Operator Instruction Manual Lovibond® ICx



Lovibond® Colour Measurement

Version 1.0 EN (29.09.2025)

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Document Version

Manual Version	ICx Firmware Version	Date
Version 1.0 EN	V1.3.13	29th September 2025

Introduction

The Lovibond® ICx is supplied with the following peripherals:

Quick Start Guide

Accessory Box Containing:

- **External Type 2 Power Supply (24v)**
- **Set of 4 Power Leads (UK, European, Chinese and United States)**
- **USB memory stick (containing the instrument manual)**
- **Conformance Standard Filter & Certificate**
- **100mm Borosilicate Cell**

A4 Envelope containing:

- **Certificate of Conformity**
- **Certificate of Calibration**
- **Quality Control Report**
- **Lovibond ICx Guide to Good Laboratory Practice**

Each instrument includes genuine Lovibond® glass cells. To ensure test result repeatability, only use Lovibond® cells, as other brands may not meet the same rigorous quality standards.

Lovibond® glass cells are manufactured to strict tolerances to ensure reliable, repeatable measurements. Each cell is produced in a dedicated facility and undergoes thorough quality control to minimise potential sources of error.

Each Lovibond® glass cell is marked with "Lovibond®" on one end, while the path length and type are indicated on the other. For example, the 100mm W600 Borosilicate cell is labelled "100 mm B".

The Lovibond® ICx is a high-precision spectrophotometer designed for objective colour measurement of clear liquids. It is an automatic, easy-to-use instrument that eliminates the subjectivity of visual methods.

Built with a rugged aluminium housing and a durable powder-coated finish, the ICx is suited for both laboratory quality control and 24/7 process control applications.

The Lovibond® ICx instrument operates as a stand-alone instrument containing a standardised light source and collimator, sample chamber, light detector, spectrometer, colour display and processor board.

The Lovibond® ICx analyses light-transmitting samples, providing colour data for:

- **Platinum-Cobalt (Pt-Co) scale**
- **Yellowness Index**
- **CIEL*a*b***

The Instrument

Figure 1: Front View

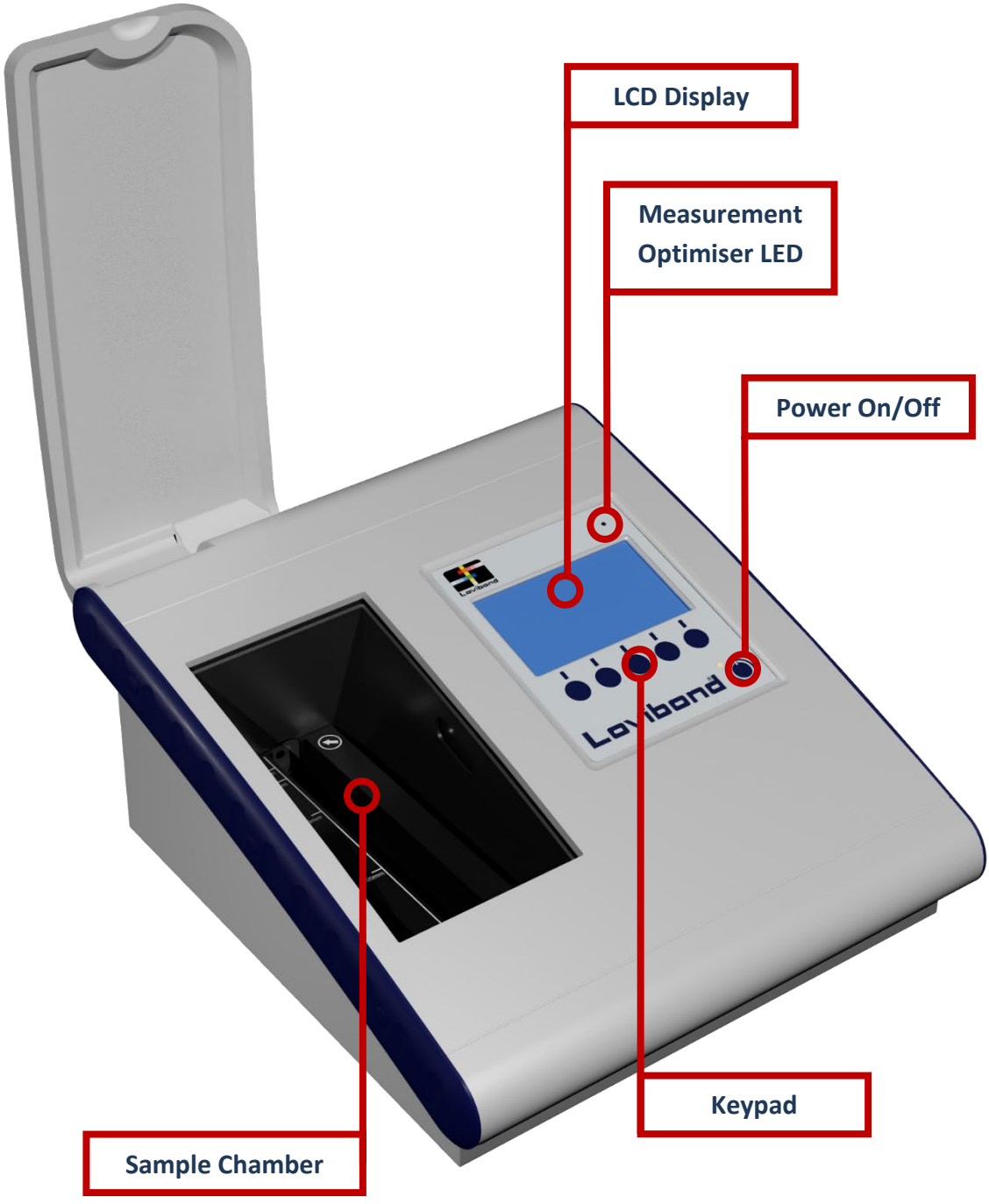
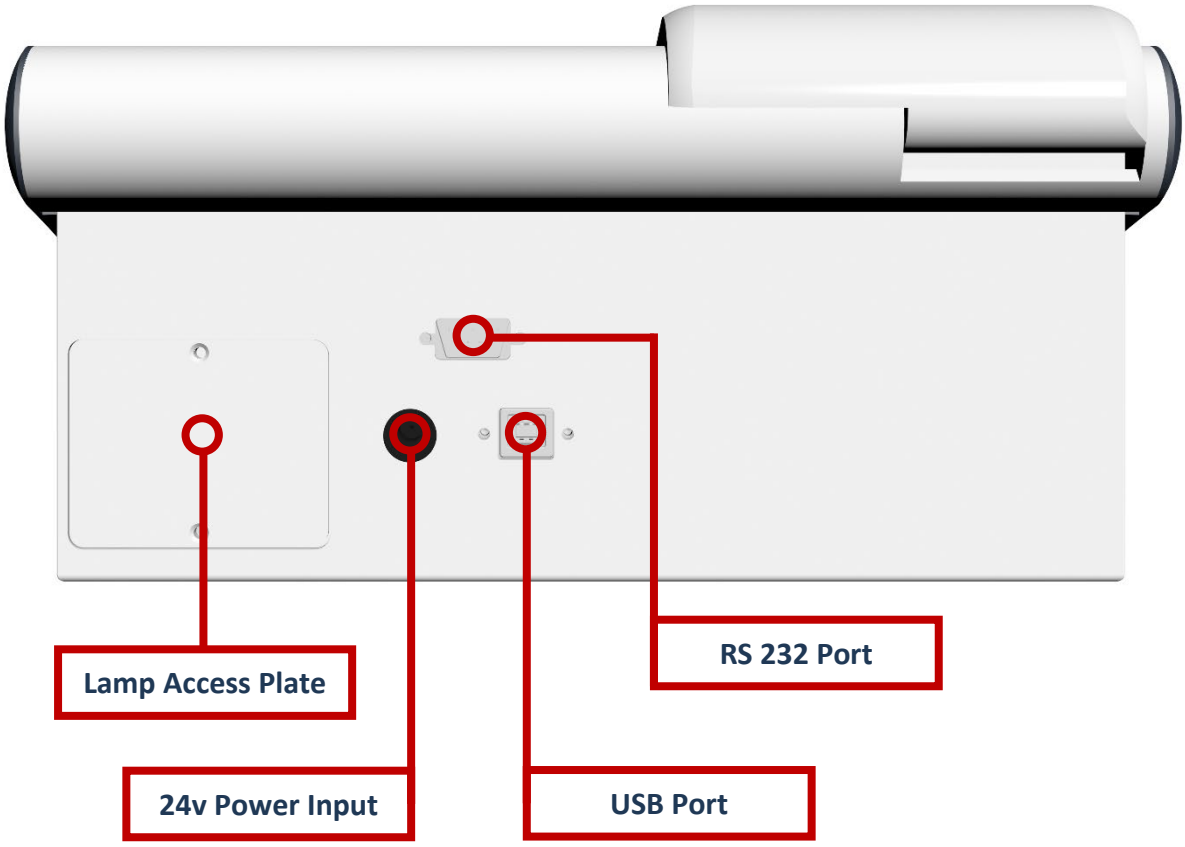


Figure 2: Rear View

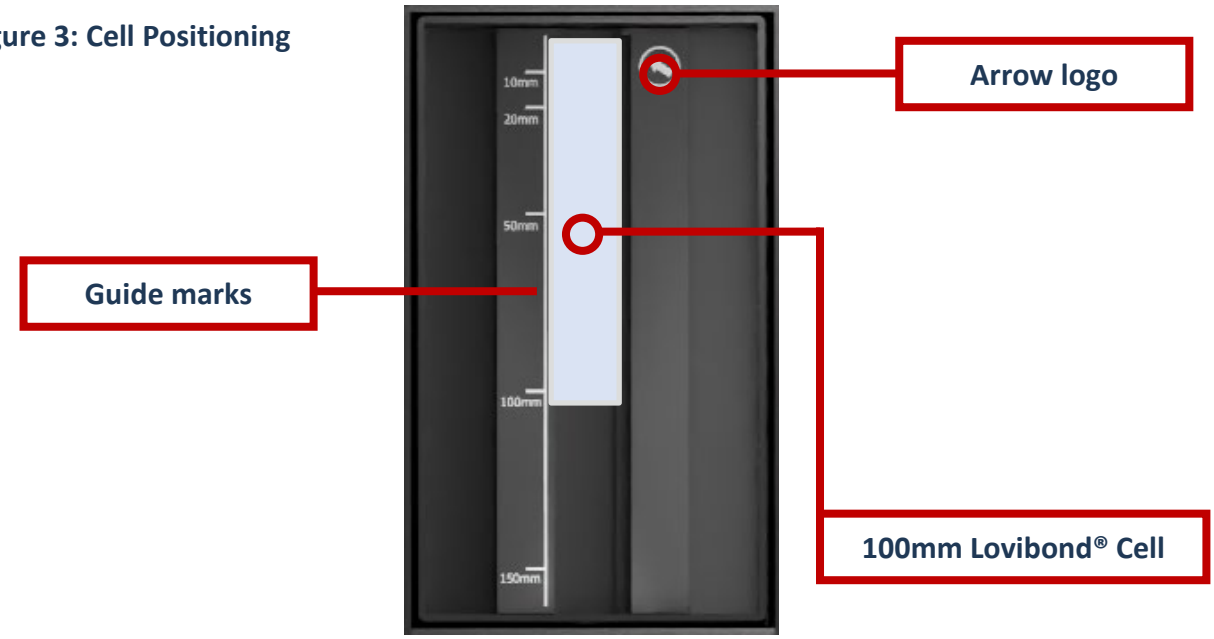


The Sample Chamber (Baseline and Sample Measurement)

When taking a **Baseline** or **Sample Measurement**, insert the cell (or conformance filter) by gently pushing it **forward and to the left**, following the arrow symbol and guide marks on the left side of the sample chamber.

This ensures the cell rests **firmly against the left wall**, remaining straight and consistently positioned for accurate and repeatable measurements.

Figure 3: Cell Positioning



Icons

Icon	Description
	**Baseline:** Pressing this key will initiate a baseline measurement
	**Measure:** Pressing this key will initiate the measurement of a sample
	**Menu:** Pressing this key will bring up the main menu
	**Up:** Used to move between selections in the menu screen or change values in settings screens
	**Down:** Used to move between selections in the menu screen or change values in settings screens
	**Left:** Used to move between selections in the menu screen or change values in settings screens
	**Right**: Used to move between selections in the menu screen or change values in settings screens
	**Enter:** Used to select items from menu or confirm changes
	**Esc:** Used to exit a menu or screen
	**OK:** Used to accept settings and confirm settings/information
	**Auto:** Used to automate processes, such as Measurements and Diagnostics
	**Previous Measurement:** Used to cycle through previously completed measurement
	**Share:** Used to open the share screen and display available options

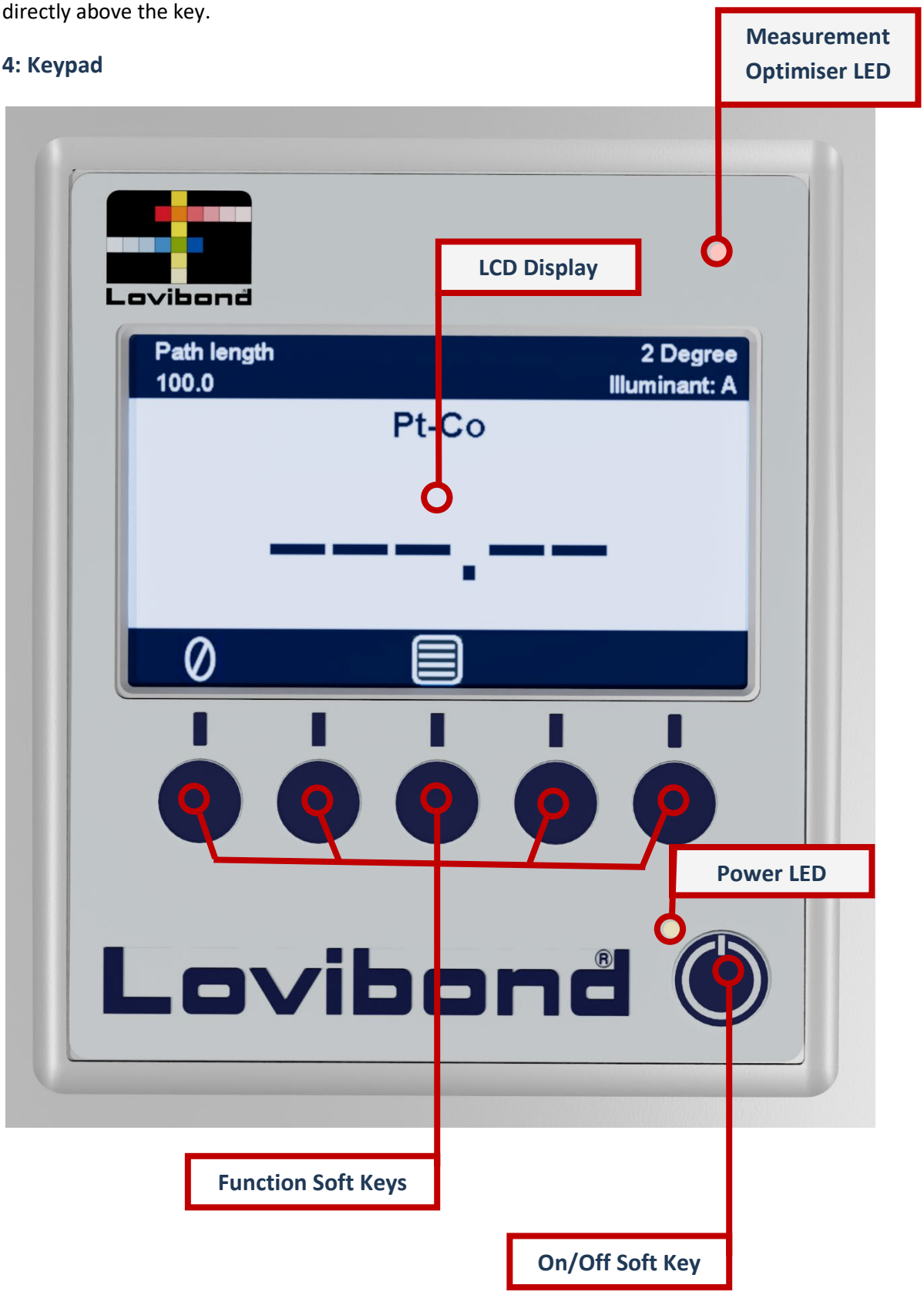
Measurement Optimiser LED

After taking a measurement, wait until the Measurement Optimiser LED stops glowing red before taking your next measurement.	

Keypad

The keys on the keypad can vary in their function. The function of each key will be related to the icon on the display directly above the key.

Figure 4: Keypad



Installation

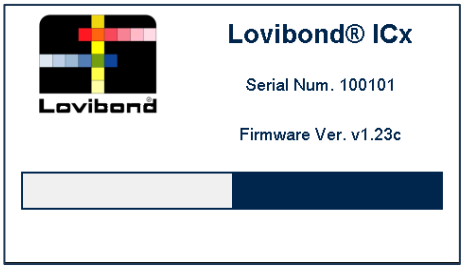
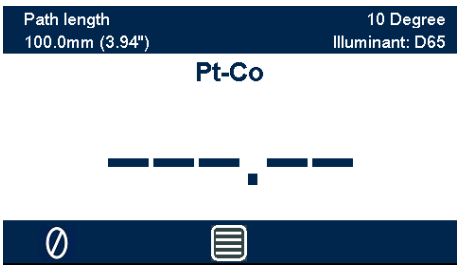
Place the instrument on a bench near a mains voltage supply which is free from excessive voltage fluctuations. The external power supply is auto voltage sensing and requires no additional configuration.

Do not operate the instrument in an atmosphere containing explosive gases.

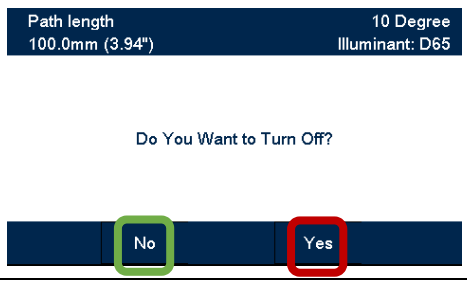
If the instrument has been in a cold environment prior to setting up, allow the instrument to warm to room temperature and ensure that all condensation has dissipated before powering on.

Plug in the mains lead and power on. The display will indicate that the instrument is on.

Switching on the instrument

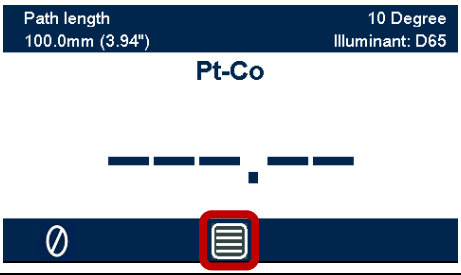
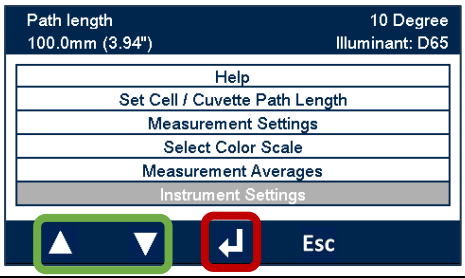
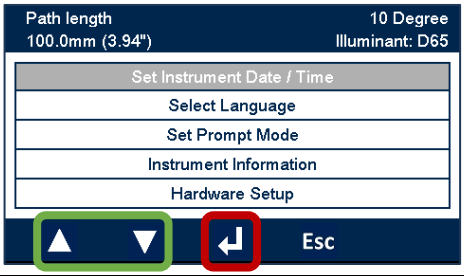
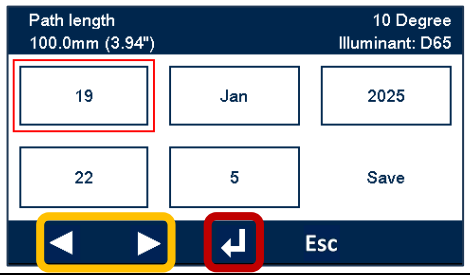
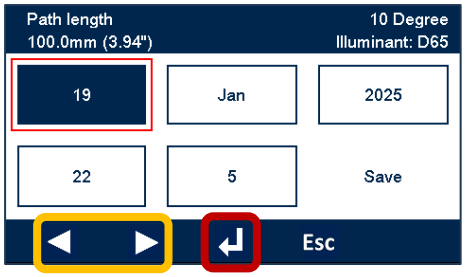
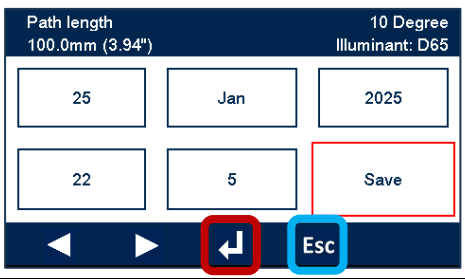
To power on the instrument, press the power button	
When the instrument is powered on, the display will show the serial number of the instrument. A progress bar will show status of the initialisation routines. Any errors will be shown	
Once the initialisation has been completed, the following screen will appear	

Switching off the instrument

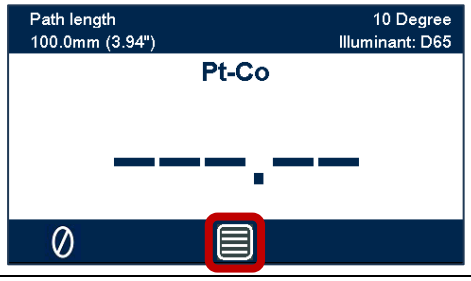
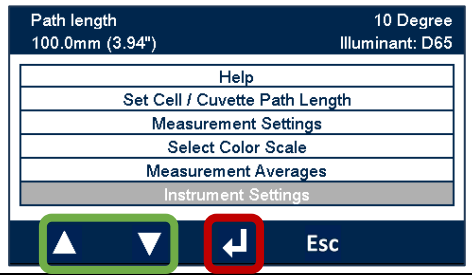
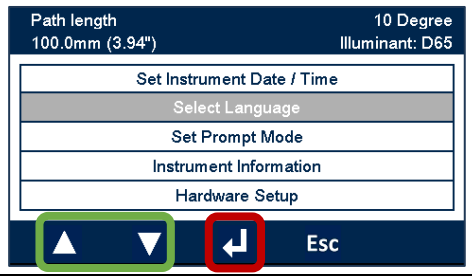
To power off the instrument, press the power button A toast message will appear to confirm powering off the instrument. Press the **"Yes Key"** to power off the instrument. To return to the menu press the **"No Key"**	

Basic Hardware Setup

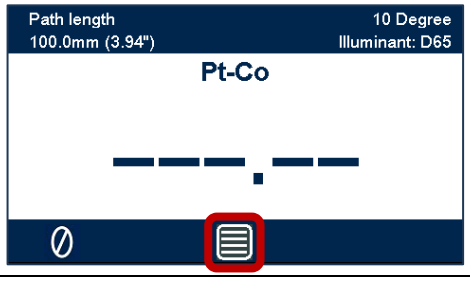
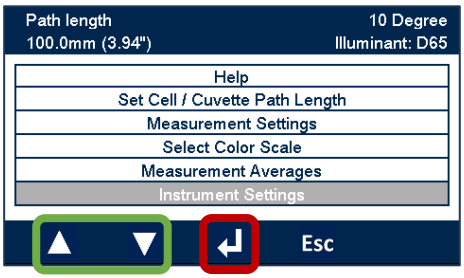
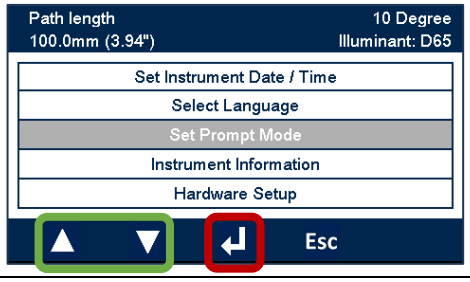
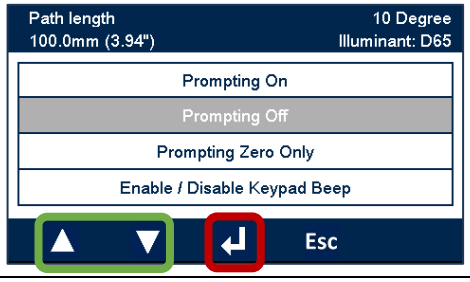
Set Date & Time

Press the **"Menu key"**	
The Main Menu will appear Press the **"Up or Down key"** until **"Instrument Settings"** is highlighted Then press the **"Enter key"**	
The Instrument Set up Menu will appear Press the **"Up or Down key"** until **"Set Instrument Date / Time"** is highlighted Then press the **"Enter key"**	
The Set Time and Date screen is displayed Use the **"Left or Right key"** to move the highlighted red box between the items to be changed At the selected item, press the **"Enter key"**	
The selected item will turn blue Use the **"Left or Right key"** to change the value shown Once the correct value has been set, press the **"Enter key"** The screen will now return to option of moving between items	
Once all items have been set, move the red highlight box to **"Save"** and press the **"Enter key"** At any time, press the **"Esc key"** to leave the screen without making any changes.	

Language Selection

Press the **"Menu key"**	
The Main Menu will appear Press the **"Up or Down key"** until **"Instrument Settings"** is highlighted Press the **"Enter key"**	
The Instrument Set Up Menu will appear Press the **"Up or Down key"** until **"Select Language"** is highlighted Press the **"Enter key"**	
The Select Language Menu will appear Use the **"Left or Right key"** to move the red selection box to the Flag of the appropriate language Press **"Enter key"** to select	

Prompt Mode

Press the **"Menu key"**	
The Main Menu will appear Press the **"Up or Down key"** until **"Instrument Settings"** is highlighted Press the **"Enter key"**	
The Instrument Set up Menu will appear. Press the **"Up or Down key"** until **"Set Prompt Mode"** is highlighted Press the **"Enter key"**	
The Set Prompt Mode Menu will appear Use the **"Up or Down key"** to select the type of prompting required Press the **"Enter key"**	

The available prompt modes are:

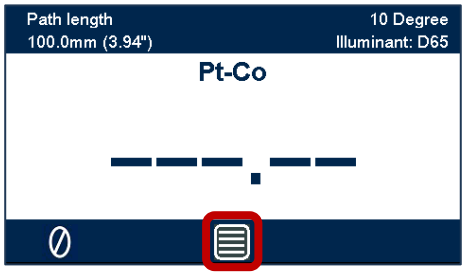
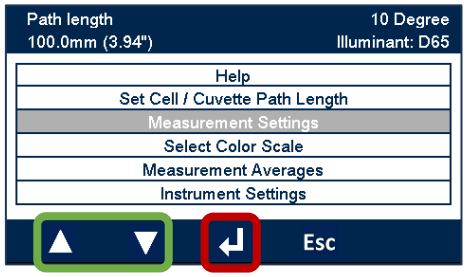
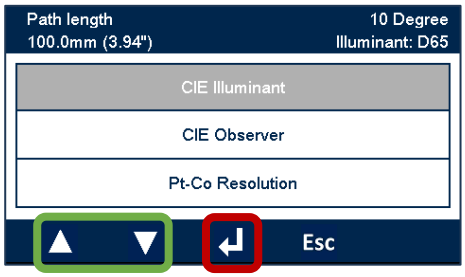
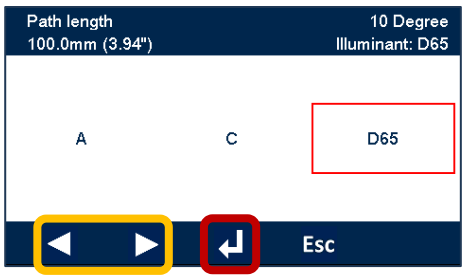
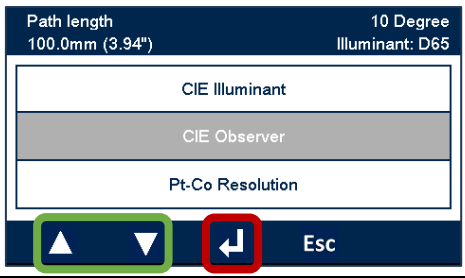
On Any interactions will prompt user to perform certain actions, this is helpful when first using the instrument.

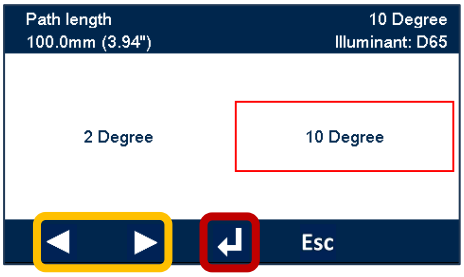
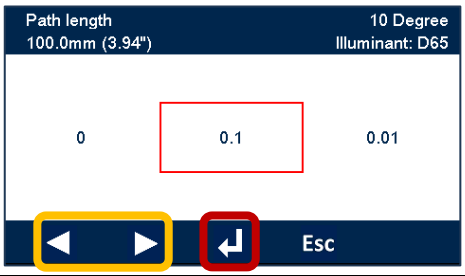
Off No prompts will be requested.

Zero Only User will be prompted to carry out the baseline procedure for the colour scale being measured.

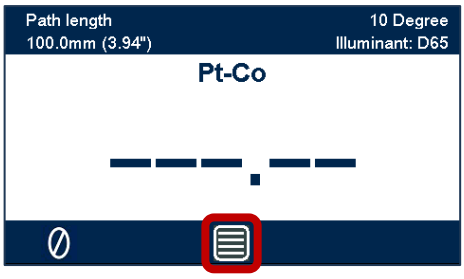
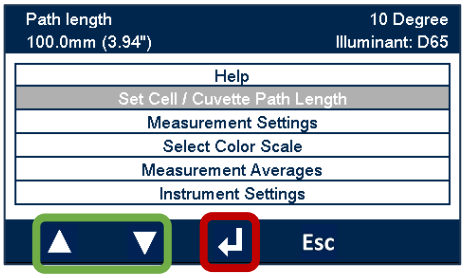
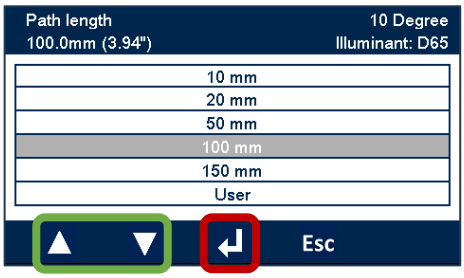
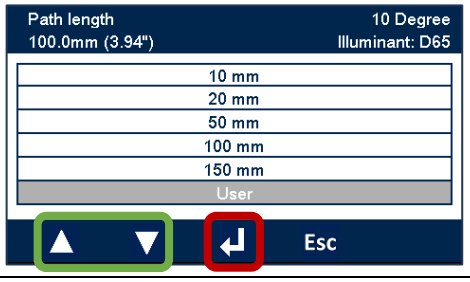
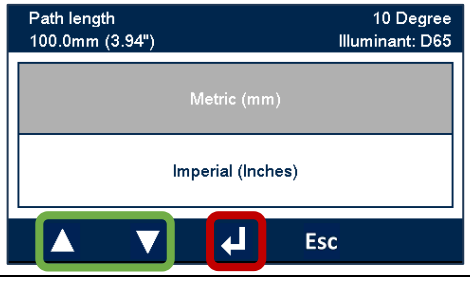
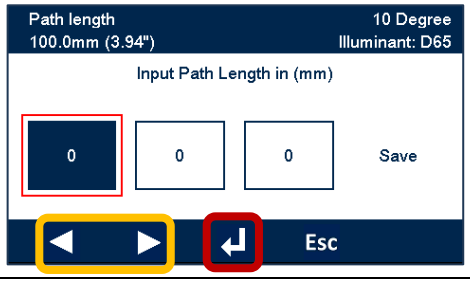
Instrument Settings

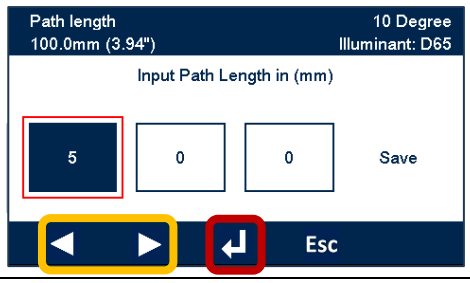
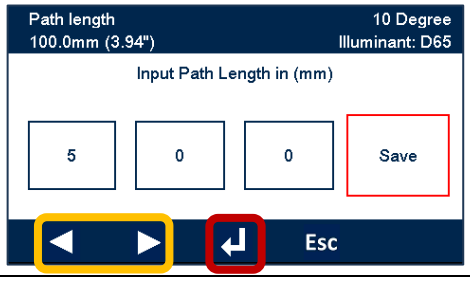
Set Illuminant, Observer & Result Resolution

Press the **"Menu key"**	
The Main Menu will appear Press the **"Up or Down key"** until **"Measurement Settings"** is highlighted Press the **"Enter key"**	
From the Measurement Setting menu press the **"Up or Down key"** until **"CIE Illuminant"** is highlighted Press the **"Enter key"**	
The Illuminant options will be displayed Press the **"Left or Right key"** to change illuminant type Press the **"Enter key"** to save and return to the previous screen **NOTE: Changing this setting will invalidate existing Baseline Measurements**	
From the Measurement Setting menu press the **"Up or Down key"** until **"CIE Observer"** is highlighted Press the **"Enter key"**	

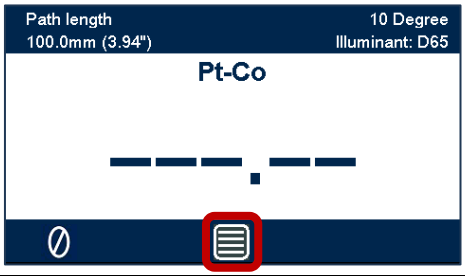
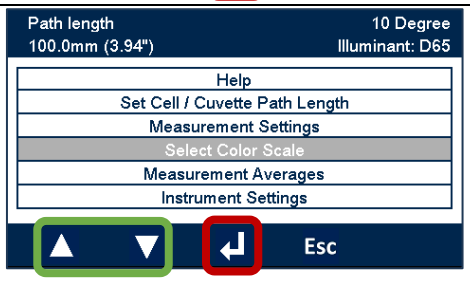
The Observer options will be displayed Press the **"Left or Right key"** to change observer type Press the **"Enter key"** to save and return to the previous screen **NOTE: Changing this setting will invalidate existing Baseline Measurements**	
From the Measurement Setting menu press the **"Up or Down key"** until **"Pt-Co Resolution"** is highlighted Press the **"Enter key"**	
The Result Resolution options will be displayed Press the **"Left or Right key"** to change resolution type Press the **"Enter key"** to save and return to the previous screen	

Set Path Length

Press the **"Menu key"**	
The Main Menu will appear Press the **"Up or Down key"** until "Set Cell / Cuvette Path Length" is highlighted Press the **"Enter key"**	
From the Pathlength options, press the **"Up or Down key"** until the desired path length is highlighted Press the **"Enter key"**	
If a custom pathlength is required, press the **"Up or Down key"** until "User" is highlighted Press the **"Enter key"**	
Press the **"Up or Down key"** to select Metric or Imperial unit type Press the **"Enter key"**	
The manual input screen will be displayed Use the **"Left or Right key"** to move the highlighted red box between the fields At the chosen item, press the **"Enter key"** to select the field	

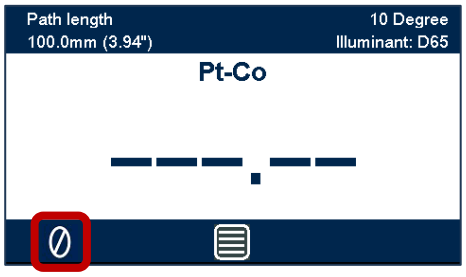
The selected field will turn blue Use the **"Left or Right key"** to change the value in the box Once the correct value has been set, press the **"Enter key"**	
Once all fields have been set, use the **"Left or Right key"** to move the red highlight box to **"Save"** Press the **"Enter key"** to save and return to the previous screen	

Colour Scales

Press the **"Menu key"**	
The Main Menu will appear Press the **"Up or Down key"** until **"Select Colour Scale"** is highlighted Press the **"Enter key"**	
The Colour Scale Selection Menu will appear Press the **"Up or Down key"** until the desired Colour Scale is highlighted Press the **"Enter key"** to save and return to the previous screen	

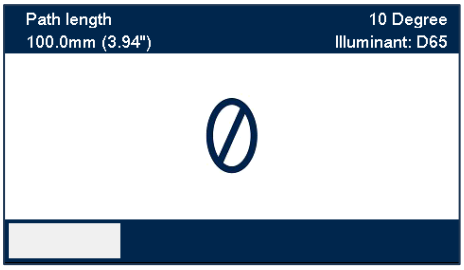
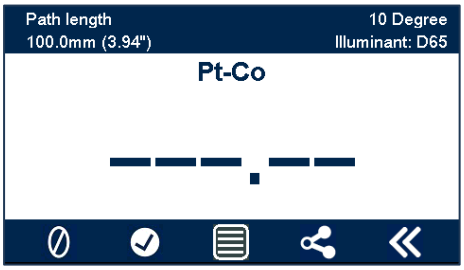
Sample Measurement

Performing a Baseline Measurement

Insert a sample of purified water into the sample chamber When inserting your 100mm Lovibond Cell, always ensure the inscribed "Lovibond" text is facing towards you. This ensures maximum accuracy when measuring samples. The cell should be carefully pushed forward and to the left, as per the arrow logo Press the **"Baseline key"**	

For optimal measurement consistency, always use the same Lovibond® cell for Baseline Measurement and subsequent Sample Measurements

The use of different cells will introduce variables into your readings that cannot be eliminated by instrumentation

When performing a Baseline measurement, the screen will change to the Baseline screen with a progress Bar	
The result screen for the selected colour scale will be shown without any values	

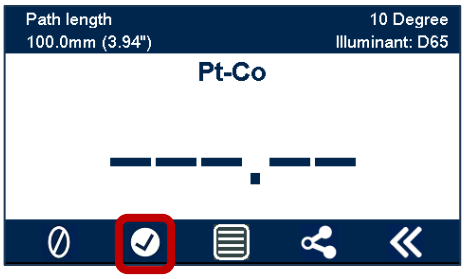
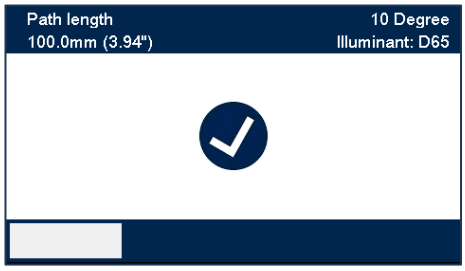
Baseline Measurement Intervals

For optimal accuracy and consistency, always perform a Baseline Measurement using the same Lovibond® cell as your Sample Measurements.

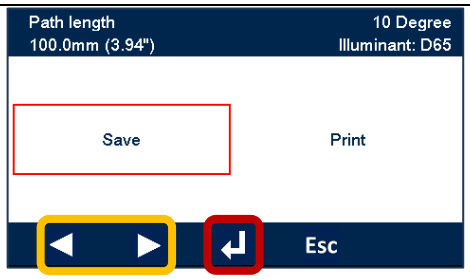
Baseline before each individual measurement whenever possible. As a minimum safeguard, re-baseline **at** least every two hours when measuring Pt-Co values below 30.

Chemicals can sometimes interact with the environment and discolour rapidly. To ensure accurate results, samples should be measured promptly and not left exposed.

Performing a Sample Measurement

Insert a sample into the sample chamber When inserting your 100mm Lovibond Cell, always ensure the inscribed "Lovibond" text is facing towards you. This ensures maximum accuracy when measuring samples. The cell should be carefully pushed forward and to the left, as per the arrow logo Press the **"Measure key"**	
For optimal measurement consistency, always use the same Lovibond® cell for Sample Measurement you used for Baseline Measurement **The use of different cells will introduce variables into your readings that cannot be eliminated by instrumentation**	
For optimal accuracy when measuring samples, we recommend performing a Baseline Measurement before each individual Sample Measurement	
When performing a sample measurement, the screen will change to the measurement screen with a progress Bar	
The result will be displayed on screen for the selected colour scale	
For best results, wait until the Measurement Optimiser LED stops glowing red before taking your next measurement.	

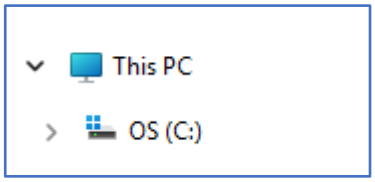
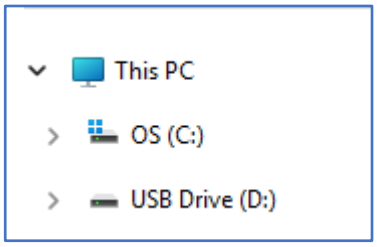
Saving Measurement to SD Card

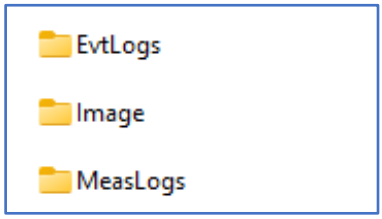
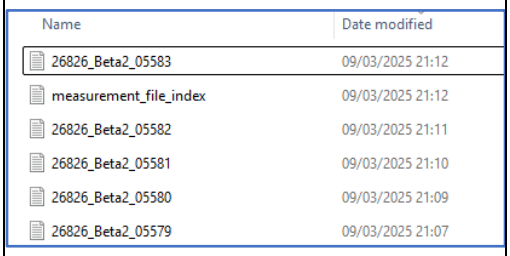
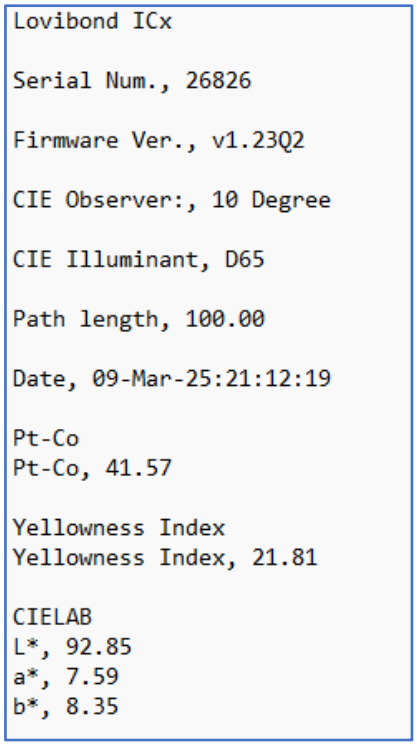
When a Sample Measurement has been completed, press the **"Share key"**	
Use the **"Left or Right key"** until **"Save"** is highlighted Press the **"Enter key"** to save the measurement to the SD Card and return to the previous screen	

To view saved measurements, connect your instrument to a PC via the included USB cable. The SD card will appear as an external drive when connected successfully

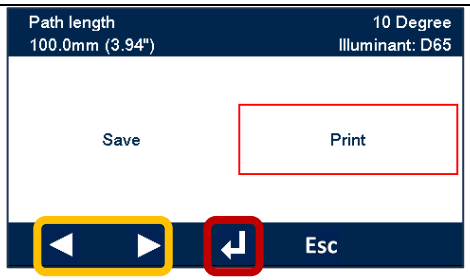
The measurements will appear as .csv files within the external drive

Viewing Saved Measurements

Connect the Lovibond® ICx to PC using the USB cable & switch the instrument on (**Please Note:** Exact appearance depends on your local PC settings)	
The Lovibond® ICx appears as a "**USB Drive**" or "**Removable Disk**" (**Please Note:** Exact appearance depends on your local PC settings)	

Select “USB Drive” the following folders appear	
Select the “**MeasLogs**” folder to view previously saved measurements If no measurements have been saved, this folder will be empty	
To view details of an individual saved measurement, select the desired file When viewed, the individual file contents are displayed per the example:	

Printing Measurements

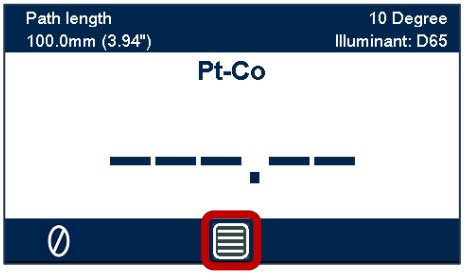
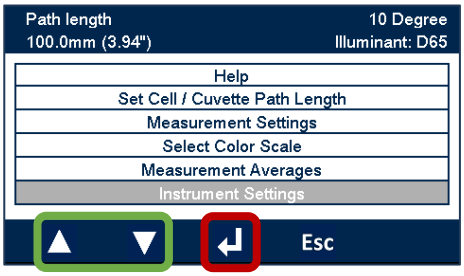
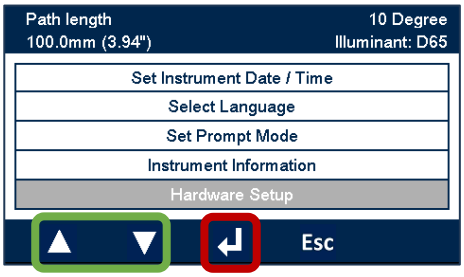
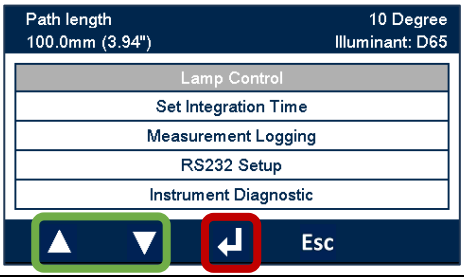
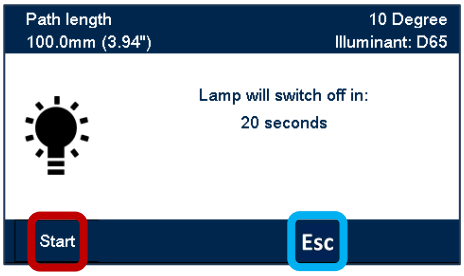
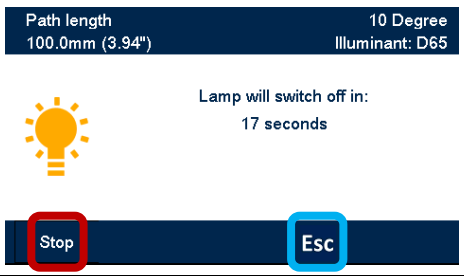
When a Sample Measurement has been completed, press the **"Share key"**	
Use the **"Left or Right key"** until **"Print"** is highlighted Press the **"Enter key"** to Print the measurement to the printer and return to the previous screen	

Viewing Previous Measurement

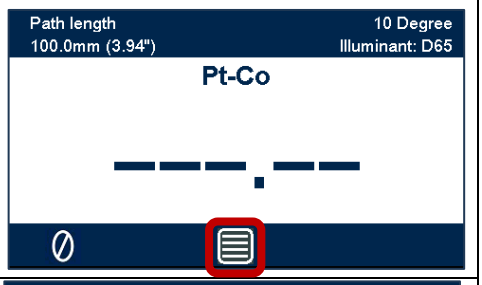
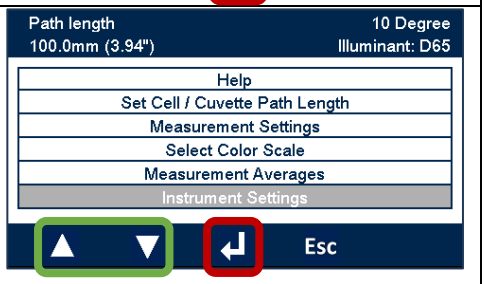
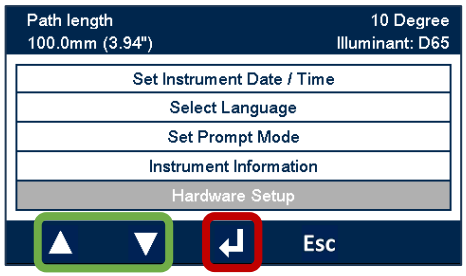
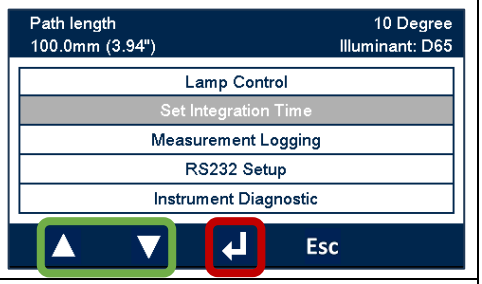
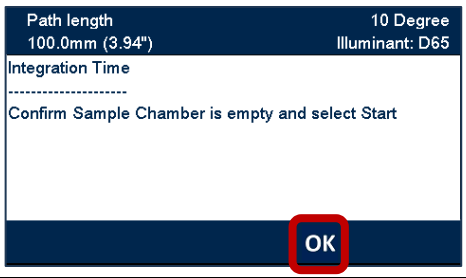
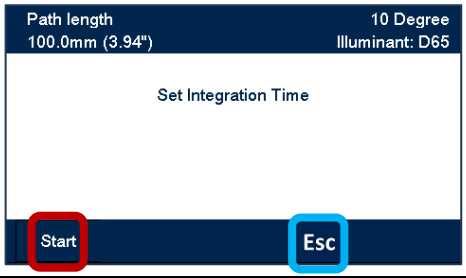
When multiple Sample Measurements have been completed, press the **"Previous Measurement key"** to view the previous measurement	
Press the **"Previous Measurement key"** to return to the latest sample measurement	

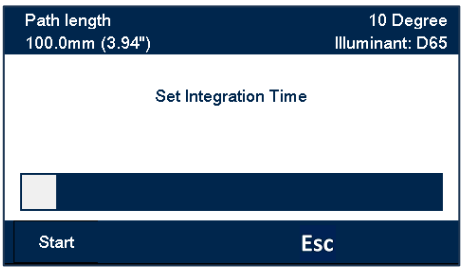
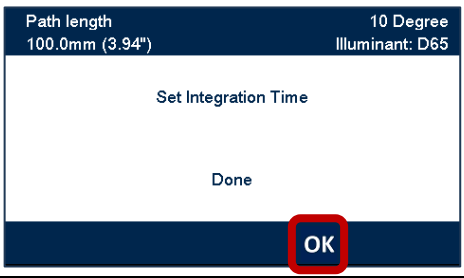
Advanced Hardware Setup

Lamp

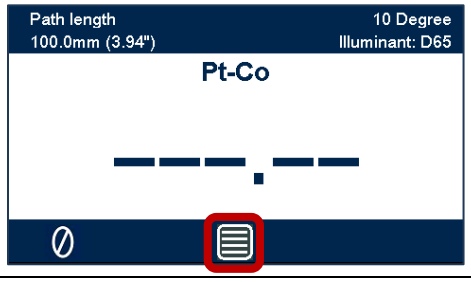
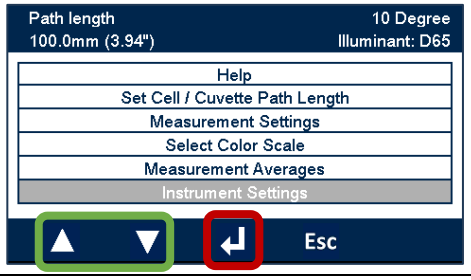
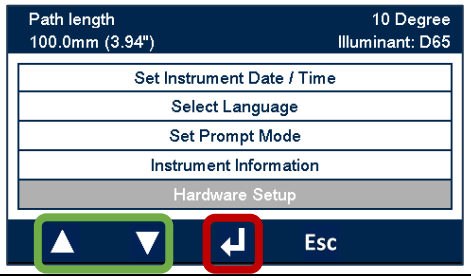
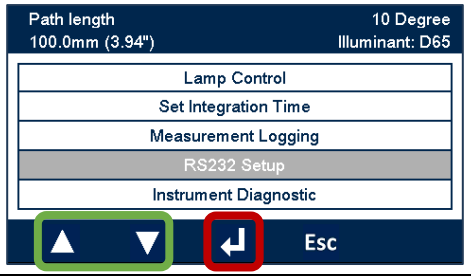
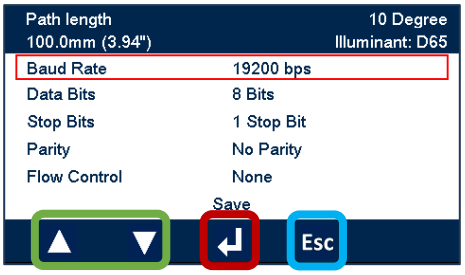
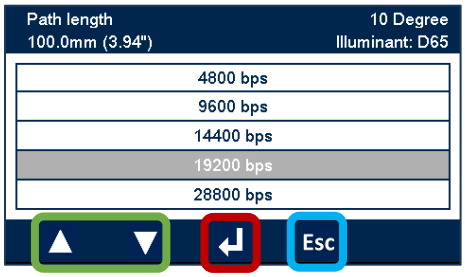
The lamp can be tested for brightness compared to the ideal factory setting Press the **"Menu key"**	
The Main Menu will appear Press the **"Up or Down key"** until **"Instrument Settings"** is highlighted Press the **"Enter key"**	
The Instrument Set up Menu will appear Press the **"Up or Down key"** until **"Hardware Setup"** is highlighted Press the **"Enter key"**	
The Hardware Setup Menu will appear Press the **"Up or Down key"** until **"Lamp Control"** is highlighted Press the **"Enter key"**	
Press the **"Start key"** to power on the lamp The Lamp Icon will turn yellow when the lamp is ON A countdown timer will start, the lamp will switch off when the counter expires. At any time, press the **"Esc key"** to leave the screen	
Press the **"Stop key"** at any time to power off the lamp The Lamp Icon will turn black to indicate that the lamp is OFF, at any time, press the **"Esc key"** to leave the screen	

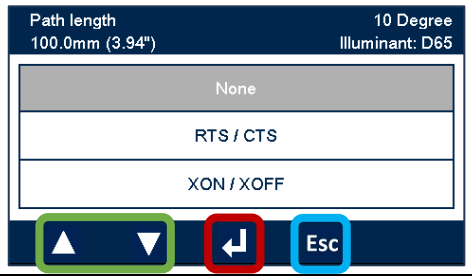
Integration Time

Press the **"Menu key"**	
The Main Menu will appear Press the **"Up or Down key"** until **"Instrument Settings"** is highlighted Press the **"Enter key"**	
The Instrument Set up Menu will appear Press the **"Up or Down key"** until **"Hardware Setup"** is highlighted Press the **"Enter key"**	
The Hardware Set Up Menu will appear Press the **"Up or Down key"** until **"Set Integration Time"** is highlighted Press the **"Enter key"**	
The instrument will prompt you to check the sample chamber is empty Press the **"OK key"** to confirm	
Press the **"Start key"** to begin the integration process Press the **"Esc key"** to leave the screen	

A progress bar will appear to show the status of the process	
When the process is complete, press the **"OK key"** to return to the Hardware Set Up Menu	

RS232 Printer Setup

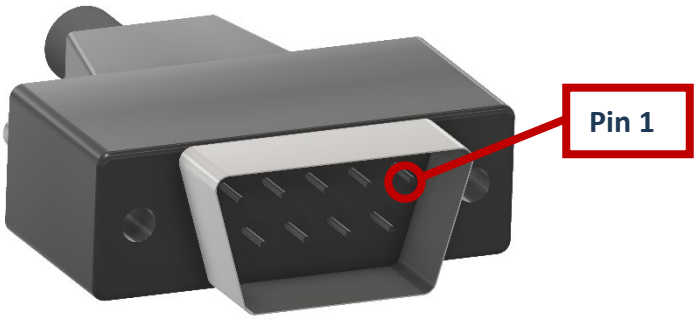
Press the **"Menu key"**	
The Main Menu will appear Press the **"Up or Down key"** until **"Instrument Settings"** is highlighted Press the **"Enter key"**	
The Instrument Set Up Menu will appear Press the **"Up or Down key"** until **"Hardware Setup"** is highlighted Press the **"Enter key"**	
The Hardware Set Up Menu will appear Press the **"Up or Down key"** until **"RS232 Setup"** is highlighted Press the **"Enter key"**	
The current settings for the RS232 port will be shown Press the **"Enter key"** to modify any setting or press the **"Esc key"** to return to the Hardware Set up Menu. Pressing the **"Enter key"** will bring up each parameter in a series of screens.	
To change the Baud rate, Press the **"Up or Down key"** until the required setting is highlighted Press the **"Enter key"** to save Press the **"Esc key"** to return to the previous screen	

To change the Data Bits, press the **"Up or Down key"** until the required setting is highlighted Press the **"Enter key"** to save Press the **"Esc key"** to return to the previous screen	
To change the Stop Bits, press **"Up or Down key"** until the required setting is highlighted Press the **"Enter key"** to save Press the **"Esc key"** to return to the previous screen	
To change the Parity, press the **"Up or Down key"** until the required setting is highlighted Press the **"Enter key"** to save Press the **"Esc key"** to return to the previous screen	
To change the Flow Control, press **"Up or Down key"** keys until the required setting is highlighted Press the **"Enter key"** to save Press the **"Esc key"** to return to the previous screen	
The settings for the RS232 port will be shown To save the settings press **"Up or Down key"** to highlight **"Save"** the **"Enter key"** to save Press the **"Esc key"** to return to the previous screen	

RS232 Connector Wiring Diagram

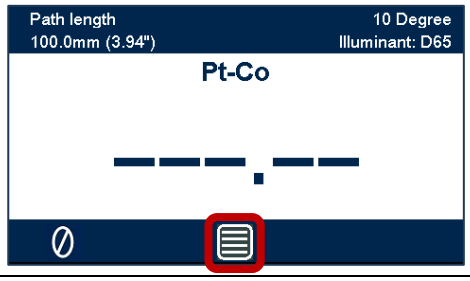
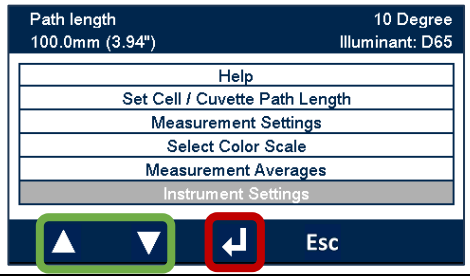
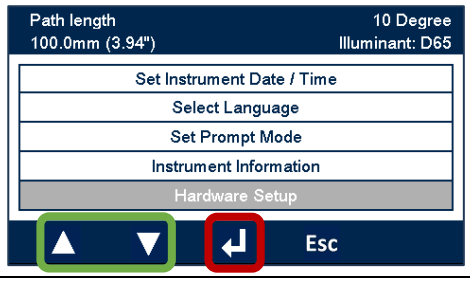
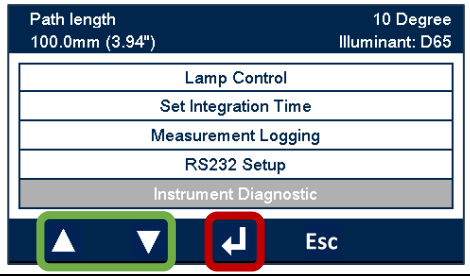
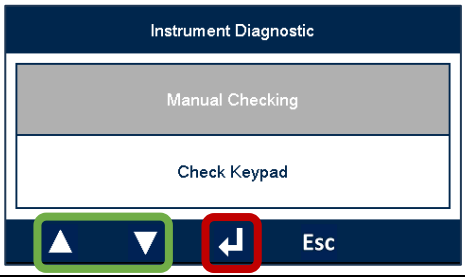
If you wish to use a printer other than that supplied by The Tintometer Ltd, please use the wiring diagram below for the RS232 connector.

Figure 5: RS232 connector and Wiring Diagram



Lovibond® ICx		Printer	
2	RX	2	RX
3	TX	3	TX
5	Ground	5	Ground
8	CTS	8	CTS
7	RTS	7	RTS

Instrument Diagnostics (Voltage Levels)

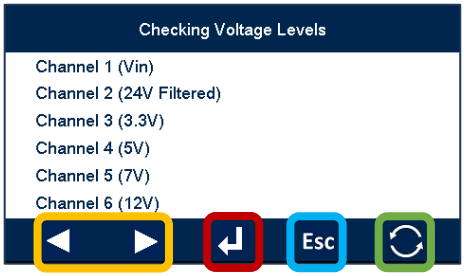
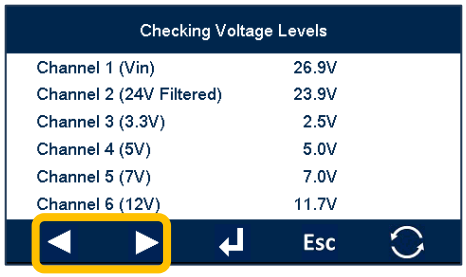
Press the **"Menu key"**	
The Instrument Settings Menu will appear Press the **"Up or Down key"** until **"Instrument Settings"** is highlighted Press the **"Enter key"**	
The Instrument Settings Menu will appear Press the **"Up or Down key"** until **"Hardware Setup"** is highlighted Press the **"Enter key"**	
The Hardware Set up Menu will appear Press the **"Up or Down key"** until **"Instrument Diagnostics"** is highlighted Press the **"Enter key"**	
From Diagnostic Menu screen press the **"Up or Down key"** until **"Manual Checking"** is highlighted Press the **"Enter key"**	

Instrument Diagnostics (Meaning of Voltage Levels)

Instrument diagnostics quickly tests voltages (V) across key hardware points and reports the following:

- **Channel 1 (Vin):** This is the Voltage Input from the external power supply.
- **Channel 2 (24V Filtered):** This is the filtered input voltage from the external power supply. Ensuring that that electrical noise has been removed and the voltage "cleaned up" for optimum instrument performance.
- **Channel 3 (3.3V):** This is an internal voltage and should be approx. 3.3V
- **Channel 4 (5V):** This is an internal voltage and should be approx. 5V.
- **Channel 5 (7V):** This is an internal voltage and should be approx. 7V.
- **Channel 6 (12V):** This is an internal voltage and should be approx. 12V.

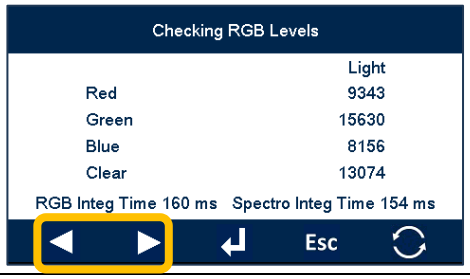
Please note small variances in Voltages are normal. Results of 0V are of concern and you should immediately contact your local **authorised Lovibond® Service Centre**.

The Diagnostic screen will be displayed showing the Voltage Check Screen Press the **"Enter key"** to begin manual testing Press the **"Left or Right key"** to change test type Press the **"Auto key"** to begin automatic testing of all types The screen will exit when this process has completed, or press the **"Esc key"** to manually exit	
The status of each test will be shown on the screen Press the **"Left or Right key"** to change tests When the routine has completed, a report can be sent to a connected printer Pressing **"Esc key"** at any time will exit the routine	

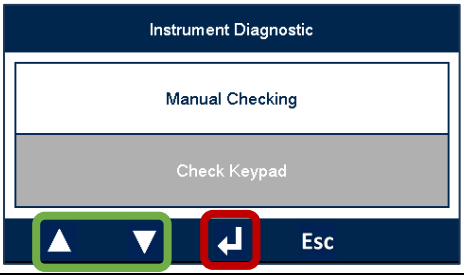
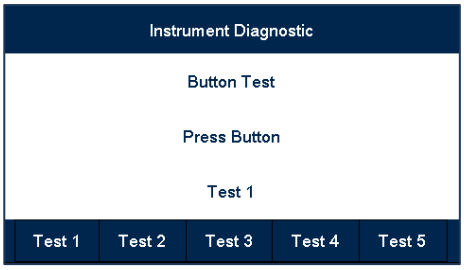
Instrument Diagnostics (Meaning of RGB Levels)

Instrument diagnostics quickly tests RGB light levels across key hardware points and reports the following:

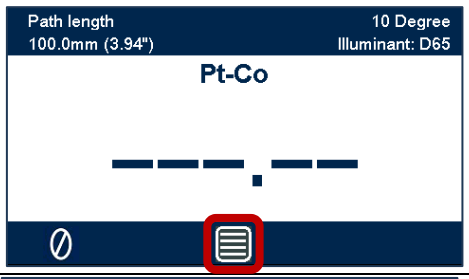
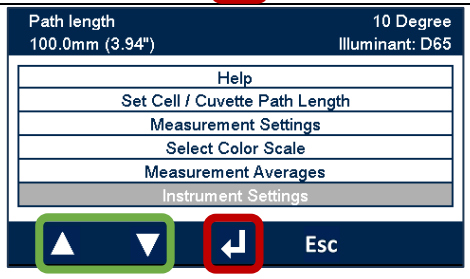
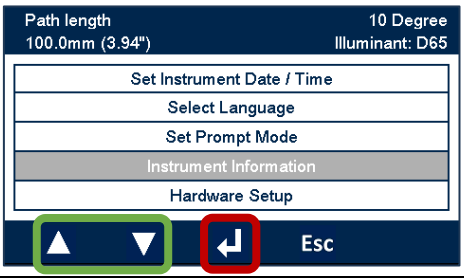
- **Red, Green and Blue:** will return a number; this indicated the amount of light detected and can vary between 5000 and 20000 depending on the colour of the light and the individual detector
- **RGB Integ Time:** This is how long the RGB sensor takes to measure the light. This can range up to 800ms.
- **Spectro Integ Time:** This is how long the spectrophotometric sensor takes to measure the light. This can range up to 800ms.

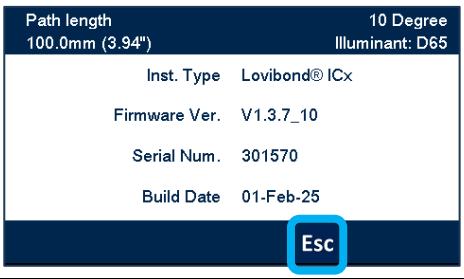
Pressing the **"Right key"** to move to the Testing of the Instrument Light Levels Press the **"Enter key"** to begin manual testing Press the **"Left or Right key"** to change test type Press the **"Auto key"** to begin automatic testing of all types The screen will exit when this process has completed, or press the **"Esc key"** to manually exit	
The status of each test will be shown on the screen Press the **"Left or Right key"** to change tests When the routine has completed, a report can be sent to a connected printer Pressing **"Esc key"** at any time will exit the routine	

Instrument Diagnostics (Check Keypad)

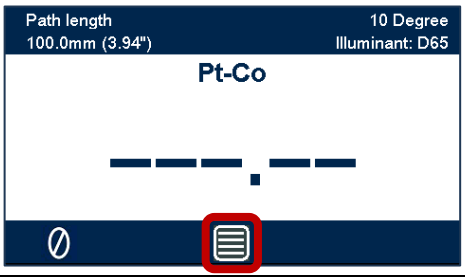
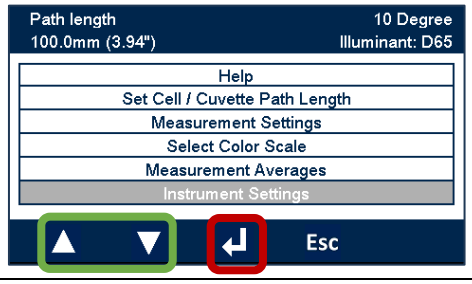
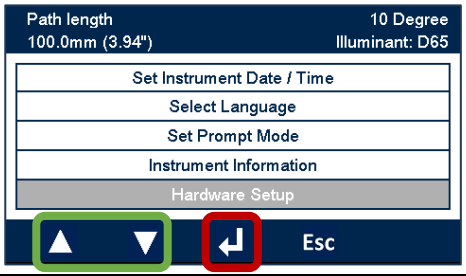
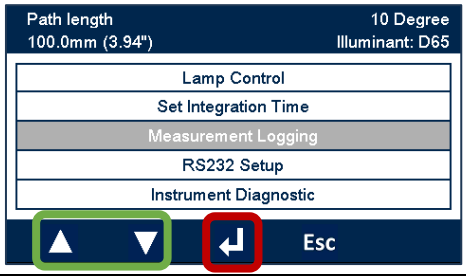
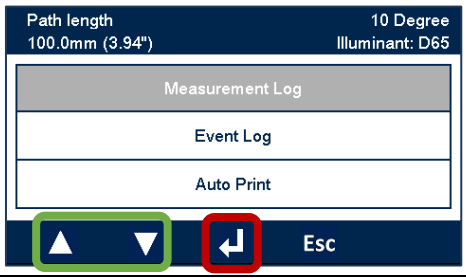
From Diagnostic Menu screen press the **"Up or Down key"** until **"Check Keypad"** is highlighted Press the **"Enter key"**	
Press each button in turn to test its function	
When the process is complete, press the **"OK key"** to return to the Diagnostic Menu screen	

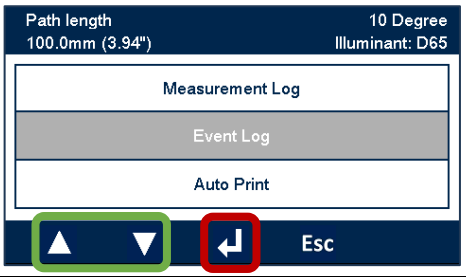
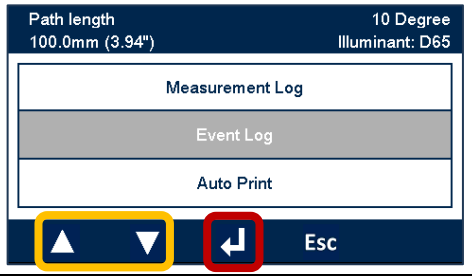
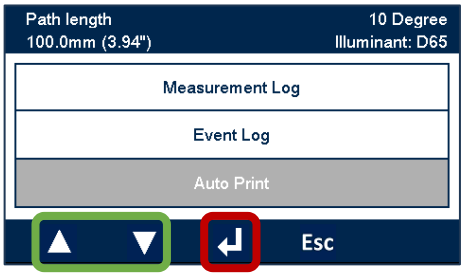
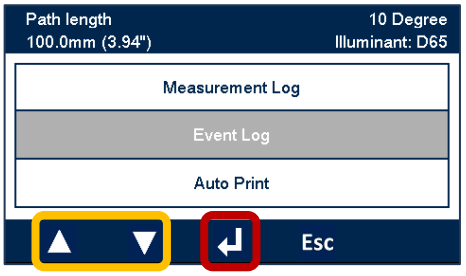
Instrument Information

Press the **"Menu key"**	
The Main Menu will appear Press the **"Up or Down key"** until **"Instrument Settings"** is highlighted Press the **"Enter key"**	
The Instrument Settings Menu will appear Press the **"Up or Down key"** until **"Instrument Information"** is highlighted Press the **"Enter key"**	

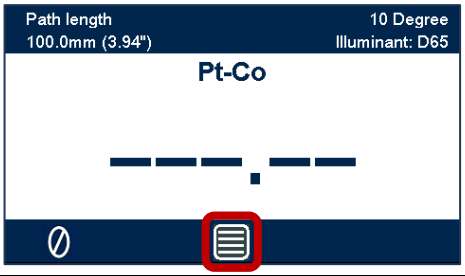
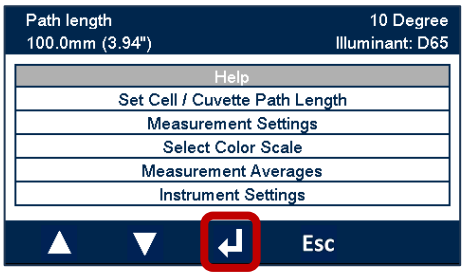
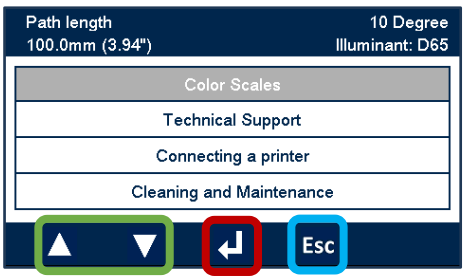
The Instrument Information screen will appear Press the **"Esc key"** to exit	

Measurement Logging, Event Logging & Auto Print

Press the **"Menu key"**	
The Main Menu will appear Press the **"Up or Down key"** until **"Instrument Settings"** is highlighted Press the **"Enter key"**	
The Instrument Settings Menu will appear Press the **"Up or Down key"** until **"Hardware Setup"** is highlighted Press the **"Enter key"**	
The Hardware Setup Menu will appear Press the **"Up or Down key"** until **"Measurement Logging"** is highlighted Press the **"Enter key"**	
From the Logging options, press the **"Up or Down key"** until **"Measurement Log"** is highlighted Press the **"Enter key"**	

Use the **"Left or Right key"** until the selected mode is highlighted Press the **"Enter key"** to save and return to the previous screen	
From the Logging options, press the **"Up or Down key"** until **"Event Log"** is highlighted Press the **"Enter key"**	
Use the **"Left or Right key"** until the selected mode is highlighted Press the **"Enter key"** to save and return to the previous screen	
From the Logging options, press the **"Up or Down key"** until **"Auto Print"** is highlighted Press the **"Enter key"**	
Use the **"Left or Right key"** until the selected mode is highlighted Press the **"Enter key"** to save and return to the previous screen	

Instrument Help

Press the **"Menu key"**	
The Main Menu will appear Press the **"Up or Down key"** until **"Help"** is highlighted Press the **"Enter key"**	
The Help Menu will appear Press the **"Up or Down key"** until your desired subject is highlighted Press the **"Enter key"** to view the contents Press the **"Esc key"** to exit	

Measurement best practice using Lovibond® cells

Cell orientation

When measuring Platinum-Cobalt values <20 it is advisable to take extra care in ensuring that the cells being used are undamaged and clean.

In addition, consistency in the orientation of the Borosilicate cells can also reduce inaccuracy.

Each Lovibond® glass cell is identified with the “Lovibond®” text at one end of the cell and the cells path length and type at the other end of the cell. In the case of the 100mm, W600, Borosilicate cell the text “100 mm B”.

Figure 6: Lovibond® cell with optional PTFE lid



When inserting your 100mm Lovibond Cell, always ensure the inscribed "Lovibond" text is facing towards you. This ensures maximum accuracy when measuring samples.

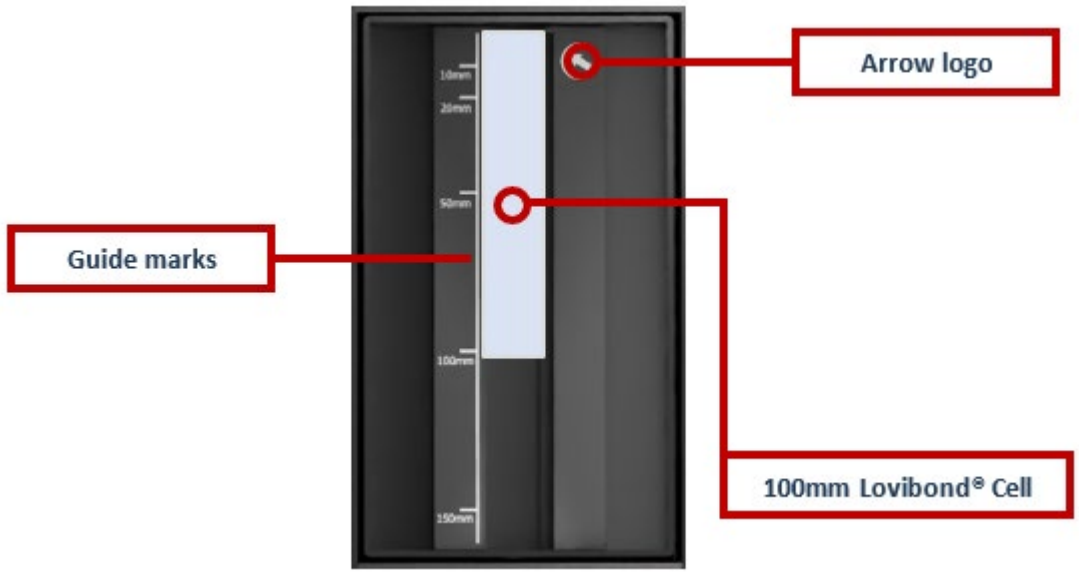
Variance in the orientation of the cell can cause variances in readings caused by the cell.

Cell positioning

When taking a **Baseline** or **Sample Measurement**, insert the cell (or conformance filter) by gently pushing it **forward and to the left**, following the arrow symbol and guide marks on the left side of the sample chamber.

This ensures the cell rests **firmly against the left wall**, remaining straight and consistently positioned for accurate and repeatable measurements.

Figure 7: Correct cell positioning



Cell handling

Each Lovibond® cell has clear glass windows at each end and frosted glass sides. The cell should only be handled by the frosted glass. Touching the clear glass windows risks leaving fingerprints and smears that, when measuring low Platinum-Cobalt values, can cause errors in the measured results.

Guide to cleaning and conformance

When the Lovibond® ICx, it is important to ensure that everything you use is as clean as possible. Any contamination on the cell or key areas of the instrument will lead to inaccurate results. This is particularly true of automatic instruments like the Lovibond® ICx which because of their enhanced precision are more sensitive to contamination.

Instrument visual inspection and diagnostics

Visual inspection of the condition of the instrument, particularly the measurement windows, should be combined with running the internal Instrument Diagnostics. See Section Instrument Diagnostics.

We recommend that these regular checks be combined with annual servicing of the Lovibond® ICx by an authorised Lovibond® Service Centre.

While damage or dirt on a cell is generally visible and easily corrected by cleaning or replacement, the same is not necessarily true of contamination of your Lovibond® ICx, which can build up over time.

Measurement of extremely corrosive samples

The Lovibond® ICx has an optional Chemically Resistant Sample Chamber.

Part number	Description
169305	ICx Chemically Resistant PTFE Replacement Sample Chamber

Preventing contamination and cleaning cells

To prevent contamination and maintain measurement accuracy, regular **conformance checks** should be part of your routine.

Dirty or contaminated cells can negatively affect results. Before use, ensure the clear ends of the cell are **free from fingerprints, smears, dust, or residue**. Most surface contamination can be removed with a soft, lint-free cloth.

New cells should be cleaned before first use. Although protective wrapping prevents physical dirt, it may leave an invisible film on the glass surface that must be wiped clean.

Before cleaning, always consult the **Material Safety Data Sheet (MSDS)** for your sample material and follow all safety recommendations.

To clean inside the cell:

- Use a **soft brush** and gently wash with **warm water**.
- If necessary, use a mild detergent that is chemically compatible with your sample.
- For stubborn residue, a suitable solvent such as **isopropanol** may be used. Ensure that any solvents are safe for your application and that appropriate safety measures are taken.

After cleaning:

1. Rinse thoroughly with clean **tap water**.
2. Perform a final rinse with **purified water** to prevent residue build-up.
3. Drain the cell **upside down** and allow it to dry completely.

Do not use wet cells, as residual moisture may dilute the sample and compromise accuracy.

Cell Material & Maintenance

Each Lovibond® ICx is supplied with a **Lovibond® W600 Borosilicate Cell**. Like optical glass, borosilicate is transparent to visible light (400–700 nm), but offers superior resistance to chemical degradation, particularly from acids and alkalis.

We recommend **regular inspection** of all cells. Replace any that show signs of damage or discolouration.

Replacement cells can be ordered by quoting the appropriate Lovibond® item code.

Lovibond cells are described as follows (W600/B/100):

W600 = Type of cell & size/height etc.
OG = Optical glass
B = Borosilicate glass for high temperature and corrosive samples
100 = 100 mm path length

Certified Conformance Standards & Liquids

After the initial compatibility of an instrument has been established, it is critical that its long-term accuracy is monitored and maintained.

Conformance Standards and Standard Reference Materials (SRM's).

Lovibond® manufacture SRM's in the form of **Glass Conformance Filters** and **Liquid References**. These are highly characterised, certified materials used as conformance standards for instruments and measurement methods. In industry the term SRM and conformance standard are often used interchangeably.

Tintometer Limited is accredited to **ISO/IEC 17025:2017 – General Requirements for the Competence of Testing and Calibration Laboratories**. This accreditation confirms technical competence for a defined scope, as detailed in the certification schedule, and demonstrates that a management system is in place (refer to the joint ISO–ILAC–IAF Communiqué, April 2017).

ISO/IEC 17025 accreditation provides assurance of **measurement traceability**—linking results to a recognised metrological reference through an unbroken chain of calibrations. Each step in the chain contributes a defined uncertainty to the final result.

Each Lovibond® ICx includes a *CIEL*a*b* Glass Conformance Filter*, used to monitor instrument performance. Refer to the section *Glass Conformance Filters* for guidance on correct use.

It is also recommended to verify the instrument's performance on the **Platinum-Cobalt (Pt-Co) scale**. This can be done by regularly measuring a **certified liquid reference** and comparing the result with the certified value provided.

By using one or more conformance checks, you can ensure your instrument provides **consistent, reliable results over time** and aligns with other instruments using the same test methods. Routine verification also helps identify performance deviations early, reducing the risk of costly errors and enabling timely corrective action.

Liquid Reference Standards

Liquid references offer key advantages over glass conformance filters, most notably because they closely resemble the samples measured in routine testing.

Using liquid references can help identify issues not only with instrument performance, but also with sample handling and measurement procedures, such as correct path length cell, cell cleanliness and proper cell positioning in the instrument sample chamber.

Liquid references provide a more comprehensive check of both instrument accuracy and operator technique.

When using a liquid refence the following steps should be followed:

1. **Lovibond® Pt-Co standards require the use of a 100mm path length cell.**
2. **Perform a Baseline Measurement with purified water in a 100mm path length cell.**
3. **Measure your liquid reference sample using the same, cleaned, cell.**
4. **Review the results in comparison to the certified values of the reference standard.**

5. **Dispose of the used liquid reference sample.**
6. **Do not pour back into the bottle, as this will contaminate the remaining reference material.**

The Tintometer® Group offers 500ml liquid reference standards. Each standard is shipped with a certificate of calibration, MSDS and 12-month guarantee of colour stability.

Glass Conformance Filters

Glass conformance filters offer several practical advantages over liquid references:

- **No risk of spillage**
- **Compact and easy to store**
- **Simple to clean if contaminated**

Their use is independent of sample preparation and operator technique, making them particularly useful for verifying **instrument stability alone**.

However, this also means that the **measurement procedure differs** slightly from that used with liquid references.

When using a glass filter, always perform the **Baseline Measurement with the sample chamber empty**.

When using a glass reference the following steps should be followed:

1. **Perform a Baseline Measurement with the instrument sample chamber empty.**
2. **Visually check that your glass conformance filter is undamaged, free of dirt and fingerprint marks.**
3. **Place your glass conformance filter in the sample chamber with the numbered 'CS label' facing the measurement window of the Lovibond® ICx. Carefully pushed forward and to the left, as per the arrow logo. This ensures that the glass is as close to the measurement window as possible.**
4. **Measure your glass conformance filter.**
5. **Review the results in comparison to the certified values of the reference standard.**

Each Lovibond® ICx ships with a CIEL*a*b* Glass Conformance Filter. This is ideal tool to check instrument performance independent of cells and sample preparation. The Filter is accompanied with a paper Certificate of Conformity. If you mislay the Certificate, contact Lovibond® with the CS number of your filter and we will provide you with a digital copy.

Lovibond® offers a range of individual filters and filter sets for various instruments and colour scales. Each item is supplied with a **certificate of conformity**, stating the **certified value**, **acceptable tolerance**, and applicable **scale, nominal value, and instrument**.

Assessing Instrument Performance

When assessing the performance of instrumentation understanding key terms like repeatability, reproducibility, and accuracy is essential for ensuring reliable results. ASTM E284 provides standardised definitions for these concepts, which are used to assess the performance of measurement system. They are as follows

Repeatability: The closeness of agreement between the results of successive measurements of the same test specimen, or of test specimens taken at random from a homogeneous supply, carried out in a single laboratory by the same method of measurement, operator, and measuring instrument with repetition over a specified period of time (usually the shortest possible).

Reproducibility: The closeness of agreement between the results of successive measurements of the same test specimen, or of test specimens taken at random from a homogeneous supply, but changing conditions such as laboratory, operator, measuring instrument, or time.

Accuracy: The closeness of agreement between a test result and an accepted reference value.

Unexpected Instrument Performance

Inappropriate choice of path length.

The Lovibond® ICx calculates Pt-Co values measured using a Lovibond® 100mm path length cell. **Do not use other path lengths for Pt-Co measurements.**

Limitations and Errors Associated with Automatic Measurement

Use with samples which are turbid, cloudy, crystalline, contain particulates or bubbles.

This will negatively affect colour measurement since turbidity, cloudiness, crystals, particulates and bubble all prevents light being transmitted through the sample and will cause reading errors.

Lack of care in sample cell cleaning and sample preparation.

If the cell is unclean, it will have a detrimental effect on the measurement being performed by providing incorrect readings. Please ensure that the clear ends of the cell are completely free from fingerprints, smears, dust or sample residue. This sort of contamination can often be cleaned off with a soft cloth.

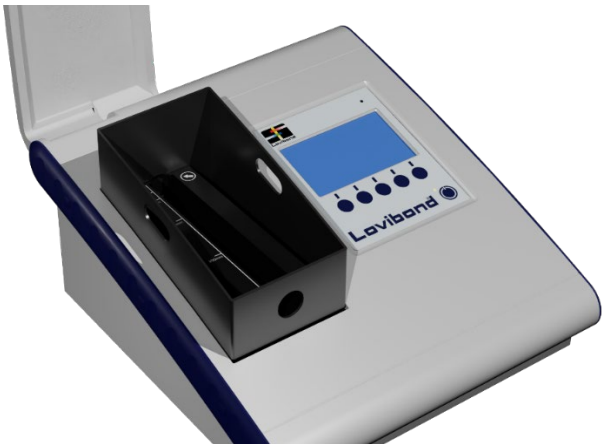
Any contamination, uneven mixing or a temperature gradient might distort the light transmitted through the sample and affect measurements.

Maintenance

Cleaning the Sample Chamber

The sample chamber can be removed for routine cleaning or replacement. To remove the sample chamber, open the sample chamber lid to its full extent. The sample chamber can then be lifted free from the instrument base as shown in the image below.

Figure 8: Lifting the Sample Chamber free.

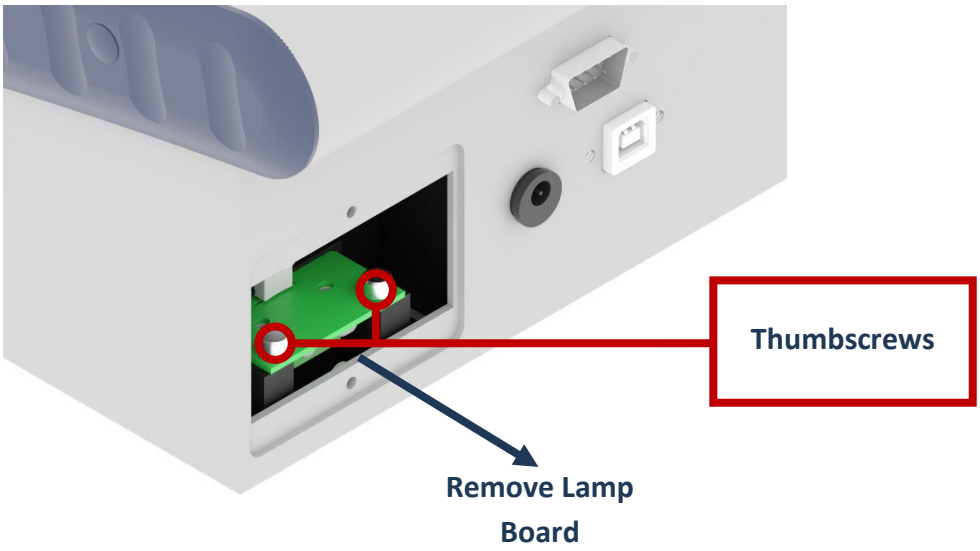


Replacing the Lamp

The expected lamp life is 600,000 measurements before failure. When replacing the lamp, always unplug the instrument from the power supply. Undo the two thumbscrews at the back of the instrument and remove the lamp plate, then undo the thumbscrews on the lamp assembly, remove the Lamp PCB and replace with the new Lamp PCB.

Do not touch the glass lens on the lamp, as fingerprints will impair its performance. Replace the lamp block and tighten the thumbscrews.

Figure 9: Replacing the lamp.



The Platinum Cobalt (Pt-Co) scale

The Platinum Cobalt scale is a standardised colour scale used to measure the colour of clear liquids. It is also commonly known as the Hazen or APHA colour scale. This scale quantifies colour in terms of yellow tint from dissolved substances, primarily for water and transparent liquids.

The scale ranges from 0 (completely clear) to 500 (dark yellow), measured by comparing the liquid's colour to a series of dilutions of a standard platinum-cobalt solution. The standards associated with this scale, ASTM D1209, ASTM D5386, and ISO 6271, offer methodologies for determining the colour of liquids. While ASTM D1209 relies on visual assessment, ASTM D5386 and ISO 6271 employ spectrophotometric techniques, all of which are essential for ensuring chemical purity and consistency in various industrial applications.

ASTM D1209-05 (2019)

Standard Test Method for Color of Clear Liquids (Platinum-Cobalt Scale)

This test method describes a procedure for the visual measurement of the colour of essentially light-coloured liquids. It is applicable only to materials in which the colour-producing bodies present have light absorption characteristics nearly identical with those of the platinum-cobalt colour standards used.

This test method is similar to the description given in Standard Methods for the Examination of Water and Wastewater and is referred to by many as “APHA Color.”

ASTM D5386-24 (2024)

Standard Test Method for Color of Liquids Using Tristimulus Colorimetry

This test method covers an instrumental method for the CIE (Commission International de l’Eclairage) tristimulus measurement of the colour of near-clear liquid samples. The transmission measurement values are converted to the colour scale in the platinum-cobalt (Pt-Co) system.

This test method has been found applicable to the colour measurement of clear, liquid samples, free of haze, with nominal Pt-Co colour values in the 0 to 100 range. It is applicable to non-fluorescent liquids with light absorption characteristics similar to those of the Pt-Co colour standard solutions.

Because water is used to standardise (we use the term Baseline Measurement) the Lovibond® ICx, a definition to note in ASTM D5386-24 is the Purity of Water—References to water shall be understood to mean clear, colourless water, conforming to Type I or Type II of Specification ASTM D1193.

It should be noted that in ASTM D1193-06 (2018), Type IV is the lowest purity. Type I, the highest purity, was used throughout the development of the Lovibond® ICx.

ASTM D5386 instructs the performing of three (3) measurements without replacing the sample. Calculating the average taken from the three (3) measurements to be the Pt-Co reading for the sample. It also states that Pt-Co reading for the sample should be rounded to the nearest whole number.

ISO 6271

Clear liquids- Estimation of colour by the platinum-cobalt colour scale

Specifies a spectrophotometric method for estimating the colour of clear liquids in terms of platinum-cobalt units (Pt-Co units). The spectrophotometric method provides a more precise way of measuring Pt-Co colour than a visual sample comparison by human eyes.

ISO 6271 includes the following statement: ***"The term 'Pt-Co colour' used here is standardised over the terms 'Hazen colour' and 'APHA colour'".***

ISO 6271 states that if the material being measured shows any visual haziness, remove the haze e.g. by filtration, centrifugation, heating, ultrasonic treatment or any other suitable means. If haziness cannot be removed, the measure value will be unreliable. It also states that care should be made not to touch the measurement area of the cell and that air bubbles should be removed.

Yellowness Index

ASTM E313-20

Standard Practice for Calculating Yellowness and Whiteness Indices from Instrumentally Measured Color Coordinates

Yellowness Index (YI) is a number calculated from spectrophotometric data that describes the change in colour of a test sample from colourless through to yellow.

When evaluating the yellowness of transparent liquids such as electrolytes or solvents, the ASTM E313 Yellowness Index becomes a useful tool to quantify discolouration, which can serve as an indicator of contamination or degradation.

Low YI values indicate minimal yellowing or a very clear, colourless appearance. A moderate YI points to a slight yellow tint. High numbers represent significant yellowing. For a liquid, this could indicate severe contamination, chemical degradation, oxidation, or the breakdown of stabilizers, depending on the substance being evaluated.

CIEL*a*b*

The **CIEL*a*b*** colour space—also referred to as **CIELAB**—is defined in multiple international standards, including those from **ASTM**, **ISO**, and the **CIE** (International Commission on Illumination), which originally developed the system.

CIEL*a*b* is a **three-dimensional colour space** designed to represent all perceivable colours based on human vision. It provides a more **uniform representation of colour differences** compared to earlier models. The three axes are:

- **L***: Lightness (0 = black, 100 = white)
- **a***: Green–Red axis (negative = green, positive = red)
- **b***: Blue–Yellow axis (negative = blue, positive = yellow)

CIEL*a*b* is widely used in industries where **accurate colour measurement** is essential, such as printing, textiles, coatings, and plastics. A key advantage of the system is its **perceptual uniformity**—numerical differences in CIEL*a*b* closely correspond to how colour differences are perceived by the human eye.

It also forms the basis for calculating **colour differences** using the **ΔE* (Delta E)** metric, which quantifies how much two colours differ.

Due to its accuracy and versatility, CIEL*a*b* has become a **global standard** for colour evaluation and is commonly referenced in quality control standards.

Regulatory and Declaration of Conformity

Disposal of Waste Electrical and Electronic Equipment



This symbol on the product or on its packaging indicates that this product shall not be treated as general waste. Instead, it shall be handed over to an applicable recycling scheme or the original manufacturer for the recycling of electrical and electronic waste.

By ensuring that this product is disposed of correctly, you will help prevent potential negative consequences for the environment and human health, which could otherwise be caused by inappropriate waste handling of this product.

The recycling of materials will help conserve natural resources. For more information about recycling this product, please contact your waste disposal service, the manufacturer, or the company from where you purchased this product.

A moulded plug is fitted to the mains power cable for your safety and convenience. Do not attempt to alter or replace this plug. If the plug becomes damaged, contact an approved service centre.

The Lovibond® ICx weighs 5.5 kg. One person may easily lift it by placing their hands at either end of the instrument and lifting. Carefully remove the Lovibond® ICx from its packing case.

The power supply, mains lead, and accessories are all included in the packaging, ensure these are not discarded.

Declaration of Conformity

The Tintometer Ltd declares that the stated product(s) below conform to the following directives / standards:
DIRECTIVES 2014/30/EU 2014/35/EU
STANDARDS TO WHICH CONFORMITY IS DECLARED EN 61326-2-1. CISPR 11, EN 61000-4-3, EN 61000-4-8, EN 61000-4-2, EN 61000-3-2, EN 61000-3-3, EN 61000-4-11, EN 61000-4-6, EN 61000-4-4, EN 61000-4-5. FCC CFR 47 Parts 15.107 & 15.109, ICES Issue 6. ANSI C63.4 BS EN 61010-1
TYPE OF EQUIPMENT Spectrocolorimeter
MODEL(S) CTL-400-1001

Signed On Behalf Of The Tintometer Ltd By:		
Name: N Barnes Title: Technical Manager	Signature: N. Barnes.	Date: 28/5/2019

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Issue: Rev 1

Technical Specifications

Performance Specifications	Information
Measurement method	Spectrometer
Lamp source	Tungsten Halogen
Wavelength range	400 - 700 nm
Photometric measuring range	0 - 100% Transmittance
Wavelength accuracy	0.2 nm
Spectral resolution	15 nm (Maximum Resolution)
Photometric accuracy	0.2% Transmittance
Photometric linearity	± 0.01% Transmittance
Stray light	Less than 0.01% Transmittance
Repeatability	± 0.25% Transmittance
Wavelength resolution	2.0 nm (Average Interval)
Detectors	Diode array spectrometer

Physical & Environmental Specifications	Information
Enclosure	Powder coated aluminium
Width	310 mm
Height	150 mm
Depth	335 mm
Weight	5.5 kg
Environmental conditions (operating mode)	Temperature : +5°C - +40°C Relative Humidity (non-condensing) : 0% - 90%
Environmental conditions (storage)	Temperature : -20°C - +85°C Relative Humidity (non-condensing) : 0% - 85%
Power	Universal via external power supply: Input range: 100 VAC to 240 VAC. 60 watts (24 volts) Frequency: 50 to 60 Hz

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