Manual macOS

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Contents

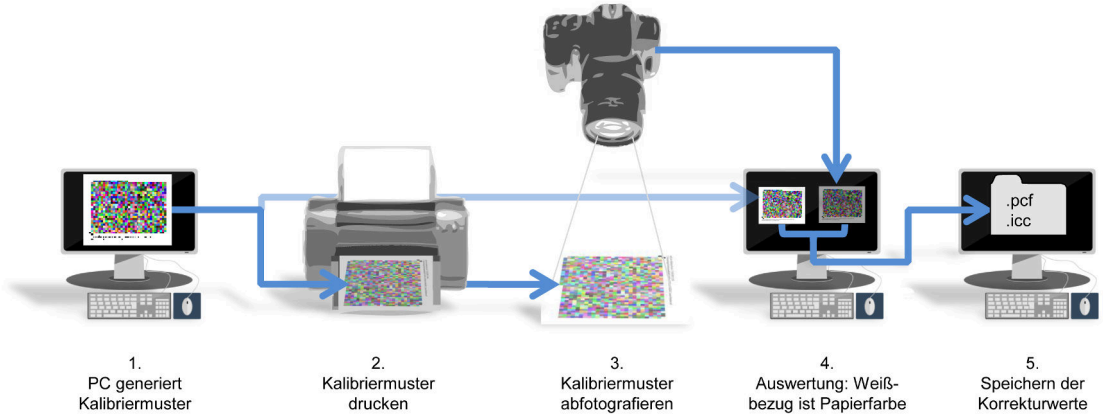
1 What is colymp?

colymp is a system for color calibration of a printer with the help of a digital camera. Here color defects of camera and printer are corrected at the same time. With colymp you can print your images in true color.

colymp is not an image manipulation program. For image manipulation you can use a software of your choice and use it simultaneously with colymp.

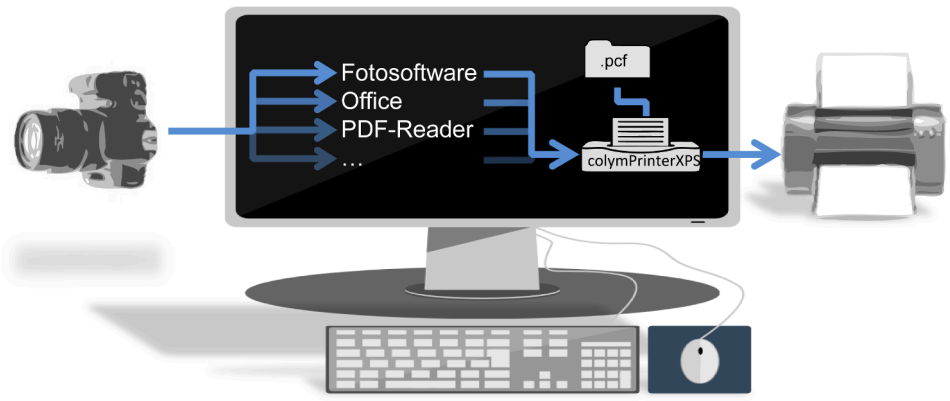
1.1 colymp

In colymp you perform the calibration of the printer:



1.2 colymPrinterXPS

Unter macOS ist im Gegensatz zu Windows kein virtueller Drucker (colymPrinterXPS) notwendig und deshalb auch in colymp nicht enthalten. Sie können unter macOS bei jedem Druckvorgang die in colymp erstellte Kalibrierung mit Hilfe von `ColorSync` verwenden, um damit farblich richtige Drucke zu erhalten (section 4).



2 Installation

2.1 Installation

You need the program package `colymp-x.x.xxx.pkg`, available on the homepage at https://www.colymp.com/pages/download. It contains all necessary files including documentation.

Save the file in a directory on your Mac and start the installation with a double click on `colymp-x.x.xxx.pkg`. You will be guided step by step through the installation process. A restart of the computer is not necessary after the installation.

2.2 Update

If you have already installed colymp, you can install an update to a new version of colymp simply by downloading the new `colymp-x.x.xxx.pkg` and double-clicking on it.

2.3 Evaluate colymp

You can evaluate colymp without prior purchase. The only limitation is that you cannot export the generated ICC profile. However, you have the possibility to load a test image within colymp and print or save it using the generated ICC profile (see subsubsection 3.1.7).

Just choose `Evaluation Version` when you start colymp:

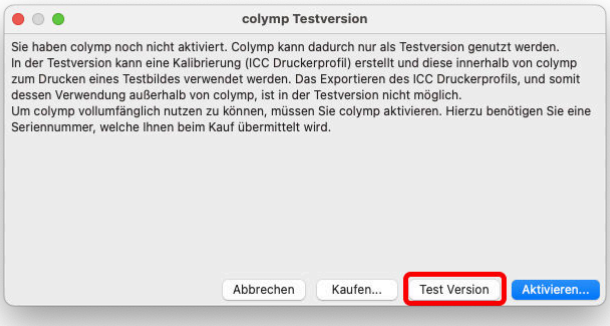


Figure 1: colymp can be evaluated before purchase

2.4 Activate colymp

In order to use colymp without restrictions, you need to activate the software. For this you need the serial number, which will be sent to you at the time of purchase. The activation requires a connection to the Internet and takes only a few moments (Figure 2).

Figure 2: Activation colymp

If an internet connection is not possible or not wanted, there is the possibility `Activate offline...`: This creates a file, which you send to us by e-mail (if necessary, from another computer). The afterwards, automatically, generated e-mail response you can then open in colymp (Figure 3).

Figure 3: Activation colymp without direct internet connection

Online activation takes place within a few seconds. Activation by e-mail may take a little longer. After the activation is done, you will receive a confirmation and you can use colymp.

3 colymp: Create a calibration [1]

With colymp you create a calibration. This is used to optimally adjust the printer to the digital camera. For this purpose, a test chart is printed out on the printer. The printout is then photographed with your camera. The photograph is then evaluated and colymp calculates a correction table[2].

The created calibration will then allow you to print the images from your camera optimally on your printer. Since the color reproduction of the camera or printer depends on very many factors, you should create a separate calibration for each variant. The number is not limited by colymp. In a calibration not only the correction table is saved, but also the printer settings (resolution, speed, quality, paper settings...)[3].

A completed calibration can also be reloaded into colymp later, for example to check the print settings. However, we recommend not to change it subsequently. If changes are nevertheless to be made, we recommend saving the calibration under a new name and, if possible, repeating the complete calibration process, i.e. printing, photographing and evaluating.

A calibration is saved as a .pcf file. Storage location and file name are freely selectable. It can also be copied without any problems. However, it is normally not possible to use it on another computer: As already mentioned, the printer settings are also stored in a calibration. These settings are driver specific and therefore not transferable. Attempting to do so will usually result in an error message. Furthermore, the color reproduction of identical printers is not necessarily identical. We therefore advise you to recreate a calibration on each system.

3.1 Calibration Procedure

At startup, colymp automatically creates a new calibration and appears with the following dialog box:

[1] We use the term “calibration” here. In fact, the process is an “adjustment”. However, experience shows that “adjustment” is too little used. In the field of color management, this process is also called “profiling”

[2] This correction table is a (printer) ICC color profile that can also be exported and used in other software (see subsubsection 3.1.7)

[3] Instead of “calibration” one could also speak of “print configuration”. By the way, Colymp saves the calibration as *.pcf file (“printer configuration”)

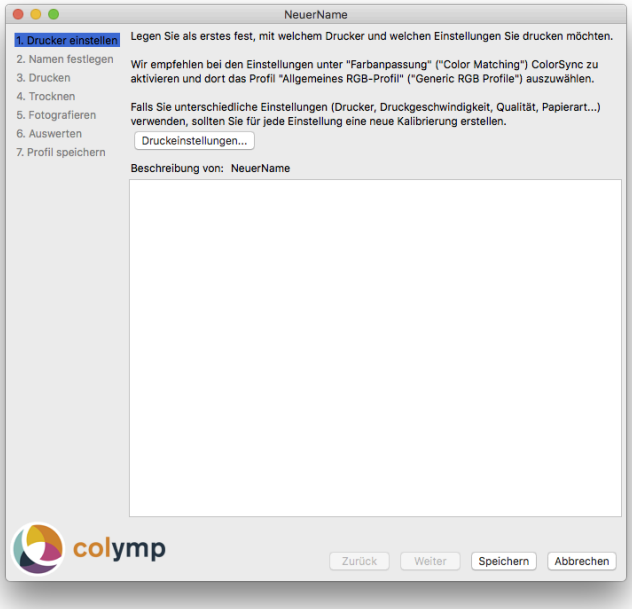


Figure 4: colymp guides you step by step through the calibration process

3.1.1 Setup Printer

First select the printer and settings you want to print with: Printer, Paper Type, Print Speed and Quality, Resolution, Paper Size. Since these settings have an impact on color reproduction, you should create a separate calibration for each change. You can create as many calibrations as you like with colymp.

For the setting under `ColorMatching` we recommend to activate `ColorSync`[4] and there to select the profile `Generic RGB Profile` (Figure 5). In this case the ICC profile created in the following can be used later with the help of `ColorSync` without further ado for printing from any program.

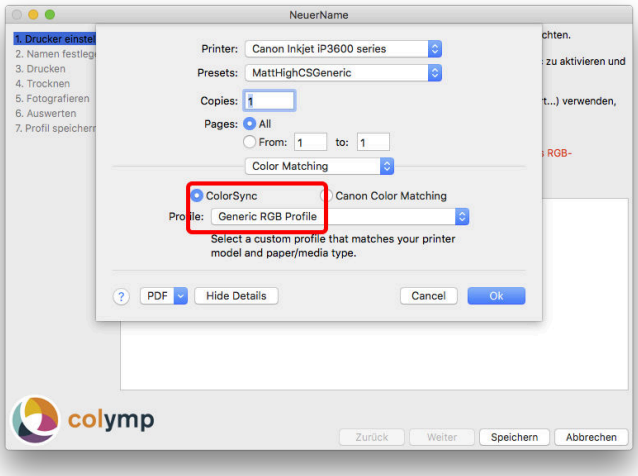


Figure 5: Print settings for calibration printing: under `Color Matching` activate `ColorSync` and there select the profile `Generic RGB Profile`.

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It is also advisable to save the printer driver settings as `Preset` in the settings dialog: Figure 6. This way you can later, when using the ICC profile, call this `Preset`, then select the new profile under `ColorSync` and then save it again as `Preset` (subsubsection 3.1.7).

[4]. If the entry `ColorMatching` (`Color Matching`) should not be displayed for your printer, only an `AirPrint driver` (from Apple) is installed for your printer. In this case it is necessary to install the driver of the printer manufacturer. For more information, see e.g. here https://support.apple.com/de-de/guide/mac-help/mchlp1077/mac or http://www.colourphil.co.uk/printing-mac_colour_problems.shtml

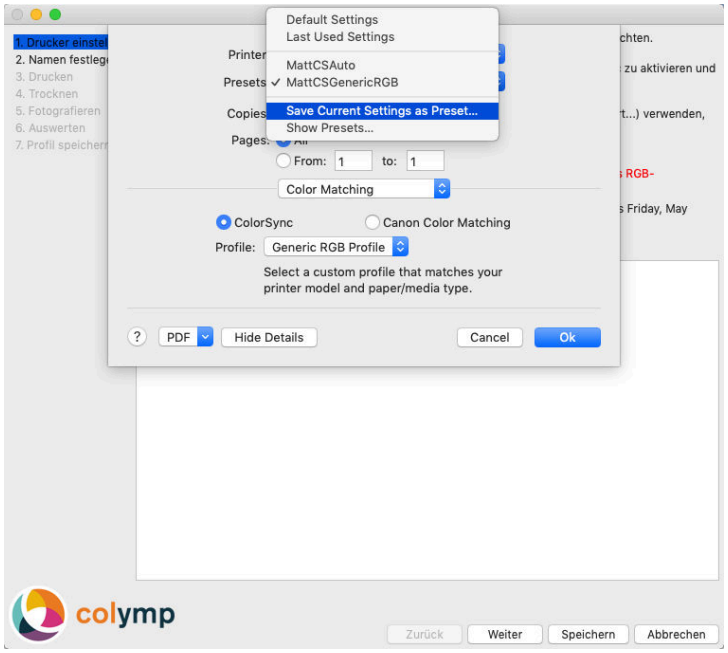


Figure 6: Recommended: Save the (changed) settings of the printer there as `Preset` (`Preset`). To do this, simply click on `Preset` and then click on `Save Current Setting as Preset...` (`Save Current Setting as Preset...`). In this example this has already been saved as `MattCSGenericRGB`.

3.1.2 Set File Name

Set the file name and location for the calibration at this point. This can be chosen arbitrarily. It is advisable to include the most important information about the calibration in the file name:

```
Canon_GlossyPaper240g_HighQuality_TungstLight
Canon_GlossyPaper240g_HighQuality_Daylight
Epson_CopyPaper80g_StdQuality_TungstLight
```

Table 1: Examples of names for different calibrations

In the description field, at the bottom of the dialog, you can insert any comments and further information at any time. colymp also writes various information into this field: e.g. when a test chart was printed, when it was evaluated or the information about the size of the color gamut.

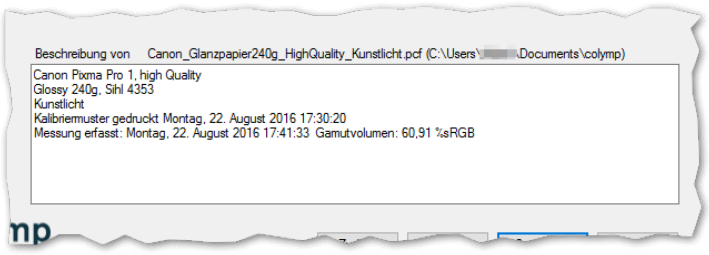


Figure 7: Example of a description: above, the user's information; the last two lines, below, were added by colymp.

3.1.3 Print Test Chart

The test chart is used to characterize the behavior of the printer:

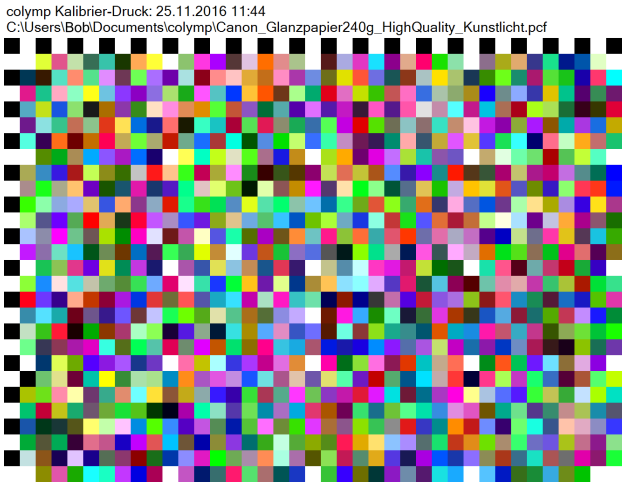


Figure 8: Calibration test chart from colymp: contains numerous colors, as well as the name of the calibration

You can have the test chart printed directly by colymp. The graphic is automatically adjusted to the paper size specified in step 2 (Printer Settings, subsubsection 3.1.1).

Alternativ können Sie das Kalibriermuster als .tif-Datei exportieren und mit Hilfe eines anderen Programms drucken. Sie können dann das Kalibriermuster auch in einer anderen Größe, Orientierung oder Form ausgeben. Sie können hierzu das `ColorSync-Dienstprogramm` (`ColorSync-Utility`) verwenden. Im dortigen Druckdialog wählen Sie `Als Farbziel drucken` (`Print as target`) aus (Figure 9).

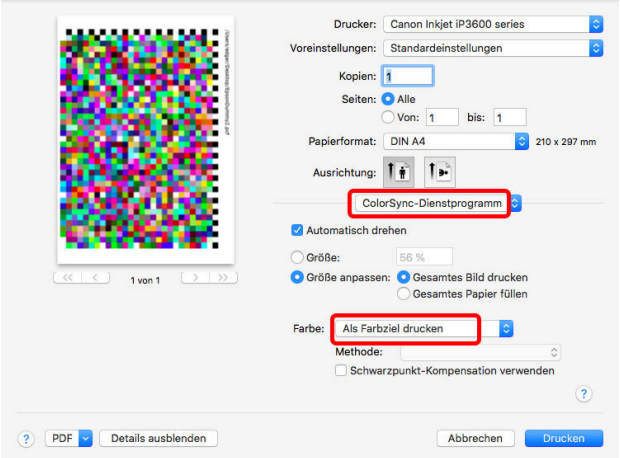


Figure 9: Alternative `ColorSync-Dienstprogramm` zum Ausdrucken des Kalibriermusters: Im dortigen Druckdialog wählen Sie unter `ColorSync-Dienstprogramm` `Als Farbziel drucken`.

The test chart generated by colymp is always the same, only the file name of the calibration (in the top line) is adjusted each time. You could therefore use a printout several times, e.g. if you do not change the print parameters, but want to generate several calibrations for different camera settings or lighting conditions.

3.1.4 Dry Test Chart

Since the colors still change considerably immediately after printing due to drying processes, it is recommended to wait a certain amount of time. If you are using a laser printer, you can also skip the waiting time.

3.1.5 Photograph Calibration Chart

Photograph the test chart with your digital camera. Pay attention to:

- Select exposure time/aperture so that the test chart is imaged as brightly as possible, but never too brightly. The highlights (paper color) must not end up pure white.
- Uniform illumination: Slight brightness gradients are corrected by colymp. However, there must be no direct shadows or chiaroscuro structures.

- Photograph in RAW format (see subsubsection 4.1.2). Images taken directly from the camera in .jpeg are only suitable in exceptional cases. Make sure to use neutral settings and disable all image optimizations in the camera (see subsubsection 4.1.1). For a list of all cameras directly supported by colymp (RAW formats), see section 6.
- Select the white balance in the camera so that the unprinted media is imaged neutrally: The camera setting "White balance automatic" usually gives good results. Optimal results are achieved by performing a white balance on the unprinted medium with the camera.[5]. When evaluating in colymp, another calculation for the media white is performed, but it is still advantageous if the best possible values for the media white are already supplied by the camera, since these are used directly in the (internal) RAW conversion.
- For glossy papers: Avoid direct reflections (see subsubsection 4.1.3).
- Notes on light: see subsubsection 4.1.4

Save the photograph to the PC. The following figures illustrate what is important when taking photographs:

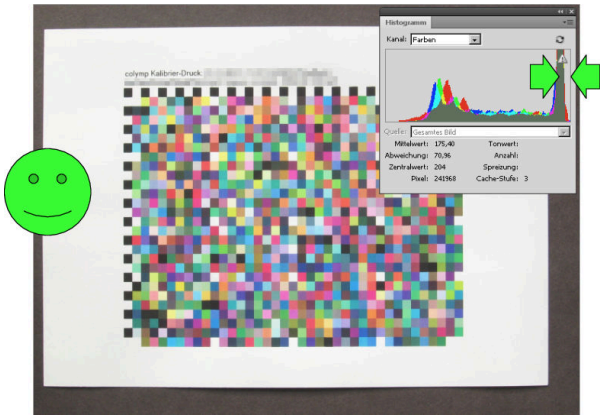


Figure 10: This is how the photograph of the test chart should be: paper is neutral white, no shadows, exposure is just right (in the histogram, the peak of the paper is slightly away from the right edge, see arrows)

.

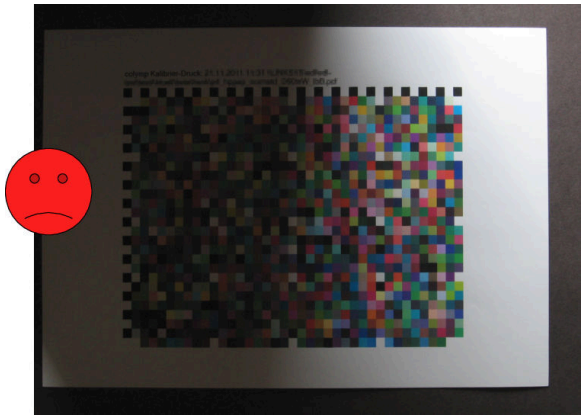


Figure 11: Photography is unusable due to the shadow

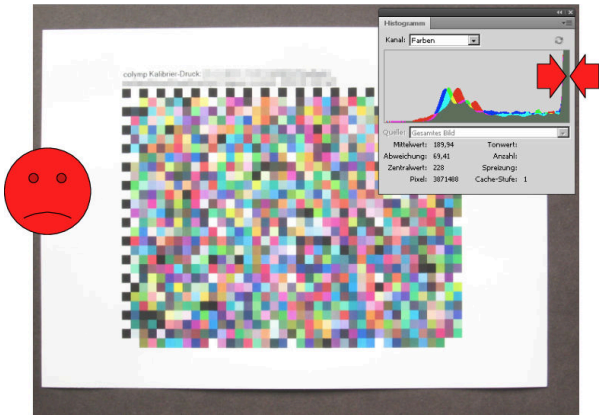


Figure 12: Photograph is overexposed: ⇒ useless (in the histogram the peak of the paper is too far to the right, at the “end stop”)!

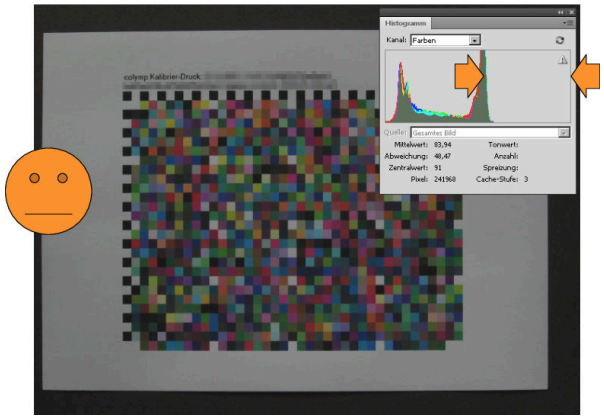


Figure 13: The photograph is underexposed: ⇒ only conditionally usable

[5]Proceed as described in the manual of your camera under “white balance”, “manual” or “own value” and simply use the unprinted paper instead of a gray card

Figure 14: Reflection by illumination light (top right): ⇒ unusable!

Figure 15: Poor white balance can cause problems

For more information on photographing the test chart, see the appendix (subsection 4.1).

3.1.6 Evaluate Test Chart

In colymp, open the photograph from the previous step (button `Select Photo...`). A new dialog box will be displayed. There you have to match the displayed template with the corresponding color patches of the photograph:

Figure 16: With colymp you can also evaluate strongly distorted photographs (in the background the photograph, in the foreground the template): The white dashed evaluation fields each lie exactly within the associated color field.

You can change the size of the dialog window as you wish, making it easier to use.

Figure 17: Zoom function

You can set the magnification in the dialog under Zoom:
As in Photoshop, you can also zoom in and out as follows:

- Press `Ctrl`+`+`: zoom in
- press `Ctrl`+`-`: zoom out
- `Alt`+`scroll wheel` (mouse): zoom in/out

You can move the displayed section not only using the scroll bars, but also (as in Photoshop, PhotoLine...):

- `shift` or `space` and `hold left mouse button`: Move window section

If you press `Ctrl` or `f` at the same time when moving the template with the mouse [6], the movement of the template is artificially reduced. This allows you to position more easily and accurately:

- `Ctrl` + move template: reduced (more precise) movement.
- `f` + move template: reduced (more precise) movement

Figure Figure 18 explains the elements of the template. The goal is to modify the template so that the dashed marks are each completely within the associated field of the photograph.

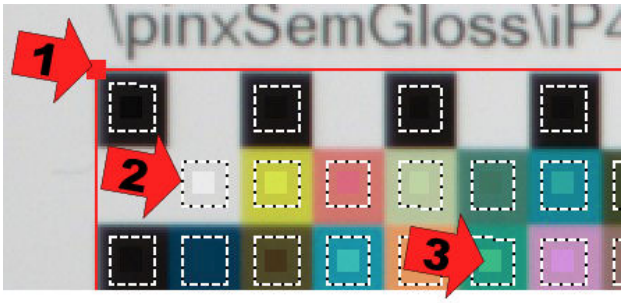


Figure 18: Elements of the evaluation template:
1. corner points of the template can be warped by clicking with the mouse
2. grid lines mark the area in which the colors are evaluated
3. small squares in the center show the color in which the test chart was printed

You can achieve this goal particularly easily by proceeding as follows:

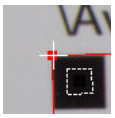
1. Use `size` to make the template approximately the same size as in the photograph.

2. Click inside the template (but not on the small red squares), hold down the mouse button and move the whole template until it is in the same position as in the photograph.

3. If the test chart was photographed upside down (or rotated 90 degrees), use `rotate` to bring the template into the same orientation. Note: the left and the upper edge of the test chart are indicated by black and white fields.

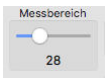
[6] Watch the mouse cursor: when pressing the Ctrl key, the crosshairs or the move cursor becomes larger

4. Click on one of the four small red squares and drag it while holding down the mouse button so that the template fits perfectly on the corresponding color fields in the photo. Pay attention to the mouse cursor: as soon as you are over a small red square, it changes into a crosshair.



5. If the test chart in the photograph is more distorted, you can also refine the red grid of the template, i.e. increase the number of small red squares. The `grid` buttons are used for this purpose.

6. The slider `Measuring Areas` determines the size of the fields in the template. If these fields are smaller, it is easier to position the template. Unfortunately, this also makes the measurement results less accurate, since not as many pixels of the photograph are evaluated. Large measuring areas are therefore all the more important the more noisy the photograph is, i.e. when taking photographs with simple cameras (small sensor size) or when photographs were taken in low light.



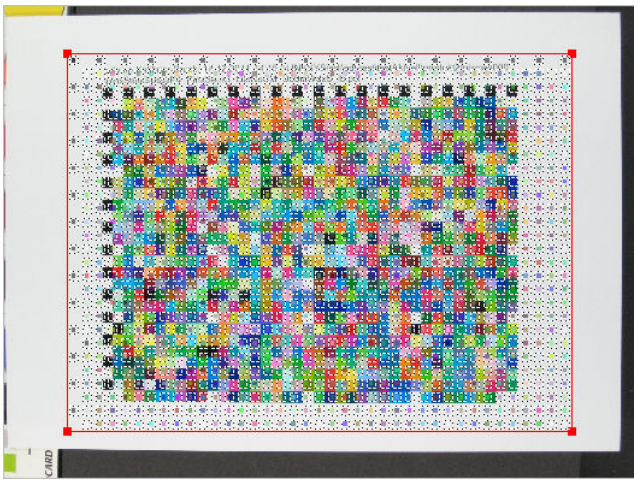


Figure 19: Position of the template at the beginning

Figure 20: Template after step 2

Figure 21: Template after step 4 (small red squares are exactly in the corners)

Figure 22: Template after step 5: Done! (9 instead of 4 small red squares)

When you have positioned the template correctly (Figure 23, Figure 24), click `Evaluate`. The dialog will then close and the correction tables will be calculated.

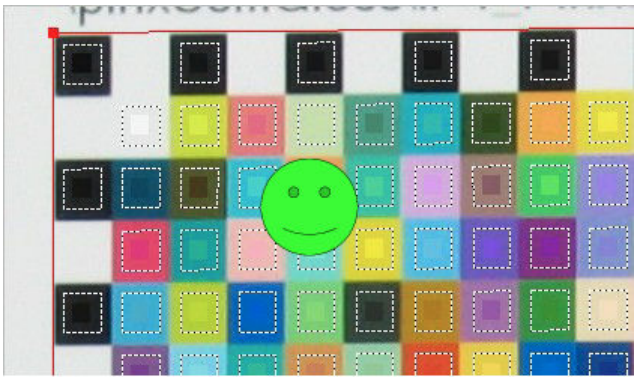


Figure 23: Template just right

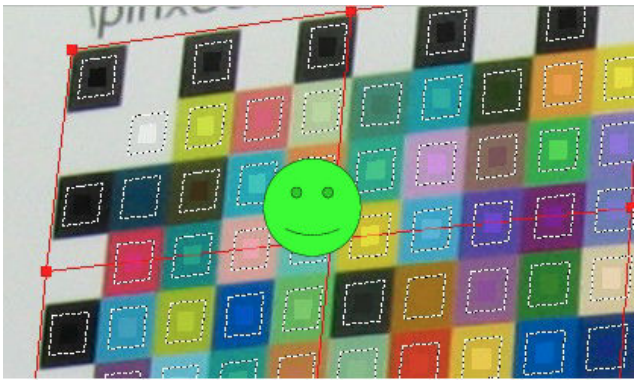


Figure 24: Template just right

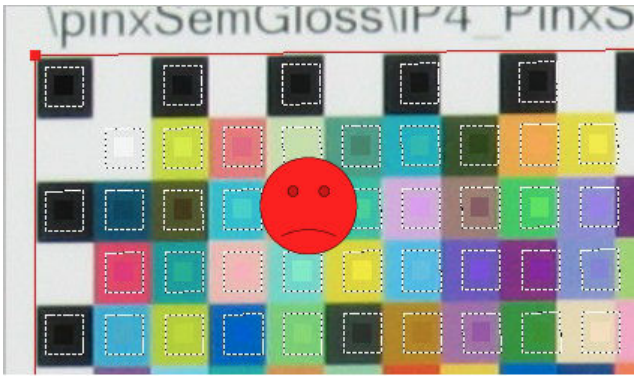


Figure 25: Stop! Fields of the template protrude into other color fields (repeat steps 4 and 5!)

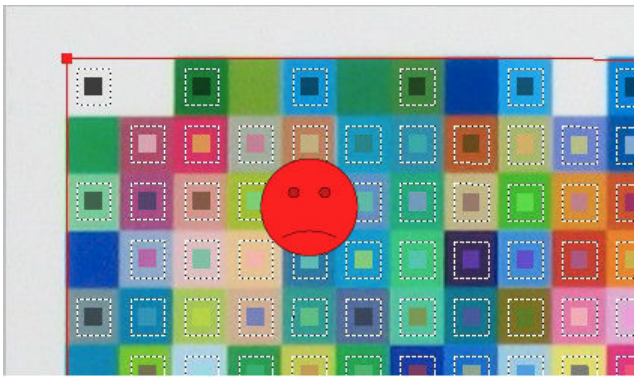


Figure 26: Stop! Squares are misplaced (colors in the small squares of the template do not match the photograph). Photography is upside down, but template is not rotated (note step 3)

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colymp makes it easier for you to position the evaluation template exactly: If you press the `Ctrl` or the `F-key` before clicking and moving the small red squares, the movement of the mouse is artificially reduced. Thus, the positioning can be more precise than with one pixel. This is signaled to you by the change of the mouse pointer (large, instead of small crosshairs). In addition, the area `MouseClick Moves` shows you what effect a mouse click, or rather dragging with the mouse, will have (Figure 27).

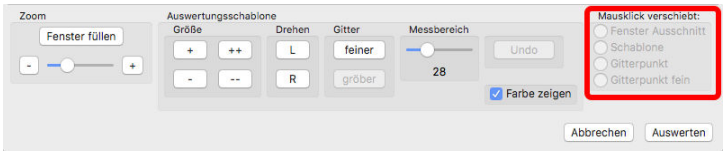

Figure 27: Colymp shows here what a mouse click/movement affects.

In colymp you have the option of photographing and evaluating a test chart several times. The results of the individual measurements are averaged and the overall result is improved. Such multiple measurements are useful, for example, if irregularities occur during printing (spots in the substrate, banding) or if gloss effects (see also subsubsection 4.1.3) interfere with a single measurement or the individual photographs are very noisy.

If you perform an evaluation several times, the position/setting of the template is taken over from the last evaluation. You benefit from this if you leave the position of the camera (tripod!) and the test chart unchanged for the individual photographs: In such a case, the template only needs to be adjusted a little or not at all.

During evaluation, colymp automatically adds some information to the description field (at the bottom of the dialog). The "gamutvolume" specification is very helpful to quickly determine how individual print settings or different paper types affect the printer's gamut.

3.1.7 Export Profile

You can export the ICC profile here and use it later when printing (section 4). We recommend saving the profile in the suggested directory (`/NutzerName/Library/ColorSync/Profiles`). When printing, the profile can then be used in any program.

At this point in colymp you also have the possibility to directly check the effect of the created calibration (i.e. the ICC profile). For this purpose, you can use the internal test image or any image of your own. You can preview, export or print the color corrected image. If you want to export the image and print it with the help of another program, please make sure that no color management is then performed there (e.g. when printing under `ColorSync` activate `ColorSync` and set the profile `Generic RGB profile` there).

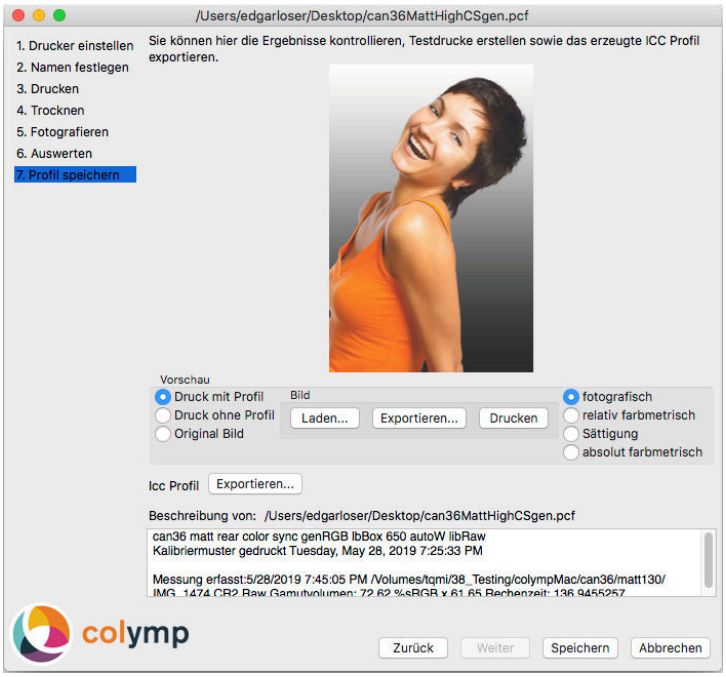

Figure 28: The last step: check and export the ICC profile

General You can use the buttons `Back` and `Next` to scroll back and forth within the dialog to make changes at another point if necessary. You can also click directly on the desired step in the left area of the window.

4 Print: Use a Calibration

With the help of `ColorSync` you can use the exported (subsubsection 3.1.7) ICC profile in any program when printing (Figure 29). Alternatively, you can use this ICC profile as output profile in some programs (e.g. PhotoShop). However, you must then ensure that only this program performs color management during printing and not `ColorSync` or the printer driver itself.

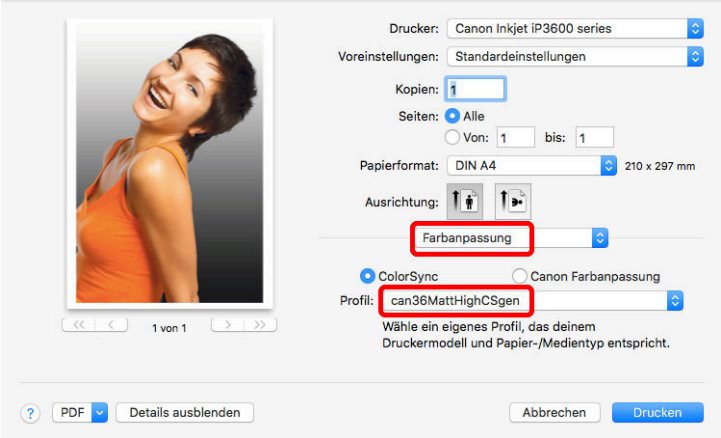

Figure 29: The saved profile (here `can36MattHighCSgen`) can be used for any printing process: In the print dialog, `Color Matching` must be used to select `ColorSync` and then the desired profile. In this example, under `Preferences Standard Settings` is selected. However, as described above (Figure 6), it is advisable to use the `Presets` you saved in the `1. Printer Settings` step (subsubsection 3.1.1) and then save them under a new name.

In special applications, besides the ICC profile, you can also set the rendering intent (Rendering Intent). In addition to the relevant programs like `Photoshop` this is also possible in `ColorSync Utility`, see Figure 30.

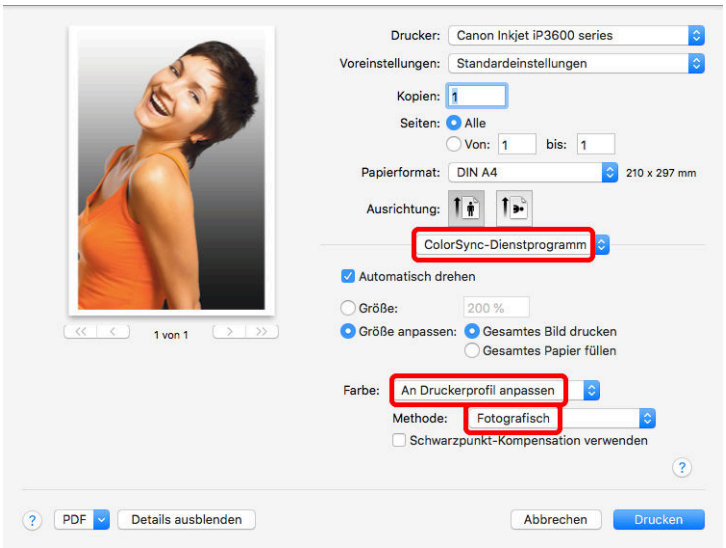

Figure 30: Print using `ColorSync utility`: Here you can select not only the ICC profile you have saved, but also the `Rendering Intent` (under `Method`).

Rendering Intent A printer cannot print all the colors that occur in the real world or that a camera can capture: For example, there are colors that are lighter than the white of the paper or darker than the black. The color spaces of the printer and the camera are different. The so-called rendering intent determines how to deal with this difference in size. The following settings are possible:

- Adjust white and black ("perceptual"): All colors are converted and in such a way that different colors of the camera are also printed differently on the printer. The details of the image are preserved, only the contrast is reduced. This setting is normally used.

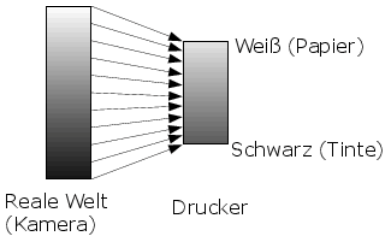

Figure 31: rendering intent: perceptual

- reproduce white and black ("absolute colorimetric"):
  With this setting, all colors that the printer can print are reproduced faithfully. All other colors are replaced by the most similar colors that can still be printed. This setting creates an exact copy of the original on the printer. However, outside the printer color space, there may be loss of detail in the images: Shadows become pure black and highlights end up pure white. There are hints on how to use this rendering intent in subsubsection 4.2.3.

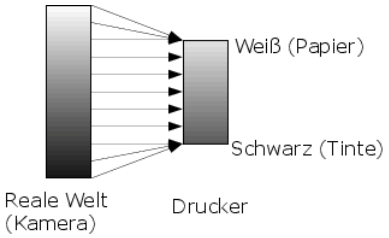

Figure 32: Rendering intent absolute colorimetric

- Match White/Reproduce Black ("relative colorimetric"): If the white point of the camera is set exactly to the white of the paper, this corresponds to the setting "absolute colorimetric" (see below). The details of the images are lost only in the depths.

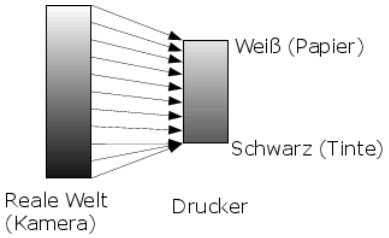

Figure 33: Rendering intent relative colorimetric

- Adjust white and black ("saturation"): This setting is roughly equivalent to the rendering intent "perceptual". However, it ensures that colors that are not printable are printed with extra saturation. The setting is therefore recommended only for graphics or diagrams, but not for photographs.

The printing results with different rendering intents are outlined in Figure 34:

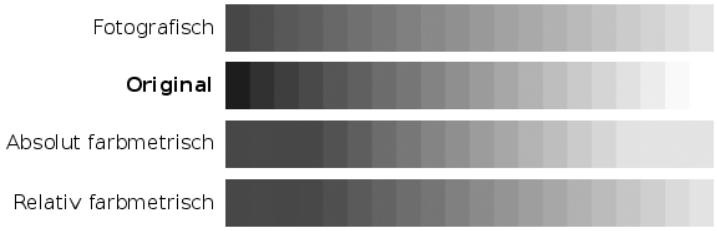

Figure 34: Compare original and print with different rendering intents:
. Only when "perceptual" printed, the details of the original are preserved everywhere. When "absolute colorimetric" is printed, the colors between the black point and white of the paper are exactly as in the original, but there is no contrast below and above. With "relative colorimetric", contrast is lost only for the colors below the black point.

Note for experts on “black point compensation”: In colymp, the rendering intent “perceptual” corresponds to the rendering intent “relative colorimetric with black point compensation”. On the “classical” variant of “perceptual” was deliberately omitted because its result is generally undesirable.

4.1 Photographing the Test Chart: advanced topics

4.1.1 Camera Settings

To photograph the test chart, you should deactivate all optimizations in the camera that have an influence on the color reproduction and use neutral settings if possible. Such optimizations are actually nothing more than falsifications and are therefore corrected by colymp during the calibration process. This means that they are turned into exactly the opposite. For example, many cameras boost the contrast in the midtones to make the images look more “powerful”. If in colymp the test chart is photographed in this way, it will result in paler colors when printed later.

If you take regular pictures after the calibration, you can reactivate the special optimizations of the camera and thus achieve the desired effect.

Unfortunately, we cannot give general instructions on how to turn off such “optimizations” in a camera. Suitable are usually settings with the attribute “neutral” or “no ...”.

The best control over disturbing optimizations you have in the RAW format. We therefore strongly recommend using RAW for photographing the test chart.

4.1.2 RAW Format

The RAW formats of digital cameras (*.nef, *.cr2, *.pef, *.dng ...) contain unaltered image data and are therefore ideal for photographing the test chart. Since version 2.0 of colymp you can evaluate images directly in RAW format. Thereby colymp automatically uses neutral settings and prevents any color falsification.

Internal RAW Converter Internally, colymp uses `libRAW`[7], which is based on `dcraw`, to convert RAW image data. For a list of all cameras (RAW formats) directly supported by colymp, see section 6. The internal RAW converter does not make any “optimizations” of the colors and is therefore perfectly suitable for calibration. In version `3.2` the calculation has been further optimized (linearity of the very dark values), so that also less exposed photographs lead to the same results.

Other RAW converters It is of course also possible to use another RAW converter and use it to create a `.jpg` or `.tif` file. However, the same advice as in the previous section applies: use neutral settings and avoid all “optimizations” of the color representation (see subsubsection 4.1.1).

RawTherapee Select the `Processing Profile` `“(Neutral)”`. Or set the `Exposure` settings to neutral by clicking `Reset` and disable all other corrections.

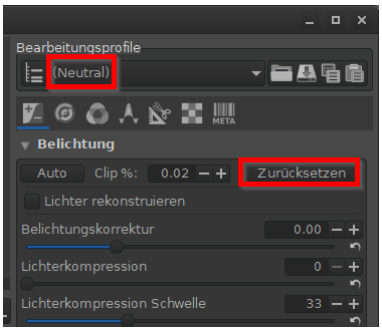

Figure 35: `RawTherapee`: Choose the `Processing Profile` `“(neutral)”`

DxoOpticsPro In `DxoOpticsPro`, not all “optimizations” can be switched off when “developing” the RAW image. Even with the `no correction` preset (or manually disabling all corrections in `LIGHTING AND COLOR`), Dxo undertakes a (here disturbing) contrast enhancement.

However, there is a possibility in `DxoOpticsPro` to convert the RAW image really neutral under `File > Export Image for ICC Profile > Export with Realistic Color Rendition...` in the main menu:

[7] https://www.libraw.org/

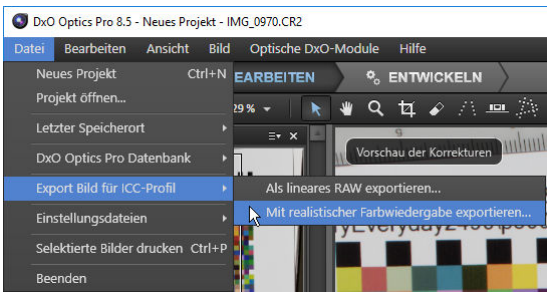

Figure 36: In `DxoOpticsPro` the only way to convert the RAW image really neutral

Lightroom, Photoshop, Photoshop Elements Here you have the possibility to create a `DCP profile` with the help of the `DNG Profile Editor` (which is freely available from Adobe), which provides a neutral reproduction during the RAW conversion. Without this modification, the contrasts in the midtone range are also increased here, as well as reduced for light and dark colors. Since the procedure is hardly known, here is a short tutorial:

1. The necessary program (`DNG Profile Editor`) is available here: https://supportdownloads.adobe.com/detail.jsp?ftpID=5493.

2. Open any RAW file from your camera in Lightroom, Photoshop, or Photoshop Elements and save it as a `.dng` file[8]. In Lightroom, this is done by `right-clicking` on the RAW file. In Photoshop and Photoshop Elements, there is a `Save Image` button for this directly in the Open/Import dialog of the RAW file (`Camera Raw`).

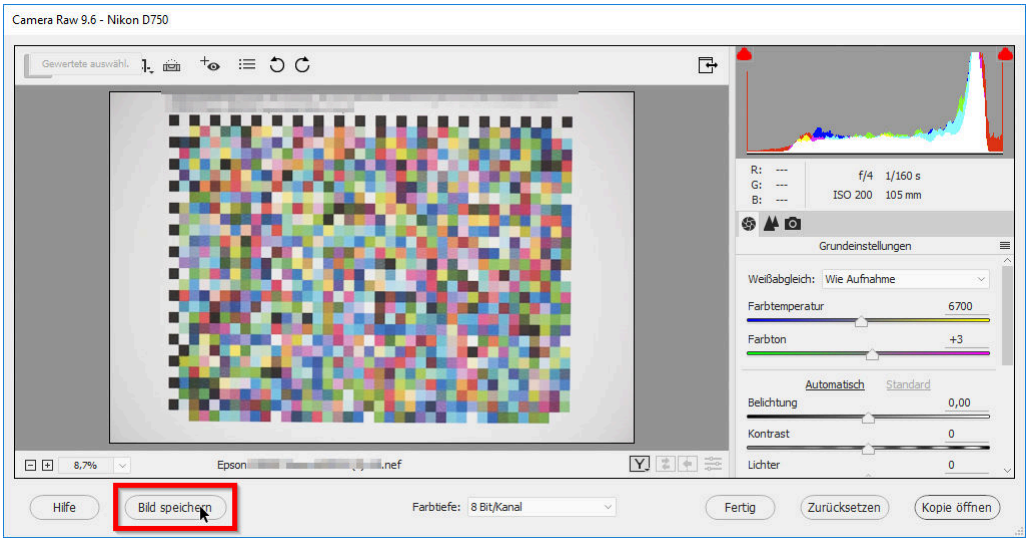

Figure 37: `Photoshop/ Camera Raw`: Save a RAW file, as a `.dng` file.

3. Open this `.dng` file in `DNG Profile Editor`: `File > Open DNG Image...` or key `Cmd-O`. Now you can select a suitable (base) camera profile. We recommend here the version "`Camera Neutral (....)`".

[8]This is Adobe's standard RAW format

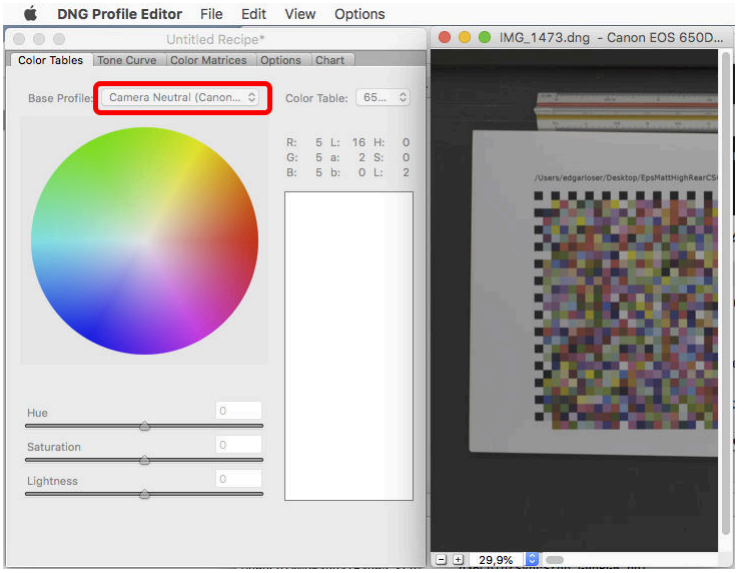

Figure 38: `DNG Profile Editor`: Here you select a camera profile as a base.

4. Now the `Base Tone Curve` must be set to `Linear`.

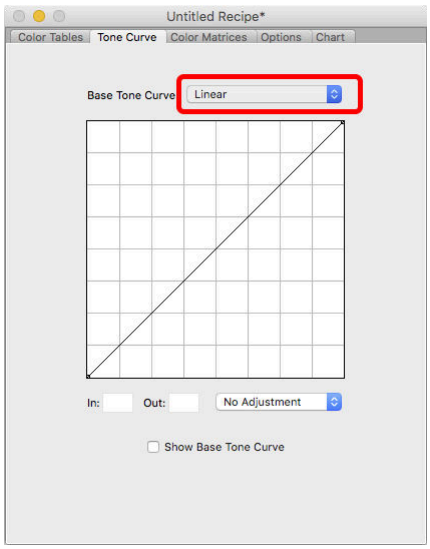

Figure 39: `DNG Profile Editor`: Set the `Base Tone Curve` to `Linear`.

5. Save the modified camera profile: `File > Export cameraXYZ Profile` or press key `Ctrl-E`. It is best to use a new file name (e.g. "`....NeutralLinear`"). Do not change the default location (`/Users/BenutzerName/Library/ApplicationSupport/Adobe/CameraRaw/CameraProfiles`) otherwise the profile will not be found.

6. You can now use the newly created camera profile in Photoshop, Photoshop Elements, or Lightroom:

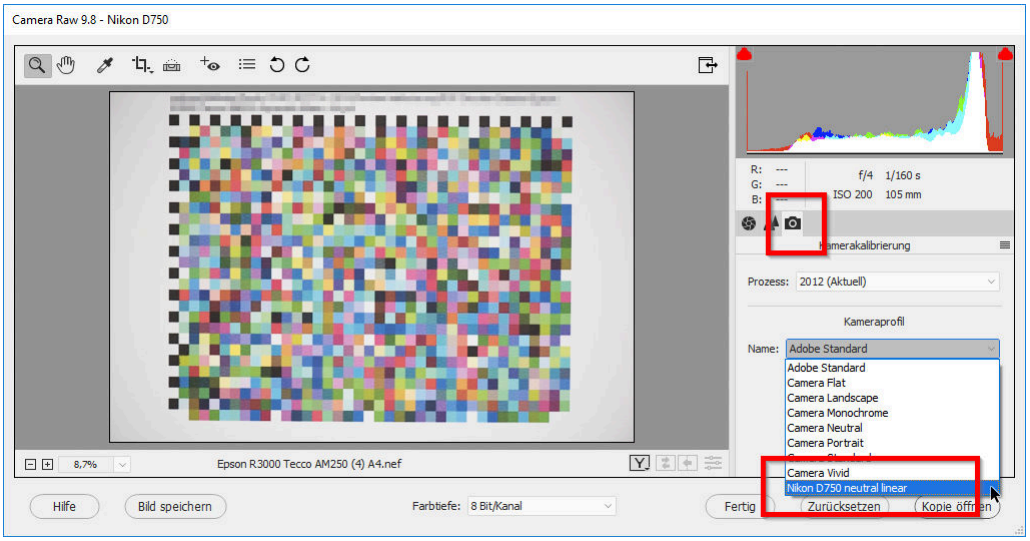

Figure 40: "Camera Raw": Here you can select the newly created ("linear") camera profile.

4.1.3 Glossy Paper

Photographing a test chart on glossy paper is a bit tricky, but also possible.

Figure 41 exemplifies the problem of glossy papers. For this purpose, a sheet was printed almost completely and uniformly in black and then photographed. Care was taken to ensure that the illumination light was not reflected directly in the sheet. Nevertheless, reflections can be seen in the black area:

Figure 41: Disturbing reflections on black printed glossy paper (photo is overexposed to enhance the effect)

These reflections (here they originate from a bright object behind the camera) can interfere with a calibration, as they become noticeable during the evaluation of the dark color patches and lead to irregularities. With matte or semi glossy materials, these problems only occur in extreme cases and are therefore less problematic. With the help of the following measures, perfect calibrations can also be achieved with glossy papers:

- Anything that could be reflected in the glossy paper should be dark: The photographer behind the camera or the ceiling of the room are poorly lit here. Only the test chart is in direct light.

Figure 42: Avoidance of reflections: Only the test chart is illuminated. The camera and everything behind (here above) the camera is dark

- Easier would be a black cardboard, curtain or the like: Anything that can be reflected in the paper is dark and won't interfere. If necessary, you could hold the cardboard diagonally above and next to the camera so that the camera is also in the shade.

Figure 43: Avoiding reflections: black cardboard behind the camera

- When photographing the test chart on a wall, it is useful to hold a cardboard (with a hole for the lens) in front of the camera. The cardboard should be twice as long and wide as the test chart.

Figure 44: Avoiding reflections: black cardboard with hole in front of the camera

- A test chart can be photographed several times, each time from a slightly different direction. All photographs of the test chart are then evaluated in colymp. Averaging reduces the effects of reflections and improves accuracy.

4.1.4 Lighting

It is always assumed that the hue of the light used to illuminate the test chart influences the color correction and that the result must therefore have a color cast. This is not the case, since colymp always measures the colors in the test chart relative to the unprinted medium. The color of the light is thus calculated out. The color of the medium itself (media white point) is also measured, but it only plays a role if the rendering intent "absolute colorimetric" (see section 4, for notes on this particular application see subsubsection 4.2.3) is printed.

However, the light still has an influence on the calibration. If entire areas of the light spectrum are missing (e.g. red and cyan in some LED systems), or if individual lines dominate the spectrum (fluorescent tubes), such light is unsuitable for viewing or even measuring colors. For photographing the test chart we recommend medium daylight, direct sunlight or special artificial light (see below). There are only two exceptions to this recommendation:

- If you want to create a calibration to faithfully reproduce a specially illuminated object (e.g., a painting in a museum), use the same light to photograph the test chart as to illuminate the original (see subsubsection 4.2.3, rendering intent "absolute colorimetric").
- If you want to view the images later under a special (artificial) light, but want to compensate the effect of this light using the calibration ("images are viewed by candlelight, but should still appear correct"), you should use exactly this light to photograph the test chart.

If you are dependent on artificial light because daylight is not available for photography, you should use light sources that have a very high color rendering index (CRI). The color temperature (hue) of the light is less relevant, as this is compensated for by the white balance. Furthermore, it is important that the light is sufficiently diffuse and does not create any light-dark structures in the paper: To this end, make sure that there is sufficient distance between the light source and the test chart.

What is the color rendering index ("CRI", "Ra")? The color rendering index indicates how complete and continuous the spectrum of a light source is: For example, LEDs, which are becoming more and more fashionable, have a very pleasant color temperature but still emit only blue and yellow light (which together make white). They have very large gaps in the green and red spectral ranges. Fluorescent tubes and energy-saving lamps also emit light only in very few and small spectral ranges. As a result, they also have a low CRI. Viewed under such light, colors can only be reproduced inadequately. In particular, gray tones, which in inkjet printers are often composed of several colored inks, then appear in a different hue than otherwise.

Incandescent lamps, on the other hand, just like halogen lamps, have a CRI of 100, the same value as sunlight. The color rendering and color relations are natural under this light. As an alternative, standard spectral lamps can be considered. These are similar to fluorescent tubes, but have additional gases and fluorescent dyes to produce an almost continuous spectrum. They have a CRI of 95 to 98: e.g. Osram Color Proof, Philips TL950, True-Light T5. Meanwhile LED lamps with very good color rendering are available. You can even find them at very reasonable prices (e.g. at Aldi "Lightway/ Müller Licht", or Kaufland "Attralux"). Look for indications like "High CRI", "CRI 95" or "Ra>95".[9].

Photographing with flashes? The flash units built into cameras are rather unsuitable for photographing a test chart. They often lead to undesirable gloss effects in the test chart (sometimes even on matte papers!). In addition, they often overexpose the test chart.

External flash units, on the other hand, can be used to prevent the unwanted reflections. Since xenon lamps have a very high CRI value, they are very well suited as illumination light.

4.1.5 Sensitivity, ASA

Do not select too high values for the sensitivity, especially on 35 mm cameras. At high ASA values, the image noise increases significantly and the measurement results become increasingly poor.

If the photograph of the test chart should nevertheless be very noisy (e.g. with a simple camera), you should use as high a value as possible for the `measuring areas` when evaluating this photograph (subsubsection 3.1.6).

[9] By the way, you can easily test the effect of a very low CRI yourself. To do this, look at a colorful object under a red incandescent lamp (party light/heat lamp) and under a red LED (modern bicycle lamp). Under the light of the red bulb, everything appears reddish, but you can still see different colors. Under the red LED, on the other hand, all colors disappear: everything appears only red-black

4.1.6 Scanner Instead of Digital Camera?

You can use colymp in the same way to optimally match a scanner to a printer. Scanners have the advantage that they are independent of ambient light, illuminate the test chart evenly, and distort much less than cameras. This makes the evaluation of a scan considerably easier than that of a photograph.

With the help of colymp, your scanner and printer will also make an excellent color copier. In this case, if possible, you should fix the illumination to a fixed value in the scan program. If you set the value "Reproduce White and Black" (see section 4) in colymp in the main menutextgreaterOptionsprint Settings, all colors will be printed in the copy exactly as in the original.

However, the light source built into the scanner is also a serious disadvantage: almost exclusively cold cathode tubes or LEDs are used in a scanner. These have a very low color rendering index (see subsubsection 4.1.4) and sometimes reproduce colors incorrectly. Furthermore, with a scanner, a "crosstalk" of a colored area to its surroundings can occur.

If you have the choice between a digital camera and a scanner to calibrate a printer with, we recommend to use the camera.

4.2 Workflows

4.2.1 Normal Case: Calibrating Camera and Printer

You want to print the images you have taken with your camera on your printer.

This is exactly what colymp was designed for. If you are using multiple cameras or printers, make sure you create a calibration for each combination (camera-printer).

4.2.2 Calibration of Printer only/ Export of ICC Profile

You also want to print on your printer images that you did not take with the exact camera that was used for the calibration.

At the beginning of section 3 it was described that colymp considers camera and printer together as one system and corrects all errors of this system simultaneously. Usually, however, the color errors of a printer are considerably larger than the color errors of a camera and it is quite reasonable to ignore the color errors of the camera completely. Today a camera is even very well suited as a color measuring device! So you can use a calibration also for printing other, third-party images. It is also possible to export the internal correction table as an ICC profile and use this as a pure printer profile.

When photographing the test chart, it is best to use the RAW format. You can further increase the precision of this profile by calibrating the camera beforehand using a tool such as ColorChecker, Spydercheckr or QP-card.

4.2.3 Faithful Reproduction of an Object

You may want to reproduce a painting, for example, or sample the surface of an object on paper.

This is the showcase of colymp. You will achieve perfect results if you photograph the test chart under exactly the same conditions as the object to be reproduced: In particular, the lighting conditions should be identical for both exposures. Also, set your camera's operation mode to manual to thereby make both shots exactly the same[10]. Also the RAW conversion must be identical for both shots (see subsubsection 4.1.2). It is also important to use the rendering intent "reproduce white and black (absolute colorimetric)" (see section 4). The printout will then not only match the original in color, but the brightness will also be exactly the same.

[10] Aperture, exposure time and white balance should be identical. In addition, you should not adjust the camera's zoom, as this changes the light intensity of the lens and thus the exposure!

Figure 45: Example of faithful reproduction using colymp. On the left the original, on the right the printout. The printout seems to be slightly darker at the right edge, because the artificial light used for the overall image was slightly less intense on the right.

5 FAQ: Frequently Asked Questions about colymp

How can the color measurement work, since the light is unknown? The calibration should always be color-corrected, right? It works because colymp always measures the colors relative to the unprinted medium. The color of the light is compensated by this. The color of the medium itself (media white point) is also measured, but it only matters if the rendering intent "absolute colorimetric" (see section 4, for notes on this particular application see. subsubsection 4.2.3) is printed. For general explanations of lighting see subsubsection 4.1.4.

Is the measurement accuracy of a digital camera really sufficient to correctly measure very dark colors? In fact, even in RAW format, a digital camera typically provides only 14-bit accurate measurements. However, since a measurement of the test chart in colymp takes into account a large number of pixels for each individual color, the signal-to-noise ratio still becomes enormous. It is therefore possible to reliably measure even extremely dark colors and their finest shades.

What are the disadvantages of using a digital camera compared to a dedicated colorimeter .

Besides all the advantages of using a digital camera for printer calibration (speed, simplicity, flexibility, price, etc.), there are also limitations. In the professional environment (print shop, prepress, design, photography...) a uniform, standardized color standard is indispensable: A document must be output exactly the same at all points there (printer, monitor, proofing system, etc.). This can (almost) only be achieved on the basis of calibrated measuring devices. A digital camera can only do this to a limited extent. Furthermore, it can happen that a digital camera measures two colors identically, but a human observer still notices (small) differences. In Figure 45 (viewed through the camera) the original and the printout are identical, but direct observation may still reveal differences. The spectral sensitivity of the RGB channels of a camera does not exactly match that of a human eye. In a colorimeter, therefore, the colors are measured (if possible) with the sensitivity of a "normal observer" (so-called XYZ values)[11].

[11] It should be noted here that even a colorimeter can only approximate the color perception of a concrete observer. The spectral curves used in the instrument (or the software) are mean values of a large number of observers (e.g. CIE-1931) and the individual deviation is sometimes considerable. In addition, a colorimeter uses a fixed light source that has a different spectral composition than the light under which an observer (or digital camera) views an image. Fluorescence effects, for example due to optical brighteners in the print media, cannot therefore be correctly detected

6 Supported Cameras (RAW Format)

The RAW formats of the following cameras are directly supported when evaluating the test chart image (see subsubsection 3.1.6). If your camera is not directly supported, we recommend converting the RAW format to `.dng`. `DNG` is a standard RAW format developed by Adobe, which is also supported by colymp. To do this, you can use Adobe Lightroom, Photoshop or Photoshop Elements, or the freely available Adobe DNG Converter https://supportdownloads.adobe.com/product.jsp?product=106&platform=Windows. Alternatively, you can develop a neutral `.jpg` or `.tif` image using these Adobe programs, see section 4.1.2.

```
ASUS
    ZenPhone4
    ZenPhone6
AVT
    F-080C
    F-145C
    F-201C
    F-510C
    F-810C
Adobe Digital Negative (DNG)
AgfaPhoto DC-833m
Alcatel 5035D
Apple
    iPad Pro
    iPhone SE
    iPhone 6s
    iPhone 6 plus
    iPhone 7
    iPhone 7 plus
    iPhone 8
    iPhone 8 plus
    iPhone X
    iPhone 12 Pro
    iPhone 12 Pro Max
    iPhone 13 Pro
    QuickTake 100
    QuickTake 150
    QuickTake 200
AutelRobotics
    XB015
    XT705 (EVO II)
BQ Aquarius U
Baumer TXG14
BlackMagic
    Cinema Camera
    Micro Cinema Camera
    Pocket Cinema Camera
    Production Camera 4k
    URSA
    URSA Mini 4k
    URSA Mini 4.6k
    URSA Mini Pro 4.6k
CLAUSS pix500
Canon
    PowerShot 600
    PowerShot A5
    PowerShot A5 Zoom
    PowerShot A50
    PowerShot A410 (CHDK hack)
    PowerShot A460 (CHDK hack)
    PowerShot A470 (CHDK hack)
    PowerShot A480 (CHDK hack)
    PowerShot A530 (CHDK hack)
    PowerShot A540 (CHDK hack)
    PowerShot A550 (CHDK hack)
    PowerShot A560 (CHDK hack)
    PowerShot A570 IS (CHDK hack)
    PowerShot A590 IS (CHDK hack)
    PowerShot A610 (CHDK hack)
    PowerShot A620 (CHDK hack)
    PowerShot A630 (CHDK hack)
    PowerShot A640 (CHDK hack)
    PowerShot A650 IS (CHDK hack)
    PowerShot A710 IS (CHDK hack)
    PowerShot A720 IS (CHDK hack)
    PowerShot A3300 IS (CHDK hack)
    PowerShot D10 (CHDK hack)
    PowerShot ELPH 130 IS / IXUS 140 / IXY 110F (CHDK hack
        )
    PowerShot ELPH 160 / IXUS 160 (CHDK hack)
    PowerShot Pro70
    PowerShot Pro90 IS
    PowerShot Pro1
    PowerShot G1
    PowerShot G1 X
    PowerShot G1 X Mark II
    PowerShot G1 X Mark III
    PowerShot G2
    PowerShot G3
    PowerShot G3 X
    PowerShot G5
    PowerShot G5 X
    PowerShot G5 X Mark II
    PowerShot G6
    PowerShot G7 (CHDK hack)
    PowerShot G7 X
    PowerShot G7 X Mark II
    PowerShot G7 X Mark III
    PowerShot G9
    PowerShot G9 X
    PowerShot G9 X Mark II
    PowerShot G10
    PowerShot G11
    PowerShot G12
    PowerShot G15
    PowerShot G16
    PowerShot S2 IS (CHDK hack)
    PowerShot S3 IS (CHDK hack)
    PowerShot S5 IS (CHDK hack)
    PowerShot SD300 / IXUS 40 / IXY Digital 50 (CHDK hack)
    PowerShot SD750 / IXUS 75 / IXY Digital 90 (CHDK hack)
    PowerShot SD900 / Digital IXUS 900 Ti / IXY Digital
        1000 (CHDK hack)
    PowerShot SD950 IS / Digital IXUS 960 IS / IXY Digital
        2000 IS (CHDK hack)
    PowerShot SD1200 IS / Digital IXUS 95 IS / IXY Digital
        110 IS (CHDK hack)
    PowerShot S30
    PowerShot S40
    PowerShot S45
    PowerShot S50
    PowerShot S60
    PowerShot S70
    PowerShot S90
    PowerShot S95
    PowerShot S100
    PowerShot S110
    PowerShot S120
    PowerShot SX1 IS
    PowerShot SX40 HS (CHDK hack, CR2)
    PowerShot SX50 HS
    PowerShot SX60 HS
    PowerShot SX70 HS
    PowerShot SX100 IS (CHDK hack)
    PowerShot SX110 IS (CHDK hack)
    PowerShot SX120 IS (CHDK hack)
    PowerShot SX130 IS (CHDK hack)
    PowerShot SX160 IS (CHDK hack)
    PowerShot SX220 HS (CHDK hack)
    PowerShot SX510 HS (CHDK hack)
    PowerShot SX710 HS (CHDK hack)
    PowerShot SX10 IS (CHDK hack)
    PowerShot SX20 IS (CHDK hack)
    PowerShot SX30 IS (CHDK hack)
    EOS R
    EOS RP
    EOS R3
    EOS R5
    EOS R6
    EOS R7
    EOS R10
    EOS D30
    EOS D60
    EOS 5DS
    EOS 5DS R
    EOS 5D
    EOS 5D Mark II
    EOS 5D Mark III
    EOS 5D Mark IV
    EOS 6D
    EOS 6D Mark II
    EOS 7D
    EOS 7D Mark II
    EOS 10D
    EOS 20D
    EOS 20Da
    EOS 30D
    EOS 40D
    EOS 50D
    EOS 60D
    EOS 60Da
    EOS 70D
    EOS 77D / 9000D
    EOS 80D
    EOS 90D
    EOS 100D / Rebel SL1 / Kiss X7
    EOS 200D / Rebel SL2 / Kiss X9
    EOS 250D / 200D II / Rebel SL3 / Kiss X10
    EOS 300D / Digital Rebel / Kiss Digital
    EOS 350D / Digital Rebel XT / Kiss Digital N
    EOS 400D / Digital Rebel XTi / Kiss Digital X
    EOS 450D / Digital Rebel XSi / Kiss X2
    EOS 500D / Rebel T1i / Kiss X3
    EOS 550D / Rebel T2i / Kiss X4
    EOS 600D / Rebel T3i / Kiss X5
    EOS 650D / Rebel T4i / Kiss X6i
    EOS 700D / Rebel T5i / Kiss X7i
    EOS 750D / Rebel T6i / Kiss X8i
    EOS 760D / Rebel T6S / 8000D
    EOS 800D / Rebel T7i / Kiss X9i
    EOS 850D / Rebel T8i / Kiss X10i
    EOS 1000D / Digital Rebel XS / Kiss F
    EOS 1100D / Rebel T3 / Kiss X50
    EOS 1200D / Kiss X70 / REBEL T5 / Hi
    EOS 1300D / Rebel T6 / Kiss X80
    EOS 1500D / 2000D / Rebel T7 / Kiss X90
    EOS 3000D / 4000D / Rebel T100
    EOS D2000
    EOS M
    EOS M2
    EOS M3
    EOS M5
    EOS M6
    EOS M6 Mark II
    EOS M10
    EOS M50 / Kiss M
    EOS M50 Mark II
    EOS M100
    EOS M200
    EOS-1D C
    EOS-1D X
    EOS-1D X Mark II
    EOS-1D X Mark III
    EOS-1D
    EOS-1D Mark II
    EOS-1D Mark II N
```

- EOS-1D Mark III
- EOS-1D Mark IV
- EOS-1Ds
- EOS-1Ds Mark II
- EOS-1Ds Mark III

Casio
- QV-2000UX (secret menu hack)
- QV-3000EX (secret menu hack)
- QV-3500EX (secret menu hack)
- QV-4000 (secret menu hack)
- QV-5700 (secret menu hack)
- QV-R41
- QV-R51
- QV-R61
- EX-F1
- EX-FC300S
- EX-FC400S
- EX-FH20
- EX-FH25
- EX-FH100
- EX-S20 / M20
- EX-S100
- EX-Z4
- EX-Z50
- EX-Z500
- EX-Z55
- EX-Z60
- EX-Z75
- EX-Z750
- EX-Z8
- EX-Z850
- EX-Z1050
- EX-ZR100
- EX-Z1080
- EX-ZR700
- EX-ZR710
- EX-ZR750
- EX-ZR800
- EX-ZR850
- EX-ZR1000
- EX-ZR1100
- EX-ZR1200
- EX-ZR1300
- EX-ZR1500
- EX-ZR3000
- EX-ZR3100
- EX-ZR3200
- EX-ZR3500
- EX-ZR3600
- EX-ZR3700
- EX-ZR4000 / 5000
- EX-ZR4100 / 5100
- EX-100
- EX-100F
- EX-100PRO
- EX-10
- EX-P505 (secret menu hack)
- EX-P600 (secret menu hack)
- EX-P700 (secret menu hack)

Contax N Digital

Creative PC-CAM 600

DJI
- 4384x3288
- Mavic Air
- Mavic Air2
- Mavic Air 2S
- Mavic Mini2
- Mavic 3
- Osmo Action
- Pocket
- Phantom4 Pro/Pro+
- Zenmuse X5
- Zenmuse X5R

DXO One

Digital Bolex
- D16
- D16M

Epson
- R-D1
- R-D1s
- R-D1x

Eyedeas E1

Foculus 531C

FujiFilm
- DBP for GX680 / DX-2000
- E550
- E900
- F500EXR / F505EXR
- F550EXR
- F600EXR / F605EXR
- F700
- F710
- F770EXR / F775EXR
- F800EXR
- F810
- F900EXR
- S2Pro
- S3Pro
- S5Pro
- S20Pro
- S1
- S100FS
- S5000
- S5100 / S5500
- S5200 / S5600
- S6000fd / S6500fd
- S7000
- S9000 / S9500
- S9100 / S9600
- S200EXR / S205EXR
- SL1000
- HS10/HS11
- HS20EXR / HS22EXR
- HS30EXR / HS33EXR / HS35EXR
- HS50EXR
- GFX 50S
- GFX 50S II
- GFX 50R
- GFX 100
- GFX 100S
- X-Pro1
- X-Pro2
- X-Pro3
- X-S1
- XQ1
- XQ2
- X100
- X100F
- X100S
- X100T
- X100V
- X10
- X20
- X30
- X70
- X-A1
- X-A2
- X-A3
- X-A5
- X-A7
- X-A10
- X-A20
- X-E1
- X-E2
- X-E2S
- X-E3
- X-E4
- X-M1
- XF1
- XF10
- X-H1
- X-H2S
- X-T1
- X-S10
- X-T1 Graphite Silver
- X-T2
- X-T3
- X-T4
- X-T10
- X-T20
- X-T30
- X-T30 II
- X-T100
- X-T200
- IS-1

GITUP
- GIT2
- GIT2P
- G3 DUO (16:9 mode only)

Gione E7

Google
- Pixel
- Pixel XL
- Pixel 3a
- Pixel 4 XL
- Pixel 4a (5G)
- Pixel 5

HTC
- UltraPixel
- MyTouch 4G
- One (A9)
- One (M9)
- 10
- U12

Hasselblad
- H2D-22
- H2D-39
- H3DII-22
- H3DII-31
- H3DII-39
- H3DII-50
- H3D-22
- H3D-31
- H3D-39
- H4D-60
- H4D-50
- H4D-40
- H4D-31
- H5D-60
- H5D-50
- H5D-50c
- H5D-40
- H6D-100c
- A6D-100c
- CFV
- CFV-50
- CFV II 50C
- CFH
- CF-22
- CF-31
- CF-39
- V96C
- L1D-20c (DJI Mavic 2 Pro)
- Lusso
- Lunar
- True Zoom
- Stellar
- Stellar II
- HV
- X1D
- X1D II 50C

Huawei
- P8 Lite (PRA-LX1)
- P9 (EVA-L09/AL00)
- P10 (VTR-L09)
- P10+ (VKY-L09)
- P10 Lite (WAS-LX1A)
- P20 (EML-L09)
- P20 Lite (ANE-LX1)
- P20 Pro (CLT-L29/L09)
- P30 Pro (VOG-L29)
- Honor6a
- Honor7a pro
- Honor8 (FRD-L09)
- Honor9
- Honor10
- Honor20
- Honor View 10 (BKL-L09)
- Honor View 20 (PCT-L29)
- Honor 20 Pro (YAL-L41)
- Mate8 (NXT-L29)
- Mate10 (BLA-L29)

- Mate20 Pro (LYA-L29)
- Mate20 Lite (SNE-LX1)

ISG 2020x1520

Ikonoskop
- A-Cam dII Panchromatic
- A-Cam dII

Imacon
- Ixpress 96, 96C
- Ixpress 384, 384C (single shot only)
- Ixpress 132C
- Ixpress 528C (single shot only)

JaiPulnix
- BB-500CL
- BB-500GE

Kandao QooCam 8K

Kinefinity
- KineMINI
- KineRAW Mini
- KineRAW S35

Kodak
- DC20
- DC25
- DC40
- DC50
- DC120
- DCS200
- DCS315C
- DCS330C
- DCS420
- DCS460
- DCS460M
- DCS460
- DCS520C
- DCS560C
- DCS620C
- DCS620X
- DCS660C
- DCS660M
- DCS720X
- DCS760C
- DCS760M
- EOSDCS1
- EOSDCS3
- NC2000
- ProBack
- PB645C
- PB645H
- PB645M
- DCS Pro 14n
- DCS Pro 14nx
- DCS Pro SLR/c
- DCS Pro SLR/n
- C330
- C603
- P850
- P880
- PIXPRO AZ901
- PIXPRO S-1
- Z980
- Z981
- Z990
- Z1015
- KAI-0340

Konica
- KD-400Z
- KD-510Z

LG
- G3
- G4
- G5 (H850)
- G6
- V20 (F800K)
- V20 (H910)
- VS995

Leaf
- AFi 5
- AFi 6
- AFi 7
- AFi-II 6
- AFi-II 7
- AFi-II 10
- AFi-II 10R
- Aptus-II 5
- Aptus-II 6
- Aptus-II 7
- Aptus-II 8
- Aptus-II 10
- Aptus-II 12
- Aptus-II 12R
- Aptus 17
- Aptus 22
- Aptus 54S
- Aptus 65
- Aptus 65S
- Aptus 75
- Aptus 75S
- Cantare
- Cantare XY
- CatchLight
- CMost
- Credo 40
- Credo 50
- Credo 60
- Credo 80
- DCB-II
- Valeo 6
- Valeo 11
- Valeo 17
- Valeo 17wi
- Valeo 22
- Valeo 22wi
- Volare

Leica
- C (Typ 112)
- CL
- C-Lux / CAM-DC25
- Digilux 2
- Digilux 3
- Digital-Modul-R
- D-LUX2
- D-LUX3
- D-LUX4
- D-LUX5
- D-LUX6
- D-LUX7
- D-Lux (Typ 109)
- M8
- M8.2
- M9
- M10
- M10-D
- M10-P
- M10-R
- M10 Monochrom
- M11
- M (Typ 240)
- M (Typ 262)
- Monochrom (Typ 240)
- Monochrom (Typ 246)
- M-D (Typ 262)
- M-E
- M-P
- R8
- Q (Typ 116)
- Q-P
- Q2
- Q2 Monochrom
- S
- S2
- S3
- S (Typ 007)
- SL (Typ 601)
- SL2
- SL2-S
- T (Typ 701)
- TL
- TL2
- X1
- X (Typ 113)
- X2
- X-E (Typ 102)
- X-U (Typ 113)
- V-LUX1
- V-LUX2
- V-LUX3
- V-LUX4
- V-LUX5
- V-Lux (Typ 114)
- X VARIO (Typ 107)

Lenovo a820

Logitech Fotoman Pixtura

Mamiya ZD

Matrix 4608x3288

Meizy MX4

Micron 2010

Minolta
- RD175 / Agfa ActionCam
- DiMAGE 5
- DiMAGE 7
- DiMAGE 7i
- DiMAGE 7Hi
- DiMAGE A1
- DiMAGE A2
- DiMAGE A200
- DiMAGE G400
- DiMAGE G500
- DiMAGE G530
- DiMAGE G600
- DiMAGE Z2
- Alpha/Dynax/Maxxum 5D
- Alpha/Dynax/Maxxum 7D

Motorola
- PIXL
- Moto G (5S)
- Moto G7 Play

Nikon
- D1
- D1H
- D1X
- D2H
- D2Hs
- D2X
- D2Xs
- D3
- D3s
- D3X
- D4
- D4s
- D40
- D40X
- D5
- D50
- D6
- D60
- D70
- D70s
- D80
- D90
- D100
- D200
- D300
- D300s
- D500
- D600
- D610
- D700
- D750
- D780
- D800
- D800E
- D810
- D810A
- D850
- D3000
- D3100
- D3200
- D3300
- D3400
- D3500
- D5000
- D5100
- D5200

D5300
D5500
D5600
D7000
D7100
D7200
D7500
Df
Z 5
Z 6
Z 6 II
Z 7
Z 7 II
Z 9 (HE/HE* formats are not supported yet)
Z 50
Z fc
1 AW1
1 J1
1 J2
1 J3
1 J4
1 J5
1 S1
1 S2
1 V1
1 V2
1 V3
Coolpix 700 ("DIAG RAW" hack)
Coolpix 800 ("DIAG RAW" hack)
Coolpix 880 ("DIAG RAW" hack)
Coolpix 900 ("DIAG RAW" hack)
Coolpix 950 ("DIAG RAW" hack)
Coolpix 990 ("DIAG RAW" hack)
Coolpix 995 ("DIAG RAW" hack)
Coolpix 2100 ("DIAG RAW" hack)
Coolpix 2500 ("DIAG RAW" hack)
Coolpix 3200 ("DIAG RAW" hack)
Coolpix 3700 ("DIAG RAW" hack)
Coolpix 4300 ("DIAG RAW" hack)
Coolpix 4500 ("DIAG RAW" hack)
Coolpix 5000
Coolpix 5400
Coolpix 5700
Coolpix 8400
Coolpix 8700
Coolpix 8800
Coolpix A
Coolpix A1000
Coolpix B700
Coolpix P330
Coolpix P340
Coolpix P950
Coolpix P6000
Coolpix P1000
Coolpix P7000
Coolpix P7100
Coolpix P7700
Coolpix P7800
Coolpix S6 ("DIAG RAW" hack)
Coolscan NEF
Nokia
7 Plus
8.3 5G
9
N95
X2
1200x1600
Lumia 930
Lumia 950 XL
Lumia 1020
Lumia 1520
OM Digital Solutions OM-1
Olympus
AIR A01
C-3030Z
C-5050Z
C-5060WZ
C-7070WZ
C-70Z / C-7000Z
C-740UZ
C-770UZ
C-8080WZ
X200 / D-560Z / C-350Z
E-1
E-3
E-5
E-10
E-20 / E-20N / E-20P
E-30
E-300
E-330
E-400
E-410
E-420
E-450
E-500
E-510
E-520
E-600
E-620
E-P1
E-P2
E-P3
E-P5
E-P7
E-PL1
E-PL1s
E-PL2
E-PL3
E-PL5
E-PL6
E-PL7
E-PL8
E-PL9
E-PL10
E-PM1
E-PM2
E-M1
E-M1 Mark II
E-M1 Mark III
E-M1X
E-M10
E-M10 Mark II
E-M10 Mark III
E-M10 Mark IV
E-M5
E-M5 Mark II
E-M5 Mark III
Pen-F
SP-310
SP-320
SP-350
SP-500UZ
SP-510UZ
SP-550UZ
SP-560UZ
SP-565UZ
SP-570UZ
Stylus 1
Stylus 1s
SH-2
SH-3
TG-4
TG-5
TG-6
XZ-1
XZ-2
XZ-10
OmniVision
4688
OV5647
OV5648
OV8850
13860
OnePlus
6 (A6003)
6T
7 Pro (GM1913)
8 Pro (IN2023)
One
A3303
A5000
PARROT
Anafi
Bebop 2
Bebop Drone
Panasonic
DMC-CM1
DMC-FZ8
DMC-FZ18
DMC-FZ28
DMC-FZ30
DMC-FZ35 / FZ38
DMC-FZ40 / FZ42 / FZ45
DMC-FZ50
DMC-FZ70 / FZ72
DC-FZ80 / FZ81 / FZ82 / FZ83 / FZ85
DMC-FZ100
DMC-FZ150
DMC-FZ200
DMC-FZ300 / FZ330
DMC-FZ1000
DC-FZ1000 II / FZ1000M2 / DC-FZ10002
DMC-FZ2000 / FZ2500 / FZH1
DMC-FX150 / FX180
DMC-G1
DMC-G10
DMC-G2
DMC-G3
DMC-G5
DMC-G6
DMC-G7 / G70
DMC-G8 / G80 / G81 / G85
DC-G9
DC-G90 / G95 / G91 / G99
DC-G100 / G110
DMC-GF1
DMC-GF2
DMC-GF3
DMC-GF5
DMC-GF6
DMC-GF7
DC-GF10 / GF90
DMC-GH1
DMC-GH2
DMC-GH3
DMC-GH4
AG-GH4
DC-GH5
DC-GH5S
DC-GH5 Mark II
DMC-GM1
DMC-GM1s
DMC-GM5
DMC-GX1
DMC-GX7
DMC-GX8
DC-GX9 / GX7mkIII
DMC-GX80 / GX85, DMC-GX7mkII
DC-GX800 / GX850, DC-GF9
DMC-L1
DMC-L10
DMC-LC1
DMC-LF1
DMC-LX1
DMC-LX2
DMC-LX3
DMC-LX5
DMC-LX7
DMC-LX9 / LX10 / LX15
DMC-LX100
DC-LX100M2
DC-S1
DC-S1H
DC-S1R
DC-S5
DMC-ZS40, DMC-TZ60 / TZ61
DMC-ZS50, DMC-TZ70 / TZ71
DMC-ZS60, DMC-TZ80 / TZ81 / TZ82 / TZ85
DC-ZS70, DC-TZ90 / TZ91 / TZ92 / TZ93
DC-ZS80, DC-TZ95 / TZ96 / TZ97
DMC-ZS100 / ZS110, DMC-TZ100 / TZ101 / TZ110, DMC-TX1

```
    DC-ZS200 / ZS220, DC-TZ200 / TZ202 / TZ220, DC-TX2
Pentax
    *ist D
    *ist DL
    *ist DL2
    *ist DS
    *ist DS2
    K10D
    K20D
    K100D
    K100D Super
    K110D
    K200D
    K2000/K-m
    KP
    K-x
    K-r
    K-01
    K-1
    K-1 Mark II
    K-3
    K-3 Mark II
    K-3 Mark III
    K-30
    K-5
    K-5 II
    K-5 IIs
    K-50
    K-500
    K-7
    K-70
    K-S1
    K-S2
    MX-1
    Q
    Q7
    Q10
    QS-1
    Optio S (secret menu or hack)
    Optio S4 (secret menu or hack)
    Optio 33WR (secret menu or hack)
    Optio 750Z (secret menu or hack)
    645D
    645Z
PhaseOne
    IQ140
    IQ150
    IQ160
    IQ180
    IQ180 IR
    IQ250
    IQ260
    IQ260 Achromatic
    IQ280
    IQ3 50MP
    IQ3 60MP
    IQ3 80MP
    IQ3 100MP
    IQ3 100MP Trichromatic
    IQ4 150MP
    LightPhase
    Achromatic+
    H 10
    H 20
    H 25
    P 20
    P 20+
    P 21
    P 25
    P 25+
    P 30
    P 30+
    P 40+
    P 45
    P 45+
    P 65
    P 65+
Photron BC2-HD
Pixelink A782
PtGrey GRAS-50S5C
RaspberryPi
    Camera
    Camera V2
Realme 3 Pro
Ricoh
    GR
    GR II
    GR III
    GR IIIx
    GR Digital
    GR Digital II
    GR Digital III
    GR Digital IV
    Caplio GX100
    Caplio GX200
    GXR Mount A12
    GXR GR Lens A12 50mm F2.5 Macro
    GXR GR Lens A12 28mm F2.5
    GXR Ricoh Lens A16 24-85mm F3.5-5.5
    GXR Ricoh Lens S10 24-72mm F2.5-4.4 VC
    GXR Ricoh Lens P10 28-300 mm F3.5-5.6 VC
Rollei d530flex
RoverShot 3320af
SMaL
    Ultra-Pocket 3
    Ultra-Pocket 4
    Ultra-Pocket 5
STV680 VGA
SVS SVS625CL
Samsung
    EX1 / TL500
    EX2F
    GX-1L
    GX-1S
    GX10
    GX20
    Galaxy Nexus
    Galaxy Note 9
    Galaxy NX (EK-GN120)
    Galaxy S3
    Galaxy S6 (SM-G920F)
    Galaxy S7
    Galaxy S7 Edge
    Galaxy S8 (SM-G950U)
    Galaxy S9 (SM-G960F)
    Galaxy S9+ (SM-G965U / 965F)
    Galaxy S10 (SM-G973F)
    Galaxy S10+ (SM-G975U)
    NX1
    NX5
    NX10
    NX11
    NX100
    NX1000
    NX1100
    NX20
    NX200
    NX210
    NX2000
    NX30
    NX300
    NX300M
    NX3000
    NX500
    NX mini / NXF1
    Pro815
    WB550 / WB560 / HZ15W
    WB2000 / TL350
    WB5000 / HZ25W
    S85 (hacked)
    S850 (hacked)
Sarnoff 4096x5440
Seitz
    6x17
    Roundshot D3
    Roundshot D2X
    Roundshot D2Xs
Sigma
    fp
    dp0 Quattro (DNG only)
    dp1 Quattro (DNG only)
    dp2 Quattro (DNG only)
    dp3 Quattro (DNG only)
    sd Quattro (DNG only)
    sd Quattro H (DNG only)
Sinar
    eMotion 22
    eMotion 54
    eSpirit 65
    eMotion 75
    eVolution 75
    3072x2048 (Sinarback 23)
    4080x4080 (Sinarback 44)
    4080x5440
    STI format
    Sinarback 54
Sony
    ILCE-1 (A1)
    ILCE-7 (A7)
    ILCE-7M2 (A7 II)
    ILCE-7M3 (A7 III)
    ILCE-7M4 (A7 IV)
    ILCE-7C (A7C)
    ILCE-7R (A7R)
    ILCE-7RM2 (A7R II)
    ILCE-7RM3 (A7R III)
    ILCE-7RM3A (A7R IIIA)
    ILCE-7RM4 (A7R IV)
    ILCE-7RM4A (A7R IVA)
    ILCE-7S (A7S)
    ILCE-7SM2 (A7S II)
    ILCE-7SM3 (A7S III)
    ILCE-9 (A9)
    ILCE-9M2 (A9 II)
    ILCA-68 (A68)
    ILCA-77M2 (A77-II)
    ILCA-99M2 (A99-II)
    ILCE-3000 / 3500
    ILCE-5000
    ILCE-5100
    ILCE-6000
    ILCE-6100
    ILCE-6300
    ILCE-6400
    ILCE-6500
    ILCE-6600
    ILCE-QX1
    DSC-F828
    DSC-HX95
    DSC-HX99
    DSC-R1
    DSC-RX0
    DSC-RX0 II
    DSC-RX1
    DSC-RX1R
    DSC-RX1R II
    DSC-RX10
    DSC-RX10 II
    DSC-RX10 III
    DSC-RX10 IV
    DSC-RX100
    DSC-RX100 II
    DSC-RX100 III
    DSC-RX100 IV
    DSC-RX100 V
    DSC-RX100 VA
    DSC-RX100 VI
    DSC-RX100 VII
    DSC-V3
    DSLR-A100
    DSLR-A200
    DSLR-A230
    DSLR-A290
    DSLR-A300
    DSLR-A330
    DSLR-A350
    DSLR-A380 / A390
    DSLR-A450
    DSLR-A500
    DSLR-A550
    DSLR-A560
    DSLR-A580
```

```
DSLR-A700
DSLR-A850
DSLR-A900
NEX-3
NEX-3N
NEX-5
NEX-5N
NEX-5R
NEX-5T
NEX-6
NEX-7
NEX-C3
NEX-F3
NEX-VG20
NEX-VG30
NEX-VG900
SLT-A33
SLT-A35
SLT-A37
SLT-A55(V)
SLT-A57
SLT-A58
SLT-A65(V)
SLT-A77(V)
SLT-A99(V)
XCD-SX910CR
IMX135-mipi 13mp
IMX135-QCOM
IMX072-mipi
    IMX214
    IMX219
    IMX230
    IMX298-mipi 16mp
    IMX219-mipi 8mp
    Xperia 5 II (XQ-AS52)
    Xperia L
    Xperia 1 III
    ZV-1 (DCZV1/B)
    ZV-E10
Vivo X51 5G (V2006)
Xiaomi
    MI3
    MI 8
    MI 9 Lite
    MI MAX
    POCO M3
    RedMi Note3 Pro
    RedMi Note7
    RedMi Note 8T
    FIMI X8SE
Xiaoyi YIAC3 (YI 4k)
YUNEEC
    CGO3
    CGO3P
    CGO4
Yi M1
Zeiss ZX1
Zenit M
```

7 Glossary

Activation For colymp to be fully usable, activation is required. During this process a "serial number" is consumed. Afterwards colymp is fully usable on this Mac.

ColorProfile (ICC Profile) Is a table of numbers that defines a color space in a numerical way. In colymp the color profile is contained in the .pcf file (calibration).

Color space Comparable to "cm" or "inch" as units for lengths, color spaces are the units for color values. A color space specifies how to interpret a numerical value that describes a color. For example, the RGB values R:149 G:44 B:44 in `sRGB` describe exactly the same, red color as the RGB values R:129 G:48 B:48 in `AdobeRGB`. Color spaces are described by ICC profiles. To convert color values from one color space to the other, both color spaces are needed. If a color space is unknown (not specified) it is usually assumed to be `sRGB` ("Standard"-RGB).

Test Chart (also called calibration chart, calibration target) Will be printed; contains various colors necessary to measure/ characterize/ calibrate the printer (see Figure 8).

Calibration (.pcf file) Contains printer settings, measurement values, correction tables (ICC profile), but not the photograph of the test chart (see section 3).

Template/ Evaluation Template The evaluation template marks the individual color patches in the photograph of a test chart. It is adapted by the user to the respective photograph (see Figure 18).

Serial number The serial number represents a voucher that is consumed when colymp is activated. You receive a serial number when you purchase colymp and can use it to activate colymp on a Mac.

8 Version History

8.1 New in colymp Version 3.x

- Version for macOS
- Support for many new RAW formats
- Improvement of RAW Converter (Version 3.2)

8.2 New in colymp Version 2.x

- colymPrinterXPS has been completely redeveloped (used to be colymPrinter): Selection of calibration *before* printing. The media format and margins of the target printer are automatically applied. The user no longer needs to set a special paper format generated by colymp before printing as in version 1.x.
- Compatibility with current Windows version: Windows Vista, Windows 7, Windows 8, Windows 8.1, Windows 10, and future versions.

- Direct support of RAW formats (when evaluating the test chart).
- support of embedded color profiles (when evaluating the test chart as well as when printing)
- support monitor profile

9 Legal

9.1 Registered Trademarks

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