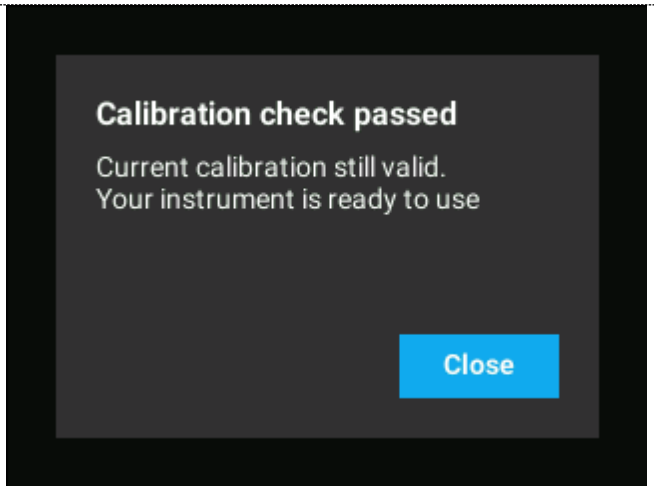
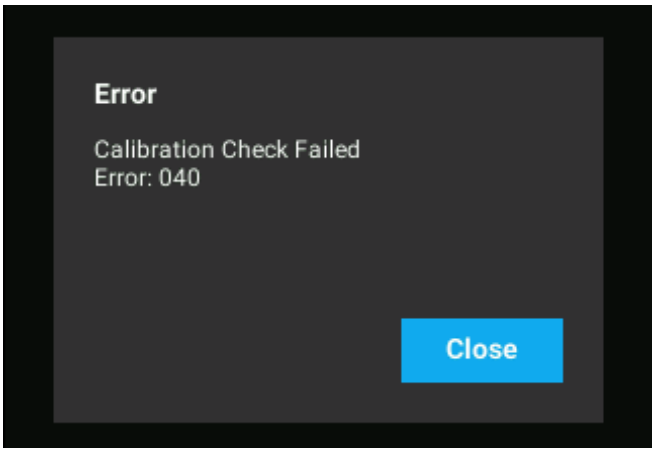
The result of the calibration control is shown in a pop-up message and can be as following:

- **Calibration check passed**

No changes are inferred.

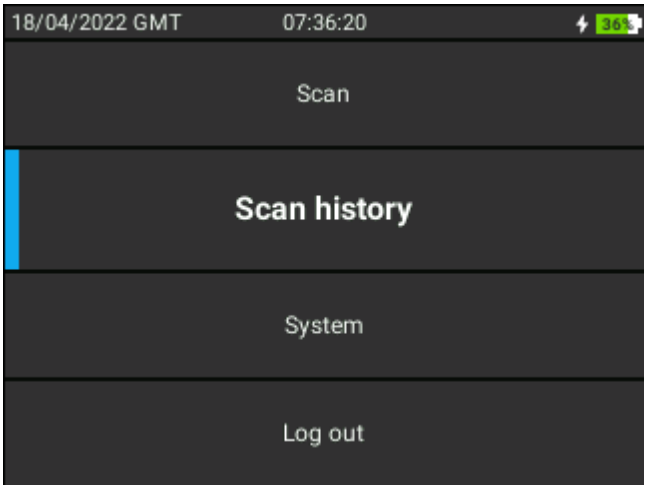
- **Processing failed. No match to the polystyrene was obtained**

Make sure that the Calibration cap is in position. It is important to have the cap placed firmly on the probe tip. Repeat the calibration procedure. Recurrent failure indicates instrument error.

	**Calibration Check Passed.** The instrument is ready to be used.
	**Calibration Check Failed.** The obtained values for the polystyrene spectrum are not within the acceptance criteria. Please reposition the calibration cap, make sure that the instrument is fully charged and rebooted and retake the process. If calibration still fails, please contact your local supplier.

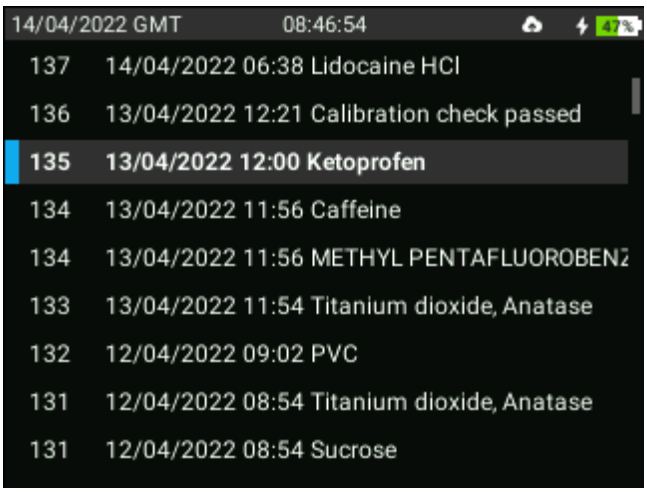
10. SCAN HISTORY

The **Scan history** function allows you to examine the history of the measurements made with the instrument.

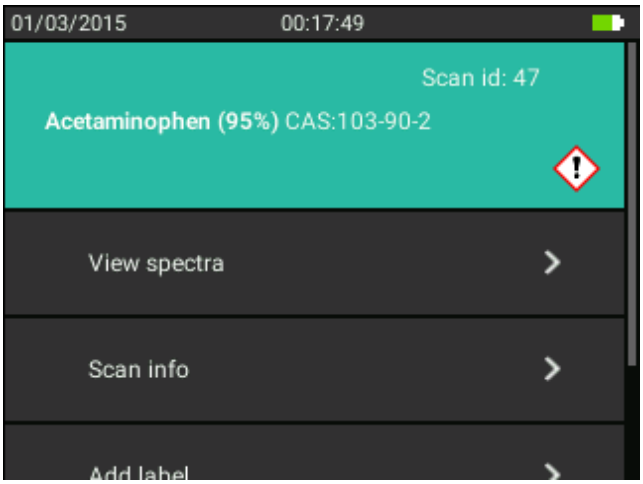


Select **Scan history** from the Main menu.

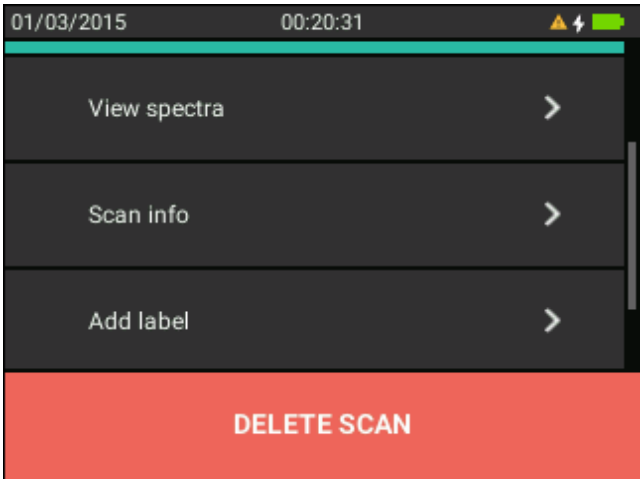
Scroll among the measurements you want to review. The measurements are grouped based on the date they were created.



Choose the specific measurement you want to review by scrolling up/down and using OK button.

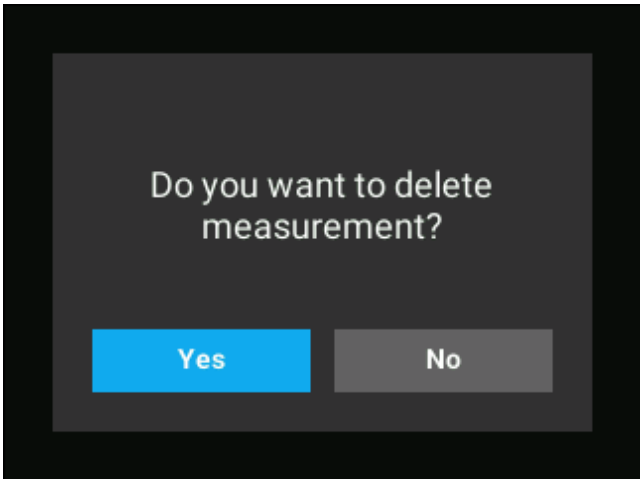


The details visible in a measurement are those from a scan result.



The user has the option to **delete** a certain **scan** by moving with the down arrow at the bottom of the screen. This will erase the measurement from the device database and will create a gap in the numbers of the scans.

N.B! This feature is only available for Lite and Pro license. In **Pro+** version, no measurement can be deleted.

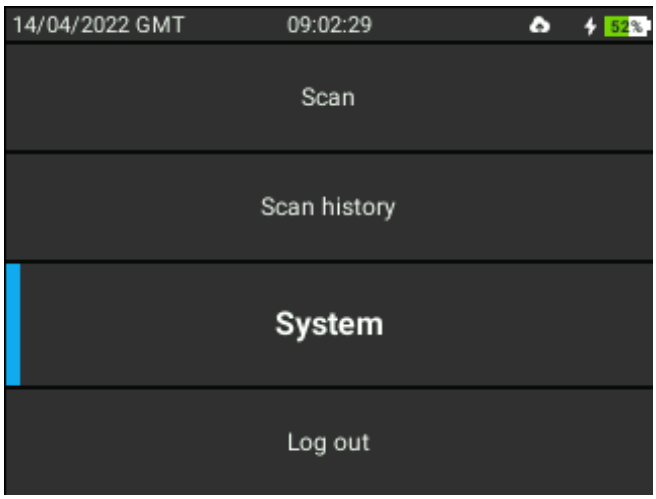
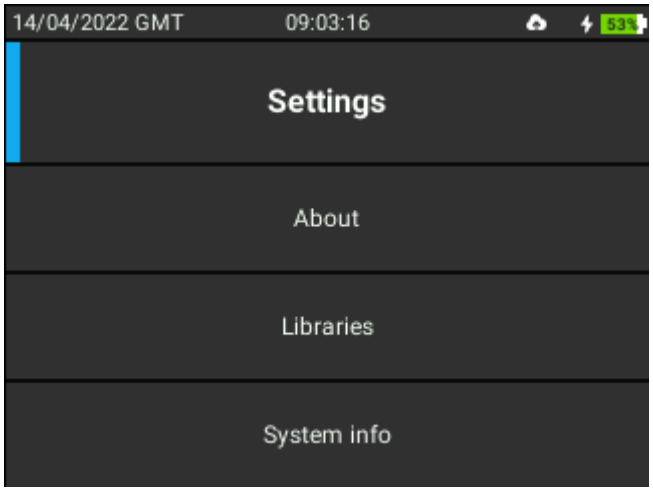


Yes button must be selected if the user wants to actually delete that specific scan. If this option is confirmed with the help of OK button, the measurement will disappear from the list.

11. SYSTEM

11.1. SETTINGS

11.2. USB MASS STORAGE

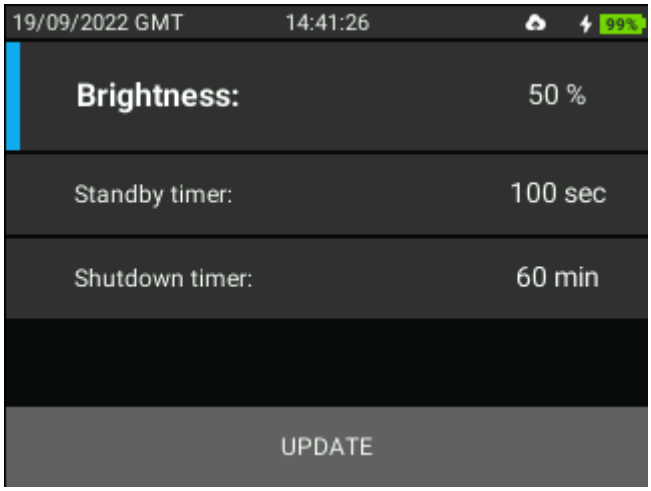
	Select **System** in the Main menu.
	Select **Settings** by using the Ok button.
	**USB mass storage** is the first option that can be activated in order to establish the connection via USB with the PC. You must select the option using the OK button and you will see the symbol activated.

11.3. WI-FI

Wi-Fi is the second option that can be activated from the Settings menu. This one is to be used in order to establish the connection with the PC via Wi-Fi. You must select it by using the OK button and the symbol will appear as activated.

11.4. LCD SETTINGS

LCD settings offers the possibility to adjust some of the screen properties according to the user's needs.



The settings that can be adjusted are :

Brightness – percentage;

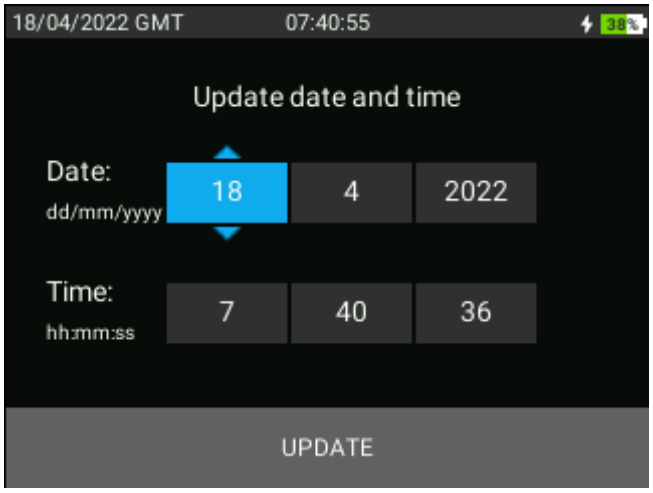
Standby timer – Time in seconds before the device enters sleep mode

Shutdown timer – Time in minutes before the device shuts down automatically.

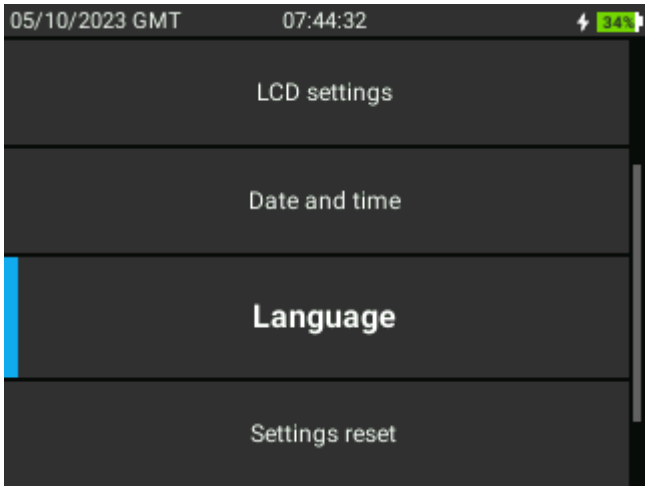
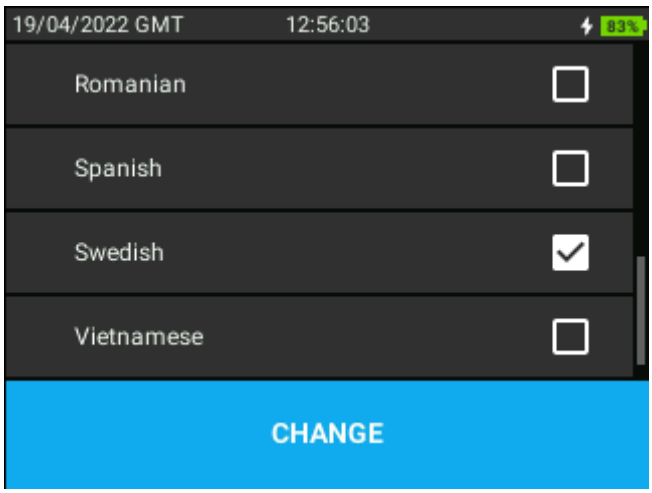
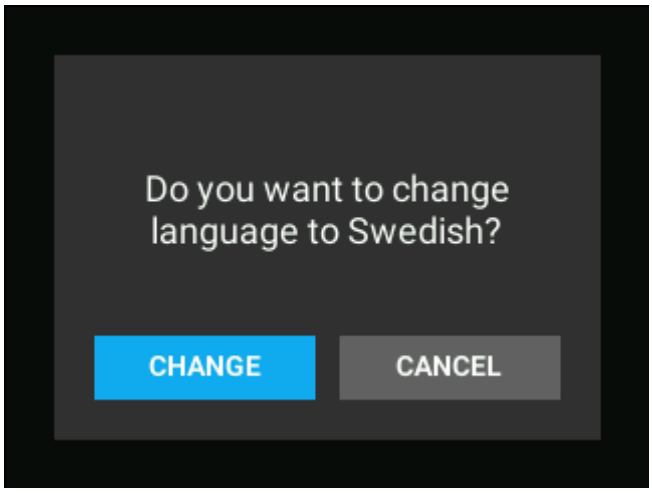
These settings can be arranged to

	improve the battery life.

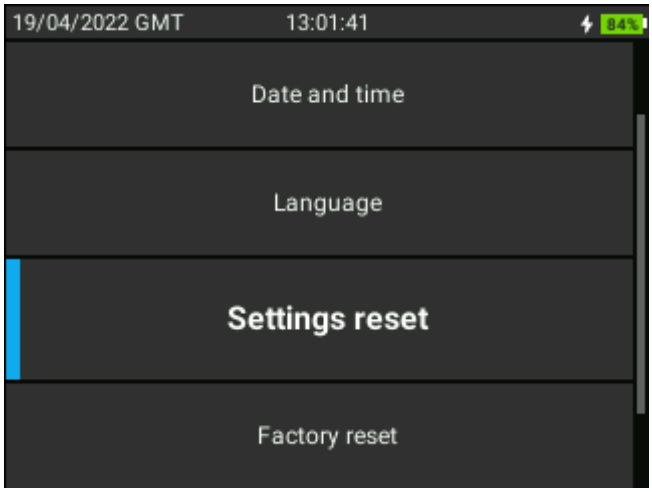
11.5. DATE AND TIME

	From this section, the user can modify the date and the time of the device; still, it is suggested that these details are configured from ChemDash using the Timesync function. N.B. This option is not available for the **Pro+** users because of audit purposes.
	All the fields can be modified using the Up/Down arrow and set by clicking **OK** button. After the correct setting is made, **UPDATE** button must be clicked.

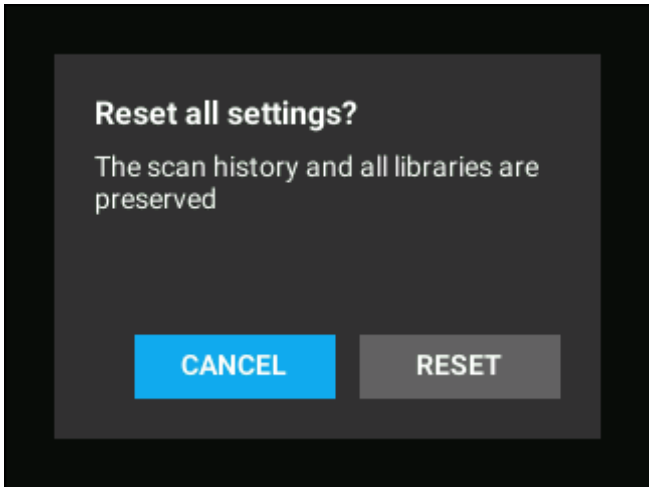
11.6. LANGUAGE

	This section allows the user to select the device language.
	The Up/Down arrow is to be used to scroll among the available languages and by pressing **OK** button, the language is selected. Then, the **CHANGE** button is pressed and the switch will be made.
	Another confirmation message will appear and the user must approve/not the change. The language will be changed immediately, without any restart of the device.

11.7. SETTINGS RESET

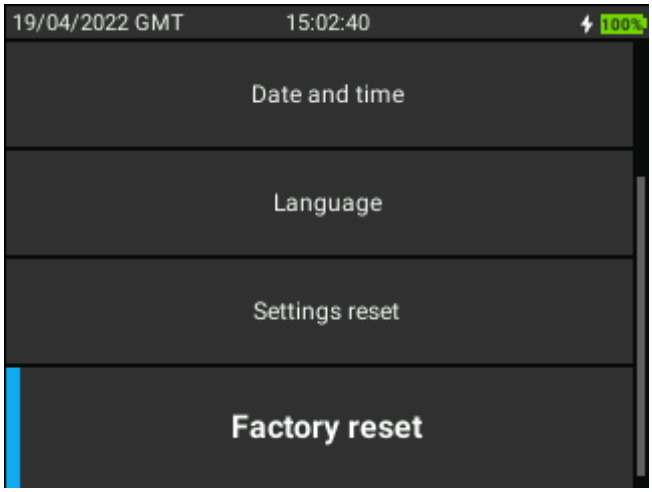


The **Settings reset** restores settings to default (Wi-Fi setup, users permissions, nominal battery capacity, etc.). It doesn't affect the scan history nor the libraries crested locally.

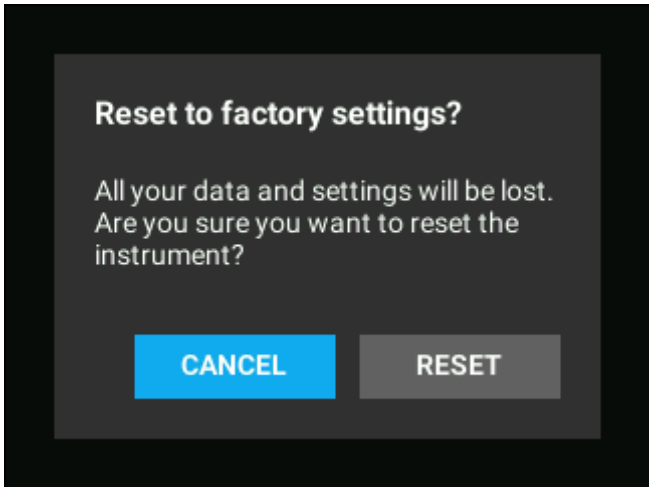


The user must confirm the choice by choosing RESET option. The instrument will restart.

11.8. FACTORY RESET



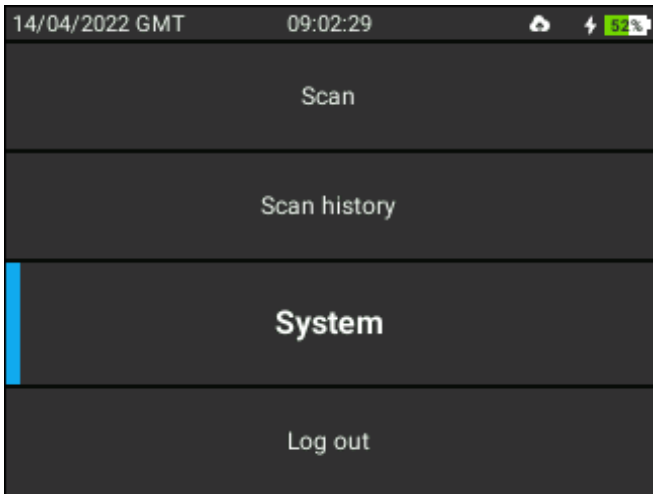
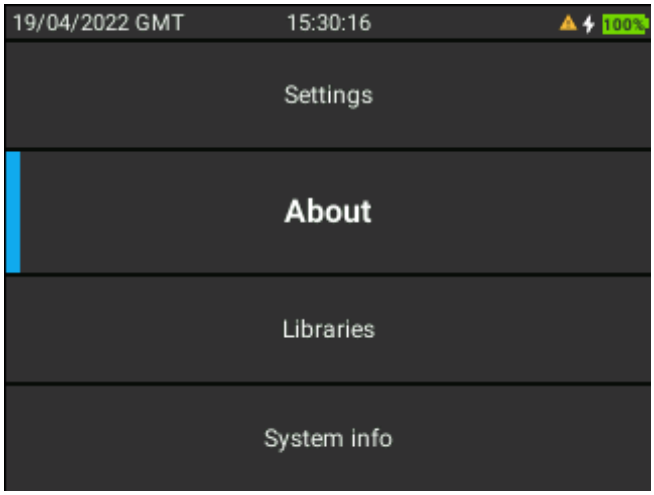
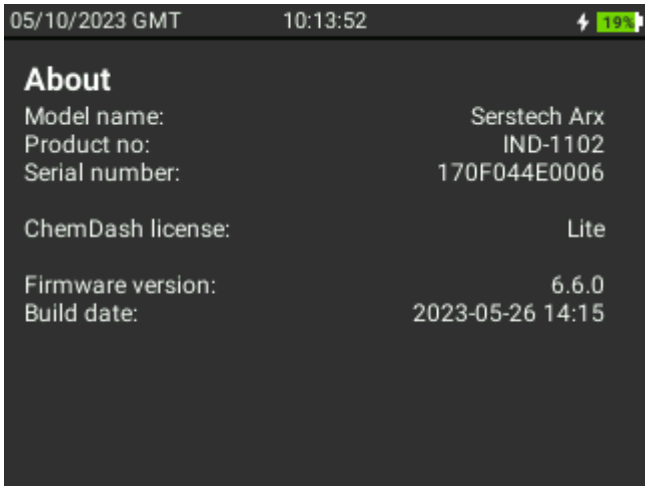
Factory reset will erase all settings and all measurements or libraries created on a certain device. It will bring the instrument at the stage it used to be when it was produced.



Another warning message will pop up announcing the user that all settings will be lost; the operation must be confirmed once more by clicking the **RESET** button.

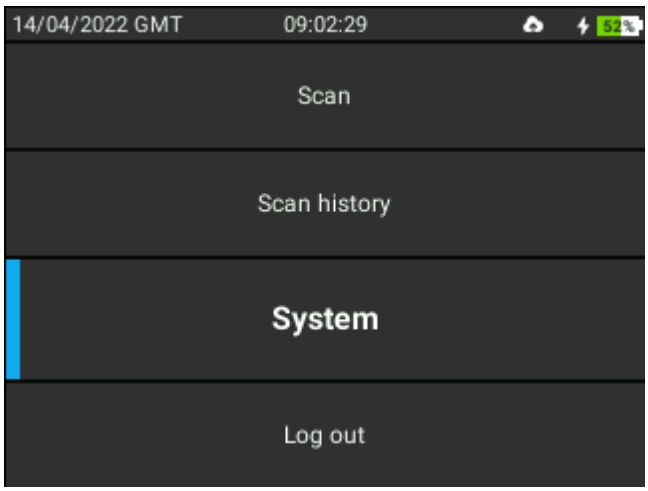
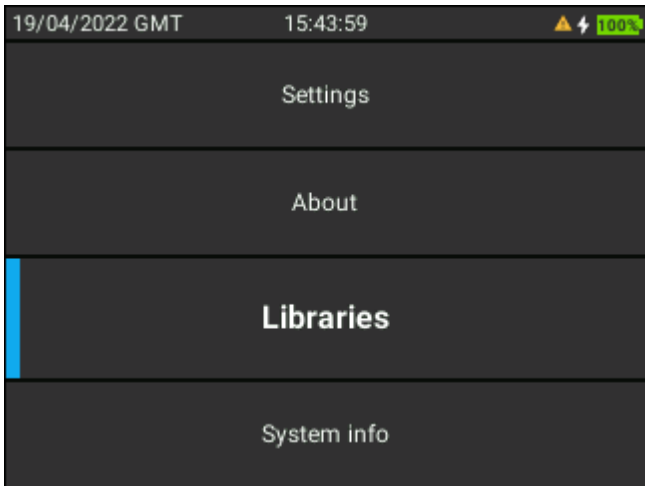
11.9. ABOUT

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

	Select **System** in the Main menu.
	Select **About**.
	The device settings for firmware and hardware are displayed. The license in this case is **Lite**. Scroll using to view the information on the instrument serial number, software and microcontroller firmware version.This information cannot be edited by the user.

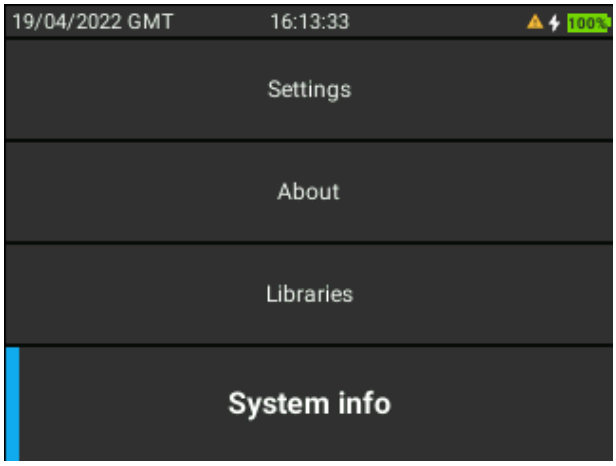
11.10. LIBRARIES

This is the section where the available libraries are displayed.

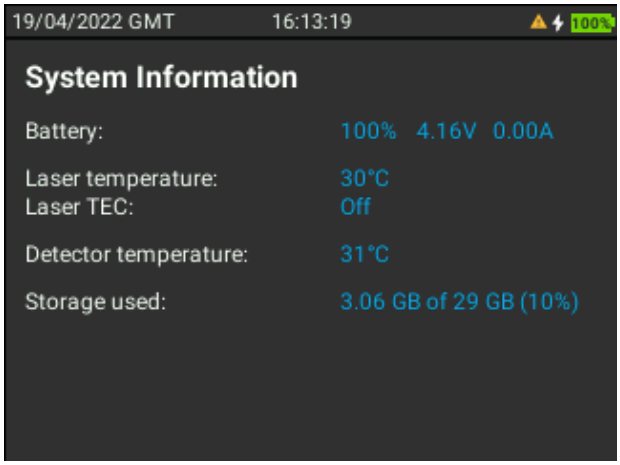
	Select **System** in the Main menu.
	Select **Libraries**.
	These are the available libraries on the device. The ones marked with **“Free”** are the one provided based on the license purchased and the ones created locally by the user. The ones marked with **“Licensed”** can be bought separately from Serstech.

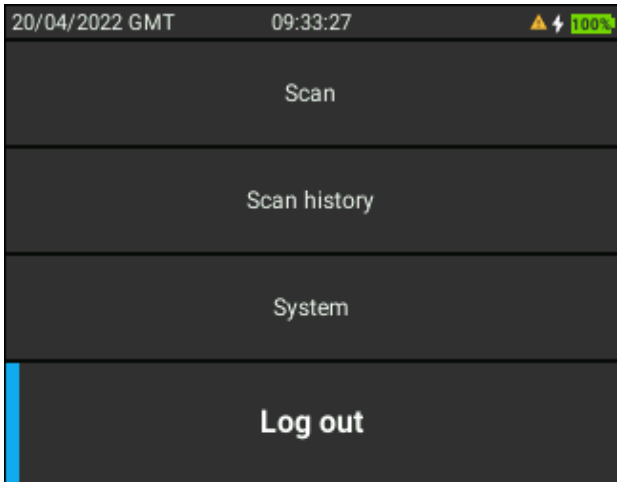
11.11. SYSTEM INFO

In this section you can see information related to the operating system.



Select **Settings** from the Main menu.





The available information is:

Battery – the percentage of the battery

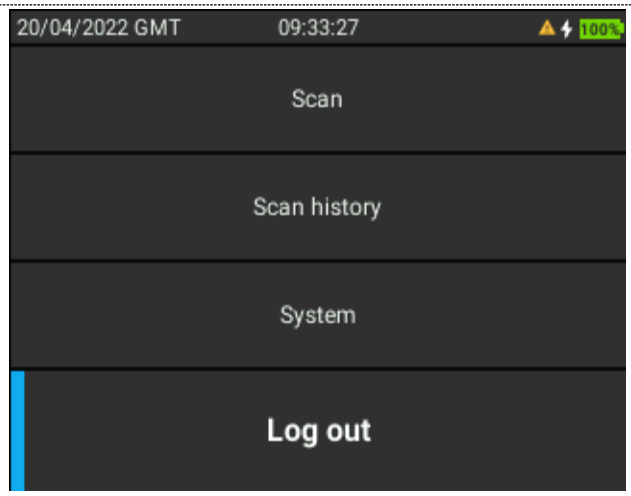
Laser temperature

Laser TEC

Detector temperature

Storage used

12. LOG OUT

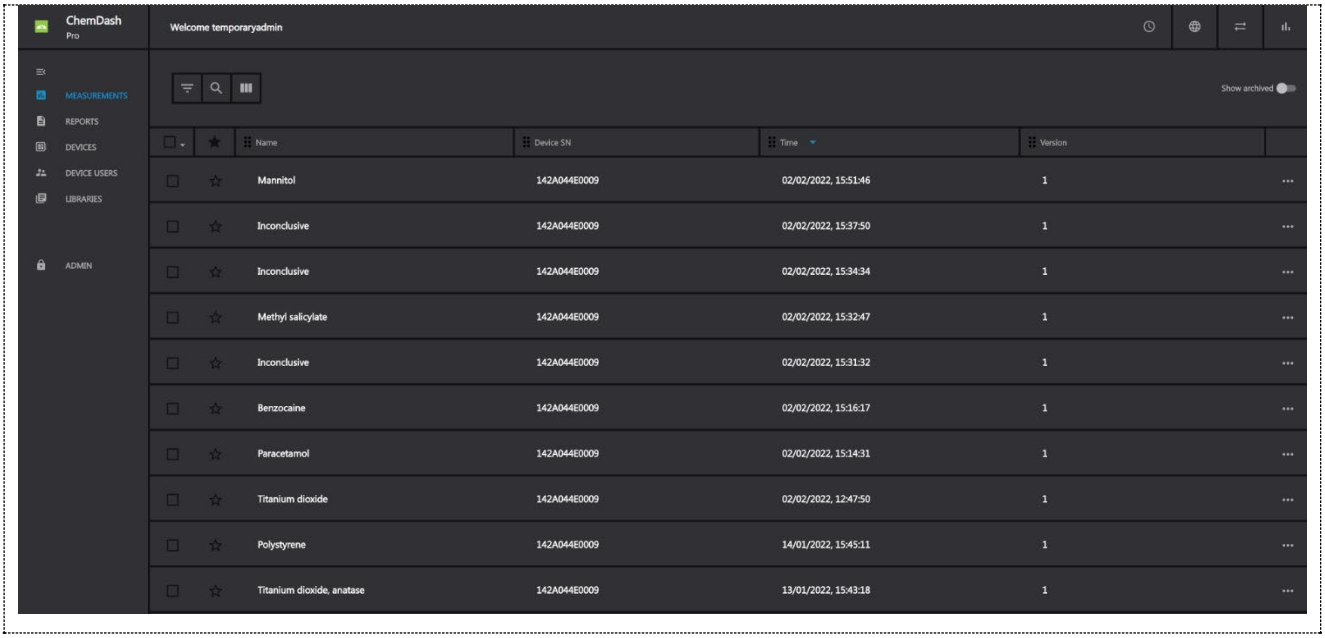


The **Log out** tab is logging the user out of the device. If the user clicks on it when selected, he/she will be taken back to the first Log in screen.

13. CHEMDASH

ChemDash is a software developed by SERSTECH. The ChemDash system will integrate with the Arx mkII spectrometers towards a powerful solution for Chemical Intelligence. ChemDash 2.0 is the perfect tool for managing 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 consists 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

14. LEGAL INFORMATION

14.1. 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.

14.2. TRADEMARK ACKNOWLEDGMENTS

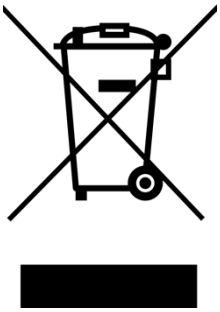
SERSTECH is a trademark of SERSTECH AB. All other company names and products are trademarks or registered trademarks of their respective companies. Ethernet, Internet Explorer, Linux, Microsoft, Mozilla, UNIX, Windows and WWW are registered trademarks of the respective holders. Java and all Java-based 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.

14.3. 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.

15. ADDITIONAL INFORMATION AND SUPPORT

15.1. DISPOSAL AND RECYCLING (EUROPE)



This symbol means that the product shall not be disposed of together with household or commercial waste. Directive 2012/19/ EU on waste electrical and electronic equipment (WEEE) is applicable in the European Union member states. To prevent potential harm to human health and the environment, the product must be disposed of in an approved and environmentally safe recycling process. For information about your nearest designated collection point, contact your local authority responsible for waste disposal. Businesses should contact the product supplier for information about how to dispose of this product correctly.

15.2. SUPPORT

For technical assistance, please contact your SERSTECH reseller. If your questions cannot be answered immediately, the reseller will forward your queries to ensure a rapid response. For more information, please visit our Support or check our FAQ page: www.serstech.com/support

16. TECHNICAL SPECIFICATIONS

Instrument type	Handheld Raman spectrometer
Weight	590 g (1.3 lb)
Size	160 mm x 85 mm x 28 mm (6.2 x 3.3 x 1.1)
Supply voltage (to PSU)	90-264 VAC, 47-63 Hz (for battery charging with following adapter)
Supply voltage USB-C Port	5VDC
Laser excitation wavelength	785nm
Laser output power	Max 300mW, user adjustable
Spectral resolution	8-10 cm^{-1}
Detector type	Linear CMOS
Connectivity	USB-C, Wi-Fi (2.4 GHz) Bluetooth ® 5.1
Operating	For indoor and outdoor usage. ≤ 2000 m above sea level
Operating temperature	-20°C to +50°C (-4°F to 122°F)
Storage temperature	-30°C to +50°C (-22°F to 122°F)
Relative humidity	5-90%
Pollution degree	PD2
Overvoltage category	Category 2
Laser for measurement	Class 3B
Laser for Barcode scanner	Class2

17. Contact Information

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