

basICColor display 6



**The New Standard
in
Monitor Calibration
Monitor Profiling
Monitor QA
Ambient/Viewing Light Control**

Why a bat?

Bats use „instrumentation“ for navigating complex 3-dimensional environments in the dark – echolocation or Sonar.



The new baslCColor display 6 took this perfect blueprint of nature as a model to navigate in 3-D color space using appropriate instrumentation.

Bats possess a complex neural compass that tracks their movements as they expertly move through their environment.

The corresponding „compass“ in baslCColor display 6 is the new calibration and profiling engine that has been developed from scratch.

The elegant flight of bats is perfectly matched in the easy to use graphical user interface which nevertheless offers powerful and sophisticated features for controlling your monitors and viewing environment.

basIColor display 6 concepts

The operating concept of basIColor display 6 offers a modular design based on WORKFLOW-concept, which makes it extremely easy to use while offering maximum flexibility and a wide range of functions.

This means that basIColor display 6 comes with a large number of predefined WORKFLOWS that represent various common use cases.

Alternatively, you can create your own WORKFLOWS using the EDITOR and save them under a name of your choice.

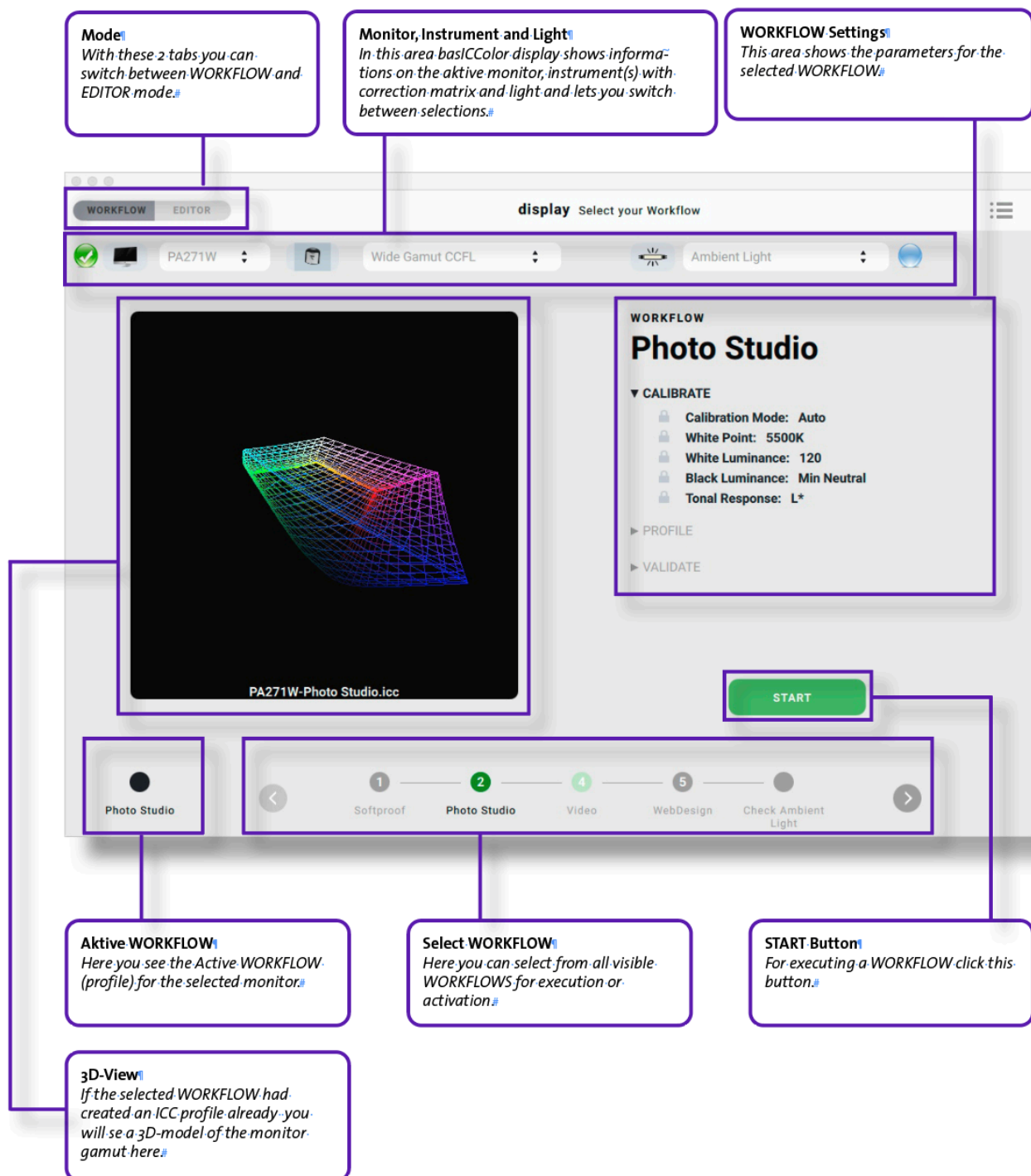
This allows you to start any task and any combination of tasks, whether monitor calibration, profiling, validation, emulating a smaller color space on wide-gamut monitors, color space testing, light testing for ambient or standardized viewing light, and even the calibration of suitable standard light stations with a single mouse click.

basIColor display 6 is separated into 2 main parts

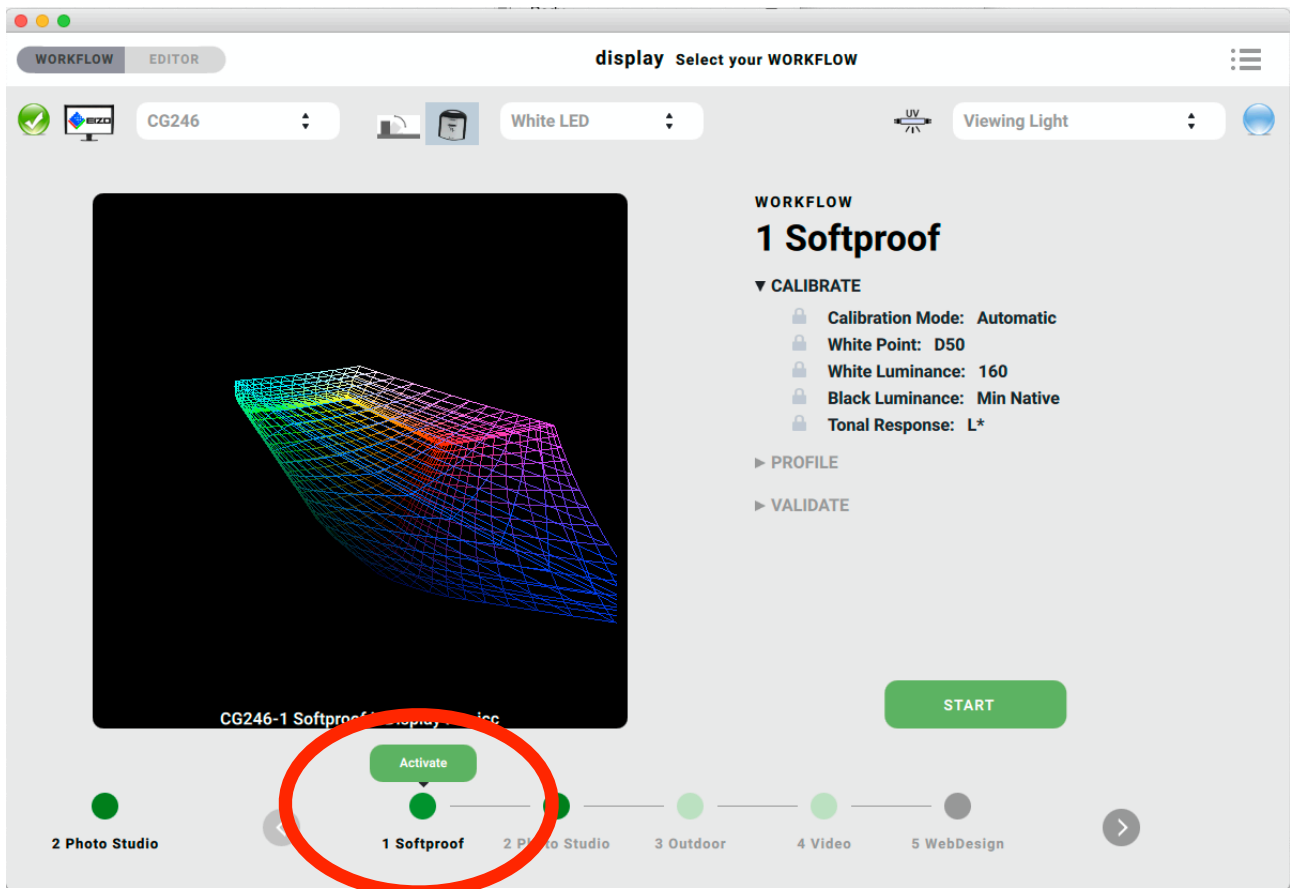
1. WORKFLOW

This is the main window where you start your calibration, profiling etc. by selecting a predefined WORKFLOW and clicking the START button. basIColor display 6 remembers the Workflows you had executed previously.

Here is a short description of the different elements.



You can switch between calibrations including the hardware-based lookup tables (LUTs) and the associated monitor ICC profile without calibrating again by just selecting the desired WORKFLOW bullet and clicking the <Activate> button. Depending on the monitor make and model it may take a few seconds before the new calibration is activated – but by far not as long as a fresh calibration/profiling.



This is true as long as you switch between 2 different Memory Location/Calibration positions in NEC monitors. If you load a different WORKFLOW into the active Memory Location (green bullet on the bottom left) the calibration LUTs will be transferred to the monitor again – and that will take time. You can identify this situation by the red dot that appears under the <Activate> button.

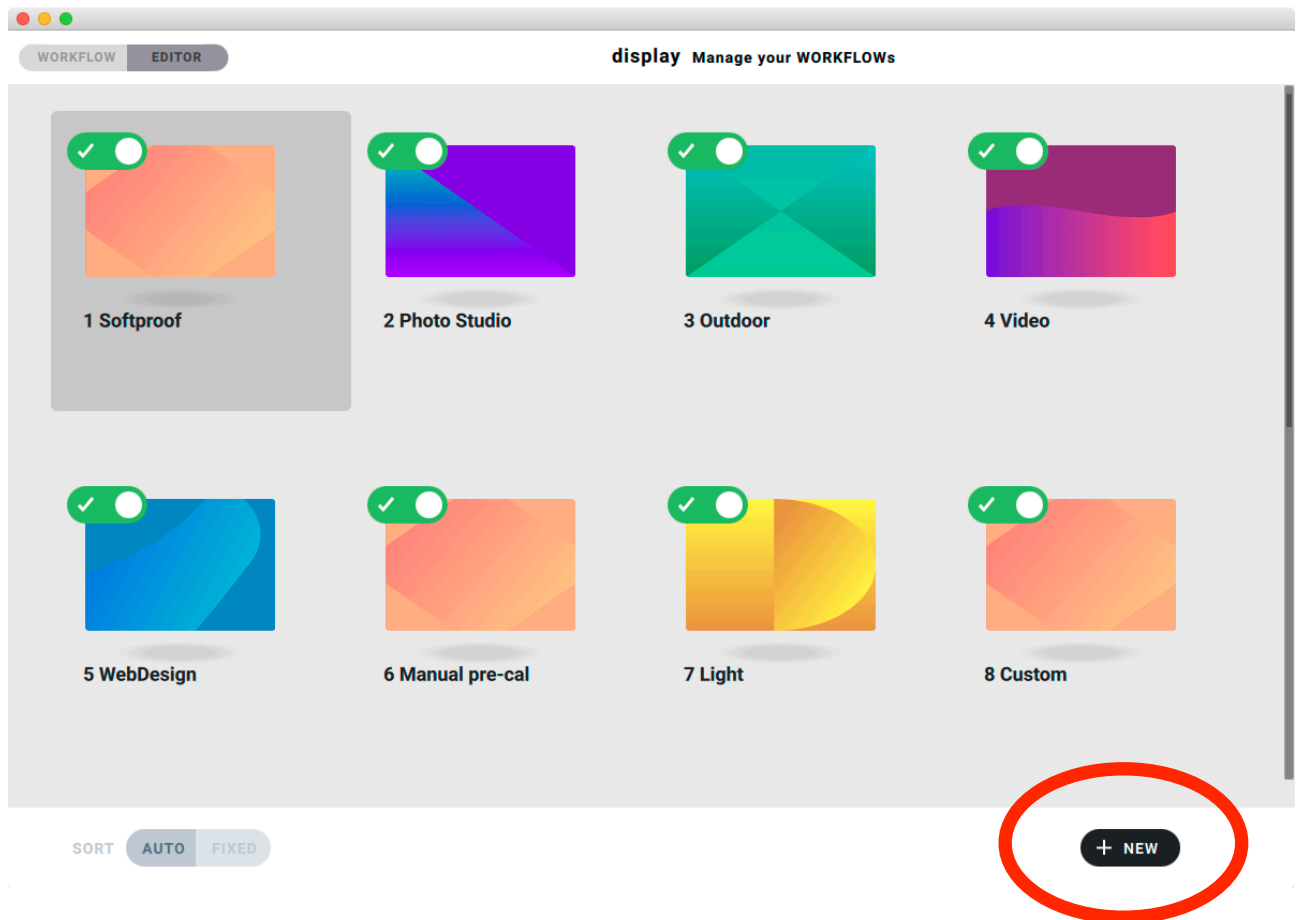


The steps contained in a WORKFLOW are described on the right side of the window, you can open the description of the various steps by clicking on the triangles. When the measurements begins, these will open according to the progress of your WORKFLOW. The graphics window will show the 3D monitor gamut after profiling is done (see image above).

The monitor QC icon (see para 3.2) will indicate the validation result, the light QC icon (see para 3.3) will indicate the result of a check of your lighting situation, if that has been performed in your WORKFLOW.

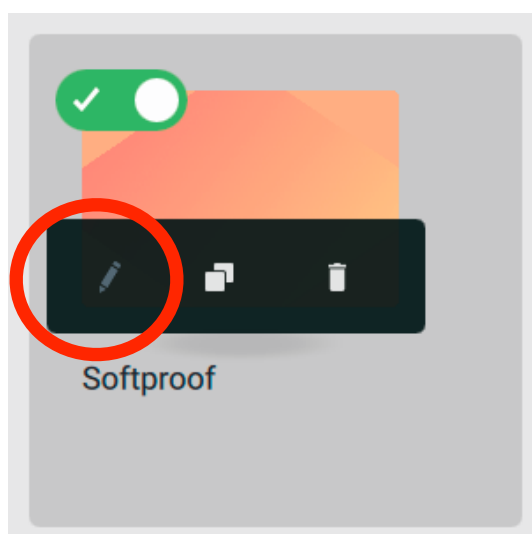
2. EDITOR

2.1. WORKFLOW MANAGER



Here you can modify, duplicate, delete existing WORKFLOWS or completely recreate a new one.

For editing, just hover over one of the images and click the pencil (edit) icon.



To create a new WORKFLOW, click <+ NEW> or duplicate an existing workflow by clicking on the two overlapping squares.

2.2.WORKFLOW EDITOR

2.2.1. EDIT mode

In both cases, the window switches to the EDIT mode, which allows you to change all settings.

display 1 Softproof - Edit WORKFLOW

WORKFLOW EDITOR

Calibrate Emulate Profile Validate Evaluate Light

Calibration Mode ?
Automatic

Tonal Response ?
L*

NEC Memory Location ?
1: Softproof

Monitor Uniformity ?
0

White Point ?
D50

White Luminance ?
160

Black Luminance ?
Min Native

← BACK SAVE WORKFLOW →

2.2.2. WORKFLOW Steps

By clicking on the tabs you can switch the steps in the WORKFLOW to on or off.

Calibrate Emulate Profile Validate Evaluate Light

Green checkmark means that this step will be performed when executing the WORKFLOW
Red cross means that this step will be skipped – even if it holds open locks (see para 2.5), the settings of this WORKFLOW step will not be displayed upon execution of the WORKFLOW.

2.3. WORKFLOWS

baslCColor display 6 is installed with predefined WORKFLOWS, the numbers in front of the names are only used for sorting in the WORKFLOW and EDITOR windows.

2.3.1. „1 Softproof“ – Calibrate, Profile, Validate

White point D50 - corresponds to the standard for softproofing in the graphics industry
Luminance 160 cd/m² – for proofing with reflective originals under standard light 500 lx
Tone value curve L* – human perception of tone value gradations.

2.3.2. „2 Photo Studio“ – Calibrate, Profile, Validate

White point 5500 K – corresponds to the white point of photo light (flash) Luminance 120 cd/m² - for dimmed environment in studio Tone curve L* – human perception of tone value gradations.

2.3.3. „3 Outdoor“ – Calibrate, Profile, Validate

Native display white point – for maximum brightness and contrast Luminance maximum – for viewing on a monitor in bright daylight Tone curve L* – human perception of tonal value gradations.

2.3.4. „4 Video“ – Calibrate, Emulate, Profile, Evaluate

White point D65 - video/cinema standard luminance 100 cd/m² - dimmed video editing suite Tone curve HDTV - the most common of many video tone curves Emulate Rec709 - matching the tone curve HDTV.

2.3.5. „5 WebDesign“ – Calibrate, Emulate, Profile, Evaluate

White point D65 - Web "standard" luminance 140 cd/m² - average office lighting Tone curve sRGB - still a kind of Web "standard" emulate sRGB - for WORKFLOWS without color management based on sRGB.

2.3.6. „6 Manual pre-cal“ – Calibrate, Profile, Validate

White point D50 - corresponds to the standard for softproofing in the graphic arts industry
Luminance 160 cd/m² - for proofing with reflective originals under standard light 500 lx
Tone value curve L* - human perception of tone value gradations

NOTE: This WORKFLOW is intended for monitors that are neither hardware-calibratable nor understand DDC/CI commands, so their brightness cannot be set by software. Before the calibration starts, you will be asked to measure the white brightness and set it manually (OSD or Control Panel). On some monitors, the OSD also allows you to adjust the color temperature. If this is not possible, leave some "air up" in the brightness so that the adjustment of the LUTs in the graphics card, which usually reduces the blue channel, does not make the monitor darker than the selected luminance.
Execute this WORKFLOW twice for optimal settings of the white luminance.

In all WORKFLOWS the black luminance is set to "Min Native", which gives the highest possible contrast. On most monitors, this results in a slightly bluish black point, but the human eye cannot see that color cast. The setting "Minimum neutral" would increase the black point to about 1 or even 2 cd/m² and thus reduce the contrast by up to a factor of 10.

2.3.7. „ 7 Light“

- No monitor calibration or profiling
- Automatic ambient light check according to ISO standard
- Automatic check of the viewing light based on the monitor calibration, i.e. the viewing conditions on the monitor and in the viewing light are compared and checked for agreement
- Calibration of the standard light
- requires light that can be calibrated (see Section 2.4.6. "Light").
- Automatic calibration of suitable standard light devices based on the monitor calibration, i.e. the viewing conditions on the monitor and in the viewing light are automatically set to match (depending on the device in color temperature and/or brightness).

2.3.8. „ 8 Custom“

- The relevant tabs are active and the locks are open
- If required, additional tabs can be activated and locks can be opened or closed
- The WORKFLOW is used to make individual settings during execution without switching to EDITOR
- Recommended only for tests or constantly changing requirements.
More comfortable is the calibration of several WORKFLOWS in different storage locations (NEC monitors) or the quick change of calibrations/profiles via the Helper App (see there).

2.3.9. More WORKFLOWS for Pro version only

- Compare Sensors
- Correlate Sensors
- DICOM

2.4. WORKFLOW Components

In baslCColor display 6 you can define your individual WORKFLOW and add it to the predefined ones. Each WORKFLOW consists of up to 6 components:

2.4.1. Calibrate

- Calibration Mode – "Auto" calibrates suitable monitors (usually connected to the computer via USB) automatically (see document Hardware_Support_List.txt installed with the software). Monitors that do not fall into the classes below can be preset and optimized here by using the "Manual" setting on the monitor's OSD.
- White Point – color temperature of the white point.
- Tonal Response – a whole range of tone value curves are available here for graphic applications and video, (DICOM for Pro version only).
- White Luminance – luminance of the white point
- NEC Memory Location – the name changes depending on the monitor model. NEC monitors of the PA or SV(R) series have 5 or 10 internal memory locations for LUTs. These are used to enable fast switching, e.g. between softproof and video, without having to accept longer download times for the LUTs. The Memory Locations must be assigned unique names.
- Black Luminance – Luminance of the blackest black. Input either Neutral (only recommended if a color cast is VISIBLE in the native black), native or default value to adjust several monitors to each other, the value of the "weakest" monitor (brightest black) should be entered here.
- Monitor Uniformity - For NEC monitors only, control the uniformity factor.
- Some EIZO CG models have a built-in color sensor that baslCColor display 6 supports. In this case an additional instrument is required for light measurement.

2.4.2. Emulate

- Emulation Color Space – Choose from the profile types „Color Space Profile“, „Monitor Profile“, „Video Profile“. The relative colorimetric rendering intent is applied automatically. If you choose „None“ no emulation will be applied.
- „RGB Printer Profile“ and „CMYK Printer Profile“ are available in baslCColor display 6 Pro only, these options default to the absolute colorimetric rendering intent.
- If the tab „Emulate“ is switched off, the native monitor gamut will be retained.
- **NOTE: Emulate is made for environments without color management which are based on defined color spaces (video, web...). Make sure your Emulation Color Space matches the color space of your data.**

2.4.3. Profile

- ICC Version – specify preferences for the encoding of your ICC profile (v2/v4).
- Profile Name – Specify the automatic naming of your profile from several components.
- NOTE: Do not use too many components since the profile name will become too long.
- NOTE: If you leave the „Lock“ unlocked you can overwrite or add to the automatically generated profile name during execution of the WORKFLOW, if so desired.
- Profile Type – select the profile type from LUT-based or Matrix-based. Since Apple broke the support for LUT-based profiles for Apple's own software in Mac OS X 10.12 and higher, we do not recommend to select this type of profile with these operating systems.
- Save To – select the storage place for your profile (Check for write permissions for „Custom...“).
- NOTE: On Windows the system profile will not be set automatically if you save profiles to a „Custom...“ folder.
- Chromatic Adaptation – select chromatic adaptation model if you deviate from D50 and want to adapt to the D50 white point, default is CAT02.

2.4.4. Validate

- Targets – selects a text file with RGB reference values that specify how many color patches you want to test your profile with, you can import your own CGATS text file.
- Tolerances – XML file that defines the tolerances f for ΔC_{max} , ΔE_{ϕ} , ΔE_{max} gray, ΔE_{max} color, ΔE_{max} primaries, Δ Luminance of the white point, Δab white point as well as the color distance formula for your validation process (Default = ΔE_{2000}).

2.4.5. Evaluate (Color Space Evaluation)

- Checks if your monitor is able to display the emulated gamut completely and correctly. If emulated it checks the emulated gamut.
- Color Space – select from the profile types „ColorSpace Profile“, „Monitor Profile“, „Video Profile“. Printer Profiles can be selected in baslCColor display 6 Pro.
- Referenz – Textdatei mit RGB-Referenzwerten für die Evaluierung • Toleranzen – XML Datei mit Toleranzwerten

2.4.6. Light

- Ambient Light – check your ambient light according to ISO specifications (should be below 32 lx, shall be below 64 lx).
- Viewing Light – select if you want to check or calibrate your viewing booth or not (in basIColor display 6 Pro suited lights like Just ColorCommunicator / moduLight or SmartLightning System can be calibrated automatically).
- White Point – Color temperature, „Auto“ will use your monitor calibration setting „White Point“ for checking or calibration your viewing light.
- Illuminance – „Auto“ will use your monitor calibration setting „White Luminance“ for checking or calibrating your viewing light (automatic calibration for suited lights in basIColor display 6 Pro only, otherwise dim your viewing light manually to the appropriate illuminance).
- UV – On/Off will switch the UV content of your suited viewing light (basIColor display 6 Pro only).

If you switch monitor calibrations and your WORKFLOW contains a calibratable light, the light will be switched automatically to match the new viewing conditions – an absolute **stand-alone** feature of basIColor display 6 Pro!

2.5. The Lock

All parameters can be predefined and they can separately be hidden (locked)



in order to hide them during execution of the WORKFLOW. This enables a „one-button-operation“.

If parameters are unlocked in the EDITOR



they can be dynamically changed during execution of the WORKFLOW.

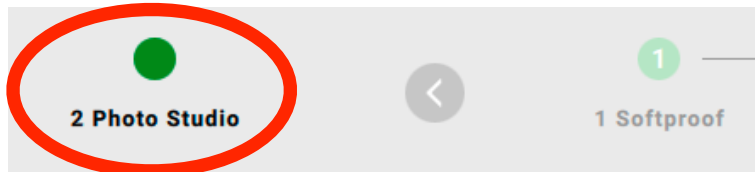
3. WORKFLOW

3.1. Status Information

basICColor display 6 gives you an immediate signal in its interface, telling you what the status of your monitor(s), light(s) and instrument(s) are.

3.2. Active WORKFLOW

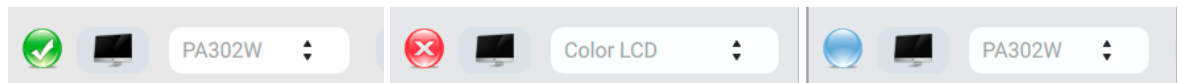
The „Active WORKFLOW“ and thus the selected calibration and profile is shown in the bottom left position of the main window .



Clicking the „Active WORKFLOW“ icon will take you to the 3D view with the option to save the respective report. A click on the button <DONE> will take you back to the main window.

3.3. Status Symbols Monitor Validation

basICColor display 6 shows the status of the selected monitor, regardless if it is just calibrated or if you had activated an existing WORKFLOW that contains Validation.



These status symbols mean :



Validation ok



Validation NOT ok

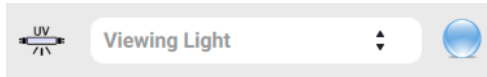
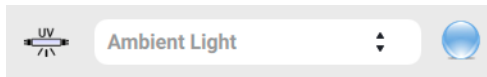


Not validated yet

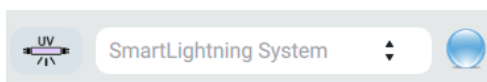
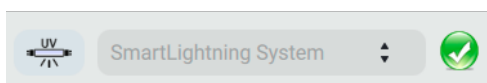
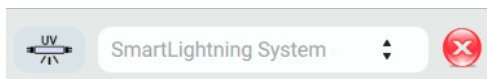
The active WORKFLOW can be re-validated by just clicking on the red/green/blue status symbol. You only need to recalibrate if your validation result is negative.

3.4. Status Symbols Light

The same is true for checking your ambient or viewing light (light booth).



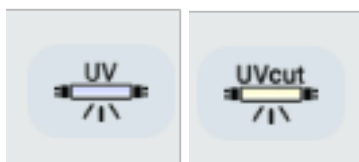
The descriptor „Viewing Light“ will change to the name of the connected light booth if one is detected and can be calibrated by baslCColor display 6.



With baslCColor display 6 Pro you can control the UV content for suited viewing lights by clicking the lamp symbol.

JUST moduLight LED: D50, D65, UV

LacunaSolutions SmartLightning System: Cold & Warm White, Blue, Green, UV 360nm, UV 400nm



3.5. System Info Monitor

basICColor display 6 shows all connected monitors and measuring instruments with their respective properties. Select the monitor you want to calibrate/profile/validate in the drop-down menu.

Im Monitor-Icon werden verschiedene Zustände bzw. Eigenschaften des Monitors bzw. des Grafiksystems (Grafikkarte - Monitor) angezeigt:



Crossed out monitor:

This monitor cannot be calibrated at all because the graphic card is unable to hold video-LUTs. The calibration parameters are being simulated in the profile which results in the desktop and symbols remaining unchanged. White Point Edit cannot be used on such systems in basICColor display 6 Pro.



RGB-curves:

This monitor cannot be hardware-calibrated, either because it is not capable at all (e.g. most Apple monitors) or because the hardware calibration capability could not be detected by the software. Calibration will be done in Video-LUTs on the graphic card.



DDC in black and white: The white luminance can be set via DDC/CI commands. This prevents the necessity of setting the luminance via video-LUTs.



DDC in color:

In addition to the white luminance, color temperature can be set via DDC/CI commands. .

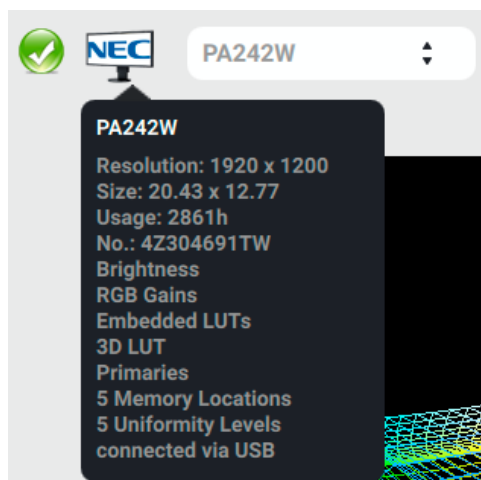


Logo:

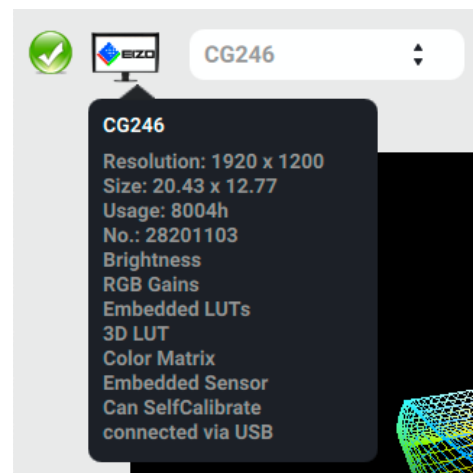
These monitors can and will be hardware-calibrated.

By hovering over the monitor symbol you can see the capabilities of the monitor selected in the combo box:

- Name / Model
- Resolution
- Size in inches
- Hours of usage
- Serial No.
- Embedded Luts
- Brightness (DDC-CI)
- Gains (bei DDC-CI)
- 3D Lookup Table
- Capability to use primaries for Emulation
- Capability to use a color matrix for Emulation
- USB connection to monitor possible/connected



Information for an NEC PA302W

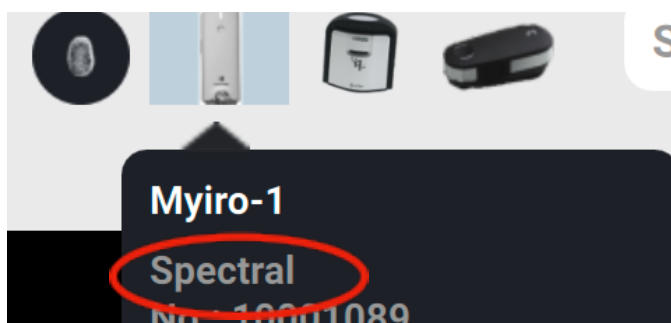
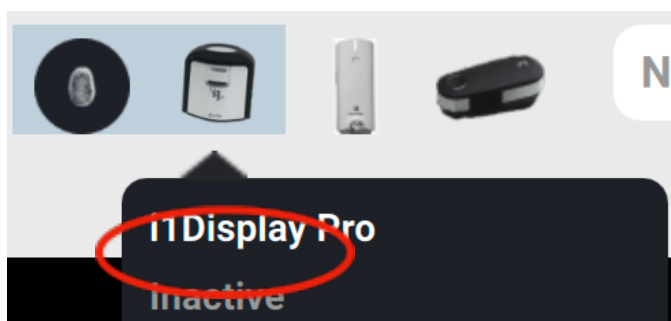
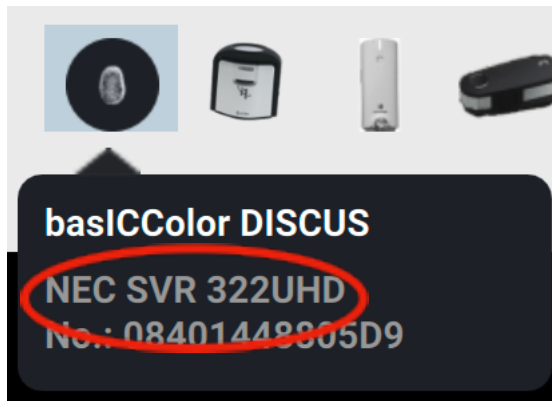


and an EIZO CG246

3.6. System Info Measurement Instrument

By hovering over the instrument symbol you can see its capabilities and settings for example:

- Name / Model
- Selected calibration matrix (for colorimeters)
Spectral (for spectrometers)
- Inactive – if you have several connected instruments but the one over which you hover your mouse is not selected
- Mode (emissive/ambient, if your instrument reports these modes)
- Operating temperature (if your instrument reports temperature)
- No.: – Serial No.



You can easily switch between instrument calibration matrices, depending on the instrument connected and activated (up to 30 monitor model-related matrices in a basIColor DISCUS). For correct calibration, profiling and validation results you need to select the correct calibration matrix for your monitor. Monitor technologies differ in their spectral properties and colorimeters need different correction matrices for different monitor technologies. These are named differently in those instruments, and monitor manufacturers not always communicate all the information you need in order to make an educated guess.

You may find more information about your monitor here:

<https://www.displayspecifications.com>

4. Special Workflows for different Industries and Standards

In today's world there are 3 major industries that creative professionals create content for

- Internet
- Film & Video
- Print
- Medical

Each of these categories work with their own set of standards which continue to evolve rapidly. .

The internet has embraced sRGB and D65 as its standard, not so color management. In some browsers it has to be switched on with cryptic commands.

print has different ISO standards for different printing methodologies like sheetfed, web or offset printing presses, using various paper types like coated or uncoated. ICC-based color management is fully established in the printing industry.

The film & video category is the one changing the most. There is a rapid transition in advertising going on, more people today see advertisements on social media platforms like Facebook or YouTube than on print. This goes hand in hand with the advancement in monitors and televisions as well as cameras to capture higher resolution content with increasing dynamic range. ICC-based color management is a myth for most products (and users) in these industries.

The main goals of basIColor display 6 are to emulate these different color spaces on inexpensive desktop monitors (wide gamut to facilitate the seamless switching between different setups.

4.1. Color Space Emulation

NOTE: Emulate is made for 2 different use cases ONLY:

1. Environments without color management which are based on a defined RGB color space (e.g. sRGB for video or web design). Make sure your Emulation Color Space matches the color space of your data.
2. You want to see a softproof of a print without converting in your design program or without leaving a program that is not able to display a softproof properly. This feature is only available in basIColor display 6 Pro.

Wide gamut monitors from Eizo and NEC have the capability to emulate a smaller color space, either by setting a color matrix or by setting specific primaries. 3D LUTs for the same purpose are also supported. This is especially important for creating content for video and the internet, the sRGB and the REC709 color spaces are identical in size, only the tonal transition is different. Applications like Adobe Premiere Pro render all of their content to REC709, making it very important to set the monitor to emulate that space.

basIColor lets you pick any color space for the emulation, as long as you have an ICC profile for it. We install a set of subfolders in your profile folder, one containing the most common video standards like P3DCI or REC709, another the most common RGB working spaces like ProPhoto or AdobeRGB1998.

When you add an emulation into your WORKFLOW the emulation becomes part of the calibration. The entire monitor including its ICC profile then represents the emulated color space. Several graphics demonstrate the color mapping and a detailed validation report confirms the monitor's usability in that stat

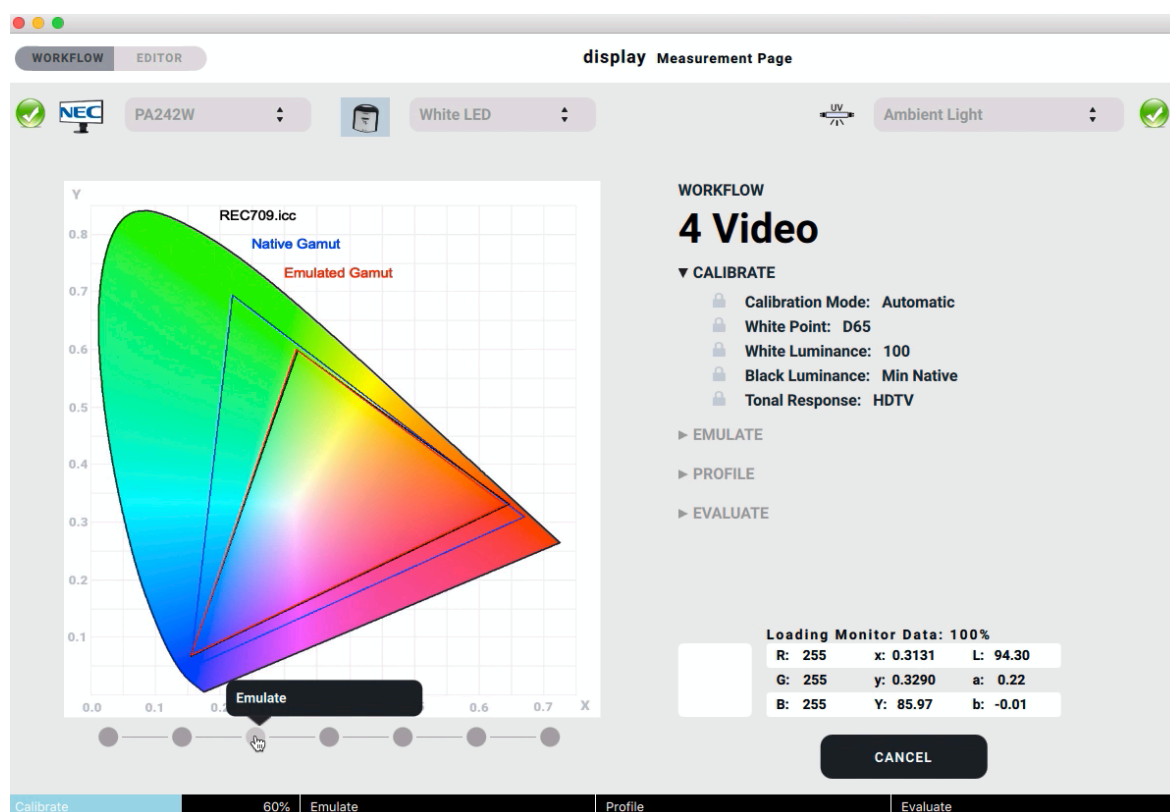
While executing a WORKFLOW containing Emulation several graphics show the progress and the result of the Evaluation of the emulated gamut. A detailed report proves the ability of your monitor to display the print gamut.

IMPORTANT! The WORKFLOW component „EMULATE“ should not be activated with Color Space set to „Auto“ if you did not emulate a smaller gamut. Setting The Color Space to any different gamut than the native monitor gamut will in such a case show the theoretical ability of the monitor to emulate this gamut.

If Emulate is active, Color Spce set to „Auto“ will automatically evaluate the emulated color space..

4.2. Softproof

While print professionals use various programs to see accurate predictions of their CMYK content (soft proofs) it would often be great to get a quick preview of what an RGB image would look like printed in whatever retouching program you may find yourself. With baslCColor display 6 you can choose to emulate a CMYK printing space and use a 3D LUT to simulate a CMYK conversion from your favorite working space, giving you the option of relative colorimetric intent with black point compensation or perceptual intent just like in the most sophisticated applications like Adobe Photoshop.



baslCColor display 6 Pro allows not only for emulating RGB-spaces but also for emulating printing spaces. The rendering intent absolute colorimetric is applied in these cases, thus simulating paper white as well.

You can store a native calibration in one memory location and the emulated calibration in another one and switch rapidly between the two for a quick preview of you print.

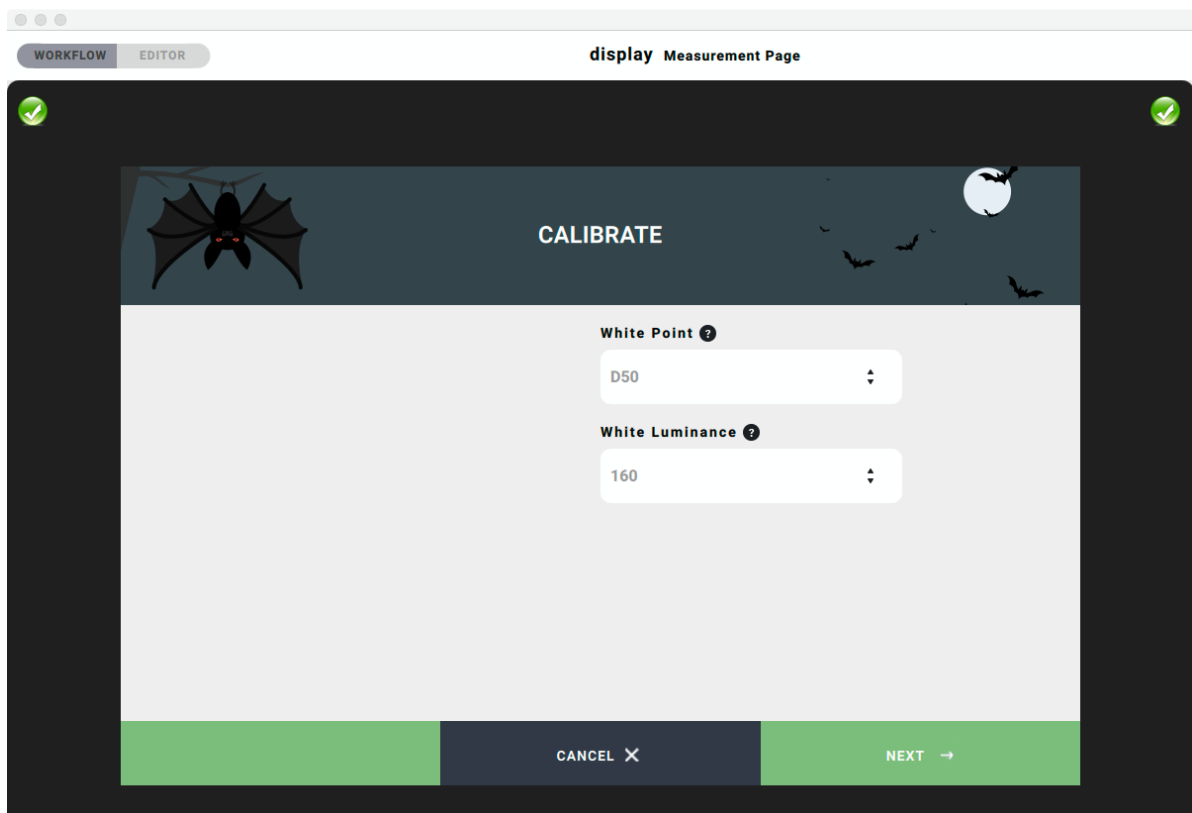
4.3. Manual pre-cal

For Most Apple Displays and Other Non-hardware-calibratable Monitors

Since the luminance of cheap monitors and not so cheap Apple MacBooks and iMacs can no longer be set via external software – thank you, Apple! – the WORKFLOW „6 Manual pre-cal“ has been added.



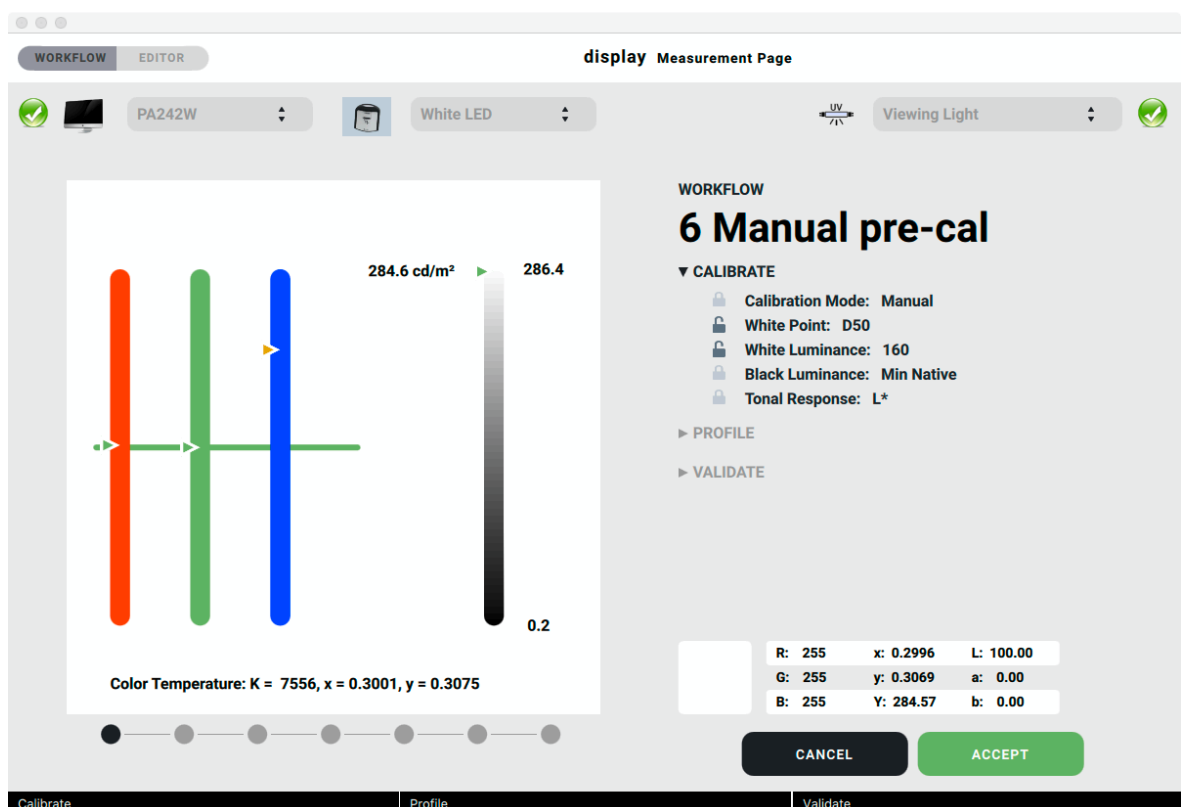
When you start the WORKFLOW, a window with 2 options for setting the desired White Point and White Luminance appears. You can edit these 2 parameters or accept the default values by clicking „NEXT ->“.



Here you will be prompted to calibrate the instrument (if applicable) and the measure window will be opened which will show the 2 options „CANCEL“ and „MEASURE“ and a graphical representation of your instrument (a MYIRO-1 in this example).



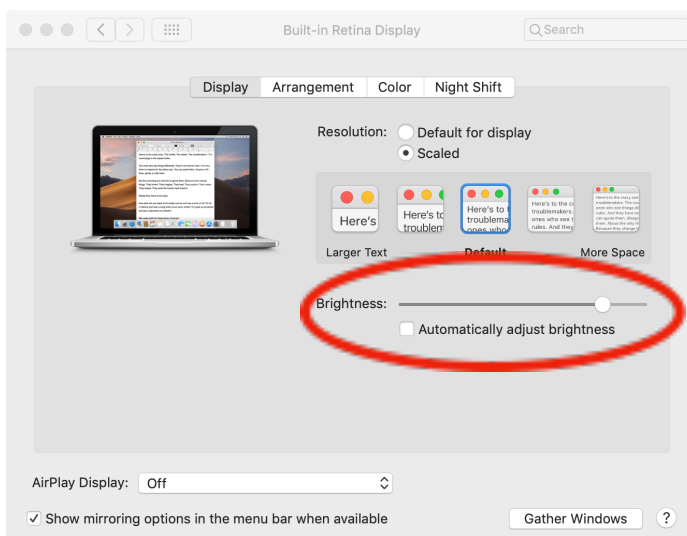
After starting the measurement the main window shows 3 color bars in red, green and blue and a gray luminance bar. The measurement values are displayed in relation to your selected parameters.



In our example the white balance is too bluish for D50 and the luminance is much too high.

If your monitor allows for setting the white point in the OSD (On-Screen-Display) you should use this feature and tune the white point so that the 3 arrows align with the horizontal line in the center of the RGB bars.

Now begin to adjust the luminance using either the hardware controls in the OSD of your monitor or by using the monitor control panel. You should set luminance slightly above the aim value in order to give the software some leeway for correcting the white balance. The further off the white balance in the beginning, the more luminance overhead is required.

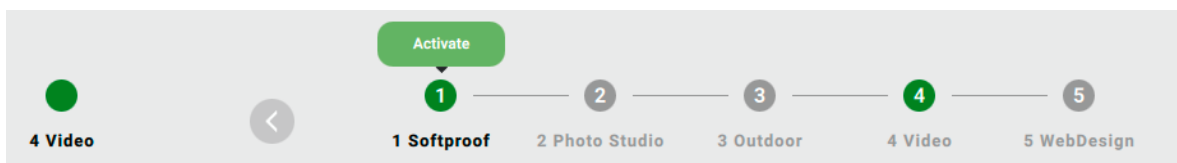


Once you have set the luminance to a satisfactory value click „ACCEPT“ in the main window in order to start the calibration.

4.4. Switching Workflows

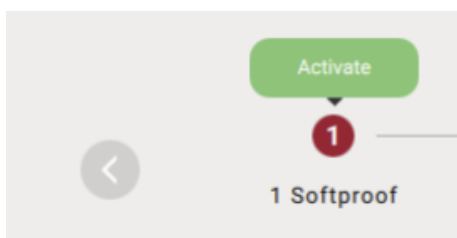
Most professional NEC monitors possess 5 *Memory Locations*, some even have 10 (need to be activated in the OSD). You can assign each of those to a WORKFLOW and switch with the click of one button from Softproof for printing to REC709 for video, all within a few seconds. On Eizo monitors the interface to the monitor is so fast that upon switching all hardware parameters are downloaded into the monitor, giving you an unlimited number of virtual *Memory Locations* .

You switch calibrations by clicking on the respective bullet – for NEC the *Memory Locations* are numbered. The numbers in the WORKFLOW names must not be confused with the *Memory Locations*, these are for alphanumerical sorting of the WORKFLOWS in the selection bar. :

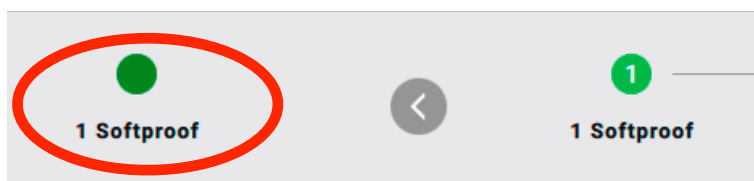


If a NEC Memory Location is occupied by another WORKFLOW the parameters need to be uploaded again. This situation is depicted by a red dot beneath the WORKFLOW name.

In this case, loading the new WORKFLOW takes its time. Thus it makes sense to store those WORKFLOWS you will need regularly in different Memory Locations.



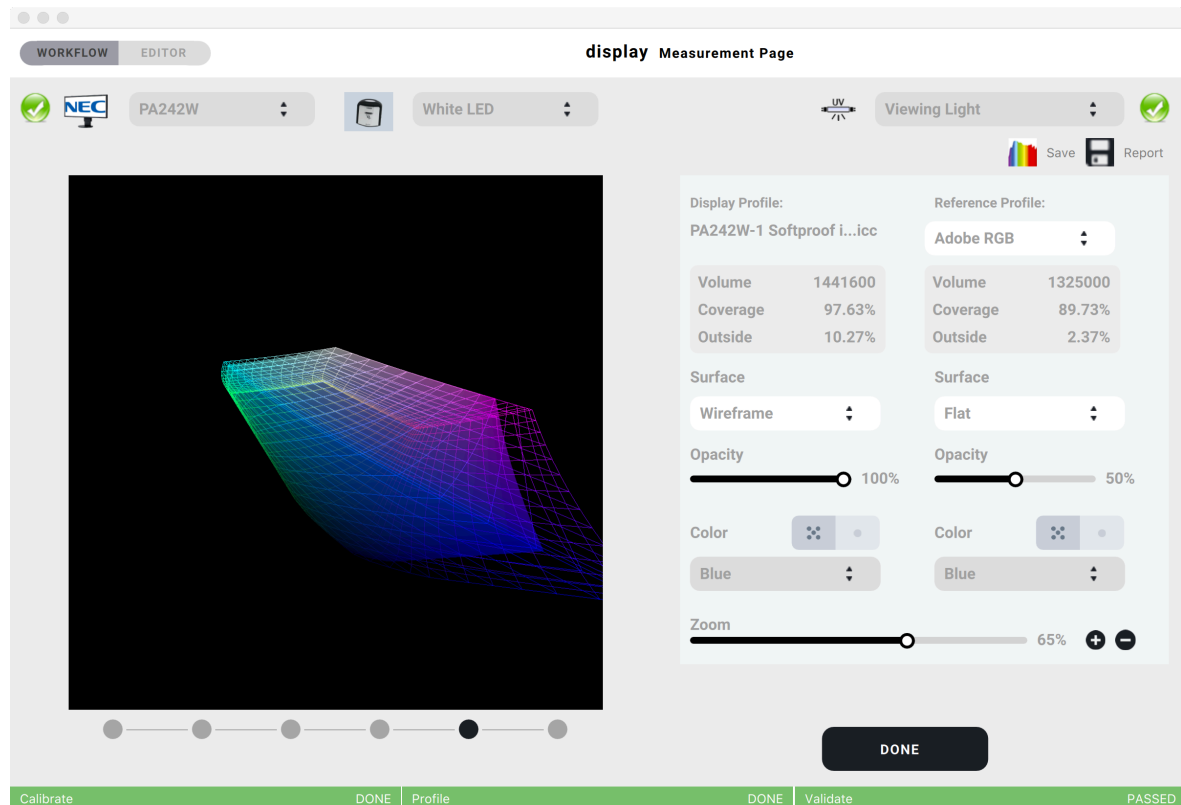
The active WORKFLOW – and thus the system profile – is indicated by a separate bullet and the name of the WORKFLOW to the left of the WORKFLOW selectors.



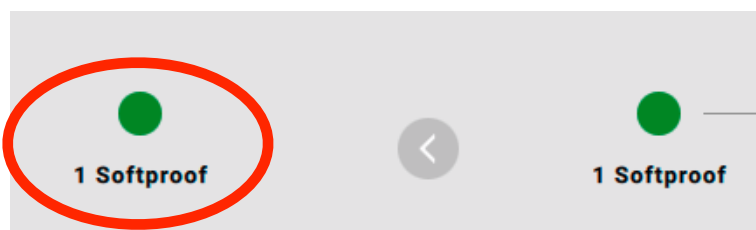
5. Report

basICColor display 6 provides a lot of information during executing a WORKFLOW. When done you can click the diskette symbol in the top right corner of the main window and save a comprehensive PDF report.

It will be stored to basICColor Jobs-Jobs display 6-Reports but can be saved to any location on your hard drive or network.



This window can be brought up by clicking the „Active WORKFLOW“ button and you can save the report at any time.



IMPORTANT! A basICColor_display6.log file is created in the Reports folder after finishing a WORKFLOW. In case of a support call, please send this log file together with the profile in question and the WORKFLOW XML file to: support@basiccolor.de.

Sample Validation Report:



Validation Results

Date/Time: Sun Nov 1 10:44:21 2020
 Display: PA242W
 Profile: PA242W-1 Softproof i1Display Pro.icc
 Color Space Emulation: Monitor Native
 Instrument: i1Display Pro (White LED)

Passed



	Target	Achieved	Tolerance
White Point	D50	Δa 0.1, Δb -0.1	Δab 2.0
Tonal Response	L*		
White Luminance	160.0 cd/m ²	159.7 cd/m ²	+/-10.0%
Black Luminance	Min Native	0.19 cd/m ²	
Contrast		1: 841	

	ΔE_{00}	Tolerance
Average	0.52	3.00
Max. gray scale	1.20	3.00
Max. chromatic Colors	1.35	10.00
Standard Dev.	0.49	

No.	L ref	a ref	b ref	L	a	b	ΔE	
1	100.00	0.00	0.00	100.00	0.00	0.00	0.00	
2	74.90	0.00	0.00	75.72	-0.39	0.30	0.88	
3	49.80	-0.01	0.00	50.54	-0.56	0.50	1.20	
4	24.70	-0.01	0.00	26.06	-0.41	0.16	1.17	
5	1.08	0.80	-2.86	1.08	0.79	-2.87	0.02	
6	98.40	-18.77	100.39	98.40	-18.81	100.39	0.02	
7	62.75	118.45	-57.43	62.70	118.40	-57.52	0.05	
8	59.17	102.76	80.17	59.22	102.28	80.10	0.12	
9	48.89	-10.66	56.94	49.37	-10.15	56.19	0.58	
10	28.67	67.18	-32.57	29.41	67.51	-32.76	0.57	
11	26.64	58.29	41.66	27.45	58.33	39.15	1.35	
12	88.34	-88.21	-19.08	88.32	-88.66	-18.41	0.33	
13	86.36	-134.01	84.13	86.36	-134.02	84.14	0.00	
14	43.19	-50.03	-10.82	43.94	-51.20	-9.61	1.11	
15	42.06	-76.00	47.74	42.53	-75.51	46.15	0.63	
16	23.91	91.35	-123.30	23.92	91.08	-122.84	0.08	
17	6.72	51.46	-69.80	7.66	49.57	-68.59	0.80	

If the WORKFLOW contains calibration, emulation, evaluation, light... these steps will be shown in the report as well.

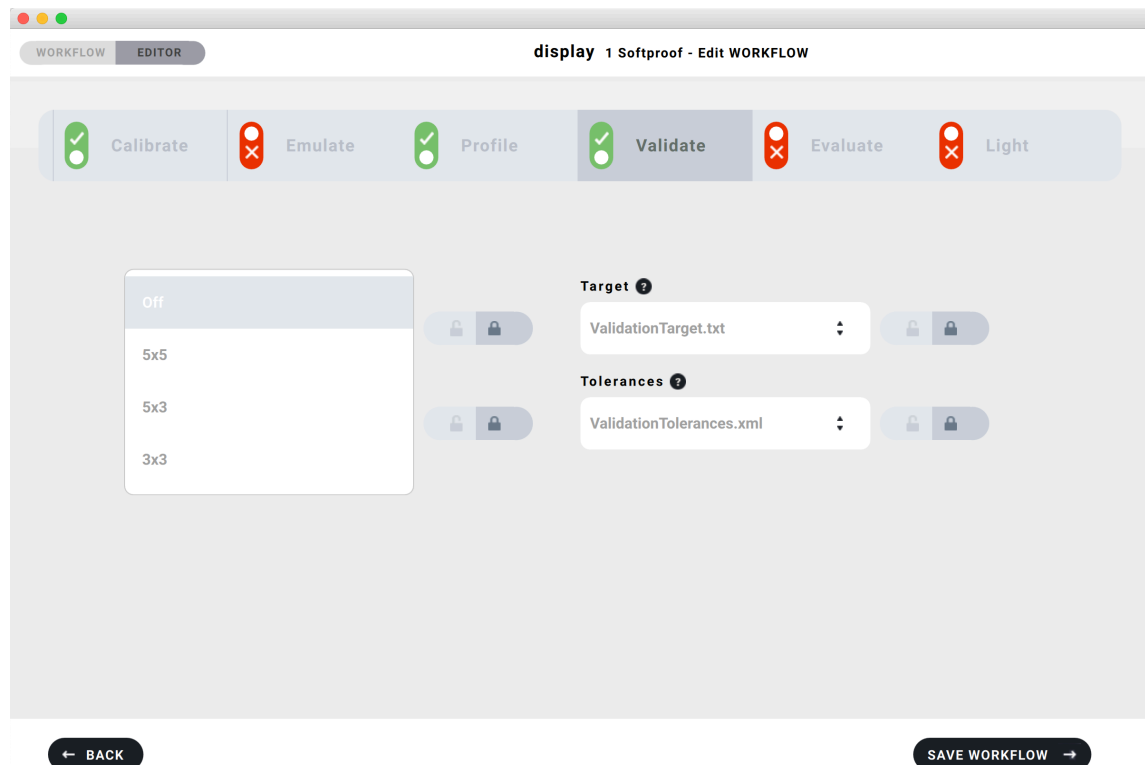
6. basIColor display 6 Pro

6.1. Option

The optional Pro Version offers additional features, which are described here. The Pro Version is activated with a TAN, either retroactively for an already installed and licensed basIColor display 6 or directly when purchasing the Pro Version (see Licensing Manual).

6.2. Uniformity

In the Validation tab the selection "Uniformity" appears.



Here you can set if and with how many measuring fields you want to check the homogeneity of the monitor. The ISO 14861 standard defines the number, position and tolerances of the measuring fields for the graphics industry, the DICOM standard (see 6.3. DICOM) defines these parameters for medical applications. For both cases, the values are stored in basIColor display 6 Pro.

For graphic applications, 25 measuring fields (a 5x5 pattern) are standard-compliant, for DICOM, a total of 5 measuring fields (this is selected with the On selection). For wide format monitors we have added a 5x3 pattern. This is not standard-compliant, but practice-oriented. So, if it is not about a certification of the monitor like Fogra or UGRA, the smaller number of measuring fields can be chosen to evaluate the homogeneity of the monitor, because the deviations mainly occur between the center and the edges of the monitor.

6.3.DICOM

For calibrating and checking monitors for medical reporting basIColor display 6 Pro has its own WORKFLOW and the necessary procedures and settings, e.g. the DICOM tone curve to obtain JNDs (Just Noticeable Differences) on the gray axis.

Validation Results

Date/Time: Sun Nov 1 12:08:22 2020
Display: PA242W
Profile: PA242W-DICOM.icc
Color Space Emulation: Monitor Native
Instrument: i1Display Pro (White LED)

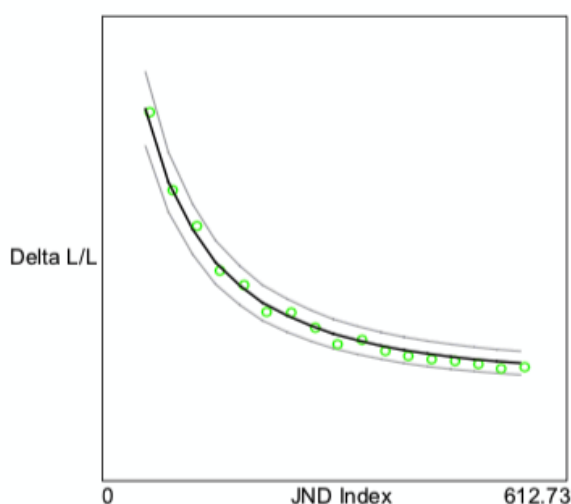
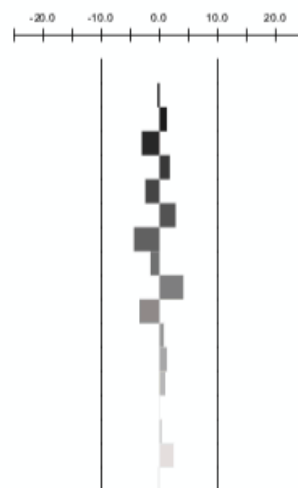
Passed



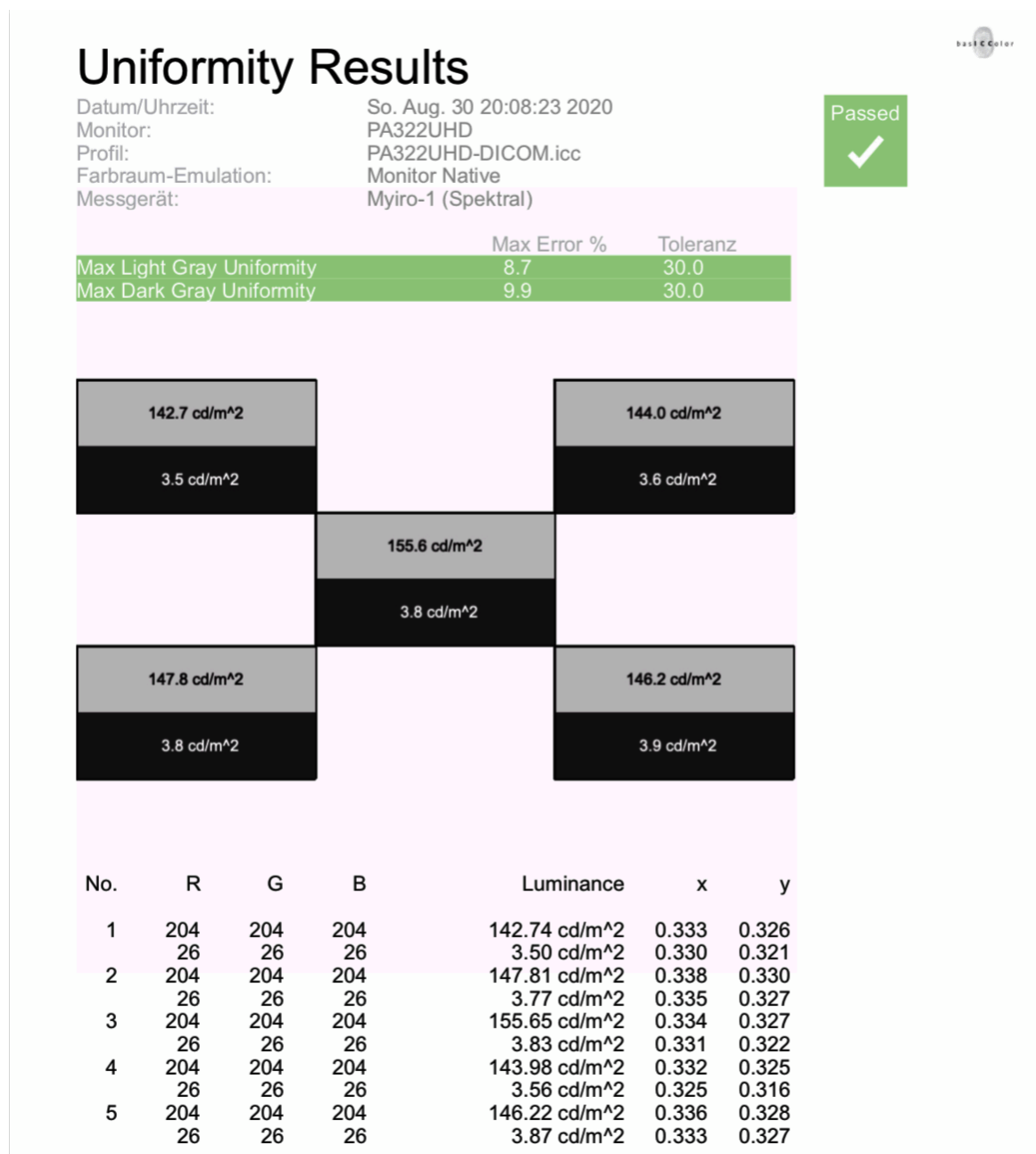
	Target	Achieved	Tolerance
White Point	Monitor Native	$\Delta a -0.2, \Delta b 0.1$	$\Delta ab 2.0$
Tonal Response	DICOM		
White Luminance	$> 170 \text{ cd/m}^2$	265.2 cd/m^2	
Black Luminance	Min Native	0.26 cd/m^2	
Gamma	1:250	1:1020	

	%	Tolerance
Max. Error	-4.40	-10 - +10

No.	Gray Value	Lum.	JND Index	Error %
1	0	0.27	29.24	0.00
2	15	0.82	63.46	-0.37
3	30	1.78	96.96	1.29
4	45	3.26	132.75	-3.05
5	60	5.38	166.23	1.79
6	75	8.31	201.59	-2.45
7	90	12.25	234.71	2.79
8	105	17.46	270.89	-4.40
9	120	24.25	305.95	-1.55
10	135	33.01	338.70	4.12
11	150	44.22	374.47	-3.47
12	165	58.48	408.55	0.78
13	180	76.54	442.43	1.29
14	195	99.32	476.39	1.01
15	210	127.97	510.74	-0.04
16	225	163.93	544.92	0.43
17	240	208.98	578.30	2.43
18	255	265.36	612.73	-0.27

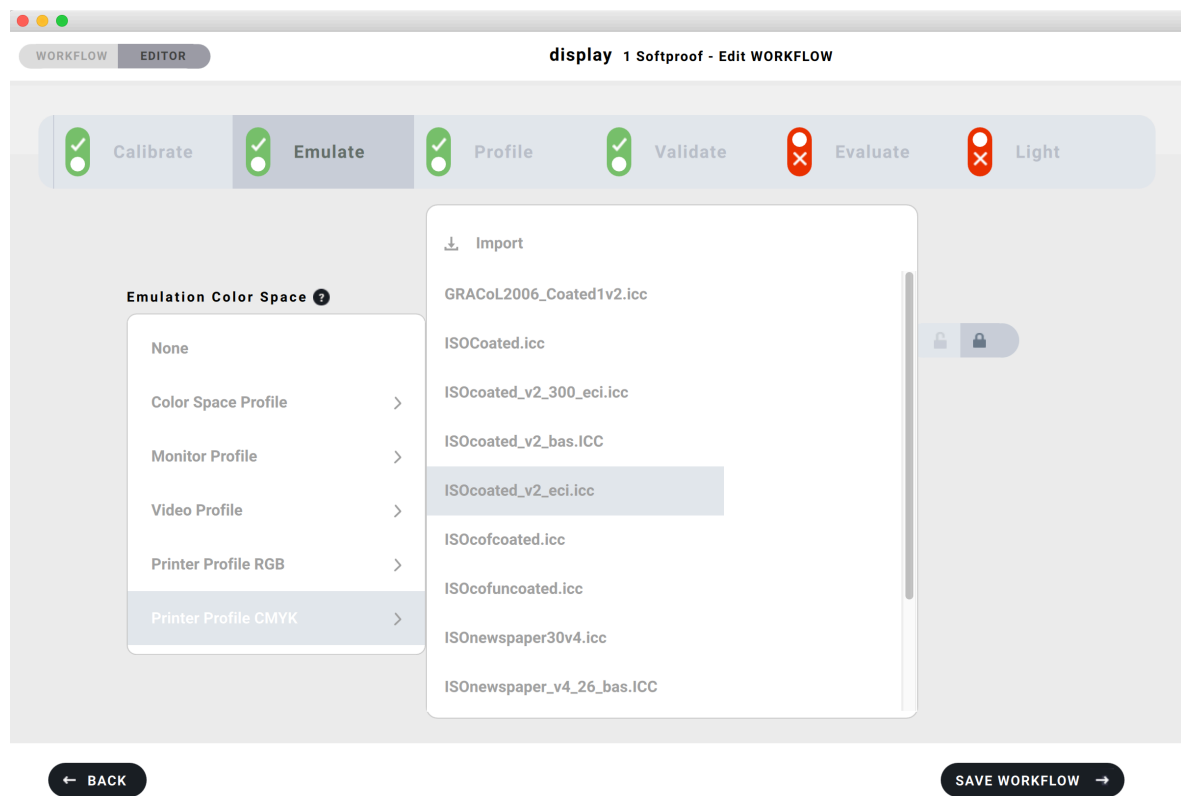


The results of the uniformity measurement are displayed graphically and numerically in the report.



6.4. CMYK-Emulation

In addition to the emulation of RGB color spaces basiCColor display 6 Pro has the ability to emulate and/or check (evaluate) print color spaces in the CMYK color model.



Attention! This calibration method is to be used ONLY for the following case:

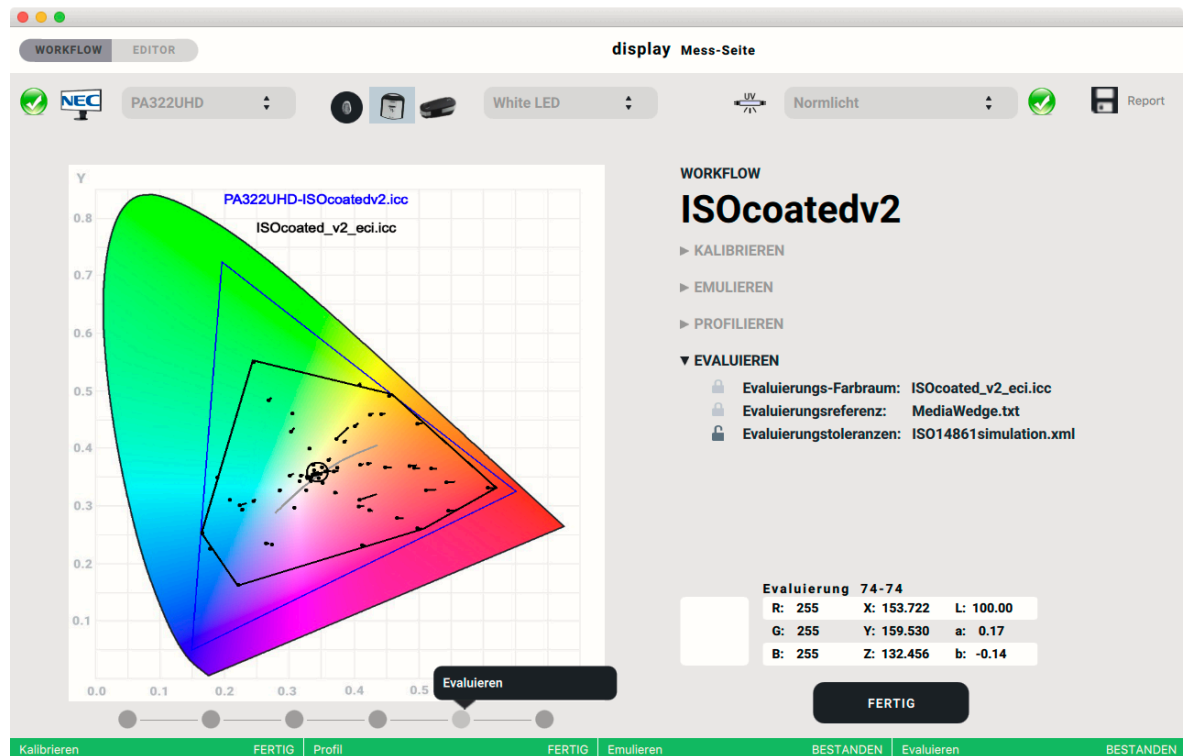
You want to view a CMYK softproof (print preview) without converting the data into this color space or leaving the RGB-based design program. This function is only available in basiCColor display 6 Pro!

So-called wide gamut monitors (gamut = color gamut) from e.g. NEC or EIZO offer the possibility to emulate a smaller color space by a color matrix, a 3D LUT or by setting the primary colors. This can be used to limit the monitor to one printing color space, i.e. to view RGB data as if it had been converted to the CMYK printing color space.

basiCColor display 6 allows to emulate any CMYK color space as long as an ICC profile is available. Therefore we install a number of folders in the system's profile folder, which already contain the most common printing profiles like ISOcoated v PSOcoated, PSOuncoated, ISONewspaper ... Installed print profiles already on your system can of course also be used.

If you activate the tab "Emulate" in a WORKFLOW, or use a ready-made one that contains the emulation, the emulation of the selected color space is executed as part of the calibration. The entire monitor then represents the emulated color space and the profile created describes the monitor calibrated in this way.

Various graphics show the course of the emulation and the result by evaluating the emulated color space. A detailed report proves the conformity of the monitor state and the usability for the desired purpose.

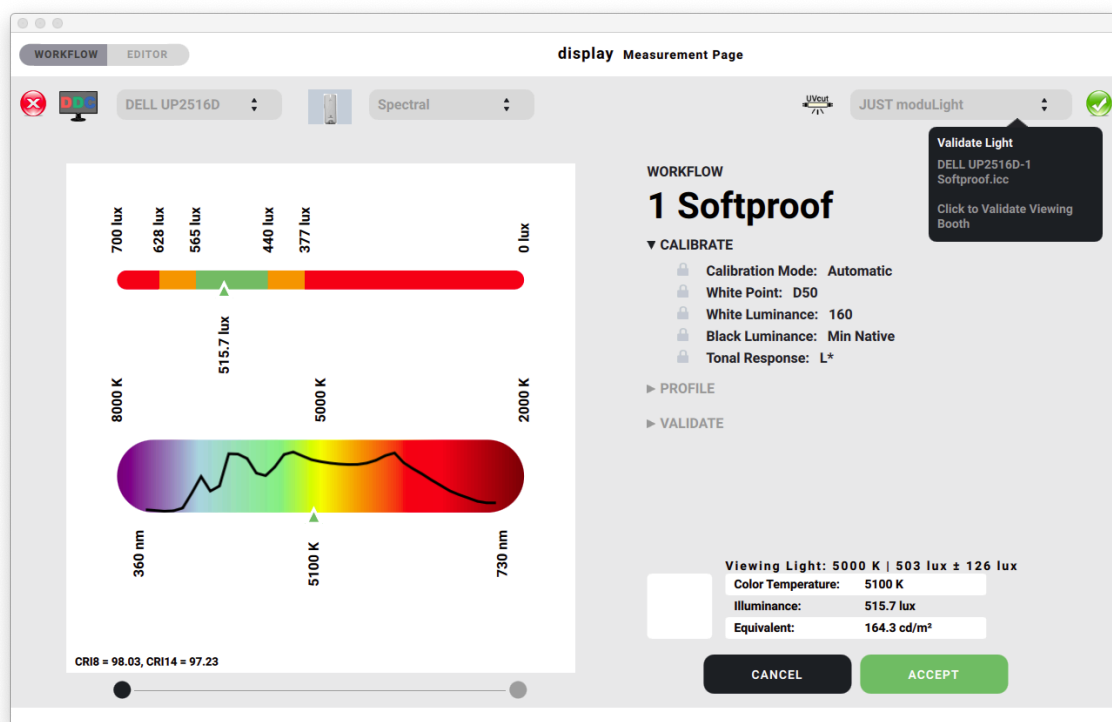


IMPORTANT: The WORKFLOW step "Evaluate" is specifically for this purpose and should not be used with other WORKFLOWS, unless you want to determine whether your monitor is capable of displaying a certain color space. In this case, the tab "Emulate" remains disabled and the tab "Evaluate" is used to check whether a desired color space could be emulated in a meaningful way.

The WORKFLOW step "Validate" does not make sense in case of emulation and should be switched off.

6.5. Spectral light measurement

baslCColor display 6 Pro allows to measure light with a spectrophotometer and shows the spectral curve.



The spectral values can be saved as a CGATS file by clicking on the Spectrum icon and used e.g. in baslCColor input 6 (Pro) as a light source for profiling.

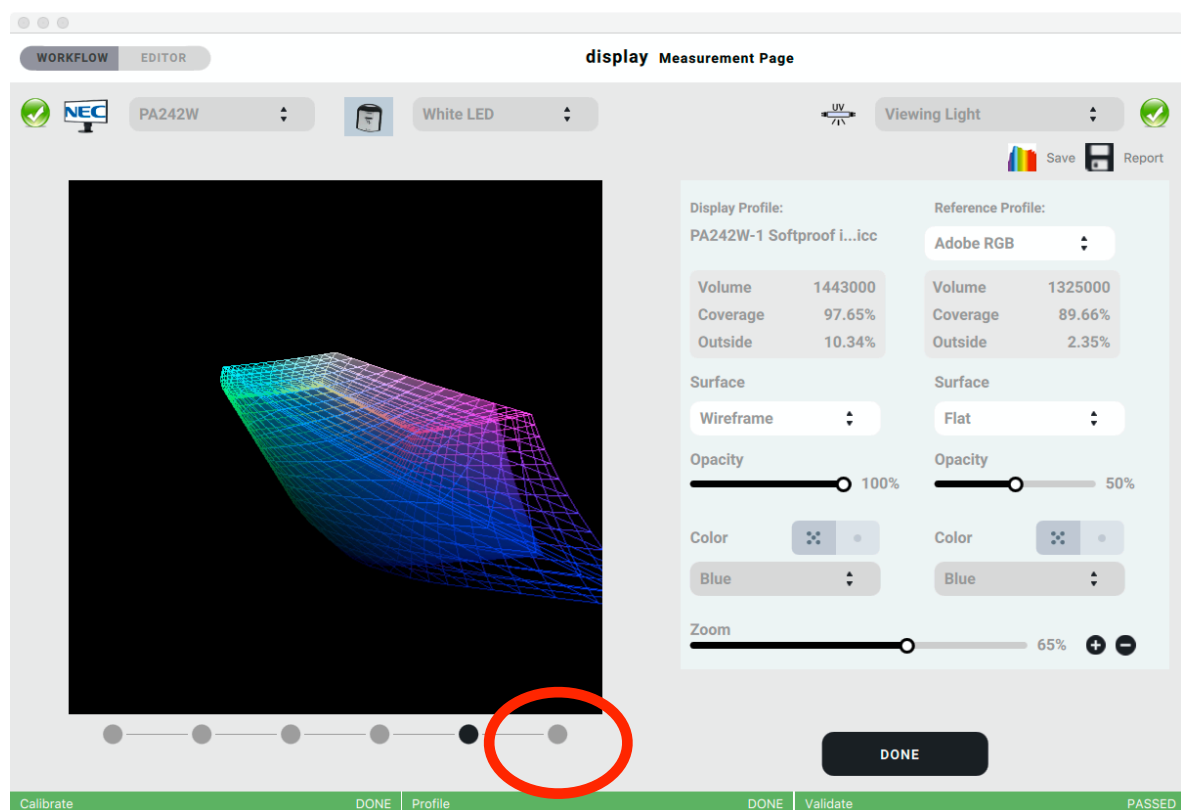
The report for the light measurement additionally shows the Color Rendering Index (CRI), both in the general form and the extended CRI. The general CRI uses 8 spectral reference colors and evaluates the color rendering under the measured light against standard light D50.

6.6. White Point Editor

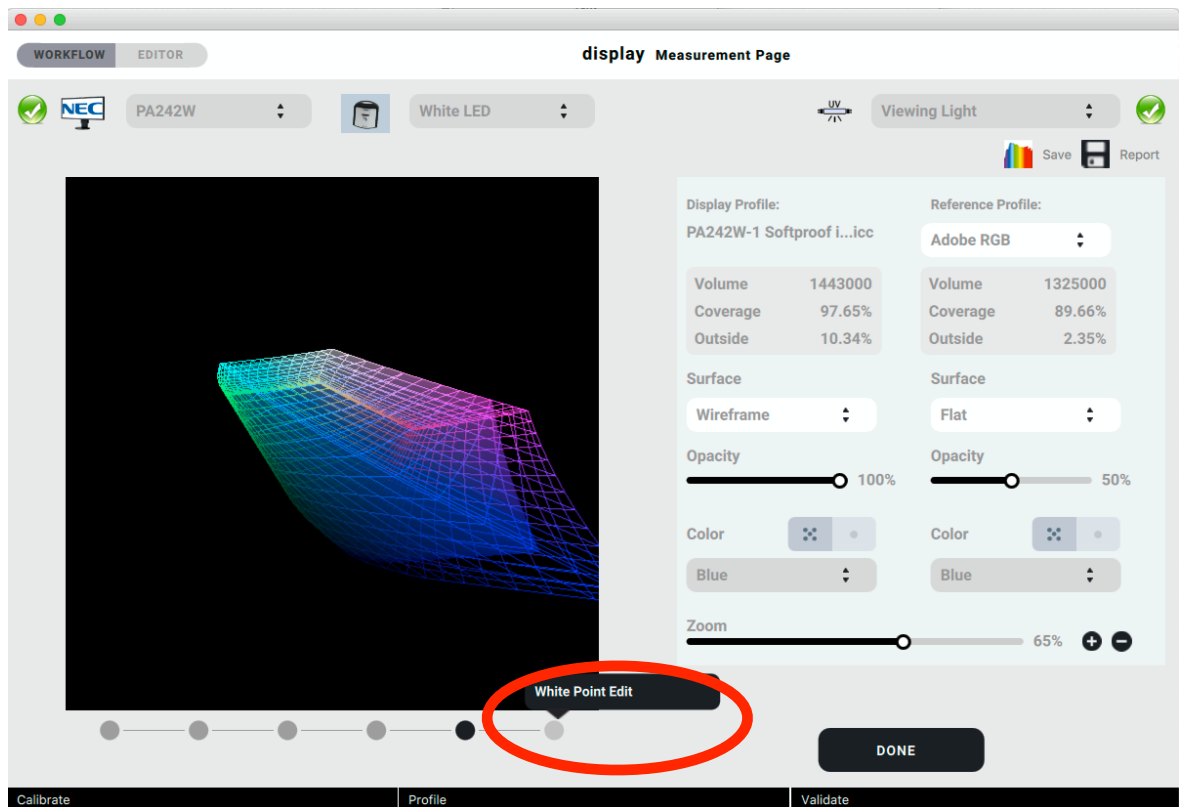
The white point editor serves several purposes:

- Adjustment of several monitors to each other, if due to sensor metamerism of the measuring devices no visual agreement is achieved with different monitor types, despite identically measured values.
- Adjustment of several monitors to each other, if no visual agreement of several monitors is achieved by observer metamerism.
- Adapting a colorimeter to a reference instrument (e.g. spectrometer).

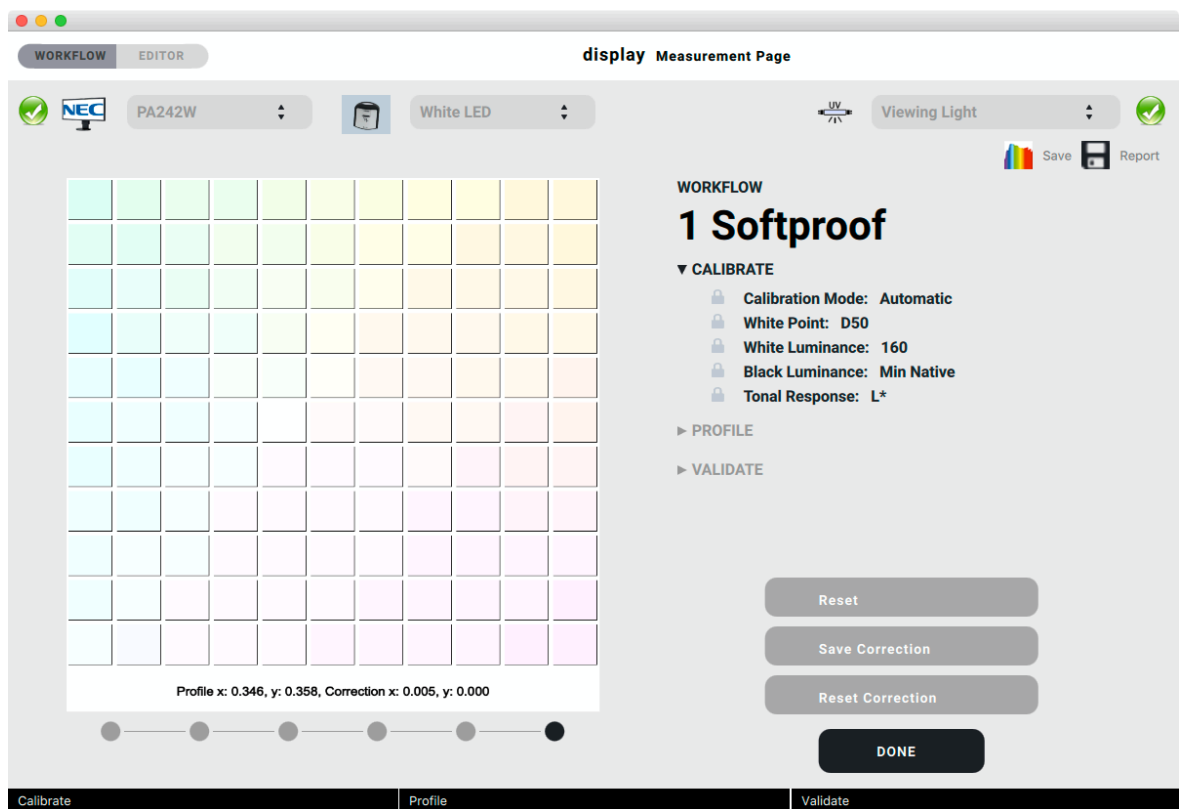
The white point editor can be called up directly after a WORKFLOW has been executed by clicking on the last point of the progress bar. This point is not jumped to automatically like the other points, since editing the white point is not a task that is performed in every WORKFLOW.



The editor can be opened later by activating the desired WORKFLOW with the profile to be edited and clicking on the "Active WORKFLOW" button. Then click again on the last - not active - point in the progress bar.



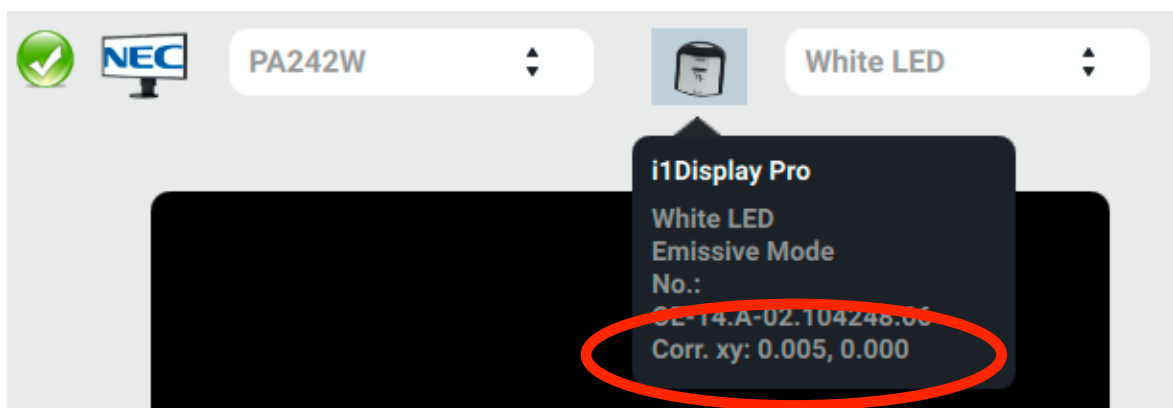
On the now appearing grid, color squares are arranged in the xy color model at a distance of 0.005 x- and y-values.



Now the white point can be changed accordingly by clicking in one of the color fields - in our example the first one to the right of the center. The x-value changes by +0.005.

It makes sense to simultaneously display a neutral black/white image on the monitor whose white point is to be changed or on the monitors that are to be adjusted to each other in an image editing software (e.g. Adobe® Photoshop) in order to visually evaluate the result of the editing along the entire gray axis.

The interactive white point changes are achieved through the VideoLuts of the active monitor. They are, however, approximations. Once you achieved the color you want you need to click on "Save Correction". This stores the x and y correction for the active monitor and the active instrument ONLY. You can verify the correction in the tooltip of the active instrument.

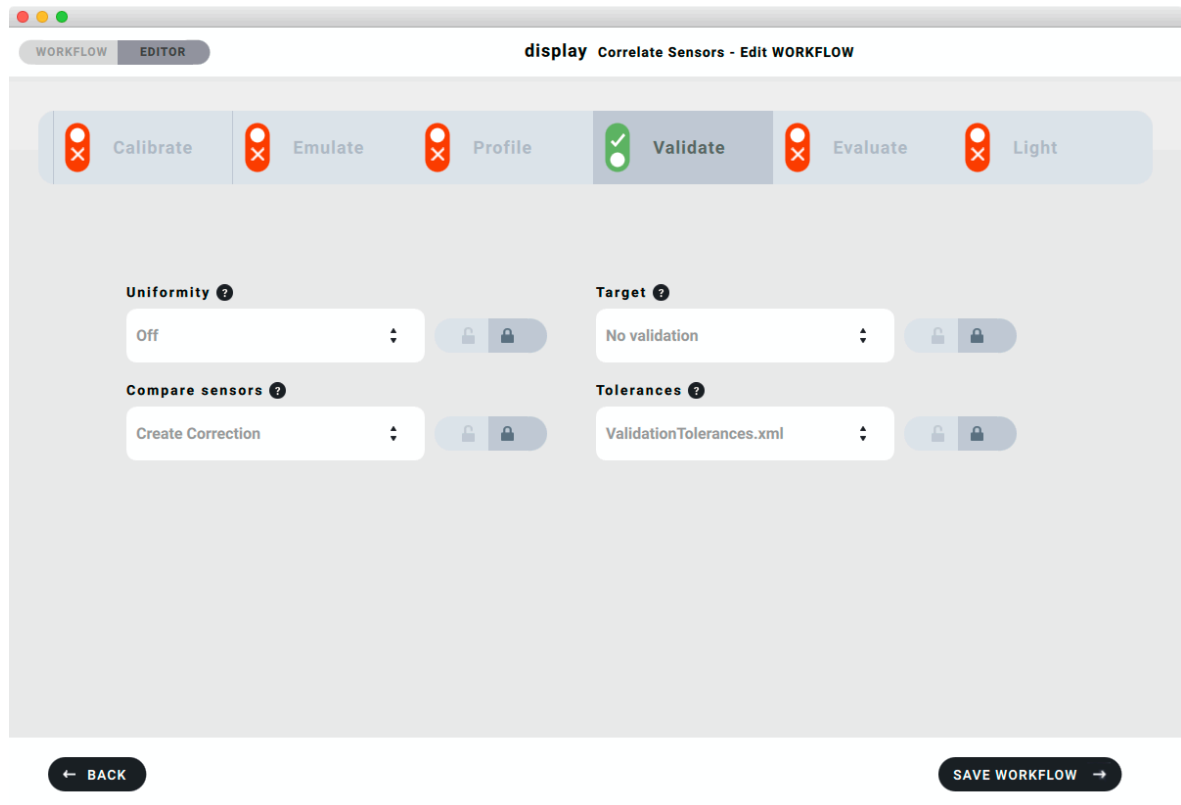


To remove the correction go back to White Point Edit and click "Reset Correction".

The white point correction will be applied to every measurement from now on, so recalibrate your monitor for the final result.

6.7. Sensor Correlation

In basICColor display 6 Pro, monitor measurement devices can be correlated with another, (preferably) high-quality measurement device. This ensures that the measurements of different sensors are (as far as possible) comparable to the measurements of a reference measuring device and to each other. A perfect match cannot be guaranteed due to the different designs.



To start a WORKFLOW with sensor correction, the reference instrument must first be selected as the active measuring instrument, in our example the MYIRO-1.

After starting the reference measurement with "MEASURE", the reference device measures a series of colors on the monitor, then basICColor display 6 Pro prompts you to connect another measurement device and (or if already connected) select and click into this field to collect data from another measurement device.

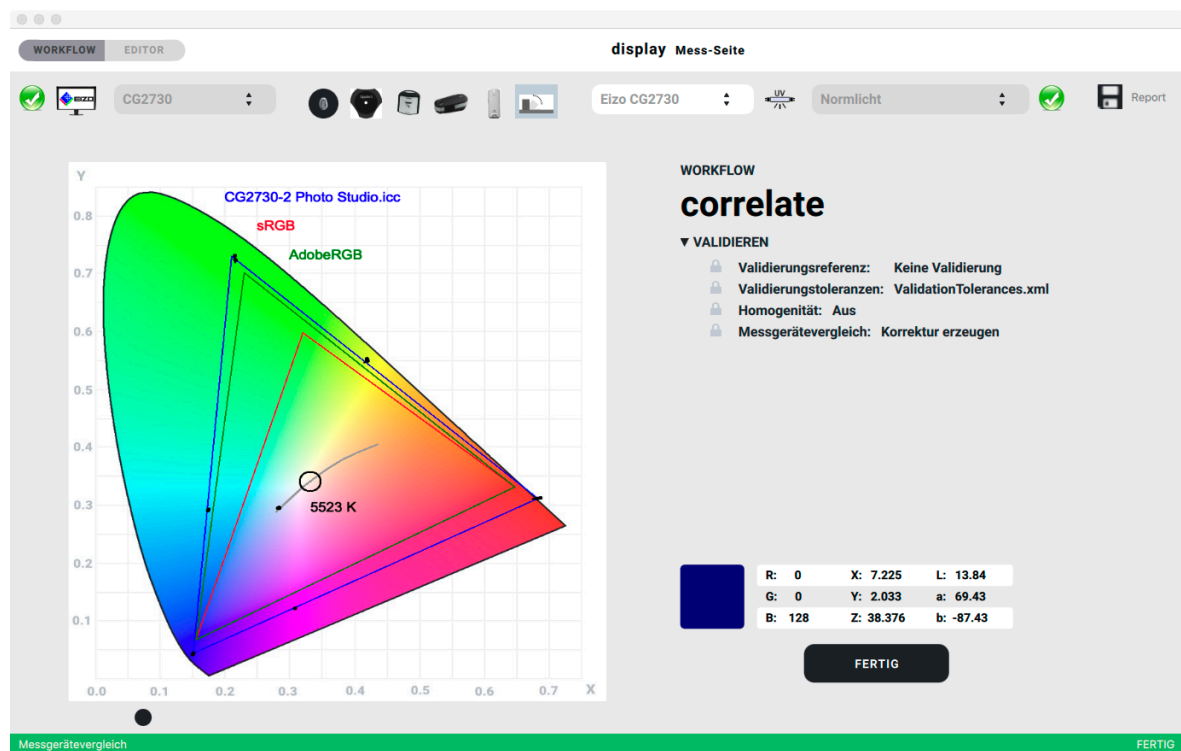


After you had measured with two (or more) measuring devices, the same message appears plus another option:

Correlate Measured Sensors

Now you can decide to correlate all sensors you have used so far, or you can select another one or even disconnect the first, already corrected measuring device and connect and select the next instrument. This procedure can be repeated as often as you like.

If you click on "Correlate measured sensors", the process is completed and the "Report" icon appears in the upper right corner with which you can save a detailed report.



6.8. Correlation Report

The report allows a before/after comparison of the measuring devices.

Uncorrected:

Reference Instrument: Myiro-1 (S/N: 10001018, Spectral)		ΔE_{00} Avg. Max.	
Instrument:	i1Pro II (S/N: 1000969, Spectral)	0.41	0.87
Instrument:	i1Pro (S/N: 100201, Spectral)	2.61	5.26
Instrument:	i1Studio (Spectral)	6.54	10.78
Instrument:	i1Display Pro (S/N: OE-14.A-02.104248.06, White LED)	2.01	6.39
Instrument:	Spyder 5 (S/N: 50035848, White LED)	3.12	5.86
Instrument:	Spyder X (S/N: 60076575, Wide LED)	1.70	5.59
Instrument:	Eizo Sensor (Eizo CG246)	3.17	7.96
Instrument:	basICColor DISCUS (S/N: 084011385431F, EIZO CG246W)	4.51	13.66

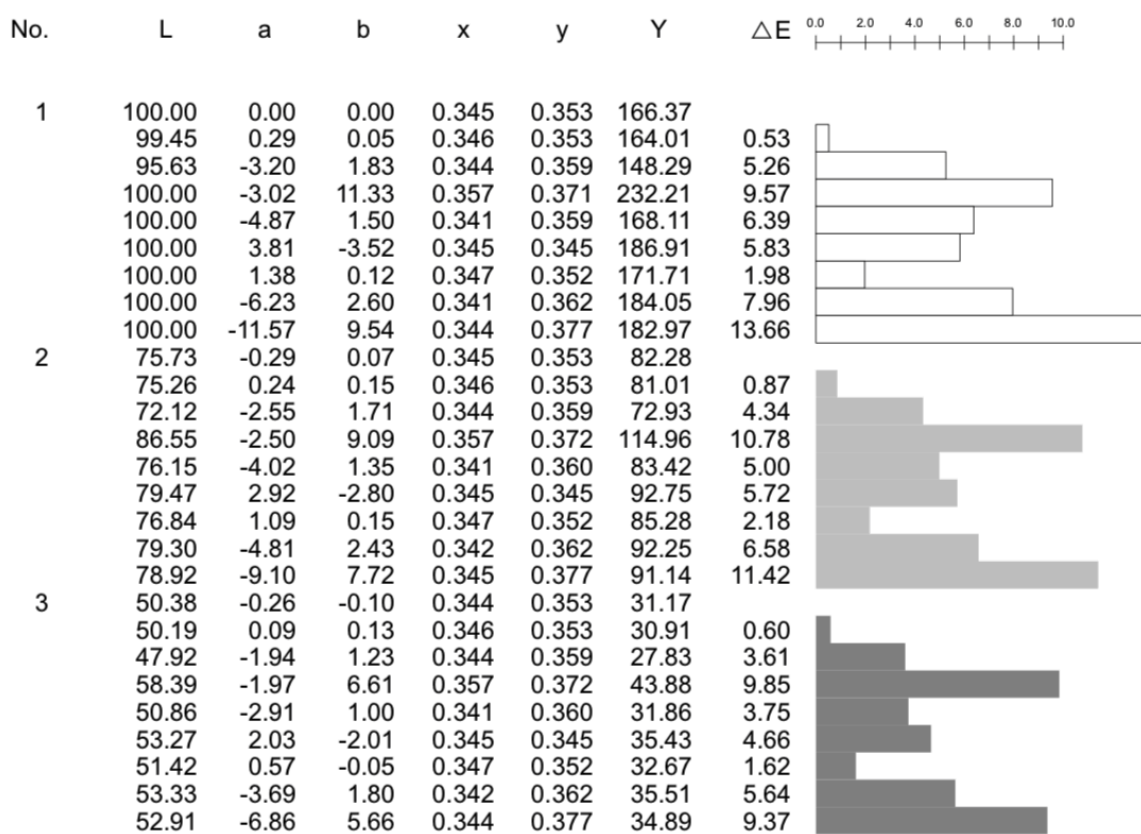
Corrected:

Reference Instrument: Myiro-1 (S/N: 10001018, Spectral)		ΔE_{00} Avg. Max.	
Instrument:	i1Pro II (S/N: 1000969, Spectral) Correlated with Myiro-1_10001018_Spectral	0.30	0.72
Instrument:	i1Pro (S/N: 100201, Spectral) Correlated with Myiro-1_10001018_Spectral	0.38	0.95
Instrument:	i1Studio (Spectral) Correlated with Myiro-1_10001018_Spectral	0.27	0.63
Instrument:	i1Display Pro (S/N: OE-14.A-02.104248.06, White LED) Correlated with Myiro-1_10001018_Spectral	0.30	0.91
Instrument:	Spyder 5 (S/N: 50035848, White LED) Correlated with Myiro-1_10001018_Spectral	0.25	0.46
Instrument:	Spyder X (S/N: 60076575, Wide LED) Correlated with Myiro-1_10001018_Spectral	0.56	1.60
Instrument:	Eizo Sensor (Eizo CG246) Correlated with Myiro-1_10001018_Spectral	0.48	1.00
Instrument:	basICColor DISCUS (S/N: 084011385431F, EIZO CG246W) Correlated with Myiro-1_10001018_Spectral	0.30	0.54

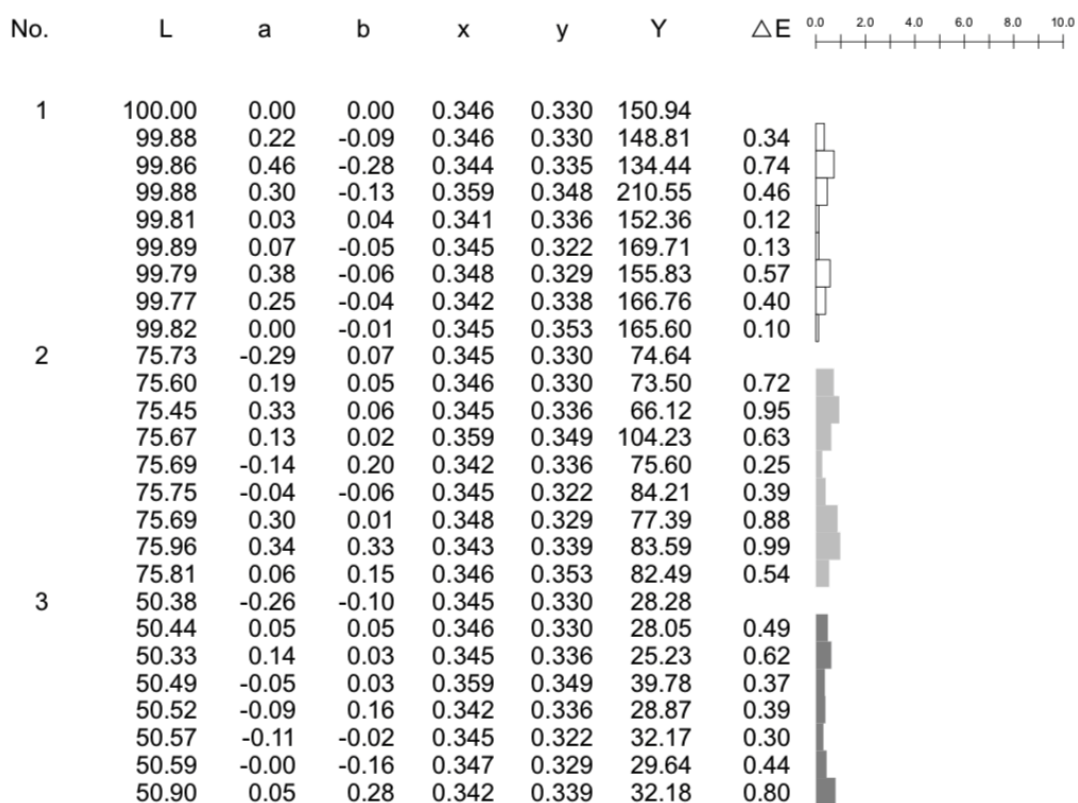
The deviations of the measuring devices have been reduced on average from a maximum of 6.5 ΔE_{00} to 0.5 ΔE_{00} , the maximum deviations from 13.6 ΔE_{00} to 1 ΔE_{00} (with only one outlier upwards).

In addition to the numerical evaluation, the values of all measuring devices on all color patches are displayed graphically, here an extract from the report:

Uncorrected:



Corrected:



We see that the accuracy in the gray axis has been improved for all measuring instruments at 1 ΔE_{00} .

The largest color deviation (i1Studio, Cyan) of over 9 ΔE_{00}

12	87.03	-98.71	-21.03	0.173	0.377	116.57		
	86.79	-97.29	-20.77	0.175	0.376	115.77	0.30	
	84.01	-94.82	-17.49	0.178	0.384	106.63	2.42	
	99.43	-115.72	-12.11	0.180	0.406	163.92	9.17	
	88.54	-98.29	-18.19	0.179	0.383	121.76	1.49	
	90.83	-102.68	-25.23	0.169	0.368	129.94	2.86	
	88.62	-98.94	-19.91	0.177	0.379	122.04	1.12	
	90.99	-103.25	-18.91	0.176	0.384	130.53	2.87	
	91.21	-109.03	-10.29	0.179	0.410	131.34	5.77	

was reduced to near 0 ΔE_{00} :

12	87.03	-98.71	-21.03	0.168	0.344	103.71		
	87.08	-98.60	-21.05	0.170	0.344	103.01	0.04	
	87.06	-98.57	-21.65	0.173	0.351	94.88	0.26	
	87.03	-98.52	-21.18	0.174	0.373	145.73	0.08	
	87.10	-98.82	-21.09	0.174	0.351	108.35	0.05	
	87.06	-98.86	-21.08	0.164	0.336	115.59	0.03	
	87.03	-98.49	-21.14	0.171	0.347	108.60	0.07	
	87.02	-98.75	-21.16	0.170	0.352	116.11	0.05	
	87.08	-98.66	-21.04	0.173	0.377	116.74	0.03	

All corrections are stored as .ccmx files in a new "Instruments" folder for each monitor on which a correlation has been made, in a monitor-specific folder. This specific correction is applied the next time the corrected instrument is measured on the respective monitor.

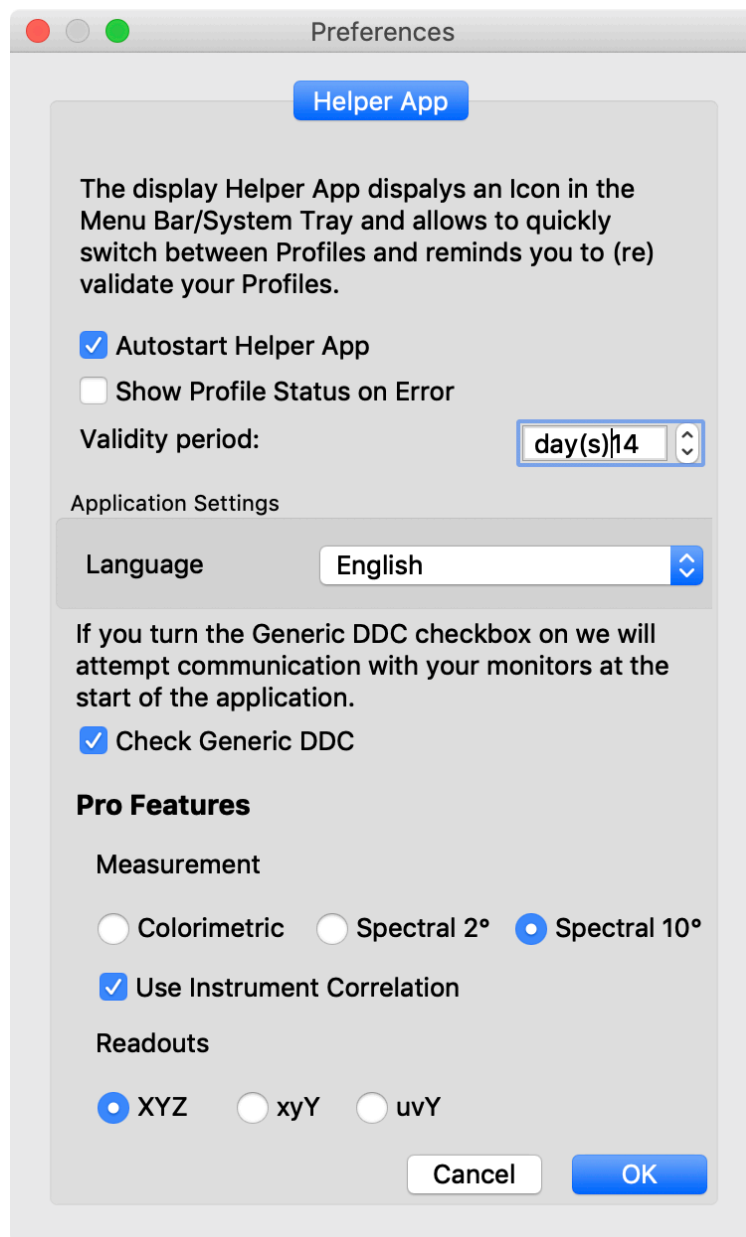
Why so complicated?

Colorimeters have sensor metamerism due to their design. The manufacturer tries to reduce this by using prefabricated correction matrices. With the i1 Display Pro, for example, you can choose between 8 corrections for different monitor technologies, with the Spyder 5 between 4 global corrections for different backlights, with basiCColor DISCUS between 30 (more are reloadable) corrections for monitor models.

basiCColor display 6 Pro allows you to optimize each measurement device for each individual monitor to achieve optimal results that are as close as possible to a reference device.

7. Preferences

Under "baslCColor display" in the menu bar (Mac) or under "File" (PC) you will find "Preferences...".



7.1. Autostart Helper App

Starts the Helper application after quitting baslCColor display. On Mac you will find it in the menu bar in the upper right corner, on PC in the system tray. While baslCColor display is active, the Helper App is inactive (gray icon).

7.2. Show Profile Status on Error

Warns if the set validity period of the profile is exceeded.

7.3. Validity Period

Here you can set the time after which you want to be reminded of a new calibration.

7.4. Language

Changes the GUI language after restarting baslCColor display

7.5. Check Generic DDC

This option should only be activated if your monitor is not hardware-calibratable and you don't know if it supports the DDC/CI commands (If you only use Apple monitors, this option can be switched off, since neither of these applies). The program will take a little longer to start if this option is activated.

Pro Features

7.6. Measurement

When using a spectrometer you can either obtain colorimetric values from the instrument or you can have baslCColor display 6 Pro calculate the colorimetric values for 2 different observers,

7.7. Use Instrument Correlation

If you correlated 1 or more instruments you can switch the correction matrices on or off by checking/unchecking this box.

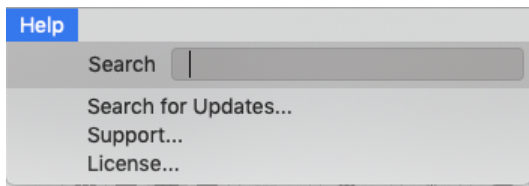
7.8. Readouts

You can switch the measurement readouts from XYZ to xyY or uvY with their radio buttons.

8. Help

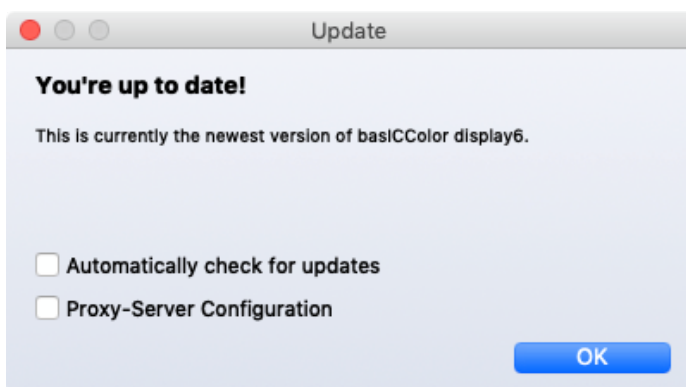
Under Help you have the following choices

8.1. Search for updates...



Activate the option "Automatically check for updates". When the program is started, baslCColor server checks whether a new program version is available and suggests it for download.

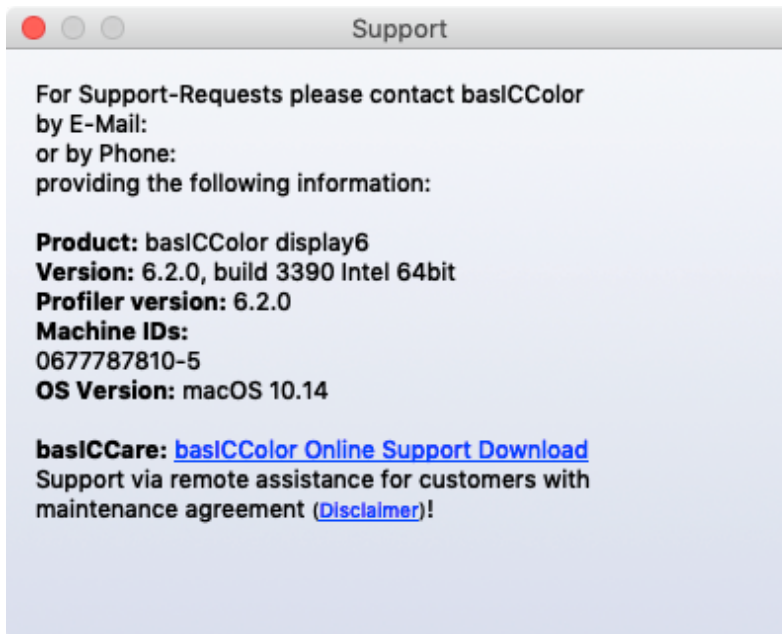
NOTE: Since this does not work reliably with every system, it is recommended to check regularly at www.basiccolor.de to see if a new version is available. The licenses are valid for all major versions, e.g. 6.1.0 to 6.2.0.



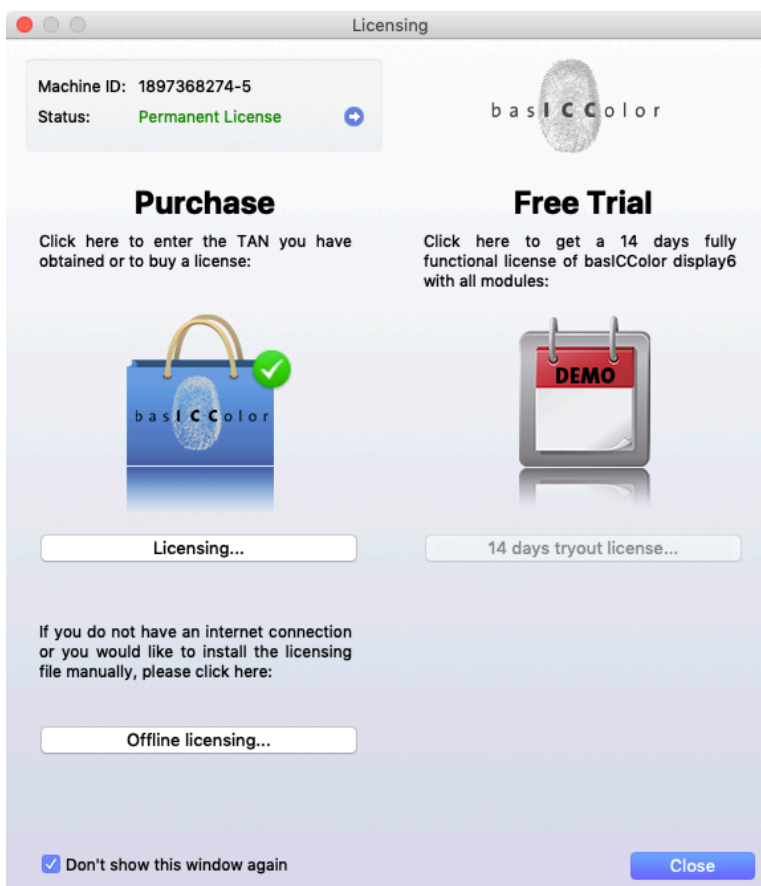
The proxy server configuration is only needed if there is an active proxy server in your network that prevents a connection to the baslCColor server - ask your system administrator.

8.2. Support...

Here you will find information about the program version and a download link to the TeamViewer software that we can use to access your computer in case of support.



8.3. License...



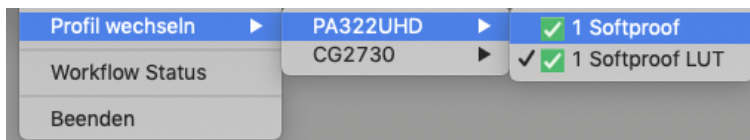
Please refer to the document "EN - basIColor Licensing.pdf", which is installed with the software in the folder "PDF Manuals".

9. display Helper

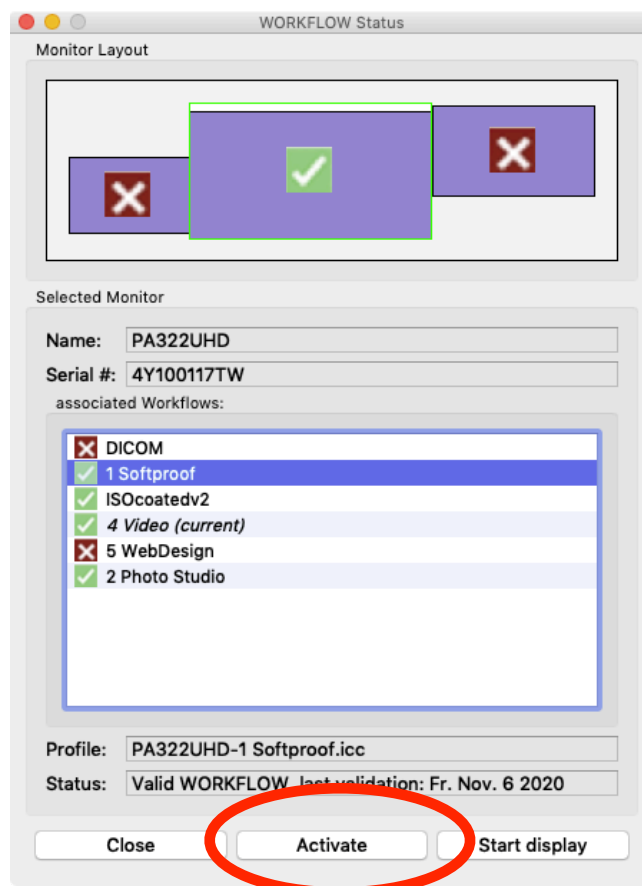
Together with basIColor display 6 we install a control panel, a helper app, which becomes active when basIColor display is closed and if the „Autostart Helper App“ checkmark in Preferences is checked .

It warns when a recalibration is necessary. The interval for the reminder is set in basIColor display 6 under "Preferences...". see para 7.2.

You can also switch WORKFLOWS (calibration and profile) directly in the helper app without opening basIColor display 6.



The WORKFLOW Status window shows an overview of connected monitors and their status. You can also switch the WORKFLOWS (profiles) here ("activate") or start basIColor display 6 ("start display").



10. List of Supported Hardware (as of November 2020)

10.1. Colorimeters

baslCColor DISCUS
baslCColor SQUID 3 (X-Rite i1Display Pro), Datacolor Spyder 3 (Windows only), Datacolor Spyder 4 (Windows only), Datacolor Spyder 5
Datacolor SpyderX
EIZO Swing
EIZO Calibration Sensor
NEC SpectraSensor Pro (X-Rite i1Display Pro) X-Rite i1Display Pro
X-Rite i1Display Pro Plus

(Klein Instruments – in the pipeline)

10.2. Spectrometers

Konica Minolta FD-7
Konica Minolta MYIRO-1 USB and WLAN
X-Rite i1 Pro, X-Rite i1 Pro 2, X-Rite i1Pro 3, X-Rite i1Pro 3 Plus
X-Rite i1Studio

10.3. Monitors (hardware-calibratable)

Eizo:

CG210, CG211, CG220, CG221, CG241W, CG301W, CG222W, CG232W, CG242W, CG243W, CG210, CG211, CG220, CG221, CG241W, CG301W, CG222W, CG232W, CG242W, CG243W, CG223W, CG245W, CG303W, CG275W, CG246, CG276, CG277, CG247, CG247X, CG248, CG318, CG2420, CG2730, CG279X, CG3145, CG319X, CG3146 CE210W, CE240W

CX240, CX270, CX271, CX241
CS230, CS240, CS270, CS2420, CS2730, CS2731, CS2740

NEC:

PA241, PA271, PA231, PA301
PA242W, PA272W, PA302W, PA242W
PA322UHD, PA322UHD2, PA243W
EA244UHD, EA304WMi, EA275WMi, EA275UHD, EA305WMi, EX241UN, EA245WMi, EX341R, EA295WMi, EA271F, EA245WMi2, EA271Q, EA271U, EA241WU, EA231WU
X841UHD, X981UHD, X651UHD, X841UHD2, X981UHD2, X651UHD2, X551UHD
P404, P484, P554, V404, V484, V554, V404-T, V484-T, V554-T, V554Q
P654Q, V654Q, C651Q, P754Q, V754Q, C751Q, V864Q, C861Q, V984Q, C981Q
PA271Q, PA311D
UN462VA, UN552, UN552S, UN552VS, UN492S, UN492SVS, UN552A, UX552S

10.4. Monitors (DDC/CI)

We also support generic DDC protocol, it is impossible to say which monitors react to that. Tested: Cinema HD (brightness only), Dell UP2516D (brightness and RGB gains), HP Dreamcolor (brightness and RGB gains), some LG monitors. BenQ SV271 pretends to support the protocol, but the screen doesn't change .

10.5. Viewing Lights

basIColor diLIGHT

basIColor LEDlight

JUST Color Communicator 2

JUST moduLight (with D50 & D65 LED, and with UV LED)

LacunaSolutions SmartLightningSystem

11. Product information basIColor display 6

11.1. Copyright Information

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11.3. Credits

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