
# Ultrospec 35c Colorimeter

## USER MANUAL

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# Contents

# Release Notes

| Date | Revision number | List of changes |
|---|---|---|
| 06 NOV 2023 | 1 | Initial release |
| 18 DEC 2023 | 2 | Correction of the photometric range in the technical specifications section. Addition of “out of range” displays for values above or below the photometric range. |

# Welcome

Congratulations on joining the community of users worldwide who rely on Harvard Bioscience products to advance Life Science. Thank you for your interest in our products. We are committed to providing you with quality products and services.

This manual will help you get to know your Biochrom Ultrospec 35c Colorimeter. The structure of the manual was designed to sequentially guide you through setting up your product in an optimal way.

# Essential Safety Notes

This section describes potential hazards which may exist in the operation of these units. Several warning labels and symbols are affixed to your instrument. These symbols are used to inform you of potential dangers which may exist or where caution is required. Before installing your new unit, please take time to familiarise yourself with these warnings and symbols.

**THE PROTECTION GIVEN BY THE EQUIPMENT MAY BE IMPAIRED IF USED IN A MANNER NOT SPECIFIED BY THE MANUFACTURER.**

## Environmental Conditions

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|---|---|
| **Operating Temperature** | 4°C to 40°C (40°F to 104°F) |
| **Storage Temperature** | -10°C to 70°C (14°F to 158°F) |
| **Operating Humidity** | 20% to 80% RH, non-condensing |
| **Storage Humidity** | 20% to 80% RH, non-condensing |
| **Altitude** | 2000 m |
| **Method of Operation** | Continuous |
| **Classification** | Class II |
| **Pollution Degree** | 2 |
| **Overvoltage Category** | II |
| **Mains supply voltage fluctuation** | ±10% |
| **Regulatory Certifications** | CE, ETL (US/CAN), WEEE, EU RoHS, CB Scheme |

## Hazards and Warnings

This instrument is subject to the following identified hazards:

Biohazard

There are no biohazardous materials within the unit, however, this unit may be exposed to biohazardous samples during normal laboratory use. To protect users against these hazards we recommend the following decontamination procedures:

- Wipe the exterior casework with disinfectant cleaning wipes.
- Remove cuvettes and cuvette holders.
    - Wash with disinfectant appropriate for the biohazard in question.
    - Rinse with distilled water.
    - Allow to dry thoroughly before reuse.

To further reduce the possibility of biohazards:

- Include an appropriate decontamination certificate for equipment returned for repair.
- Ensure that the operator of the equipment is provided with a safe working environment.
- Use, store and dispose of any chemicals in accordance with manufacturer's guidelines and local safety regulations.
- Provide suitable ventilation when working with volatile solvents or toxic substances.
- Dispose of solvents and chemicals that may be classed as hazardous waste in accordance with local regulatory practice.
- Determine if personal protective equipment (PPE) is required for handling laboratory samples.

| | |
|---|---|
|  Caution | Make Proper Connections. Make sure all connections are made properly and securely. Any signal wire connections to the unit must be no longer than three meters. |
|  | Avoid Exposed Circuitry. Do not touch any electronic circuitry inside of the product. |
|  | Orient the Equipment Properly. Do not orient the equipment so that is difficult to manage the disconnection device. |
|  | Observe all Warning Labels on Product. Read all labels on product to ensure proper usage. |
|  | The unit can be connected to a PC. To preserve the integrity of the measuring equipment it is essential that the attached PC itself conforms to basic safety and EMC standards and is set up in accordance with the manufacturers' instructions. If in doubt, consult the information that came with your PC.<br><br>The following safety precautions should be observed when operating a PC:<br>• To reduce the chance of eye strain, set up the PC display with the correct viewing position, free from glare and with appropriate brightness and contrast settings.<br>• To reduce the chance of cross contamination from biological samples, use appropriate personnel protection measures and disinfectant wipes on keyboard and mouse. |
|  | In the event of contamination, malfunction or hazard occurring, the operator should disconnect the unit, by removing the power cord, and isolate for decontamination and/or repair. |

If there are any questions about the operation of this instrument, call Harvard Bioscience Technical Support at: +1 508 893 8999 (USA number), or +44 1223 423 723 (UK number) or visit: https://support.biochrom.co.uk

## Safety Notes Related to Li-Ion Batteries

Your device contains a rechargeable Li-Ion battery. Lithium-Ion rechargeable batteries require routine maintenance and care in their use and handling.

**Please read and follow the guidelines below to safely use Lithium-Ion batteries.**

*Overview*

Do not leave batteries unused for extended periods of time, either in the product or in storage. When a battery has been unused for 6 months, check the charge status and charge or dispose of the battery as appropriate.

Lithium-Ion batteries continue to slowly discharge (self-discharge) when not in use or while in storage. Routinely check the battery's charge status. This product user manual includes information on how to check battery status, as well as battery charging instructions. See sections below: Battery Maintenance and Charging.

Use only Biochrom approved batteries in your Biochrom products.

### *Battery Maintenance*

Observe and note the run time that a new fully-charged battery provides for powering your product. Use this new battery run time as a basis to compare run times for older batteries. The runtime of your battery will vary depending on the product's configuration and the applications that you run.

Routinely check the battery's charge status.

Carefully monitor batteries that are approaching the end of their estimated life.

Consider replacing the battery with a new one if you note either of the following conditions:

- The battery run time drops below about 80% of the original run time.
- The battery charge time increases significantly.

If a battery is stored or otherwise unused for an extended period, be sure to follow the storage instructions in this document. If you do not follow the instructions, and the battery has no charge remaining when you check it, consider it to be damaged. Do not attempt to recharge it or to use it. Replace it with a new battery.

### *Charging*

Please connect the instrument to a power outlet using the USB-C cable and charger provided in order to charge the internal battery. Leave the device plugged in for approx. 6 hours in order to fully charge the battery. For best performance, it is recommended to charge the battery regularly using the USB charger provided. The level of battery charge is indicated by the battery icon located on the top right corner of the screen.

### *Storage*

Charge or discharge the battery to approximately 50% of capacity before storage.

Charge the battery to approximately 50% of capacity at least once every six months.

Remove the battery and store it separately from the product.

Store the battery at temperatures between 5 °C and 20 °C (41 °F and 68 °F).

### *Handling Precautions*

Do not disassemble, crush, or puncture a battery.

Do not short the external contacts on a battery.

Do not dispose of a battery in fire or water.

Do not expose a battery to temperatures above 60 °C (140 °F).

Keep the battery away from children.

Avoid exposing the battery to excessive shock or vibration.

Do not use a damaged battery.

If a battery pack has leaking fluids, do not touch any fluids. Dispose of a leaking battery pack (see Disposal and Recycling in this document).

In case of eye contact with fluid, do not rub eyes. Immediately flush eyes thoroughly with water for at least 15 minutes, lifting upper and lower lids, until no evidence of the fluid remains. Seek medical attention.

### *Transportation*

Always check all applicable local, national, and international regulations before transporting a Lithium-Ion battery.

Transporting an end-of-life, damaged, or recalled battery may, in certain cases, be specifically limited or prohibited.

**When it is determined that the Ultrospec 30 Cell Density Meter needs to be returned to Harvard Bioscience, regardless of whether the battery is damaged or defective, the battery MUST be removed from the device prior to shipping the instrument. DO NOT return the battery to Harvard Bioscience. Store the battery in a safe place, in accordance with the Storage guidance described above.**

*Disposal and Recycling*

Lithium-Ion batteries are subject to disposal and recycling regulations that vary by country and region. Always check and follow your applicable regulations before disposing of any battery.

Many countries prohibit the disposal of waste electronic equipment in standard waste receptacles.

## Caution Notice

The Biochrom Ultrospec 35c Colorimeter is intended for laboratory use only and can be used in research and development applications. These systems have been designed to meet the standards for electromagnetic compatibility (EMC) intended for laboratory equipment applications as well as the applicable safety requirements for electrical equipment for measurement, control, and laboratory use. The unit itself does not generate waste but may be used to treat samples that are hazardous. Please use appropriate PPE and ensure disposal in accordance with local regulations and practices.

## Cleaning and General Care

The instrument has no serviceable parts.

*Cleaning*

The instrument requires little maintenance, but the following are considered good practice:

- Keep the instrument clean and dry. Wipe off any spilt liquids immediately. Clean with a slightly damp cloth; a non-abrasive water-based soap or detergent may be used. The instrument may be wiped.
- Remove the cuvettes from the instrument when not in use.
- Store in a cool place away from corrosive chemicals or fumes.

*Decontamination Procedure*

To decontaminate we recommend that the instrument is wiped with ethanol or other antibacterial detergent as required. A soaked cloth may be inserted into the cuvette chamber or ethanol sprayed directly into the compartment.

# Warranty and Repair

## Warranty Policy

Biochrom warrants these instruments for a period of **twelve (12) months** from the date of purchase. Where appropriate, Biochrom will repair or replace the unit for defects of workmanship or materials. This warranty does not extend to damage resulting from misuse, neglect, or abuse, normal wear and tear, or accidental damage. This warranty extends only to the original purchaser.

Products failing within the first 30 days of end user operation are considered dead on arrival (DOA) and where appropriate a replacement will be given if a repair is not possible. In the instance of a DOA Biochrom will incur the return shipping charges.

**IN NO EVENT SHALL BIOCHROM BE LIABLE FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES.** Some states do not allow the exclusion or limitation of incidental or consequential damages so the above limitation to exclusion may not apply to you. **THERE ARE NO IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR USE, OR OF ANY OTHER NATURE.** Some states do not allow this limitation on an implied warranty, so the above limitation may not apply to you.

## Returns and Repairs

If any defect arises within or outside the warranty period, please contact:

| | |
|---|---|
| **US Office Technical Support** | |
| Email | support@biochrom.co.uk |
| Online Returns form | https://support.biochrom.co.uk/hc/en-us/requests/new?ticket_form_id=1500000731442 |
| Telephone (Toll Free) | +1 800 272 2775 |
| Telephone (Outside the US) | +1 508 893 8999 |
| Address | 84 October Hill Road<br>Holliston MA 01746<br>USA |
| **UK Office Technical Support** | |
| Email | support@biochrom.co.uk |
| Online Returns form | https://support.biochrom.co.uk/hc/en-us/requests/new?ticket_form_id=1500000731442 |
| Telephone | +44 (0) 1223 423 723 |
| Address | Unit 7, Enterprise Zone<br>3970 Cambridge Research Park<br>Beach Drive, Waterbeach<br>Cambridge, United Kingdom<br>CB25 9PE |

**Goods will not be accepted for return unless an RMA (Return Materials Authorization) number has been issued. The unit must be returned only once the online RMA form has been completed and submitted, and an RMA number has been issued. The customer is responsible for shipping charges unless the failure is within 30 days of receiving the goods. Please allow a reasonable amount of time for completion of repairs or replacement.**

**IMPORTANT SAFETY NOTE:**

**THE LI-ION BATTERY MUST BE REMOVED FROM THE INSTRUMENT PRIOR TO SHIP THE INSTRUMENT BACK TO BIOCHROM FOR REPAIRS, REGARDLESS OF WHETHER IT IS DEFECTIVE OR NOT.**

**DO NOT RETURN THE LI-ION BATTERY TO HARVARD BIOSCIENCE**

# Instrument Overview

## General Layout


1: Sample cell compartment

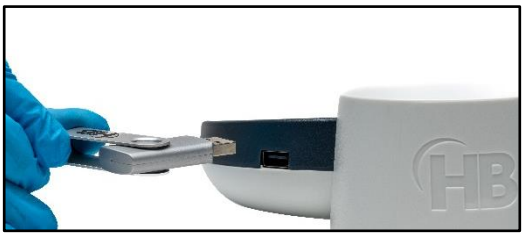
2 Colour touchscreen

## Touchscreen Display

The instrument has a 480x272-pixel resolution backlit LCD colour display with touch panel for navigating the instrument's built-in firmware.

## Instrument Connections

USB-C port for connecting to PC/laptop and charging the device, using the USB-C cable supplied.



USB-A port for connecting a USB flash drive

## Instrument Data Output

Measurement data can be exported to a USB flash drive via the USB A socket on the side of the instrument, as a comma-separated value (.csv). Data can also be exported to a PC/laptop via a web interface, using the USB cable provided.

## Principle and Intended Use

The Ultrospec 35c Colorimeter is a small, robust, easy to use laboratory instrument designed for measuring the absorbance/transmission of liquid samples in either a cuvette or test tube at fixed wavelengths.

It has been designed with both the student user and “field” user in mind. It is ideal for teaching the principles of science and analysis, as well as being rugged enough for measurements in, for example, Industry or remote locations where simple colorimetric tests need to be made.

The instrument measures in absorbance and % transmission mode as well as in simple kinetics, enabling changes in absorbance over time and reaction rates to be determined. The user-selectable wavelengths are: 450, 500, 520, 540, 600 and 640 nm.

The wavelength is selected by accessing the user interface via the on-board touchscreen display located below the cell compartment.

The instrument produces wavelength-specific light via an LED array that is directed through the reference and sample solutions in turn to a detector. This colour is normally chosen to be complimentary (that which is most absorbed) to the test solution. The amount of energy passing through the reference is deemed equivalent to 100% transmission and is compared with that through the absorbing sample, measured as T% (normally 0< T< 100).

Successful measurement of concentration is dependent on arranging the chemistry and conditions to get the best agreement with the Beer/Lambert Law. To make full use of the instrument’s excellent performance, it is recommended to arrange the chemistry and dilutions to give Absorbance readings in the range 0.2 - 1.2A. Below 0.2A the relative concentration accuracy is reduced, whilst Absorbance readings above 1.2A imply concentrations of high molar strength that do not obey Beer/Lambert's Law so well. In addition, small photometric errors become increasingly important, and the effect of stray light will increase.

If it is not possible to stay within these bounds it may be desirable to make calibration curves for known concentrations and their measured Absorbances. As colorimeter measurements are comparative it is essential that only the solutions themselves change. This product contains fully stabilised light source and electronics with a fixed light path.

Always use this instrument on a flat surface or held horizontally. Failure to do this may result in stray light affecting the results

The instrument has a USB-C type port that can be used to link it to a wall socket 5V adapter or a PC/laptop for charging the battery. This port can also be used to transfer data onto the PC/laptop.

It also has USB-A type port that allows connecting a USB memory stick for saving the data.

## Technical Specifications

| | |
|---|---|
| **Wavelength range (nm)** | 450 to 640nm |
| **Beam Height** | 11mm (measured from bottom of cuvette) |
| **LED array (nm)** | 450, 500, 520, 540, 600, 640 |
| **Bandwidth (nm)** | 40 nm |
| **Range** | Absorbance: 0 to 2.5 A |
| **Accuracy** | <±0.05A at 1A using neutral Density Filter and flat-edge cuvette |
| **Repeatability** | ±0.02A at 1A in 10mm cuvette |
| **Operation Modes** | Absorbance, Transmission, Kinetics |
| **Cuvette Holder** | Accepts 10mm pathlength semi micro and macro cuvettes - or- 16mm round test tubes.<br>Can accept 10-12mm tubes with optional adapter |
| **Output Connector: USB-A** | Interface for memory device |
| **Power Connector: USB-C** | Input power at 5V, 2 A max |
| **Power (via charger)** | USB charger specifications:<br>100-240V, 50/60Hz, 10 W |
| **Battery** | Internal rechargeable Li-Ion battery |
| **Dimensions (mm)** | 170mm W x 210 D x 50 mm H |
| **Weight (kg)** | 0.6 kg (1.3 lbs) |

# Installation

## Unpacking and Contents List

The following items and quantities are supplied as standard with the Ultrospec 35c. Please check this contents list against the actual content in the box. If any discrepancies are found, please contact Biochrom or your local dealer.


| Item Description | Quantity |
|---|---|
| Ultrospec 35c Colorimeter | 1 |
| Battery Pack (inside the unit) | 1 |
| Pack of 8 disposable cuvettes | 1 |
| USB Charger with pack of plug adapters (UK, EU, USA, China/AUS) | 1 |
| USB-C Cable | 1 |
| Quick Start Guide | 1 |

If this equipment is used in a manner not specified or in environmental conditions not appropriate for safe operation, the protection provided by the equipment may be impaired and instrument warranty withdrawn.

## Positioning

Ensure your proposed installation site conforms to the environmental conditions for safe operation. Please refer to the information stated in paragraph **Environmental Conditions**

- The instrument must be placed on a stable, level bench or table capable of supporting its weight allowing sufficient space around the instrument for air to circulate freely.
- Locate the instrument in an atmosphere free from dust and corrosive fumes. Use the dust cover to further protect the instrument when not in use.

## Installing

- If the instrument has been stored in a cold environment, then it should be allowed to come to room temperature before turning it on to avoid compromising the optical system.
- The instrument can be powered by either the internal rechargeable battery or by the mains.
- The battery will last approx. 8 hours when fully charged with normal use. A full battery recharge will take approx. 6 hours (overnight).
- The instrument can be operated either on battery or plugged in to a mains power outlet via the USB-C charger.

## First Time Use and Initial Setup

To power up the unit first time after unpacking, please connect the instrument to a power outlet using the USB-C cable and charger provided.

Once plugged in, the unit will automatically start and show the Start Up screen after a few seconds:


Start-up screen

Following the Start Up screen,

1. Select your preferred language. The unit will briefly reboot.
2. Select the clock format (12h/24h), set the time, date, and date format.

The unit will then show the main measurement page as below.


Home screen

## Power ON/OFF

There is no physical ON/OFF button on this unit. Once the initial startup routine has been completed as described above, the unit will automatically go on standby mode after the predefined sleep time has elapsed. To wake up the unit, simply touch the screen.

If the battery is depleted, plug in the unit to a power outlet as described in the section above. This will reboot the unit.

# Instrument Operations

The instrument firmware uses an intuitive menu arrangement that is navigated using the colour touchscreen.

## Home screen


Home screen

On the Home screen, the following information is displayed:

| | |
|---|---|
|  | Current wavelength being selected |
|  | Current time and date |
|  | Battery charge status. When the unit is plugged in and charging, a lightning is displayed near the battery icon. |
|  | Results folder |
|  | Settings |
|  | Return to previous screen (inactive) |
|  | Return to previous screen (active) |
|  | Absorbance/Transmittance readings. Press the unit symbol to toggle between Absorbance units (Abs) and Transmittance (%T) |
|  | Reference button. Press to zero the colorimeter and set reference to 0.00 Abs. The reference should be done on a blank solution, free from the substance that needs measuring, contained in the same type of cuvette that is used to measure the samples. |

| | |
|---|---|
|  | Sample measurement button. Press to start measuring the absorbance/transmittance of the sample at the selected wavelength. This button becomes active once a reference has been done. |
|  | Kinetics measurement button. Press to start kinetics measurement on the sample. This button becomes active once a reference has been done |

## Setting up the wavelength

From the Home screen, press the wavelength symbol **λ** on the top left corner to access the wavelength selection.


Press the left  or right  arrows until the desired wavelength has been reached.

Confirm the selection by pressing the  icon.

The Home screen is then displayed, showing the selected wavelength on the top left corner.

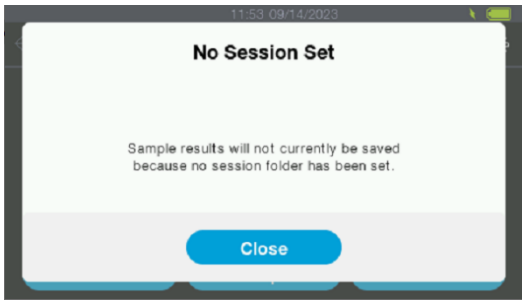
## Performing an Absorbance or Transmittance measurement

1. Wake up the instrument by touching the screen.


2. Select the required wavelength as described in the paragraph **Setting up the wavelength**


3. Select Abs or %T mode by pressing the unit symbol


4. Place a reference into the cuvette compartment and press the “Reference” button




5. An advisory message will come up to notify the user no session folders have been set. Therefore, the results will not be automatically saved in the device. Close the message to continue to the measurement page. If you wish to save your measurements, a session folder needs to be created and selected before taking a measurement (See section **Creating a New Session Folder**). Otherwise proceed to next step. This message will only display once and will not be displayed again until the device has either entered sleep mode or restarted.


6. The display will show the "Ref" message to indicate the unit has been zeroed.

7. Remove the reference sample and replace with the sample solution in a cuvette


8. Press the Sample button.


9. The result is displayed in absorbance or %Transmittance units.



10. If the measurement obtained is outside of the acceptable range of 0 to 2.5A, the unit will display in orange the following: <0.0A if the value is below 0A or >2.6A if the value is above 2.6A.

Multiple samples can be compared with the same reference by placing different samples in the cuvette holder and making measurements for each one by pressing the “sample” button.

It is recommended to re-reference with the reference solution every 10 to 15 minutes to avoid any slow instrument drift. If in doubt, always re-reference prior to a sample measurement.

## Making a Kinetics Measurement

The kinetics mode provides a continuous readout of changes in absorbance of a sample.


1. Select the required wavelength as described in the paragraph **Setting up the wavelength**


2. Select Abs or %T mode by pressing the unit symbol

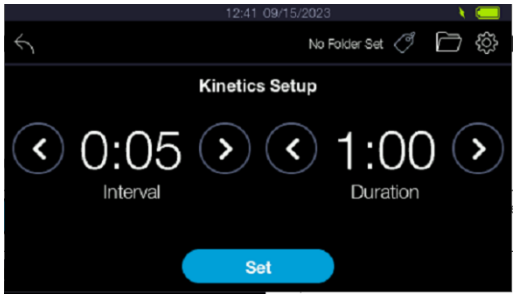

3. Place a reference into the cuvette compartment and press the “Reference” button


4. The display will show the “Ref” message to indicate the unit has been zeroed.

5. Remove the reference sample and replace with the sample solution in a cuvette


6. Press the Kinetics button.

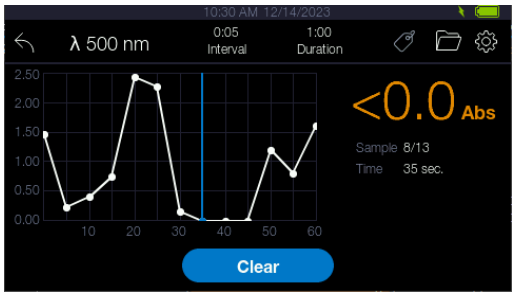

7. Press “Interval” or “Duration” on the top of the screen to set the time between measurements and the total duration of the assay.

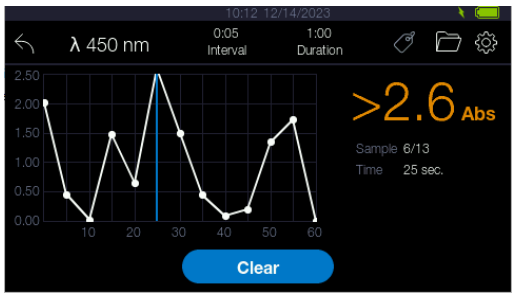



8. Set the Duration by scrolling left or right
9. Set the time interval between measurements
10. Press the **Set** button to save the settings.

11. Press Start to begin the measurements. The instrument will perform the number of measurements at the set intervals


12. After all the measurements are done, the graph will be displayed, showing each data points. Click on the data points to display the Absorbance or T% value associated to it, as well as the time stamp.
13. Press Clear to reset the display and re-do a new set of kinetics measurements



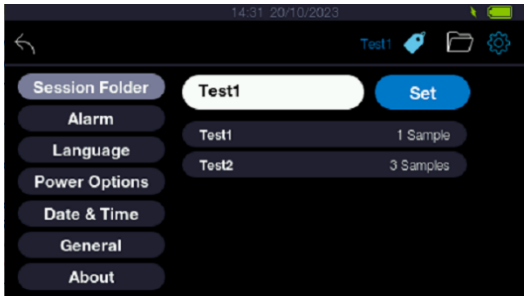




14. If the measured values from the sample fall outside of the photometric range, the absorbance value will report in orange colour either <0.0A if the measurement is below 0A or >2.6A if the measurement is above 2.6A

## Settings

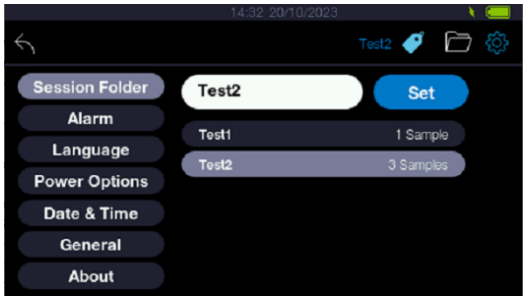
To access the instrument's settings page, press the cog icon on the top right corner of the display:

*Session Folder*

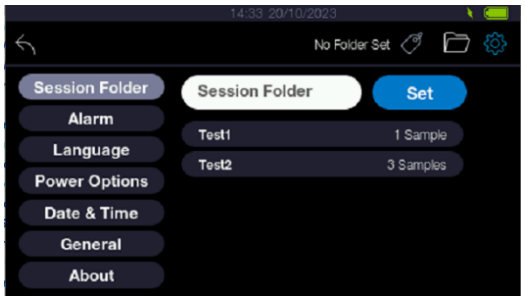



1. This section allows the user to create new folders or select existing folders that will be used to store sample results.
2. To create a new folder, enter the folder name in the white box and then press "Set." This will become the active folder where measurements will be saved


3. The number of measurements saved in each folder is indicated on the right-hand side of the folder name.

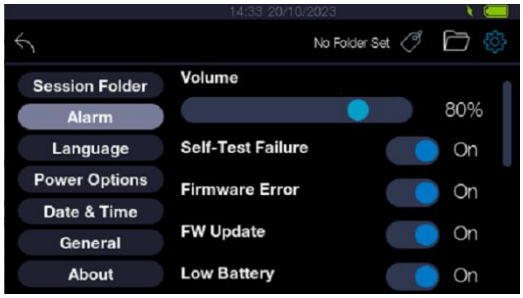



4. To use an existing folder to save data, highlight the folder and press "Set." In this example, "test2" becomes the active folder and is displayed next to the blue tag. All subsequent measurements will be saved in this folder.




5. If you do not wish to save measurements, delete the folder name in the white box and press "Set." "No Folder Set" will be indicated near the tag icon to indicate that subsequent measurements will not be saved.

*Alarm*



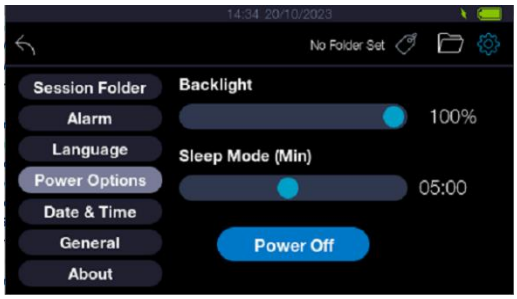

1. This section allows the user to enable/disable various alarms on the unit. Toggle the alarm ON or OFF according to your preference for each of the features displayed.


2. Use the slider to adjust the volume of the audible alarm between 0% (no audible signal) to 100%.

*Language*


1. This section allows the user to select the language displayed by the unit. Currently, English and Chinese (Mandarin) are supported.

*Power Options*

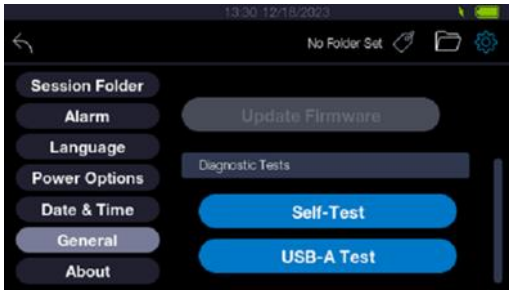



1. This section allows the user to set the level of backlighting for the display. Please note that applying more backlighting will drain more power from the battery and therefore may deplete it quicker.
2. The Sleep Mode slider allows the user to select the time after which the unit will go to sleep. The slider can be set between 30 seconds and 10 minutes.
3. The “Power Off” button allows the user to force the unit to go into Sleep Mode.

*Date & Time*

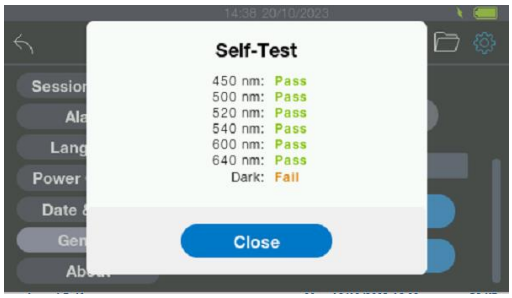

1. This section allows the user to set the time, time format, date and date format as required.
2. 24h Clock: this button allows to switch between 12h (am/pm) and 24h clock format.
3. Time: this is where the user can set the hour and minutes.
4. Date: Select the Year (Y), Month (M) and Day (D)
5. Date format: There is the choice between 3 date formats that can be displayed.

*General*

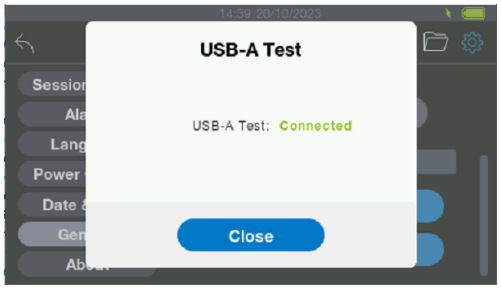



1. This section allows the user to update the firmware to a newer version and to also perform diagnostic tests.
2. To update the firmware the new firmware package must be loaded onto a USB Flash Drive.
3. Connect the USB Flash Drive containing the new firmware package and go to the FW update section.
4. The new firmware package will be automatically recognised.
5. Press “Update Firmware” button once blue to launch the update procedure. This may take a few minutes.
6. After the update, the unit will automatically reboot.


7. The Diagnostic Tests section allows the user to perform automated diagnostics of the device.




8. Press the “Self-Test” function to run a diagnostic of the hardware. The device will return the results of the test. If a parameter fails, it will be displayed in orange.




9. Press the “USB-A Test” button to test the connectivity with a USB flash drive. The instrument will report whether the connectivity is established with an external flash drive.
10. NOTE: a USB flash drive must be inserted in the USB-A port to conduct this test.

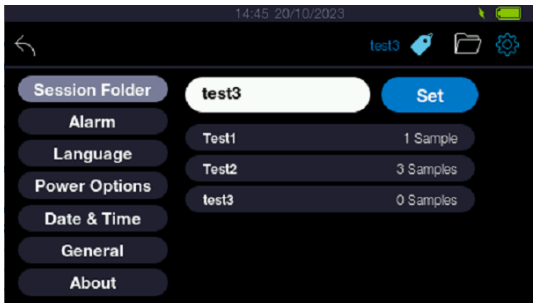
## *About*


1. This section displays the serial number of the unit and gives information about firmware version, warranty expiry and last calibration date.
2. Scanning the QR code with a phone will open the Biochrom Support Centre webpage where the user can find technical resources for the device, such as manuals and knowledge articles.

## Data Management

*Creating a New Session Folder*

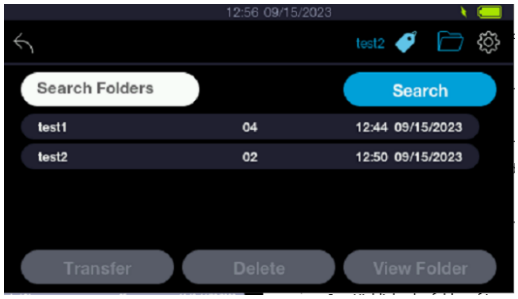

1. Click on the tag icon in the top right corner to create a folder to save data. If a folder has already been selected, the tag will be displayed in blue with the folder name next to it. By clicking on it, it will open the session folder menu, listing all available folders that have been created (if any).



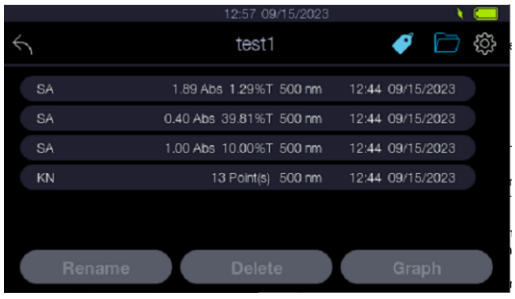

2. Enter a name for your folder in the white box, then press "SET." The session folder is now created (blue tag), and measurements will be saved in this active folder.
3. Click on the back arrow 

*Viewing Sessions Folders*

1. To retrieve data saved in folders, click on the folder icon.




2. Highlight the folder of interest and click on "View Folder"

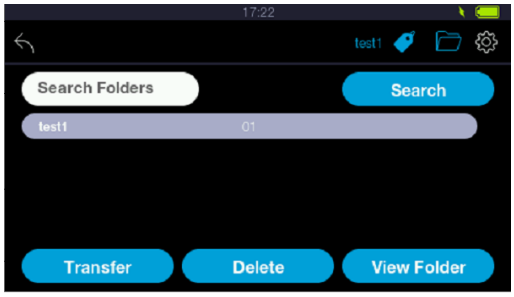



3. Saved measurements will be recorded in the folder. The first column indicates the type of measurement. SA stands for "sample," KN stands for "kinetics".
4. The following information is then displayed for each measurement: value in absorbance unit and transmittance unit, wavelength, time, and date of measurement.
5. Highlight the measurement record to either delete, rename, or view the associated graph (only for kinetics measurements).

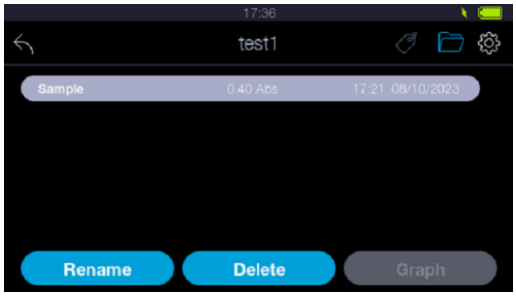
6. **NOTE: If no session folders have been selected before making any measurements, then the results will not be saved on the device.**

*Deleting Sample Data and/or Session Folders*

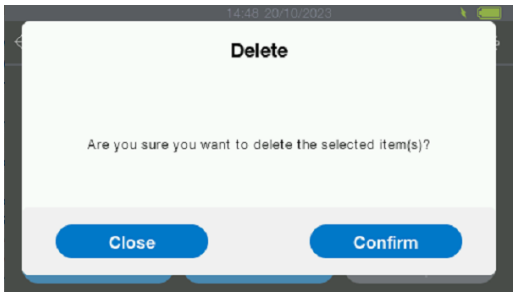
1. Click on the folder icon.



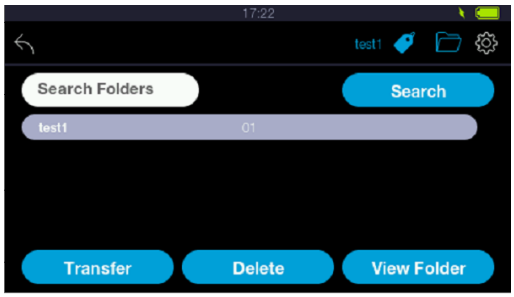

2. Highlight the folder of interest and click on “View Folder”



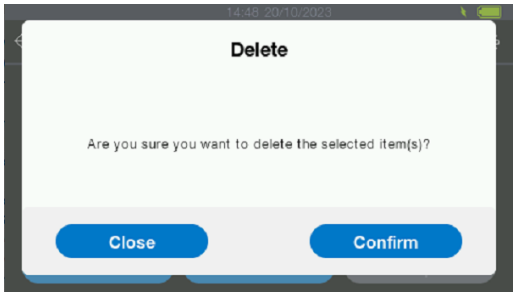

3. Select the sample data that needs deleting and press the “Delete” button.




4. Confirm the deletion by pressing “Confirm”.




5. To delete a Session Folder, Select the session folder of interest and press the “Delete” button



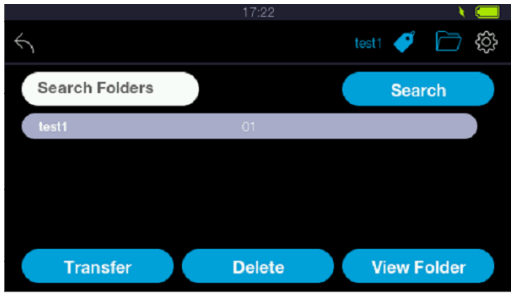

6. Confirm the deletion by pressing “Confirm”.

**NOTE: If no session folders have been selected before making any measurements, then results will not be saved on the device.**

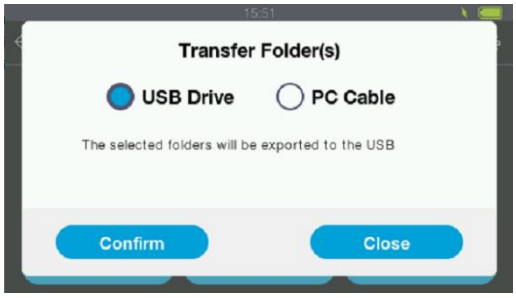
*Transferring Data onto a USB Flash Drive*

7. Insert a USB flash drive onto the USB-A port located on the side of the unit. USB flash drives with FAT32 format must be used for proper compatibility.

8. Click on the folder icon.




9. Highlight the folder of interest and click on “Transfer”

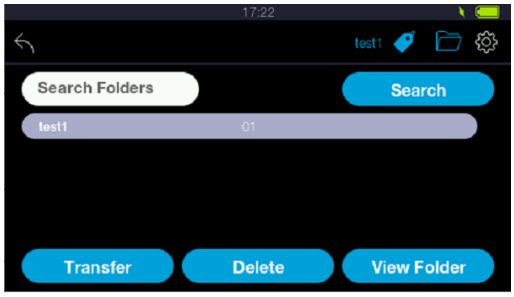



10. Select “USB Drive” then press “Confirm.”

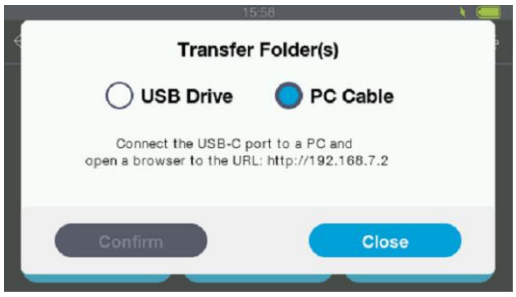
*Transferring Data onto a Laptop/PC*

1. Connect the U35c to a laptop/PC via an available USB port using the USB-C cable provided.

2. Click on the folder icon.




3. Highlight the folder of interest and click on “Transfer”




4. Select “PC Cable” then open a Web browser page and enter the URL specified on the device in the address bar.


5. The device web server page will open.
6. Select the section of interest from the menu bar on the left:
7. Display Readings: this allows to display any reading that have been saved on the device
8. Import/Export Data: this allows to export session folders, including all its data onto the PC, in the form of a .csv file.
9. Standard Curves: this allows importing or exporting standard curves in the form of a csv file.
10. Status: displays the status of the device, battery level, serial number, uptime, and firmware version.
11. System Log: Display any error messages that may have occurred during the current session.
12. Language: Change the language of the web server page.
13. Contact Us: opens the Biochrom Support Centre page for further technical support. An Internet connection is required to reach this page.

# Useful Calculations

## Beer-Lambert Law

$A = c\varepsilon l$

A is the absorbance, which although unit-less is usually described as A or AU (absorbance units).

C is the concentration in molar units (M).

ε is the molar extinction coefficient in per molar unit per cm ($M^{-1}cm^{-1}$).

l is the pathlength in centimetres (cm).

As the absorbance value is the known quantity, the Beer-Lambert equation can be rearranged to make concentration (c) the product:

$$c = \frac{A}{\varepsilon \times l}$$

Alternative extinction coefficients can be applied to calculate the concentration in alternative units

| ε | | c |
|---|---|---|
| Molar extinction coefficient ($M^{-1}cm^{-1}$) | ➡ | Molar, or moles per litre, concentration (M, mol $L^{-1}$) |
| Mass extinction coefficient ($g^{-1}cm^{-1}$) | ➡ | 0.1 % Mass per volume concentration (g $L^{-1}$) |
| E1% extinction coefficient ($mg^{-1}mL^{-1}cm^{-1}$) | ➡ | 1 % Mass per volume concentration (10g $L^{-1}$) |

Conversions between molar, mass, E1% extinction coefficients:

$$\frac{\text{Molar Extinction Coefficient}}{\text{Molecular Weight (g mol}^{-1})} = \text{Mass Extinction Coefficient}$$

Mass Extinction Coefficient × 10 = E1% Extinction Coefficient

When E1% extinction coefficient is used, the absorbance is multiplied by 10 to present the concentration as a 0.1 % weight per volume (w/v) unit in keeping with convention:

$$c = \frac{A \times 10}{E1\% \times l}$$

References:

Beer, A. (1852). Bestimmung der Absorption des roten Lichts in farbigen Flüssigkeiten. 1st ed. Leipzig: Johann Ambbosius Barth.

Lambert, J. (1760). Photometrie. Photometria sive de ensura et gradibus luminis, colorum et umbrae. 1st ed. Augsburg: Eberhardt Klett, p.391.

# Troubleshooting

| Message Displayed | Details/Possible Causes | Remedies |
|---|---|---|
| **Power-on self-test has detected an error with the device:**<br>**LED sensor failure.**<br>**Please contact a service technician.** | This light sensor has malfunctioned and is not working properly. Possible issues:<br>• The sensor is broken and no longer works.<br>• The Sensor is no longer sensitive enough to adequately detect the LED light for accurate absorbance measurements. | Please contact Technical Support for further advice |
| **Power-on self-test has detected an error with the device:**<br>**LED intensity low at X nm.**<br>**Please contact a service technician.** | Self-test has detected an issue with one of the LED lights on the device. 'X' in the message can be any of the available wavelength on the device: 450, 500, 520, 540, 600, 640<br>Light path is obstructed during startup.<br>The LED is broken and no longer works, or the fiber optic alignment is off and no longer directs the light into the sensor. | Verify that there is nothing in the cell compartment that is obstructing the light path during startup, including a sample cell.<br>If the cell compartment is clear from any obstructions and the error still occurs, please contact Technical Support. |
| **An error occurred while updating. Please try again or contact a service technician.** | This message occurs if something goes wrong during the Firmware (FW) update process. Potential causes include:<br>• The wrong FW package is being loaded (Colorimeter FW on CDM or CDM FW on Colorimeter)<br>• FW package file is corrupt.<br>• The USB stick was removed while updating.<br>• Device lost power while updating. | • Verify the correct firmware package file has been used.<br>• Do not remove the USB stick until the entire firmware update process has finished.<br>• Please ensure the unit is either fully charged or plugged in to power source while updating. |
| **Battery levels are low. Please consider charging the device.** | Battery levels are critical (below 12%). Device could lose power soon if not plugged in. | Please connect the device to a power source to recharge the battery. |
| **The warranty date for this device has been reached** | The warranty on the device has lapsed and expired. | N/A |
| **The service and calibration due date on this device has been reached.** | The calibration date on the device has been reached and needs to be recalibrated. | Please contact Technical Support to arrange a re-calibration of the device. |
| **The device is nearing the maximum storage capacity. Please consider deleting or** | Message displays when the number of session folders, samples or (on CDM) standard | This is just a warning so no action is needed however user might want to consider transferring or |

| | | |
|---|---|---|
| **transferring data to make additional space.** | curves reaches 90% capacity (45 of 50 total). | deleting data to make additional space. |
| **The device has reached storage capacity. Please delete or transfer data to continue.** | The maximum number of session folders has been reached (50 folders). | Transfer or delete data to make space. |
| **The active folder has reached the maximum number of samples. Please transfer or delete the samples in this folder to continue using it.** | The maximum number of samples for the currently set session folder has been reached (50 samples). | Transfer or delete to make space. |
| **The device has reached the maximum number of curves. Please delete existing curves to upload or create a new curve.** | The maximum number of curves (CDM) has been reached (50 curves). | Transfer or delete to make space. |
| **The file is improperly formatted and cannot be used** | Can occur on the CDM when attempting to use a curve uploaded into the device. This error can be displayed if:<br>• The curve CSV file is corrupted.<br>• The curve CSV file is not correctly formatted. | User should delete the file on the device and reupload ensuring it has been correctly formatted. |
| **An error occurred while transferring file(s). Please ensure the USB Drive is properly inserted.** | Device encountered an error when trying to export data to a USB drive. | • Ensure the USB drive is fully inserted.<br>• Do not remove the USB drive while transferring data.<br>• Charge the device if battery levels are critical. Device may not have enough battery to power a USB drive. |
| **The file X already exists on the connected USB drive and will not be transferred.** | The 'X' in the message will display the CSV file name. Occurs when a file being transferred to a USB drive already exists on the drive. | Delete the file on the USB drive and try again. |
| **The name chosen already exists. Please choose another name.** | The name entered (new folder or new curve) already exists on the device. | Choose a different name or delete the existing name. |
| **Sample results will not currently be saved because no session folder has been set.** | Occurs when the reference button is pressed, and no active session folder has been set. It will only display once and will not be displayed again until the device has either entered sleep mode or restarted. | If data needs to be saved, then set a session folder in the settings. |

# Accessories, Spares & Services

## Accessories & Consumables

| Part Number | Description |
|---|---|
| **80-3000-57** | Adapter set for 10 and 12mm test tubes |
| **80-2004-53** | Pack of 100 disposable cuvettes, 1mL min. volume |
| **80-2084-11** | Pack of 100 disposable cuvettes, 0.5mL min. volume |

## Spare parts

| Part Number | Description |
|---|---|
| **80-3007-99** | User replaceable battery |
| **80-3008-08** | USB-C Cable |
| **80-3008-09** | Power Supply |

## Workshop Services

| Part Number | Description |
|---|---|
| **80-3008-07** | Ultrospec 35c/Ultrospec 30 Calibration Only Service |
| **80-3008-10** | Ultrospec 35c/Ultrospec 30 Corrective Repair Service |

# Contact Information

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