

TECHKON

Erfolg ist messbar

Spectro-Densitometer
SpectroDens

Software
SpectroConnect



Manual

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Welcome

We welcome you among the worldwide community of users of TECHKON products. We are happy that you have selected this high-quality measurement instrument. It will be a valuable tool for your day-to-day quality control tasks. With this manual we invite you to learn how to use SpectroDens.

The manual is divided into three chapters:

CHAPTER 1: How to use TECHKON SpectroDens

CHAPTER 2: Description of the measurement functions

CHAPTER 3: How to use the Windows software SpectroConnect

For the first steps we recommend to read chapter 1; in particular paragraph 1.4.

You will be fascinated that after only 15 minutes you will know how to work with SpectroDens. The second chapter will show you detailed insight into the measurement functions and chapter 3 is about the Windows software SpectroConnect, which is part of the package.

Please get the device registered by using the registration card, which you will find in the appendix of this manual. That way we can keep you updated about product news.

Please visit us as well on internet at www.techkon.com. You will find useful information about the complete product range and new software versions.

Do you have any suggestions for improvements or do you require information that goes beyond the contents of this manual? We will be glad to hear from you. Your suggestions or questions make an important contribution to the continuous optimization of our documentation and products.

Your TECHKON Team

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Chapter 1

How to use TECHKON SpectroDens

1.1 Product description

With the new SpectroDens generation TECHKON continues the success story of the SpectroDens hand-held devices in the long term. The dictum during product development was: Pursue proven concepts and integrate new meaningful technologies. The result sets a new standard.

A measurement device for all applications

SpectroDens is an all-purpose measurement device, that is universally used for quality control in the printing industry as well as for other tasks, where colors have to be judged critically. SpectroDens is exceptionally suitable, no matter which application. Thanks to the individually adjustable display functions, you can quickly set up the device for your particular job. The solid aluminum unibody case makes the device a reliable tool even in a harsh industrial environment. Direct positioning of the measurement head on the measurement field ensures a secure and quick measurement. All SpectroDens models are equipped with tracking wheels so that, in addition to individual measurements, scanning measurements of up to 10 seconds can be carried out on print control strips and media wedges.

Two devices in one

As a spectro-densitometer, SpectroDens combines the qualities of a highly accurate spectro-photometer and an easy-to-use densitometer. Measurement is spectral, i.e. the entire color information – the spectral fingerprint of the color – is precisely registered. The data is converted into measurement data for descriptive analysis and display:

- Densitometric data is widely used in quality control during the printing process.
- Colorimetric data is used in the evaluation of print proofs, the creation of color profiles in color management as well as the color matching and formulation of inks.

Densitometry / Density measurement

A push of a button provides you with solid density as well as all useful additional information such as dot gain, dot area, gray balance and print contrast. In the automatic measurement mode the device always displays the relevant information instantly. You can even quickly and easily produce complete printing curves. The spectral measure-

ment technology calculates not only density values for CMYK, but also exact data for the density of spot colors.

Colorimetry

All standard colorimetric functions are displayed clearly. Even the entire CIE L*a*b* color circle appears in the high resolution color display. As a result understanding CIE L*a*b* values becomes very easy and clear. In the color library 25.000 reference colors and complete digital color books can be saved.

Standardized measurement

Thanks to its ISO-compliant measuring head SpectroDens works strictly according to the standards valid for the graphic industry. Select different status filters for density measurement in the device settings. A special technical feature is the polarization filter which can be switched on and off by a push of a button and makes SpectroDens particularly good at evaluating the Ugra/Fogra media wedge.

Using the latest LED technology SpectroDens provides D50 illumination and therefore fulfills the M0, M1, M2, M3 measuring conditions in accordance to ISO 13655. The lifetime of the LED illumination is nearly unlimited. Moreover the new design of the direction-independent measuring head provides reliable measurements of a wide range of print media.

Software SpectroConnect

The supplied Windows-software TECHKON SpectroConnect provides the connection between SpectroDens and the PC via the micro-USB connector or via the optionally available WLAN-module. Measurement data can thus be comfortably processed on the PC and transferred, for example, to Microsoft Excel™.

Use the color library to load complete digital color books quickly and easily into the device. An import of color values in CXF® format is possible as well. SpectroConnect is also the connecting module for other applications, e.g. programs for the production of printing curves, for colorimetric quality control or for checking the compliance of printing products to ISO standards.

Three different performance packages

We supply SpectroDens in three types of performance packages: The model **Basic** with all density functions and the **Advanced** version which adds essential colorimetric functions and a color library. The fully equipped flagship model SpectroDens **Premium** meets all demands with regard to quality control. All SpectroDens devices can also be used for scans and feature a brilliant color display. Optionally data transmission by means of a WLAN module is possible. SpectroDens can be upgraded post-purchase by program upload to higher versions (charged service).



SpectroDens Basic

- Automatic density
- Density CMYK (with reference measurements)
- Dot area
- Dot gain
- Print contrast
- Gray and color balance
- Ink trapping
- Printing curve
- Density spectrum
- Spectral density for spot colors
- Trend function ExPresso mini
- Slur/doubling
- Dot area to Yule-Nielsen for printing plates
- LED technology provides measurement conditions M0, M1, M2, M3 according to ISO 13655
- Spot Colour Tone Value (SCTV)
- Spot Colour Tone Value (SCTV) Printing curve
- Average

SpectroDens Advanced

Same functions as SpectroDens Basic and additionally:

- CIE L*a*b*
- CIE L*a*b* + D
- $\Delta E^*a^*b^*$
- CIE L*C*h*ab
- CIE XYZ
- CIE color circle
- ΔE^*cmc
- ΔE^*CIE94
- $\Delta E^*CIE2000$
- Remission spectrum
- InkCheck: Color control of spot colors
- Color library with up to 20 color books and a total number of 25.000 reference values
- Memory capacity for 3.000 sample values and 300 reference values
- G7™

SpectroDens Premium

Same functions as SpectroDens Advanced and additionally:

- Ugra/Fogra media wedge evaluation
- ISO-Check: Color control according to ISO 12647
- CIE L*u*v*
- CIE L*C*h*uv
- CIE xyY
- DIN Lab99
- Metamery index
- Whiteness
- Yellowness
- Pass/fail tolerance
- Opacity
- OBA-Check
- Visual Opacity
- Universal SCAN function

1.2 Packing list

Contents of delivery

- Measurement device SpectroDens
- Charging console with integrated absolute white standard
- Power supply unit with country-specific plug adapter, suitable for Europe, UK and USA
- Manual with ISO 9000 compliant certificate (pdf on data media)
- Manufacturer certificate
- Micro-USB cable for PC connection
- USB stick with Windows software TECHKON SpectroConnect



Contents of delivery of SpectroDens

Optional accessories

- Exchangeable apertures: 3.0 mm (standard) and 1.5 mm for control patches of 3 x 3 mm minimum
- WLAN module
- Print control strips TECHKON TCS (the digital print control strips TECHKON TCS can be downloaded free of charge at www.techkon.com)
- Device upgrades for **Basic**- or **Advanced** models to higher functionality
- Color reference SpectroCheck NG

Replacement parts

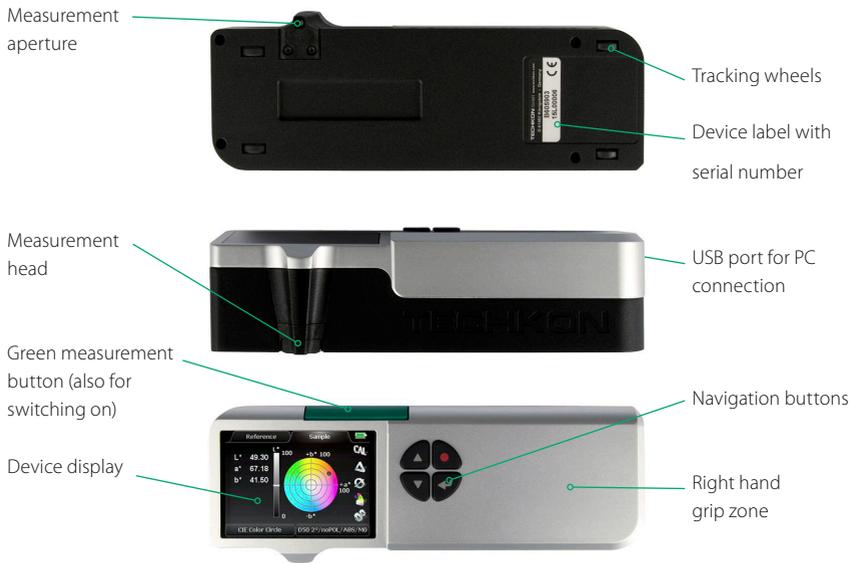
- Charging console with white standard
- AC adapter
- Rechargeable battery

You will find the technical specifications in the appendix of this manual.

1.3 Design of SpectroDens

SpectroDens is a solidly designed measurement device which is very functional and easy to use. It is compact in size; the buttons can be reached with the right index finger when the device is held with the right hand. The LCD display is inclined towards the user, so the display information can be read clearly.

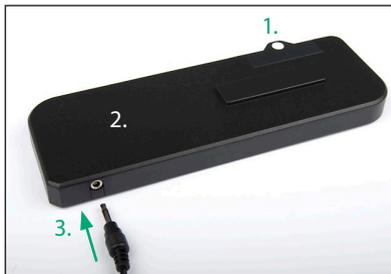
SpectroDens can be easily positioned on the measurement sample.



The device incorporates a high-resolution spectral sensor which analyzes the color spectrum of the measured sample. The spectral data is the base information for calculating densitometric and colorimetric data which is displayed. Densitometric values can be solid density, dot area, dot gain or trapping values. Colorimetric values are typically CIE $L^*a^*b^*$ - or ΔE^* -color information.

The USB-connector is for linking with a PC. The USB-cable with a Micro-USB plug, which fits into the connector at the right side of the device, is part of the package.

The charging console incorporates an absolute white standard, which should not be touched but should always be kept clean.



1. Absolute white standard
2. Charging area for wireless, inductive battery charging
3. Low voltage connector for the plug of the AC adapter

The above image shows how to connect the plug of the AC adapter with the charging console. The AC adapter can be used universally for 100 – 240 V and 47 – 63 Hz.

There are three adapter plugs for different countries. To change an adapter plug, just unlock the lock, pull the plug off the AC adapter and push in the new one. Make sure it is connected firmly.

Connect the mains plug to the power socket. The socket must be located near the facility and must be easily accessible. Do not use the power plug if the power cord is damaged.

Always use the original TECHKON SpectroDens AC adapter. The use of other power sources is hazardous and can damage the device.



AC adapter with three different mains plugs



Device in the state of charging

1.4 Working with SpectroDens

Switching on and off

SpectroDens is switched on by pressing the green measurement button. It is immediately ready to measure. In this state power consumption is very low.

The device switches off automatically within the set switch-off time. The switch-off time can be set in the device settings from one minute to 3 hours. Switching it on again with the green measurement button will show on the display the last measurement done. There is no button to turn SpectroDens off.

Charging

The **battery status** is displayed as a battery symbol in the upper right corner of the LC-display, when the unit is turned on.

When the battery turns empty, the battery symbol turns to red. In this state several measurements still can be obtained; but it is time to put it on the charging console to avoid a total discharge and damage of the battery.

Charging is done by simply placing the device on the charging console. Please ensure that the inductive charging area on the bottom of the device and on the charging console is free of stickers and is always clean. Five seconds after placing the device on the charging console, the battery symbol indicates the charging function with a symbolized flash. The charge status is displayed from the color red (charging required) to a green filled battery symbol.

Several thousand measurements can be carried out with one battery charge. Completely charging an empty battery will take approximately four hours.

SpectroDens has a regulated charging management. This means it will power-charge an empty battery, so the device can be used again after a few minutes. On the other hand, there is no overcharging of full batteries.

Disposal instructions: Please dispose of the battery only in a designated recycling center.

You can park the device on the charging console when not in use. This way it is guaranteed to have always an operational measurement instrument at hand.

How to measure

After switching on SpectroDens, it is instantly ready to measure. Just position the measurement aperture on top of the measurement sample and press shortly with the index finger the green measurement button. Within one second the resulting measurement value will appear on the display of the device.

Please ensure that the device always has a firm stand on a flat surface. There must not be a distance between the measurement head and the sample where light could pass through, because this can influence the measurement. On the bottom of the device there are tracking wheels which allow to drive easily and fast to the measurement point.

The color of the background material underneath the measurement sample can have an influence on the measurement result. Different technical standards describe which backing material to use.

In the printing industry the following procedure according to ISO 12647-2 (offset) is widely used:

- white backing for proofs and
- black backing for prints.

Scan measurement:

Depending on the display instructions for the measuring function, position the measuring head in front of or on the area to be measured.

The measurement device must be aligned parallel to the control strip at the right edge of the casing.

Press and hold the green measuring button. After the circle appears on the display, the device can be moved at a steady speed across the control strip.

The movement ends on the last control patch and the measurement button is released.

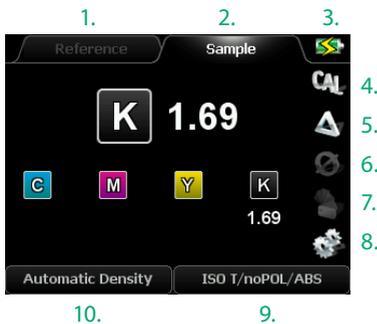
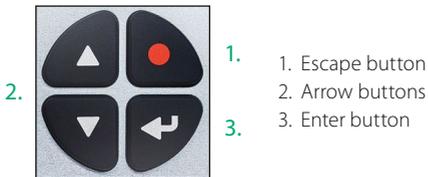
Depending on the measurement function, the results are shown on the display, saved or transferred to the software via the active data connection.

Device settings with the display menu

Thanks to the interactive device menu, settings are very easy to adjust. The display is divided logically into a center and a frame. The center displays the measurement results. It is framed by interactive “soft keys” and status information displays. Pressing shortly on one of the arrow buttons will move an active cursor from “soft key” to “soft key” around the frame. An active “soft key” is indicated by a frame.

By keeping an arrow button pressed, the cursor travels from “soft key” to “soft key” at a constant speed until the arrow button is depressed again. By pressing the enter button a function behind a “soft key” is selected and a selectable menu appears. Within such a menu again the navigation is done via the arrow buttons and the selections are made with the enter button. Depending on the device setting and measuring function, certain “soft keys” cannot be activated.

Pressing the red, round escape button will always bring you one step back in the menu or will close a menu window. It can be compared to the escape button or undo-function on a PC. It will always bring you back to the measurement mode.



The center of the display shows the current measurements.

1. Reference measurement
2. Sample measurement
3. Battery and charging status
4. Stack of paper icon for paper white calibration;
5. CAL icon for absolute white calibration
6. DELTA-mode (= for comparisons)
7. Average function
8. Color library
9. Device settings
9. Measurement conditions
10. Measurement functions

TIP:

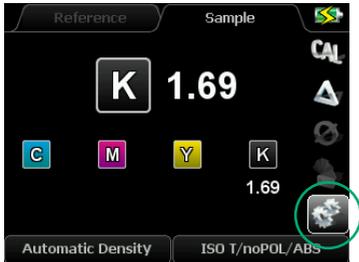
By holding down the red Escape button (1.) and then pressing one of the two arrow buttons (2.), SpectroDens switches directly between the densitometric and colorimetric measurement function last used.

Menu: Device settings



The “soft key” with the cogwheel symbol opens the window for the device settings.

Within this window you can navigate with the arrow buttons and select with the enter button. The red escape button brings you back to the measurement mode.

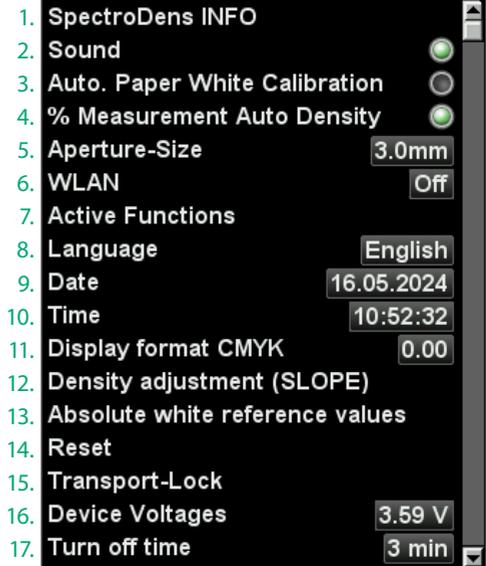


1. The **SpectroDens INFO** screen informs about the type of device (Basic, Advanced or Premium), the software- and hardware-version as well as the serial number. It also indicates whether a WLAN module is installed and informs about device checks.

2. **Sound** will activate an acoustic signal after each measurement.

3. With activated **Automatic Paper White Calibration** SpectroDens will always perform automatically a paper white calibration when a measurement on a paper white is made.

We recommend to activate this function only when the substrate to be printed is often changed.



4. In the measurement function **Automatic Density**, the device recognizes %-patches, switches automatically to the display of the dot area and shows the calculated values.

The automatic switch to %-values can also be turned off using the device setting **% Measurement Automatic Density** to avoid switching caused by fluctuation. When the function is deactivated, the device will always show the density values and the dot area will not be calculated automatically.

Menu: Device settings



5. The size of the mounted aperture is set here. Changing between the two available **aperture sizes** is explained on page 32.

6. SpectroDens can be connected to a **WLAN** network to send information via wireless data transmission to the PC. The WLAN module is available as optional accessory.

7. **Active Functions** allows the user to personalize the device by disabling those of the measurement functions that are not currently needed. So the handling is concentrated on the essentials. If necessary, the inactive measurement functions are simply reactivated.

8. Sets the menu **Language** of the device.

9./10. All measurement values get a **Date-** and **Time-**stamp. This information will be visible when the data is transmitted to the PC software SpectroConnect.

11. For the measurement of densities, the **Display format CMYK** can be selected.

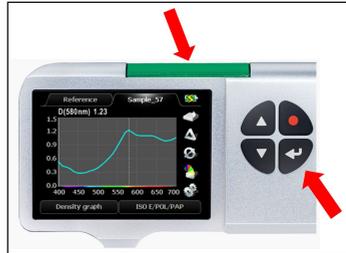
The device can display two or three decimals. The information in the chosen format is carried out in all density modes.

12./13. The functions **Density adjustment (SLOPE)** and **Absolute white reference values** are for the internal device adjustment. The device is correctly adjusted by the factory and changes of these settings should be made only in special cases (see page 20 f.: Setting of the Density adjustment (SLOPE)).

14. A **Reset** puts the device to factory settings.

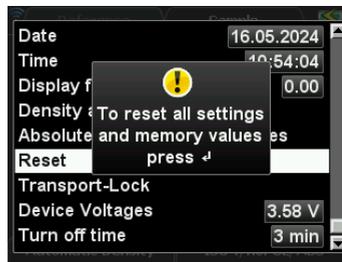
Attention! All stored measurement values and a recently made calibration will be deleted and should therefore be saved on the PC if necessary, by using the Windows software SpectroConnect.

Only the factory-set calibration values are still valid. A reset may be useful, if SpectroDens does not work properly.



HARDWARE RESET:

Press the green measuring button together with the enter button for ten seconds.



15. The **Transport-Lock** is activated in this menu item with the measurement button. Unlocking the transport mode is carried out identically to a hardware RESET 14.

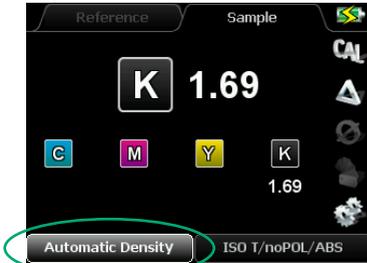
16. The information of **Device Voltages** is for device diagnosis by service personnel.

17. The **Turn off time** can be set in predefined steps from one minute to 3 hours.

Menu: Measurement functions

When the “soft key” in the left section of the lower bar is activated, a window opens where you can select the measurement functions.

The measurement functions listed below are described in detail in chapter 2.



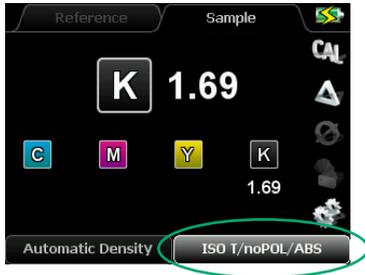
- | | |
|--------------------------|-------|
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| 2. Densities CMYK | p. 37 |
| 3. Dot Area | p. 39 |
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| 11. Density Graph | p. 49 |
| 12. ExPresso Mini | p. 50 |
| 13. CIE L*a*b* + D | p. 53 |
| 14. CIE L*a*b* | p. 53 |
| 15. CIE Color Circle | p. 55 |
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| 24. CIE xyY | p. 69 |
| 25. DIN Lab99 | p. 69 |
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1. Automatic Density
2. Densities CMYK
3. Dot Area
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6. Trapping
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8. Printing Curve SCTV
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10. Slur and Doubling
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12. ExPresso Mini
- CIE -----
13. CIE L*a*b* + D
14. CIE L*a*b*
15. CIE Color Circle
16. G7™
17. Remission curve
18. InkCheck
19. CIE XYZ
20. CIE L*C*h* ab
21. ISO-Check
22. CIE L*u*v*
23. CIE L*C*h* uv
24. CIE xyY
25. DIN Lab99
26. Metamerism-Index
27. Whiteness/Yellowness
28. PASS / FAIL
29. Media Wedge
30. SCAN
31. Opacity
32. OBA-Check
33. Visual Opacity

Menu: Measurement conditions

When the “soft key” in the right section of the lower bar is activated, a window opens where you can set the measurement conditions which define the parameters of the measurement, e.g. which filter will be applied.

The measurement conditions 4. – 18. are described in detail together with the corresponding measurement functions in chapter 2.



1. The device has an integrated **Polarizing filter**, which can be activated or deactivated by a push of a button. Polarizing filters compensate for measurement differences between glossy and non-glossy surfaces (e.g. freshly printed and dried sheets). The technical standards in Europe recommend the use of such a filter for densitometric measurements. On the other hand, colorimetric measurements (e.g. $L^*a^*b^*$ -measurements) should be taken without a polarizing filter.

By selecting **Auto** from the menu, this will be taken into account and there will be automatically the right filter setting for the European location (not UK).

2. There are two possibilities for defining the **White Reference**: Density measurements usually are referred to the white value of the paper printed on ($D = 0.00$). Colorimetric measurements refer to an absolute white reference which is supplied as a ceramic tile on the charging console.

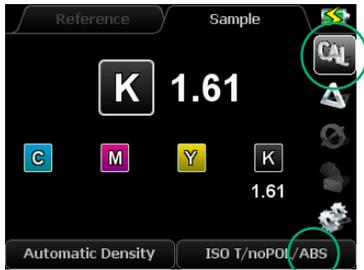
1. Polarizing filter	Auto
2. White Reference	Auto
3. Density Filter	ISO E
4. Density Reference Setup	REF 1
5. Dotgain Setup	
6. Printing Curve Setup	
7. Yule Nielsen coefficient	1.00
8. Trapping formula	Preucil
9. Measurement Condition	M1
10. Illuminant	D50
11. Observer	2°
12. CIE Color Circle Setup	$L^*a^*b^*$
13. G7™ Setup	
14. ISO Check Setup	
15. ΔE equation	ΔE CIELAB
16. PASS/FAIL tolerance	3.0
17. Media Wedge Setup	
18. W/Y Setup	
19. Scan Setup	

By selecting **Auto** from the menu, there will always be the right setting according to the measurement mode which is selected.

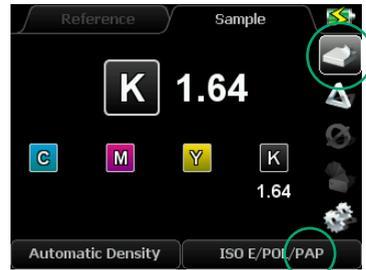
3. Depending on the regional technical standards different **Density Filter** settings are required. SpectroDens as a powerful spectrophotometer has the great advantage that any filter specification can be exactly calculated out of the spectral data. There is no limitation known from conventional filter based densitometers with fixed filters built in.

In Europe filter ISO E is to be selected as the standard filter.

Menu: Calibration



CAL icon with manual settings (e.g. USA, UK)



Paper stack icon with Auto settings (Europe)

A calibration should be carried out before each series of measurements, to ensure that the correct sample / paper type has been calibrated. A calibration is as easy to carry out as a measurement: Navigate the “soft key” to the **CAL** (or Paper stack) icon, and place the device with the measurement head on top of a blank area of the paper sheet. The calibration can be started now by pressing either the **enter button** or the **green measurement button**. Make sure that the measuring device rests securely on the sample and uses the same background (white, gray or black) as for subsequent measurements. By proceeding with the **CAL** icon, a second calibration on the charging plate will follow. After these calibration steps, a message appears indicating that the calibration was successful. The device is now ready for measurements.

In accordance with international standards in the printing industry, the density measurement works with different regional settings:

Europe:

Density filter ISO E, polarization filter switched on (M3),

White reference: Paper white PAP

If the measurement conditions (page 17 – settings 1., 2.) are set to **Auto**, the correct settings for the European standard are automatically set when switching between density and colorimetric measurement functions.

USA: Manual settings of the measurement conditions, see also page 17 – 1., 2.

Density filter ISO T, polarization filter off (M0),

White reference: Absolute (white ceramic of the charging plate)*

*For the US standard settings, the paper white calibration is also integrated into the calibration process, as all dot area calculations are based on paper white.

Calibration on the white reference ceramic (**Absolute**) can be useful for special substrates.

1.5 Care, maintenance and service

SpectroDens is a highly-precise optical instrument. It is designed to work in harsh, industrial environments. However, it should be handled with care. Avoid mechanical shocks, heat, dusty or humid environments! Keep it always at a safe place, for example in the carrying case.

Cleaning

The measurement head with the optical system is sealed against dust and dirt. Take care that the visible, open measurement aperture is always free of dust. You can clean the measurement aperture with oil-free, clean compressed air and a brush used for cleaning photographic equipment. For easy cleaning the aperture can be taken off from the measurement head by unscrewing three screws with a special TORX T6 screwdriver (which is part of the package of a spare aperture set).

Clean the device casing and the display window only with a soft cloth and a non-aggressive plastic cleaner. Never use alcohol or chemically aggressive solvent-based cleaners which can destroy the surfaces. The same procedure is valid for the white standard which is integrated in the charging console. If the white standard should be defective, it has to be replaced completely.

Please do not stick any labels at the bottom of the device. This could lead to faulty measurements, because the direct contact – which is important for the correct optical field of depth – might not be maintained. The battery charge can be affected by a label as well.

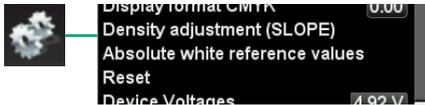
Maintenance and service

To ensure perfect functioning, we recommend a device check at the TECHKON Service Center every 24 months. The function of the color measurement can be checked on site with the additional TECHKON SpectroCheck NG color reference.



Device adjustment

Should SpectroDens do not work properly, first check, if all instrument settings and measurement conditions are set correctly. Especially the settings of the **Density adjustment (SLOPE)** and the **Absolute white reference values** influence the measurement result.

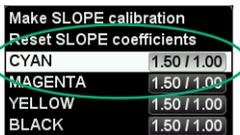


Setting of the Density adjustment (SLOPE)

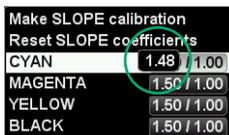
With the **SLOPE correction** values it is possible to adjust SpectroDens to the density values of other devices.



Activate the "soft key" with the cogwheel icon and select the menu item **Density adjustment (SLOPE)**.



Select the menu item **CYAN**.



Enter the Cyan value, you find on the calibration chart. By pressing the arrow buttons the value can be increased or decreased.



In the same way enter the data given by the calibration chart for Magenta, Yellow and Black.

Make SLOPE calibration	
Reset SLOPE coefficients	
CYAN	1.48 / 1.00
MAGENTA	1.55 / 1.00
YELLOW	1.54 / 1.00
BLACK	1.82 / 1.00

Select the menu item **Make SLOPE calibration**.



Carry out a paper white calibration as described in the device display.



Now measure consecutively the solid patches of Cyan, Magenta, Yellow and Black.



A correct measurement is indicated by a green dot behind the respective color.

Make SLOPE calibration	
Reset SLOPE coefficients	
CYAN	1.48 / 1.07
MAGENTA	1.55 / 1.06
YELLOW	1.54 / 1.15
BLACK	1.82 / 0.99

The SLOPE correction values are shown.

Make SLOPE calibration	
Reset SLOPE coefficients	
CYAN	1.48 / 1.07
MAGENTA	1.55 / 1.06
YELLOW	1.54 / 1.15
BLACK	1.82 / 0.99

A reset of the SLOPE correction values is done by activating the menu item **Reset SLOPE coefficients**. You reset the device back to its original factory settings.

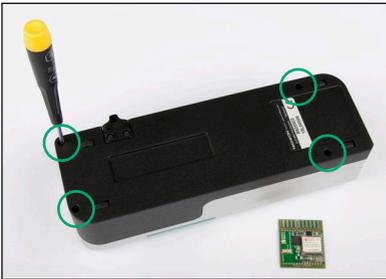
Setup of the SpectroDens WLAN connection

To be able to use the WLAN function in SpectroDens, a WLAN module has to be installed. The module is available as accessory from TECHKON. It is a small electronic board which can be inserted into the instrument easily.

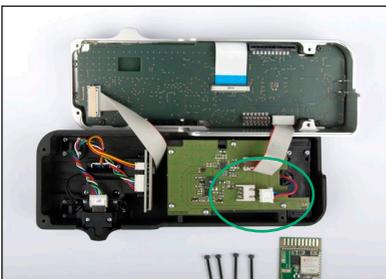
Assembly of the WLAN module



SpectroDens WLAN module



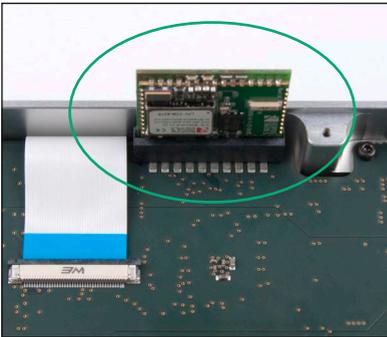
To insert the module the casing has to be opened.



Lift the upper case carefully and put the two casing parts side by side on the table.

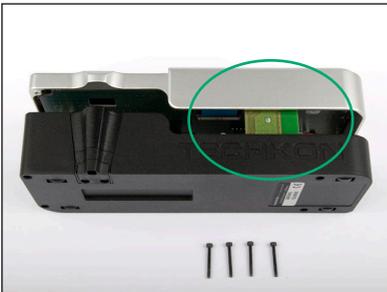


The slot into which the WLAN module has to be inserted is located on the main board.



Due to its polarity reversal protection the board cannot be inserted in a wrong way.

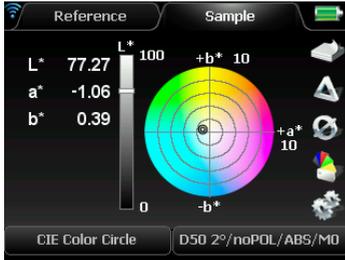
After the WLAN module is inserted in its slot, connect the battery cable again. The plug has to clip into the socket.



When putting the casing together, make sure the WLAN module fits properly in its compartment.

Tighten carefully all four screws on the bottom of the device. Now the instrument is ready to use.

Configuration of the device



In the upper left corner of the device display the WLAN symbol will be shown when activated.

The color of the symbol depends on the status.

Gray: Searching

Blue: Connection established



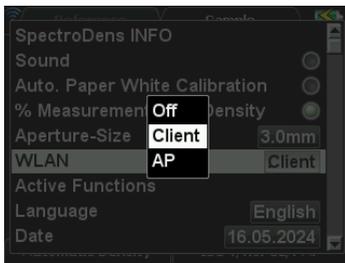
Two different connection types are available for the WLAN connection:

Client

for the **infrastructure** connection method or **Ad-Hoc**,

AP

for the **access point** connection method.



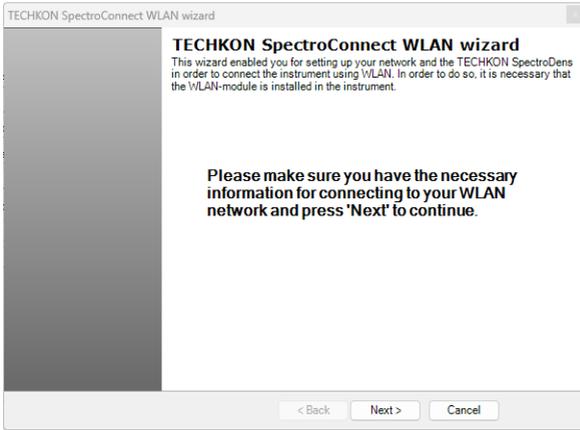
The AP connection requires a WLAN board with TECHKON article: SD4-WLAN-5GE.



After successful client connection via the SpectroConnect software, the WLAN information can be queried under **SpectroDens INFO**.

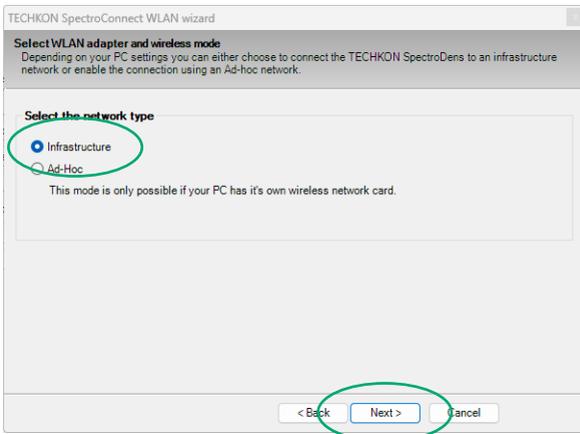
NOTE: For a long battery life, the switch-off time of the SpectroDens can be optimized via the device settings (see page 14).

The WLAN wizard will guide you through the setup process.
Make sure you have all information about your WLAN network available.



Two types of WLAN connections are possible: Infrastructure and Ad-Hoc.
Infrastructure should be selected if a WLAN network is already installed in the working area.
Ad-Hoc allows a direct connection to a PC using its WLAN module or any WLAN USB stick.

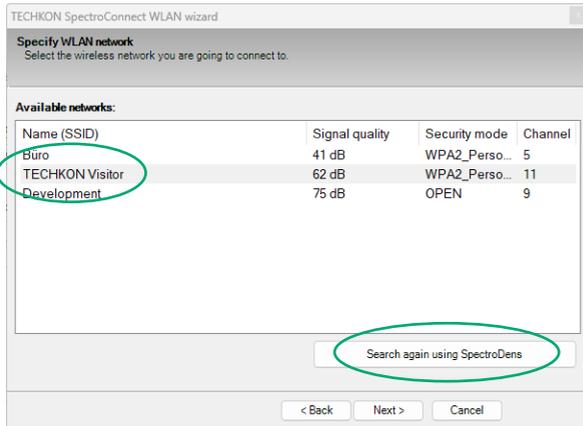
Infrastructure



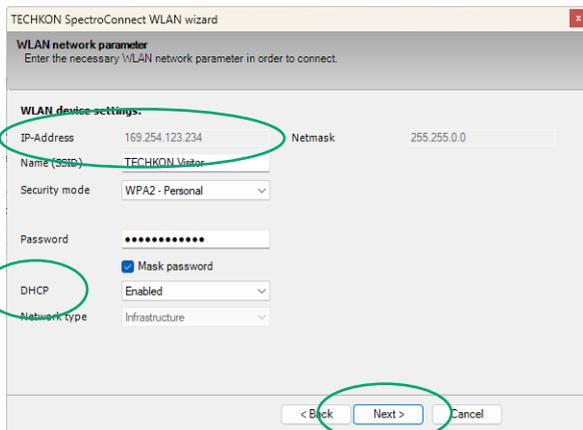
Select **Infrastructure** and click on the **Next** button.

The wizard will show all WLAN networks which are available.

Select your network and click on the **Next** button.



If your network is not listed, search again by pressing the **Search again with SpectroDens** button and make sure that the network to be connected is within optimal range.



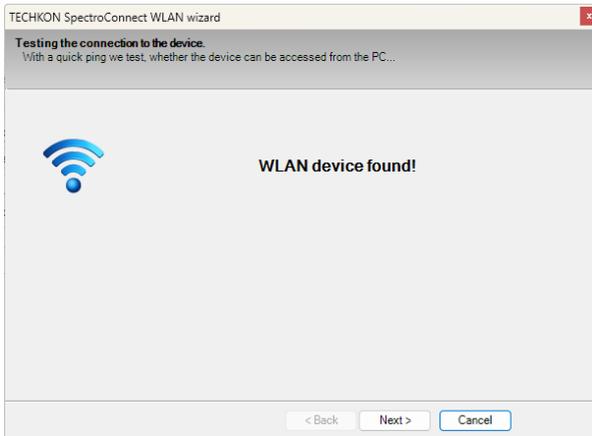
Now enter your IP address, netmask and the password of your WLAN network. Activate DHCP if your network supports this function, then a free IP address will be assigned automatically.

NOTE:

Under Windows 10 and 11 for computers with a WLAN card, a **mobile hot spot connection** can be activated for wireless data transmission. DHCP must be activated. The IP address is not permanently assigned.

SpectroDens is now looking for the WLAN network and if available will establish a connection.

The gray color of the symbol is indicating the search function. Once the WLAN network is found and the connection is established, the color of the symbol will change to blue.

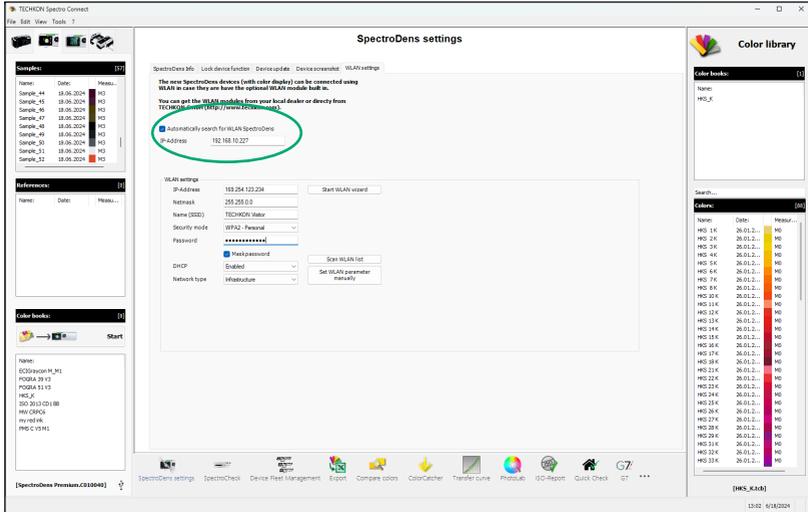


SpectroDens is now connected to the WLAN network and ready to be used wirelessly.



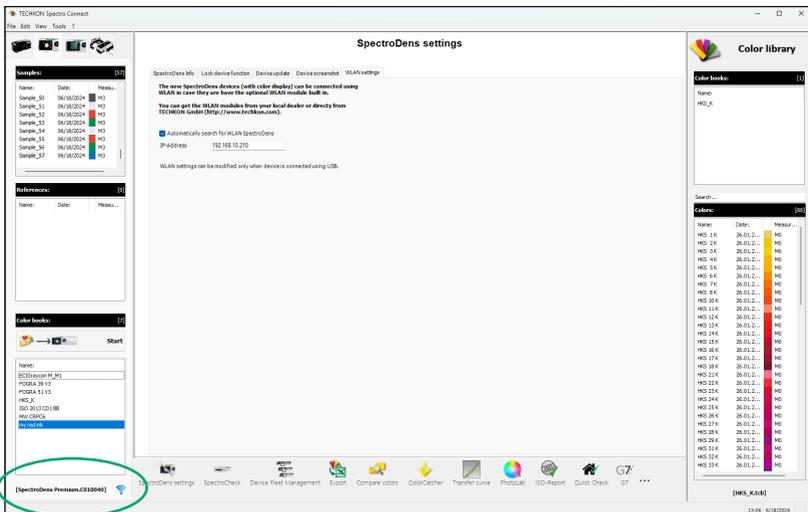
The settings will be applied and shown in the WLAN settings.

By activating the function **Automatically search for WLAN SpectroDens** the connection will be established automatically when used next time.



Now you can disconnect the USB cable.

The connection via WLAN will be indicated by the symbol next to the serial number. The blue color of the symbol indicates an active connection.



Setting up a WLAN Enterprise connection

The following requirements are necessary for a WLAN Enterprise connection:

- **WLAN card of the current type**
(chip identification: RS91135B and RS9113DB) and successor
- **Infrastructure with router access points**
- **Authentication server**
RADIUS server (Remote Authentication Dial-In User Service) with **configured users and passwords**.

To set up the Enterprise connection, we recommend using the WLAN menu navigation in the SpectroConnect software.

Manual settings should only be made by specialists.

The following settings are possible:

WLAN settings

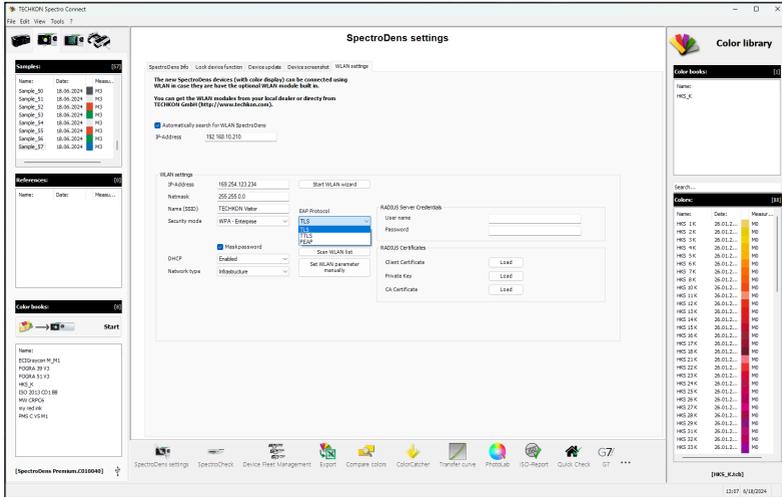
IP-Address	169.254.123.234	Start WLAN wizard
Netmask	255.255.0.0	
Name (SSID)	TECHKON Visitor	EAP Protocol
Security mode	WPA - Enterprise	TLS
DHCP		Scan WLAN list
Network type	Infrastructure	Set WLAN parameter manually

Security protocol:

Open
WPA – Personal
WPA2 – Personal
WEP
WPA – Enterprise
WPA2 – Enterprise

Security protocols for WPA and WPA 2 Enterprise – EAP Protocol:

TLS: no password necessary, only certificate
TTLS: password and user name necessary, no certificate
PEAP: password and user name necessary, no certificate
PEAP: password and user name necessary, no certificate



Radius server authentication

The user name is read from the EAP-TLS client certificate and the password is specified by the IT administrator.

RADIUS Server Credentials

User name

Password

All Radius certificates (client and CA) are also provided by the local IT administrator.

RADIUS Certificates

Client Certificate

Private Key

CA Certificate

These are the following file formats:

Client certificate: *.pem, *.der, *.cer, *.crt, *.pfx, *.p12

CA certificate: *.pem, *.der, *.cer, *.crt + password

Private key: *.pfx, *.p12, *.key

Changing the 3.0 mm and 1.5 mm measuring apertures

A small measuring aperture is available as an accessory for the special requirement of recording small measuring fields.

3.0 x 3.0 mm must be the minimum dimension for the control patches.

Place the device on a soft surface. Loosen the two screws on the underside of the device using a Torx T6 screwdriver.



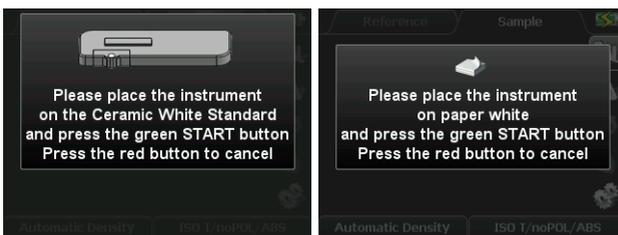
Pull the aperture out of the measurement head track and replace the aperture.

After changing the aperture, the correct aperture size must be set in the device settings.

Alternatively, the device must be RESET.



After changing the aperture size, SpectroDens prompts for a new calibration for density measurement and color measurement:



Device information and safety instructions

The use of this device in a different way than recommended by TECHKON GmbH can endanger the device safety.

WARNING: This device may not be used in potentially explosive atmospheres.

Please protect your eyes and do not look directly into the measurement aperture when the device is switched on.

Operating conditions: Ambient temperature: 10 to 35 °C, max. 30 to 85 % relative humidity (non-condensing); storage temperature: -20 to 50 °C.

Reset

A device reset sets the device back to factory settings. All calibration data (including SLOPE values), stored measurement values, reference-, target-, and tolerance-values will be deleted.

If the reset procedure in the settings window is not possible, a hardware reset has to be carried out. This is done by pressing the Enter button and the green measurement button simultaneously for 10 seconds.

Warranty

The warranty for TECHKON products is 24 months starting with the date of purchase. Consumable and wearing parts are excluded from this. The invoice is the certificate of warranty. The warranty is invalid if the damage is caused by inadequate use of the device.

Should a TECHKON product do not work according to the specification, please contact us before sending us the device. In most cases we can solve the problem over the phone or via E-mail.

Inspection intervals

TECHKON SpectroDens is maintenance free. We recommend to **validate the complete functionality of the devices in a 24 months time interval** in the TECHKON service center.

Please send the device always securely in the carrying case with complete accessories. For a flat fee the device will be cleaned, checked and re-calibrated. In case a repair or exchange of components should be necessary we will inform you in advance.

Chapter 2

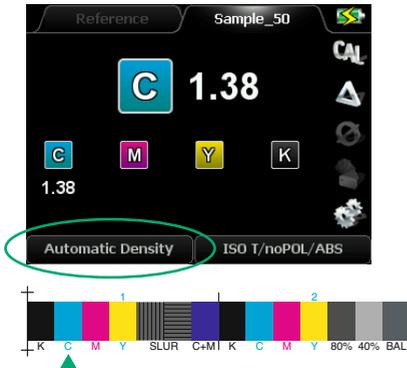
Description of the measurement functions

2.1 Measurement functions of SpectroDens Basic

Automatic Density

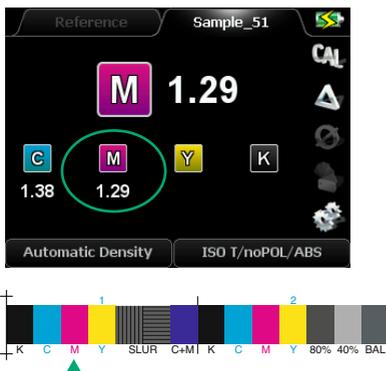
SpectroDens Basic comprises all functions related to density measurement. A very practical feature is the **Automatic Density** mode. By a push of the green measurement button the relevant measurement values are displayed. Depending on the type of measurement patch this can be:

- Solid density D
- Dot area in %
- Gray balance

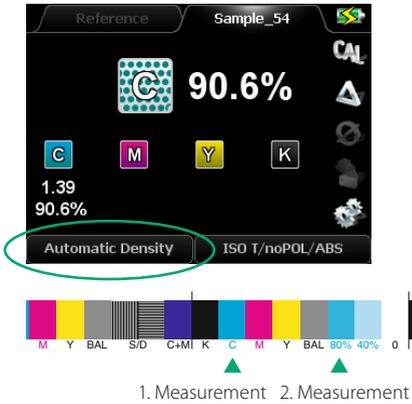


In this example the measurement has been taken on a Cyan patch. SpectroDens recognizes the type of process color and displays the **solid density** value of Cyan, which is displayed with the "C" symbol. Values for Cyan (C), Magenta (M), Yellow (Y) and Black (K = key color) can be shown.

The density value is a value without a unit. It corresponds to the amount of ink applied on the paper surface. The higher the density value the higher the thickness of the ink layer. The correct density value is dependent on the printing parameters (paper, ink, printing process). Usually, density values are between 1.00 and 2.00.



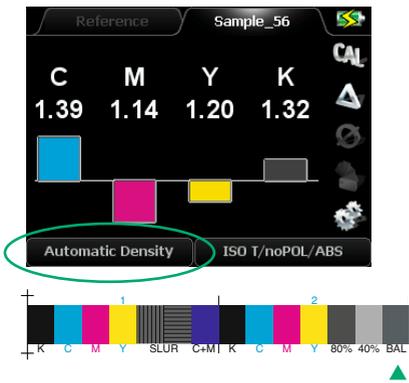
The second measurement has been taken on a Magenta patch. The former Cyan measurement still gets displayed. Measurements of a specific process color will be overwritten as soon as a new measurement of this specific color will be made.



For the display of **dot area** (or dot percentage) in %, two measurements have to be made: First the solid density patch and then the %-patch, which is in this example a 80 %-patch. The resulting dot percentage is in this case 90.6 %; the referring **dot gain** is 10.6 %:

$$90.6 \% - 80 \% = 10.6 \%$$

Should a solid density value be displayed instead of the desired dot percentage value, then the density measured first was significantly higher than the second one. In this case we recommend to delete the displayed value by pressing the red escape button and to measure again. Please also check the option **% Measurement Automatic Density** (see page 15).



A gray balance patch is composed of different portions of Cyan, Magenta and Yellow. It does not include black ink.

When making a measurement on a **gray balance** patch, the referring density values for all four process colors are shown in a bar graph. The values for Cyan, Magenta and Yellow should be in close range to each other to ensure a neutral gray balance without a color hue.

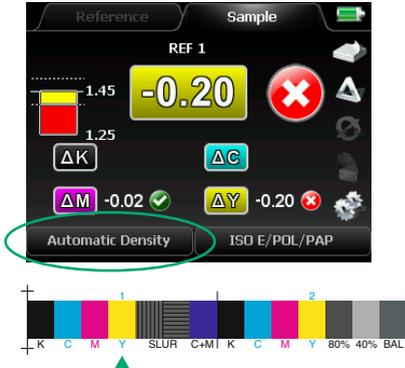
It is important that the gray balance patch, on which the measurement is taken, comprises the right %-values to achieve a neutral gray when printed correctly. The process standard ISO 12647 for offset print defines the values as:

- C = 50 %,
- M = 40 % and
- Y = 40 %.

The value for Black indicates how dark the gray color is. The higher the value for Black (= K) the darker the sample.



In **DELTA Mode** (= comparison mode) the measured values are compared to reference values. The mode is activated by navigating to the “soft key” with the triangle symbol and selecting it.



In the example on the left side a Yellow patch was measured.

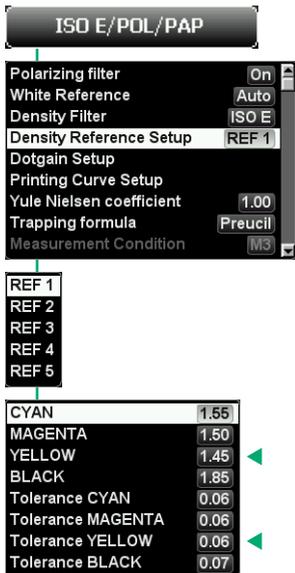
The measured solid density is:

$$Y = 1.25$$

This is 0.20 less than the set reference (= target) density of $Y = 1.45$.

The measured value is outside the limits of the set tolerance of ± 0.06 . Therefore it is marked with a cross symbol in the round icon.

A checkmark symbol would be shown in case of a measurement within the tolerance limits.



The setting of **reference values** and **tolerances** is done in the menu under the item measurement conditions.

In the **Density Reference Setup** up to five data sets (REF 1 – 5) for reference (= target) densities can be edited. Reference densities recommended for the five defined paper classes are already pre-set.

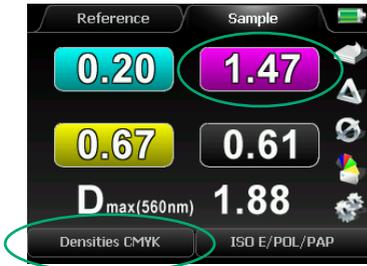
The tolerances define the lower and upper limits around the reference values. In this example for Yellow:

$$1.45 + 0.06 = 1.51$$

$$1.45 - 0.06 = 1.39$$

Densities CMYK

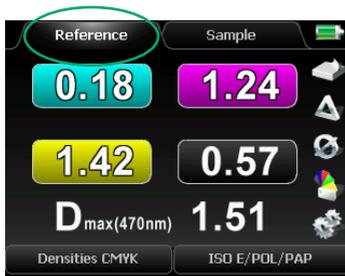
In the measurement function **Densities CMYK** all four partial densities for Cyan, Magenta, Yellow and Black are displayed.



In this example, a solid Magenta patch was measured. The solid density is:

 M = 1.47

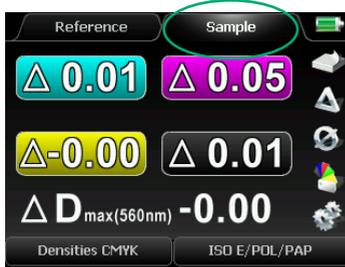
But why are densities for the other colors shown as well? Shouldn't they have a value of 0? No. These are the so-called **partial densities**. No printing ink is 100 % spectrally pure. There will always be partial colors besides the actual main color.



 Patch for reference measurement

This function also makes comparison between measurements and reference values. In this example the reference value was not taken from the reference memory but was measured just before by putting the "soft key" to **Reference**:

1. First select via "soft key" **Reference** and make a measurement on a patch which will be the future reference patch.



 Patch for sample measurement

2. Now activate via "soft key" **Sample** and make a measurement on a sample patch. A triangle symbol in front of the measurement value indicates that delta values (difference between reference and sample) are shown. Future sample measurements will be compared to the once measured reference values as well.

3. Now activate the **DELTA Mode** by selecting the triangle symbol.

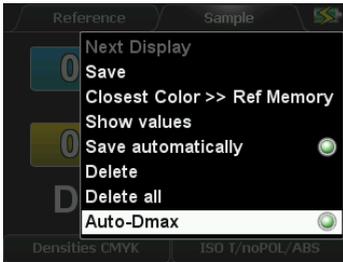
The function **Densities CMYK** is especially suitable for the measurement of multicolored composed CMYK colors, e.g. in logos, to find out the reason for possible color shifts.



Dmax measurement function

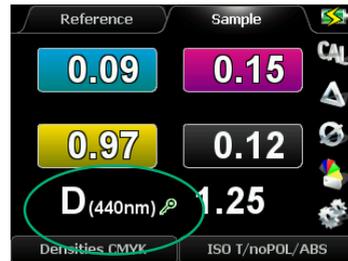
Only spectral density values that apply to the same wavelengths may be compared with each other.

SpectroDens also automatically displays the spectral density in the bottom line of the Density CMYK measurement function.



The density values for CMYK provide information on the extent to which the spot color can also be captured by the standard density filters designed for CMYK colors. As the blue measured is spectrally similar to the process color cyan, a relatively high value is displayed for the cyan density.

If the Auto-Dmax option is deactivated in the sample measurement by pressing the ENTER key, the wavelength of the maximum density signal is permanently saved for the measured sample.



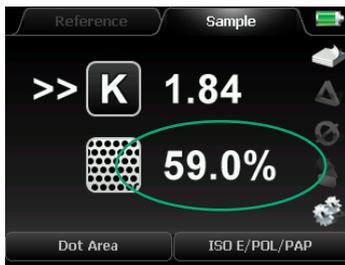
The saving of the maximum wavelength is indicated by the key symbol.

Dot Area

For the function **Dot Area** (= dot percentage) two measurements have to be carried out. First a measurement on a solid patch and then a measurement on a %-patch (= screen patch). The dot area value is calculated with the Murray-Davies formula.



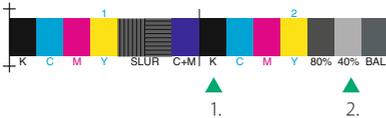
1. First place the measurement head above a solid patch and start the measurement by pressing the green button. The solid density value will be displayed.
2. Now make a second measurement on a %-patch and the **dot area** in % will be shown.



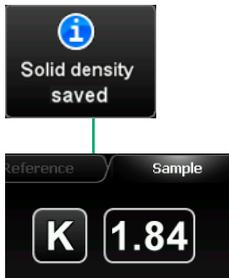
In this case a measurement has been taken on a 40 %-patch.

The resulting dot gain can be easily calculated:
 $59\% - 40\% = 19\%$

The dot gain value gives the information to what degree a point is enlarged (or decreased) during each process step of the reproduction process chain.



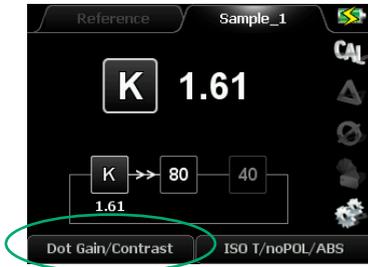
The double arrow on the left side of the device display indicates which measurement has to be done next.



Should several dot area values refer to the same solid density, this value has to be measured only once and can be saved for consecutive %-measurements. After a solid density measurement, just keep the enter button pushed for approximately 3 seconds until the density value is framed. Now an unlimited number of %-measurements can be made. Deactivating is done by keeping the enter button pressed again.

Dot Gain / Contrast

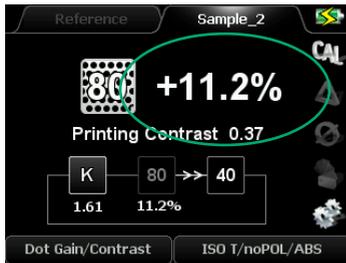
The function **Dot Gain / Contrast** is closely related to the previously described function of dot area. Here also, first a solid density measurement is carried out and then %-measurements follow.



In the lower part of the device display there is shown which patch has to be measured next.

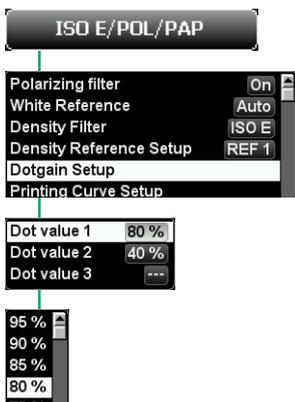
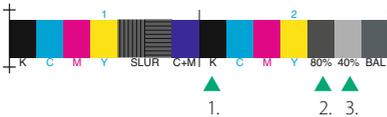
In this case there just has been measured a solid density patch with a density of 1.61.

The double arrow points to the 80 meaning an 80 %-patch has to be measured next.



After the last %-measurement has been done (in this case the 80 %-patch) additionally to the **Dot Gain** value the **Printing Contrast** will be calculated and displayed.

The round escape button will always lead back to the previous step in case a wrong measurement has been made.

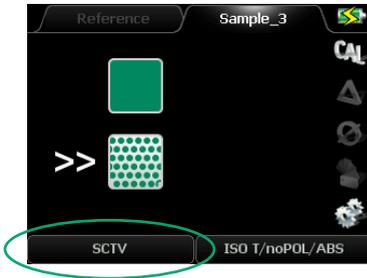


The setting for the %-patches to be measured is done in **Dot Gain Setup**.

Up to three percentage values can be edited. The TECHKON TCS print control strips include two different %-patches; 80 % and 40 %.

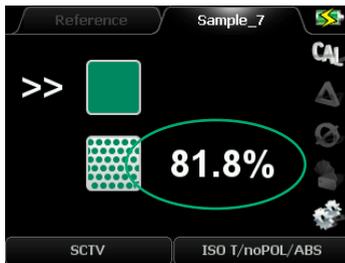
SCTV

The **Spot Colour Tone Value (SCTV)** function, which is defined in ISO 20654:2017, provides a precise colorimetric quality inspection for spot colors. SpectroDens supports SCTV for single tone value measurements and the SCTV printing curve (see page 44).



1. First place the measurement head above a solid patch and start the measurement by pressing the green button. The solid density value will be displayed.

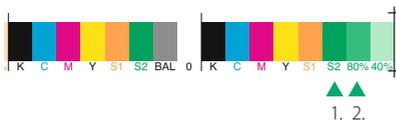
2. Now make a second measurement on a %-patch and the **dot area** in % will be shown.



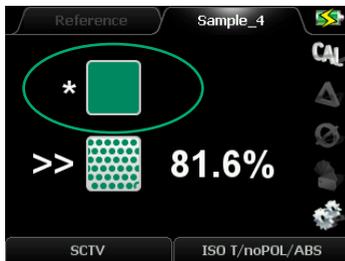
In this case a measurement has been taken on a 80 %-patch.

SCTV is calculated colorimetrically.

The calculation is designed in such a way that the SCTV values for visually similar color changes in a step wedge increase evenly for a large number of spot colors.



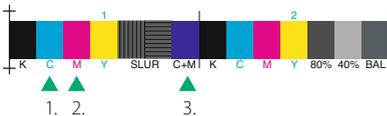
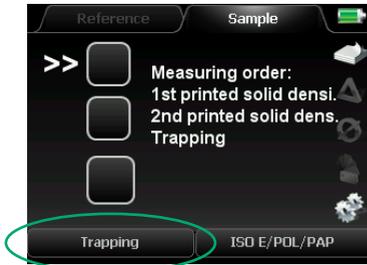
The double arrow on the left side of the device display indicates which measurement has to be done next.



Should several dot area values refer to the same solid density, this value has to be measured only once and can be saved for consecutive %-measurements. After a solid density measurement, just **keep the return button pushed for approximately 3 seconds** until the density value is framed. The saved solid tone is marked with an asterisk *. Any number of measurements can now be carried out on halftone fields. Pressing and holding the return button again cancels the saving.

Trapping

With the feature **Trapping** there can be checked, how good two layers of ink which are printed over each other represent the resulting mixed color.



Three measurements are necessary: Two measurements on each of the two separate process colors and finally one measurement on the resulting overprinted patch.

Here in this example first Cyan and second Magenta has been measured. The final measurement is done on a blue patch as the overprint of Cyan and Magenta. The trapping value is 73.2 %. The higher the value the better the overprint of two colors.

Additionally to the trapping value in % there are the densities for the separate color patches displayed. The densities are always displayed with the filter channel of the second printed ink; in this case Magenta. This explains why the density value for the first printed ink Cyan is so low. SpectroDens will recognize automatically the order of colors as they are printed. Switching the first and second measurement therefore will lead to the same result.

There are no standard values for the trapping measurement. The values which can be obtained depend on the printing process and particularly on the type of ink and paper used. Typical values for standardized print with Paper Class 1 (glossy, coated) are: $C+M > 60\%$, $M+Y > 72\%$ and $C+Y > 85\%$.

SpectroDens offers extended trapping calculation according to Professor Ritz and Felix Brunner, which ensure a better comparison between $C+M$, $M+Y$ and $C+Y$ measurements. An alternative determination how well two separate colors overprint can be checked with a colorimetric function, such as the $L^*C^*h^*$ -feature, where the L^* - and C^* -values give the information of the printable gamut.

Printing Curve

The measurement function **Printing Curve** displays a complete transfer curve, which describes how screen dots (and total values) are transferred during the several process steps of the reproduction process.



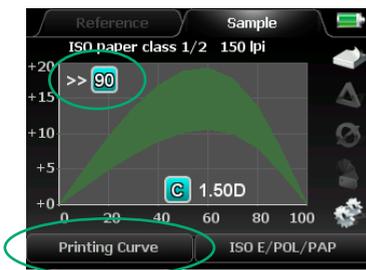
First, make the required settings in the **Printing Curve Setup**:

1. Tolerance ISO PC 1/2
2. Dot frequency 150 lpi
3. Display Mode DG

1. Tolerance range can be set according to standard values (in this case the ISO Paper Class 1/2 was selected)

2. Dot (screen) frequency (only relevant for the display of tolerance values)

3. Increments of the wedge to be measured, e.g. in 5 % steps



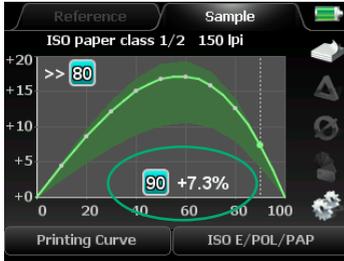
In the first step a 100 %-(solid) patch is measured. SpectroDens recognizes automatically the color and displays the solid density. In this case $D = 1.50$ for Cyan.

The double arrow in the upper left corner indicates that the next patch to be measured will be a 90 %-patch. Now all other pre-set %-patches can be measured on the measurement wedge.



1. ▲
2. ▲

Step wedges with separation bars (as shown) can be measured by scanning. Just keep the green start-button pressed during the whole scanning procedure.



Now the corresponding current dot area is indicated in the lower right section of the display. In this case: + 7.3 % dot gain is displayed at 90 % dot percentage.

The shaded area close to the curve shows the tolerance range. The curve should be within this area.

A wrong measurement can be easily deleted by the red escape button and the device will be ready again to read the patch correctly.

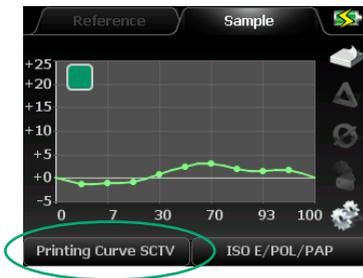
When using the scan function we recommend to use a patch width of 5 x 5 mm (min. 4 x 4 mm) with the standard aperture and a patch width of 4 x 4 mm (min. 3 x 3 mm) with the exchangeable 1,5 mm aperture.

Printing Curve SCTV

The measurement function **Printing Curve SCTV** displays a complete transfer curve of a spot color, which describes how screen dots (and tonal values) are transferred during the several process steps of the reproduction process.

SCTV is calculated colorimetrically. The calculation is designed in such a way that the SCTV values for visually similar color changes in a step wedge increase evenly for a large number of spot colors.

For this reason, the calibration of the SCTV curve of a spot color results in an ideal, linear curve image.



The measurement of the **Printing Curve SCTV** is carried out analogous to the regular **Printing Curve** (described on page 43 f).

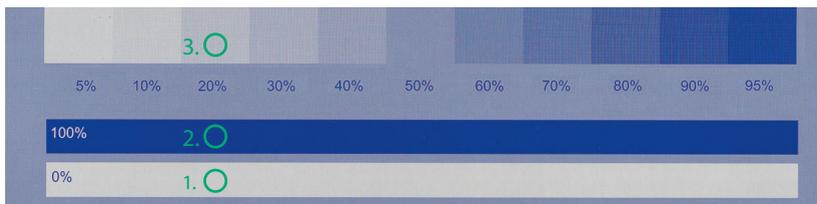
Only the calibration of the device is done on paper as well as on the absolute white standard.

Printing Plate

Beside energy and focus of the laser, dot gain is the most important information which has to be checked in plate exposure. Special plate measuring instruments working with video analysis have been developed for this application; for example TECHKON SpectroPlate. Compared to densitometers and colorimeters they offer big advantages. Nevertheless it is basically possible to make measurements with a densitometer on a printing plate. In doing so one should regard the following: Variations in the coating of the printing plates may result in strong influences on the measurements, especially in the crucial range under 10 %. Variations of 0.02 D can cause errors up to 6 %.

The values measured with a densitometer do not correspond with the geometric dot area, due to the fact that the densitometric measurement process is subject to optical influences, which increase the measurement value. Therefore densitometers measure always a higher value than video analysis devices. But the measurement value of the densitometer can be taken as a reference value for the tonal value adjustment.

For the measurement of the zero point (1.), the solid patch (2.) and the screen patch (3.) you should select areas on the printing plate which are located as close as possible to each other.



The measurement feature **Printing Plate** measurement allows reading values directly on printing plates. The process is comparable to reading on printed paper.

Before taking a measurement it is important, that the rubber coating is washed off the printing plate, because otherwise light gets lost and the measurement result will be distorted. In addition a correction factor, the so-called Yule-Nielsen factor, can be set according to the material characteristics of the printing plate. Usually the plate manufacturer will furnish the information about the factor for the different plate types.



The setting of the Yule-Nielsen factor is done in the settings window of the measurement conditions. If there is no information about the factor available from the documentation furnished with the plates, we recommend to keep the value in a neutral range at $n = 1.00$.

The measurement is performed as known from measuring on printed paper:



1. First, calibrate on a light, not imaged area of the printing plate, as it would be a paper white calibration.



2. Now measure a dark, 100 %-imaged patch. SpectroDens will select one of the four CMYK channels where the contrast signal is highest depending on the color shade of the plate. In this case the Cyan channel gave the highest signal, because the plate is blue/violet.

3. Now the measurement on a %-patch is carried out and displayed. Additional %-measurements can be easily made. It is not necessary to measure the solid density again, because it is already saved, which is indicated by the frame around the value.

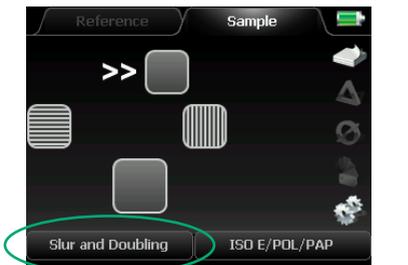


Slur and Doubling

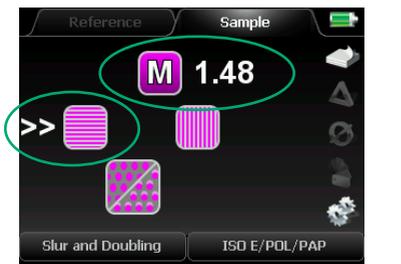
With the measurement function **Slur and Doubling** printing deficiencies, caused by inexact, geometrical transfer of the image from the plate to the paper can be evaluated.

Slurring means that the printed dot deforms from the transfer of the printing plate to the rubber blanket or from the rubber blanket to the paper. The effect of doubling will be present when a printed dot is transferred a second time with less intensity geometrically slightly offset. This ghost image is caused by ink being re-transferred to the rubber blanket which should have stayed completely on the printed paper.

To make the slur and doubling measurement possible, it is necessary to have on the color bar vertical and horizontal lined patches with identical line thickness as it is the case with the print control strip TECHKON TCS.



1.



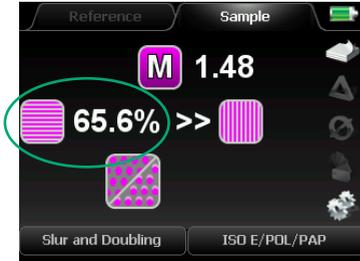
2.

Three measurements have to be carried out:

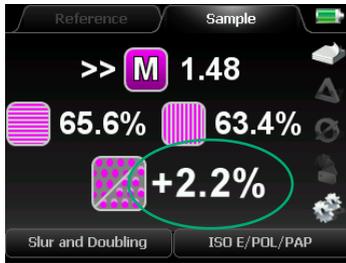
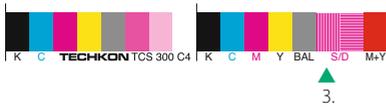
1. The first measurement on the solid patch; in this case of Magenta.

2. The second measurement on the horizontal lined patch of the same process color.

After the measurement of the horizontal lined patch the dot area of the patch is calculated and stored (see the following figure).



3. The third measurement on a vertical lined patch. After the measurement of the vertical lines again the dot area of the patch is calculated and stored (see the following figure).

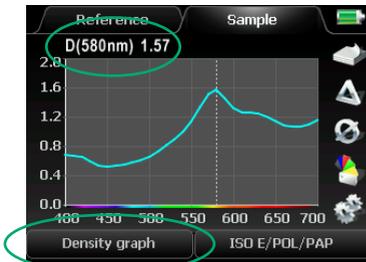


As a result the so-called slur/doubling factor in % is displayed.

0 % is the best achievable factor, meaning the dot transfer is perfect, the horizontal and vertical lines of the measurement patches have the same thickness and that neither slur nor doubling effects are present. Values up around 5 % still are acceptable. %-values higher than 10 % indicate significant geometrical errors in print due to slur or doubling effects. There are no standard values for the maximum allowable %-factor.

Density Graph

The function **Density Graph** enables the exact display of density values for any spot color. Usually the standards define density filter characteristics only for the process colors Cyan, Magenta, Yellow and Black. Thanks to the spectral measurement of SpectroDens, a virtual spectral density characteristic for any spot color can be obtained. The great advantage is that the process control of spot colors can now be as easily achieved as known from the four process colors.

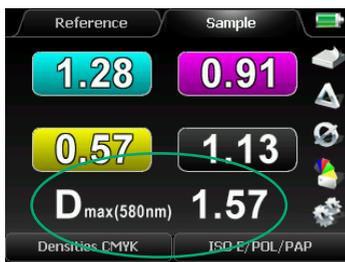


In the following example a measurement has been made on a blue spot color.

The density graph is derived from the remission spectrum and represents the density spectrum for wavelengths from 400 to 700 nm. The peak of the curve displays where the spectral density value has to be taken.

In this case the spectral density for the blue color is $D = 1.57$ at a peak wavelength of 580 nm.

Only spectral densities relating to the same peak wavelength (D_{max}) can be compared.



SpectroDens displays the spectral density automatically as well in the **Densities CMYK** measurement mode.

The density values for CMYK show to what extent the spot color can as well be registered by the CMYK-color related standard density filters.

Here in this case, the blue color is close to a Cyan, therefore the density value in the Cyan channel is quite high.

ExPresso Mini

The measurement function **ExPresso Mini** allows the fast control of the printing quality during the printing process. The last ten consecutive measurements of a printing color can be taken on a print control strip of a printed sheet for the ink zone control. In addition ExPresso Mini provides the opportunity to get an overview of the stability of the print run, by measuring the last ten printed sheets.

Advanced functions for the fast and comprehensive control of the printing quality during the printing process features the software TECHKON ExPresso 4.0 in connection with the automatic measurement system TECHKON SpectroDrive.



ExPresso Mini can display the last ten measurements per color.

When, after the tenth measurement, the display is filled up with measurement values, the already existing values shift with every new measurement one step to the left, and the first value falls away.



The reference line marks the average value of all measurements.



The tolerance area is defined with ± 0.10 density.

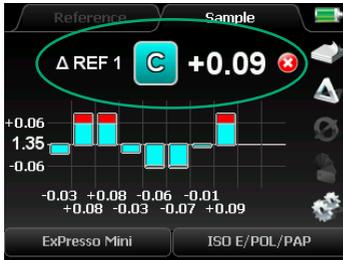
The average value is recalculated after every measurement.



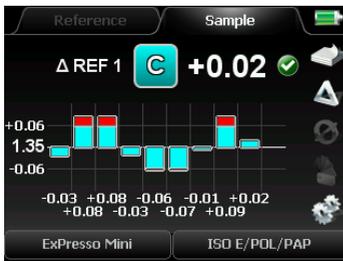
In ExPresso Mini the **Delta Mode** can be activated.



Taken measurements will then be compared to reference densities, pre-set in the **Density Reference Setup**.



The reference data and the result will be displayed. The reference line is always the reference value and the corresponding tolerance.



The figure describes the situation inside and outside of the tolerance and the situation outside of the graphic space.

The measurement conditions M0, M1, M2, M3 according to ISO 13655-2017

Many types of paper contain optical brighteners or pigments to improve the visual performance of the paper. The brighteners and pigments are used to make the paper look brighter and whiter. But for the accurate color adjustment they are quite a challenge, because the type of ambient light influences the color perception in most cases to a large extent. To be able to evaluate these printing substrates precisely when measuring, new standards have been defined concerning the measurement conditions.

The following measurement conditions are selectable in the measurement parameter menu of the SpectroDens color measurement device.

Measurement condition M0 is used when the printing substrate contains no or only little optical brighteners. The measurement light corresponds to the standard illumination type A and the UV component of the source, which activates the optical brighteners, is not specified. Almost every color measurement device in the graphic industries works so far with this measurement condition. This measurement condition should also be used, when measurement values have to be compliant to older devices.

Measurement condition M1 was defined to activate optical brighteners with a specified component of UV light, to be able to evaluate the effect of the brighteners more precisely. The measurement light conforms to the illumination type D 50 with a specified UV component.

Measurement condition M2 describes the measurement without UV light. In older devices this measurement condition was realized using an UV-Cut filter. The comparison of the measurement value M1 to M2 shows clearly how strong the effect of optical brighteners is.

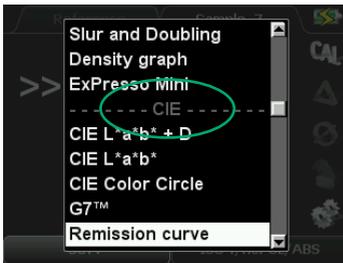
Measurement condition M3 is mainly used for densitometric measurements and only to a less extent for colorimetric measurements. It describes the use of polarization filters which reduce surface reflections to minimize measurement deviations between wet and dry printing sheets.

2.2 Additional functions of SpectroDens Advanced

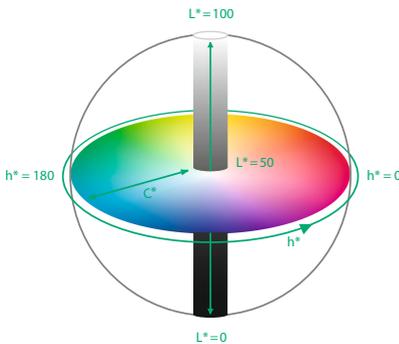
CIE L*a*b* + D and CIE L*a*b*

The previously described measurement functions all were based on densitometry.

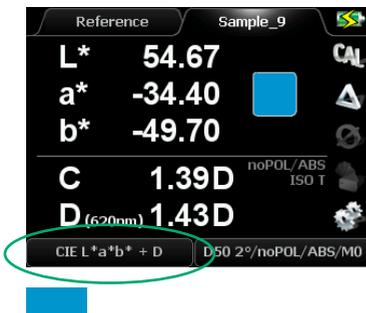
Thanks to the spectral performance of SpectroDens it is possible to calculate and display colorimetric values as well. Measurements in **colorimetry** modes have the advantage of an absolute description of color based on characteristic values.



The thematic separation between densitometric and colorimetric functions is displayed by a dotted line within the measurement function window. CIE stands for the international color institute Commission Internationale de l'Eclairage which publishes the standards for colorimetry.



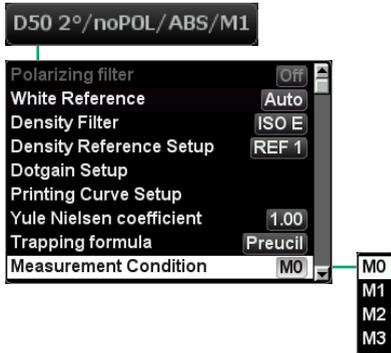
The most popular color system in the printing industry is the CIE L*a*b* color space. Every color is precisely described by three values: The L*-value stands for the luminance and can have values between 0 (a theoretical, absolute Black) and 100 (a theoretical, ideal White). The a*-value describes the color value on the Green/Red-axis (- a*: Green, + a*: Red) and the b*-value the color value on the Blue/Yellow-axis (- b*: Blue, + b*: Yellow).



Colorimetric L*a*b*-measurement on a blue sample.

If instead of the measuring function CIE L*a*b* the measuring function CIE L*a*b* + D is selected, in addition to the CIE L*a*b* values, the density value of the sample with respect to the prevailing CMYK color will also be displayed.

In colorimetry the white reference is absolute in contrary to densitometry where the white is usually referenced to paper white. Before making colorimetric measurements, an absolute white calibration has to be carried out by placing SpectroDens on the charging console and calibrating on the round, white ceramic standard.



Colorimetric measurements can only be compared when the measurement conditions are the same:

- Polfilter: off
- White reference: Absolute
- Illuminant: D50
- Observer: 2°

When selecting **Auto** in the polarizing filter setting, there will be automatically the polarizing filter inactivated when making colorimetric measurements.

The color distance ΔE^* describes how close two different colors match. A value of 0 means that they are identical. ΔE^* -color differences in the range of 5 result in considerably perceptible deviations when reference and sample are close together and observed at the same time.



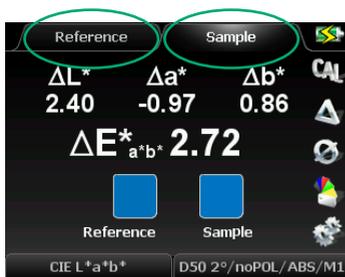
For measurements of the color distance ΔE^* of two different colors, activate the **DELTA Mode** first by selecting the “soft key” with the triangle icon.

Color comparison:



Now two measurements are made:

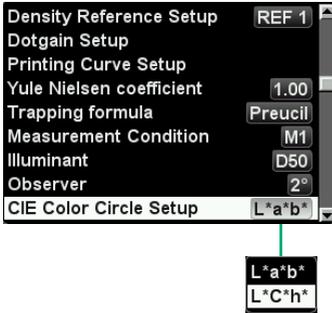
1. Reference measurement
2. Sample measurement



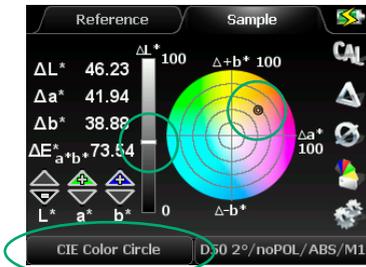
The color distance ΔE^* is displayed with two digits. Additionally the components ΔL^* , Δa^* and Δb^* can be seen.

CIE Color Circle

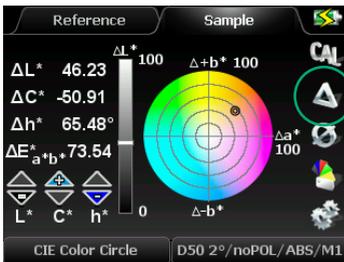
The function **CIE Color Circle** shows the $L^*a^*b^*$ -color values as well. Optionally $L^*C^*h^*$ -values can be displayed. Additionally there is a graphic display and a color is shown as a spot within the color circle.



Select the **CIE Color Circle Setup** function out of the list of measurement conditions. Then choose $L^*a^*b^*$ or $L^*C^*h^*$.



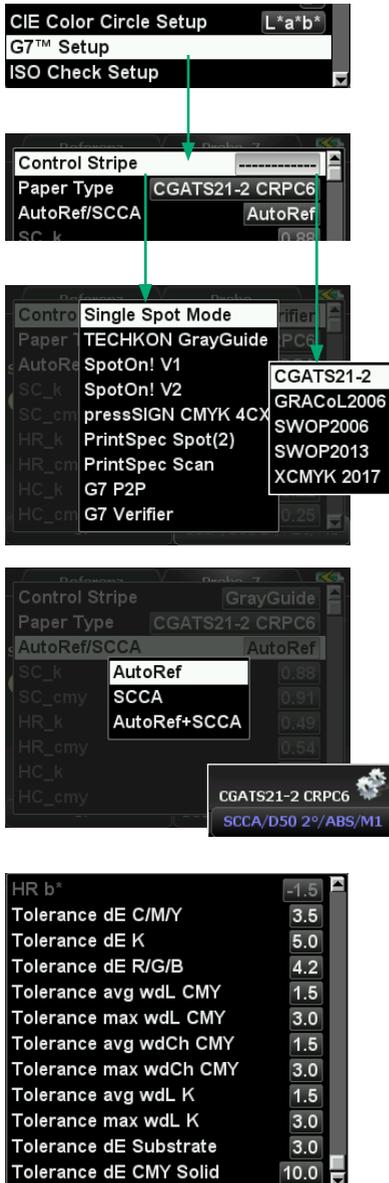
As a result the **CIE Color Circle** feature displays $L^*a^*b^*$, $L^*C^*h^*$ or $L^*C^*H^*$ values.



The measurement function **CIE Color Circle**, (as well as **CIE XYZ** and **Remission Curve**), can be operated in absolute mode with DELTA ON or in comparison mode with DELTA OFF.

G7™

The measurement function G7™ supports the calibration of presses and proofs accord. to the method developed by the IDEAlliance (International Digital Enterprise Alliance).



Requirements for the control fields:

CMYK 100 %, RGB, PAPER, K 25, 50 & 75%
 Highlight Range (HR) 50/40/40
 Highlight Contrast (HC) 25/19/19
 Shadow Contrast (SC) 75/66/66

The G7™ setup is first set via the **measurement conditions** menu area.

Here you can select the settings for: Single measurement **Single Spot Mode** or the corresponding control strip for the scanning measurement. The target values are calculated automatically for the paper type used.

The following options are available for the calculation:

SCCA: (measurement conditions shown in blue) When activated, substrate corrected target values for CMYK and RGB are calculated. The target value for paper white is also reset accordingly with $\Delta E = 0.00$.

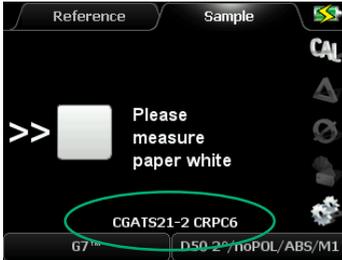
Auto-Ref + SCCA: (measurement conditions shown in blue) Correction of the grey balance references with compensation of the paper white and the 300% CMY patch.

Permissible **tolerances** can be set at the end of the G7™ measurement conditions.

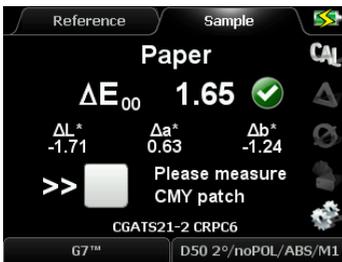


Single spot mode:

To obtain correct measurements, an absolute white calibration must be carried out. A corresponding display confirms the successful calibration.



The device is now ready to measure. The selected paper reference is shown in the display.



The results of the paper white measurement are shown with the ΔE (2000) deviation.

Now the measurement of the CMY patch (300 %) is required.

The $L^*a^*b^*$ value is displayed as ΔE with the respective deviations.



The measurement is then carried out on a K solid ink patch.

After these essential measurements, the subsequent measurements can be carried out in any order:



If the CMY solid inks are measured, the measured values are compared with the reference values. The ΔE^* value appears and a check mark or X indicates whether the value is within or outside the tolerance.

The selected **reference** of the paper is always displayed.



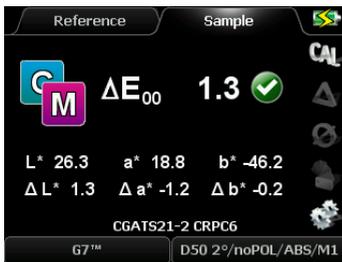


The ΔE^* value is calculated if the deviation is within a reasonable range.



If the deviation exceeds the tolerance, only the measured density with CIE Lab value is displayed without comparison to a control patch.

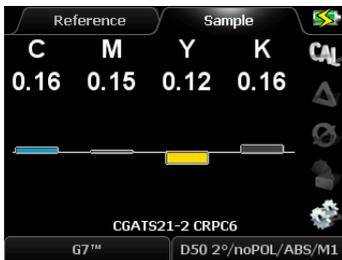
This applies to all CMYK colors.



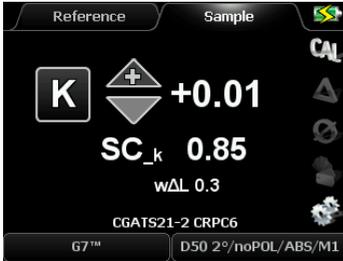
The color measurement works on ink trapping patches (RGB) in the same way.

The determined patch type is displayed in the print sequence of the two print colors.

The measured value is compared with the reference values and the deviation is displayed as ΔE^* value.

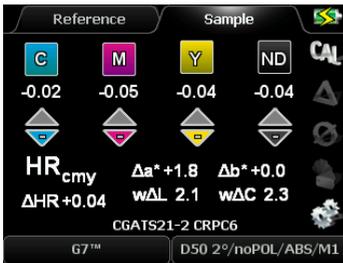


If paper white or **any other** undefined measuring field is measured, all four densities are displayed simultaneously.



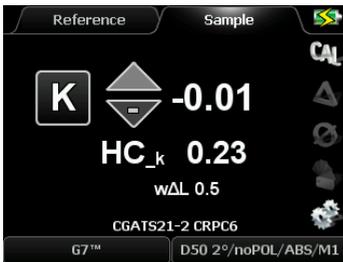
If the measured value is close to the SC_{cmly} “Neutral Density” target value, it is supplemented by adjustment recommendations.

SC means Shadow Contrast.



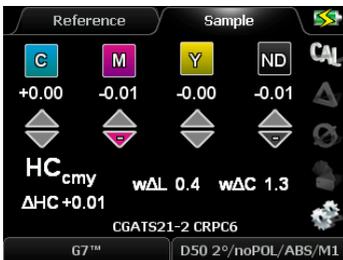
HR_{cmly} is also determined. The adjustment recommendations are made using colored arrows and values.

HR means Highlight Range.

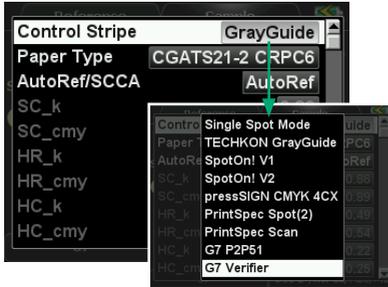


As soon as the measured value is close to the HC_{cmly} “Neutral Density” target value, this is recognised and displayed.

HC means Highlight Contrast.



The control recommendations are displayed in the same way for the black fields SC_k, HR_k and HC_k.

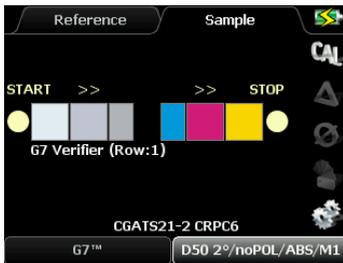


SCAN mode:

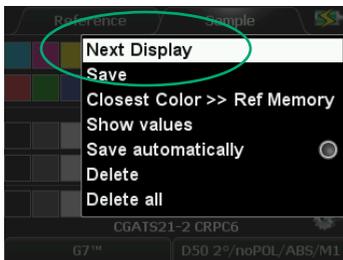
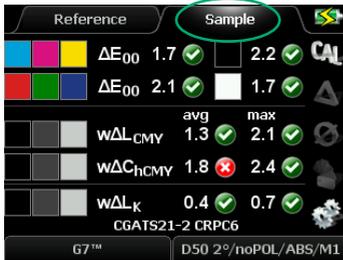
Different control strips are available for the scan measurement.

The yellow marking shows the position of the measuring aperture.

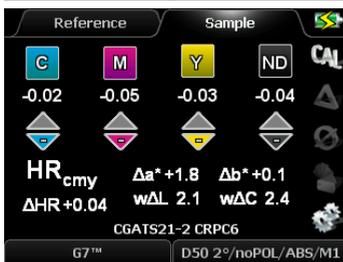
The start button must be pressed continuously between the start and stop position.



After the scan, a G7 overall evaluation is available, which can also be saved and printed out via the G7™ module in the SpectroConnect programme.



The details of the evaluation such as SC, HR, HC, ΔE of CMYK, RGB and paper can be displayed via the **Sample** and **Next display** soft keys.

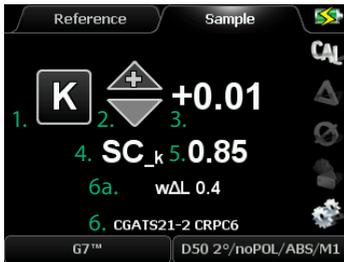


Example HR cmy

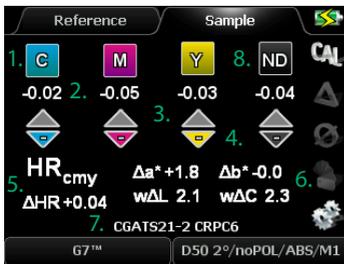


Detailed information:

1. Detected color
2. Measured density
3. ΔE^* -difference compared to ISO reference
4. Indication in/out tolerance
5. Paper type



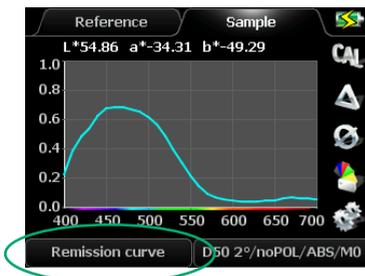
1. Detected color
2. Direction of adjustment
3. Recommended adjustment
4. Detected patch type
5. Measured value
- 6a. Weighted ΔL
6. Paper type



1. Color
2. Recommended adjustment
3. Adjustment as bar graph
4. Direction of adjustment
5. Detected patch type
6. Differences of HR_cmy and a*b* values compared to target values
7. Paper type
8. Indicator for neutral density ND CMY

Remission Curve

The function **Remission Curve** offers the complete spectral graph.



Remission values are shown in 10 nanometer steps in the spectral range of 400 to 700 nm. A remission value has a range between 0 (no remission, absolute darkness) and 1 (ideal total remission of the emitted light).

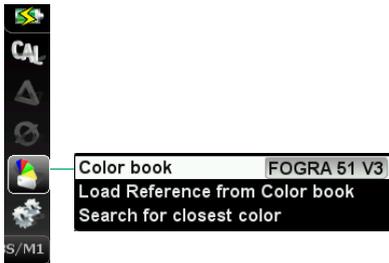
The remission curve is the most exact and total description of a color.

InkCheck

The measurement function **InkCheck** combines in a very easy way the advantages of colorimetry with the familiar densitometry. Thanks to this helpful function, working with the process standard ISO 12647 is simply achieved. The colorimetric deviations are reported and additionally recommendations for amounts of ink supplied in terms of density values are given.

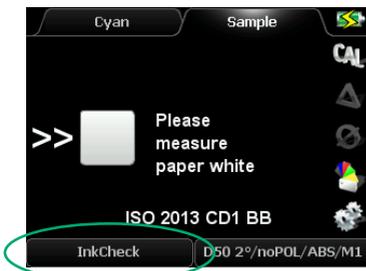
In contrast to the measurement function ISO-Check (see p. 65) the measurement function InkCheck is not only able to check the CMYK print ink, but also spot colors, provided that the appropriate spot colors were chosen as references in advance. In addition to the color books which are included in the contents of delivery, for example the HKS-color books, you can create your own color books for spot colors and use them as a reference. Imported colour data in CXF format with remission data can also be imported here as a reference and used for comparison.

The recommendations for amounts of ink supplied in terms of density values for spot colors are based on CIE L*a*b* measurements.

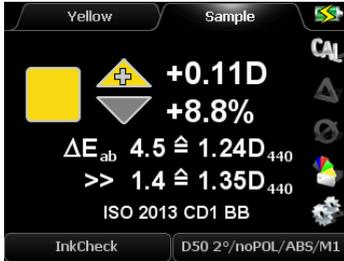


First, a color book which holds the reference color data has to be selected in the reference menu. The reference values for the 5 paper classes defined in the ISO standard are pre-set in the device memory. The data set "Proof" is for measurements on white backing and the data set "Print" for measurements on black backing.

Notice: If they can not be found in the device memory, they can be uploaded with the Windows software SpectroConnect.



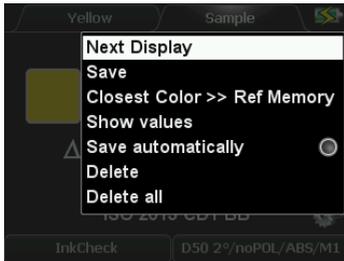
First, a calibration on paper white has to be made. Position the device on the paper white and confirm the request to measure the paper white by pressing the green measurement button.



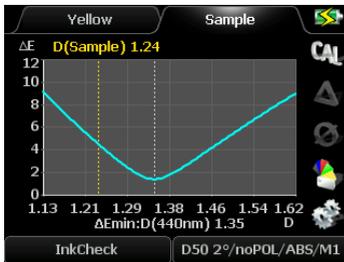
Now the device is ready for measurements on solid color patches. In this case a yellow patch was measured.

Density trend: Rule recommendation: It is recommended to increase the ink application by 0.11 density values.

Color deviation: At present, the colour difference to the reference is 4.5 ΔE^* . After implementing the recommended rule, the colour deviation will probably only be around 1.4 ΔE^* .



A minimal colour deviation may still be present even with optimum ink application due to the special paper/printing ink combination.



D50 2°/noPOL/ABS/M1

Please note that the density values are obtained without the polarizing filter activated and therefore are lower as values obtained with polarizing filter. Please ensure that the right measurement conditions are set.

CIE XYZ

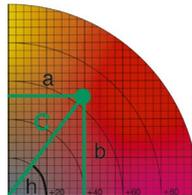
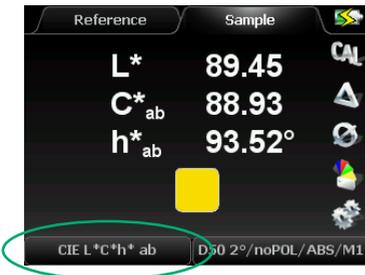
The CIE XYZ will display standard color values.



XYZ standard color values are (beside $L^*a^*b^*$ -values) a different way of describing the color values. They are not as practical to use and therefore not as widely used in the printing industry.

CIE $L^*C^*h^*$ ab

The CIE $L^*C^*h^*$ ab display is closely related to the CIE $L^*a^*b^*$ display (see p. 53). Instead of Cartesian coordinates, polar coordinates are used. The value C^* stands for Chroma and the angular value h^* for hue.



$L^*C^*h^*$ -values are very popular, because they describe colors in a simple way. The further the color is located from the center of the color circle, the more saturated and vivid it appears.

2.3 Additional functions of SpectroDens Premium

ISO-Check

The measurement function **ISO-Check** provides the fast check of a print with regard to the compliance with the ISO standard values ISO 12647-2. The $L^*a^*b^*$ -values, the dot gain and the dot spread of the printing inks CMYK are documented.



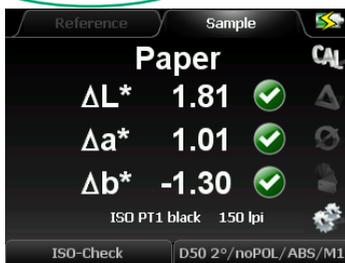
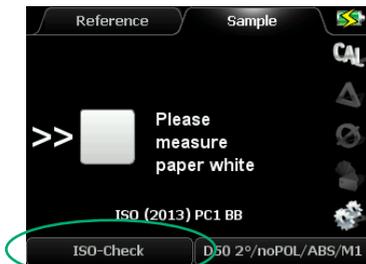
First the **ISO Check Setup** in the menu section of the measurement conditions has to be set.

You can select the control strip and the paper type. If you choose the TECHKON print control strip you can select two dot values additionally.

ISO 12647-2 defines the following standards:

- Dot frequency 150 lpi (60 L/cm)
- Dot values 80 % (75 %) and 40 % (50 %)

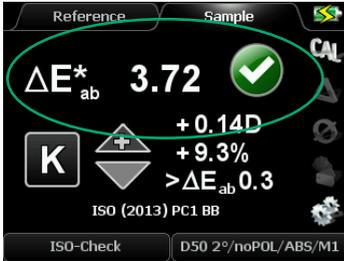
In the next step the paper white **must** be measured. When the message for measuring the paper white is displayed, please confirm it by pressing the green measurement button.



When the $\Delta L^*a^*b^*$ -values are marked with checkmarks, the paper white is in accordance with the ISO-standards.

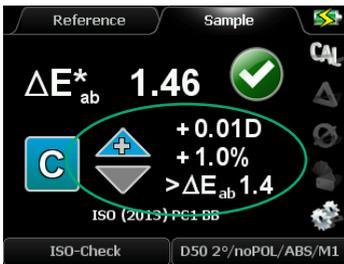


The following PSO/PSO control elements can be measured for the scanning process. During the short scan, simply press and hold the green start button.

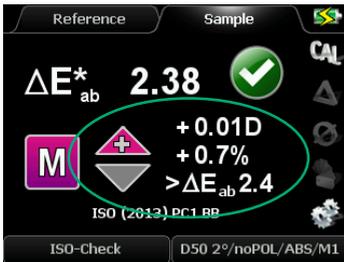


When the solid density is measured, the compliance with the tolerances is checked.

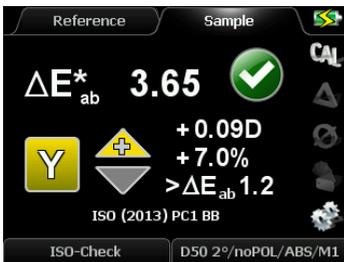
In this example the measurement has been taken on a black solid patch.



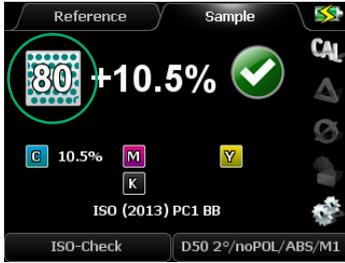
At the same time the recommendation how to adjust the density is calculated.



The smallest possible ΔE^* -value is calculated in advance.



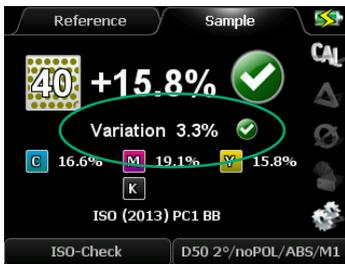
The measurement function ISO-Check recognizes, whether the given tolerances can be achieved with the set of print ink in use. If this is not the case, another set of print ink must be used.



After the measurement of the solid patch, you can measure the %-patch, which you have defined in the setup.



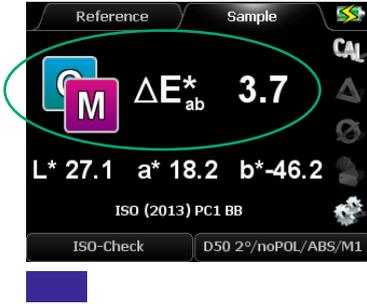
The dot gain is checked in regard to its conformity to the ISO-standards.



Concerning the midtone the spread will be displayed additionally (CMY).

The deviation of the colors CMY is allowed to reach $\pm 4\%$ in the middle-tone of 40% per ink.

But to avoid that the gray balance is disturbed too much, the spread limits the permitted difference between the highest and the lowest tonal value to 5%.



By measuring the trapping only the variation from the reference will be displayed.



The ISO standards define no tolerances for trapping, only informative reference values are given.

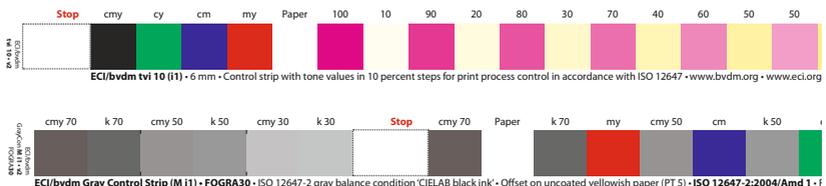
But it is recommended, not to exceed a ΔE^* -value of 10 in the secondary colors, which corresponds with the sum of the permitted ΔE^* -deviations of the primary colors.



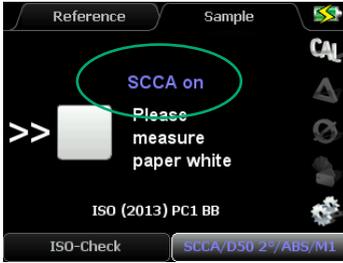
Instead of scanning the TECHKON strip the measurement function ISO-Check can also capture the ECI/bvdm Gray Control Strip version tv1 10 (i1) and (M i1).

When using the scan function we recommend to use a patch width of 5 x 5 mm (min. 4 x 4 mm) with the standard aperture and a patch width of 4 x 4 mm (min. 3 x 3 mm) with the exchangeable 1,5 mm aperture.

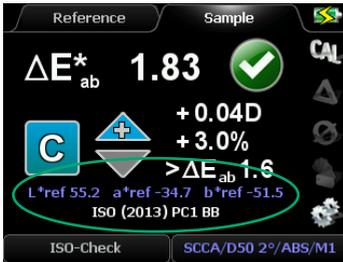
In the submenu of the **Sample** soft key, the detailed measured values and graphics can be called up by selecting **Next Display**.



ECI Gray Control Strips: ECI/bvdm tv1 10 (i1) and M i1



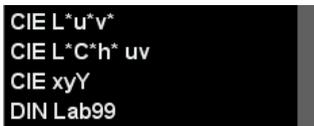
The ISO-Check function features the use of the SCCA reference value correction (selectable in the ISO-Check setup).



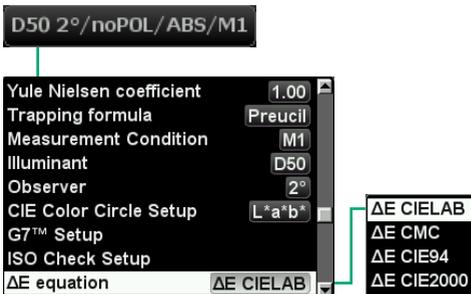
CIE L*u*v*, CIE L*C*h* uv, CIE xyY and DIN Lab99

The Premium-version of SpectroDens enables the display of additional color spaces, which might be used mainly in industries outside printing:

CIE L*u*v*, CIE L*C*h* uv, CIE xyY and DIN Lab99.



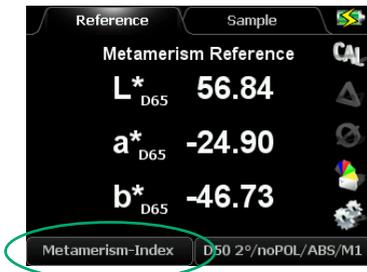
Different formulas for calculating the color distance ΔE^* can be selected as well. The Euclidean color distance $\Delta E^* a^*b^*$ is the most widely used, although it is criticized that for certain areas in the color space the visual perception of color distances does not match the $\Delta E^* a^*b^*$ color distance accordingly.



Metamerism-Index

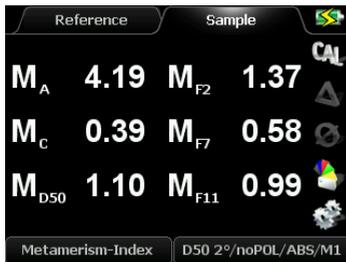
Metamerism is the visual phenomenon that two colors match under certain light conditions and differ under different light conditions.

Colorimetry offers the possibility to detect this effect by measuring the color distance between the two color samples under two exactly defined light sources. The result of this operation is the **Metamerism-Index**.



For the determination of the **Metamerism-Index** there are two measurements to be made.

1. A reference measurement, which refers to illuminant condition D65.



2. A sample measurement on the sample patch.

As a result the color distances in $\Delta E^* a^*b^*$ for illuminant conditions A, C and D50 are shown.

Identical color impression under light condition 1:

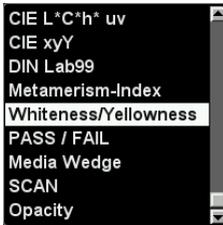


Color deviation under light condition 2 caused by metamerism:



Whiteness / Yellowness

Whiteness- and Yellowness-indices are quality parameters important for the paper industry. SpectroDens Premium will display the whiteness and yellowness indices according to the following standards: Whiteness: E 313, Berger, Stensby, TP 425 – Yellowness: E 313/CIE, D 1925.

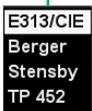


Whiteness index:

Values are usually between 90 and 120 for “white” paper. The higher the value, the “whiter” (= the brighter) the paper. Artificial optical brighteners in the paper will lead to high values as well.

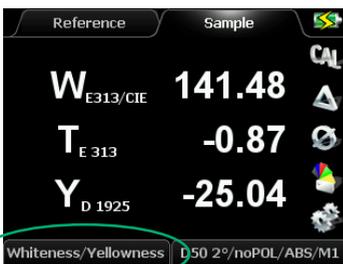
Yellowness index:

Positive value: the paper has a yellow cast
Negative value: the paper has a blue cast



Paper Whiteness is defined by how closely a surface matches the properties of a perfect reflecting diffuser, i.e. an ideal reflecting surface that neither absorbs nor transmits light, but reflects it at equal intensities in all directions. For the purposes of this standard, the color of such a surface is known as preferred white. Whiteness is closely related to our visual perception of the color of paper. Sometimes these variations in whiteness are subtle. For instance two pieces of paper that fall at different ends of the spectrum on the CIE whiteness index may appear white by themselves however when juxtaposed; their variations are revealed.

The type of light paper is viewed under can affect how it looks to the human eye along with other elements like optical brightening agents (OBAs) used in paper production. For example, when OBAs are applied to a dull sheet of paper it will look brighter in natural light and dull in artificial light. When there are little to no OBAs applied the paper will look brighter in artificial lighting when compared to its counterpart with larger amounts of OBAs. The TECHKON SpectroDens uses the Stensby and Berger formula's for quantifying the whiteness of a print substrate.



Brightness T (TAPPI 452)

Like whiteness, paper brightness is also a measurement of the amount of light reflected from paper. Unlike whiteness, it is focused on a narrow wavelength of blue light as opposed to all wavelengths in the spectrum. The higher the number on the brightness scale, the more light a particular sheet reflects. Brightness is just one part of the equation when determining the visual aspects of paper. Two sheets with identical brightness can look drastically different because shade and whiteness are not taken into account.

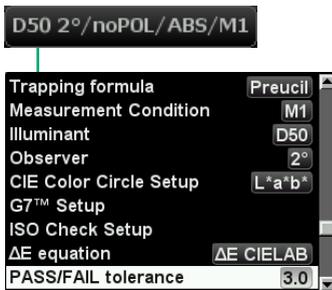
In general, there are two measurement systems that are widely used for determining paper brightness. One (used in North America) is the TAPPI scale. The other (used primarily in other parts of the world) is the ISO system. Some papers can have a rating higher than 100 on the brightness scale. This is due to optical brightening agents present in the paper. When these are applied, the paper can actually reflect more light than is coming from the source. An easy way to remember this is the brighter, the whiter.

Yellowness CIE

Yellowness is the degree that the color of a surface is shifted from preferred white (or colorless) towards yellow.

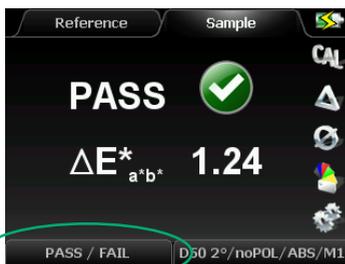
PASS / FAIL

The **PASS / FAIL** function shows at a glance if a measured sample is in or out a set tolerance compared to a reference value.



First, set the allowable limits of the ΔE^* -tolerance.

Select in the menu section of the measurement conditions the item **PASS / FAIL tolerance** and edit the desired tolerance value by pressing the arrow buttons.



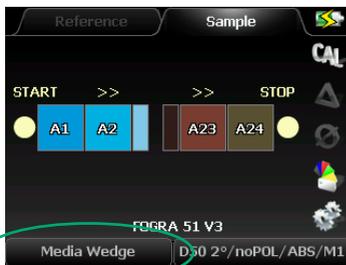
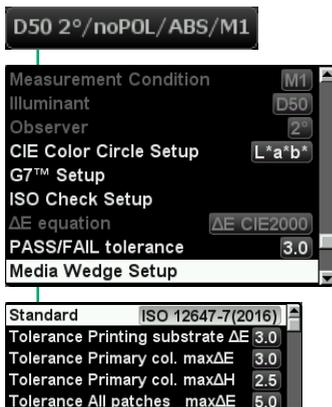
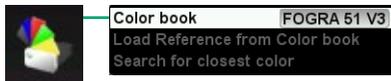
Every sample measurement is compared to the reference.

If the color distance is within the set tolerance (in this case $1.24 < 3.0$), **PASS** will be displayed.

For out of tolerance measurements, accordingly **FAIL** will be shown accompanied by an acoustic signal of three short beeps.

Media Wedge

The **Ugra / Fogra Media Wedge** CMYK is a control element for checking the color consistency of digital proof systems issued by the printing institute Fogra. This practical function is for measuring and analyzing the patches of this control element.



First, a **Color book** has to be selected which contains the Fogra reference data. If not found in the device memory, the color book which is valid for the paper class to be measured, can be uploaded from the Windows software SpectroConnect.

Additional settings have to be made in the **Media Wedge Setup** window. The settings for ΔE^* -tolerances are according to Fogra specifications.

By activating **Automatic Measurement** the device will make consecutive measurements automatically with **Measurement Interval** to be set. Starting and stopping a measurement series is done by pressing the green measurement button.

The reading of the media wedge is from left to right and from first to second row. The measurement begins with patch A1, then A2, etc.. Wrong measurements can be corrected by pressing the red escape button and re-measuring.

After all measurements have been performed, the total result will be displayed.

Media Wedges with separation bars can also be measured by scanning. Just keep the green start-button pressed during the whole scanning procedure.

The Windows software SpectroConnect allows to analyze the measured data in detail and to print a report (see p. 106 f.).

Scan

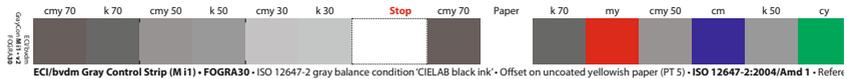
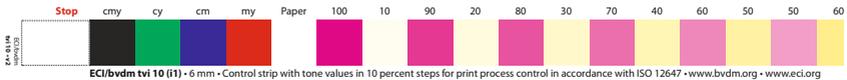
The measurement function **Scan** provides the scanning of individual control elements.

The scanning procedure is very easy. Choose the measurement function **SCAN** in the device menu. Then place the measurement device on the print control strip. Take care that the measurement aperture is positioned in front of the first measurement patch (= start position) and that the device edge is aligned to the print control strip.

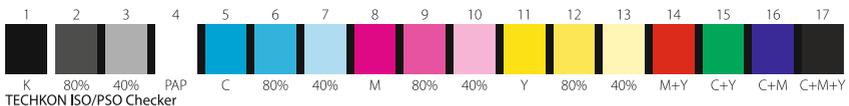


Now press and hold the measurement button, move the device in constant speed along the print control strip until you reach the last patch to be measured (= stop position) and release the measurement button. If the measurement was carried out successfully a short acoustic signal can be heard and all color patches are displayed in the device.

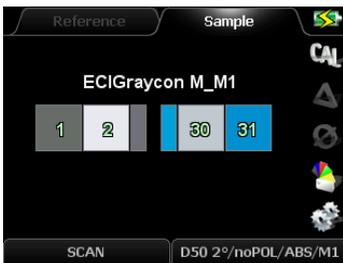
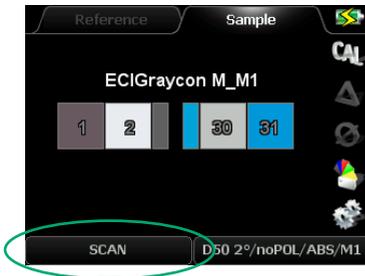
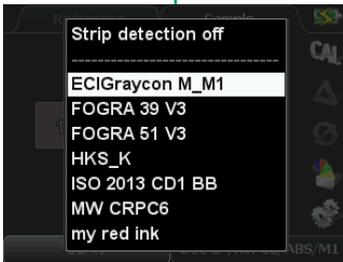
The patch recognition works with the visual delimitation of the fields, which is realised via a high-contrast separator bar or a change of patches.



ECI Gray Control Strips: ECI/bvdm tv10 (i1) and M i1



TECHKON ISO/PSO Checker



SCAN function with strip detection

The improved SpectroDens scan function includes:

Defining a control strip by uploading a color book into SpectroDens and using it as a template.

Improved algorithms for pattern recognition: Checking whether the number and sequence of fields have been scanned.

No guide track is required. The four tracking wheels move in a straight line during scanning by the alignment of the device edge according to the control strip.

SpectroDens informs the user with an error message on the display if the wrong number of fields were scanned or the scanning speed was too high or too low.

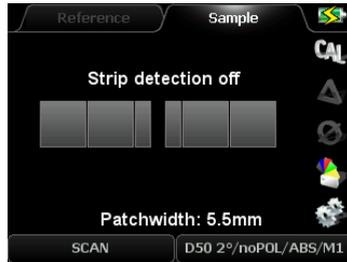
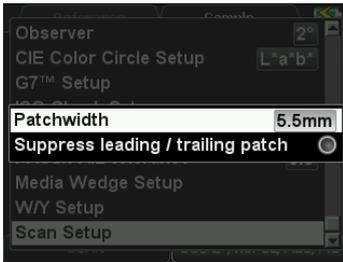
The patch numbering turns green if the control strip is successfully recognised.

A maximum measuring time of 10 seconds is available for the SCAN measurement.

Improved field recognition by specifying the field width

Under the measurement conditions, the patch width can be set under the **SCAN** setup.

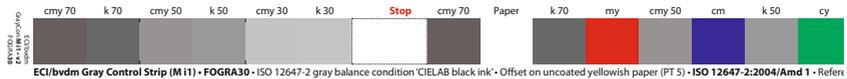
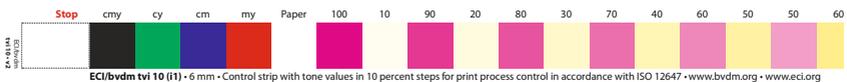
Optionally, the first and last measurement field can be deleted from the **SCAN** measurement.



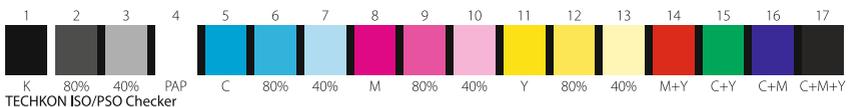
By specifying the fixed field width, measurements with identical colour fields or multiple substrate sequences are also possible.

With the SpectroConnect **Export** module, the measurement data can be transferred directly to other Windows applications such as Microsoft Excel™, Word™ or any other program that processes colour data.

Examples of readable control elements:



ECI Gray Control Strips: ECI/bvdm tvi 10 (i1) und M i1

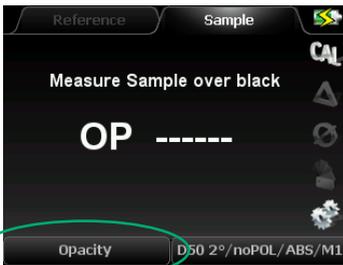


Opacity

Opacity refers to the transparency or opaqueness of paper. Papers with lower opacity tend to let text and images show through more than papers with higher opacity. Opacity is expressed as a percentage in paper. For example, paper with 98 % opacity means that 98 % of light is not allowed to pass through the paper.



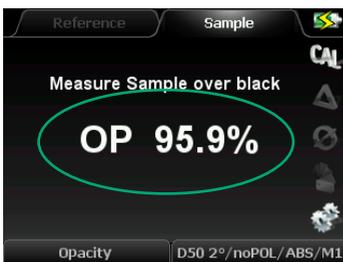
Select the **Opacity** function from the measurement functions menu.



Place the sheet of paper to be measured on a black backing.



In the next step take a measurement of the same sheet of paper after you have placed it on a stack of white paper (minimum 50 sheets).



Now the measurement device displays the result of the opacity measurement.

For further measurements just press the enter button and repeat the whole procedure.

OBA-Check

Optical Brightening Agents (= OBAs) which are used more and more in the paper production, have a significant effect not only on how we perceive the paper under different illuminants, but also on the results of the printing process. The measurement function **OBA-Check** provides precise information about the intensity of the optical brightening agents used and the shade of the paper.



Choose the function **OBA-Check** from the menu measurement functions.

First you have to switch to the „soft-key“ **CAL** to carry out a calibration on the absolute white standard.

SpectroDens performs the **OBA-Check** applying the measurement conditions M1 and M2, i.e. with and without stimulation through UV light (see p. 52). The difference between the two CIEb*-values leads to the final measurement result.



The amount of optical brightening agents according to ΔB (ISO 15397) and its categorization according to ISO 12647-2:

- $(0 \leq \Delta B < 1)$ no OBA
- $(0 \leq \Delta B < 4)$ OBA faint
- $(4 \leq \Delta B < 8)$ OBA low
- $(8 \leq \Delta B < 14)$ OBA moderate
- $(14 \leq \Delta B < 25^*)$ OBA high

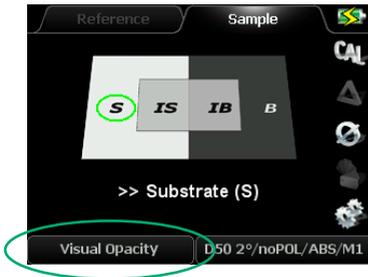
The table shows the relation between ΔB - and CIEb*-values for the practical application.

OBA amount	no OBA	faint	low	moderate	high
ΔB	0 to 1	1 to 4	4 to 8	8 to 14	14 to 25*
$\Delta CIEb^*$	0	0,3 to 2,0	2,0 to 3,7	3,7 to 6,2	6,2 to 10,4*

* and beyond

Visual Opacity

Based on ISO 23498:2020, the light transmission of white printing ink on transparent substrates can be determined:



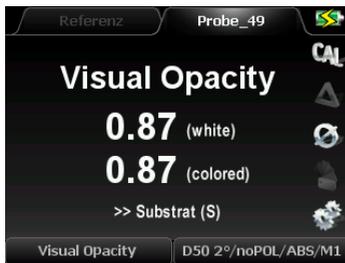
Prerequisite for the measurement documents:

Substrates:

S: Test chart $L^* 92 \pm 1$

B: Black region $L^* < 27.7$

The **green circle** visualises the four measurements to be carried out.



S: Substrate

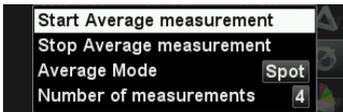
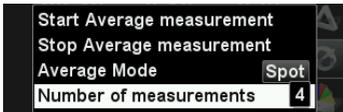
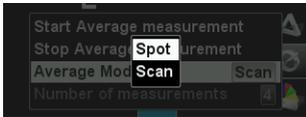
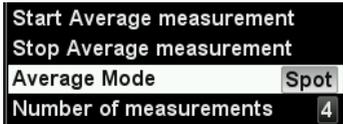
IS: Ink on substrate

IB: Ink on black backing

B: Black backing

Average values

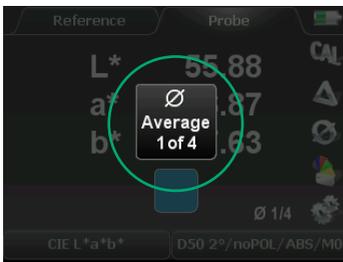
Average values can be calculated and displayed from individual measurements or SCAN measurements. This function can be useful when measuring uneven surfaces.



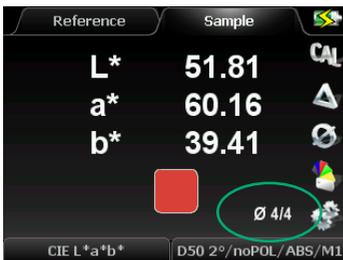
Two average value modes for SPOT or SCAN measurement are available:

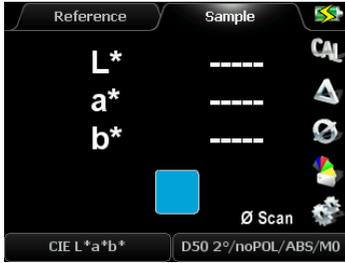
Spot measurement: The number of measurements to be used for calculating the average value is set here. A maximum of 9 individual measurements are possible. Now start the average value measurement by confirming the selection of the **Start average value** measurement menu item with the Enter button.

The number of individual measurements already carried out is displayed here.



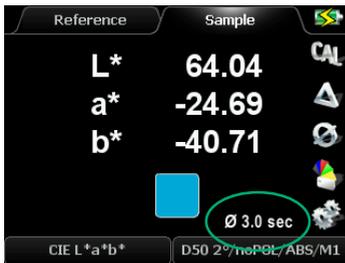
Once all individual measurements have been carried out, the calculated average value is displayed and saved if necessary.





SCAN measurement:

The average value measurement is carried out by pressing the green measurement button.



While the SpectroDens is moved along a scanning path.

The duration of the measurement time for calculating the average value is specified as 3.0 seconds in this example.

2.4 Storage of measurement values

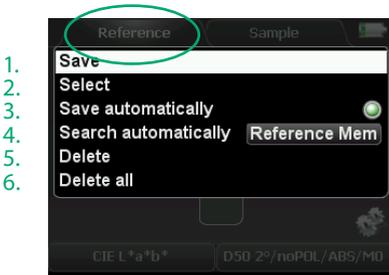
The versions SpectroDens Advanced and Premium include a **Color library**. This is a **digital memory** for storing color values, which can be compared or exchanged with the Windows software SpectroConnect.

There are three different sections where color values can be stored:

- Reference memory for up to 300 reference values
- Sample memory for up to 3000 sample values
- Color book memory for up to 20 color books with a total number of 25000 reference values

Reference memory

To access the **Reference memory**, you have to select **Reference** in the display. A memory capacity for 300 references is at your disposal. After the 300th color value is stored, the message indicates that the memory is full.



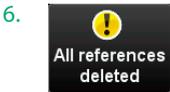
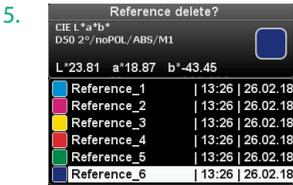
By pressing the enter button with the device in **Reference** mode a pop-up window opens. Within the window navigation is done with the arrow keys.



1. With **Save** the last reference measurement is stored.



2. **Select** shows a list of stored color values. Within the list, values can be selected and displayed by using the arrow- and enter-buttons.



3. By activating **Save automatically** all future reference measurements will be stored automatically.

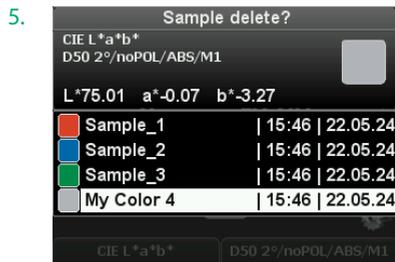
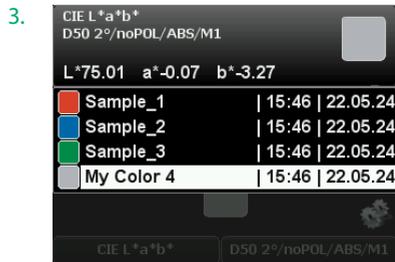
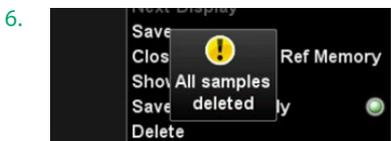
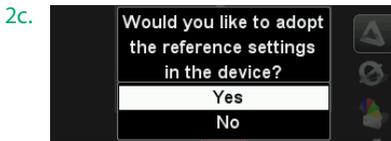
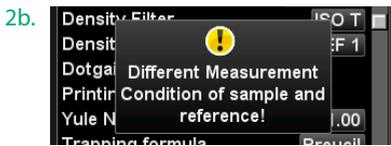
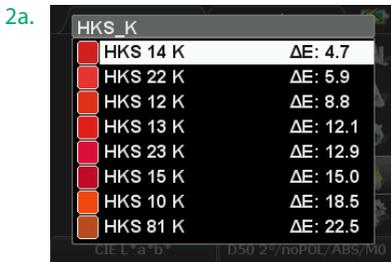
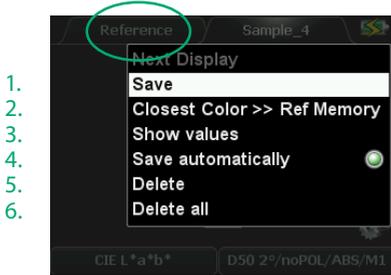
4. By activating **Search automatically Reference Mem** the closest matching reference color when making a sample measurement will be displayed. This feature is active in the sample mode with DELTA Mode on.

5. **Delete** will remove selected color values from the list.

6. **Delete all** will remove all values in the list.

Sample memory

The **Sample memory** has almost the same functions as the reference memory. Here up to 3000 sample color values can be stored. However the sample memory is a ring memory, i.e. maximum 3000 samples can be stored before the first sample will be overwritten by a new measurement. The pop-up window opens by pressing the enter button with the device in **Sample** mode. The correction of different settings of the measuring conditions between SpectroDens and color references takes place after a confirmation (2b, 2c).



Color book memory

Additionally to storing reference and sample color values, complete **Color books** can be managed. A color book is a folder which can hold up to 25000 single color values. An example are the HKS® spot color collections which are included in SpectroDens with the software package SpectroConnect. New color books can easily be edited and transferred into the device. Up to 20 color books can be stored in SpectroDens; there is no limitation of storing color books in the Windows software SpectroConnect.



1. **Color book** FOGRA 51 V3
2. Load Reference from Color book
3. Search for closest color

- CD 1 BB
- CD 5 BB
- ECI Graycon M
- FOGRA 39 V3
- FOGRA 51 V3**
- FOGRA 52 V3
- HKS_K
- PANTONE+ So(M1)

CD 1 BB		
<input type="checkbox"/>	Black	14:04 17.06.14
<input checked="" type="checkbox"/>	Cyan	14:04 17.06.14
<input type="checkbox"/>	Magenta	14:04 17.06.14
<input type="checkbox"/>	Yellow	14:04 17.06.14
<input type="checkbox"/>	Red M+Y	14:04 17.06.14
<input type="checkbox"/>	Green C+Y	14:04 17.06.14
<input type="checkbox"/>	Blue C+M	14:04 17.06.14
<input type="checkbox"/>	PS 1	14:05 17.06.14
<input type="checkbox"/>	C+M+Y	14:04 17.06.14

Red M+Y Sample

ΔL^* Δa^* Δb^* CAL

2.31 -1.13 -3.13

$\Delta E^*_{a^*b^*}$ **4.05**

Red M+Y Sample

CIE L*a*b* D50 2°/noPOL/ABS/M1

The “soft key” with the color book symbol opens the window for the settings of the color book memory.

1. Here a **Color book** is selected from the list.

2. With **Load Reference from Color book** a single color value from a color book is loaded into the reference memory.

3. **Search for closest color** determines the closest color match in a color book compared to a sample value.

Chapter 3

How to use the Windows software SpectroConnect

3.1 Software description

The supplied Windows software **TECHKON SpectroConnect** allows to transfer measurement data to the PC and to make device specific settings via the PC. The measurement values can be displayed on the computer monitor. Color information is displayed, colors can be compared and data can be exported into other software applications, e.g. Microsoft Excel™.



When using **SpectroDens Basic** the device has to be connected via the USB cable to the PC when working with SpectroConnect. When performing a measurement with the device, the value will be displayed immediately on the computer screen.

The models **SpectroDens Advanced** and **Premium** have an internal memory for up to 300 reference values, 3000 sample values and 20 “digital” color books, which can contain up to 25000 color values. When connecting the device to the PC via the USB cable, all stored values will be uploaded to the software and displayed on the computer screen. Of course, the device can be operated as usual when connected to the PC.

The software requires a computer with a free USB port and a completely installed Microsoft Windows 10 or 11 operating system.

3.2 Installation

It is important, to carry out the following steps in the right order, to make sure that the USB device driver will be installed properly.

1. Please insert the supplied USB stick into the USB port of your computer WITHOUT the SpectroDens being connected to the PC.
2. The installation routine will start automatically.
Follow the steps of the installation, until it is completed.
3. Now, after the installation was finished successfully you can connect the device with the Micro-USB cable to the computer.

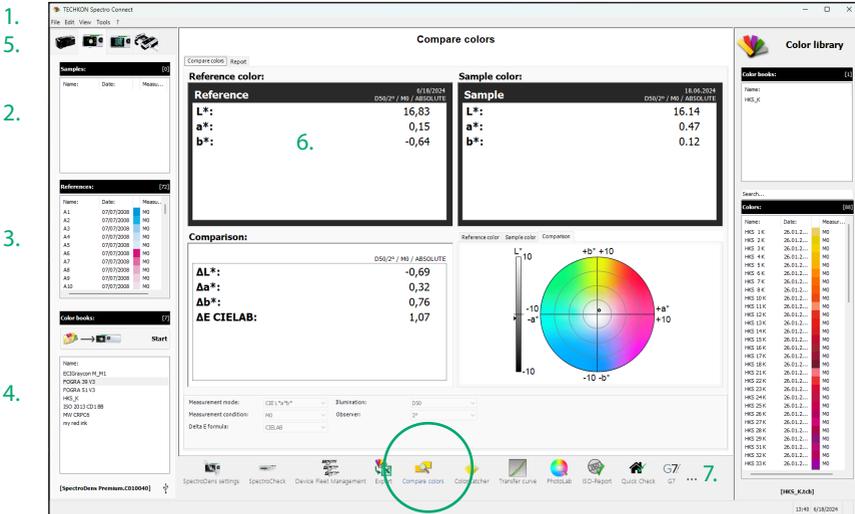
3.3 Overview / Software module: Compare colors

The application will be installed in the Windows program files section in the folder **TECHKON GmbH / TECHKON SpectroConnect**.

Software symbol
SpectroConnect



After starting the program the software module **Compare Colors** will appear. Like all the SpectroConnect software modules it is divided into four logical segments: On the left side you see the memory content of the connected device, in the center the active program module, on the right side the color library which is stored on the PC and in the section at the bottom a bar which lists all available and selectable program modules.



1. The menu bar includes functions known from standard Windows applications. They comprise: New, Open, Save, Print and Quit.

2. The window **Samples** shows samples which are stored in the device. Only in SpectroDens Advanced and Premium available.

3. The window **References** shows stored references. Only in SpectroDens Advanced and Premium available.

4. The window **Color books** displays the color books which are stored in the color library of the device. Per Drag and Drop you can

copy references and complete color books from here.

5. In this section, the appropriate measurement device can be selected.

6. Window of the active program module

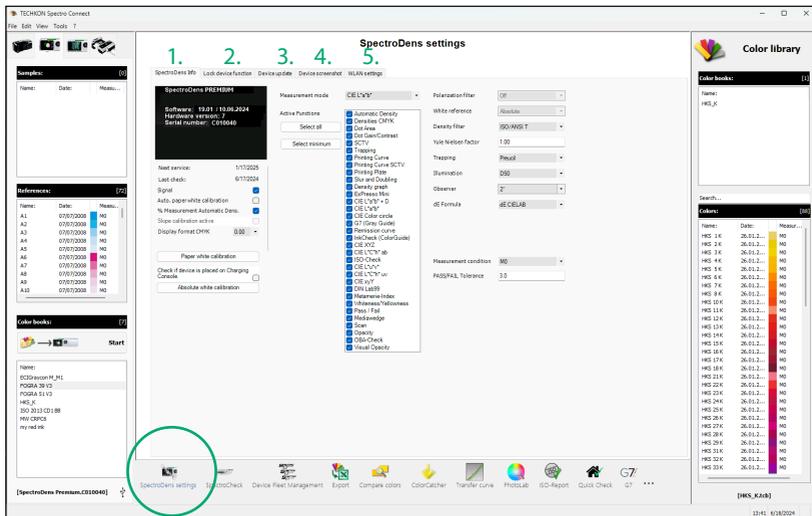
7. This bar shows the list of available program modules. They can be selected from this bar directly via mouse click and the application will appear in the middle of the display.

After launching SpectroConnect it is pre-set to display the module **Compare colors**.

3.4 Software module: SpectroDens settings

In this module device specific settings can be made.

1. **SpectroDens Info:** All settings, which can be made at the device can also be made with this software feature.
2. **Lock device functions:** Device functions can be locked and unlocked with this feature. Locked functions will appear in shaded gray on the LCD display.
3. **Device update:** New device software can be uploaded into the device. There are two different types of files to upload:
 - Device update: loads the new version of device software
 - Device upgrade: upgrades to SpectroDens Advanced or Premium (must be purchased)
4. **Device screenshot:** This shows the device display on the computer screen. All measurement buttons can be remotely operated by the mouse pointer. The screenshot can be saved. This is a very useful feature for product trainings.
5. **WLAN settings:** Window for the configuration of the WLAN connection (see p. 22 ff.)

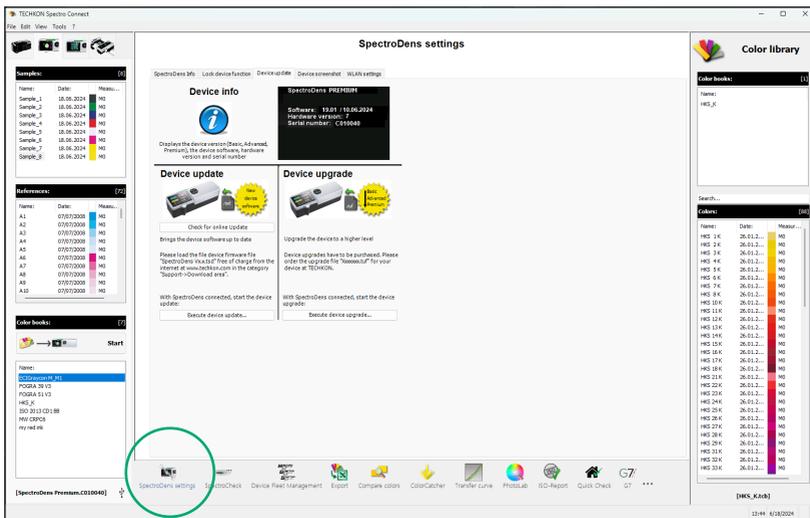


3.5 Device update and device upgrade

By the application of this module SpectroDens can be loaded with a new internal firmware which is selected by **Device update** or SpectroDens can be expanded in functionality by **Device upgrade**.

The SpectroDens **Basic** model can be extended via data upload to **Advanced-** or **Premium-** functionality without the need to send the instrument to the TECHKON service center. Of course, the same procedure applies for upgrades from **Advanced** to **Premium**.

The procedure is explained in the program window:

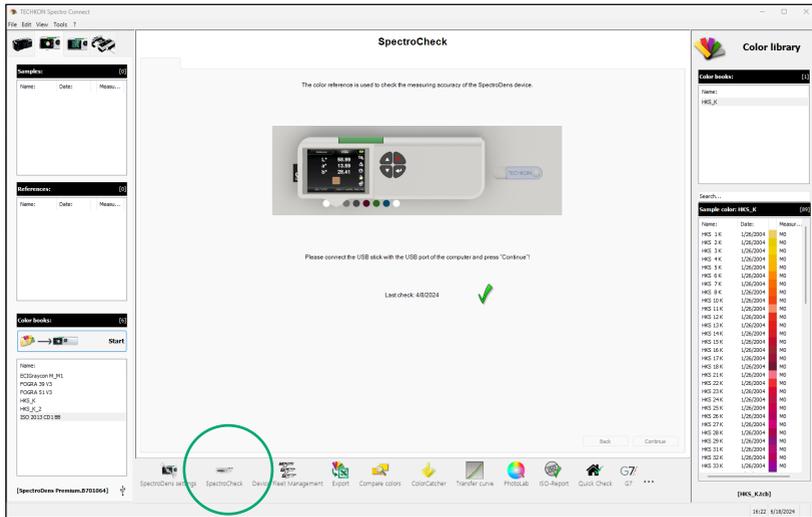


3.6 Software module: SpectroCheck

Insert the enclosed USB data stick with the reference values into the USB port and connect SpectroDens to the computer using the USB cable.

The **SpectroCheck** software module will now guide you step by step through checking the measuring device. The information as to whether the measuring device meets the technical specifications can also be printed out.

NOTE: The test of the TECHKON SpectroDens is to be carried out with the cleaned standard aperture 3.0 mm and requires the corresponding and clean white standard.



Individual results

Gray		✓	Green		✓
Pink		✓	Blue		!
White		✓	Dark Gray		✓
Light Gray		✓	UV White		✓

Overall result

Details and Print

The measuring accuracy of the device is within tolerance.

Print report

Print preview

TECHKON

Erfolg ist messbar

Device type: SpectroDens Premium

Serial number: C203040

SpectroCheck Serial number: SC C03004

Date/Time: 5/23/2024 2:33 PM

Temperature: 22.5 °C

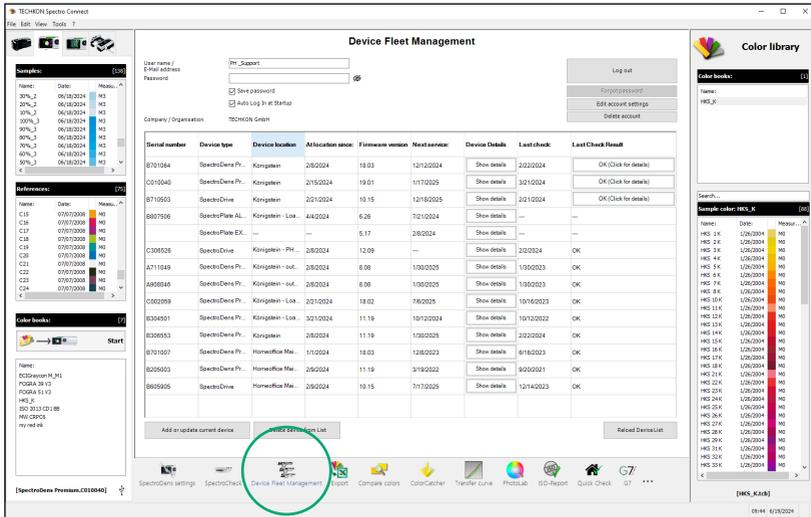
SpectroCheck Service Status: Calibration required

Title	L*	a*	b*	L* ref	a* ref	b* ref	ΔE	Result
Gray	58.01	-0.37	0.51	55.94	-0.28	0.43	0.14	✓
Pink	40.72	30.63	7.10	40.77	30.25	6.73	0.53	✓
Green	50.43	-33.20	13.16	50.43	-32.85	13.24	0.38	✓
Blue	49.77	-17.65	-10.64	49.59	-17.54	-12.09	0.78	!
White	96.25	-0.05	1.99	96.05	-0.17	1.74	0.34	✓
Light Gray	82.63	-0.15	0.16	82.55	-0.10	0.08	0.12	✓
Dark Gray	27.15	0.12	-0.15	27.30	0.14	-0.23	0.17	✓
UV White	97.23	2.27	-6.99	97.15	2.57	-6.81	0.38	✓
Overall result								✓

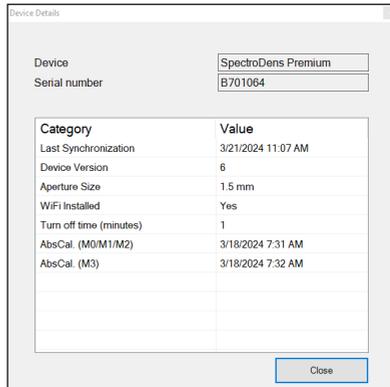
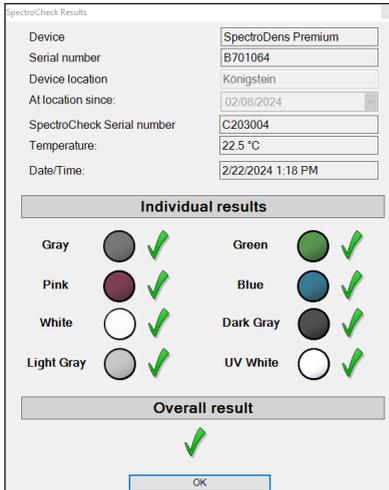
Close

3.7 Software module: Device Fleet Management

With the web based **Device Fleet Management** module, managing and monitoring of the of all TECHKON Spectro devices is possible:



For each device the last device check result and device condition can be checked in detail.



Also a multi user web access from any location shows the actual device condition:

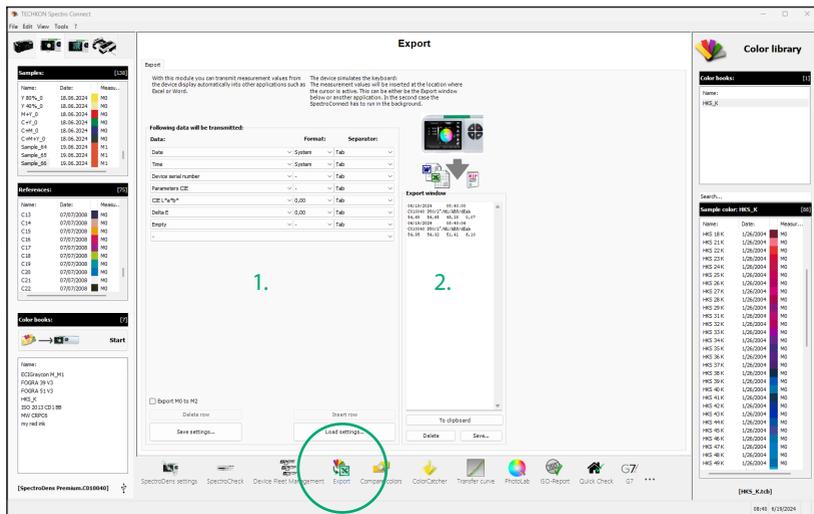
The screenshot shows the 'TECHKON Fleet Management' web application. At the top, there is a language dropdown set to 'English', a 'User Name / E-Mail Address' field, and a 'Password' field with a toggle for visibility. A 'Log Out' button is positioned below the password field. A 'Refresh List' button is located in the top right corner of the main content area.

Serial Number	device Type	Device location	At location since:	Firmware Version	Next Service	Device Details	Last Check	Check Result
B306553	SpectroDens Premium	Königstein	Thu, Feb 8, 2024	11.19	Thu, Jan 30, 2025	Details	Thu, Feb 22, 2024	OK
A711049	SpectroDens Premium	Königstein - outdated	Thu, Feb 8, 2024	8.08	Thu, Jan 30, 2025	Details	Mon, Jan 30, 2023	OK
A908046	SpectroDens Premium	Königstein - outdated	Thu, Feb 8, 2024	8.08	Thu, Jan 30, 2025	Details	Mon, Jan 30, 2023	OK
B701064	SpectroDens Premium	Königstein	Thu, Feb 8, 2024	18.03	Thu, Dec 12, 2024	Details	Thu, Feb 22, 2024	OK Details

3.8 Software module: Export

Measurement data can be exported in any other Windows application e.g. Microsoft Excel™, Word™ or other programs which can handle color data, e.g. a RIP calibration software.

SpectroDens works like the keyboard: Pressing the measurement button will place the measurement value automatically at the location where the cursor is.

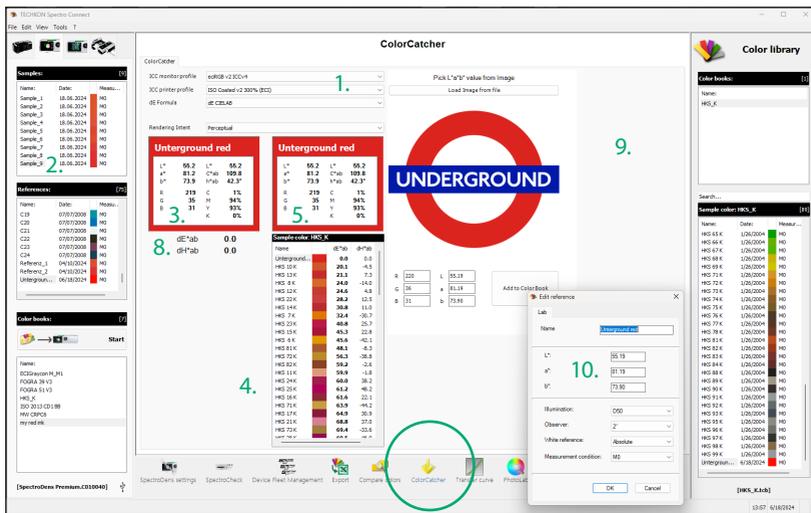


1. Here is defined, which data will be transmitted, how it will be formatted and what type of spacing between the measurement data will be. All the settings can be saved and recalled later.

2. The Export window can also be used for testing data transmissions.

3.9 Software module: ColorCatcher

The program module **ColorCatcher** is available in the models SpectroDens Advanced and Premium. Based on a $L^*a^*b^*$ -measurement and referring to selected ICC profiles this program module displays the conversion into the color models $L^*C^*h^*$, RGB and CMYK. Furthermore an automatic search for the closest matching color of a pre-set or self created color book is carried out. The lower part of the module window informs you about the exact color deviations between the sample and the recommended color of the color book.

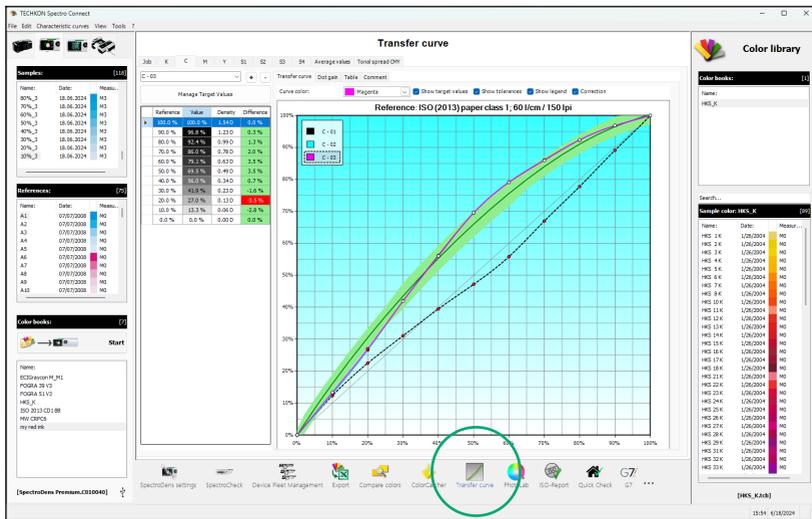


1. Selected ICC profiles
2. Measured sample color
3. Calculation of $L^*a^*b^*$ -, RGB-, $L^*C^*h^*$ - and CMYK-values based on selected ICC profiles for the current sample.
4. Shows the closest match to the current sample out of the selected color book.
5. Calculation of $L^*a^*b^*$ -, RGB-, $L^*C^*h^*$ - and CMYK-values based on selected ICC profiles.
6. Self created color book
7. Colors from a color book
8. Variations and visible differences
9. The pipette function can be used to extract colour information from an image file in JPG or PNG format.
10. The results are displayed in the RGB components and as a CIE $L^*a^*b^*$ value. The color determined can be added to the color library.

3.10 Software module: Transfer curve

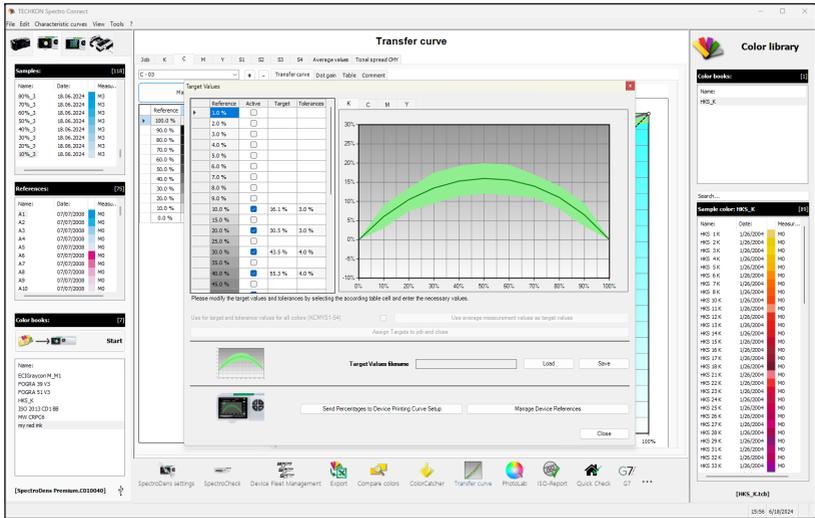
Using the software module **Transfer curve** you can fast and easily determine transfer characteristics on prints and check the compliance of the dot gain according to ISO 12647 targets or individual standards. The software calculates at the same time compensation values for the adjustment during plate exposure.

Values for CMYK as well as spot colors can be analyzed. Measurement results can be displayed as graphics or charts. Furthermore several curves can be compared and average values can be calculated.



Step wedges can be evaluated in any % steps. The structure of the step wedge can be defined in the required % steps via the **Manage target values** item in the software or in the **Transfer curve setup** of the SpectroDens. The following tolerances are currently available in the SpectroDens Transfer curve setup (page 43 f):





In the section **Manage target values** the target values can be edited. Furthermore settings for the assignments of the targets can be defined.

Target Values

Reference	Active	Target	Tolerances
1.0 %	<input type="checkbox"/>		
2.0 %	<input type="checkbox"/>		
3.0 %	<input type="checkbox"/>		
4.0 %	<input type="checkbox"/>		
5.0 %	<input type="checkbox"/>		
6.0 %	<input type="checkbox"/>		
7.0 %	<input type="checkbox"/>		
8.0 %	<input type="checkbox"/>		
9.0 %	<input type="checkbox"/>		
10.0 %	<input checked="" type="checkbox"/>	18.0 %	3.0 %
15.0 %	<input type="checkbox"/>		
20.0 %	<input checked="" type="checkbox"/>	30.5 %	3.0 %
25.0 %	<input type="checkbox"/>		
30.0 %	<input checked="" type="checkbox"/>	43.5 %	4.0 %
35.0 %	<input type="checkbox"/>		
40.0 %	<input checked="" type="checkbox"/>	55.3 %	4.0 %
45.0 %	<input type="checkbox"/>		

1.

2.

Please modify the target values and tolerances by selecting the according table cell and enter the necessary values.

Use for target and tolerance values for all colors (KCMYST-S4) Use average measurement values as target values

Assign Targets to job and close

3.

Target Values filename REF_Curve01 Load Save

4. Send Percentages to Device Printing Curve Setup

5. Manage Device References

Close

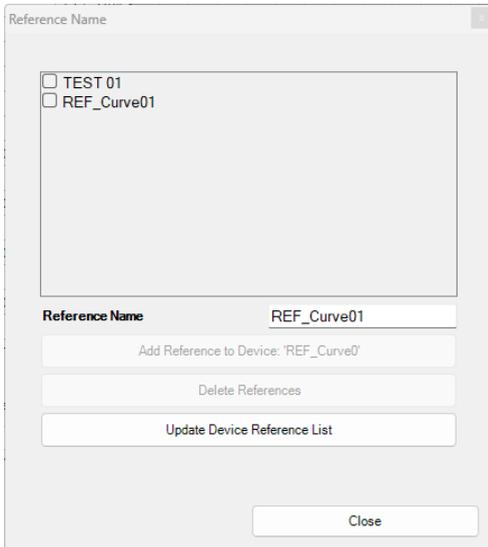
1. References, setpoints and tolerances can be created and activated in this table.

2. Graphical representation of the current setpoint table with tolerances.

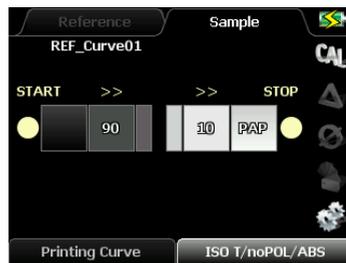
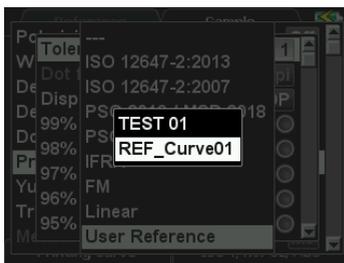
3. Management of the setpoint file, which must be saved as a file in order to use your own transfer curve setpoints. The setpoint file is only available after transfer to the SpectroDens measuring device.

4. The changes made to the % steps from the table (1.) can be sent to SpectroDens.

5. A loaded or saved setpoint file can be transferred to the device. Setpoint files that are no longer required can be deleted.

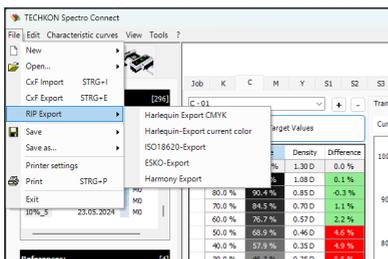


Once the new reference/tolerance has been added to the device, it can be activated in the pressure characteristic setup by selecting **User Reference**:



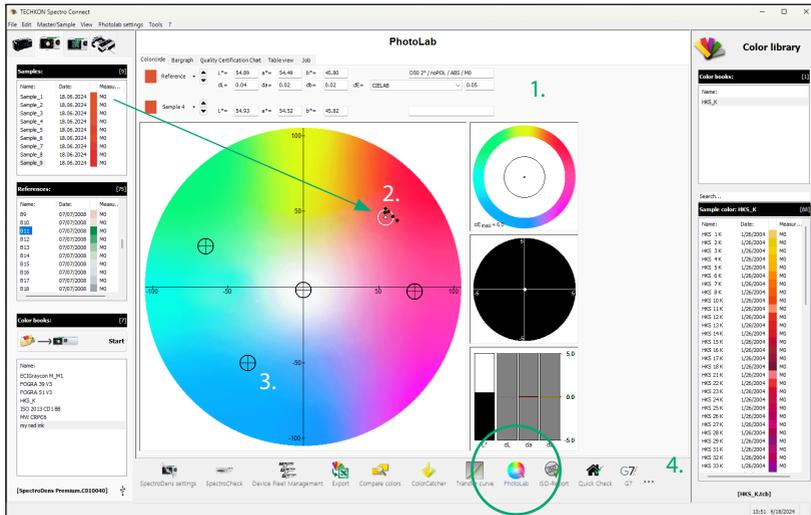
RIP export:

The following export formats are available for correcting the CTP characteristic curve:



3.1 Software module: PhotoLab

TECHKON **PhotoLab** is an optionally available program module for evaluating and displaying $L^*a^*b^*$ color data graphically. Color differences between sample and reference colors can be analyzed. PhotoLab is only available in the SpectroDens Premium version.



1. In the upper section of the module window, the color differences between sample and reference are shown numerically.

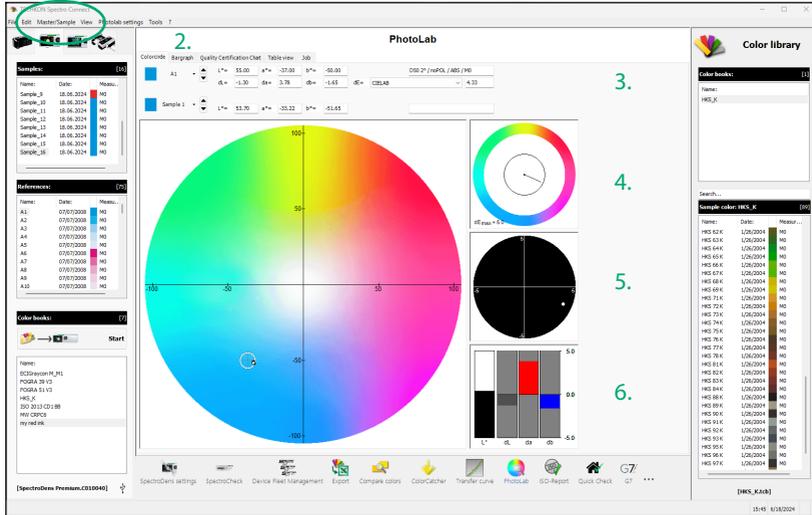
2. Reference: viewfinder with tolerance circle
 Sample: bold point
 The current selected value is marked in white.

3. Color samples and references are directly imported into PhotoLab by making measurements with SpectroDens having it connected to the PC via the USB-cable.

Furthermore, color values and complete color books from the device memory or out of the PC color library can be selected and be moved by drag-and-drop with the mouse pointer directly to the center of the display where the $L^*a^*b^*$ color circle is.

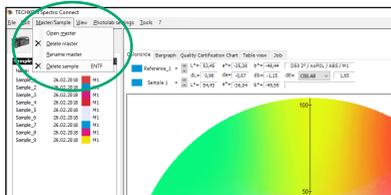
A pop-up window will ask, if the values should be used as sample or as reference values.

4. A mouse click on the program symbol will start the plug-in PhotoLab within the SpectroConnect environment.



1. Samples and references can be selected directly with a mouse click or by choosing from the “pull-down” menu.

Delete and renaming is done via the menu.



2. Different modes of the $L^*a^*b^*$ -display can be selected:

- The modes **Bargraph** and **Quality Certification Chart** show the trend of ΔL^* -, Δa^* - and Δb^* -values of a measurement series.
- The **Table View** shows all values numerically.
- In the **Job** window job relevant text data can be edited.

3. A measurement value highlighted in red indicates an out-of-tolerance sample.

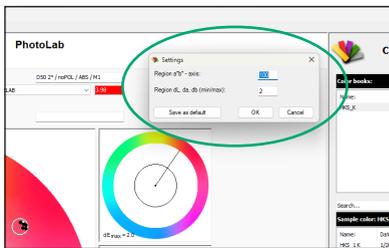
4. The black circle line indicates the tolerance limit of the ΔE^* -region. If the black pointer reaches into the outer segment of the circle, the tolerance has been exceeded.

5. Enlarged view of the tolerance circle

6. Display of the color components ΔL^* , Δa^* and Δb^* .

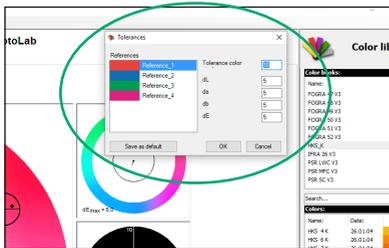
PhotoLab settings

If you activate the **PhotoLab settings** in the menu bar, you can call up and edit three areas:



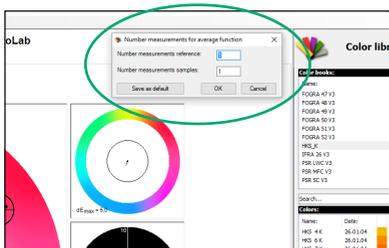
1. General settings:

This is the window for setting the dimensions of the $L^*a^*b^*$ color circle and the $\Delta L^*a^*b^*$ color deviation.



2. Tolerances:

In this window the tolerances for the color deviations are defined and the size of the tolerance circle is set.



3. Mean values:

It can be appropriate to take several single measurements on one sample which then are averaged to an average value. The number of measurements which result in the calculation of the average value is defined in this window.

3.12 Software module: ISO-Report

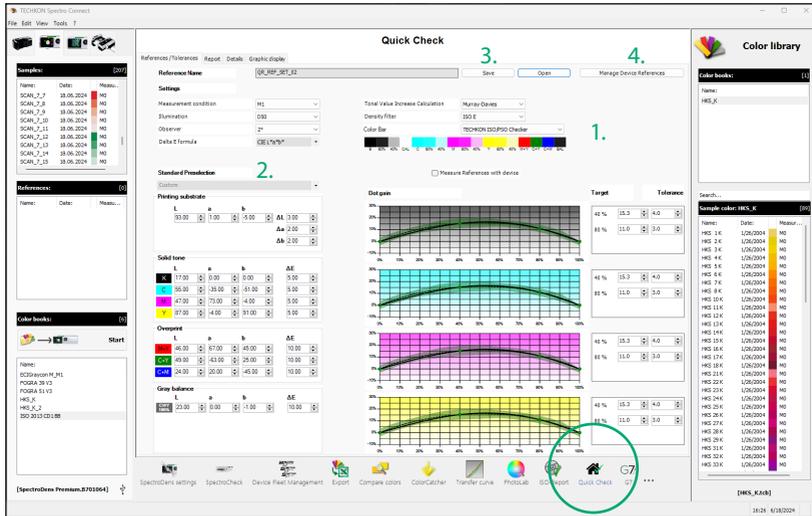
The software module **ISO-Report** allows a fast and comprehensive documentation according to the ISO standard. The ISO-Report can be printed out. **ISO-Report** is only available in the SpectroDens Premium version.

The screenshot shows the 'ISO-Report' window in the TECHKON Spectro Connect software. The interface includes a sidebar with 'Samples' and 'References' tables, a 'Color books' panel, and a main workspace for the 'ISO-Report Diagram view'. The workspace displays a job name 'My Job' dated '4/18/2024'. It features a 'Paper type' section with parameters like d_1^* (1.06), d_2^* (1.13), and d_3^* (-1.63). Below this, there are color bars for CMYK and RGB with associated density and color difference values. A 'Color Library' panel on the right shows a list of color swatches, and a 'Color books' panel on the left shows the current color book 'HKS_K'. A green circle highlights the 'ISO-Report' icon in the bottom toolbar.

The screenshot shows the 'ISO-Report' window in the TECHKON Spectro Connect software. The interface includes a sidebar with 'Samples' and 'References' tables, a 'Color books' panel, and a main workspace for the 'ISO-Report Diagram view'. The workspace displays a job name 'My Job' dated '4/18/2024'. It features an 'L*a*b* Color circle' and four 'Dot gain' graphs. A 'Color Library' panel on the right shows a list of color swatches, and a 'Color books' panel on the left shows the current color book 'HKS_K'. A green circle highlights the 'ISO-Report' icon in the bottom toolbar.

3.13 Software module: Quick Check

The **Quick Check** software module is available as a chargeable add-on module for SpectroDens Premium. It is used for quick scanning comparison of color locations and tone value increases according to your own in-house standards.

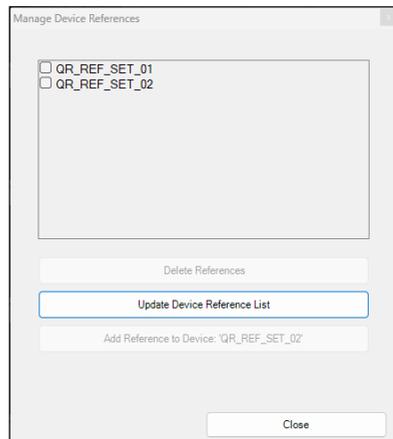


1. Selection of the control strip for spot or SCAN measurement.

2. Selection of the standard: The international standards according to ISO, PSO, G7 and IFRA are available; if you change the measured values according to your own specifications for colour locations or tonal values, this setting changes to User-defined.

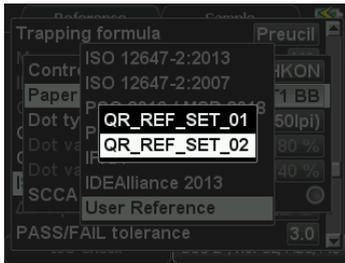
3. The reference must be saved as a file so that it can be used on the SpectroDens.

4. Management of the target value file:



The new reference file is only available after it has been transferred to the SpectroDens.

The references can be called up after transmission via the **ISO-Check** measurement function in the **ISO-Check setup** → **Paper type** → **User reference**:



If there is no data connection to the SpectroConnect software, the measurement data is recorded via the **ISO-Check** measurement function with activated data memory (2).

3.14 Software module: G7

The G7™ measurement function enables the calibration of prints and proofs according to the IDEAlliance (International Digital Enterprise Alliance) method and is available for SpectroDens Advanced and Premium.

The following control strips are required for the scanning evaluation: TECHKON Gray-Guide Checker, SpotOn! V1/V2, pressSIGN CMYK 4CX or PrintSpec.

The screenshot displays the G7 measurement configuration and results in the SpectroConnect software. The interface includes a 'G7' title bar, a 'Color bar' dropdown menu (labeled 1), a 'Paper' dropdown menu (labeled 4), and a 'Print' button. The 'Paper type' is set to 'CGATS21-2 CRPC' (labeled 2) and the 'Job' is 'G/18/2024' (labeled 3). The 'Results' section shows a table of colorimetric data for various color bars and paper types.

Color Bar	max	Tolerance	min	Tolerance
LEED	2.2	3.5	2.7	5.0
LEED	3.0	4.2	0.6	3.0
HLL CMY	1.1	1.5	1.3	3.0
WLCX CMY	1.0	1.5	1.4	3.0
HLL K	0.9	1.5	1.2	3.0

The 'Color Library' panel on the right shows a list of color bars and their status. The 'G7' icon in the bottom right corner is circled in green.

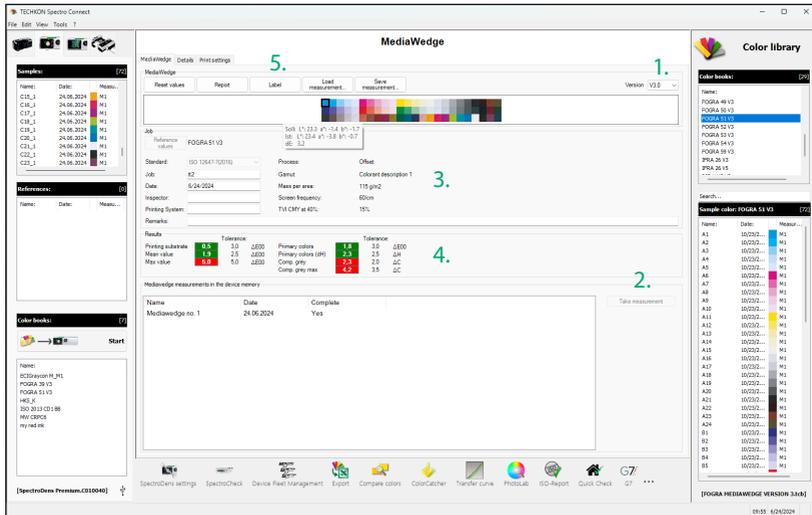
1. Selection of the control strip for single spot or SCAN measurement. The selection of the control strip is updated between SpectroDens and the software.
2. Selection of the paper type: The G7 standards CGATS21-2 CRPC, SWOP 2006, 2013 and XCMYK 2017 are available.
3. The job settings can be saved as a setup file and called up again.
4. A report print of the individual results is available.

3.15 Software module: Media Wedge

The program module **Media Wedge** serves the fast, colorimetric analysis of the Ugra / Fogra Media Wedge. This digital control element is available from Fogra, the German “Graphic Technology Research Association” (www.fogra.org). The test element is placed at the border of a proof. The software evaluates the color quality printed in colorimetric terms.

Color differences between the Fogra target values and the measured samples will be clearly represented in this program module.

The software module **Media Wedge** is only available in the SpectroDens Premium version.



1. Manual selection of the media wedge version. (You will find the version number on the printed test element.) The software supports the Ugra / Fogra Media Wedge in version 3.0 as well.

2. With SpectroDens Premium there is a media wedge feature within the device as well.

Measurements can be made remotely without a connection to the PC. When the device

gets connected later, the measured data will be uploaded.

3. Selection of reference values

4. Overview of measurement results

5. A short protocol can be printed with a Dymo label printer on a self-adhesive label which can be stuck on the proof. Alternatively a detailed report of the measurement values can be printed.

Media Wedge evaluation: Label and details

Mediawedge Analysis

Job:	Proof 01	Inspector:	Pure Digital X
Date:	08.04.2024	Proof printer:	
Remarks:			

	dE 00	Max. Tolerance	Remarks			
Print. Substr.:	1,3	3,0	OK	✓		
Mean:	2,0	2,5	OK	✓		
Max:	8,4	5,0	Not OK	✗		
Primary colors:	2,5	3,0	OK	✓		
Primary col. (dH):	3,1	2,5	Not OK	✗		
Comp. grey (dC):	2,5	2,0	Not OK	✗		
Comp. grey max (dC)	4,7	3,5	Not OK	✗		

Printing and measurement conditions:
 Offset printing, according to ISO 12647-2:2013, OFCOM, print substrate 1 = premium coated, fluorescence moderate (8-14 Deltab according to ISO 15397), 115 g/m², tone value increase curves A (CMYK)
 D50, 2 degree, geometry 45/0, no polarisation filter, white backing, according to ISO 13655:2009 M1

After the import of the media wedge a short protocol will be generated and can be printed on a self-adhesive label with a Dymo label printer.

The screenshot displays the 'MediaWedge' analysis results in the SpectroConnect software. The main window shows a table of colorimetric data for various color patches (A1 to A30) and a color calibration chart. The table includes columns for 'No.', 'Area*', 'Area**', 'Area**', 'Actual*%', 'Actual**%', 'dE00', 'dH', and 'Actual'. The color calibration chart shows a range of colors from black to white, with corresponding 'dE00' values. The interface also includes a sidebar with navigation options and a color library on the right.

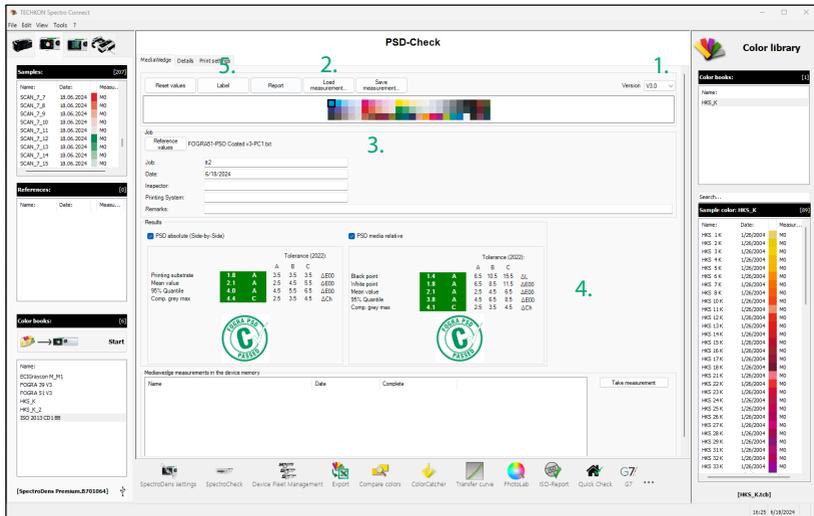
No.	Area* ¹	Area**	Area**	Actual* ¹	Actual** ²	dE00	dH ¹	Actual
A1	66,1	194,9	32,5	94,3	-33,1	-5,8	1,9	1,1
A2	66,6	194,9	39,8	63,7	-29,5	-8,8	2,4	0,1
A3	79,2	128,9	34,9	79,2	-12,3	-24,3	0,7	0,0
A4	81,2	5,6	-18,6	87,6	-4,8	-13,7	1,3	0,1
A5	91,2	-3,3	-39,9	91,2	-1,7	-8,8	1,1	0,1
A6	80,2	79,3	6,2	48,0	76,0	0,0	2,2	0,2
A7	80,4	12,7	6,2	62,1	48,7	-4,9	2,0	2,8
A8	70,4	28,1	6,2	73,2	25,1	-1,6	2,1	0,7
A9	85,2	14,7	4,2	86,4	11,8	-7,4	2,3	0,7
A10	90,1	8,2	7,6	90,6	6,3	-6,0	1,8	0,9
A7	88,3	-0,0	92,4	88,7	-4,8	90,4	0,8	0,9
A12	88,4	-4,2	61,3	90,0	-4,8	62,1	0,5	0,6
A13	60,3	-0,9	30,2	61,7	-1,4	30,1	0,5	0,5
A14	93,7	-1,2	11,9	93,2	-1,1	8,8	2,1	0,3
A15	99,4	-0,1	3,3	93,8	6,0	1,1	1,8	0,0
A16	89,8	1,2	-5,8	89,5	1,0	-5,5	0,8	0,1
A17	80,7	0,9	-6,4	84,1	0,9	-5,1	1,0	0,0
A18	69,8	0,5	-9,8	70,4	0,4	-4,3	0,7	0,0
A19	62,0	0,2	-3,9	64,6	0,2	-3,0	0,9	0,1
A20	37,5	-0,1	-2,5	36,5	0,2	-1,8	1,1	0,2
A21	18,6	0,1	-6,3	18,4	0,1	-6,7	1,7	0,1
A22	13,3	8,9	4,3	14,0	8,7	3,2	1,0	0,9
A23	10,1	20,0	20,0	20,0	22,8	20,4	0,2	1,4
A24	24,7	-3,4	21,3	24,2	-3,4	17,9	1,9	0,6
A25	21,1	29,7	-42,5	24,4	18,2	-44,2	1,0	1,4
B1	40,1	17,9	-38,5	40,1	15,2	-37,4	1,4	2,1
B2	15,4	62,2	-26,1	64,0	15,0	-24,2	1,7	0,6
B4	76,1	8,8	-17,1	80,8	5,3	-14,6	2,6	0,5
B5	86,5	4,1	-12,0	87,9	5,0	-10,2	1,8	0,5
B6	48,0	89,2	45,9	48,4	67,9	45,3	0,7	0,4
B7	58,4	46,3	36,8	60,1	46,8	23,9	1,0	1,2
B8	75,4	25,3	35,4	75,5	21,3	21,8	3,3	3,7
B9	84,0	8,3	8,3	85,9	8,6	4,2	2,9	0,2
B10	88,5	6,7	1,3	90,3	5,1	-0,4	2,3	1,6

The software supports the Ugra / Fogra Media Wedge in version 3.0 as well. The picture shows the section **Details**.

3.16 Software module: PSD-Check

The **PSD-Check** software module is available as a chargeable add-on module for SpectroDens Premium.

As with the Media Wedge check, the digital printing process is checked in accordance with the Fogra Process Standard for Digital Printing. The PSD Check is carried out with the SpectroConnect software in the **SCAN measurement** function. If there is no data connection to the SpectroConnect software, the measurement data is recorded via the Media Wedge measurement function with activated data memory (2.).



1. Manual selection of the media wedge version. All layouts of the Fogra Media Wedge CMYK V3.0 are supported.

2. Saved measurements from the Media Wedge measurement function of the SpectroDens can be transferred for the measured value display.

3. Selection of the reference conditions

4. Overview of the measurement result according to absolute (side-by-side) and media relative evaluation methods.

5. A short protocol can be output with a Dymo label printer, which is then stuck onto the proof.

Optionally, a detailed report of the measured values can be printed out, and the results can be printed out with a label and a complete report with a customised logo.

3.17 Software module: SpectroChart

The software module **SpectroChart** allows the fast and easy evaluation of test charts like for example ECI 2002, IT8.7/3, Fogra27L, Fogra39L and others.

Related target templates in .tgg-format are deposited in the folder **User → Public → Public Documents → TECHKON GmbH → TECHKON SpectroConnect**.

The measurement results are saved in ISO-format. This way they can be imported into common ICC profile generator software.

In the program section **Job** (1.) the job is specified. This is also where the target is selected, whose patch widths and the number of patches per line can also be defined (2.). When captured with SpectroDens, optical separator lines must be included to recognise the patches of the target. The respective final format of the target is calculated automatically and displayed to the user. Alternatively, the default settings of the respective target template can simply be adopted or a predefined paper format can be selected.

When the button **Create Tiff file** (3.) is used, the target can be saved as a tiff file on the PC, where you can initiate to get it printed. Additionally the “Job” section can be used to save the job and to start the export of the measurement values.

In the program section **Measurement** (4.) the current measurement result is displayed clearly. Furthermore here you can define and activate a ΔE value as tolerance.

The screenshot displays the SpectroChart software interface. The main window is titled "SpectroChart" and contains several sections:

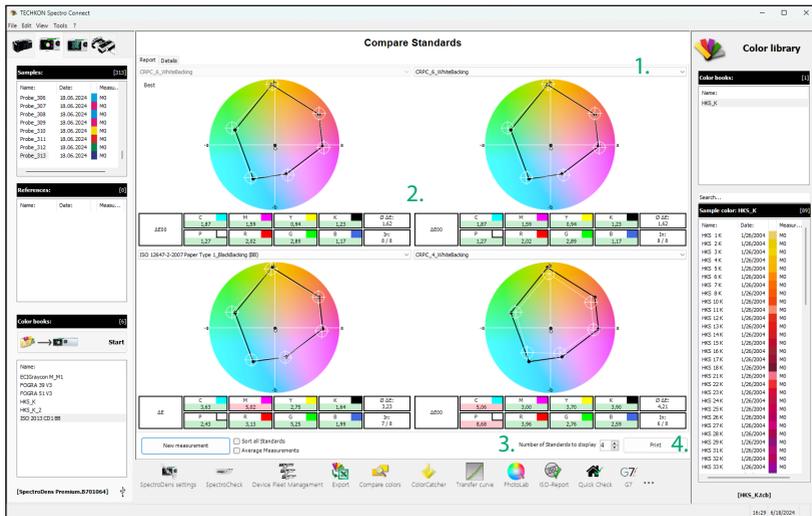
- Job Measurement (1. 4.):** A section for configuring the job. It includes fields for "Job:", "Name:", "Date:", and "Comment:". There are buttons for "New job", "Load job", and "Save job". A "Create Tiff file" button (3.) is also present. Below these fields, there are settings for "Patch width:", "Patches per row:", "Dimension (mm)", and "Separator Lines".
- Target Selection (2.):** A dropdown menu for selecting a target template, currently showing "CC-0000.tgg".
- Color Library:** A panel on the right side showing a list of color libraries. The "Sample color: HKS_K" is selected. Below this, there is a search bar and a table of color libraries with columns for "Name", "Date", and "Measure".
- Measurement Results:** A large central area displaying a color chart with various patches. The chart is labeled "1. 4." and "2.".
- References:** A table on the left side showing a list of references with columns for "Name", "Date", and "Measure".
- Color books:** A section on the left side showing a list of color books with columns for "Name" and "Measure".

The interface also includes a menu bar at the top with "File", "Edit", "View", and "Tools". At the bottom, there is a toolbar with various icons for "SpectroDens settings", "SpectroCheck", "Device Fw-Management", "Export", "Compare colors", "ColorCatcher", "Transfer Color", "PhotoLab", "ICC-Report", "Quick-Check", and "C7". The status bar at the bottom right shows the date "18.12. 16:32:04".

3.18 Software module: Compare Standards

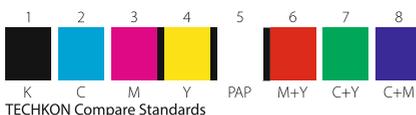
The Compare standards software module is available as a chargeable add-on module for SpectroDens Advanced and Premium.

This module makes it easy to determine which standard the print result matches from the CMYK colour set and substrate combination.



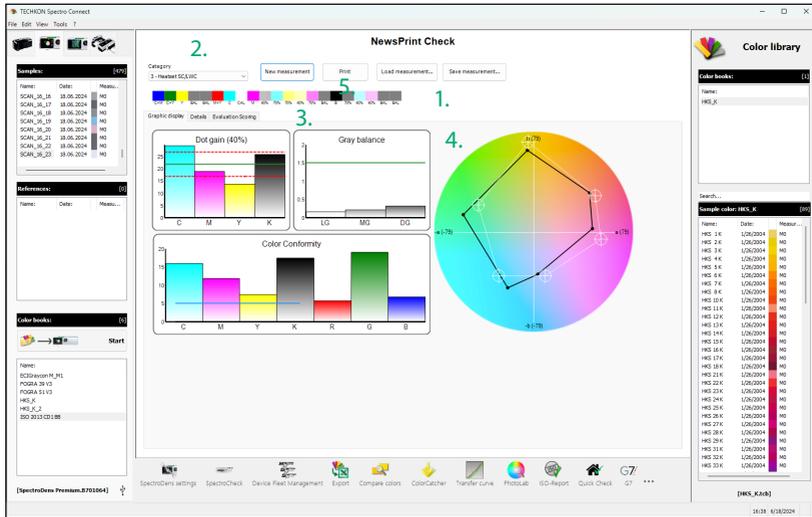
1. Selection of print standards
2. Detailed results for colour and substrate material
3. Selection for the number of standards to be compared (max. 8)
4. Report printout

The SpectroDens Premium can also be used to record measured values by scanning with the following control element:



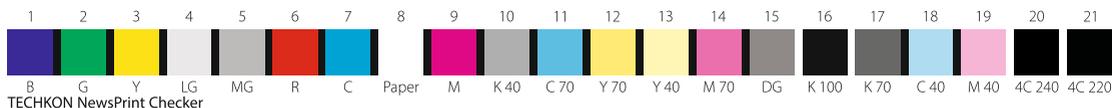
3.19 Software module: NewsPrint Check

The **NewsPrint Check** software module is available as an additional module for SpectroDens Advanced and Premium for a fee.



1. When the module is selected, SpectroDens switches to scan mode.
2. Selection of the category for single spot or SCAN measurement
3. Selection of the paper type: The G7 standards CGATS21-2 CRPC, SWOP 2006, 2013 and XCMYK 2017 are available.
4. The job settings can be saved as a setup file and called up again
5. A report printout of the individual results is available.

The SpectroDens Premium can also be used to record measured values by scanning with the following control element:



Appendix

Specifications

Measurement geometry	0°: 45° optics according to ISO 5-4
Spectral range	400 to 700 nm in 10 nm steps, spectral resolution 10 nm, pixel distance sensor < 3 nm
Measurement aperture	3 mm round standard; 1.5 mm round optional
Light source	LED, provides measurement conditions M0, M1, M2, M3 according to ISO 13655
Polarization filter	Twice linear crossed, switched on and off per button release
Measurement time	Approx. 1 sec. per measurement; max. 10 seconds in scan mode
White reference	Absolute and relative; absolute white standard integrated and protected in charging console
Illumination types	A, C, D50, D65, F 2/7/11
Standard observer	2°, 10°
Density filter	DIN 16536, DIN 16536 NB, ISO/ANSI T, ISO/ANSI I, ISO E; spectral density D _{max}
Density measurement range	0.00 – 2.50 D
Repeatability	0.01 D; 0.03 CIE $\Delta E^*a^*b^*$
Inter-instrument agreement	0.01 D; 0.3 CIE $\Delta E^*a^*b^*$
Display	Color LC backlight display, anti-reflective, 320 x 240 pixels
Power supply	Rechargeable LiFePO4 battery, regulated recharge via charging console with AC adapter, 100 – 240 V, 47 – 63 Hz, approx. 10000 measurements per battery charge, battery level control
Communication port	USB; WLAN module optional
Weight	495 grams
Dimensions	62 x 50 x 185 mm (approx. 2.4 x 2.0 x 7.3 inches)

System requirements for TECHKON software:

Windows 10 or 11; 32- and 64-bit, minimum: IBM-compatible PC with i5 processor or comparable processor, 4 GB RAM, 2 USB ports

Performance packages SpectroDens Basic, Advanced and Premium: see page 7

Accessories, spare parts and contents of delivery: see page 8

Manufacturer certificate

applicable for ISO 9000 documentation

Device: Spectro-Densitometer TECHKON SpectroDens

Serial Number:

Manufacturer: TECHKON GmbH • Wiesbadener Str. 27 • D-61462 Königstein
Telephone: +49 (0)6174 9244 50 • Telefax: +49 (0)6174 9244 99
info@techkon.com • www.techkon.com

Certification: The device is compliant with EU directive 2014/53/EU concerning the electromagnetic compatibility EMC and is provided with the CE label. The device is RoHS compliant (class 9). Japanese Radio Law and Japanese Telecommunications Business Law Compliance. This device is granted pursuant to the Japanese Radio Law (電波法) and the Japanese Telecommunications Business Law (電気通信事業法). This device should not be modified (otherwise the granted designation number will become invalid).

The device complies with the Japanese Type Approval:



Notice: The supplied AC adapter is according to regulations UL, IP 40, IEC 950 and VDE EN-EC10. The device is to be used only with the original TECHKON SpectroDens AC adapter.

Maintenance: The device is maintenance free. The measurement aperture has to be kept clean from dust. It can be cleaned with clean, compressed air and an optics brush.

We recommend a functionality check-up every 24 months at the TECHKON service center, which includes the issue of a new Manufacturer certificate.

Warranty: The warranty for TECHKON products is 24 months starting with the date of purchase. The warranty is invalid if the damage is caused by improper use of the device. Only original TECHKON spare parts and accessories are to be used.

Recycling: The device is according to §14 ElektroG registered under the EAP no.: DE 98280049. Devices for disposal can be sent directly to the manufacturer.

Calibration: The integrated spectral sensor is calibrated by a white calibration. After performing a white calibration with the supplied absolute white standard integrated in the charging console, the device is long term stable. We recommend to make a white calibration before every measurement series, to ensure the device is calibrated correctly.

The remission values documented on the back of the charging console are derived from a ceramic white standard, which is referenced to measurements taken and certified by the National Institute of Standard and Technology (NIST).

Standards: The calculation of colorimetric values is according to the formulas and tables of ISO 13655:2017 and publications of CIE.

The calculation of densitometric values is according to the formulas and tables of ISO 5-3.

ETSI EN301-489-1 EMC standard for radio equipment and services V2.1.1 (2017-02)

ETSI EN301-489-17 EMC standard for radio equipment: specific conditions for broadband data transmission systems V3.1.1 (2017-02)

ETSI EN 300 328 RF spectrum use V2.1.1/2016-11

Place

Date

Signature

D-61462 Königstein

EU-Konformitätserklärung
EC-Declaration of Conformity
Déclaration de Conformité de la CE
Dichiarazione di conformità CE

Hersteller: TECHKON GmbH
Manufacturer / constructeur / costruttore

Adresse: Wiesbadener Str. 27
Address / adresse / indirizzo

erklärt, dass die Produkte: D-61462 Königstein
Declares that the products / déclare, que le produits / si dichiara che il prodotto

Typ: SpectroDens
Type / tipo

Verwendungszweck: Farbmessungen
Intended use / utilisation prévue /
uso previsto Color measurements / mesure de la
couleur / misurazione del colore

bei bestimmungsgemäßer Anwendung den grundlegenden Anforderungen gemäß EU-Richtlinie 2004/108/EC entspricht und dass die folgenden Normen angewandt wurden:

complies with the essential requirements of the 2004/108/EC Directive, if used for its intended use and that the following standards has been applied: / répond aux exigences essentielles de l'article 3 de la directive 2004/108/EC, prévu qu'il soit utilisé selon sa destination, et qu'il répond aux standards suivants: / soddisfa tutti i requisiti della direttiva 2004/108/EC qualora venga utilizzato per l'uso previsto e che le seguenti norme siano applicate:

angewendete Norm: EN 55022:2006
Applied standard / standard appliqué /
norma applicata issue / édition pubblicato

Ausgabe: 2008-05
+A1: 2007

EN 55024
Ausgabe: 2003-01
1998+A1:2001+A2:2003

ETSI EN301-489-1 EMC standard for radio equipment and services V2.1.1 (2017-02)

ETSI EN301-489-17 EMC standard for radio equipment: specific conditions for
broadband data transmission systems V3.1.1 (2017-02)

ETSI EN 300 328 RF spectrum use V2.1.1/2016-11

UK Declaration of Conformity

We

Company name: TECHKON GmbH
Postal address: Wiesbadener Straße 27
City: Königstein
Postal code: D-61462
Country: Germany
Web site: www.techkon.com

Declare that this Declaration is issued under our sole responsibility and belongs to the following product:

Apparatus model/Product: Colour measurement device
Type: SpectroDens
Batch: --
Serial number: --

Object of the Declaration:

[Device for measuring colour and determining for instance printing quality.](#)

The object of the Declaration described above is in conformity with the following United Kingdom Regulations:

[RoHS directive \(Restriction of the use of hazardous substances\) SI 2012 No. 3032 as amended by SI 2020 No. 1647 SI 2021 No. 422 and SI 2019 No. 492](#)

[Radio Equipment Regulations 2017 \(SI 2017 No. 1206, as amended by SI 2019 No. 696\)](#)

The following designated standards have been applied:

EN 55032:2015/A11:2020	EN 55035:2017/A11:2020
EN 301 489-1 V1.9.2	EN 62479:2010
EN 300 328 V2.2.2	EN 62368-1:2014
EN IEC 63000:2018	

Signed for and on behalf of:

Königstein	22.12.2021	Albin Baranauskas, Managing Director
Place of issue	Date of issue	Name, function, signature

Please copy this registration card and send it by mail or via telefax to us. This way we can keep you informed in future about product news. You can send your registration information by E-mail as well.

TECHKON GmbH ■ Wiesbadener Str. 27 ■ D-61462 Königstein/Germany ■ Telefax: +49 (0)6174 9244 99 ■ E-mail: info@techkon.com



TECHKON Registration card

- Please send me information about the entire TECHKON product range
- Please put my E-mail address on the mailing list for the TECHKON-Newsletter

TECHKON GmbH
Wiesbadener Str 27
D-61462 Königstein

Via telefax to: +49 (0)6174 9244 99

Name: _____

Company: _____

Department / Job title: _____

Address: _____

City / ZIP-Code: _____

Country: _____

Telephone: _____

Telefax: _____

E-mail: _____

Your TECHKON-Dealer: _____

Device Serial number: _____
(Label on the bottom of the device)

Erfolg ist messbar

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