

SpectroEye™

Operating Manual



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Welcome!

SpectroEye is a spectrophotometer which has a fully modular structure, and so is extremely flexible and easy to use. The purpose of this manual is to illustrate the various fields of application and how to integrate SpectroEye into your working environment in the most effective way possible.

We hope you enjoy reading the manual, and enjoy working with your SpectroEye as well.

We welcome any suggestions or ideas you may have for improvements. Contact us through your authorised dealer, or via the Internet!

The X-Rite SpectroEye team.

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Specific safety recommendations



This section contains particularly important information for the correct use of the instrument and for achieving good results. Failure to observe these warnings could result in errors or loss of data!



Failure to observe the following recommendation could result in damage to the SpectroEye or other equipment, for which X-Rite declines all responsibility.



Failure to observe the following recommendations could compromise personal safety and that of others.

Additional function symbol



The function described here is not part of the SpectroEye LT specifications. The corresponding description should only be read if the related function package is installed on your instrument.

Other recommendations

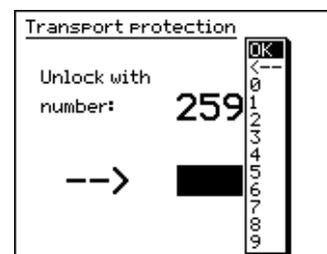


If additional information on the subject illustrated is contained in other sections of the manual, the "book" symbol refers to the corresponding chapter.



Brief recommendations for putting theoretical information into practice.

Screenshots



Brief guide to the manual

The manual is divided into four chapters: Set-up, Use, Practice and Appendix. The content of each chapter is given to the right. This system gives quick and precise access to the information you require.

The page layout of the manual includes two columns. The wider text column contains all the functional descriptions, examples and explanations. These are clarified, integrated or indicated by additional information, such as "Screenshots" and recommendations, highlighted in grey in the outer column. We recommend getting to know these supplements and their relative symbols by carefully reading the corresponding explanations in the left margin.

As well as important safety recommendations, this chapter contains all the information necessary for setting-up and using the measuring device.

Set-up

1

This chapter is an introduction to the operating principles of the device. It illustrates how to make chromatic measurements and comparisons with the SpectroEye through a number of classic application examples.

Use

2

In this chapter we will take a detailed look at selected functions which highlight the high standard of the SpectroEye unit.

Functions

3

This chapter describes the maintenance procedures for the SpectroEye, lists the technical specifications and states the declaration of conformity to industrial standards.

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1 Set-up

1.1 General

1.1.1 General safety recommendations

Failure to observe the safety recommendations and instructions given by this manual may result in measurement error and loss of data, as well as damage to persons and property.



SpectroEye is not flameproof, therefore the device must not be used in environments where the risk of explosion exists, or in areas subject to strong electromagnetic fields.

Do not use SpectroEye in ambient temperatures in excess of 35°C (95° F).

Never open SpectroEye. Unauthorised opening of the device shall immediately invalidate the warranty. For any repairs, contact your authorised dealer.

Ensure that the supply cable provided is connected to a mains socket equipped with earth contact to avoid a shock hazard.



To avoid operating errors, SpectroEye should be used exclusively by specifically trained personnel.

SpectroEye must only be used on dry, flat, horizontal and stable surfaces, and must not be exposed to direct sunlight.

SpectroEye must only be used in the operating conditions specified below.

SpectroEye must be protected from chemical substances, corrosive vapours, strong mechanical vibration and impact.

Use only X-Rite original spare parts and accessories.

For transport purposes only use the original packing and secure the instrument with the transport protection (Settings > General > Transport protection).



The SpectroEye case must be kept clean using a clean cloth slightly dampened in soapy water.

The white calibration tile should be cleaned at least once a year according to the instructions in chapter 4.1 (depending on usage and dust in environment)

X-Rite recommends to verify your SpectroEye regularly with NetProfiler and/or to recertify it. Contact your X-Rite dealer or your nearest X-Rite service center to find out more about NetProfiler and/or recertification.



The specified operating conditions are given in the appendix under item 4.3 "Technical specifications".



Read chapter 1.3.

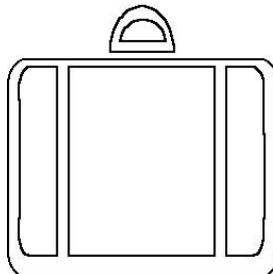


It is advisable to keep the case in good condition ! If the SpectroEye has to be transported or shipped, it must be packed in the original case to avoid damage. X-Rite declines all responsibility for damage to the SpectroEye during transport caused by inadequate packaging.

1.1.2 Supply specifications

1.1.2.1 Basic equipment and accessories

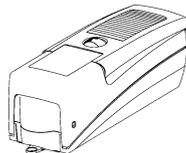
The SpectroEye and related standard accessories are delivered in a case.



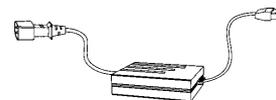
On delivery, check that the content of the case is complete.

The following elements must be present:

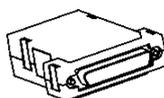
1. SpectroEye



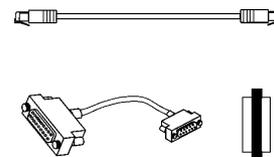
2. Battery charger



3. Communications adapter



4. Connecting cable set



5. Operating manual



1.1.2.2 Equipment firmware

The firmware for the SpectroEye has a modular configuration. This means that the range of functions must be configured according to requirements when the device is purchased, and that possible supplementary functions can be added at any time.

- **SpectroEye LT is equipped with the following standard measurement functions:**

Densitometry	- Density - All densities - Dot gain - Dot area - Contrast - Trapping - Print characteristic - Auto function
Colorimetry	- CIELAB with CIE L*a*b*, CIE L*C*h (a*b*) and ΔE CIELAB



- **SpectroEye is equipped with the following additional standard measurement functions:**

Spectrum	- Reflection spectrum
Color difference	- ΔE^*94 , ΔE^*2000 , ΔE^* CMC, ΔE^* FMCII
Special functions	- Best Match
Color guides	- Pantone® Formula Guide

- **The following additional functions may be purchased and enabled:**

Densitometry	- Hue error - Greyness - Printing plate
Spectrum	- Density spectrum
Colorimetry	- CIE XYZ, CIE xyY - CIELUV with CIE L*u*v*, CIE L*C*h (u*v*) and ΔE CIELUV - LABmg, LCHmg and ΔE mg - Hunter Lab and ΔE Hunter Lab - Reflection factor RxRyRz
Color difference	- Metamerism
Dye strength	- Absolute (K/S) and relative (DS)
White- and Yellowness	- W CIE, W E313, W Berger, W Stensby, ISO Brightness R457, Y E313, Y D1925, T CIE
Color guides	- HKS E/K/N/Z, DIC Color Guide
Security	- Setting protection - Multiple users



Indications regarding basic and supplementary functions are as per October 2007. Modifications may be made at any time.

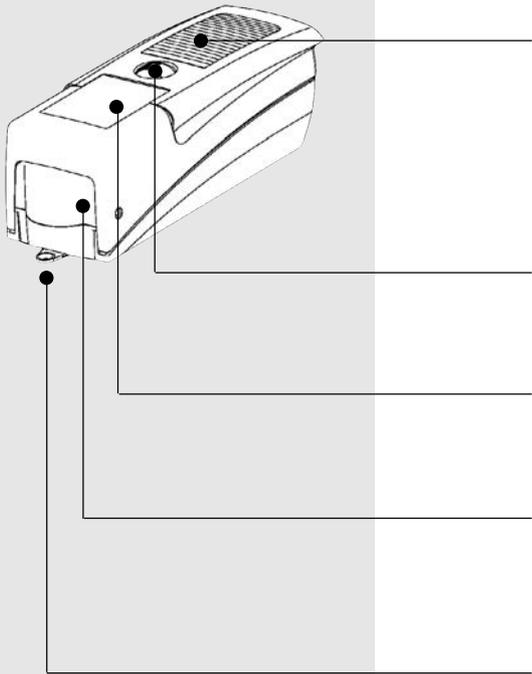
Contact your X-Rite dealer who will be happy to inform you of any innovations or variations.



When reading this manual, check if the description of these supplementary functions is indicated by the puzzle symbol. This will save you the time of reading sections regarding functions which are not applicable to your instrument.

1.1.3 SpectroEye functional elements

1



Measurement pad

Pressing lightly on this pad starts a measurement or selects the menu option highlighted on the display.

Control wheel

Instrument firmware functions, menu options or measurement windows can be selected using this wheel.

The display

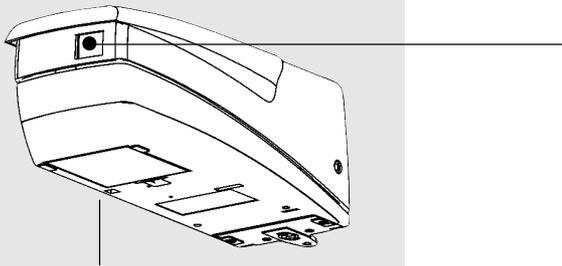
The display is easy to view and has graphic capabilities. It displays the available functions and measurement results.

Measurement module

The moving measurement head contains the optics, the built-in white reference and automatic filter wheel, in a high precision multiple use measurement module.

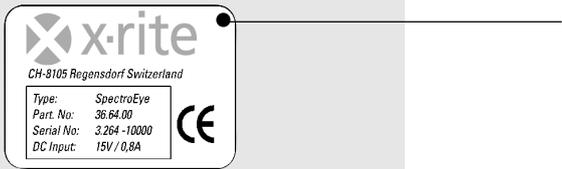
Targeting aperture

The targeting aperture is fully visible. Quick and accurate positioning is simple even with small color patches and color bars.



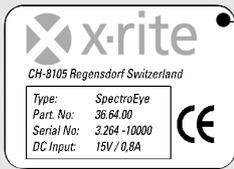
Data port

The SpectroEye is equipped with a multi-function port. Data exchange, protocol management and battery charging are all performed by the same interface.



Serial plate

The certification plate gives the main specifications of the SpectroEye at a glance. The serial number of the instrument is very important, and must be quoted when contacting X-Rite either by phone or via the Internet.



1.2 SpectroEye preparation

1.2.1 Charging the batteries

The SpectroEye is subject to quality control and the batteries are charged prior to delivery. If a long period of time passes between delivery from X-Rite and Set-up, the instrument must be recharged using the battery charger supplied.

Procedure

1. Connect the battery charger to the mains supply by means of the mains cable
2. Insert the charging plug into the SpectroEye port
3. Recharge the instrument for approximately three hours
4. Remove the charging cable and disconnect the battery charger from the mains when charging is complete

1.2.2 Transportation safety deactivation

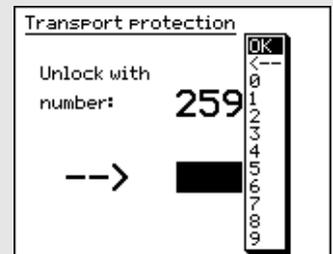
The SpectroEye is fitted with an electronic transportation safety system, which prevents involuntary operation and thus damage to the measuring head due to impact or vibration during transport.

Procedure

1. Press the measurement pad area down for about three seconds to cancel any input which may have been created by transport and unpacking movements.
2. Briefly press the measurement pad. The display shows the field for entering code **259** and a window for the number selection.
3. At this point enter the numbers 2, 5 and 9 in succession, pressing the measurement pad each time to choose a number. If a mistake is made during code entry or you wish to cancel a single entry, bring the cursor bar to **←** and press the measurement pad. To cancel the entire sequence, keep the measuring pad pressed for about three seconds.
4. If the figures have been correctly entered, bring the cursor bar to the **OK** field and press the measurement pad. The display will then show a menu.
5. Bring the cursor bar to the item **Return** on the displayed menu and press the measurement pad until the main menu appears.



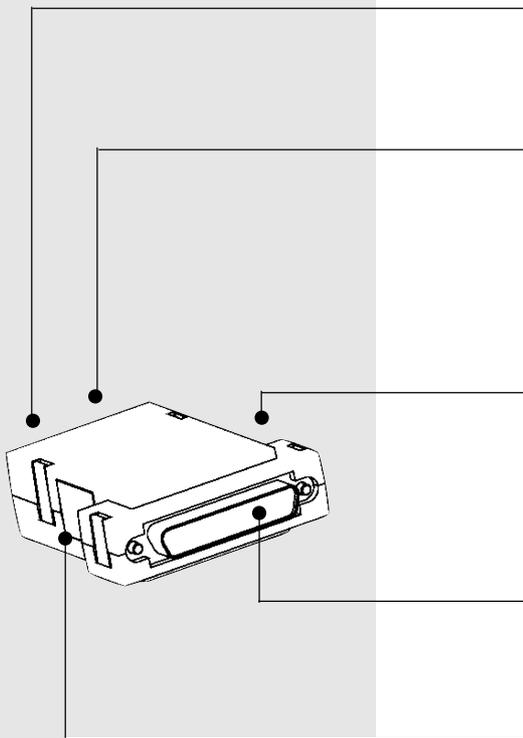
During the recharging process the SpectroEye tends to become warm. This is due to the rapid charge system and is perfectly normal.



For transportation always secure the instrument with the transport protection (read chapter 1.3).



If the SpectroEye does not require connection to any other instrument, the battery charger can also be connected directly.



1.2.3 SpectroEye connection options

The SpectroEye connection socket is multi-functional, meaning that the power supply, serial communications and the Ethernet are built into one socket. It is possible to connect single devices directly to the SpectroEye, or various devices simultaneously by means of the communications adapter.

1.2.3.1 Communications adapter

This adapter connects the SpectroEye to all the possible accessories: computer (PC or MAC), printer or battery charger. Various connections can be made simultaneously through the adapter, with only one cable connected to the instrument itself.

Instrument

The SpectroEye is connected to the connector cable through this socket.

Ethernet = / Power

Ethernet or the battery charger can be connected to this socket. This Ethernet connection is not crossed and can be used when the SpectroEye is connected to the network via a Hub. If the socket is not used for Ethernet, the battery charger can be connected here.

Ethernet X / Power

Ethernet or the battery charger can be connected to this socket. This Ethernet connection is crossed, and is used when the SpectroEye is connected directly to a PC. If the socket is not used for Ethernet, the battery charger can be connected here.

Serial 1

This socket is used for serial communications if a Mini DIN shaped plug is not available.

Serial 2

This socket is used for serial communications if a Mini DIN shaped plug is available.

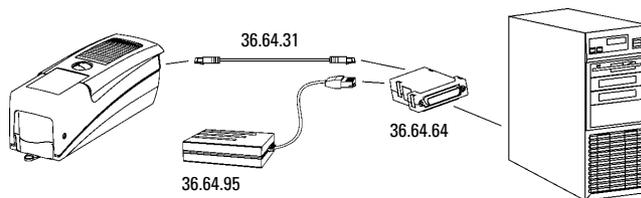
1.2.3.2 Connecting the battery charger

1. Insert connecting cable 36.64.31 into the SpectroEye data port.
2. Insert the other end of the connecting cable into the instrument socket of the communications adapter.
3. Insert the battery charger plug into a free Power socket on the communications adapter. The battery charger is connected to the mains electricity supply by means of the power cord supplied.

1.2.3.3 Connecting to a serial port

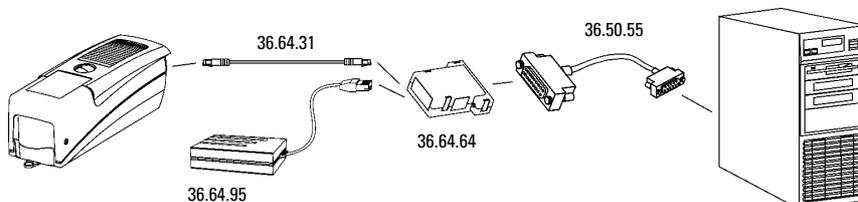
Connecting to a 25 pin serial interface port

1. Insert connecting cable 36.64.31 into the SpectroEye data port.
2. Insert the other end of the connecting cable into the instrument socket of the communications adapter.
3. Connect the Serial socket on the communications adapter to the serial port.



Connecting to a 9 pin serial interface port

1. Insert connecting cable 36.64.31 into the SpectroEye data port.
2. Insert the other end of the connecting cable into the instrument socket of the communications adapter.
3. Insert the intermediate cable 36.50.55 between the Serial socket on the communications adapter and the serial port.



Take care to use the right connecting cable!



Take care to use the right connecting cable!



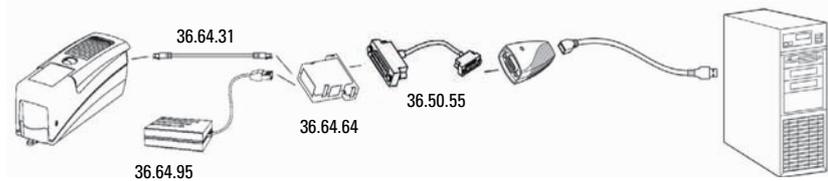
Take care to use the right connecting cable!



Take care to use the right connecting cable!

1.2.3.4 Connecting to a USB port

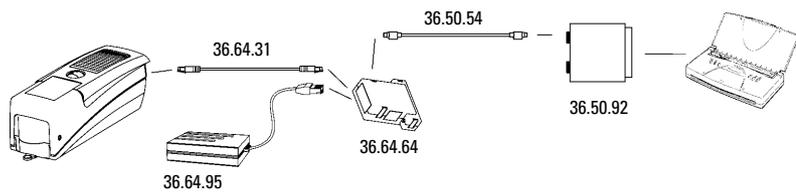
1. Insert connecting cable 36.64.31 into the SpectroEye data port.
2. Insert the other end of the connecting cable into the instrument socket of the communications adapter.
3. Insert the intermediate cable 36.50.55, the USB-Serial adapter and the USB cable between the Serial socket on the communications adapter and the USB port.



1.2.3.5 Connecting to a printer

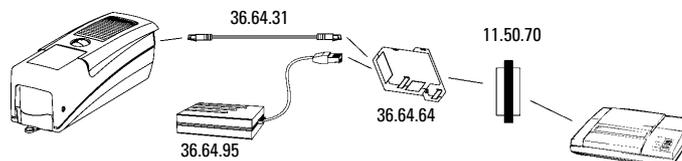
Connecting a printer through a parallel interface

1. Insert connecting cable 36.64.31 into the SpectroEye data port.
2. Insert the other end of the connecting cable into the instrument socket of the communications adapter.
3. Insert converter 36.50.92 into the printer interface port.
4. Connect the converter with the proper battery charger.
5. Insert the intermediate cable 36.50.54 between the communications adapter Serial port and the converter.



Connecting to a printer with serial interface

1. Insert connecting cable 36.64.31 into the SpectroEye data port.
2. Insert the other end of the connecting cable into the instrument socket of the communications adapter.
3. Insert adapter 11.50.70 between the communications adapter Serial port and the printer.



For connecting to the specific Seiko model DPU 411 or DPU 414 printer, read section 1.2.3.6.



Take care to use the right connecting cable!

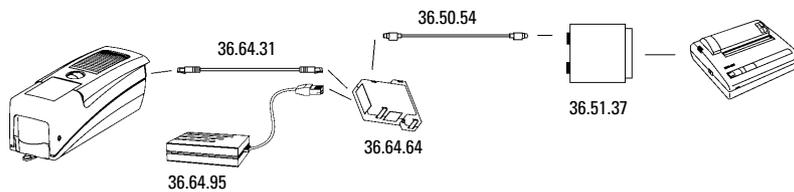


Take care to use the right connecting cable!

1.2.3.6 Connecting to a Seiko printer

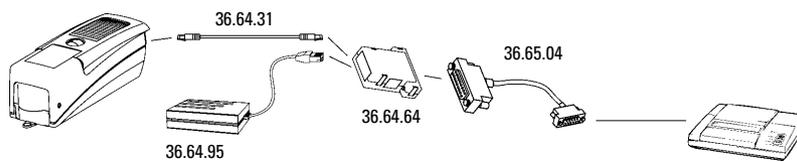
Connecting to a Seiko model DPU 411 printer

1. Insert connecting cable 36.64.31 into the SpectroEye data port.
2. Insert the other end of the connecting cable into the instrument socket of the communications adapter.
3. Insert Seiko adapter 36.51.37 into the printer interface port.
4. Insert the intermediate cable 36.50.54 between the communications adapter Serial port and the printer interface port.



Connecting to a Seiko model DPU 414 printer

1. Insert connecting cable 36.64.31 into the SpectroEye data port.
2. Insert the other end of the connecting cable into the instrument socket of the communications adapter.
3. Insert the intermediate cable 36.65.04 between the communications adapter Serial port and the printer interface port.



Take care to use the right connecting cable!



Take care to use the right connecting cable!



X-Rite declines all responsibility for damage to the SpectroEye during transport caused by inadequate packaging and protection.

1.3 Transport

For transporting the SpectroEye, always use the original case and secure the instrument with the transport protection.

To activate the transport protection, select the following from main menu:

Settings > General > Transport protection > Lock transport protection

and confirm with **Yes**.

To remove the transport protection, simply enter the number **259**.

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2. Use

The SpectroEye has just two control devices to control the instrument operations, the control wheel and the measurement pad. The measurement pad is designed according to technical-application criteria so the functions can be adapted to individual user requirements quickly and easily.

Based on concrete examples, this chapter illustrates both the principles of the instrument and its use.

2.1 Instrument philosophy and firmware structure

The starting point for instrument use is the **Main Menu** (see figure). The **Main Menu** is subdivided into three activity sectors as follows:

1. **Colour measurement and comparison**
2. **Data management**
3. **User selection**



A detailed illustration of these three sectors is given in the following sections.

2.1.1 Color measurement and comparison

There are three ways in which sample measurement and comparison can be accomplished. Which is chosen will depend on the operating mode the operator wishes to use and the measurement application.

The choices are:

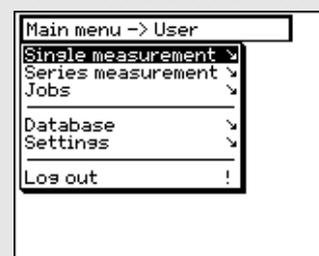
- **Single measurement**
- **Series measurement**
- **Jobs**

In **Single measurement** you can measure a single sample, or you can compare a single sample with a reference, without saving the results into the instrument. Each new measurement overwrites the preceding value.

In **Series measurement** you have the option of saving **various** references into the instrument as **Series**. The measured sample is assigned to the corresponding reference either automatically or manually. While the reference values are kept stored until deleted by the operator, the samples are overwritten for each new measurement.



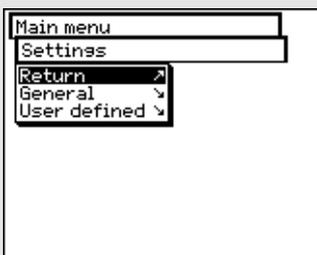
This chapter must be read carefully. It contains important basic information which is helpful for a quick understanding of the SpectroEye operation and how to obtain the best possible performance.



Read chapter 2.4.1



Read chapter 2.4.2



 *With the Multiple User option the instrument is configured so that each user works with the functions and setting set for their own particular type of work. This further serves to protect data and settings from possible unauthorised access.*

Using Jobs you can create complete jobs with all the relevant information. As well as the name of the job, conditions of measurement, etc. **all** the references and **all** the samples are saved by the instrument. The assignment of measured samples to their corresponding references may be either automatic or manual. All data remain saved until they are deleted by the operator.

2.1.2 Data management

Data stored in the instrument for long periods must be managed and maintained. It is also possible to establish and modify the fundamental settings.

At the Data management level, there is a distinction between:

- **Database**
- **Settings**

The following is managed in the **Database**:

- **Jobs** Client data, measurement conditions
- **Reference libraries** Collection of references which are automatically created, apart from the color guides.
- **Users** Creation and modification of the various users and related passwords

In **Settings**, there are general settings and user defined settings:

- **General** Specific instrument settings, shared by users, such as LCD contrast, date and time, etc.
- **User defined** Specific user settings, such as the setting of the LCD for right-handed or left-handed use, measurement conditions, etc.

2.1.3 User selection

 If the Multiple Users package has been purchased and installed, the **Log out** option is given as the last item on the main menu. This serves to protect specific user data from possible unauthorised access. It puts the SpectroEye into a protected condition, and the instrument can only be rendered operative by entering a user name and password.

2.2 Operating principles

Through the main menu, the software of the SpectroEye leads to the measurement windows. The wheel may be used to select the desired menu options, while the measurement pad – besides performing a measurement – also acts as the ENTER key.

2.2.1 Menu

Starting from the main menu, through the various sub-menus select which operation is to be performed.

The procedure is always the same:

1. Turn the wheel until the black cursor bar is positioned on the desired menu option.

Note:

A black vertical indicator bar on the menu indicates the current position in the overall menu. If the menu is too long to be contained in a single page, turn the control wheel to scroll the page and view parts of the menu not initially displayed.

2. To confirm, press the measurement pad.

Pressing the measurement pad activates various procedures which are indicated by different symbols displayed at the end of a given line on the menu:

The program passes to the next lower level.

↙ The program passes to the next higher level.

↗ The program performs the chosen operation.

! After having pressed the measurement pad, the value preceding the symbol can be modified using the wheel, and the new setting value can be confirmed by pressing the measurement pad again.

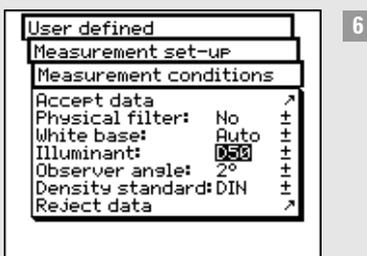
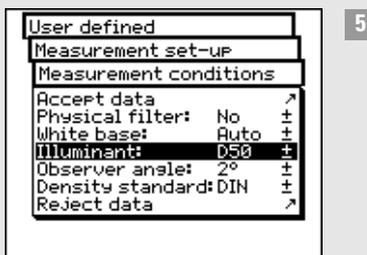
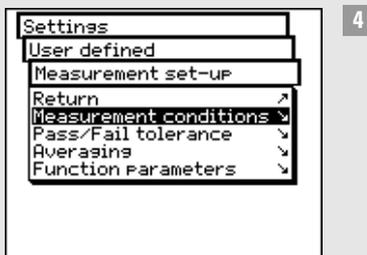
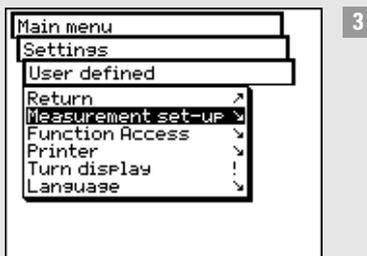
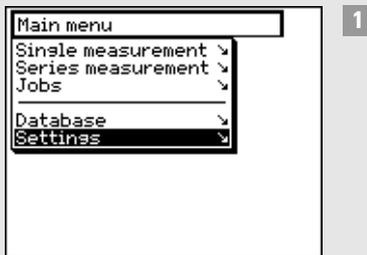
This displays the current status of a setting. In this mode

✓ it is possible to see which settings are active when a menu is selected. A different setting can be activated by pressing the measurement pad.



 *The measurement key must always be pressed briefly, because it is used to quit a given menu when held down for longer (about three seconds).*





It is sometimes necessary to browse through different menus to recall a given function. To avoid describing this procedure each time in detail, this manual gives an abbreviated description.

For example, to set illuminant D65, you must proceed as follows:

- 1 In the main menu, turn the wheel until the cursor bar is on **Settings**, then press the measurement pad to select the next sub-menu.
- 2 Turn the wheel until the cursor bar is on **User defined**, then press the measurement pad again to select the next sub-menu.
- 3 In this menu, turn the wheel until the cursor bar is on **Measurement set-up** and press the pad again to select the next sub-menu.
- 4 Turn the wheel until the cursor is on **Measurement conditions** then press the measurement pad again to select the next sub-menu.
- 5 Bring the cursor bar to the **Illuminant** menu option and press the measurement pad. At this point the currently set illuminant is highlighted in a dark color.
- 6 All the illuminant options **A, C, D65, D50, Dxx, F2, F11, Fxx, (User)** can be viewed in sequence by turning the control wheel. Turn the wheel until the desired illuminant (D65) is displayed and press the measurement pad again to Accept the new data setting.

The entire procedure will be described in this manual as follows:

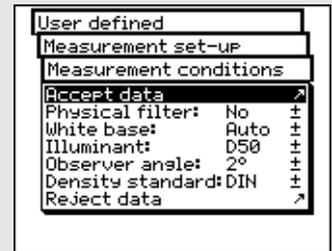
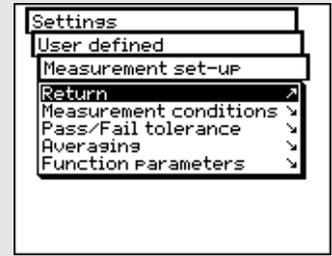
From the main menu, select

Settings > User defined > Measurement set-up > Measurement conditions > Illuminant

and set **D65**.

To exit the menu, proceed as follows according to the type of window:

1. If the window does not allow setting operations, exit by selecting the **Return** option or by keeping the measurement key pressed for about three seconds.
2. If the window allows for setting modifications, quit by selecting the **Accept data** option to save any modifications. If no modifications are to be made, exit by using the **Reject data** option, or by keeping the measurement pad pressed for about three seconds.



2.2.2 Measurement window

After having selected **Single Measurement, Series Measurement** or **Jobs** from the main menu, the software leads you to the actual functions for measurement and analysis of values through the **Measurement Window**.

2.2.2.1 Measurement window structure

The measurement window contains various elements, these are divided between display items and action fields:

- **Display items**

All the fields without frames are display items which change depending on the instrument measurements, settings or analyses.

These include:

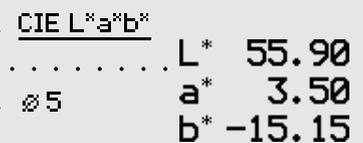
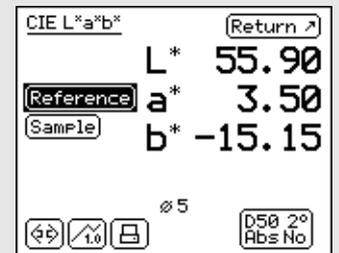
1. Display of the current measurement function
2. Display of measurement results
3. Measurement settings, information, analysis

- **Action fields**

All the fields and graphics with frames are used to activate measurements or to enable further settings. As with the menus, the control wheel can also be used to select the desired active field. The selected field can then be activated by pressing the measurement pad.

The action fields are the following:

1. Measurement field for references or samples measurement
2. Measurement window exit field
3. Symbols bar





The function of the icons is illustrated in detail in the corresponding points of chapter 2.4.

2



Read chapter 2.4.1.6



Read chapter 2.4.1.3



Read chapter 2.4.1.4

2.2.2.2 The symbols bar

The symbols bar contains the various selectable icons. One or more icons illustrated below may not appear in the bar for various reasons. One of these reasons is that only the icons actually required for the selected measurement are displayed. For example if a spectrum measurement function is selected, the density filter icon will not appear. There are also certain icons for optional functions which may not be installed on the SpectroEye. These icons are only available if the optional function has been purchased and installed. In the following overview, these are distinguished by the puzzle symbol.

Function icons are subdivided into four groups:

1. Icons for display modification

These icons simply serve to switch the given display. The measured values are maintained.



Measurement function

Selecting this icon modifies the measurement mode. In this way you can switch between colorimetric and density functions.



Absolute / Difference

If the Absolute / Difference icon is selected after having measured the reference and the sample, the display always switches between the absolute value measured for the sample and the difference between the reference and sample.



Numerical / Graphical

Use this to switch between graphical and numerical displays of measurement values.



Filter Density

In density measurement you can choose between manual and automatic filter selection.



ΔE Formula

In spectral measurement, the color differences can be calculated using different formulas. This icon permits selection of the desired formula from the list.



Scroll

This icon is necessary if numerical representation has been selected for reflection or density spectra. In this case it is not possible to display all the measurement values in a single window. Select this icon to scroll through the list of measurement values.

2. Icons for settings modification



Averaging

This icon must be selected if various measurements are to be performed on a reference value or sample, and which SpectroEye must calculate the average value.



Stop averaging

This icon is displayed only when averaging is in process. If during a measurement sequence the measured values are found to diverge slightly, the current averaging calculation can be terminated quickly.



Function parameters

With this icon it is possible to set individual conditions and parameters according to the selected measurement function. These are:

- Normalised illuminants for metamerism calculation
- Dye-strength parameters
- Yule-Nielsen coefficients
- Half-tone percentage values by increment
- Scale graduation for print characteristic
- ΔE CMC factors
- ΔE^*94 factors
- ΔE^*2000 factors



Density calibration

The function of this icon is to adapt the measured values of your SpectroEye to the values of your densitometer.



Enter CIELAB reference values

In the mode "Single measurement", for the functions CIE $L^*a^*b^*$ and CIE L^*C^*h , CIELAB values can be entered in. The CIELAB references can be saved in reference libraries and can be used from there in jobs. If it is possible to calculate from the Lab values the values for another color space, the corresponding values are displayed in the selected function

3. Icons for recalling database functions



Select from database

Instead of measuring a reference color, the measurement value can be taken from a database.



Similar color

This icon must be selected if the SpectroEye has to search in a database for the nearest measured value.



Recipe

If a reference has been selected from one of the color guides, the standard recipe in the instrument memory can be displayed using this icon.

 *Read chapter 2.4.2.4*

 *Read chapter 2.4.2.2*

 *Read chapter 2.4.2.1*

 *Read chapter 2.4.3.3*

 *Read chapter 2.4.1.5*



Select Reference

This icon is used to modify jobs or measurement series for which various references have been defined. This function determines which reference is assigned to a sample. The assignment may be manually defined or performed automatically by the SpectroEye.



Modify reference

Within a given job or series, this icon permits creation of new references or modification of existing ones.



Reference parameters

This icon is used to set a new name and a new measurement tolerance for a reference.



Save in database

This icon is used to save a measured reference into a created reference library.



Sample

This icon allows you to scroll through the samples created within a job or to cancel them.

4. Other icons



Print

The various print options can be selected using this icon.



Special icon: Measurement conditions

This icon allows the measurement conditions to be modified.

2.3 Initial settings

When working with the SpectroEye, modification of some basic settings are rarely done or never need to be performed. Many of these default settings directly influence measured results, so these settings must be reviewed immediately after deactivating the transport protection!

The basic settings can be found in the main menu under the **Settings option**. These are subdivided into **General** and **User defined** settings. **General** settings are global i.e. even if the SpectroEye will be configured for several users, these settings will apply to all. These are maintained until they are explicitly modified. **User defined** settings refer to specific applications. If the SpectroEye is subsequently configured for various users, these can be independently configured for each user.

2.3.1 General settings

From the main menu, first select:

Settings > General

The following settings can be modified:

- **Data Interface**
- **LCD contrast**
- **Date and time**

The remaining settings, such as:



- **Setting protection**
- **Battery**
- **New functions**
- **Instrument type**
- **Service**
- **Transport protection**

do not need to be defined immediately and can be reviewed at a later time.

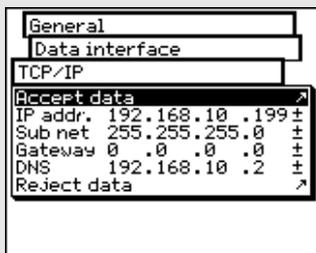


If the basic settings are not made immediately, be sure to at least check them before beginning a job.





These settings must match those of the connected device. Please check the corresponding instructions in the manual provided by the device or software supplier. The default settings are: Baud rate = 9600 and Handshake = Xon/Xoff.



To find out whether settings other than the default values are required, contact your system administrator.

2.3.1.1 Data interface

In order to correctly make the serial connection to the printer, a computer, or to the Ethernet connection of the computer or network, the interface parameters must be correctly configured.

The following is a description of the variations offered by the Menu options:

Settings > General > Data interface

- To define the parameters for serial transmission between the SpectroEye and the printer or PC, select the **Serial** option and proceed as follows:

1. First set the correct transmission speed using the **Baud rate** option.
2. Then under **Handshake**, select
 - **No**
 - **Xon/Xoff**
 - **Hardware**
3. Save settings with **Accept data**.

- To connect the SpectroEye through an Ethernet interface to the Internet or a company Intranet, select the **TCP/IP** option and configure it as follows:

1. Set the sequence of correct addresses for:
 - **IP addr.**
 - **Sub net**
 - **Gateway**
 - **DNS**
2. Save settings using **Accept data**.

2.3.1.2 LCD contrast

To adjust the LCD contrast to ambient lighting conditions, from the main menu, select:

Settings > General > LCD contrast

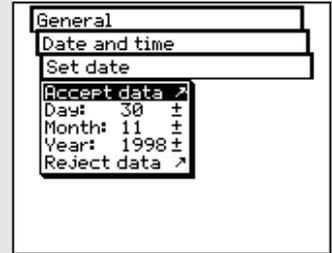
To get the best contrast, select one of the values within the scale. The change is immediately visible on the LCD.



2.3.1.3 Date and time

To automatically integrate the measurement results with the correct date and time, the SpectroEye is equipped with a clock/calendar. Its accuracy should be checked regularly, by selecting:

Settings > General > Date and time

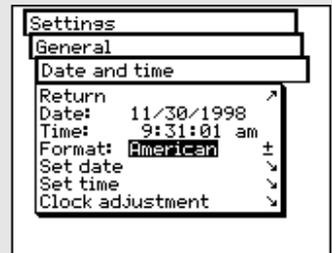


 Remember to correct the clock even when changing from summer to standard time and viceversa.

The current date and time are displayed. If incorrect, they can be modified in this menu:

• Format

This command sets the display format for the date. Choose between American or European format. American format is month/day/year, where as European is day.month.year.



• Set date

Select the **Set date** menu option. Correct the settings of:

- Day
- Month
- Year

Save the new date with **Accept data**.

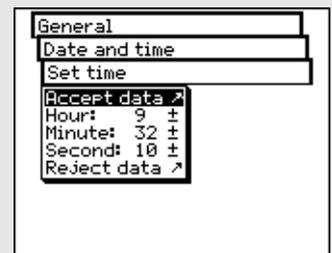


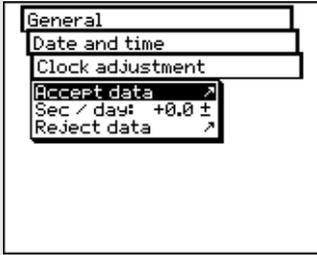
• Set time

Now select **Set time** menu option. Correct the settings of:

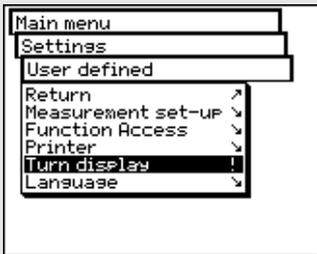
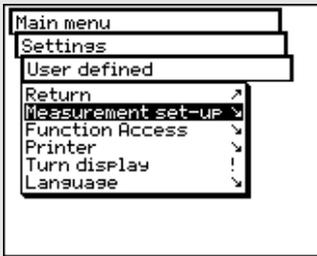
- Hour
- Minutes
- Seconds

Save the new time with **Accept data**.





 If the clock runs slow, a positive value must be entered (to speed it up), whereas if it runs fast, this value must be negative (to slow it down).



• **Clock adjustment**

The clock built into the SpectroEye may be running either slightly fast or slightly slow. If the time on print-outs is wrong, the clock can either be reset as described previously, or its long term speed can be adjusted.

Proceed as described in the following example:

If after four weeks, you find that the SpectroEye clock is four minutes slow.

1. Calculate the correction factor:
in 28 days, the clock lost 240 seconds, equal to 8.6 seconds per day.
2. Select **Clock adjustment** from the menu.
3. Select **Sec/day** and enter the correction factor +8.6.
4. Save the correction with **Accept data**.

2.3.2 User defined settings

From the main menu, select:

Settings > User defined

Make the following settings:

- **Turn display**
- **Printer**
- **Measurement set-up**

The settings relating to:

- **Function access**
- **Language**

will be addressed later in this manual.

2.3.2.1 Turn display

The SpectroEye is designed to be used with one hand. On delivery from the factory, it is set for use with the right hand. So that left-handed people may also use the SpectroEye with ease, the displayed data can be rotated.

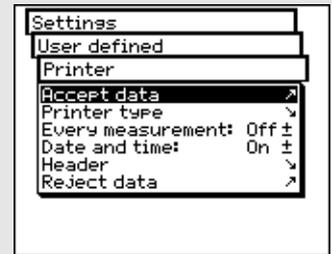
From the main menu, select

Settings > User defined > Turn display

The display on the LCD is immediately rotated.

2.3.2.2 Printer

Measurement results can be sent directly to a printer, without the need of a computer. In such cases the printer is connected directly to the SpectroEye through the serial interface port. To obtain a correct print-out, it is necessary to give the SpectroEye specifics about the printer to be used.



Always follow the indications given in the printer manual and read the instructions for connecting the SpectroEye to a printer in chapter 1.2.3.5 to 1.2.3.6.

From the main menu, select

Settings > User defined > Printer

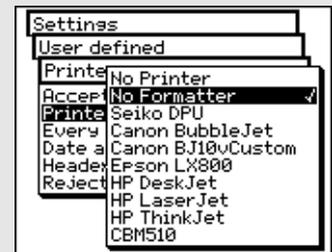
and proceed as follows

1. First, select the **Printer type** option and then the model of printer to use.

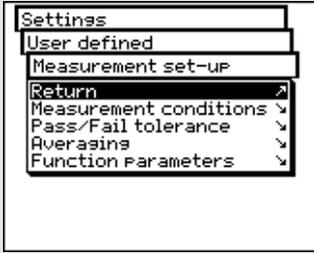
Available printers:

- **No printer**
- **No formatter**
- **Seiko DPU**
- **Canon BubbleJet**
- **Canon BJ10vCustom**
- **EPSON LX800**
- **HP DeskJet**
- **HP LaserJet**
- **HP ThinkJet**
- **CBM510**

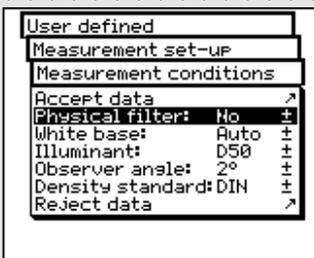
2. If you require the date and time to be entered automatically with the print-outs, select **Date and time** menu option and set the displayed value to **On**.
3. The printer protocol heading can be defined by selecting the **Header** menu item. Enter the text which is to appear in the printer protocol; 5 lines are available.
4. Save settings using **Accept data**.



If your printer does not appear on the list, consult its manual to see whether it is compatible with one of the printers listed. Otherwise, select the No formatter setting.



Here you should select the most frequently used settings in normal operation. In this way it is possible to guarantee a consistency to the color measurement, which should only be modified occasionally to meet the application requirements.



If you don't know which filter is to be used, select **NO** for spectral measurements and **POL** for densitometric ones.



In practice the densitometric analyses are based on paper (Pap setting) while the spectrophotometric ones are based on the integrated white reference (Abs setting). It is advisable to select the Auto setting and change it only in special cases.

2.3.2.3 Measurement set-up

Settings of **Measurement set-up** menu are considered the default ones. They are always taken as basic settings when you are working with a Single measurement or when you create a Series measurement or Jobs.

To define these basic settings, starting from the main menu you must select

Settings > User defined > Measurement set-up
and then:

- **Measurement conditions**

All settings of the **Measurement conditions** menu should be made with great care as they affect the measurement results. They can be checked on the symbol bar of the measurement window and can be changed to meet the application requirements, at any time.

The measurement conditions include:

- **Physical filter**

Determine if the measurement must be performed using a physical filter.

The following filter settings are available

- **No** -> without filter
- **Pol** -> polarisation filter
- **D65** -> Average North Sky daylight
- **UVCut** -> UV suppression
- **Auto** -> automatic selection



If you select **Auto**, SpectroEye will automatically use the physical filter usually adopted for the selected function. For densitometric functions, this is the polarisation filter, while for spectrophotometric functions it is without filter.

- **White base**

For a correct spectral or density measurement, the corresponding white base must be defined.

The following settings are available

- **Auto** -> automatic selection
- **Pap** -> paper white
- **Abs** -> absolute white

If you select **Pap**, as white base, all subsequent measurements will refer exclusively to the printed ink layer, while the paper color effect will not be included. To obtain the basic base reference you should always measure the paper used.

If you select **Abs**, besides the printed ink layer, the measurement will also include the paper effect. Here the integrated white reference will be used as the white base.

If you select **Auto**, SpectroEye will automatically use the white base usually adopted for the selected function. For densitometric functions, this is the white base of paper, while for spectrophotometric functions it is the absolute white base.

- Illuminant

To calculate the special color values, select the desired normalised illuminant.

The most commonly used normalised illuminants are immediately available:

A, C, D65, D50, F2, F7, F11

The normalised illuminants of **D** and **F** series must be set-up using the **Dxx** and **Fxx** menu items. When you perform this selection, an additional menu line appears, where you can select the desired color temperature.

Here the following illuminants are available:

Fxx: F1 to F12

Dxx: D30 to D300

- Observer angle

When analysing the colorimetric values, the calculation and consequently the result depend on the definition of the observer angle.

In this menu line you must select the observer angle, normally between **2°** and **10°**.

- Density standard

If you wish to use the SpectroEye spectrophotometer also as a densitometer, you must define which density standard to operate with.

In this menu line select either:

DIN, DIN NB, ANSI A, ANSI E, ANSI I, ANSI T, SPI

Save your settings in the **Measurement conditions** menu using **Accept data** and proceed with:



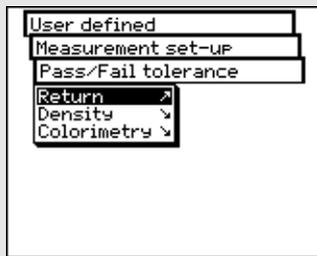
Usually the normalised illuminant for the Graphic Arts industry used is D50.



You can freely select one of the two settings. It is extremely important that for color comparison the selected setting is always kept constant.



Normally the density standard used in the USA is ANSI T while in Europe it is DIN. As a guide line it is advisable to select the settings corresponding to the set of physical filters available on the densitometer, should one already be in use.

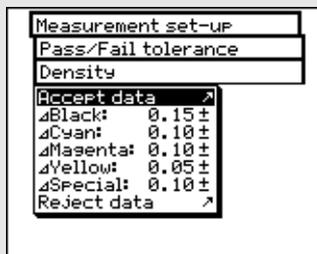


Pass/Fail tolerance

When you work with Series measurements or Jobs, immediately after the reference and sample measurement, you obtain an evaluation in terms of pass/fail.

The measured values are included in (Pass) or excluded from (Fail) based on the tolerance values defined in this menu.

The tolerances are defined separately for densitometric and spectral measurements as follows:



Starting from the **Measurement set-up** menu, select **Pass/Fail tolerance > Density**

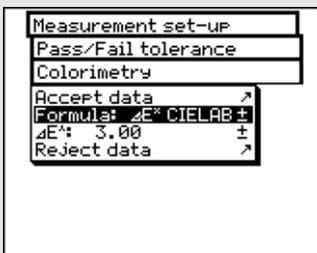
Enter the sequence of tolerances corresponding to the maximum densities of the process colors. The tolerance values indicate how much the solid density value of a measured sample can shift from the solid density of the reference.



The tolerances set-up in this menu must be considered only as a first recommendation. In general, it is advisable to choose tolerance limits based on customer needs and product requirements.

Example:

The reference for cyan has been measured with a solid density of 1.55. The tolerance value was set-up to +/- 0.10. All the measured samples are within the density range of 1.45 and 1.65 i.e. within the allowed tolerance. Therefore, in the measurement window **Pass** will be displayed. If the solid density is higher or lower than such limits, **Fail** will be displayed.



Next, starting from the **Measurement set-up** menu, select **Pass/Fail tolerance > Colorimetry**

In the **Formula:** menu line select the formula you want to use to define the tolerance.

The following formulas and tolerance settings are available:

Supplied with the base instrument: - $\Delta L^* \Delta a^* \Delta b^*$
- $\Delta E^* \text{ CIELAB}$



Options: - $\Delta E \text{ CMC}$, $\Delta E \text{ FMCII}$, ΔE^*94 , ΔE^*2000
- $\Delta E^* \text{ CIELUV}$
- $\Delta E \text{ mg}$
- $\Delta E \text{ Hunter Lab}$



The tolerances set-up here must be considered only as a first recommendation. It is advisable to tune tolerance limits based on customer needs and product requirements.

As soon as you have chosen one of the above formula, the corresponding parameters are displayed in one or more menu lines. When the data entry procedure is completed, save the tolerance values using **Accept data**.

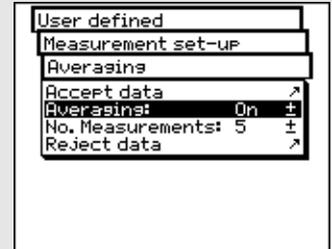
All the subsequent Pass/Fail evaluations will refer to this formula and to the tolerances defined here. The Pass/Fail evaluation is displayed only if the corresponding measurement function has been selected.

• **Averaging**

For non-homogeneous samples and references SpectroEye is able to calculate the average of different measurements.

Starting from the **Measurement set-up** menu, select **Averaging**.

Here you can activate or de-activate automatic averaging, as well as set-up the number of measurements to be taken for each average. If the averaging function is activated, an icon appears on the symbol bar of the measurement window, which allows these settings to be changed.



• **Function parameters**

Some measurement functions are based on parameters which must be adjusted to individual working conditions.

To modify these, starting from the **Measurement set-up** menu, select **Function parameters**.

Enter each parameter used for the following functions:

- **Dot gain**

Enter the screen percentage value provided in the color bar halftone fields for dot gain measurement.

- **Print characteristic**

Set-up the halftone levels from which the print characteristics must be created.

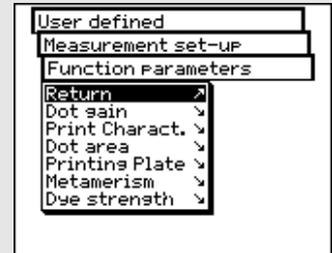
- **Dot area**

For dot area calculation you may use the **Murray-Davies** and **Yule-Nielsen** formulas.

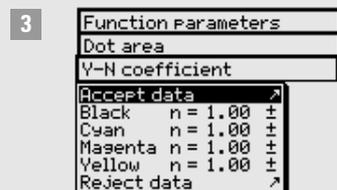
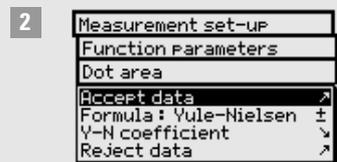
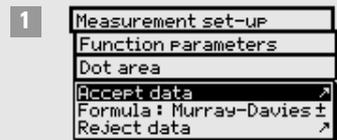
1 2 While for the Murray-Davies formula the degree of light optical absorption is predefined, in the Yule-Nielsen formula this can be adapted for different conditions.

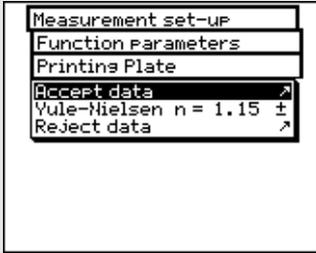
First, select the **Formula:** menu item, and choose the formula to be used for calculation. If you choose the Yule-Nielsen formula, another line appears within the menu where you can set the **Y-N coefficient**.

3 Here the “n” values for black, cyan, magenta and yellow are entered.



Normally the Murray-Davies formula is used. The Yule-Nielsen formula should only be used in special cases, i.e. to determine the physical area coverage.





2



The recommended settings for the printing industry are: $l=2$ and $c=1$.



The recommended settings for the printing industry are: $kL=1$, $kC=1$ and $kH=1$.



- Printing plate

When measuring the printing plate, to determine the physical dot area coverage of your printing plate, set the Yule-Nielsen factor.



- Metamerism

By determining the metamerism index you define the mutual color modification of two colors when the illuminant changes. The first illuminant used is that defined within the

Settings > User defined > Measurement set-up > Measurement conditions > Illuminant

menu.

Enter the test illuminants for which the color changes for the first illuminant must be determined.

You may define a maximum of three test illuminants.



- ΔE CMC

In order to calculate the color difference using CMC, you must enter the correction factors for brightness (i) and chroma (c).



- ΔE^*94 , ΔE^*2000

To calculate the color difference according to ΔE^*94 or to ΔE^*2000 you must enter the correction factors for brightness (kL), chroma (kC) and hue (kH).



- Dye strength

To determine the dye strength you must first choose one of the available calculation methods:

at max K/S, **xyz weight KS** and **Best Match ΔE** .

Next, access the Colorant menu item, enter the type of ink for which you wish to determine the dye strength. You may choose **Transparent ink**,

Opaque ink and **Textile dye**.

During the measurement, the symbol bar of the measurement window shows the function parameter icon. After having selected the corresponding measurement functions you can always change all settings performed.

2.4 Working with the SpectroEye

This section gives a detailed description of the different SpectroEye measurement procedures, i.e. the single measurement, the series measurement and the jobs creation. In addition, it provides information about data management, data base allocation and explains which settings are to be performed.

2.4.1 Single measurement

With **Single measurement** you can measure a single sample or you can compare a sample with a reference without saving the measurement results in the instrument.

Each new measurement overwrites the previous one. Two examples are used, the spectral measurement of color with CIELAB and the simple density measurement. They will show how the measurement and reference sample comparisons are performed. It is suggested the operator follow the procedures step-by-step.

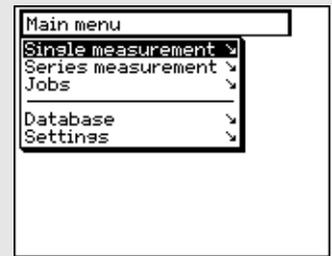
By selecting the **Single measurement** item from the main menu, you immediately get the measurement window



2.4.1.1 Checking the measurement conditions

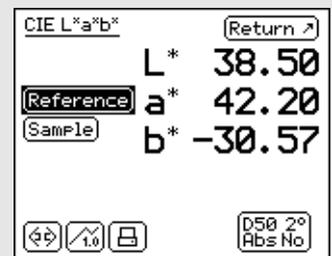
The special icon at the end of the symbol bar of the measurement window shows the active measurement conditions. Ensure that settings are still matching your needs. At delivery time the SpectroEye is configured in such a way that the measurement conditions cannot be directly changed using the special icon. As these settings greatly affect the measurement results they must be kept constant, especially during the comparisons between measured values.

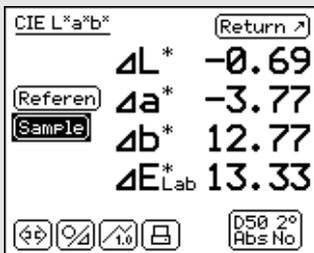
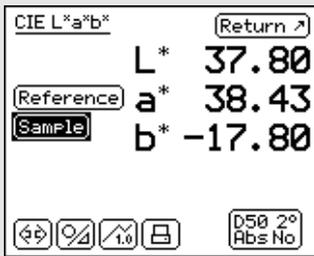
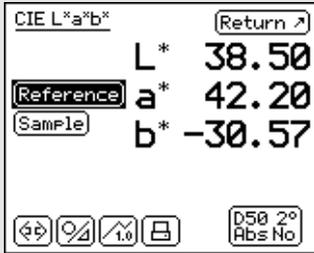
If for technical reasons related to the application you wish to use this icon to change settings, you can make it available through the settings.



If SpectroEye is not in CIELAB mode, first read section 2.4.1.6 to see how to define the measurement functions and set-up the CIELAB mode.

2





2.4.1.2 Reference and sample measurement

Using the **Reference** and **Sample** fields, perform a measurement for each of these items. A Reference is usually intended as an original color element, i.e. the original provided by a customer which must be reproduced. A sample is the reproduced color sample to be compared with the reference.

The measurement data detection sequence can be easily selected. To do this, position the SpectroEye on the area to ensuring that the measurement aperture is completely filled with the color to be measured. Lay the instrument on the measurement surface and ensure it is perfectly level and not subject to vibrations.

The measured color values are all saved independently and they are shown at the beginning as absolute values. If, after the measurement, the control wheel is used to switch between the **Reference** and **Sample** fields, the display also changes, thus allowing the comparison of absolute values.



2.4.1.3 Comparison of measurement values

If you wish to compare the reference and the sample using the color difference between the two measurements, the sample display can be switched from the absolute values of the sample to the difference values between the reference and sample.

To make this easier, you can use the **Absolute/Difference** icon available on the symbol bar. When you select this icon, the display shows the difference and, on subsequent selection of the same icon, it will come back to the absolute value.



2.4.1.4 Graphic representation of measurement results

The graphic representation may be very useful to correctly interpret the measurement results. To change between numerical and graphical display you can use the **Graphical/Numerical** icons on the symbol bar. The SpectroEye may represent both absolute values and differences in graphical mode.

For the CIELAB function the various graphic representation possibilities are as follows:

- **Graphic representation of absolute measurement values**

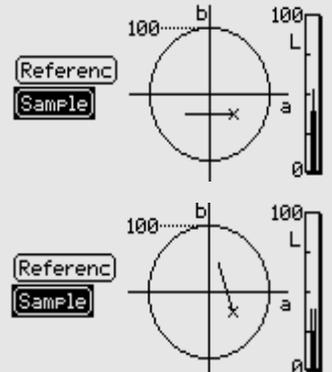
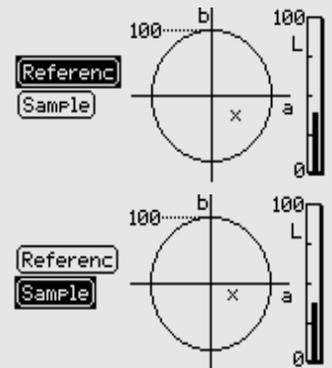
In numerical mode, using the absolute difference icon, first select the absolute representation, then switch to graphic representation using the Graphical/Numerical icon.

The graphical representation of CIELAB values shows the CIELAB system with the green-red axis (a), the yellow-blue axis (b) and a saturation ring with unit 100. The (x) mark inside the representation shows the position of the measured value. The third dimension of the CIELAB system, i.e. the brightness, is represented by the vertical bar on the right side of display. The brightness value can be read according to the length of the black bar.

- **Graphic representation of the color difference between reference and sample**

Using the **Absolute/Difference** icon, select the Difference option for the sample.

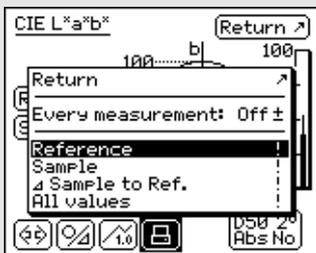
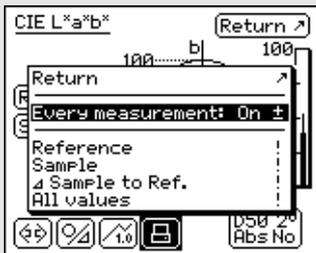
The cross mark (x) indicates the position of the reference item, while the line indicates the direction where the sample diverges from the reference itself. The length of the line is always the same i.e. it does not represent a distance between the measurement values. In the brightness display, the brightness of the reference is represented by the thick black bar. If the sample is lighter than the reference, this is represented by a thinner line above the thicker one (see the top figure). If the sample is darker than the reference, a thin light line is shown inside the thicker black line (see the bottom figure). This line also will always have the same length, so it can only be used to detect the direction.





The printer connection options are described in chapter 1.2.3.5 and 1.2.3.6.

The printer to be connected, as well as the company data which should appear on the printing protocol, can be defined as shown on chapter 2.3.2.2.



2.4.1.5 Printing the measurement values

To obtain a documentation of measurement results, the SpectroEye may be connected directly to a printer.

If in the user defined settings a printer has already been defined, the symbol bar shows the **Printer** icon.

When you select this icon, a menu appears which allows you to choose different printing possibilities:

1. If in general you wish to print all the measurements on a single printer, select the **Every measurement** menu item and set the display to **On**. From then on, all the measurements performed will be printed automatically.

2. If you wish to obtain a printed result only for particular measurements already performed and just shown on the screen, set the **Every measurement** menu item to **Off** and select which of the last measured values should be printed. The following options are available:

- **Reference**
- **Sample**
- **Δ Sample to Ref.**
- **All values**

The printing output is determined by the current display mode. If the SpectroEye display is set to graphical mode, both graphics and numerical values will be printed. If the numerical display is selected, only the measurement values will be printed.



2.4.1.6 Switching between measurement functions

The SpectroEye allows the originals to be quickly and simply analyzed within the measurement modes, once they have been measured.

The SpectroEye comes with the Density and CIELAB measurement functions. The following section gives a detailed explanation on how to switch from CIELAB to Density functions.

Select the **Measurement function** icon from the symbol bar.

The displayed menu lists all the available measurement functions. Select the **Density** function to reproduce the following example.

As the densitometric measurement is normally referenced to the white paper, when a density function is called for the first time, the operator is requested to measure the **White paper**, before the measured results are shown on display. It is not necessary, however, to remeasure the reference or sample.

Switching to different measurement functions is related to the modification of displays within the measurement windows.

In this example, the display of the following elements, change:

- **Measurement functions**
- **Measurement values**
- **Measurement conditions**
- **Display for density filter selection**

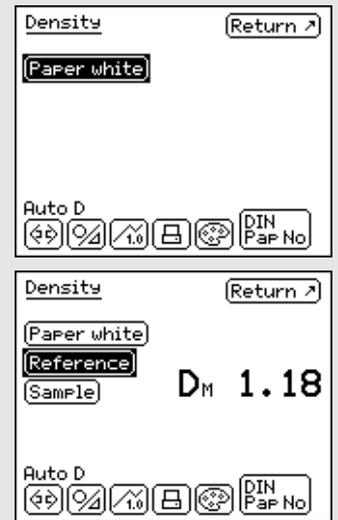
It may also happen that within a different measurement function, some icons as well measurement buttons are available, which are still unknown.

In our example this occurs for the icon:

- **Density filter**



Settings such as **Graphical/Numerical, Absolute/Difference** etc. are used without variations.



2.4.2 Series measurement

In **Series measurement** it is possible to save in the SpectroEye's memory, several references as Series. The measured sample is either automatically or manually assigned to the related reference. While the reference values are kept in memory until they are deleted by the operator, the samples are overwritten for each new measurement.

To operate in Series measurement is described here using the color measurement function of the CIELAB system.

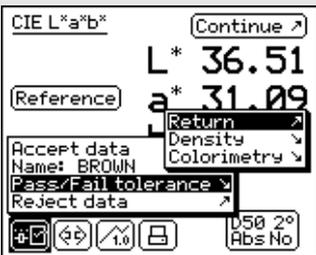
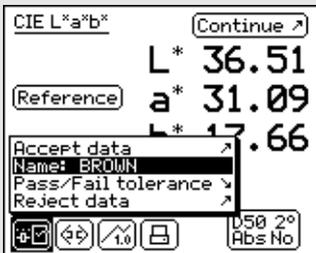
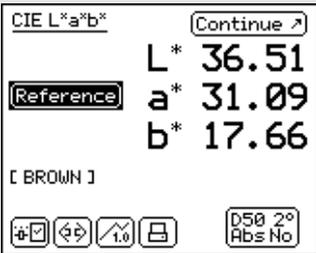
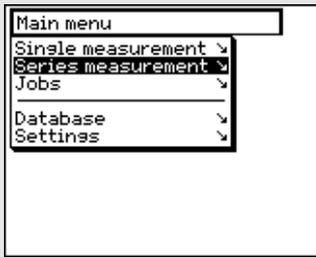
To understand this procedure the **Single measurement** section (2.4.1) should already have been reviewed.

2.4.2.1 Creating a series of references

From main menu select:

Series measurement > New measurement > New reference

A special **Reference measurement** window appears. This is the window used to exclusively create and process the references.



First, check your measurement conditions. Next measure the desired reference. As soon as the measurement value is taken, a reference name assigned by SpectroEye appears, and the **Reference parameters** icon is displayed in the symbol bar.

Select the icon to change the color name and to define the tolerances for subsequent Pass/Fail evaluation.

To change the name, cancelling that proposed, use the **Name:** menu item, and enter a new name.

Here you can define both the density and colorimetric tolerances which will be used for subsequent analysis. The tolerance values proposed here are taken from **Settings** in the **User defined > Standard measurement > Pass/Fail tolerance** menu.

Whether these values are taken without changes or they are modified, the settings are always saved together with the corresponding reference. The default settings are then kept unchanged and they will be re-proposed as standard settings for each new reference.

Input your own settings and exit the reference window with **Continue**. The measured reference is included in the **New series** menu and you are requested to define another original through **New reference**. Repeat the operation described above for all references.

2.4.2.2 Additional processing and deleting of references

After assigning the last reference, a list of all available references appears in the **New series** menu. If, during a reference definition, either you forgot to enter the tolerance values, you wish to repeat the measurement or you wish to change the name, just select the corresponding reference menu item. Then the reference window is selected, where you may perform the changes.

To cancel a reference from the memory, select **Delete reference** from the **New series** menu, then select the reference name and confirm with **Yes**.

Both the additional processing and the reference cancellation may also be performed inside the measurement window.

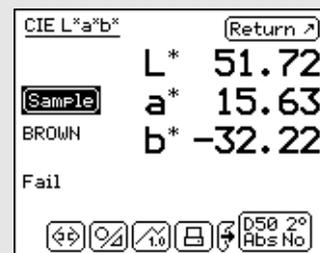
You may switch to this window, to perform changes, using the **Modify reference** icon inside the reference window.



2.4.2.3 Measurement of samples

To measure samples, select the **Continue** item within the **New series** menu. You will switch to the measurement window. Here, the measurement window is used primarily to measure and analyse samples.

Measure a sample. As soon as the measurement value is taken, this is automatically assigned to a defined reference, the reference name is displayed and a Pass/Fail evaluation is performed. With the measurement of a new sample the previous measurement value is overwritten, and a reference assignment as well as a Pass/Fail evaluation are performed.

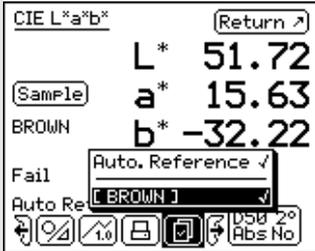




2.4.2.4 Assigning samples to a reference

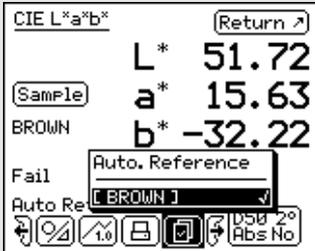
SpectroEye automatically assigns a sample to the reference which, from the colorimetry viewpoint, is the closest to the value of the sample. If you wish to define which reference is to be assigned to the measured sample, use the **Select reference** icon inside the symbol bar.

Besides the automatic assignment, the following options are available:



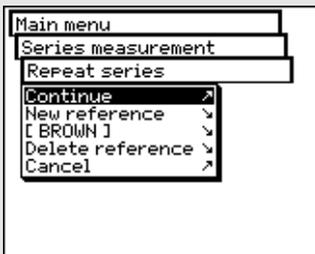
- **Short-term manual assignment**

The **Auto. Reference** menu item is activated. Select the name of the reference which the last measured sample must be compared with. In this case the color comparison with the selected reference is performed only once. For the next measurement, the automatic assignment will be used again.



- **Long-term manual assignment**

The **Auto. Reference** menu item is not activated. Select the reference name with which the sample must be compared. In this case, all the subsequent samples will be compared with the selected reference. The selected assignment will be maintained until you select, another reference, using the **Select reference** icon or until you re-activate the automatic assignment using the **Auto. Reference** menu item.



2.4.2.5 Repeating a series

When you leave a measurement series, you are requested to save the series' reference data. These reference values are maintained until you create a **New series**. The new series will be saved when you leave the new measurement series, the old series now being overwritten.

To return to the most recently saved series, starting from main menu select:

Measurement series > Repeat series

The series can be processed as described above, or you can copy the references without any modification to start the measurement of samples.

2.4.3 Jobs

Working with **Jobs** you may create complete jobs with all the related information. Besides the job names, the measurement conditions etc, **all** the references and **all** the samples measured for this purpose are stored inside the equipment. The assignment of measured samples to the corresponding reference may occur either automatically or manually. All data are kept in memory until they are expressly deleted.

The operations available with the Jobs function are described here according to the color measurement of the CIELAB system. To understand this procedure the **Single measurement** and **Series measurement** sections should have already been read.

2.4.3.1 Creating a job

From main menu select

Jobs > New job

and enter the job's specific data.

The job specific data include:

- Job **Name**
- Job **References**
- **Measurement conditions**
- **Averaging** settings

These data and settings are defined separately for each job and stored into the SpectroEye.

To enter them, proceed as follows:

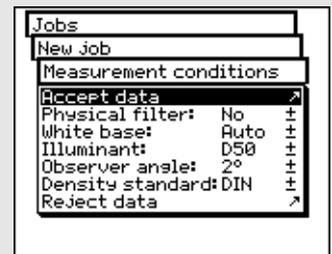
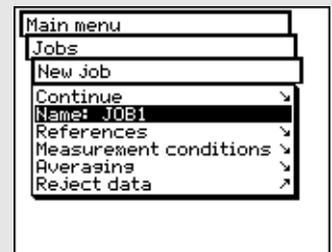
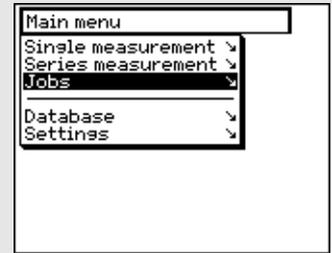
• Enter the job name

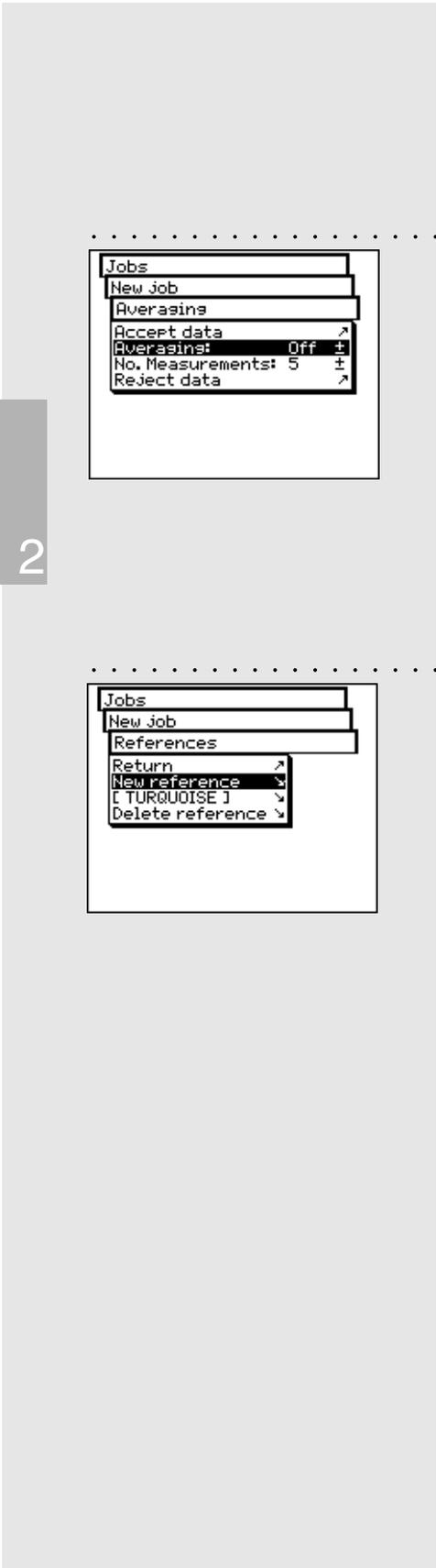
The SpectroEye automatically assigns a name to the new job which can be modified using the **Name:** menu option.

• Checking the measurement conditions

Select the **Measurement conditions** menu item and set-up the desired parameter for:

- **Physical filter**
- **White base**
- **Illuminant**
- **Observer angle**
- **Density standard**





2

The settings proposed here are taken from **Settings** in the **User defined > Standard measurement** menu. Whether these values are taken without changes or they are modified, the settings are always saved together with the corresponding job. The standard settings are then kept unchanged and they will be repropose as standard settings for each new job.

• **Definition of settings for averaging**

For non-homogeneous samples and references, SpectroEye can calculate the average of different measurements, in such a way as to ensure optimum measurement values.

Select the **Averaging** menu item

It is possible to activate or deactivate the automatic averaging, as well as to set-up the number of measurements to be taken for the averaging. If the averaging function has been activated, the **Averaging** icon appears in the symbol bar of the measurement window. This allows these settings to be changed again. Using the **Stop averaging** icon the averaging operation can be turned off.



• **Creating a new series of references**

Select the **References > New reference** menu items.

The special “References” window appears. This window is used exclusively to create and process references.

Measure the desired reference. As soon as the measurement value is taken, a reference name assigned by SpectroEye appears and the symbol bar shows the **Reference parameter** icon.

Select this icon to change the color name and to define the tolerances for the subsequent Pass/Fail evaluation.

Change the name by cancelling the default one, using the **Name:** menu item, and enter a new name. To define the tolerances for this reference select the **Pass/Fail tolerance** menu item. You have the option to define both the density tolerances and colorimetric tolerances for the subsequent analyses.

It is advisable to set-up the measurement conditions without modifying them again until the job is completed.

The tolerance values proposed here are taken from **Settings** inside the **User defined > Standard measurement > Pass/Fail tolerance** menu item.

Whether these values are taken without changes or they are modified, the settings are always saved together with the corresponding reference. The default settings are then kept unchanged and they will be repropose as standard settings for each new reference.

Input your own settings and leave the reference windows using **Continue**. The measured values now appear inside the **References** menu and you are requested to define another original using **New reference**. Repeat the described operation for all the references.

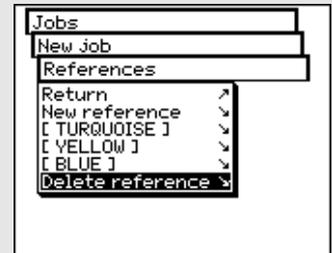
• **Additional processing and deleting of references**

After the definition of the last reference, a list of all available references appears in the References menu. If, during a reference definition, you forgot to enter the tolerance values, you wish to repeat the measurement or you wish to change the name again, just select the corresponding reference menu item. Then the reference window is selected, where you may perform the changes.

To delete a reference from the memory, select **Delete Reference** from the Reference menu, then select the reference name and confirm with **Yes**.

Both the additional processing and reference cancellation may also be performed inside the measurement window.

You may switch to this window, to perform changes, using the **Modify reference** icon inside the reference window.

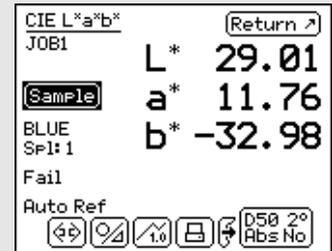


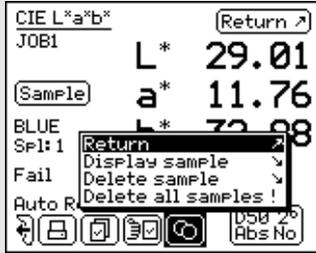
2.4.3.2 **Measurement of samples**

To measure samples, select the **Continue** item within the **New job** menu. The measurement window will appear.

The measurement window is used mainly to measure and analyse samples.

Measure a sample. As soon as the measurement value is taken, this is automatically assigned to a defined reference, the reference name is displayed and a Pass/Fail evaluation is performed. The measured samples are numbered with a progressive number, which may be read on the display under the reference name. With the measurement of a new sample, the previous value is saved to the jobs database. The new measurement value replaces the previous one on the display. The assignment of the new sample to a reference, the Pass/Fail evaluation and the sample numbering are then performed.





2.4.3.3 Additional processing and deleting of samples

The SpectroEye stores all the samples measured within a job. When a series of samples have been taken they can be displayed and deleted, as desired. To do this select the Sample icon within the measurement windows.

If you wish to display a given sample, select the menu items **Display sample > Sample** and then the numbers of the desired samples. As soon as the selection is confirmed by means of **Display**, the measurement value with all the corresponding data appears in the measurement window.

2.4.3.4 Remeasure a job

When leaving a job, you will be requested to save the job data.

The saved jobs are maintained until they are deleted by the operator using **Database > Jobs** from main menu.

Besides creating a new job you have two more possibilities which allow you to get data from already existing jobs:

- **Processing a job as repetition**

With a job repetition, a copy of an already saved job is created and called. In this function, all the job specific data are taken and made available, i.e.:

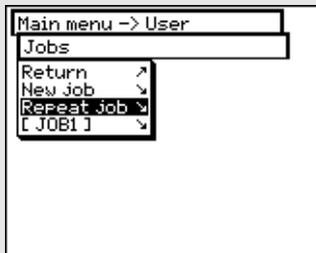
- **Name**
- **References**
- **Measurement conditions**
- **Averaging**

All data of the samples belonging to the old job are automatically deleted and you can immediately start the new measurement series.

To recall a job repetition select from main menu the following:

Jobs > Repeat job

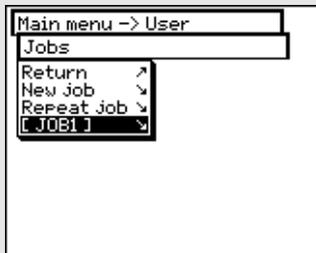
You will get the list of saved jobs. Select the job you wish to repeat. Change the job specific data as desired or continue with the measurement of samples using **Continue**.



- **Enhancement or additional processing of a job**

Starting from main menu select the **Jobs** menu item.

By selecting the job name you immediately enter the measurement window and can proceed with the measurement of samples resuming the job exactly where it was stopped during the last job processing session.



2.5 Database Management and Maintenance

A very important feature of SpectroEye is the possibility to collect data inside the instrument for long term storage. From the **Database** menu select:

- **Jobs** Collection of processed jobs including customer and job specific data
- **Reference libraries** Collection of often needed references apart from the customer jobs
- **Users** Collection of different user settings.

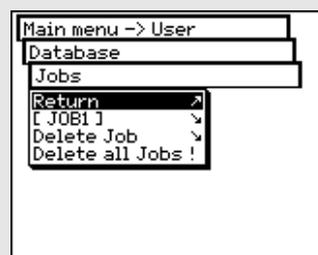


2.5.1 Jobs

If all the jobs have been stored inside the instrument, these can be subsequently deleted or modified.

To do this, from main menu select

Database > Jobs

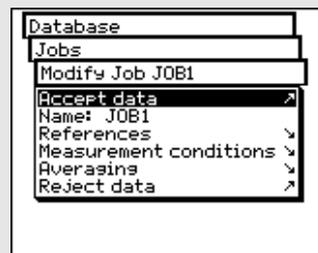


2.5.1.1 Modification of jobs data

From the **Jobs** menu, select the name of the job for which you want to change the data.

The job specific data include:

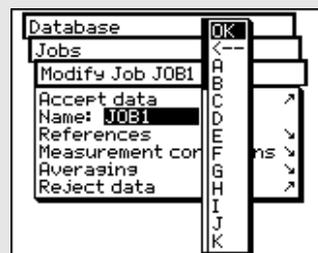
- **Name**
- **Reference**
- **Measurement conditions**
- **Averaging**



To modify data, proceed as follows:

- **Changing the job name**

The job name may be changed, deleted or replaced with a new name by simply selecting the **Name:** menu line.



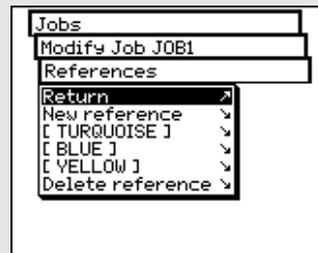
- **Changing a reference**

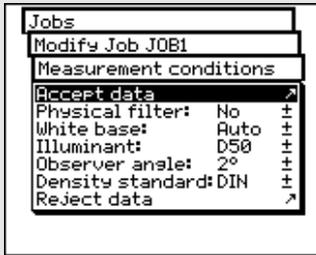
From **Modify Job** menu, select the **References** menu line. Here you can add new references, delete or modify already existing references.

To modify a reference, select the **Reference** item.

The reference windows will appear.

Here you can change the desired items, as described in section 2.4.2 Series Measurement.

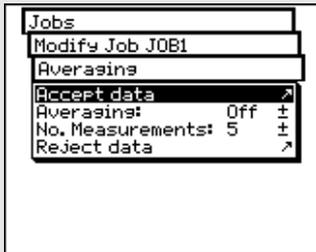




• Changing the measurement conditions

Select the **Measurement conditions** menu line and set up the desired parameters:

- **Physical filter**
- **White base**
- **Illuminant**
- **Observer angle**
- **Density standard**



• Settings for averaging modification

Select the **Averaging** menu line. You can activate and de-activate the automatic averaging feature, as well as define the number of measurements to be used for the averaging function.

If the averaging function is active, the toolbar buttons of the measurement window will show the **Averaging** icon with which you still have the possibility to change settings, and the **Stop Averaging** icon, to immediately interrupt the averaging function.



2.5.1.2 Delete Jobs

From **Database > Jobs** menu, choose the **Delete Job** menu item to select a given job to be deleted. To delete all the job's data, select the **Delete all Jobs** menu item. The data will be deleted only if you choose **Yes** to the delete confirmation request.

2.5.2 Reference libraries

A reference library is a collection of “personal” reference data which come from different sources and may be saved as a library: references can be obtained from the standard color guides or they can be measured directly. This means that a self defined selection will be available for your daily job.

2.5.2.1 Creating a new library

To create a new personal library, select the following from the main menu:

Database > Reference libraries > New library

To create a library, proceed as follows:

- **Enter the reference library name**

SpectroEye automatically assigns a name to the new reference library; however you can change it by selecting the **Name:** menu item.

- **Enter the reference**

Select **References > New reference** menu; the references window will appear. Check first whether the measurement conditions meet your requirements.

Measure, the desired reference. As soon as the desired measurement value is shown on the display, the reference name automatically assigned by SpectroEye will appear, and the toolbar buttons will include the **Reference parameters** icon.

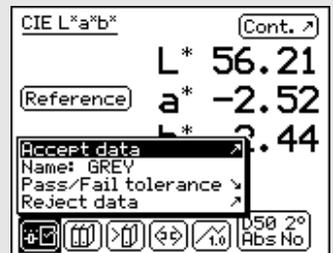
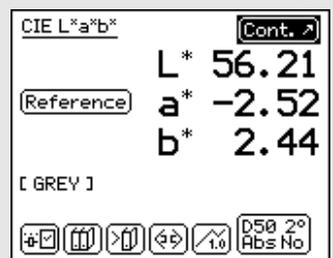
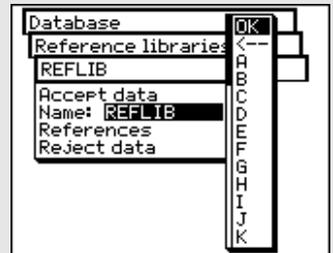
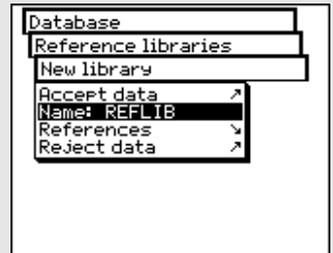


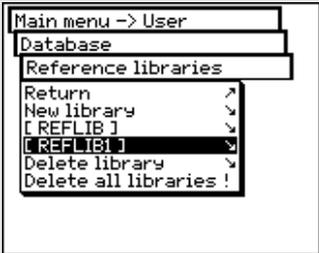
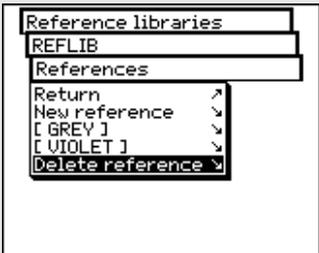
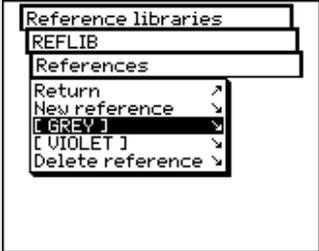
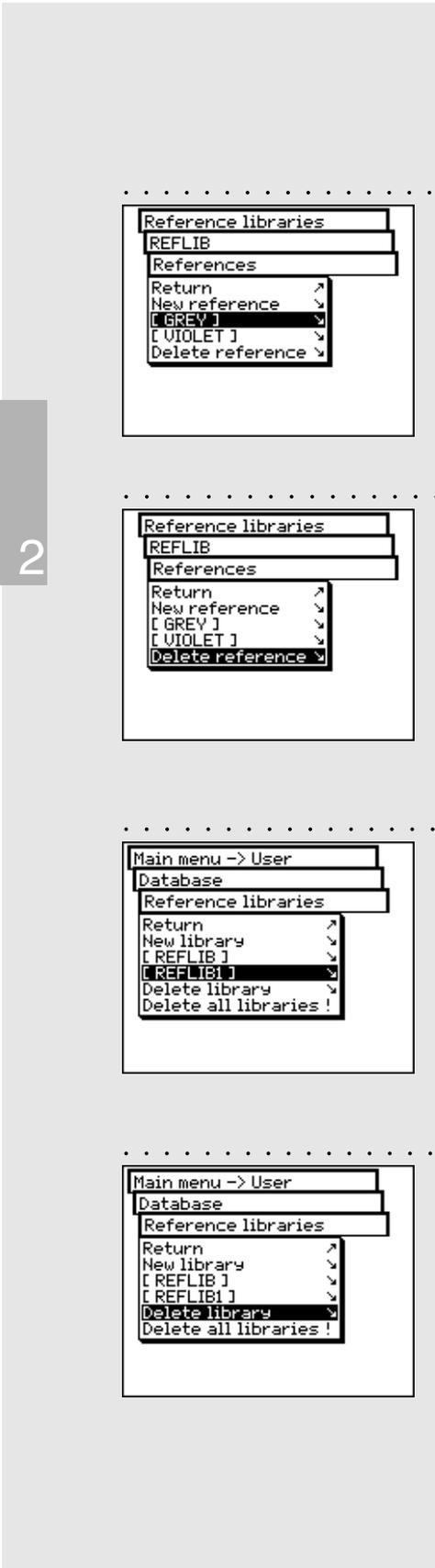
Select this icon to change the name of the color and to define the tolerances for subsequent pass/fail evaluation.

Change the name deleting that pre-assigned to the **Name:** menu item and entering a new reference name.

To define the tolerances for these references select the **Pass/Fail tolerance** menu item.

You can define both the density and colorimetry tolerances for a subsequent evaluation. Confirm your settings using **Accept data**.





Leave the references window using **Continue**. The new reference will be inserted in the References menu and you will be prompted to define a new project using **New reference**. Repeat the described procedure for all references.

• **Subsequent management and cancellation of references**

After the insertion of the last reference you will see, in the **References** menu, a list containing all the reference names. If, during the definition of a reference, you forget to specify the tolerance values, you want to repeat the measurement or further change the names, select the menu line corresponding to the reference. The references window will be displayed, where you carry out changes, as described above.

To delete a reference from the instrument memory, select the **Delete reference** line from **References** menu, then select the name of the reference you want to delete and confirm with **Yes**.

A subsequent management and cancellation of references may also be performed inside the measurement window.



Through the **Modify reference** icon you reach the reference window where you can carry out the desired changes.

2.5.2.2 Managing an existing library

From main menu select **Database > Reference libraries**. Select from the list the desired library, then select the name of the reference library to be modified using the **Name:** menu item, or use **References** menu item to display the reference data currently stored. Here you can process, add or delete references, as described above.

2.5.2.3 Deleting a reference library

To select and delete a given library, select from **Database > Reference libraries** menu, the **Delete library** menu item. To delete all the libraries select the **Delete all libraries** menu item. The data will be deleted only if you choose **Yes** to the confirmation request.

2.5.3 Users

With the **Multi-user** function package you will have the ability to configure your SpectroEye for different users or user groups. You may create new users inside the database, delete or edit the user names and passwords.

2.5.3.1 Creating new users

From main menu, select the following item

Database > Users > New user

The software automatically assigns a user name. First select the **Name:** menu item to delete the name automatically assigned, and define a new unique name for the user. Now define the password with which the new user will be recognised in the future, by selecting **Password > New password** menu item. If the user settings are not protected by a password, this operation may be skipped.

Each user may automatically define its own settings in the **Settings > User defined** menu. The available basic settings can be used as a base for this definition. To get the settings select the **Copy settings** menu item.

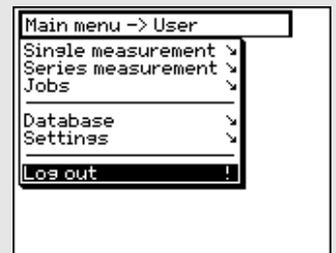
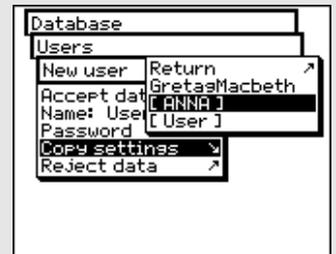
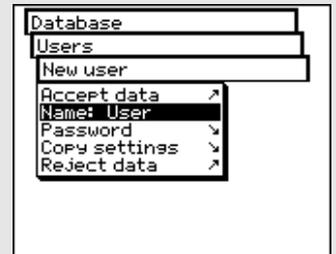
You may choose the following options (explained in the following examples):

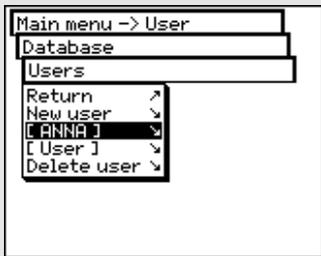
- **X-Rite** Standard setting defined when the SpectroEye is delivered.
- **User x** Setting related to an already existing user.

Choose one of the above options and leave the **New user** menu using **Accept data**.

If you have already stored one or more users, when you leave the user database, the **Log out** item will appear on the main menu. Select this menu item so that the system can recognise you as a defined user.

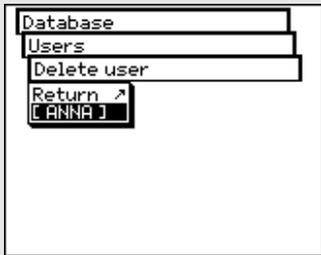
Your setting will be loaded, however you will have the ability to change it later on.





2.5.3.2 Modify user

In order to modify data such as name, password or settings and save them to a given user, first select the **Database > Users** item from main menu, then select the user name from the list. If the selected user has a password assigned, you will be prompted to enter this password prior to making changes, as described above.



2.5.3.3 Delete user

To delete a user select the **Database > User > Delete user** item from the main menu. The display will show all the users not currently active. If you select a user and reply with **Yes** to the confirmation question, the user will be deleted.

2.6 Settings

When working with the SpectroEye, modification of some basic settings are rarely done or never need to be performed. Many of these default settings directly influence measured results, so these settings must be reviewed immediately after deactivating the transport protection!

The basic settings can be found in the main menu under the **Settings** option. These are subdivided into **General** and **User defined** settings. **General** settings are global i.e. even if the SpectroEye will be configured for several users, these settings will apply to all. These are maintained until they are explicitly modified. **User defined** settings refer to specific applications. If the SpectroEye is subsequently configured for various users, these can be independently configured for each user.

2.6.1 General settings

From the main menu, first select:

Settings > General

The following settings can be modified:



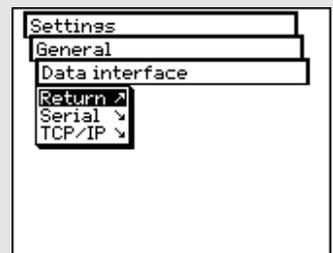
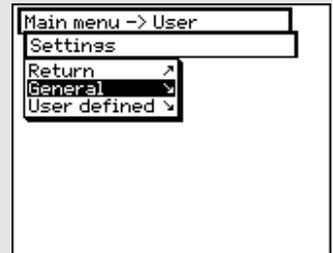
- **Data interface**
- **Setting protection**
- **LCD contrast**
- **Date and time**
- **Battery**
- **New functions**
- **Instrument type**
- **Service**
- **Transport protection**

2.6.1.1 Data interface

In order to correctly make the serial connection to the printer, a computer, or to the Ethernet connection of the computer or network, the interface parameters must be correctly configured.

The following is a description of the variations offered by the Menu options:

Settings > General > Data interface

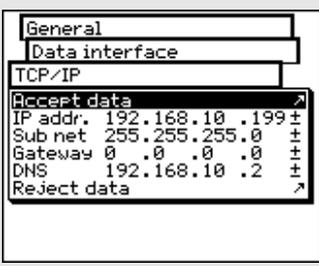




 *These settings must match those of the connected device. Please check the corresponding instructions in the manual provided by the device or software supplier. The default settings are: Baud rate = 9600 and Handshake = Xon/Xoff.*

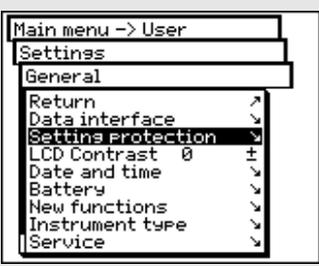
- To define the parameters for serial transmission between the SpectroEye and the printer or PC, select the **Serial** option and proceed as follows:
 1. First set the correct transmission speed using the **Baud rate** option.
 2. Then under **Handshake**, select
 - **No**
 - **Xon/Xoff**
 - **Hardware**
 3. Save settings with **Accept data**.

2



 *To find out whether settings other than the default values are required, contact your system administrator.*

- To connect the SpectroEye through an Ethernet interface to the Internet or a company Intranet, select the TCP/IP option and configure it as follows:
 1. Set the sequence of correct addresses for:
 - **IP addr.**
 - **Sub net**
 - **Gateway**
 - **DNS**
 2. Save settings using **Accept data**.



2.6.1.2 Setting protection

 This menu item is available only if you have purchased the **Setting protection** function package.

The following settings can be password protected against unauthorised changes:

- Settings inside the **Database > Users** menu
- Settings inside the **Settings** menu



To enter a password, select the following from the main menu:

Settings > General > Setting protection > New password

In the **Password:** menu item, indicate your password and confirm with **Accept data**.

If a password was defined, when you try to access this menu, you will be prompted to enter this password. Only when you enter the password can you proceed with the setting phase.

You may periodically modify the password by entering a new password in the **New password** item, from the **Setting protection** menu.

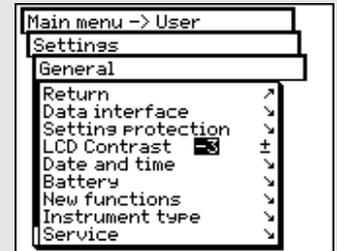
To remove a password protection, select the **Delete password** item, from the **Setting protection** menu.

2.6.1.3 LCD contrast

To adjust the LCD contrast to ambient lighting conditions, from the main menu, select:

Settings > General > LCD contrast

To get the best contrast, select one of the values within the scale. The change is immediately visible on the LCD.



2.6.1.4 Date and time

To automatically integrate the measurement results with the correct date and time, the SpectroEye is equipped with a clock/calendar. Its accuracy should be checked regularly, by selecting:

Settings > General > Date and time



The current date and time are displayed. If incorrect, they can be modified in this menu:

- **Format**

This command sets the display format for the date. Choose between **American** or **European** format. American format is month/day/year, where as European is day.month.year.

 Remember to correct the clock even when changing from summer to standard time and viceversa.

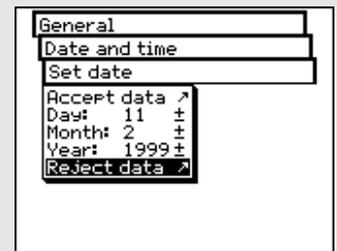


- **Set date**

Select the **Set date** menu option. Correct the settings of:

- Day
- Month
- Year

Save the new date with **Accept data**.



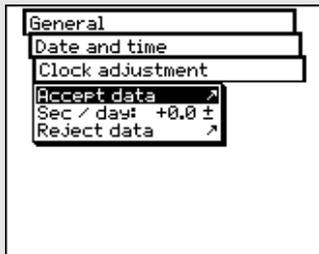


- **Set time**

Now select **Set time** menu option. Correct the settings:

- **Hour**
- **Minute**
- **Second**

Save the new time with **Accept data**.



- **Clock adjustment**

The clock built into the SpectroEye may be running either slightly fast or slightly slow. If the time on print-outs is wrong, the clock can either be reset as described previously, or its long term speed can be adjusted.

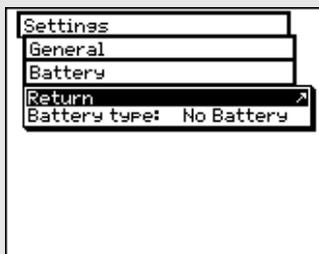
Proceed as described in the following example:

If after four weeks, you find that the SpectroEye clock is four minutes slow.

1. Calculate the correction factor:
in 28 days, the clock lost 240 seconds, equal to 8.6 seconds per day.
2. Select **Clock adjustment** from the menu.
3. Select **Sec/day** and enter the correction factor +8.6.
4. Save the correction with **Accept data**.



If the clock runs slow, a positive value must be entered (to speed it up), whereas if it runs fast, this value must be negative (to slow it down).

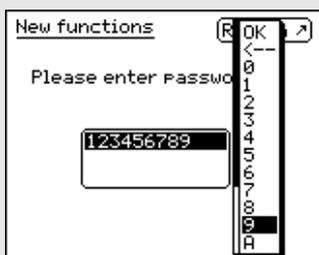


2.6.1.5 Battery

From main menu, select the following item

Settings > General > Battery

to detect, which type of battery is being used.



2.6.1.6 New functions

The available functions of your SpectroEye may be configured exactly according to your needs. The functions which you did not purchase initially may be added by inputting a special code. When you request a new function from your dealer, you will receive a code allowing you to include the corresponding measurement function.

To activate one or more functions, select the following item from the main menu

Settings > General > New functions

At this point you will be requested to enter the special code. Once the code has been specified, the new function will be available.

2.6.1.7 Instrument type

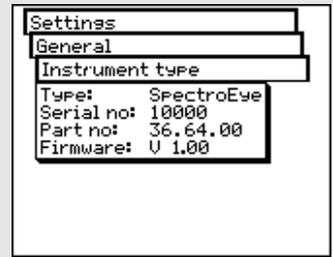
When you select from the main menu the following item:

Settings > General > Instrument type

the display will show all the information needed to identify your instrument:

- Type
- Serial No
- Part No
- Firmware

These data are needed when you request service support, either directly or via internet.

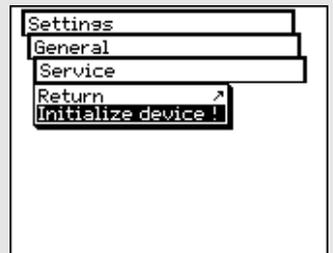


2.6.1.8 Service

In the case of a particular problem, your service centre will request you to perform the instrument initialization.

To do this, select the **Initialize device** item from the **Settings > General > Service** menu.

During the device initialization, the software will be restarted and the interface will be reset. In this phase only the current measurement data are deleted, while the series or jobs data will not be affected. During the first measurement cancellation phase, the filter wheel will also be re-initialized.



2.6.1.9 Transport protection

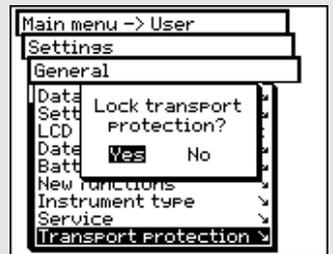
Before packing and sending your SpectroEye or transporting on long travels, it is advisable to activate the transport protection feature. This will help to avoid damage to the measurement head due to accidental bumps.

To activate the transport protection, select the following from the main menu:

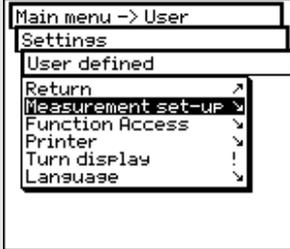
Settings > General > Transport protection > Lock transport protection

and confirm with **Yes**.

To remove the transport protection, simply enter the number **259**.



To avoid damage you are requested to activate the electronic transport protection before every device transport.



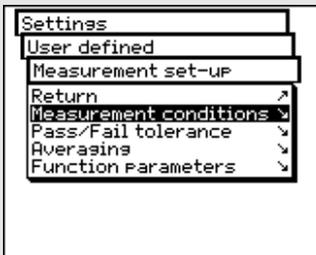
2.6.2 User defined settings

First select the following from the main menu

Settings > User defined

Here you can define the following settings:

- **Measurement set-up**
- **Function Access**
- **Printer**
- **Turn display**
- **Language**



2.6.2.1 Measurement set-up

Settings of **Measurement set-up** menu are considered the default ones. They are always taken as basic settings when you are working with a Single measurement or when you create a Series measurement or Jobs.

To define these basic settings, starting from the main menu you must select

Settings > User defined > Measurement set-up

and then:

- **Measurement conditions**

All settings of the **Measurement conditions** menu should be made with great care as they affect the measurement results. They can be checked on the symbol bar of the measurement window and can be changed to meet the application requirements, at any time.

The measurement conditions include:

- Physical filter

Determine if the measurement must be performed using a physical filter.

The following filter settings are available

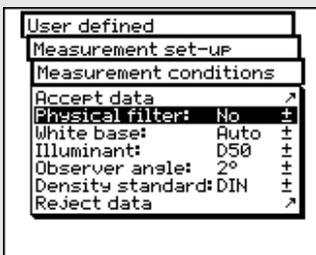
- **No** -> without filter
- **Pol** -> polarisation filter
- **D65** -> Average North Sky daylight
- **UVCut** -> UV suppression
- **Auto** -> automatic selection



If you select **Auto**, SpectroEye will automatically use the physical filter usually adopted for the selected function. For densitometric functions, this is the polarisation filter, while for spectrophotometric functions it is without filter.



Here you should select the most frequently used settings in normal operation. In this way it is possible to guarantee a consistency to the color measurement, which should only be modified occasionally to meet the application requirements.



If you don't know which filter must be used select **NO** for spectral measurements and **POL** for densitometric measurements.

- White base

For a correct spectral or density measurement, the corresponding white base must be defined.

The following settings are available

- **Auto** -> automatic selection
- **Pap** -> paper white
- **Abs** -> absolute white

If you select **Pap**, as white base, all subsequent measurements will refer exclusively to the printed ink layer, while the paper color effect will not be included. To obtain the basic base reference you should always measure the paper used.

If you select **Abs**, besides the printed ink layer, the measurement will also include the paper effect. Here the integrated white reference will be used as the white base.

If you select **Auto**, SpectroEye will automatically use the white base usually adopted for the selected function. For densitometric functions, this is the white base of paper, while for spectrophotometric functions it is the absolute white base.

- Illuminant

To calculate the special color values, select the desired normalised illuminant.

The most commonly used normalised illuminants are already available:

A, C, D65, D50, F2, F7, F11

The normalised illuminants of **D** and **F** series must be set-up using the **Dxx** and **Fxx** menu items. When you perform this selection, an additional menu line appears, where you can select the desired color temperature.

Here the following illuminants are available:

Fxx: F1 to F12

Dxx: D30 to D300

- Observer angle

When analysing the colorimetric values, the calculation and consequently the result depend on the definition of the observer angle.

In this menu line you must select the observer angle, normally between **2°** and **10°**.



In practice the densitometric analyses are based on paper (Pap setting) while the spectrophotometric ones are based on the integrated white reference (Abs setting). It is advisable to select the Auto setting and change it only in special cases.



Usually the normalised illuminant for the Graphic Arts industry used is D50.

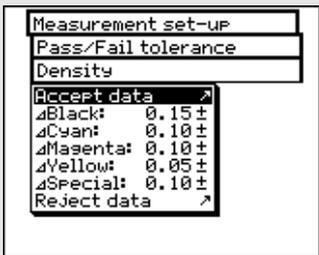
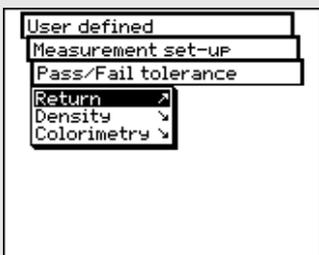


You can freely select one of the two settings. It is extremely important that for chromatic comparison the selected setting is always kept constant.



Normally the density standard used in the USA is ANSI T while in Europe it is DIN. As a guide line it is advisable to select the settings corresponding to the set of physical filters available on the densitometer.

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The tolerances set-up in this menu must be considered only as a first recommendation. It is advisable to tune tolerance limits based on customer needs and product requirements.

- Density standard

If you wish to use the SpectroEye spectrophotometer also as a densitometer, you must define which density standard to operate with.

In this menu line select either:

DIN, DIN NB, ANSI A, ANSI E, ANSI I, ANSI T, SPI

Save your settings in **Measurement conditions** menu using **Accept data** and proceed with:

• Pass/Fail tolerance

When you work with Series measurements or Jobs, immediately after the reference and sample measurement, you obtain an evaluation in terms of pass/fail. The measured values are included in (Pass) or excluded from (Fail) based on the tolerance values defined in this menu. The tolerances are defined separately for densitometric and spectral measurements as follows:

Starting from the **Measurement set-up** menu, select **Pass/Fail tolerance > Density**

Enter the sequence of tolerances corresponding to the maximum densities of the process colors. The tolerance values indicate how much the solid density value of a measured sample can shift from the solid density of the reference.

Example:

The reference for cyan has been measured with a solid density of 1.55. The tolerance value was set-up to +/- 0.10. All the measured samples are within the density range of 1.45 and 1.65 i.e. within the allowed tolerance. Therefore, in the measurement window **Pass** will be displayed. If the solid density is higher or lower than such limits, **Fail** will be displayed.

Next, starting from the **Measurement set-up** menu, select **Pass/Fail tolerance > Colorimetry**

In the **Formula:** menu line select the formula you want to use to define the tolerance.

The following formulas and tolerance settings are available:

Supplied with the base instrument

- $\Delta L^* \Delta a^* \Delta b^*$
- $\Delta E^* \text{ CIELAB}$



Options

- $\Delta E \text{ CMC}$, $\Delta E \text{ FMCII}$, ΔE^*94 , ΔE^*2000
- $\Delta E^* \text{ CIELUV}$
- $\Delta E \text{ mg}$
- $\Delta E \text{ Hunter Lab}$

As soon as you have chosen one of the above formula, the corresponding parameters are displayed in one or more menu lines. When the data entry procedure is completed, save the tolerance values using **Accept data**.

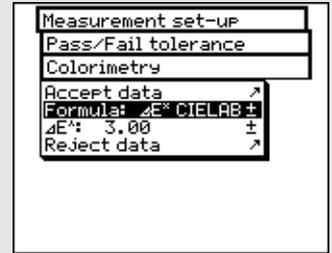
All the subsequent Pass/Fail evaluations will refer to this formula and to the tolerances defined here. The Pass/Fail evaluation is displayed only if the corresponding measurement function has been selected.

• **Averaging**

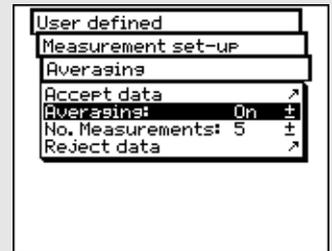
For non-homogeneous samples and references SpectroEye is able to calculate the average of different measurements.

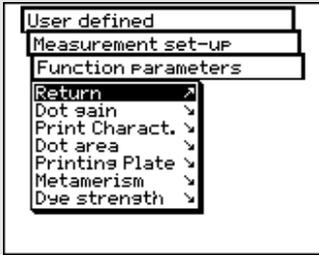
Starting from the **Measurement set-up** menu, select **Averaging**.

Here you can activate or de-activate automatic averaging, as well as set-up the number of measurements to be taken for each average. If the averaging function is activated, an icon appears on the symbol bar of the measurement window, which allows these settings to be changed.



The tolerances set-up here must be considered only as a first recommendation. It is advisable to tune tolerance limits based on customer needs and product requirements.





• **Function parameters**

Some measurement functions are based on parameters which must be adjusted to individual working conditions.

To modify these, starting from the **Measurement set-up** menu, select **Function parameters**.

Enter each parameter used for the following functions:

- **Dot gain**

Enter the screen percentage value provided in the color bar halftone fields for dot gain measurement.

- **Print characteristic**

Set-up the halftone levels from which the print characteristics must be created.

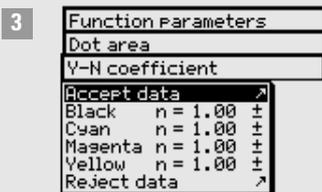
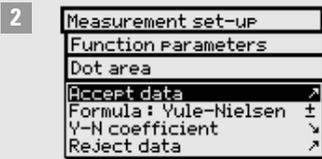
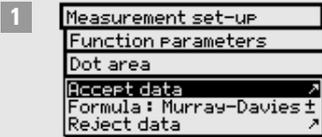
- **Dot area**

For dot area calculation you may use the **Murray-Davies** and **Yule-Nielsen** formulas. While for the Murray-Davies formula the degree of light optical absorption is predefined, in the Yule-Nielsen formula this can be adapted for different conditions.

First, select the **Formula:** menu item, and choose the formula to be used for calculation. If you choose the Yule-Nielsen formula, another line appears within the menu where you can set the **Y-N coefficient**. Here the “n” values for black, cyan, magenta and yellow are entered.

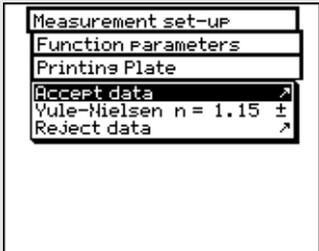
 Normally the Murray-Davies formula is used. The Yule-Nielsen formula should only be used in special cases, i.e. to determine the physical area coverage.

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3



- **Printing Plate**

When measuring the printing plate, to determine the physical dot area coverage of your printing plate, set the Yule-Nielsen factor.

- **Metamerism**

By determining the metamerism index you define the mutual color modification of two colors when the illuminant changes. The first illuminant used is that defined within the

Settings > User defined > Measurement set-up > Measurement conditions > Illuminant menu.

Enter the test illuminants for which the color changes of the first illuminant must be determined.

You may define a maximum of three test illuminants.

- **ΔE CMC**

In order to calculate the color difference using CMC, you must enter the correction factors for brightness (i) and chroma (c).

- **ΔE^*94 , ΔE^*2000**

To calculate the color difference using to ΔE^*94 or ΔE^*2000 you must enter the correction factors for brightness (kL), chroma (kC) and hue (kH).

- **Dye strength**

To determine the dye strength you must first choose one of the available calculation methods:

at max K/S, **xyz weight KS** and **Best Match ΔE** .

Next, access the Colorant menu item, enter the type of ink for which you wish to determine the dye strength. You may choose **Transparent ink**, **Opaque ink** and **Textile dye**.

During the measurement, the symbol bar of the measurement window shows the function parameter icon. After having selected the corresponding measurement functions you can always change all settings performed.



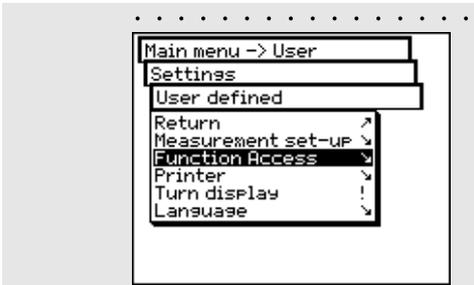
The recommended settings for the printing industry are: $l=2$ and $c=1$.



The recommended settings for the printing industry are: $kL=1$, $kC=1$ and $kH=1$.



In general, any function is neither cancelled nor inserted here, but rather made available in the user area.

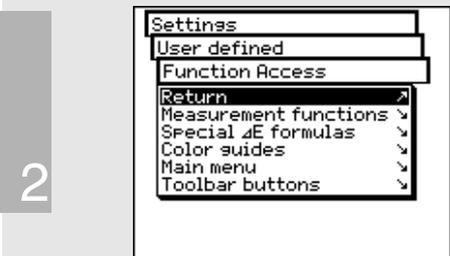


2.6.2.2 Function Access

The user area may be individually adjusted during the function access, according to the specific user needs. For example, if you want to use your SpectroEye as a simple density measurement tool, connected to a printer, you will want to de-activate all the spectrophotometric functions. This setting may be performed separately for each user, so that every operator has an optimised user area available for their own job.

To activate and/or de-activate the desired function, select the following from the main menu:

Settings > User defined > Function Access



According to the working needs, it is possible to carry out the following settings:

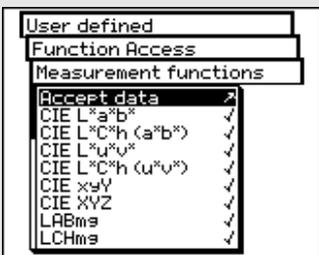
- **Measurement functions**
- **Special ΔE formulas**
- **Color guides**
- **Main menu**
- **Toolbar buttons**

As soon as you select the menu lines, these are marked with a “check symbol” and made available to the user. When you select the marked menu lines, the “check symbol” is removed. In this way, that function will not be available any more in the user area.

The setting options of each individual sector is explained in detail in the following list:

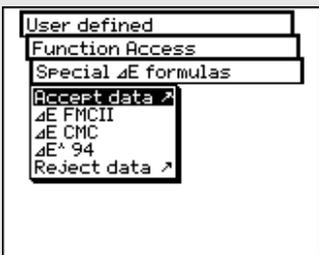
- **Measurement functions**

In the **Function Access** menu, select the **Measurement functions** menu item. This menu allows one to define which measurement functions can be selected within the measurement window using the **Measurement function** icon. The selected settings becomes active using **Accept data**.



- **Special ΔE formulas**

In the **Function Access** menu, select the **Special ΔE formulas** menu item. Usually, not all the formulas available will be used. Through the **ΔE Formula** icon you may determine which special ΔE-formula(s) must be made available inside the measurement window. The selected settings become active using **Accept data**.



 • **Color guides**

In the **Function Access** menu, select the **Color guides** item menu. Here you have the ability to prevent access to particular standard color guides. The selected settings becomes active using **Accept data**.

• **Main menu**

In the **Function Access** menu, select the **Main Menu** item. Here you have the ability to prevent access to particular areas of the main menu. The selected settings becomes active using **Accept data**.

• **Toolbar buttons**

In the **Function Access** menu, select the **Toolbar buttons > Buttons** item.

Here you can decide which icons will be available in the toolbar of the measurement window. The selected icons will become active using **Accept data**.

Selecting the **Balloon help** menu item in the **Toolbar buttons** menu, you can decide if the measurement window icons will have to be explained by means of an on-line help.

2.6.2.3 Printer

Measurement results can be sent directly to a printer, without the need of a computer. In such cases the printer is connected directly to the SpectroEye through the serial interface port.

To obtain a correct print-out, it is necessary to give the SpectroEye specifics about the printer to be used.

From the main menu, select

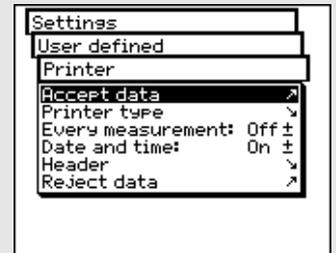
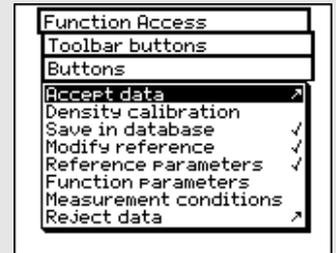
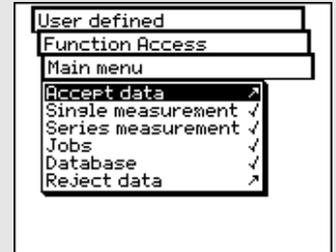
Settings > User defined > Printer

and proceed as follows

1. First, select the **Printer type** option and then the model of printer to use.

Available printers:

- **No printer**
- **No formatter**
- **Seiko DPU**
- **Canon BubbleJet**



 Read the suggestions in the manual of your printer as well as the suggestions for connecting a printer to SpectroEye from chapter 1.2.3.5 to chapter 1.2.3.6.



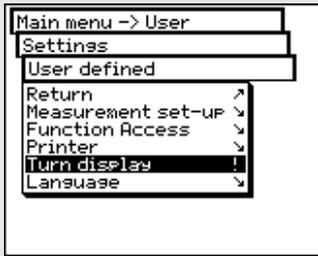


If this list does not include your printer, check the printer manual to see if this is compatible with one of the listed models. Otherwise select the No Formatter option.

- Canon BJ10vCustom
- EPSON LX800
- HP DeskJet
- HP LaserJet
- HP ThinkJet
- CBM510

2. If you require the date and time to be entered automatically with the print-outs, select **Date and time** menu option and set the displayed value to **On**.
3. The printer protocol heading can be defined by selecting the **Header** menu item. Enter the text which is to appear in the printer protocol; 5 lines are available.
4. Save settings using **Accept data**.

2



2.6.2.4 Turn display

The SpectroEye is designed to be used with one hand. On delivery from the factory, it is set for use with the right hand. So that left-handed people may also use the SpectroEye with ease, the displayed data can be rotated.

From the main menu, select

Settings > User defined > Turn display

The display on the LCD is immediately rotated.



2.6.2.5 Language

The SpectroEye software is available in several languages. To change the language, select the following from main menu:

Settings > User defined > Language

The display changes as soon as you select the requested language.

If you press and hold down the measurement key for about 15 seconds, the program immediately selects the language menu. In this way you can easily switch from an unknown language to a known one.



3.1 Best Match

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4

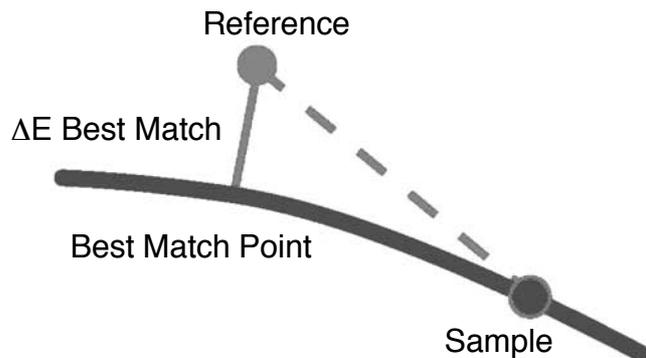
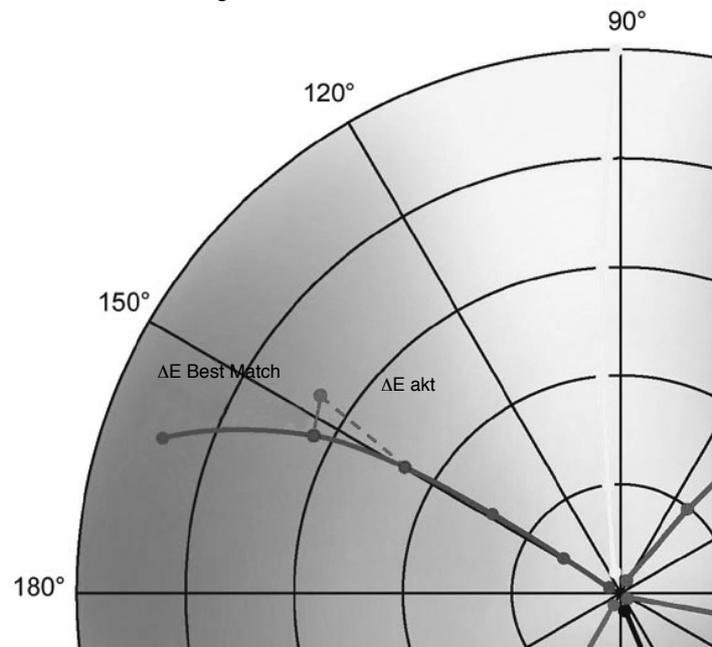
3. Functions

In this chapter we will take a detailed look at selected functions which highlight the high standard of the SpectroEye unit.

3.1 Best Match

3.1.1 General

The illustration below shows the Best Match function with the aid of the CIELAB color space using an example of two different shades of green:



The curve describes the hue shift when changing the ink thickness in relation to ink concentration. The length of the line forming a perpendicular connection between the reference point and the curve corresponds to the Best Match for the nominal value.



The SpectroEye **Best Match** function allows you to quickly and easily establish if a mixed color matches a specified target color or whether you will need to mix a new batch. The deviation is calculated on the basis of colorimetric and densitometric differences between the reference and the sample colors. The colorimetric deviations are provided as ΔE (color difference) and the densitometric differences as D (density difference). The densitometric measurement also helps when printing special colors and checking screen colors by indicating the required layer thickness (in offset printing) and concentration (in flexo and gravure printing) with which a color must be printed to achieve the most accurate reproduction of the target color.



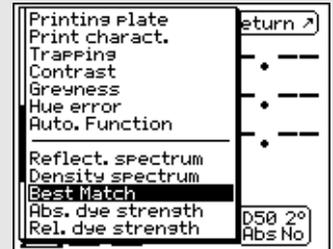
You can use the Best Match function when formulating and mixing colors and to check the color during printing. This function detects the slightest deviations from the target color immediately, saving you time and money throughout the print run.

3.1.2 Configuring the Function

From the **Main Menu**, select **Single Measurement**.

Select the **Measurement Function** icon.

Select the **Best Match** function.



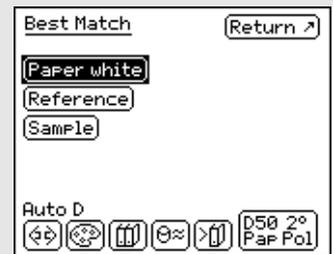
3.1.3 Performing the Measurement



Always measure **Paper White** first. To do this, select Paper White, place the measurement module on the point you want to measure and press the measurement pad.

Now measure the **Reference Color**. To do this, select **Reference**, place the measurement module on the point you want to measure and perform the measurement.

The displays shows the measured **Density D** with the associated **Wavelength**. In this case, we use a shade of green as the reference color. The density D is measured at a wavelength of 640 nm and is 1.43.

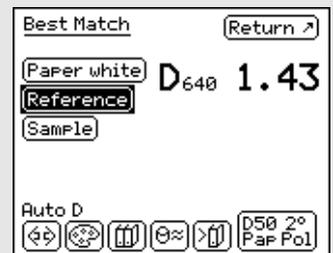


To do this, select the icon **Accept from Database** and select the desired color (for example, Pantone colors).

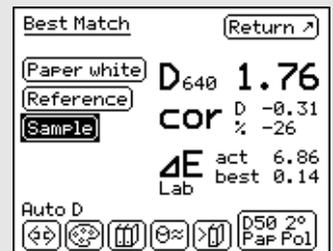
You are now ready to measure the color you want to compare.

Choose a **Sample**.

Place the measurement module on the point you want to measure and perform the measurement.



Instead of a reference table on paper, you can also copy special color combinations from the database.





The maximum permitted **Color Difference ΔE** is determined for each print job. If the value of **ΔE best** is greater than the specified ΔE , you cannot achieve the desired color quality by changing the density.



For more information on printing, please refer to Chapter 2.4.1.5 *Printing the Measurement Values*.

3.1.4 Interpreting the Measurement Results

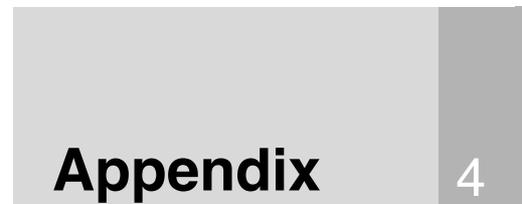
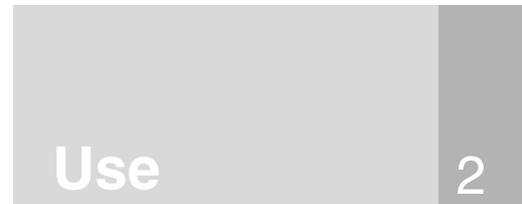
Here we measure a second shade of green, for example, which has as its **Density D** a value of 1.76 at 640 nm. Below this you can see the recommended **Correction cor** needed to achieve optimum results: in relation to the reference color you should correct the **Density D** by -0.31/-26% in order to achieve the closest possible match with the target color.

The **color difference ΔE act** indicates how close the current color is to the desired target color. In our example ΔE akt is 6.86. If you implement the recommended changes to the density, you can achieve a color difference of **ΔE best** as the **Best Match** (optimum possible match). In our example ΔE best is 0.14.



You can print this measurement result by selecting the **Print** icon.

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4. Appendix

4.1 Clean White Calibration Tile

The white calibration tile should be cleaned at least once per year (depending on usage and dust in environment).



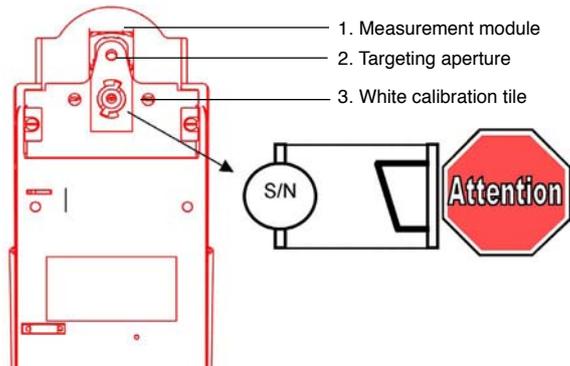
Do not use compressed air to blow dust out of your SpectroEye instrument!



Under no circumstances should you try to clean parts not specified in the description!



X-Rite recommends to verify your SpectroEye regularly with NetProfiler and/or to recertify it. Contact your X-Rite dealer or your nearest X-Rite service center to find more about recertification.



- Move the **measurement module** out by selecting the item “Carriage” in menu service:
Settings > General > Service
- Use the white tile tool to **turn the white calibration tile counter clock wise** to the stopper.
- Pull out **white calibration tile** with the help of the white tile tool.
- Wet a cotton bud stick or lint-free wiper in alcohol and carefully **clean the white calibration tile**.
- Insert white calibration tile and turn it with the white tile tool clockwise to the stopper.
IMPORTANT: The white calibration tile must be mounted as shown above (tilted plane).
- Move the **measurement module** in by selecting the item “Carriage” in menu service:
Settings > General > Service

4.2 Warranty Conditions

X-Rite, Incorporated (“X-Rite”) warrants each instrument manufactured to be free of defects in material and workmanship (excluding battery pack) for a period of 12 months, unless different local regulations apply. This warranty shall be fulfilled by the repair or replacement, at the option of X-Rite, of any part or parts, free of charge including labor, F.O.B. its factory or authorized service center.

This warranty shall be voided by any repair, alteration, or modification, by persons other than employees of X-Rite, or those expressly authorized by X-Rite to perform repairs, and by any abuse, misuse, or neglect of the product, or by use not in accordance with X-Rite’s published instructions.

X-Rite reserves the right to make changes in design and /or improvements to its products without any obligation to include these changes in any products previously manufactured. Correction of defects by repair or replacement shall constitute fulfillment of all warranty obligations on the part of X-Rite.

THIS WARRANTY IS EXPLICITLY IN LIEU OF ANY OTHER EXPRESSED OR IMPLIED WARRANTIES, INCLUDING ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR ANY PARTICULAR PURPOSE. THIS WARRANTY OBLIGATION IS LIMITED TO REPAIR OR REPLACEMENT OF THE UNIT RETURNED TO X-RITE OR AN AUTHORIZED SERVICE CENTER FOR THAT PURPOSE.

This agreement shall be interpreted in accordance with the laws of the State of Michigan and jurisdiction and venue shall lie with the courts of Michigan as selected by X-Rite, Incorporated.

4.3 Technical specifications

	SpectroEye LT	SpectroEye	Options
Measurement functions	Colorimetry	CIE L*a*b*, CIE L*C*h (a*b*), ΔE* CIELAB	CIE XYZ, CIE xyY; CIE L*u*v*, CIE L*C*h (u*v*), ΔE CIELUV; LABmg, LCHmg, ΔEmg; Hunter Lab, ΔE Hunter Lab; RxRyRz
	Special color deviation formulas	Optional	ΔE*2000, ΔE*94, ΔE CMC, ΔE FMCII, Metamerism
	Densitometry	Density, All densities (Grey Balance), Dot gain, Dot area, Trapping Contrast, Print characteristic, Auto Function	Density, All densities (Grey Balance), Dot gain, Dot area, Trapping Contrast, Print characteristic, Auto Function Printing plate, Greyness, Hue error
	Spectrum	optional	Reflection spectrum Density spectrum
	Special functions	optional	Best Match
	Color guides	optional	PANTONE Formula Guide (coated, uncoated, matte) DIC Color Guide; HKS E, K, N and Z
	Dye Strength	optional	optional Absolute (K/S) and relative (K/S)
	White- and Yellowness	optional	optional Whiteness CIE, Whiteness ASTM E313, Whiteness Berger, Whiteness Stensby, ISO Brightness R457, Yellowness ASTM E313, Yellowness ASTM D1925, Tint CIE
	Security	optional	optional Setting protection, Multi user
Measurement Conditions	White base	Absolute, relative	
	Illumination types	D50, D65, A, C, D30...D300, F1...F12	
	Standard observers	2°, 10°	
	Density standards	ISO Status A, ISO Status E, ISO Status I, ISO Status T, DIN 16536, DIN 16536 NB, SPI	
Measurement technology	Spectral analysis	Holographic diffraction grating	
	Spectral range	380nm to 730nm	
	Physical resolution	10nm (internal resolution: 3.3nm)	
	Measurement geometry	45°/0° ring optic, DIN 5033	
	Measurement aperture	4.5mm or 3.2 mm (selectable upon order)	
	Light source	Gas-filled tungsten, type A illumination	
	Physical filters	No (incandescent lamp light), Polarized, D65 (Approximated daylight), Optional UV cutoff	
	Measurement time	Approximately 1.5 sec	
	Measurement range	Density DIN 16536: 0.0D-2.5D	
	Inter-instrument agreement	Typical 0.3 ΔE* CIELAB, or 0.15 ΔE CMC(2:1) average based on 12 BCRA tiles (D50, 2°)	
	Linearity	± 0.01D	
	Short-term repeatability	0.02 ΔE* CIELAB (D50, 2°), mean value of 10 measurements every 10 seconds on white	
	Density repeatability	Density DIN 16536 (Repeatability ±0.01D): No Filter 0.0D-2.5D, Yellow 0.0D-2.0D Pol Filter 0.0D-2.2D, Yellow 0.0 D-1.8D	
	Filter wheel	Electronic selection of filter	
	White calibration	Automatic on integrated white tile	
	Instrument check	Automatic check of the spectral calibration	
	Density filter recognition	Manual and automatic	
	Average	Averaging for multiple measurement values	
	Color detection	Manual and automatic assignment of samples to references	
Data interface	Serial data interface	RS232C with Baud rate: 300 to 57,600	
Power supply	Internal battery	NiMH battery pack, nom. 7.2V, 1300 mAh	
	SpectroEye supply	15VDC, 0.8A	
	AC adapter requirements	85 VAC to 270 VAC, 47 Hz to 63 Hz	
	Charge time	Approximately 3 hours, automatic disconnection	
	Charge status	Automatic capacity checking and display	
	Measurements per charge	Approximately 3000	
Mechanical data	Physical dimensions	24.5 cm length, 8.3 cm width, 8 cm height (9.6 x 3.3 x 3.2 in)	
	Weight	Approximately 990 g, (2.18 lb)	
Environmental conditions	Storage temperature	-20°C to 50°C	
	Operating temperature	10°C to 35°C	
	Humidity	max. 80%, non condensing	
	General	Use only in indoor environments, usable up to 4000 mNN only, over voltage Class II, dirty degree 2	

Specifications subject to change without notice.

4.4 Declaration of conformity

EC-DECLARATION OF CONFORMITY

The undersigned, representing the following manufacturer

X-Rite Europe AG
Althardstrasse 70
CH-8105 Regensdorf
Switzerland

herewith declares that the product

Spectrophotometer
SpectroEye

is in conformity with the provisions of the following EC directive(s)
(including all applicable amendments)

73/23/EEC Electrical equipment for use within specified voltage limits
89/336/EEC Electromagnetic compatibility

and that the standards and/or technical specifications referenced
overleaf have been applied.

Last two digits of the year in which the CE marking was affixed: **99**

CH-8105 Regensdorf, 1. Feb. 1999

Th. Senn
Vicepresident



G. Bonafini
Program Manager





Headquarters

4300 44th Street SE, Grand Rapids, MI 49412 USA
Phone: 800-248-9748 or +1 616-803-2000

European Headquarters

Althardstrasse 70, CH-8105 Regensdorf, Switzerland
Phone: +41 44-842-2400

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