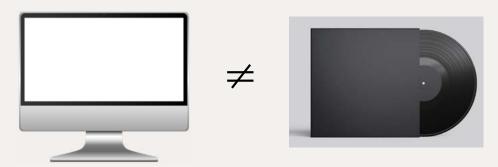# XDISC®

Print Guide
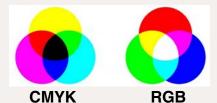## Print Considerations - What to consider ordering?

As you are no doubt aware, Printing on all types of paper and cardboard is a complex process. The choice of technology and materials that will be used for production will ultimately affect the outcome and introduce risks of colour matching issues.

Table of contents:

1.   Differences in color perception LCD vs. real production.

Computer screens (LCD, LED, OLED) and printed materials operate on different color spaces and use different technologies to generate colors. Computer screens display colors in the RGB (Red, Green, Blue) space, while printing is done in the CMYK (Cyan, Magenta,Yellow, Black) space.

CMYK   RGB

RGB screen:
Each color on the screen is created by mixing red, green, and blue light (RGB).
This technology allows for bright, intense, and wide color ranges (e.g., neon). LCD or LED screens glow with light, which makes colors appear more vivid and bright compared to printing.

CMYK printing:
In printing, colors are created by applying inks: cyan, magenta, yellow, and black.
The print does not emit light, so the colors are reflected from the surface of the paper or other material. This makes them look more subdued and less bright than on the screen.
Some intense RGB colors (e.g., neon shades or very bright greens and blues) cannot be faithfully reproduced in the CMYK space - they will look different or less intense after printing.

Need to convert the file to CMYK:
Before sending the file to the printer, you need to convert it from RGB to CMYK, because all printing machines work only in the CMYK space. If this is not done this can be done by the printer but can cause unwanted color changes. Photoshop, Illustrator or InDesign allow you to set the document's color space to CMYK. It is worth doing this conversion yourself, because then you can control and adjust the colors more precisely (e.g. reduce brightness, improve color balance). Converting from RGB to CMYK may cause some colors to look more muted or darker - this is normal, because CMYK has a narrower color gamut than RGB.

How to achieve the most accurate color reproduction?
Use a CMYK sampler: Many graphic programs allow you to preview the design in the CMYK space before printing. In Photoshop, you can enable CMYK preview mode (View > Proof Colors)
to see roughly how the colors will look when printed.
Monitor calibration: Use a calibrated monitor (hardware calibrator) to minimize differences in color perception.
Proof: Order a proof from a print shop to make sure the colors on the finished product will be as you expect.

2.Differences in printing technology: Offset vs. Digital printing
What is the difference between offset and digital printing?

Offset printing:
Technology: Inks are transferred to paper using flat matrices and cylinders (with an intermediate offset cylinder).
Costs: Cost-effective for large print runs (500+ pieces) – high costs of preparation for printing (making matrices), but low unit costs for large quantities.
Colours: Very good colour stability and quality, especially when printing large surfaces or uniform colours. Colours are more stable and uniform, especially when printing on larger surfaces. Deeper shades and more natural tonal transitions can be obtained.

Lead time: Requires longer preparation (making matrices, setting up machines), but allows for quick printing of large print runs after starting production.

Digital printing:
Technology: Direct printing from file to material – similar to a large, professional laser or inkjet printer.
Costs: Cost-effective for small print runs (up to 500 pieces), as it does not require matrices or special forms (printing plates).
Colours: Colours are more saturated, but less stable on larger surfaces. It is more difficult to achieve a uniform background over a large area (there may be tonal differences or „matching").
Digital printing can produce more vibrant colours, but does not always reproduce large, uniform backgrounds well – subtle tonal differences or streaks may appear.

Lead time: Shorter preparation and production time – the file is printed directly, which allows small orders to be completed quickly.

Due to differences in the way inks are applied, the same design may look slightly different in offset and digital printing.

offset

digital printing

3. Differences in the perception of colours on different substrates with different finishes

In printing, the final visual effect depends not only on the paints, but also on the type of material used. Paper, cardboard or cardboard differ in structure, thickness and colour, which has a direct impact on how the colours will look on the finished print. Printed paints are not 100% opaque - the colours interact with the substrate, which can lead to subtle (or significant) changes in colour.

Paper - used for inserts, booklets, inserts
Types:
Coated paper (smooth, coated): makes the paint stay on the surface, making the colours more vivid and more contrasting.
Offset paper (uncoated): gives a more matte effect - the colours will be subdued and less bright.

Cardboard - used for envelopes, gatefolds, digipacks:
Cardboard: absorbs more paint, which can make colors look less saturated and more dull.
It is more difficult to obtain sharp details and intense colors on cardboard than on smooth paper.
Types:
- GC1 - a solid cardboard coated on both sides, with a bleached and smooth top side and a creamy back side. It perfectly reproduces intense colors and high contrast.
- GC2 - is also a solid cardboard, but bleached on both sides, although only one is coated.
It allows for aesthetic printing on both sides, working well in envelopes printed on both sides.
- GD2 - is a waste paper cardboard, with a bleached top side and a gray bottom side, often chosen for cheaper, ecological packaging. It is less stiff and with limited color saturation.

Texture of the substrate:
Textured paper (e.g. art paper or watercolor paper) can disrupt the uniform application of color, which gives the effect of subtle shadows and changes the saturation of colors. A smooth surface (coated paper, foil) allows for sharp lines and uniform color surfaces.

When choosing a substrate, you need to consider what effect you want:
- Prestigious editions (e.g. vinyl covers, digipaks) can use cardboard or matte, artistic papers to give the project an exclusive, elegant look.
- Promotional materials (flyers, posters) look better on coated paper, which will emphasize the intensity of the colors.
- Printing on mass-dyed substrates (e.g. gray or colored paper) changes the perception of colors - the paints take over part of the tone of the substrate. For example, red ink on green paper can look dimmed and brown.

How to prepare a project taking the substrate into account?
Proof on the right material: If the print is to be made on an unusual substrate (e.g. cardstock, cream paper), it is worth ordering a test print on the same material to make sure the colors are as expected.
Color adjustment: In designs that are to be printed on dark or colored substrates, it is worth increasing the brightness and contrast of the graphic to minimize the impact of the substrate color.

4. Impact of packaging finish

The type of finish used affects not only the appearance, but also the durability and reception of the packaging. Here's how different types of lamination films affect the final effect:

Matte dispersion: (standad seal)
Reduces light reflections and adds depth to colours. Works well for projects whereba subdued effect is desired, although it can make colours look less vibrant. It is resistant to dirt, but offers less scratch protection than foil coatings.

Glossy dispersion:
Gives the surface a distinctive shine, emphasizing the intensity of colours and details.

Matte foil:
Reduces light reflections, making colours appear more subtle and deep. It can make darker colours look more intense, but at the same time less „vivid". It is more susceptible to fingerprints and scratches, which is why it is often used in combination with a spot UV varnish (e.g. on a logo) for contrast.

Glossy foil:
Gives the packaging an intense shine that highlights vivid colours and details. Works well for designs that are meant to attract attention and seem more dynamic. It protects against dirt and moisture, which increases the durability of the packaging. However, it can cause light reflections, which can make details of small text harder to see from certain angles.

Soft-touch(velvet foil):
Gives a velvety-touch finish, which gives the packaging a luxurious character. It evokes positive sensory associations, which can increase the attractiveness of the product. It is less resistant to scratches, but works great for exclusive editions and limited products.

Spot varnishing on matte foil:
UV varnish or 3D varnish applied to a matte surface creates a contrast between shiny and subdued elements. Such a finish adds elegance to the design and makes selected elements (e.g. logo) stand out.

Reverse printing:
Reverse printing refers to the printing on the back of a package or an element such as a cardboard cover, booklet or insert. Depending on the material used and its structure, the effects may vary.
On GC1 cardboard, where the reverse has a creamy shade, the colours may be less intense than on the front side. In the case of GC2, where the reverse is also whitened, the print will be more similar to the front, although slightly toned down. On GD2, the reverse remains grey or brown, which limits the aesthetic possibilities
– the colours will look muted and less expressive there.

The choice of the right type of lamination depends on what aesthetics and functionality you want to give to the package. Matte foil adds elegance, glossy emphasises colours, and soft-touch introduces a luxurious character. Additional elements, such as spot varnish, can increase the attractiveness of the design and help highlight key details.

5. Problems with Print-ready files

a. Not meeting specifications
One of the most common problems with print-ready files is not meeting the technical requirements
of the printer.
Incorrect dimensions: Files may be the wrong size or may not include bleeds (usually 3-5 mm around the design). Bleeds are necessary to avoid white edges after trimming.
Resolution: The minimum resolution for printed files is 300 dpi. Lower resolutions will result in blurry or pixelated images and graphics.
File format: We require PDFs with composite CMYK. Files saved in RGB or other formats (e.g. JPG) may cause color issues.
No embedded fonts: If fonts are not embedded or converted to outlines, text may display incorrectly or in the wrong font.

b. Color differences in files (e.g. banderole, gatefold, insert)
Vinyl and CD projects often include different elements such as banderole, gatefolds, inserts, and booklets.
Color inconsistency between elements: If different parts of the design (e.g. banderole and cover) are designed separately or on different files, color discrepancies can occur.
CMYK and Pantone issue: One element may be designed using Pantone colors and another in CMYK, resulting in differences in color appearance when printed.
Lack of consistent color profile: Every part of the design should be saved in the same color space (CMYK) and with the same ICC profile. Failure to do so can lead to differences in the shades of the same colors.
Solution: Use color proofs and make sure all files are prepared to the same color
specification. It is also worth testing a test print of the entire project on the chosen substrate.

c. Issues with letter size and legibility
Text that is too small: Letter size that is too small (especially on a dark background) can make the text illegible after printing. The minimum recommended font size is usually 6 pt for text on a light background and 8 pt on a dark background.
Thin lines and delicate fonts: Thin lines or decorative elements can „get lost" in printing, especially on card stock or textured paper.
Insufficient leading: Closely spaced lines of text can blend together, affecting legibility.
Solution: Always make a test PDF proof at 100% scale to check that text is legible and well spaced. It is a good idea to avoid fonts with thin lines, especially on dark backgrounds.

d. Problem with multi-color black
In CMYK printing, black can be created from a mixture of multiple colors (e.g. 50% Cyan, 50% Magenta, 50% Yellow, 100% Black). This solution can cause:
Registration problems: Printing can cause shifts that make the black color look patchy or blurry.
Glares and spots: On solid surfaces, multi-component black may not dry evenly, leading to streaks or spots.
Solution: Use single-component black (K=100%) for text and thin elements.
If you need a deep, intense black on large surfaces (e.g. background), use a rich black - e.g. C=30, M=30, Y=30, K=100.
Make sure all text and small black elements are saved as 100% K to avoid registration problems.

6. Proofs – when and for which printing technology

What is proofing and why is it important?
- Digital proof: A physical test print on a special device calibrated to reproduce the CMYK or Pantone space. It allows you to see the actual colors, layout of elements and sharpness of details.
Used before offset or digital printing to ensure compliance with the customer's expectations.
When to order a proof?
Proofs are especially recommended for:
- Designs consisting of many elements, such as covers, inserts, banderole, envelopes or wrappers, where all elements must be consistent in color.
- Exclusive productions (e.g. limited editions of vinyl records or CDs), where special attention is paid to the quality of materials and finishing.
- Prints requiring precise color reproduction (e.g. using Pantone or designs with large areas of uniform color).
- Unusual substrates (e.g. colored paper, textured cardboard), which may affect the final appearance of colors.

Proof and printing technologies
Offset:
A contract proof is essential because the colours in this technology are applied using CMYK or Pantone inks, and minimal differences can affect the final effect. In the case of large offset print runs, proof helps avoid costly errors.
Digital printing:
Proofs are less critical because the design is printed directly from the file. The colours can be assessed based on previous digital proofs. Proof is particularly useful in the case of personalised projects, where each copy is different (e.g. numbered editions).
Screen printing and other special technologies:
Screen printing requires checking the colour matching and the quality of the effects on the selected material, especially when the design includes different surfaces (e.g. paper, textiles, plastic).

Ordering a proof guarantees that all production elements will be colour and technically consistent, which is particularly important for demanding projects such as vinyl covers or digipacks.

Proofs – Proper viewing of patterns
After sending the project, each file is sent back as a proof – a low-quality PDF, which is used to verify the project before printing. Regularly reviewing proofs allows you to catch any errors, such as:
incorrect effects – make sure that all graphic effects (shadows, tonal transitions) are as intended;
spelling errors – even a minor typo can negatively affect the reception of the project;

composition – verify that the elements are in the right places (front/back, pages);

color consistency – check that the colors are uniform and in accordance with the guidelines on all pages.

Scrupulous control of these aspects will help avoid problems and ensure a professional, satisfying final product.

7. Color drift in printing – what is it and how to avoid it?

What does color drift mean?

Color drift is unwanted differences in color between different copies of the same print or between elements of the same production (e.g. cover, insert, label). It can be visible as changes in hue, saturation or contrast on different parts of the design. In extreme cases, colors may appear faded or uneven.

Causes of color drift:

- Changes in conditions during printing: In offset printing, even minor differences in machine settings (e.g. temperature, amount of ink) can cause colors to differ in different batches of the print run.
- Different substrates: Colors printed on different materials (e.g. coated paper vs. cardboard) will look different, which can cause the impression of inconsistency.
- Mixing CMYK inks: In offset and digital technology, colors are built from four basic colors (Cyan, Magenta, Yellow, Black). If the inks are not perfectly calibrated or their quantities change minimally, differences in colors may occur.
- Color registration problems: Even small shifts in the application of ink layers can cause colors to differ slightly.
Humidity and environmental conditions: Changes in air humidity can affect the absorbency of the paper and cause uneven ink absorption.

Where is color drift the most problematic?

Offset printing - especially with large print runs, where each batch of sheets may differ slightly from the previous one.
Multi-element productions - e.g. cover, insert and banderole printed on different materials may differ in color, even though the same inks and settings were used.
Screen printing and special prints - in this technology, each color layer is applied separately, which can lead to differences in intensity and saturation.

How to avoid color drift?

- **Contract proof:** A proof on the selected substrate will help determine how the colors will look in reality and minimize the risk of discrepancies.
- **Using Pantone:** In the case of key colours (e.g. logo or background), it is worth using Pantone paints, which provide greater precision than the CMYK mixture.
- **Unification of the substrate:** If the project includes different elements (e.g. covers, inserts, banderole), it is best to choose substrates of similar grammage and colour.

8. Our standards

All prints are made in accordance with the Fogra39 standard.
For offset printing technology, XDISC offers the possibility of accepting colours based on a certified colour proof. The print reference material then becomes the accepted digital proof, taking into account the ISO tolerances specified for a given printable substrate.

Deviations in printing technologies

Each printing technology has its own specific deviations and features that must be taken into account:

Offset: A slight shift in colours and details may occur, especially with large print runs.
Requires precise machine setting and great attention to colour matching.
Digital printing: Although more flexible and allows for quick production, it can have differences in color reproduction depending on the material and printer settings.
Screen printing: Has deeper colors but requires precise layer matching, which can lead to color drift if not calibrated correctly.

9. What to look for depending on your preferences
Quality: It is important that each element of the design (e.g. text, graphics, colors) is refined and in line with expectations. It is crucial that the print is resistant to fading, and the colors are intense and uniform. Using proofs allows for earlier quality checks.
Costs: The choice of printing technology can significantly affect the final cost of production. Offset printing is more cost-effective for large print runs, while digital printing may be more beneficial for smaller series. A well-planned budget should also include the cost of materials and any corrections after proofing.
Time: Different printing technologies have different lead times. Digital printing usually has a shorter production time, while offset requires more time to prepare the machine and make test prints. Time planning should include additional time for corrections, proof approval and production finalization.

10. How does all this relate to CD and label printing?
In the case of CD and label printing, all of the above factors are extremely important:
Print quality: Colors must be accurately reproduced, as many people judge a product based on its appearance. Prints must be resistant to abrasion and fading, so that the discs look good for a longer period of time.
Costs: Decisions regarding the choice of materials and technology (e.g. matte or glossy finish) can affect the total cost of production.
Lead time: Customization to the customer's needs, especially in the case of last-minute orders, where time is of the essence.

Notes to customers:
When designing, pay attention to the following elements, which can be important for the final result:
Special effects: If the design includes effects such as gilding, embossing or spot varnish, make sure that they are correctly designed and compatible with the printing technology.
Colors: It is a good idea to establish what colors are to be used and make sure that all design elements are consistent in color.