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WHITE ONTO BLACK

HIGHLY OPAQUE WHITE ADJUSTMENTS

If you want to achieve a really opaque white print on black (or grey, green, red, blue...) you usually do this by screen or pad printing technology. Coates Screen Inks GmbH offers various opaque white adjustments. Processed with the correct printing parameters these opaque white adjustments will make all other printing processes look tame by comparison.

In the following we will explain in detail all there is to know about the opaque whites.

OPACITY

The opacity of a printing ink defines the ability to cover the colour of a substrate, another ink already printed on a substrate, or colour differences of a substrate to a certain degree.

Opacity is achieved by diffuse reflection or absorption of incident light. In that respect the pigments contained in the printing ink play the most important role. The opacity of black pigments is a result of light absorption. The more light black pigments absorb, which consequently cannot be reflected anymore, the higher is their degree of opacity.

Opposed to the above, opacity of white pigments is mainly achieved with a high degree of light scattering (diffraction/refractive index).

One good example for light scattering in our daily life is the condensation of water vapour on glass materials. While thin and even water films will hardly have any influence on the transparency of the glass as the incident light is hardly diffracted or reflected, the glass pane will become almost opaque if water vapours condense on its surface. The reason for this is the diffuse scattering/reflection of the incident light.

The better the scattering properties of white pigments and the higher the content of these pigments in the printing ink is, the better will be the opacity of white printing inks.



PROCESSING BY SCREEN PRINTING

In addition to the opaque white itself the thickness of the printed ink layer is another decisive factor in achieving best possible opacity; the thicker the ink layer is the better is the opacity.

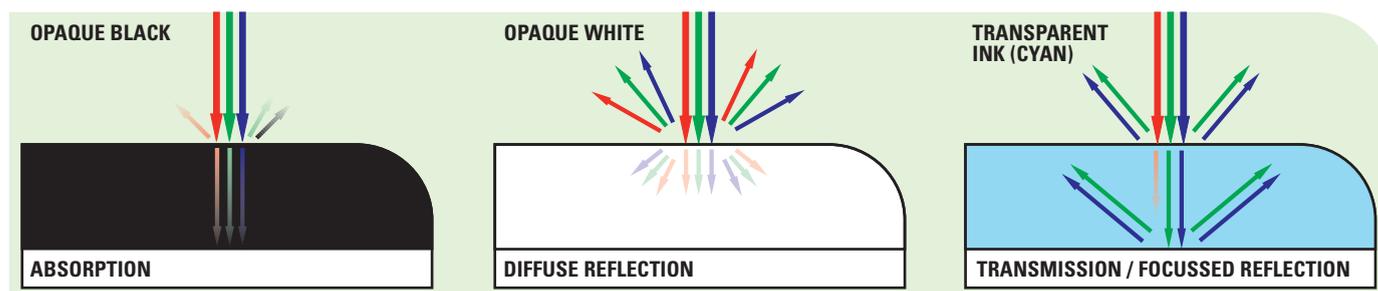
WHITE PIGMENT

We only use high quality titanium dioxide types as white pigments in our screen and pad printing inks. For highly opaque white shades we choose pigment types with the highest possible refractive index. Furthermore, in that respect, the principle "the more the better" applies. The more pigment the ink contains, the better is its opacity. However, as all high quality colorants titanium dioxide is a powder limiting the addition amount in the binder system of an ink type. For highly opaque white screen or pad printing inks, however, you will need a large quantity of pigment, additions of 20% and more.

Depending on conditions fabrics ranging from 30 - 120 threads/cm are possible. Fabrics with a mesh count of 30 are mainly used for water based or plastisol textile inks. Starting with counts of 40 our opaque whites of ink ranges TZ or ZE 1690 are used for printing onto coarse black synthetic fabrics like bags or clothing. For non absorbent substrates often fabrics ranging from 60 and 100 are used for the application of solid white prints. For printing of fine lines or texts 120 threads/cm fabrics can be used in combination with a high quality emulsion and a stencil thickness of 15-20µ to achieve excellent results.

PROCESSING BY PAD PRINTING

The printing form, the cliché used for pad printing does not allow the variety of ink layer thicknesses possible with the choice of different screen fabrics described above. Layer thickness achieved by pad process approximately corresponds to that achieved with 120 threads/cm fabrics. As however, pad inks dry a lot faster than screen inks you can usually achieve excellent results by directly printing several layers on top of each other (two, three or four times wet on wet).



Adding large amounts of pigmentation will naturally also increasingly change the ratio between the transparent binder (the "adhesion component" of the ink) and the pigment (the powder component responsible for the opacity). It should be obvious that there will not be enough binder resin to achieve good adhesion on the substrate starting from a certain amount of pigment content. Pigments then also cannot be perfectly covered and enclosed by the binder agent causing chalking and very fast weathering of prints. Depending on the ink system pigment additions of 50% and sometimes also lower will cause the mixture to become instable and UV systems may not cure properly any more. Therefore we make sure that all our white adjustments, especially the highly opaque ones, have a solid and well-balanced pigment binder ratio.

Fabrics for UV-curing inks are more complex. Whereas solvent based inks dry physically (evaporation of solvents) and thus ink curing is actually depending on time, UV inks cure by photo-chemical reaction, which may be hindered by content of too many pigments. The pigments absorb a part of the incident UV light and with an increasing ink layer thickness they decrease the effectiveness of ink curing by light scattering. Starting from a defined layer thickness a complete curing of the ink film will no longer be possible. Therefore our UV-curing opaque whites are mostly processed using fabrics with a mesh count between 100 and 150. Nevertheless, we do achieve excellent results.

COVERING OF COLOUR CONTRASTS

Printing of evenly coloured surfaces (black, blue, red etc.) with opaque white will usually show good results independent from the substrate colour. High-contrast substrates will be much more difficult, such as double-sided stickers or signs. Various printed images (text/picture) are printed on top of each other with an opaque light blocking obliterating layer. The higher the contrast is, the more difficult it will be to achieve an even opaque white covering and light blocking effect.

In such cases a so-called obliterating grey is printed as light blocking layer either behind or between the white layers. This obliterating grey is a mixture of opaque white with some parts of certain silver pigments. Coates Screen Inks GmbH offers ready-to-print adjustments of this obliterating grey in several ink ranges.



WHITE COLOUR SHADES OFFERED BY COATES SCREEN:

White 50:

White of C-MIX 2000 colour system. Has a medium opacity. W50 whites of solvent-based and UV-curing ink ranges all have a consistent pigmentation. Suitable as mixing white for matching of PMS-Pantone, HKS, RAL, NCS or own formulations on white substrates.

White 60:

Product of our traditional standard ink colour range, developed before Pantone or HKS systems became popular. Shows medium to good opacity and has a slightly different pigmentation than W50. Pigmentation may vary slightly from ink range to ink range. Thus this shade is not recommended for mixing of guide-formulations of our C-MIX data base.

White 60-HD:

White 60/HD is our classic opaque white. White adjustment 60/HD (HD = Highly Opaque) is offered in almost all our screen and pad printing ink ranges. Adjustments 60/HD show very high opacity and very high pigmentation. White 60/HD shades are individually adapted to the binder system of each ink range in respect to maximum possible pigment volume concentration.

SPECIAL, EXTREMELY OPAQUE ADJUSTMENTS

PK-Jet 60/129-HD-NT:

This special adjustment exhibits excellent, extremely high opacity because of maximum allowable pigment concentration.

This solvent based adjustment is used for double-sided stickers or as obliterating white for four colour process prints applied on the second surface. Mainly used for PVC self-adhesive foils, partially also for rigid-PVC, PMMA or PC. Due to the extremely high pigment concentration prints have to be tested for tension cracks and their suitability in further processing steps in addition to the usual resistance assessments (adhesion/scratch resistance).

UVX 60/688-HD-B:

Top performance white of our UV-curing ink range UVX. Can be printed and cured well even with fabrics with a mesh count of 100 threads/cm. UVX 60/688-HD-B is ideal for application as obliterating white for double-sided stickers on PVC self-adhesive foils. Product can also be adjusted as obliterating grey (light blocking barrier) with 4% silver paste B 79/13. This ink is especially suitable for PVC self-adhesive foils and partially also on some rigid PVC-types.

UVU 60/719-HD-PP:

This is an excellent extremely opaque white offered in our ink range UVU. We recommend use of fabrics of 120 - 150 threads/cm. Suitable for printing onto coloured polypropylene wall sheets (pre-treated), rigid PVC, polystyrene. UVU 60/719-HD-PP is also used as blocking/obliterating white on reverse side of transparent materials.

UVN 60/742-HD:

This extremely opaque white is commonly used as pre-print white on transparent PVC stickers or primer coated PP/PE self-adhesive foils in label production. Partially UVN 60/742-HD is also suitable for rigid PVC.



WEATHER RESISTANCE

Generally all highly opaque (HD) ink adjustments are not recommended for outdoor applications. Due to their high concentration the pigments cannot be properly protected from weather influences by the binder system. For outdoor applications printers should use white shades W50 or 60 of suitable ranges (e.g. HG, Z/PVC, ZM) and apply prints using coarse fabrics.

SUITABILITY ASSESSMENT

Although you may be sure that an ink range, e.g. HG or TP 300 shows excellent adhesion on a certain substrate you should pay special attention to evaluation of adhesion and scratch resistance of opaque whites. As already described above the high pigment content of the ink may cause adhesion problems in some (rare) individual cases. To achieve sufficient adhesion the opaque white can then be mixed with varnish.

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