USER GUIDE

calc ICC

Professional color conversion on iPhone and iPad

Convert • Inspect • Proof • Compare

A practical reference for working with individual colors and ICC profiles.

Powered by Little CMS

Contents

1. Getting Started

1.1 What calc ICC is

calc ICC is a professional color conversion calculator for iPhone and iPad. It converts individual color values through ICC color profiles and lets you inspect the numerical and colorimetric results directly on your device. Unlike image editors or file conversion tools, calc ICC works with one color at a time. You select an input ICC profile, enter the color values, select an output profile when required, and calc ICC immediately calculates the corresponding output values.

Depending on the profiles and options selected, calc ICC can also display Profile Connection Space values, perform soft proofing and gamut checking, maintain CMYK ink formulas where possible, work with DeviceLink profiles and Named Color Profiles, and compare colors using CIEDE2000. The application is powered by Little CMS and performs its color calculations locally on the device.

1.2 Who it is for

calc ICC is intended for people who work with color values and ICC profiles and need a fast way to inspect or verify individual colors.

Typical users include:

- Prepress and print production professionals
- Color management consultants and profile creators
- Graphic designers and photographers
- Printing, packaging and proofing specialists
- Quality control personnel
- Software developers working with ICC color management
- Students and educators studying color spaces and color conversion

It can also be useful whenever a desktop color management application would be unnecessarily cumbersome for checking a single value.

For example, calc ICC can quickly answer questions such as:

- What CMYK values correspond to a given RGB color under a particular printer profile?
- What is the PCS Lab value of a device color?
- How does changing the rendering intent affect a conversion?
- Is a color outside the gamut of a selected printing condition?
- What values are produced by a DeviceLink profile?
- What device values correspond to a color stored in an ICC Named Color Profile?
- How different is the current color from a previously saved reference?

calc ICC is not an image converter, profile editor, calibration application, or measurement tool. It does not replace a colorimeter or spectrophotometer, and it cannot guarantee that a physical print or display will match the calculated values. Results depend on the accuracy and suitability of the ICC profiles being used and on the real devices and processes they describe.

1.3 The main screen

The main screen is designed to behave like a specialized pocket calculator for color management.

It is divided into four main areas:

Profiles

The upper part of the screen shows the active input ICC profile and, for ordinary profile conversions, the selected output ICC profile. Tap a profile name to select another profile. The output profile may become unavailable for some specialized profile types. For example, a DeviceLink profile already defines its destination color space and therefore does not require a separately selected output profile. An eye control is displayed beside the output profile when the current input color has usable PCS information. Tapping it opens a full-screen approximation of the current color.

Values

The value area displays the input and output channels for the active profiles. Input values are editable. Tap any input channel to make it active, then use the calculator keypad to enter its value. Output values are calculated automatically and cannot be edited. Channel names depend on the selected profiles. Common examples include R, G and B for RGB profiles, C, M, Y and K for CMYK profiles, or L*, a* and b* for Lab. Multichannel profiles may contain additional channels.

PCS

When available, the PCS row displays the Profile Connection Space representation of the current input color.

The PCS can be displayed as:

- CIE L*a*b*
- CIE L*C*h°
- CIE XYZ

The PCS display can also be hidden.

If a conversion from the history has been selected as a comparison reference, this area can additionally display the CIEDE2000 difference between the reference color and the current color.

Keypad and controls

The lower part of the screen contains the numeric keypad together with the controls used to configure the conversion.

Depending on the active profiles, these controls can include:

- Rendering intent
- Black Point Compensation
- Numeric format
- PCS display
- Maintain Formula
- Soft proofing and gamut checking

Controls that do not apply to the current profile combination are disabled automatically.

Some advanced controls are part of calc ICC Pro. After a verified Pro lifetime purchase, calc ICC remembers the unlock locally so normal launches remain unlocked offline. After reinstalling the app, use StoreKit verification or Restore Purchases to restore access.

1.4 Your first conversion

The fastest way to understand calc ICC is to perform a simple RGB conversion. On first use, calc ICC provides built-in profiles that can be used immediately, so no profile import is required.

To perform a conversion:

1. Tap the input profile and select the desired source ICC profile.
2. Tap the output profile and select the desired destination ICC profile.
3. Tap the first input channel.
4. Enter its value using the keypad.
5. Press Enter to advance to the next channel.
6. Repeat the process for the remaining input channels.
7. After entering the final channel, press Enter again to complete the conversion.

The output values are recalculated while you enter the numbers, so you can see the result immediately. The final Enter confirms the completed color and adds it to Conversion History.

For a simple first test, select **sRGB IEC61966-2.1** as the input profile and **Display P3** as the output profile, then enter an RGB color.

For example:

```
R = 255 G = 128 B = 0
```

The output area immediately shows the equivalent Display P3 values calculated through the selected ICC profiles. You can change any input value afterward and the result will update automatically.

1.5 Reading input, output, PCS, and warnings

A calc ICC result can contain several kinds of information.

Input values

These are the values you entered and are interpreted according to the selected input ICC profile. A value such as RGB 255, 128, 0 does not define a complete color by itself. Its actual color meaning depends on the profile associated with those numbers.

Output values

These are the device values produced by the active color transformation. For a normal profile-to-profile conversion, the output values are expressed in the color space of the selected output ICC profile. The number and names of the output channels depend on that profile.

PCS values

When available, PCS values provide a device-independent representation of the input color. calc ICC can display the PCS as Lab, LCh or XYZ. This is useful for examining the color independently of its device encoding and for comparing colors from different profile combinations.

Warnings

A yellow warning triangle can indicate that the current color is outside a relevant gamut. The exact meaning depends on where the warning appears. During soft proofing, the warning indicates that the current source color is outside the gamut of the selected proof condition. The PCS color preview can also display a warning when the calculated Display P3 components fall outside the range that the device display can represent. These are different tests and should not be interpreted as equivalent. The relevant sections of this guide explain them in detail.

1.6 Contextual help and the Guided Tour

calc ICC includes built-in help so that most controls can be understood without repeatedly consulting this manual.

Guided Tour

The Guided Tour is displayed when calc ICC is first used and introduces the main parts of the application, including:

- Profile selection
- Color value entry
- PCS display
- Conversion controls
- Maintain Formula
- Conversion History
- Contextual help

You can open the Guided Tour again at any time from the application menu.

Contextual help

Many controls and value areas provide help through a long press. Press and hold a control to see an explanation of its purpose and, where appropriate, how it affects the color conversion.

Contextual help is available for subjects such as:

- Rendering intents
- Numeric formats
- PCS
- Maintain Formula
- Profile selection
- Input and output values
- Named colors

Long pressing an input or output value can also provide additional actions such as copying values, copying a complete conversion, pasting a compatible calc ICC conversion, or opening Help.

This manual provides the broader explanation and practical context behind those controls. For quick reminders while using the application, the built in contextual help is usually the fastest reference.

2. Working with ICC Profiles

2.1 Input and output profiles

ICC profiles give meaning to the numbers entered in calc ICC and define how those values are converted.

In a standard conversion, calc ICC uses two profiles:

- An **input profile**, which defines the meaning of the values you enter.
- An **output profile**, which defines the destination color space and therefore the values calculated by the application.

For example, the RGB values 200, 100, 50 interpreted through sRGB do not necessarily represent exactly the same color as the same numerical values interpreted through Adobe RGB (1998). The profile is part of the color definition.

Likewise, converting that color to a printer profile produces output values appropriate for the printing condition described by that profile. Tap either profile name on the main screen to select a different profile. The available controls and channel values automatically adapt to the selected profiles. RGB profiles normally provide three channels, CMYK profiles provide four, and multichannel profiles can provide additional channels. Some specialized ICC profile classes work differently. A DeviceLink profile already contains a direct conversion from one device space to another. When a DeviceLink is selected as the input profile, there is no separately selectable output profile.

A Named Color Profile contains a collection of named colors rather than a normal set of numeric channels. calc ICC can present one as a searchable input swatchbook or use it as an output target for nearest-color matching. These specialized workflows are described later in this chapter.

2.2 Built-in profiles

calc ICC includes several profiles that are available immediately after installation:

- sRGB IEC61966-2.1
- Display P3
- Adobe RGB (1998)
- CIE L*a*b* D50
- CIE L*a*b* D65
- CIE L*C*h° D50
- CIE XYZ D50
- OK Lab

These profiles allow many common conversions to be performed without importing additional files.

The initial conversion uses sRGB IEC61966-2.1 as the input profile and Display P3 as the output profile. The built-in profiles cannot be deleted. Additional ICC profiles can be imported with calc ICC Pro. This is particularly useful when working with printer profiles, proofing profiles, custom RGB spaces, DeviceLinks, Named Color Profiles, or multichannel printing conditions.

2.3 Importing ICC profiles

calc ICC Pro can import ICC profiles through the iOS Files interface.

To import a profile:

1. Open the application menu.
2. Choose **Import ICC profiles**.
3. Select the desired profile from Files.
4. Review the information presented by calc ICC.
5. Accept the embedded copyright notice if you are permitted to use the profile.

calc ICC recognizes files with the following filename extensions:

- `.icc`
- `.icm`
- `.pf`

Before accepting a profile, calc ICC opens and validates its ICC structure.

The application verifies that the profile can be read, that its color space and profile class are supported, and that a usable profile description is available. calc ICC also reads the profile's embedded copyright notice and requires explicit acceptance before storing the file. Importing a profile does not modify the original ICC file. Once the profile has been accepted, calc ICC stores its own protected local copy. The external file used for the import is therefore no longer required by the application and can be removed from its original Files location if desired. After a successful import, the new profile becomes the active input profile.

2.4 Selecting, searching, and deleting profiles

Tap an input or output profile name on the main screen to open the profile selector. The selector lists the profiles currently available to calc ICC.

Searching

Use the search field to find a profile by its description or name. This is particularly useful when many printer, proofing, or custom profiles have been imported.

Recent profiles

calc ICC keeps a short list of recently selected profiles so that frequently used profiles can be reached quickly. Up to five recent profile selections are retained.

Current selection

The currently selected profile is identified with a checkmark. Selecting another profile closes the selector and rebuilds the color conversion using the new profile.

Swapping profiles

For ordinary profile conversions, the input and output profiles can be exchanged using the swap command. This is useful when you want to reverse the direction of a compatible conversion. Swapping is available whenever the current workflow has PCS data. If the output is a Named Color Profile, calc ICC carries the closest matched entry into the new named-color input. Enabling swap turns soft proofing off first because proof output is not a destination-space value. Swapping remains unavailable for DeviceLinks.

Deleting imported profiles

Imported profiles can be removed from the profile selector using the standard swipe-to-delete gesture. Built-in profiles are protected and cannot be deleted. If a profile currently being used is deleted, calc ICC automatically selects an appropriate built-in replacement. The normal fallback profiles are sRGB for the input and Display P3 for the output. Deleting an imported profile removes calc ICC's stored copy. It does not affect the original file from which the profile was imported. A deleted imported profile can be imported again later if the original ICC file is still available.

2.5 DeviceLink profiles

A DeviceLink profile is different from an ordinary ICC input or output profile. Instead of describing one device space and connecting it through the Profile Connection Space, a DeviceLink directly defines a transformation from one device space to another. For this reason, calc ICC treats a DeviceLink as a complete conversion.

When a DeviceLink is selected as the input profile:

- The DeviceLink defines both the input and output color spaces.
- The normal output profile selector is unavailable.
- Input and output channel names are obtained from the DeviceLink.
- Rendering intent cannot be selected.
- Soft proofing is unavailable.
- PCS display is unavailable.
- Gamut checking through a separate proof profile is unavailable.

If the DeviceLink contains colorant information, calc ICC uses those names for the corresponding channels where possible.

DeviceLinks can also contain multichannel transformations, allowing calc ICC to inspect conversions involving more than four channels. Using a DeviceLink is otherwise straightforward. Select the DeviceLink as the input profile, enter the source channel values, and read the resulting destination values. Because the transformation is already encoded inside the profile, controls that would normally alter how an ICC conversion is built are intentionally disabled.

2.6 Named Color Profiles and swatchbooks

An ICC Named Color Profile contains a collection of named colors together with the information required to represent or convert them. calc ICC treats a Named Color Profile as a searchable electronic swatchbook. When a Named Color Profile is selected as the input profile, the normal numeric input fields are replaced by a named-color selection field. Tap the field, or press Enter, to open the color list. You can search for a color by name. Search matching is insensitive to case and diacritical marks, which makes large swatchbooks easier to navigate. Select a color from the list to use it as the current input.

calc ICC then converts the selected named color through the currently selected ordinary output profile and displays the resulting device values. Selecting a named color also completes the conversion and records it in Conversion History. The last selected entry is remembered separately for each input Named Color Profile and restored when that profile is selected again. With an ordinary output profile, Proof can be enabled for a named-color input. The displayed output remains the direct named-color conversion; Proof adds target-gamut checking rather than an input-space soft-proof round trip.

This workflow makes it possible to use an ICC Named Color Profile directly as a portable swatchbook. For example, a named color can be selected and converted into the RGB values required by a display profile or into the CMYK values produced by a printer profile.

2.7 Named Color Profiles as output targets

A Named Color Profile can also be selected as the output. calc ICC compares the current input-side PCS Lab color with every embedded named entry and displays the closest match by minimum CIEDE2000 difference. The output area shows the matched name, including any profile prefix or suffix. The PCS row shows the match's ΔE00. Conversion History and copied summaries retain both the matched name and the difference. This is a nearest-swatch search, not a device-channel conversion. Proof is unavailable when the output is a Named Color Profile. Swapping profiles selects the matched root entry as the new named-color input.

3. Conversion Controls

> Conversion controls change the calculation or value display. Availability depends on the selected profiles, and some controls require calc ICC Pro.

3.1 Rendering intents

Rendering intents determine how colors are mapped between spaces. calc ICC provides:

- Perceptual
- Relative Colorimetric
- Relative Colorimetric with Black Point Compensation
- Saturation
- Absolute Colorimetric

Tap the control to cycle through available options and recalculate the output.

Perceptual

Maintains overall visual relationships when gamuts differ. Profile behavior varies. Perceptual is the initial default.

Relative Colorimetric

Maps in-gamut colors as directly as possible, interprets source white relative to destination white, and handles out-of-gamut colors according to the profile.

Relative Colorimetric with Black Point Compensation

Adds Black Point Compensation to Relative Colorimetric to improve mapping between different black levels. See Section 3.2.

Saturation

Prioritizes vividness and color differentiation rather than strict colorimetric accuracy. Results depend on the profiles.

Absolute Colorimetric

Maintains the source reference-white colorimetry instead of adapting it to destination white. It is commonly used for proofing and measurement-oriented comparisons.

Choosing a rendering intent

Choose according to the task, profiles, and desired out-of-gamut treatment. Compare intents with the same color and profiles as described in Chapter 6.

3.2 Black Point Compensation

Black Point Compensation, usually abbreviated as BPC, is available in calc ICC as part of Relative Colorimetric with Black Point Compensation. Different devices and printing conditions can have very different darkest reproducible colors.

For example, a display may reproduce a much deeper black than a particular printing process. A direct Relative Colorimetric conversion can map the source and destination black levels in a way that loses useful tonal separation near black.

Black Point Compensation adjusts the mapping between those black points so that shadow values can be distributed more effectively within the destination range. BPC does not create a darker destination black than the device can reproduce. Instead, it changes how the source tonal range is mapped toward the available destination black. Whether BPC produces a significant visible or numerical difference depends on the profiles and the color being converted. In calc ICC, select Relative Colorimetric with Black Point Compensation using the rendering intent control when you want BPC to be part of the transformation.

3.3 Numeric formats

calc ICC can display and accept device-channel values in several numerical representations. Changing the numeric format changes how the values are shown and entered. It does not change the underlying color or the ICC transformation. The control cycles through Auto, 8-bit integer, 8-bit decimal, integer percentage, decimal percentage, normalized floating point, 8-bit hexadecimal, 16-bit hexadecimal, and 16-bit integer.

Auto

Auto selects by color-space family:

- RGB and Gray values use an 8-bit style range.
- CMY, CMYK, and multichannel values use percentages.
- Other device spaces use normalized values where appropriate.

Examples for the same approximate midrange value are `128`, `127.50`, `50%`, `50.00%`, `0.500`, `0x80`, `0x8080`, and `32896`. Hexadecimal modes enable A to F and accept an optional `0x` prefix.

Special color spaces

Not every color space is naturally represented as a normalized device range. Lab-like values are entered and displayed directly in their appropriate numerical form rather than being forced into a 0 to 255 or percentage representation. XYZ values are shown using a 0–100-style scale even though calc ICC may use normalized values internally.

Values outside nominal range

Some formats are constrained to their normal device range. Integer, integer percentage, hexadecimal, and 16-bit integer inputs are clamped to the corresponding normalized range. Decimal 8-bit, decimal percentage, and normalized floating-point formats can retain values outside the nominal range when the underlying transform can use them. This can be useful when inspecting extended-range calculations. Changing the numeric format affects the displayed representation and the representation stored in future history entries, but not the current underlying color.

3.4 Profile Connection Space: Lab, LCh, and XYZ

The Profile Connection Space, or PCS, is the device-independent intermediate representation used by ordinary ICC profile conversions.

When the active input profile provides a usable PCS, calc ICC can display the current input color in one of three forms:

- CIE L*a*b*
- CIE L*C*h°
- CIE XYZ

Use the PCS control to cycle between these representations or to hide the PCS row.

Lab

CIE L*a*b* represents color using three components:

- L* for lightness
- a* for the green to red opponent axis
- b* for the blue to yellow opponent axis

Lab is widely used in color management because it provides a convenient device-independent representation for comparison and analysis.

LCh

CIE L*C*h° is a cylindrical representation derived from Lab.

It expresses the color using:

- L* for lightness
- C* for chroma
- h° for hue angle

LCh can be more intuitive when examining changes in hue or chroma.

XYZ

CIE XYZ is another device-independent color representation. calc ICC presents XYZ values using a 0–100-style scale.

What the PCS values represent

The PCS row describes the color produced by the input side of the transformation. It should not be confused with the numerical output values of the selected destination profile. The output rows show device values for the destination space, while the PCS row provides a device-independent representation of the input color. PCS values can also be used for color comparison. When a suitable history entry has been selected as a reference, calc ICC displays the live CIEDE2000 difference in the PCS area.

PCS display is not available for DeviceLink workflows because a DeviceLink directly connects two device spaces and calc ICC does not expose a separate input-to-PCS path for that conversion.

3.5 Maintain Formula

Maintain Formula is a specialized calc ICC feature for CMYK-to-CMYK conversions. A normal CMYK conversion aims to reproduce the desired color in the destination space, but several different combinations of C, M, Y, and K can often produce a similar colorimetric result. In some workflows, the structure of the original ink formula is also important.

For example, a source color might be built using only Cyan and Magenta. A conventional conversion could reproduce a similar appearance using Cyan, Magenta, Yellow, and Black.

With Maintain Formula enabled, calc ICC attempts to retain the structure of the source ink recipe where possible while still targeting the intended color appearance.

For example, a C+M source construction is preferentially kept as a C+M style construction rather than being replaced by an unrelated four-ink combination.

Maintain Formula is available only when both the input and output device spaces are CMYK. Its behavior also depends on the selected profiles, the rendering intent, and the color being converted. It is therefore not a guarantee that every source formula can be reproduced unchanged. When Maintain Formula is active, calc ICC uses the appropriate specialized conversion behavior and recalculates the current output immediately. A practical CMYK-to-CMYK example is included in Chapter 6.

3.6 When controls are unavailable

Disabled controls do not apply to the active transformation:

DeviceLink profiles

- Rendering intent is unavailable.
- PCS display is unavailable.
- Soft proofing is unavailable.
- A separate output profile cannot be selected.

Named Color Profiles

Named-color input keeps its direct output values when Proof is enabled and adds target-gamut checking. A Named Color Profile used as output performs nearest-color matching, so Proof is unavailable in that output mode.

Maintain Formula

Maintain Formula requires CMYK input and output.

PCS

PCS display requires a usable input-to-PCS path and is unavailable for DeviceLinks.

Rendering intent

Rendering intent requires a meaningful intent-dependent conversion and is unavailable for DeviceLinks.

Soft proofing

Proof requires PCS data and a suitable ordinary output profile. It is unavailable for DeviceLinks and Named Color Profile output. Named-color input supports gamut checking without an input-space proof round trip. See Chapter 4.

4. Soft Proofing, Gamut, and Color Preview

> Soft proofing simulates a target output condition. PCS preview approximates the current PCS color on-screen. Their yellow warnings have different meanings.

4.1 What soft proofing does

When soft proofing is active, the output profile becomes the **proof profile**. Instead of proof-profile values, calc ICC returns input-space values that simulate the selected output condition.

Use it to examine:

- How would this RGB color be affected by a particular printing condition?
- Which source-space values represent the simulated printed result?
- Is the original color outside the gamut of the selected proof condition?
- How does changing the proof profile affect the result?

Proof requires a PCS-based workflow and an ordinary output profile. It is unavailable for DeviceLinks and Named Color Profile output. With named-color input, it performs gamut checking while leaving the direct output values unchanged.

4.2 Using an output profile as a proof condition

Select the normal input profile and the output condition to simulate. Before soft proofing, output rows show destination values. After enabling it, that profile becomes the proof condition and the simulated result appears in the **input color space**.

For example, if the input is sRGB and the selected proof profile is CMYK, the result shown during soft proofing is expressed as RGB values in the sRGB input space.

The output profile label turns yellow while it acts as the proof condition. Disable soft proofing to restore standard conversion.

4.3 Gamut checking

While soft proofing, calc ICC checks the source color against the proof-profile gamut. If calc ICC determines that the current source color lies outside the gamut of the selected proof condition, it displays a yellow warning triangle beside the output values. The color is still valid and the conversion has not failed. The warning means that mapping or clipping is required for that condition. When a completed soft-proof conversion is stored in Conversion History, its gamut status is also stored as either In gamut or Out of gamut. This status belongs only to the proof-profile test.

4.4 Understanding the yellow warning

A soft-proof triangle beside the output refers to the selected **proof profile** and may change when you:

- Change the input color
- Change the proof profile
- Change a transform setting
- Enable or disable soft proofing

Interpret the result within the active profiles and settings. It is not a permanent property of the color. The PCS preview triangle uses a separate test.

4.5 PCS color preview

When the active input profile provides usable PCS information, an eye control appears beside the output profile selector. Tap the eye to open a full-screen preview of the current PCS color. The full-screen patch converts input-side PCS Lab to Display P3 through iOS color management. It does not display the raw numerical output. In an sRGB-to-CMYK conversion, for example, it approximates the input-side PCS color rather than visualizing CMYK values. Tap anywhere on the preview to return to the calculator.

Display P3 gamut indication

Before drawing the preview, calc ICC checks the calculated Display P3 components. If one or more components fall outside the nominal Display P3 range, a yellow warning triangle appears over the preview. This means that the PCS color cannot be represented directly within the Display P3 range used for the visual patch. The displayed color must therefore be clipped to a representable value. This warning refers only to the Display P3 preview. It says nothing about whether the color is inside or outside the gamut of a selected printer or proof profile.

4.6 Why the preview is only an approximation

The preview is a visual aid, not a calibrated soft proof. Its accuracy is limited by several factors.

Display gamut

Colors outside Display P3 are clipped to a representable result and trigger the preview warning.

Display characteristics

Devices, display aging, viewing angle, and hardware affect appearance.

Brightness and viewing conditions

Brightness and ambient illumination influence perception.

System display behavior

calc ICC supplies Display P3 values to iOS, but the device is not a reference colorimeter or calibrated proofing monitor.

Printed color cannot be reproduced literally by emitted light

Print reflects light and also depends on paper, inks, illumination, finish, optical brighteners, surrounding colors, and viewing conditions. Use the preview as a visual aid, not a measurement or contractual proof.

4.7 Proof-gamut warning vs Display P3 preview warning

calc ICC performs two independent checks:

Proof-gamut warning

A triangle beside conversion values asks whether the proof profile can represent the source color. Its result can be stored in Conversion History.

Display P3 preview warning

A triangle inside PCS preview asks whether Display P3 can represent the PCS color within nominal component range. It applies only to the preview and is not stored as conversion gamut status.

The two results are independent

A color can be:

- Inside the proof-profile gamut and inside Display P3
- Outside the proof-profile gamut but inside Display P3
- Inside the proof-profile gamut but outside Display P3
- Outside both

For example, a saturated color can fit Display P3 but not a printer gamut. Warning location identifies the test: beside values means **proof profile**; inside the patch means **Display P3 preview**.

5. History, Copy/Paste, and Color Comparison

> calc ICC keeps a compact history of completed conversions and provides several ways to reuse, copy, restore, and compare them.

The history is intended as a working record rather than as a permanent database. It stores the most recent completed conversions and makes it easy to inspect previous results, restore compatible states, and select a reference for live ΔE00 comparison.

5.1 Conversion History

calc ICC stores the 40 most recent completed conversions. A conversion is added to the history when you complete the final input channel with Enter or when you select a named color from a Named Color Profile. Live recalculation by itself does not create a history entry.

Each history item can contain:

- Date and time
- Input profile
- Input channel names and values
- Selected named color, when applicable
- Output or proof profile
- Output channel names and values
- PCS Lab values, when available
- In-gamut or out-of-gamut status, when applicable
- A restorable calculator-state snapshot for conversions created by versions that support full-state restoration

The newest entries appear first.

Consecutive completed conversions are not duplicated when the displayed result and restorable settings are identical. You can delete individual history entries or clear the history completely. If a deleted item was being used as the active ΔE00 reference, the reference is also cleared.

5.2 Restoring previous work

Recent history entries can contain enough information to recreate the calculator state associated with that conversion.

This includes information such as:

- Input profile
- Output profile
- Raw input values
- Named-color selection, when applicable
- Rendering intent
- Numeric format
- PCS display mode
- Soft-proofing state
- Maintain Formula state

Restoration is possible only when the required profiles and settings are still valid.

For example, if a conversion depends on an imported profile that has since been deleted, calc ICC cannot fully restore that state.

Older history entries created before restorable snapshots were supported can still be read and copied as text, but they cannot recreate the full calculator state.

5.3 Copy Value and Copy All

Press and hold an input, output, or named-color value to open the context menu.

The available actions include **Copy Value** and **Copy All**.

Copy Value

Copy Value copies only the currently visible value set in a compact plain-text form. For normal channel values, this means the visible channel names and values. For a Named Color Profile, it copies the selected color name. This is useful when you only need the numerical result and do not need the full conversion context.

Copy All

Copy All copies a more complete description of the current conversion.

The readable text can include:

- Date and time
- Input profile
- Input values
- Output or proof profile
- Output values
- PCS Lab values, when available
- Gamut status
- Rendering intent
- Numeric format
- PCS display choice
- Soft-proofing state
- Maintain Formula state

In addition to the readable text, calc ICC also places a private, versioned representation of the conversion on the clipboard.

This private representation contains the information required to restore a compatible calc ICC state with greater fidelity than plain text alone.

The readable text is intended for people and for pasting into other applications.

The private representation is intended only for calc ICC.

5.4 Pasting calc ICC conversions

Paste is available when the clipboard contains a compatible conversion previously copied by calc ICC.

Pasting can restore:

- Input profile
- Output profile
- Raw input values
- Named-color selection
- Rendering intent
- Numeric format
- PCS display mode
- Soft-proofing state
- Maintain Formula state

After restoring the settings, calc ICC recalculates the result using the current application state and installed profiles.

Paste is not a general text parser.

Typing or copying an arbitrary text string such as:

RGB 255 128 0 does not create a restorable calc ICC conversion. The clipboard must contain the private calc ICC representation produced by Copy All.

Restoration can fail when:

- The clipboard representation is incompatible
- A required imported profile is no longer installed
- The saved output profile is no longer valid for output use
- The required transform cannot be rebuilt
- The stored data comes from an unsupported application version or state

When this happens, calc ICC does not attempt to reconstruct a partial or potentially misleading conversion.

Plain-text content can still be read or pasted into other applications independently of whether full restoration is possible.

5.5 Selecting a ΔE00 reference

A history entry that contains PCS Lab data can be selected as the reference for color comparison. Open Conversion History and choose the desired entry. You can select it using the available Set as Reference action. The selected entry is visually highlighted so that you can identify the active reference. Only one history entry can be used as the comparison reference at a time. Entries without valid PCS Lab data cannot be selected.

This includes DeviceLink results, because calc ICC does not expose PCS values for DeviceLink workflows.

The reference is session state. It is not intended as a permanent tagged or named reference stored independently of the history. Deleting the selected history item or clearing the history also clears the active reference.

5.6 Comparing the current color with a reference

Once a history entry has been selected as the reference, return to the main calculator. If PCS display is enabled, calc ICC shows the live CIEDE2000 difference between the selected reference and the current color. The comparison appears in the PCS area. calc ICC uses the saved PCS Lab values of the reference and compares them with the current live PCS Lab values. The comparison works even if the PCS row is currently displayed as LCh or XYZ, because the underlying calculation uses Lab values. A lower ΔE00 value indicates a smaller color difference.

A value of zero means that the two compared PCS Lab values are identical.

As you change:

- Input values
- Profiles
- Rendering intent
- Soft-proofing state
- Other transformation settings

the current color is recalculated and the displayed ΔE00 value updates automatically.

This makes it possible to keep one color fixed as a reference while experimenting with the current conversion. calc ICC does not calculate ΔE00 independently for every history item. The displayed value always compares the one selected reference with the current live color.

5.7 Last Results

The most recent completed conversion can also be opened through the Last Results Home Screen quick action. This provides fast access to the latest saved result without first navigating through the full Conversion History.

calc ICC also supports its application URL for the same purpose:

```
calcicc://last-results
```

If no conversion has yet been completed, Last Results indicates that there is no saved result available. The Last Results view is a shortcut to the most recent completed conversion. It does not change the 40-entry history limit or create a separate result store.

6. Practical Workflows

This chapter applies the controls described earlier to common color-management tasks.

6.1 RGB to RGB conversion

To translate a color between RGB spaces:

1. Select the source RGB profile as the input profile.
2. Select the destination RGB profile as the output profile.
3. Enter the source R, G, and B values.
4. Read the converted R, G, and B values in the output area.

The result updates while you edit. Enable PCS display or open the PCS color preview when you also need the input color's colorimetric values or an on-screen approximation.

Example

For sRGB `255, 128, 0`, select sRGB IEC61966-2.1 as input and Display P3 as output. The Display P3 numbers will generally differ because RGB values require a profile to define their color meaning.

6.2 RGB to printer CMYK

Import the appropriate printer profile if required, then:

1. Select the RGB source profile as the input profile.
2. Select the printer profile as the output profile.
3. Choose the desired rendering intent.
4. Enter the RGB values.
5. Read the resulting C, M, Y, and K values.

For example, convert sRGB `200, 80, 60` through the selected printer profile. The CMYK recipe is specific to that profile and rendering intent; another printer profile can produce different values.

Inspecting PCS at the same time

Enable PCS display when comparing the same source color across printer profiles. PCS remains associated with the input color while CMYK changes with the output profile.

6.3 Comparing rendering intents

To compare intents:

1. Select the desired input profile.
2. Select the desired output profile.
3. Enter the color you want to inspect.
4. Note the current output values.
5. Change the rendering intent.
6. Compare the new output values.
7. Repeat for the other intents as required.

Because calc ICC recalculates the conversion immediately, you can compare the effect of each intent without re-entering the source color.

Compare Perceptual, Relative Colorimetric, Relative Colorimetric with Black Point Compensation, Saturation, and Absolute Colorimetric as needed. Differences depend on the profiles and are often largest near or outside the destination gamut.

Using history for comparison

Complete the conversion under each intent to store the results in Conversion History.

Using PCS and ΔE00

Select one saved result as the ΔE00 reference, then change the intent and observe the live difference.

6.4 Checking whether a color fits a target gamut

To check whether a source color is in the gamut of a target condition:

1. Select the source profile as the input profile.
2. Select the target printer or proof profile as the output profile.
3. Enter the source color.
4. Enable soft proofing.
5. Inspect the output area for the yellow gamut warning triangle.

No proof-gamut warning means the color is considered in gamut for the active proof condition. A yellow triangle beside the output means it is outside that gamut under the current settings. Edit the source values to explore where the warning changes. The triangle inside the full-screen PCS preview tests Display P3 instead and is independent.

6.5 CMYK-to-CMYK with Maintain Formula

CMYK conversions can produce a similar color with a different ink recipe. For example, a source may intentionally use only Cyan and Magenta:

```
C = 70% M = 40% Y = 0% K = 0%
```

A conventional conversion may introduce Y or K. Enable **Maintain Formula** when the C+M structure matters.

To use it:

1. Select a CMYK profile as the input profile.
2. Select another CMYK profile as the output profile.
3. Enter the source CMYK values.
4. Note the standard conversion result.
5. Enable Maintain Formula.
6. Compare the new CMYK output.

calc ICC tries to keep the destination recipe based on C and M where possible. It does not guarantee identical percentages. Results depend on the profiles, rendering intent, and source color.

Comparing both methods

1. Complete and save the normal CMYK conversion.
2. Enable Maintain Formula.
3. Complete and save the second conversion.
4. Compare the two entries in Conversion History.

If both entries have PCS Lab data, select one as the ΔE00 reference to compare color difference alongside ink structure.

6.6 Inspecting a DeviceLink

To inspect a DeviceLink:

1. Import the DeviceLink profile if it is not already installed.
2. Select it as the input profile.
3. Enter the source channel values.
4. Read the destination values produced by the DeviceLink.

The DeviceLink defines the destination and conversion behavior, so output profile selection, rendering intent, PCS display, and soft proofing are unavailable.

Multichannel DeviceLinks

For more than four channels, calc ICC adapts the interface and uses profile channel names when available.

Practical use

A DeviceLink can be tested with representative values to inspect:

- Neutral behavior
- Black generation
- Ink-channel behavior
- Special colorant behavior
- Multichannel output
- Selected edge cases

calc ICC evaluates one color at a time, making this a diagnostic workflow rather than batch processing.

6.7 Using a Named Color Profile

To use one:

1. Import the Named Color Profile if required.
2. Select it as the input profile.
3. Tap the named-color field or press Enter.
4. Search for the desired color.
5. Select the color.
6. Read the converted output values.

The selected ordinary output profile determines the RGB or CMYK destination values.

Example

For a swatch named Brand Orange, select a printer profile to calculate its CMYK values, or select Display P3 to inspect RGB values. Enable Proof to check whether the swatch is outside that ordinary output profile's gamut; the device output remains a direct conversion.

6.8 Finding the closest named color

To find the closest entry in a Named Color Profile:

1. Select an ordinary source profile and enter the color to identify.
2. Select the Named Color Profile as output.
3. Read the closest name in the output area and its ΔE00 in the PCS row.
4. Complete the conversion to save the match and ΔE00 in Conversion History.

A smaller ΔE00 means a closer PCS Lab match. Use Swap Profiles when you want to make the matched swatch the new named-color input.

6.9 Comparing two colors with ΔE00

To compare two colors:

1. Create the first color and complete the conversion so that it is stored in Conversion History.
2. Open Conversion History.
3. Select that entry as **Set as Reference**.
4. Return to the calculator.
5. Enter or select the second color.
6. Enable PCS display if it is not already visible.
7. Read the live ΔE00 value in the PCS area.

The reference remains fixed while you edit the current color. A smaller ΔE00 indicates a smaller difference; zero indicates identical PCS Lab values.

Example workflow

1. Enter the reference color using the appropriate profile.
2. Save it to history.
3. Set it as the ΔE00 reference.
4. Change to the profile or color space you want to work in.
5. Adjust the new color values.
6. Watch the ΔE00 value as you make changes.

Continue adjusting until the difference is acceptable for the task.

Important limitations

ΔE00 requires PCS Lab data, so DeviceLink results cannot be references. It is a color-difference metric, not a guarantee that physical samples will match under every viewing condition.

7. Troubleshooting and Reference

Unavailable controls usually reflect the active profiles or workflow rather than an application error.

7.1 Why a control is disabled

Check these common conditions:

Rendering intent

- A DeviceLink profile is selected
- The active profiles do not provide a meaningful intent-dependent transform

Maintain Formula

Available only when both input and output are CMYK.

Soft proofing

- A DeviceLink profile is selected
- A suitable PCS-based proofing path cannot be created

PCS display

Check: Unavailable for DeviceLinks or when calc ICC cannot create a usable input-to-PCS transform.

Output profile selection

Check: Unavailable with a DeviceLink because it already contains the destination transformation.

7.2 Why a profile cannot be imported

Import can fail when:

- The file is not a valid ICC profile
- The ICC structure cannot be read correctly
- The profile uses an unsupported color space
- The profile class is not supported
- A readable profile description is unavailable
- The selected file is damaged or incomplete

Supported filename extensions are `.icc`, `.icm`, and `.pf`. calc ICC displays the embedded copyright information and requires acceptance. If import fails, verify that the file is complete and suitable for the intended workflow.

7.3 Why a profile cannot be selected as output

Ordinary profiles and Named Color Profiles can be selected as outputs. DeviceLinks cannot, because they already define a complete conversion. A Named Color Profile output shows the nearest embedded swatch and its ΔE00 instead of device-channel values.

7.4 Why PCS or soft proofing is unavailable

PCS is unavailable

Check: calc ICC cannot build a usable input-to-PCS transform. DeviceLink workflows are the most common case because they directly connect device spaces.

Soft proofing is unavailable

Check: Proof requires PCS data and a suitable ordinary output profile. It is unavailable for DeviceLink input, Named Color Profile output, and profile combinations that cannot create the required path.

- DeviceLink input
- Profile combinations that do not support the required proofing path

Use an ordinary output profile. Ordinary inputs receive an input-space soft proof; named-color inputs retain direct output values and receive gamut checking only.

7.5 Why a conversion cannot be pasted or restored

Full restoration requires compatible private data created by **Copy All**. Plain text such as `RGB 255 128 0` is not enough. Restoration can fail if:

- The clipboard data is incompatible
- A required imported profile has been deleted
- The saved output profile is no longer valid
- The required transform cannot be recreated
- The stored state belongs to an unsupported version or configuration

> **Check: An older history entry may remain readable and copyable even when its full state cannot be restored.**

7.6 Why results may differ from another application

Before comparing applications, verify the same:

- Input profile
- Output profile
- Rendering intent
- Black Point Compensation setting
- Proofing state
- Numeric precision and display format
- Relevant transformation options

Profiles with similar names may be different files. Internal processing choices can also differ. Compare the complete configuration, not only the visible numbers.

7.7 Limitations of visual color preview

The PCS preview is an approximation, not a calibrated reference or contractual proof. It converts input-side PCS Lab to Display P3, and its appearance depends on:

- Display gamut
- Physical display characteristics
- Screen brightness
- Ambient illumination
- Viewing angle
- Device condition
- iOS display processing

If Display P3 components are outside nominal range, calc ICC shows a yellow triangle and clips the visible patch values. This is separate from the soft-proof gamut warning. Printed appearance also depends on paper, inks, finish, illumination, optical brighteners, and viewing conditions. Use appropriate measurement or proofing for technical decisions.

7.8 Frequently Asked Questions

Can calc ICC convert images or documents?

No. It converts one color value at a time, not photographs, PDFs, or documents.

Can calc ICC create or edit ICC profiles?

No. Profiles can be imported and used, but not created, edited, or exported.

Can calc ICC use profiles with more than four channels?

Yes. The interface adapts to multichannel profiles and DeviceLinks.

Why do the same RGB values look different with different profiles?

The profile determines the color meaning of RGB values.

Does changing the numeric format change the color?

No. It changes the representation, not the underlying color.

Why can I not choose an output profile with a DeviceLink?

A DeviceLink already defines both source and destination spaces.

How does Proof work with Named Color Profiles?

With named-color input and an ordinary output profile, Proof adds gamut checking but keeps the direct output conversion. With a Named Color Profile as output, Proof is unavailable because that mode performs nearest-swatch matching.

What does the yellow triangle mean?

Beside soft-proof output, it indicates that the source color is outside the selected proof gamut. Inside PCS preview, it indicates Display P3 components outside nominal range. These tests are independent.

Can I restore any text copied to the clipboard?

No. Full restoration requires the private calc ICC data generated by Copy All.

Can a DeviceLink result be used as a ΔE00 reference?

No. DeviceLink workflows do not provide the required PCS Lab data.

Does calc ICC send my colors or profiles to a server?

Calculations run locally without an application-specific account. Imported profiles and Conversion History are stored in the application container, subject to normal operating-system backup behavior.

7.9 Glossary

ICC profile

A standardized data structure describing a color space, device, or transformation.

Input profile
The profile that gives meaning to entered values.

Output profile
The profile defining destination device values. During soft proofing, it acts as the proof condition.

PCS
Profile Connection Space, the device-independent intermediate used by ordinary ICC conversions. calc ICC displays it as Lab, LCh, or XYZ.

Lab
CIE L*a*b*, using lightness and two opponent color axes.

LCh
CIE L*C*h°, a cylindrical Lab representation using lightness, chroma, and hue angle.

XYZ
CIE XYZ, a device-independent colorimetric representation.

Rendering intent
The policy for mapping colors between source and destination spaces.

BPC
Black Point Compensation, used with Relative Colorimetric to improve black-point mapping.

Soft proofing
A simulation through a proof profile, returned in the input color space.

Gamut
The colors a device or output condition can represent.

DeviceLink
An ICC profile defining a direct device-to-device transformation without a separate output profile.

Named Color Profile
An ICC profile containing named colors, used as a searchable input swatchbook or a nearest-color output target.

Swatchbook
The workflow for browsing and selecting colors from a Named Color Profile used as input.

Maintain Formula
A CMYK-to-CMYK option that tries to keep the original ink-recipe structure where possible.

ΔE00
CIEDE2000 color difference between a history reference and the live PCS Lab color. Lower values indicate smaller differences.

Display P3
A wide-gamut RGB space used by supported Apple displays and for the PCS color preview.

Appendix A: Built-in Profiles

calc ICC includes a set of built-in profiles and color spaces that can be used immediately without importing additional files.

Check: These built-in profiles cannot be deleted.

BUILT-IN PROFILES AT A GLANCE

Profile	Color space	Typical use
sRGB IEC61966-2.1	RGB	Standard RGB interchange, web, general-purpose RGB conversion
Display P3	RGB	Wide-gamut RGB used by supported Apple displays
Adobe RGB (1998)	RGB	Wide-gamut RGB commonly used in photography and imaging workflows
CIE L*a*b* D50	Lab	Device-independent colorimetric values referenced to D50
CIE L*a*b* D65	Lab	Lab values referenced to D65
CIE L*C*h° D50	LCh	Cylindrical Lab representation using lightness, chroma, and hue
CIE XYZ D50	XYZ	Device-independent tristimulus values referenced to D50
OK Lab	OK Lab	Perceptual color representation useful for color analysis and comparison

The initial calc ICC configuration uses:

Input profile: sRGB IEC61966-2.1 Output profile: Display P3 Additional ICC profiles can be imported with calc ICC Pro when a workflow requires printer profiles, custom RGB spaces, DeviceLinks, Named Color Profiles, multichannel profiles, or other supported ICC conditions.

Appendix B: Numeric Format Reference

For normalized device-channel color spaces, calc ICC provides nine numeric display formats.

Changing the numeric format changes how values are entered and displayed. It does not change the underlying color or ICC transformation.

NUMERIC DISPLAY FORMATS

Control label	Representation	Typical example
auto	Automatically selected according to color-space family	RGB as 0 to 255, CMYK as percentage
255	Rounded 8-bit decimal	128
255.0	Decimal 8-bit scale	127.50
100%	Rounded percentage	50%
100.0%	Decimal percentage	50.00%
1.0	Normalized floating point	0.500
0xff	8-bit hexadecimal	0x80
0xffff	16-bit hexadecimal	0x8080
65535	Rounded 16-bit decimal	32896

Auto normally uses 0 to 255 for RGB and Gray, percentage for CMY, CMYK, and multichannel device spaces, and normalized values for other device spaces where appropriate. Hexadecimal modes enable A to F and accept an optional 0x prefix. Lab-like values are entered directly. XYZ uses a 0–100-style display scale. Integer, integer-percentage, and hexadecimal formats are clamped to nominal range. Decimal 8-bit, decimal percentage, and normalized floating point can retain out-of-range values when the transform supports them. Rounding varies by representation, and the selected format is used for future Conversion History entries.

Appendix C: Feature Availability by Profile Type

Availability depends on the active profile types, color spaces, and supported transforms.

FEATURE AVAILABILITY BY PROFILE TYPE

Feature	Ordinary ICC profile	DeviceLink	Named Color Profile
Numeric input	Yes	Yes	No
Named-color selection	No	No	Yes
Separate output profile	Yes	No	Yes; may be ordinary or named
Rendering intent	When supported	No	When supported
Black Point Compensation	With Relative Colorimetric when supported	No	When supported
Numeric format selection	Yes for applicable device spaces	Yes for applicable device spaces	Output values only
PCS display	When available	No	When available
PCS color preview	When PCS is available	No	When PCS is available
Soft proofing	When supported	No	Gamut check as input; no Proof as output
Proof-profile gamut checking	During soft proofing	No	Yes as input with ordinary output
Maintain Formula	CMYK to CMYK only	No	No
Conversion History	Yes	Yes	Yes
Copy Value	Yes	Yes	Yes
Copy All	Yes	Yes	Yes
Paste compatible calc ICC state	Yes, when restorable	Yes, when restorable	Yes, when restorable
ΔE00 reference	When PCS Lab is available	No	When PCS Lab is available
Multichannel support	Yes	Yes	Depends on profile
Profile import	calc ICC Pro	calc ICC Pro	calc ICC Pro
Selectable as normal output	Yes, when suitable	No	Yes, for closest named-color match

DeviceLinks contain the complete transformation, so PCS-dependent controls are unavailable. Named Color Profiles provide named selection as input and closest-swatch matching as output. Named-color input supports proof-gamut checking with an ordinary output, while named-color output does not support Proof. Maintain Formula requires CMYK input and CMYK output. A disabled control normally means that the active workflow does not support it.