Sensegood Spectrophotometer

User's Manual

Version 1.0





www.sensegoodinstruments.com



Revision History

The following table shows the revision history for this document.

Date	Version	Revision
31/10/2019	1.0	Initial release.



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Caution: If the equipment is used in a manner not specified by the Sensegood, the overall safety may be impaired. The instrument is for indoor use only and not suitable for a wet location.

When reading a sample, the illumination flashes. Please avoid looking directly at the light. User's discretion is advised.



Safety Notes

For your safety when using the Sensegood spectrophotometer, you should pay attention to the following:

- General safety instruction that should be observed at all times while operating the instrument.
- Use of this equipment in a manner not specified by the manufacturer may impair the protection afforded by the equipment.
- Danger of electric shock if liquids are spilled and fire if volatile or flammable liquids are spilled. Use care when measuring liquid samples.
- Please take care to remove fingers, jewelry and clothing to prevent damage when sample platform is rotating.
- Sensegood spectrophotometer is for indoor use only at an altitude of up to 2000m and pollution degree 2.



Sensegood Spectrophotometer User's Manual

This document briefly covers the operational aspects of the Sensegood spectrophotometer.

To assemble the instrument, please refer to: Assembly and Quick start guide For instrument support and troubleshooting, please refer to: Troubleshooting guide For SensegoodSmart utility, please refer to utility user's manual.

Document repository: <u>https://sensegoodinstruments.com/support.php</u>





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Annotation – Instrument parts



The figure in the left represents the Sensegood spectrophotometer in benchtop configuration while in the right is backside view of the sensor head. The numberings mentioned represent corresponding parts as narrated below.

- 1. Sensor head
- 2. Color Touch TFT LCD
- 3. Stylus resting hole
- 4. Short pipe (12mm square/ 14mm round)
- 5. Long pipe (12mm square/ 14mm round)
- 6. Cross coupler
- 7. Shaft end coupler-1
- 8. Shaft end coupler-2

- 9. MicroUSB cutout
- 10. Rotating platform
- 11. Load bearings
- 12. Base motor assembly enclosure
- 13. Cutout for buzzer audio signals
- 14. ON/OFF switch
- 15. Motor socket
- 16. Sensor-illuminant protective projection





Annotation – On screen menus and functions

The LCD snapshot mentioned above represents the on screen menus of Sensegood spectrophotometer. The numberings mentioned represent corresponding screens or functions as narrated below.

- 1. Graph screen spectral representation
- 2. Table screen all color attributes
- 3. Match screen color difference
- 4. Indices screen color index library
- 5. Illuminant observer selection screen
- 6. Set any screen as default screen
- 7. Operational settings, help and more
- 8. Mute/ unmute buzzer
- 9. GO Press to measure
- 10. Enable/Disable auto repeat measurement
- 11. Enable/Disable averaging
- 12. Subscreen area to represent data/graph corresponding to the selected menu screen



Powering up the instrument

First assemble the instrument for desired configuration, refer to: Sensegood spectrophotometer assembly guide.

Available at: https://sensegoodinstruments.com/support.php

- If you are intended to use the rotating platform, plug-in the motor wire jack to the motor socket which is available at the back side of the sensor head.
- Now connect data cable to the provided microUSB slot. Provide the supply using 5V adapter or power bank or computer USB port.
- Turn on the instrument using ON/OFF switch. You should be able to see following boot screen with the instrument's serial number mentioned at the bottom.



Note: It is best not to touch the screen while the instrument is booting up. If you see other screen than similar to the one mentioned above, restart the instrument.



Measurement Functions

Measurement related functions:



GO: To start one time measurement

Auto measurement (left most icon): To enable or disable auto repeat measurement AVG: To enable or disable averaging

Further details:

- When averaging is enabled, AVG icon remains in green. It can be disabled by pressing it again.
- Averaging can be used in single measurement mode (GO) or in auto measurement mode.



- When averaging is activated and GO is pressed, the instrument takes multiple measurements. While in auto measurement with averaging mode, the instrument takes two consecutive measurements.
- When auto measurement icon is green, it indicates that the instrument is set for auto repeat measurement mode. The instrument waits for the next automatic measurement till the user set repeat interval (discussed further) and the icon remains green during this time.
- In auto measurement mode, instrument wakes up to take measurement at every repeat interval. While instrument measures and forms display, auto measurement icon remains in red. During this time the screen remains irresponsive to the touch.



• Once the auto measurement mode is enabled, instrument will start the measurement automatically and the user does not have to press GO. Auto measurement mode can be deactivated at any time by pressing the same icon when it is green.



Screen Navigations

Graph screen – Spectral representation:

- Following figure in the left shows the graph screen when the instrument is powered up and yet no measurement is taken.
- Graph screen is the representation of measured spectral components at each visible wavelength from 400nm 700nm at 1nm resolution.
- This screen also mentions the peak wavelength a wavelength where the highest magnitude in the spectrum is observed.
- Press any menu icon to exit and to enter new menu.





• Figure above in the right shows the measured spectral graph of a sample. Filled spectral color is abstract information and the correct numerical representation can be obtained from the color attributes presented in table screen which is discussed further.



Table screen – All color attributes:

- Table screen is the compilation of all color attributes in one screen.
- On the top of the table, it mentions the selected illuminant and observer. D65/10⁰ is the default selection.
- The instrument takes measurement and represents color data in XYZ, Yxy, CIE L*a*b*, CIE L*C*h⁰, CIE L*u*v*, Hunter Lab, RGB, rgb, CMYK, Hex color code, CCT (Correlated Color Temperature), and peak wavelength a wavelength where the highest magnitude in the spectrum is observed.
- Following figure in the left shows the table screen when the instrument is powered up and yet no measurement is taken. Figure in the right shows the measured color attributes of a sample.
- Press any menu icon to exit and to enter new menu.







Match screen:

• This screen represents the color difference or the amount of matching between two colors. One can be sample and the other can be reference. Following figure shows the match screen when the instrument is powered up and yet no measurement is taken.

	SETTINGS			
MATCH:	X D65/10 ⁰			
DE*:	DL*:			
Da [*] :	Db*:			
Alarm Limit:				
OI	85 % +			
Alarm if Match % i	s less than Limit %			
NEW REFERENCE	SAVE REFERENCE			
	MATCH INDICES			

- Reference can be the standard color and you want to achieve the same during the production. Reference can be provided by your customer, or you can set yourself. Sample is the unit taken from the production process.
- Process to be followed to find color difference:
 - First, instrument needs to measure the reference color. Take the product/ surface/ color/ sample/ substrate which you want to consider as a reference for measurement. Press "<u>NEW REFERENCE</u>". Instrument will measure the reference color and save the color attributes in its RAM.
 - Now consider a sample for measurement. Just press "GO" to check the amount of percentage match between reference and sample.
- If the reference is not available in instrument's RAM or memory and if "GO" is pressed, it will
 indicate the same by displaying the message: "Reference not available". First, you should
 consider measuring a reference by pressing "NEW REFERENCE".
- Note that the instrument has reference color data in its RAM and it will be lost upon next powering on.

Save reference in instrument's memory:

- If you intend to use the reference color data even after restart, you should save the same in the instrument's memory by pressing "SAVE REFERENCE".
- Once "SAVE REFERENCE" is pressed, it will ask for the confirmation: "Save reference to memory?". Press "YES" to save it to the memory. The instrument should display a message: "Reference and Alarm Limit saved."



- Now you can use the saved reference even after restarting the instrument. Navigating to match screen and just pressing "GO" will compare the sample under measurement with the saved reference in the memory.
- You can replace old reference in the memory by measuring "NEW REFERENCE" and using "SAVE REFERENCE".

Process picturization:

Please refer to below indicative illustration.



Result interpretation:

The sample is duller, greener and bluer than the reference. Color difference is 4.67 units. Color matching percentage is 95%.

Understand following scenario:

Instrument will consider the saved reference (call it Reference-A) available in its memory upon power on. If "<u>NEW REFERENCE</u>" is pressed, instrument will measure a new reference and keep it in its RAM (call it Reference-B). Instrument will temporarily override the Reference-A and will now consider Reference-B till instrument restart. Upon next restart, as instrument's RAM data will be erased, now Reference-A will be effective.

Save reference to the computer:

At a time, only one reference will be effective in the instrument for color difference and matching analysis. However, using the SensegoodSmart computer interface utility, one can store ideally any number of references in the computer. Also any reference available in the computer can be downloaded to the instrument for color comparison. This helps users when they deal with multiple products in different colors.

Process:

Once the reference is measured by the instrument, you must take at least one measurement so that the SensegoodSmart utility can fetch the measurement data from the instrument automatically. After the measurement data reflects in the utility, user can export the same to .sego file using the utility. This exported .sego file contains reference color information along with the Alarm Limit/ color tolerance (discussed further).

Receive reference from the computer:

A user can have any number of reference files stored in the computer, specific to different projects or specific to the customers. User can select and import the desired reference file from computer to the SensegoodSmart utility. The imported file has the reference color information and the allowed tolerance – Alarm Limit. Now press "Send Reference to Device" in the utility to send the reference data to the Sensegood Spectrophotometer.



Acknowledgement:

Once the reference is sent successfully, the instrument should display a message: "Reference saved to the memory."

Now the instrument is ready to measure the samples and evaluate the amount of percentage match considering set Alarm Limit, by comparing the sample with the downloaded reference. This downloaded reference in the device remains saved in its memory until either new reference is saved using "SAVE REFERENCE" in the instrument or new reference is downloaded to the instrument using the utility.

Alarm Limit/ color tolerance

- Using Sensegood spectrophotometer, you can ensure consistency and accuracy throughout your quality process by establishing color tolerances. A color tolerance is the acceptable difference in color between a sample and the standard reference.
- Color tolerance or Alarm Limit can be adjusted by user by pressing "+" and "-" icons. "SAVE REFERENCE" procedure also saves Alarm Limit in instrument's memory along with the reference color information.
- Sensegood spectrophotometer compares color of sample with saved standard reference and gives match value in percentage. If matching is poor; below set Alarm Limit, it provides audible alarm (playing buzzer) and display indication on LCD to alert operator. Hence operator can quickly react and take appropriate action.
- Buzzer plays for few seconds after every measurement if Match% is less than the set Alarm Limit.
- Match screen represents: Match%, color distance ΔE*, ΔL*, Δa*, Δb*, and user set Alarm Limit. It also indicates whether the sample is Lighter/Duller, Redder/Greener, and Yellower/Bluer than the reference.

L* is an indication of light:

If ΔL^* is positive value, sample is brighter than the reference If ΔL^* is negative value, sample is duller than the reference

a* corresponds to red-green:

If Δa^* is positive value, sample is redder than the reference

If Δa^* is negative value, sample is greener than the reference

b* corresponds to yellow-blue:

If Δb^* is positive value, sample is yellower than the reference If Δb^* is negative value, sample is bluer than the reference

Please refer to the figure below.





 It displays Match% in green (Pass indication) if it is greater than the set Alarm Limit – refer to below figure in the left. Same way, it displays Match% in red (Fail indication) if it is less than the set Alarm Limit – refer to below figure in the right.



- It always evaluates considering D65/10⁰ setting to maintain the consistency in color comparison.
- Press any menu icon to exit match screen and enter the new menu.



Indices screen:

 Sensegood spectrophotometer firmware is equipped with various color indices: Whiteness index CIE, Whiteness index Hunter, Whiteness index Stensby, Whiteness index all (CIE, Hunter, and Stensby), Yellowness index (YI), Baking contrast unit (BCU), Tomato color index (TCI), Ripening index a*/b* and b*/a*, Citrus color index (CCI), Citrus number (CN), Citrus red index (CR), SCAA Agtron number





- Selecting the "INDICES" menu opens up the list of color indices which can be navigated by "NEXT" and "PREV" icons.
- The index which was used last time is highlighted in green. Pressing any index enters the index screen specific to the selected index.
- Once in desired index screen, user can press "GO". The instrument will take the measurement, calculate the corresponding index and display the values accordingly.
- The figure below shows the example of "SCAA_Agtron_Coffee" (Agtron number).





- Note that the instrument automatically selects the illuminant and observer (discussed further) based on which the index algorithm is defined. For example, for citrus color index, illuminant-observer combination is C/2⁰.
- Press any menu icon to exit indices screen and enter to new menu.



Illuminant and Observer selection screen:

- User can select any combination of illuminant and observer. After measurement, instrument will do calculations and it will present the color data accordingly.
- Available simulated illuminants: A, C, D65, D50, D55, D75
- Available simulated observers: 2⁰, 10⁰
- The selected illuminant-observer pair will be highlighted with green in this screen. It can also be seen in the table screen.
- The default selection is $D65/10^{\circ}$.
- Press any menu icon to exit this screen and enter to new menu.





Default screen (function):

- When instrument is powered on, it displays default screen.
- Default screen can be: graph screen, table screen, match screen, or any index screen. Out of these, user can set any screen as a default screen.
- Setting any screen as default screen: First, user has to open the desired screen. Then just press "DEFAULT SCREEN" icon to make that screen as a power on default.
- Set default screen is indicated by a yellow circle at the corner of the respective icon. Following figure shows that graph screen is set as a default screen.



• This feature provides ease to users by eliminating to navigate to the required screen every time when the instrument is powered on.



Settings Menu

Settings:

- These screens have options for instrument specific operational settings. Figure mentioned below shows the typical settings screens.
- User can enter any settings by pressing any of the options except Motor and Buzzer related settings.
- Pressing "EXIT" brings user to previously opened screen.







Target Distance settings:

- Target distance is the distance between sample surface and the instrument.
- Following figure shows the target distance selection screen. User can adjust the target distance from 0 cm to 6 cm by pressing "+" and "-" icons.



- User can select the desired distance according to the application, and keep the same distance physically between the sample surface and the instrument.
- Example 1: Handheld operations contact type measurements: For direct sample contact measurements, the physical distance between sensor and sample surface is 0 cm. Hence, adjust the target distance to 0 cm in instrument settings before doing measurements.
- Example 2: Benchtop configuration non contact type: Suggested physical distance 1 or 2 cm for accurate measurements. Adjust the same target distance in the settings before doing measurements.
- Example 3: If user is desired to use the instrument for color difference measurements, physical distance can be anywhere from 0cm to 6cm. User need to set the same target distance in instrument settings accordingly.

Additional points:

Note that the target distance is measured excluding the instrument projection (Annotation 16: Sensor-illuminant protective projection which is of 1cm height). Refer to the following figure.





- Target distance is considered from the sample's surface and not from the sample tray.
- Keep target distance consistent: As the target distance varies, the color seen by the sensor varies because of certain parameters such as the interference of external light sources. Hence, it is recommended that you keep the consistent configuration of physical and set target distance throughout your all measurements.
- Field of view: Sensor can measure the color of any surface which lies in its field of view. In Sensegood spectrophotometer, field of view is the area where the light focuses on. Make sure that the light completely falls on the sample surface and not outside of it. As the target distance increases, the field of view increases, so select the distance accordingly considering field of view. Refer to the following figure.



- For absolute color measurement, recommended target distance can be within 0-2 cm range. For color difference measurements, it can be within 0-6cm range.
- Lower target distance is desirable to reduce errors due to stray light.



Motor settings:

- Motor can be used in benchtop configuration only. If you do not intend to use the motor then use this setting to disable it. Also electrically disconnect the motor by removing the motor wire jack from the socket.
- The selection is stored in instrument's memory and remains unchanged even after restart, until it is changed by user.
- After pressing "GO" and before measurement starts, motor stabilization delay of 3 seconds gets added if the motor is enabled from the settings.

Turn ON Motor: Currently motor is disabled, press to enable

Turn OFF Motor: Currently motor is enabled, press to disable





Buzzer settings:

- Buzzer and other instrument sounds can be enabled or disabled using this setting.
- The selection is stored in instrument's memory and remains unchanged even after restart, until it is changed by user.

Turn ON Buzzer: Currently buzzer is disabled, press to enable

Turn OFF Buzzer: Currently buzzer is enabled, press to disable



• If buzzer is disabled using this setting, you can see buzzer icon (Annotation 8: Mute/ unmute buzzer) turning red as shown below.



• Without navigating to the buzzer setting, user can temporarily enable or disable the buzzer just by pressing the buzzer icon (Annotation 8: Mute/ unmute buzzer). Instrument will not store this in its memory and the buzzer will get enabled on next restart.





Repeat Interval selection:

- Instrument takes measurement at every repeat interval when auto measurement mode is enabled.
- Repeat interval can be 30, 60 or 120 seconds, and can be selected by the user.
- The selected repeat interval is highlighted in green. 30 seconds is the default setting.
- Pressing on any of the tabs will select that specific interval and it will get back to the main settings screen.
- The selection is stored in instrument's memory and remains unchanged even after restart, until it is changed by user.





Start Delay:

- When "GO" is pressed, instrument takes measurement after start delay has passed.
- User can set start delay within the range of 0 60 seconds.
- This feature is particularly helpful in handheld measurements where it is comfortable to take measurement sometimes after "GO" is pressed.
- Start delay is not effective in auto measurement mode
- Apart from this, motor stabilization delay of 3 seconds gets added if the motor is enabled from the settings.
- The selection is stored in instrument's memory and remains unchanged even after restart, until it is changed by user.





Help

- Help screen can be opened from the settings. Figure below shows the help screen.
- This screen provides the procedure to "SELF TEST" and software "FACTORY RESET".

Facing Problem?		
1. Please visit support page at: www.sensegoodinstruments.com		
2. Watch youtube videos: -Sensegood Spectrophotometer-		
3. Restore factory software. Press: FACTORY RESET		
4. Extreme case: Apply hardware reset. Refer to the manual for details.		
5. If the problem still persists, contact us.		
EXIT		

Self test:

- At any point of time you can test your instrument for its functionality.
- This test includes LED tests for its brightness, buzzer test, motor test, and computer interface software compatibility test.
- Before initiating the self test, power the instrument by connecting it with the computer to perform all the tests. If the instrument is not connected to the computer, still you can perform all the tests except the computer interface software compatibility test.
- Just press "SELF TEST", and a new screen will show up mentioning "1. Dim LED test". Check and verify the dim LED light and press anywhere on the blue portion of the screen for the next test.
- Next it will show "2. Bright LED test". Check and verify the bright LED light and press anywhere on the blue portion of the screen for the next test.
- Next it will show "3. Buzzer test". Verify that the buzzer beeps and press anywhere on the blue portion of the screen for the next test. In this test buzzer will always beep irrespective of if the buzzer is enabled or disabled in the setting.
- Next it will show "4. Motor test". Check and verify if the motor is working and press anywhere on the blue portion of the screen for the next test. In this test motor will always rotate irrespective of if the motor is enabled or disabled in the setting.





• Next it will show "5. Software test". Now take any sample having single uniform color. Now in the computer which is connected to the instrument, open the SensegoodSmart utility and open the communication port. Now place the considered sample in direct contact with the instrument for contact measurement. Now, press anywhere on the blue portion of the screen in the instrument. It will take the measurement of the considered sample and display the spectral graph on the instrument's screen. You should be able to see the peak in the region of wavelengths where the sample's color lies. Verify that the same spectral graph shown in the instrument is reflected in the SensegoodSmart utility. Now the instrument's screen will look like below.





• If all the tests are verified, instrument's health is ok. This completes the self test procedure. You should restart the instrument.

Factory Reset:

- Pressing "FACTORY RESET" initiates software factory reset.
- This will erase all user settings and reset the instrument to the factory settings. However, this will not affect the instrument's factory calibration; it will still remain even after reset.
- Along with the software factory reset, instrument also supports hardware reset for extreme cases. Please refer to the troubleshooting manual before you initiate reset.
- Once pressed, it will display the confirmation screen as shown below. Press "YES" to reset.
- Upon successful reset, you will see a message being displayed prompting restart. Now you will require restarting the instrument.







Adjust Offset

- User can provide adjustments using this feature. Default offset is 0.
- All color attributes are recalculated based on the offsets provided in this screen.
- Applied offsets also affect the color index results. E.g., reducing CIE b reduces the yellow component and hence also reduces the value of yellowness index further increasing the value of whiteness index (as yellowness decreases, whiteness increases).





Sample holder selection and sample preparation guidelines

- Sensegood spectrophotometer empowers your ergonomics to use any sample holder of your choice such as; tray, bowl or jar depending on the type of your sample and application.
- You can put any solid, liquid, powder or paste in the sample holder and do the analysis.
- Color of the sample holder should be white, black or transparent.
- Sample holder in neutral white color is the most recommended, as it can give comparatively good response even for semi-transparent liquid and paste samples.
- Holder/tray size should be enough to provide the adequate area to the sample to satisfy fieldof-view criteria. So that the sensor's light does not fall outside.
- Sample placed in the tray/holder should be uniform in height. Just make a quick level using your hand and you are ready to measure. You can consider giving a quick compress to the powdery samples to maintain the consistency of measurement process.
- Samples that aren't opaque need to be folded, wound, or stacked depending upon the material so measurements aren't affected by background colors showing through.
- Samples with directional orientations such as textile samples; must be carefully measured to avoid errors. Consider situating the samples in the same orientation and take measurements. Even taking multiple measurements in averaging mode should be considered.
- Samples with irregular colors need to be measured multiple times. Move and mix the sample between each measurement and average the data.
- For accuracy, maintain the consistency of the sample being filled in the tray. i.e., amount of sample (certain amount will achieve specific height in the tray which will affect the target distance) and arrangement/placement of sample (e.g., cookies).
- For online/in-process measurements, consider installing the sensor where the sample flows more uniformly i.e. sample height roughly remains the same.



Suggested settings in various configurations and applications

Portable/ Handheld use:

- Only sensor head is used.
- No motor electrical connection, Motor is disabled in settings.
- Typically averaging and auto measurement is not used.
- Target distance is set to 0 cm.
- Contact measurements are performed.
- User can set desired start delay.
- One can use portable power bank (not provided) along with the sensor head.
- User may set color tolerance and check for the match percentage.
- User can have long pipe attached to sensor for extended reach.
- Below figure illustrates the configuration.



Benchtop/table-top use:

- Motor is electrically connected and also it is enabled in settings.
- Typically averaging is on.
- Target distance is physically determined and the same distance is set in the settings.
- For absolute color measurement, target distance can be 1 or 2 cm, for color difference measurement it can be within 1 cm to 6 cm range.
- Noncontact measurements are performed as typically sample platform is rotating.
- User can introduce start delay if required. However typically it is 0 seconds.
- Averaging is kept typically on.
- Auto measurement is typically disabled. However if you are using this instrument in continuous production sample tests you can consider enabling auto measurement mode with desired repeat interval of 30, 60 or 120 seconds.
- User may set color tolerance and check for the match percentage.
- Below figure illustrates the configuration.





Online/in-process use:

- Only sensor head with pipe attachments is used.
- No motor electrical connection, Motor is disabled in settings.
- Averaging can be typically off.
- Auto measurement mode is enabled with desired repeat interval of 30, 60 or 120 seconds.
- Target distance can be within 1cm to 6cm range.
- Start delay is not effective in auto measurement mode, so it is kept 0 seconds.
- Typical LCD view is match screen. For the same, user need to take reference color measurement, set color tolerance/ Alarm Limit and check for the match percentage.
- Below figure illustrates the configuration.





Your First Measurement

- Assemble the instrument according to the type of your application. Give power supply using the 5V adapter or power bank or by connecting it to computer USB port.
- Carry out the settings discussed above as per your configuration.
- Keep the sample ready as discussed in sample preparation section.
- You may just press "GO" to check how light is falling on the sample. Light should not fall outside the sample surface, adjust the distance accordingly.
- Determine desirable physical target distance and set the same in the settings.
- Open the screen you want to see; graph, table, etc. Just press "GO" to measure the color of your sample.
- Now for the same target distance, you can measure all of your samples just by pressing "GO".
- Note: In case if you see a message: "INVALID! Move sensor head upwards" when "GO" is pressed, do following:
 - 1. Verify if the target distance set in settings is the same as the physical target distance.
 - 2. If above point is verified then move sensor head upwards (increase target distance) physically in 0.5 cm steps till the message stops coming after pressing "GO". In this procedure, don't change the target distance in settings, just increase the physical sample-to-sensor distance.



Automated Measurement

The Sensegood Spectrophotometer supports automated measurements without human intervention.

To use this feature, put the instrument in auto measurement mode. User can select the desired auto repeat measurement interval. The instrument will automatically wake up at set intervals and it will take measurements. On the other hand once the SensegoodSmart utility is initialized, it does fully automated operation, it automatically detects the new measurement data, no commands/ no buttons to be clicked for fetching the data from the instrument.

This feature is particularly helpful in online/in-process continuous automated measurements. Manufacturer or quality supervisor can set tolerance by setting Alarm Limit in match screen. Instrument will automatically wake up, measure and compare the color attributes with desired reference against the set tolerance and represent the color difference as a single number representation – as match percentage. If it is less than the set threshold, the same will be reflected in the utility by indicating match percentage in red (Fail). If it is within specified tolerance limit, the value will be shown in green (Pass). This color code for Pass/Fail makes easy for production-line-operator to take decision whether to accept, reject or reprocess the sample.



About LCD



- Instrument has 69mm color touch TFT.
- Its resistive touch works with gentle pressure at specific location.
- For smooth functioning of the LCD, user must use provided stylus.
- For touch robustness, icons are configured to work with press and hold.
- Press and hold till you hear a beep or the desired screen shows up. However you won't hear touch sounds if buzzer is muted.



Computer Interface

1. Open SensegoodSmart utility using the desktop shortcut as shown below. Alternatively you can open it by navigating through Windows® Start menu.



2. Select the Port using drop-down menu as shown below. Then press "Open/Close" button once to open the selected port. The color will change to gray indicating the selected port is now configured and open to communicate with the instrument.

Select Port :	Select Port :
COM5 ~	COM5
COM5	
Open/Close	Open/Close

3. Take a measurement using Sensegood Spectrophotometer. Once the instrument's screen is updated with the measurement data, the same should be automatically reflected to the SensegoodSmart screen. For more details refer to the utility user's manual.



Global Color Management

SensegoodSmart utility lets you to convey numeric color data across all production plants that may be located at multiple places across the globe. Central plant generates .sego file considering the desired reference and allowed tolerance. It further shares the same file with different production plants. Each production plant downloads received .sego file using "Send Reference to Device" to the Sensegood spectrophotometer to compare color attributes of the product manufactured in their plant with the numerical color information received from central plant or management. This enables them to reproduce each product consistently across all the plants.



SensegoodSmart utility. Machine compares locally manufactured product's color with the received reference color data and gives the amount of match in percentage. Machine warns by alarm and also by display indications, if Match % is below the color tolerance allowed by central plant/HQ. Machine indicates if the local product is brighter/duller, redder/greener, yellower/bluer than the standard reference. Eventually, this ensures that all the products manufactured in all plants across the globe will remain within allowed color tolerance set by central plant/HQ.

There is no restriction on number of machines. This way, one central plant can handle any number of plants. Sensegood spectrophotometer along with SensegoodSmart utility is a complete global color management solution that you could ask for.



This feature is helpful in any industry having operations at multiple locations and the color quality of the product is to be maintained throughout the supply chain (e.g., paper, plastic and packaging industry) and also where the product is built by assembling the parts from different suppliers (e.g., automobile industry). In automated measurement, further one can also use remote desktop application like AnyDesk to remotely check the real time measurement status and product's color consistency.

Refer to SensegoodSmart Utility User's Manual for more details.



Each supplier plant transfers received reference color data to the local Sensegood Spectrophotometer using SensegoodSmart utility. Machine compares locally manufactured product's color with the received reference color data and gives the amount of match in percentage. Machine warns by alarm and also by display indications, if Match % is below the color tolerance allowed by central plant/HQ. Machine indicates if the local product is brighter/duller, redder/greener, yellower/bluer than the standard reference. Eventually, this ensures that all the suppliers supply products manufactured in their plants across the globe that remain within the allowed color tolerance set by manufacturer/HQ/central plant.

There is no restriction on number of machines. This way, one central plant can handle any number of suppliers. Sensegood spectrophotometer along with SensegoodSmart utility is a complete global color management solution that you could ask for.



Find Commercial Colors

This section explains how to find a closest commercial color to that of a color measured of a sample.

Measured color attributes are represented as numerical values in Table screen. Sensegood Spectrophotometer follows Commission Internationale de l'éclairage (International Commission on Illumination) CIE1931, CIE1964 and CIE1976. Hence generated numerical values are in compatible standard color space coordinate format and the values can be fitted in any third party tool which follows CIE.

For an example, one such tool is available at <u>https://www.easyrgb.com/en/match.php#inputFORM</u>. Select appropriate data type and provide numerical color data measured by the instrument and press MATCH to find out available closest commercial colors.



Recommended Practices

- For liquid, pastes and powders it is intuitive to not to use 0 cm target distance (contact measurement).
- Place instrument on a leveled surface in case of benchtop operation.
- In case of online measurement, mount the sensor on non vibrating surface.
- Reduce any external light falling on to the sample.
- Turn on/off the mains supply when not in use.
- Disconnect with the computer when not in use.
- Use the provided adapter or any good quality +5V 1–2Amp adapter only.
- In settings: Turn off the motor if you haven't connected the motor electrically or you are not intending to use it.
- Attach motor wire jack to socket only when the instrument is powered off.
- It is good practice to tie the data cable and motor cable with the stand pipes using cable ties to avoid cable movements.
- Use stylus for touch screen. Press gently.
- It is best not to touch the screen while the instrument is booting up. If you see other screen than similar to the one mentioned above, restart the instrument.
- Refer to the troubleshooting manual before applying reset.

Additional recommendations:

- Maintain consistent environmental conditions
- Temperature: The spectrophotometer should be operated in a temperature-controlled environment based on your specific application and guidelines. If your samples are affected by temperature, we recommend using a conditioning chamber to control this.
- Humidity: As with temperature, it's recommended to have humidity within tolerance. You should also operate your spectrophotometer in a clean environment where the air is free from chemicals, including smoke.



Maintenance and Safety Guidelines

Sensegood spectrophotometer is engineered to be virtually maintenance free. However, this section outlines the few parts of the sensor that are to be maintained for the instrument to function properly.

Cleaning:

- Keep instrument off while cleaning it.
- Use clean cloth to wipe of any dust deposit on the LCD.
- The instrument is NOT waterproof, but the exterior may be wiped with a damp cloth.
- Gently clean LEDs and sensor filter glass with industry grade isopropyl alcohol using cotton swab. Make sure that no stain remains otherwise it will hamper the instrument's measurement performance.
- Blow dry or allow it to dry thoroughly.
- In case of liquid spillage in the motor compartment, immediately turn off power from mains supply and clean it from going into the motor shaft. If it is connected to the computer, immediately disconnect or else possible short circuit may damage the computer. Keep the instrument off or keep motor disconnected until it gets thoroughly dried.

Safety:

- Do not view the instrument LED's directly as it may be damaging to the eyes.
- Do not submerge the instrument in water.
- Do not take the instrument apart as the instrument does not include any user repairable parts.
- Do not disassemble the instrument and attempt to clean the optical components.
- Do not open the instrument or remove any covers except using the instructions given in this User's Manual or under the direction of Sensegood technical support.
- If you face any problem please refer to the troubleshooting manual.



Instrument Repair, Problems, and Questions

The following Sensegood policies are described in this chapter:

- Warranty
- Shipping related
- Packing and shipping for repairs
- Technical assistance

Warranty:

Sensegood instruments are rugged in general and their operation is celebrated in the field. However, Sensegood warrants that all instruments it manufactures are free from defects in material and workmanship under normal use. This warranty is limited to repairing any defective hardware or software that may cause the instrument to perform outside of its extreme tolerances. This warranty is six months from the date of manufacturing of new instruments.

The warranty is void if the user has made unauthorized repairs, improperly installation, operated, or subjected the instrument to conditions outside of the operating conditions that may be specified in the product documentation. The Sensegood warranty does not cover consumable items such as led s, sensor, fuses, controller and other integrated circuits, etc. Motor and circuit damages due to motor overload, liquid spill over in motor, and other improper operations are not covered under warranty. Scratches on display, breaks or any other damages related to display are not covered under warranty. Instrument mishandling, improper use, unauthorized access to internal circuits, components, parts, un-thoughtful resets, and damages due to supply voltage problems, such as fluctuations, surges, over voltage, over current are not covered under warranty. Customer will have to bear to and fro freight charges for repair or service and any additional charges if any parts or components needed to be replaced including warranty repairs. Instrument's purchase will be considered non cancellable non returnable. Applicable jurisdiction is Himatnagar, Gujarat.

Questions concerning operation, maintenance, or repair of your equipment can be directed to the Sensegood support. Additional information can be obtained at www.sensegoodinstruments.com.



Shipping related:

All materials are sold in any shipping terms, from Sensegood, responsibility ends upon delivery to the first carrier. All claims for loss or damage must be rendered by the consignee against the carrier. A copy of this notice must also be forwarded to Sensegood within five days.

Do not return any damaged or incorrect items until all instructions are received from the Sensegood.

Sensegood offers complete repair services for all instruments it manufactures. If your equipment is not functioning properly, contact Sensegood support for maintenance or repair instructions. Many times, on-the-phone diagnosis is all that is required.

If repair is required, the instrument may be returned to a Sensegood service facility. For schedule and terms for repairs, contact Sensegood support. Please read the next section, "When You Need Assistance," prior to contacting Sensegood.

Customers are responsible for incoming and outgoing freight charges for instrument returned to Sensegood for all calibrations, repairs, including warranty or privileged warranty repairs.

Packing and Shipping Instruments for Repair

Please regard the following instructions when packing your instrument to return it to Sensegood for repair. Please save the original packing to use if needed. These instructions do not replace the recommended professional packaging for your instrument, but may assist in eliminating the need for a shipment claim due to faulty packaging. Purchasing freight insurance does not guarantee a successful damaged shipment claim if the carrier determines the instrument was not packaged properly.

- Cover the display and measurement area with density foam. Do not use the duct tape. Painter's tape is preferred if required, as it will not leave residue on the instrument.
- Enclose a photocopy of the invoice.
- Provide an itemized packing list of all contents of the shipment.
- Insure the shipment.

When you need assistance

When you have a problem with an instrument or software, or need technical advice concerning a specific application, contact us or visit the Sensegood support webpage. If you need to contact Sensegood for assistance, please have the following information available:

- The instrument for which you need assistance (Spectrophotometer)
- The serial number of the instrument (mentioned at the instrument's boot screen)
- If software related query then: computer configuration the type of processor, operating system and version that you are using, and the brand, if applicable.
- The specific nature of the problem, including the precise description.
- The steps performed prior to the start of the problem.
- Steps already performed to reconcile the problem and/or results of any diagnostic tests.
- The type of product being measured.
- Environmental conditions under which the instrument is normally used (temperature, humidity, dust, fumes, etc.)



E-waste Disposal Guidelines

We firmly believe in green global foot print. We use recyclable plastic and packaging material. The instrument does not contain battery. Please consider following disposal guidelines:

- Do not throw electronics in bins having "Do not Dispose" sign.
- Do not dismantle your electronic Products on your own.
- Do not give e-waste to informal and unorganized sectors like Local Scrap Dealer/ Rag Pickers.
- Do not dispose your product in garbage bins along with municipal waste that ultimately reaches landfills.

Recommended:

Give your electronic waste to a certified e-waste recycler:

Ensure that only Authorized Recyclers/Dismantler handle your electronic products. Recycling companies are dedicated to recycling e-waste in a safe and responsible way.

Sell off:

One man's junk is another man's treasure as the old saying goes. This can be applied to helping you get rid of your old electronics. You can tap into online sites or even resort to having a garage sale as this will help you get rid of your outdated electronics as well as earning some money.

Donate:

Instruments in working conditions can be donated as they may be useful to students, universities, researchers, laboratories, and also to industries. A lot of organizations and businesses offer electronic donation programs which you can choose from.

Visit civic institutions:

Enquire amongst your government, universities, and schools for any recycling programs they run as a lot of organizations have started assigning a certain day and place for environmentally conscious citizens to come and drop off their e-waste.



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