photoLab® color

COLOR MEASUREMENT WITH PHOTOLAB 7x00 AND CONNECTION TO PC

WTW

a **xylem** brand

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photoLab® color - Contents

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1   Overview

Functions   The program photoLab® color is used for color measurement with a photometer of the photoLab 7x00 series and a PC connected to it. The photometer is controlled by the program photoLab® color . The calculation is based on the spectra measured by the photometer.

The program photoLab® color has the following features:

● Color measurement with the following photometers:
photoLab 7100® VIS
photoLab 7600® UV-VIS

● Displaying the measured values of all color measurements on the PC

● Exporting the measured values of all color measurements in CSV data format

● Printing the measured values of all color measurements

Methods   Color is an important quality criterion. Therefore, color measurement is often subject to standards, industry requirements or internal regulations, especially in production, or is used for the evaluation of raw materials. For this the program photoLab® color provides the following methods:

● Color CIE 15:2004
Color spaces: CIE color measurement of tristimulus values XYZ, primary color components x,y,z, CIE-L*a*b and CIE-L*u*v according to CIE 15:2004 3rd Edition. No standardization; cells to be used: 10 mm, 20 mm, 50 mm and round cells

● ADMI
ADMI color index, according to APHA 2120F (ADMI Weighted-Ordinate Spectrophotometric Method). The platinum cobalt standard of the American Public Health Association (APHA) was taken over from the American Dye Manufacturers Institute (ADMI).
The ADMI color index is used for the measurement of wastewater and water whose color strength is similar to that of the platinum cobalt color scale but whose shade of color can be quite different from it.
Standardization to 10 mm; cells to be used: 10 mm, 20 mm, 50 mm and round cells

● Iodine color value - in analogy to DIN 6162A
The iodine color value is used to determine the color depth of clear liquids whose color ranges from uncolored or yellowish to dark brown and is similar to that of a iodine potassium iodide solution. Areas of use for the iodine color value are for example solvents, plasticizers, resins, oils and fatty acids.
Standardization to 10 mm; cells to be used: 10 mm, 20 mm, 50 mm and round cells

● Hazen:
Hazen/APHA/Pt-Co color value in analogy to APHA 2120B, DIN EN ISO 6271-2, Water Research Vol. 30, No. 11 2771-2775, 1996
The Hazen/APHA/Pt-Co color value was originally developed for the measurement of slightly yellowish waste water samples. Today the Hazen/APHA/Pt-Co color value is mainly used as a quality characteristic in the chemical industry for the assessment of raw materials such as fats and oils or in the pharmaceutical industry. The Hazen/APHA/Pt-Co color value is used to determine the aging of products caused by the influence of light and temperature, contamination of products or process changes. It should only be used for slightly yellowish, nearly colorless samples.

– Wavelength 340 nm: Standardization to 10 mm; cells to be used: 10 mm, 20 mm, 50 mm and round cells.

– Wavelengths 445 nm, 455 nm and 465 nm: Standardization to 50 mm; cells to be used: only 50 mm cells.

● Gardner:
The Gardner color index according to DIN EN ISO 4630-2 is defined with the CIE primary color components x and y.
The Gardner color index can be used for clear, yellowish brown samples such as oils, clear coating materials, and solutions of fatty acids, polymerized fatty acids, resins, tall oils, tall oil fatty acids, pine resin and other products.
Standardization to 10 mm; cells to be used: 10 mm, 20 mm, 50 mm and round cells

● Sugar color ICUMSA:
Sugar color measurement according to ICUMSA Method GS1/3-7 and Method GS2/3-10 can be used for solutions of raw sugar and brown sugar and for colored syrups at pH 7.0.
Standardization to 10 mm; cells to be used: 10 mm, 20 mm, 50 mm and round cells

● Beer color

– EBC color index: European beer color (European Brewery Convention)
The EBC color index is an important parameter for the quality monitoring of beer and wort in the brewing process. According to MEBAK 2.13.2, the EBC color index is determined through absorbance measurement at 430 nm with 10 mm cells.
Standardization to 10 mm; cells to be used: 10 mm, 20 mm, 50 mm and round cells

– ASBC color index: American beer color (American Society of Brewing Chemists)
According to the Standard Reference Method (SRM), the ASBC color index can be calculated from the EBC color index.
Standardization to 10 mm; cells to be used: 10 mm, 20 mm, 50 mm and round cells

- Yellowness index E313:
The yellowness index according to ASTM method E313 is used to determine product changes caused by light, chemical influences and processing steps in industrial applications.
No standardization; cells to be used: 10 mm, 20 mm, 50 mm and round cells

- ASTM ISO 2049:
ASTM color scale (petroleum products). The ASTM color scale is used for petroleum products such as lubricants, fuel oils, diesel fuel, and paraffin. It is calculated using the CIE tristimulus values X, Y, Z.
Standardization to 32.5 mm; cells to be used: 10 mm, 20 mm, 50 mm and round cells

Standardization of results

– The measurement results of most color measurements are - irrespective of the cell size used - standardized to a certain cell size, as stated. Therefore, even if different cell sizes are used, the measurement results of a solution are the same.

– For the methods Color CIE 15:2004 and Yellowness-Index E313, the measurement results are not standardized to a certain cell size. Therefore, the measurement results are different if different cell sizes are used for measurement.

2 Installation

2.1 System requirements of the photoLab 7x00

- Software version 2.89 or higher

2.2 PC system requirements

- PC with operating system Microsoft Windows® 10

- CD-ROM drive (for installation from a CD-ROM)

- At least one free Ethernet interface
(see operating manual od the photometer)

The current version of the photoLab® color software is ready to be downloaded (www.xylemanalytics.com).

An existing installation can be replaced by the new installation.

2.3   Installation from CD-ROM

1   Insert the installation CD for the photoLab® color program in the CD-ROM drive.

2   Call up the Windows® Explorer.

3   In the Windows® Explorer, select the CD-ROM drive.

4   In the "Software" directory, execute the installation file photoLabColor_Vxxx.exe.

5   Follow the instructions of the setup program. The required registration number is on the silver-colored label on the CD packaging (enter with hyphens!).
The program is installed.

Keep the registration number. You will need it later to download and install the program updates for photoLab® color or photoLab® Data spectral from the WTW website.

2.4   Installation or update after download

1   Download the ZIP file from www.xylemanalytics.com.

2   In a file manager (e.g. Windows® Explorer), select the download directory.

3   Unzip the compressed ZIP file.

4   Run the installation file for the desired language.

5   Follow the instructions of the setup program.
The program is installed.

3   Connecting the photometer to a PC

The connection between the photometer and PC is made via an Ethernet network connection. The connection can be made in the following ways:

● Connection of photometer and PC to the same network
 (e.g. photometer via Ethernet cable [LAN],
 PC via Ethernet cable [LAN] or wireless [WLAN])

● Direct connection of photometer and PC

Details on establishing the connection from the photometer to a PC via the Ethernet interface (see operating manual for the photometer).

4 Starting photoLab® color

1 Start the photoLab® color software in the Windows® Start menu (Start / Programs / WTW / photoLab® color).
The photoLab® color program searches for available photometers and starts. The search may take some seconds.
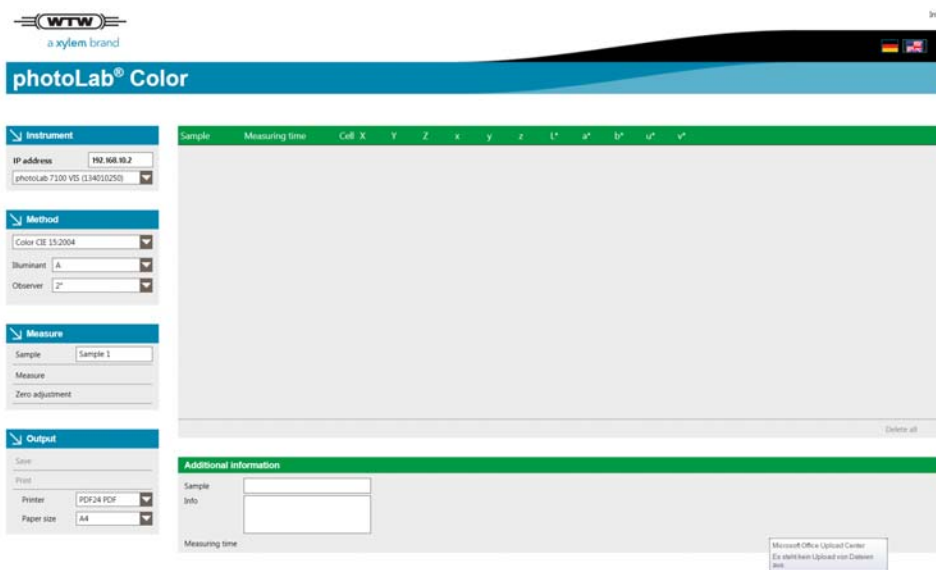
- The connected photometer appears in the field *Instrument* on the screen of the PC with the serial number.

- When the photometer is connected to the program photo-Lab® color , it is in remote mode and indicates this on the display.

- Most of the photometer keys are blocked in the remote mode. Only the ESC, HOME and TIMER keys work, plus the On/Off key.

- The HOME and ESC keys interrupt the remote mode. It is restored with the Measure key in the program photoLab® color .

- If TIMER is pressed, the Timer function can be operated with the relevant keys. After the ESC key was pressed the photometer returns to the Remote mode.

5 Operation

5.1 Changing the language

The default language of the program photoLab® color is English. You can, however, switch to German at any time or toggle between the languages.

1 Click on one of the country symbols with the mouse (English on the left, German on the right side) on the right-hand upper edge of the screen. The screen language is immediately changed.

Setting the language

5.2 Overview

The program photoLab® color has a clearly structured display. On the left-hand side of the display there are the input and selection fields:

	Button	**Function**
Functions	*Instrument*	Here you can select the photometer with which the photoLab® color program should communicate. The program automatically connects with the first photometer connected to the PC. It can only ever be connected to one photometer.
	Method	Here you select the method, e.g. ADMI or Iodine color value
	Illuminant	The illuminant is a method specific setting: The color measurement takes place with a defined illuminant whose spectral distribution and color temperature are known. It is also called the standard illuminant.
	Observer	The observer is a method specific setting: Depending on the standard, the calculation is based on different observer angles.
	Concentration	(Method specific setting for sugar color ICUMSA)
	Sample	Here you can assign a unique name to the sample.
	Measure	Start measurement (may take 1 - 2 minutes)
	Zero adjustment	Start zero adjustment (may take 1 - 2 minutes)
	Save	Save the color values measured and displayed on the PC to a *.csv file.
	Print	Print the color values measured and displayed on the PC.
	Printer	Select a printer
	Paper size	Select the paper size
	Additional information:	
	Sample	Here you can assign a unique name to the sample.
	Info	Here you can enter additional information on the sample and measurement.

5.3   Carrying out color measurements with the photometer

Activities on the photometer are not described in detail here. Follow the instructions in your photometer operating manual.

1   Select the instrument in the *Instrument* field as necessary. Normally the connected photometer is automatically selected by the program.

2   Select the measurement method under *Method*.

3   Select the additional settings for the measurement method as necessary.

4   If necessary, assign a descriptive name to the sample. Otherwise the program will automatically assign the names to the samples measured: Sample 1, sample 2, sample 3 etc.

5   If necessary, carry out the zero adjustment (insert zero cell and click button *Zero adjustment*). Measurement may take 1 - 2 minutes.

6   Confirm the message *Zero adjustment carried out*.

7   Insert the sample in the photometer (see photometer operating manual) and click the *Measure* button. The sample is measured with the selected method (may last 1 - 2 minutes), and the measured values subsequently appear on the display.

8   Measure further samples as necessary.

Example: List of measured values

| Sample	Measuring time	Cell	ICUMSA
Sample 1	2/1/2016 5:02:25 PM	Round	4.43
Sample 2	2/1/2016 5:02:38 PM	Round	453.73
Sample 3	2/1/2016 5:02:50 PM	Round	1063.19
Sample 4	2/1/2016 5:03:02 PM	Round	6.06
Sample 5	2/1/2016 5:03:14 PM	Round	454.71
Sample 6	2/1/2016 5:04:00 PM	Round	1071.66
Sample 7	2/1/2016 5:04:11 PM	Round	4.18
Sample 8	2/1/2016 5:04:25 PM	Round	454.83
Sample 9	2/1/2016 5:04:37 PM	Round	1062.18

- We recommend that you use only cells that are recognized by the instrument (see photometer operating manual). The photometer measures, however, also with other cells and informs you if the zero adjustment was carried out with a cell that was not recognized. In this case the cell size has to be selected for measuring (Round, 10 mm, 20 mm, 50 mm).

- Always use the same cell size for measuring that was used for the zero adjustment!

- Make sure that only one cell is inserted during zero adjustment and measurement. Otherwise an error message will occur or the measurement results will be incorrect.

5.4   Changing the method

Prior to changing the method for color measuring you have to delete all measurement results. Save the color values you want to process to a *.csv file.

1   Click the button *Delete all* at the bottom right of the measured value field. A security prompt appears:

Security prompt prior to changing the method

Delete measured values

Save measured values before deleting?

Save   Do not save   Cancel
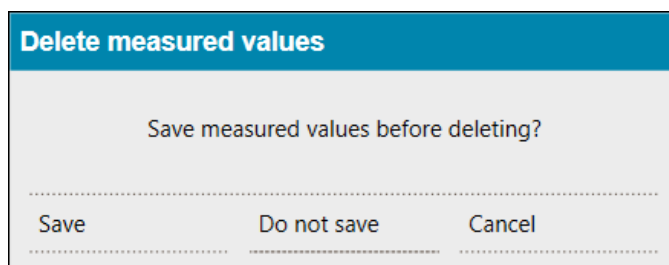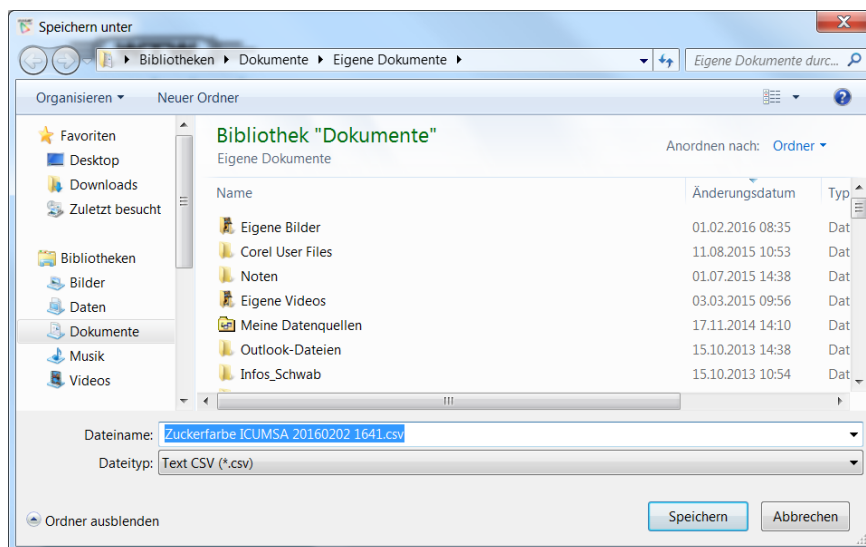
2   Click the required option. If *Save* was selected, a window to save the *.csv file pops up (see section 5.5).

5.5   Saving the color values

Save the color values you want to document or process to a *.csv file. Proceed as follows to save the values:

1   Click the button *Save* under *Output*. A window to save the *.csv file pops up. A file name is proposed.

Saving the measured values

2   Select another directory as necessary.

3   Change the file name as necessary and confirm *Save*. The file with the color values is saved as a *.csv file.

Measured values in *.csv file

Instrument	photoLab 6100 VIS (134010250)
Method	Color CIE 15:2004
Illuminate	A
Observer	2°

Name	Cell	Info	Timestamp	X	Y	Z	x	y	z	L*	a*	b*	u*	v*
Probe 1	Rund	filtriert	25.02.2016 16:26	109,8	100	36,4	0,446	0,4061	0,1479	100	0	0	0	0
Probe 2	Rund		25.02.2016 16:32	109,6	88,9	32,2	0,4751	0,3853	0,1396	95,5	18,9	0,3	36,2	-4,8
Probe 3	Rund		25.02.2016 16:33	53,1	69,5	26,5	0,3561	0,4661	0,1778	86,8	-50,5	-2,8	-84,4	9,9
Probe 4	Rund		25.02.2016 16:34	113,3	105,2	20,2	0,4746	0,4407	0,0847	102	-3,3	39	4,1	22,4
Probe 5	Rund		25.02.2016 16:35	108,9	89,3	33,2	0,4707	0,3858	0,1435	95,7	17,2	-1,4	32,2	-5,5
Probe 6	Rund		25.02.2016 16:36	53,1	69,5	26,5	0,356	0,4663	0,1776	86,8	-50,6	-2,7	-84,6	9,9
Probe 7	Rund		25.02.2016 16:42	53,1	69,5	26,4	0,3562	0,4667	0,177	86,8	-50,6	-2,4	-84,6	10,1
Probe 8	Rund		25.02.2016 16:43	121,4	117,3	20,9	0,4677	0,4516	0,0806	106,3	-10,3	44,6	-7,8	27
Probe 9	Rund		25.02.2016 16:45	52,5	68,8	26	0,3566	0,4668	0,1766	86,4	-50,3	-2,3	-84	10,1
Probe 10	Rund		25.02.2016 16:48	113,1	105,1	20,2	0,4746	0,4407	0,0848	101,9	-3,3	38,9	4	22,4

The following data are stored to the *.csv file:

– Instrument with series number

– Method

– Method specific settings if available

– All data shown on the display of the program photoLab® color (sample, cell, measuring time, measured values)

– Additional information (if available)

5.6   Printing the color values

You can print out the color values measured and displayed. The program photoLab® color offers the printers installed on the PC for the printing.

1   Select a printer as necessary.

2   Select the paper format as necessary (A4 or US letter).

3   Click the *Print* button under *Output*. The color values are printed.

Sample printout

photoLab® Color

Instrument photoLab 6100 VIS (134010250)
Method   Color CIE 15:2004
Illuminant A
Observer   2°

Sample	Info	Measuring time	Cell	X	Y	Z	x	y	z	L*	a*	b*	u*	v*
Sample 1		02/25/2016 05:10:16	Round	113.2	105.1	20.2	0.4747	0.4406	0.0848	101.9	-3.3	38.9	4.2	22.3
Sample 2		02/25/2016 05:11:32	Round	50.5	67.2	27.5	0.3479	0.4630	0.1891	85.6	-52.1	-6.9	-87.5	7.3
Sample 3		02/25/2016 05:12:22	Round	104.0	86.1	32.7	0.4668	0.3864	0.1468	94.4	15.3	-2.8	28.1	-5.8
Sample 4		02/25/2016 05:13:22	Round	110.8	104.0	21.1	0.4695	0.4410	0.0895	101.5	-5.2	35.9	-0.2	21.4
Sample 5		02/25/2016 05:14:36	Round	50.6	67.4	27.5	0.3477	0.4631	0.1892	85.7	-52.2	-6.9	-87.6	7.4
Sample 6	filtered	02/25/2016 05:15:26	Round	106.8	88.4	33.8	0.4661	0.3862	0.1477	95.3	15.3	-3.2	28.0	-6.1
Sample 7		02/25/2016 05:16:26	Round	111.0	104.2	21.0	0.4699	0.4410	0.0891	101.6	-5.1	36.2	0.1	21.5
Sample 8		02/25/2016 05:17:34	Round	57.6	70.7	27.9	0.3691	0.4526	0.1783	87.3	-42.1	-4.8	-72.3	6.7
Sample 9		02/25/2016 05:18:18	Round	107.2	88.8	33.9	0.4662	0.3863	0.1476	95.5	15.3	-3.1	28.1	-6.1
Sample 10		02/25/2016 05:19:27	Round	111.9	105.1	21.3	0.4695	0.4410	0.0895	101.9	-5.3	36.0	-0.3	21.5

5.7 Saving additional information

Even after measuring, you can assign a new name to each sample measured and displayed. Besides you can enter additional information on the sample or measurement. This information is printed or saved in the column *Info*.

1   Use the mouse or the up/down keys to select a sample. The current name of the sample appears under the header *Additional information* in the field *Sample.*

2   Enter a new name for the sample in the *Sample* field.

3   Enter additional information in the *Info* field as necessary.

Entering additional information

5.8 Calling up the software status

Proceed as follow when you would like to know which software status your version of the program photoLab® color has:

1   Click the *Info* field on the right-hand upper corner of the screen. A field with version number and manufacturer's address appears in the center of the screen.

2   To exit the display, click next to the field.

6   What to do if ...

Error	Cause	Remedy
No photometer is available for the connection.	– No suitable photometer was identified.	– Check the following prerequisites: – The Ethernet cable is correctly connected – The IP address entered in the PC program matches the IP entered in the photometer. – The network settings of the PC are correct (see operating manual of the photometer).
Photometer beeps at regular intervals.	– You probably tried to use the softkeys to start a function on the photometer before the self-test was carried out.	– Quit the function with the ESC key, start the self-test with Start / Enter.
Display: No zero adjustment	– For this method and/or cell type no zero adjustment was carried out – The zero adjustment was deleted, e.g. by separating the connection between the photometer and the program photoLab® color .	– Carrying out a zero adjustment
Memory error	– No more memory capacity on the PC.	– Make more memory capacity available and restart the program photoLab® color
The program photoLab® color was terminated but the photometer is still in Remote mode.	– Remote mode not yet interrupted	– Press the ESC on the photometer

Xylem |ˈzīləm|

1) The tissue in plants that brings water upward from the roots;
2) a leading global water technology company.

We're a global team unified in a common purpose: creating advanced technology solutions to the world's water challenges. Developing new technologies that will improve the way water is used, conserved, and re-used in the future is central to our work. Our products and services move, treat, analyze, monitor and return water to the environment, in public utility, industrial, residential and commercial building services settings. Xylem also provides a leading portfolio of smart metering, network technologies and advanced analytics solutions for water, electric and gas utilities. In more than 150 countries, we have strong, long-standing relationships with customers who know us for our powerful combination of leading product brands and applications expertise with a strong focus on developing comprehensive, sustainable solutions.

For more information on how Xylem can help you, go to www.xylem.com.

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