White Paper

How to measure Glass / Plexiglas

Date 19 Okt. 2009 Edition: 2

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Plexiglas

Opal glass

Transparent

Backlit

Spectro LFP RT

Profile-Xpert

Reference area

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Abstract:

This white paper explains how to measure glass, Plexiglas or similar transparent media in order to get most accurate colors on these kinds of media in digital printing.

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Introduction

A special application of digital printing is the print on glass or similar material. The printed image is viewed through an illumination from behind the image. Measurement with traditional reflective spectrophotometers is therefore not applicable. This document describes how the printed colors can be measured with a transmission spectrophotometer in order to be capable to calibrate and profile the digital printer correctly for such applications.

This document covers generally the print on transparent media and does not limit to glass printing. Any printing application requiring to be calibrated to backlit viewing is covered.

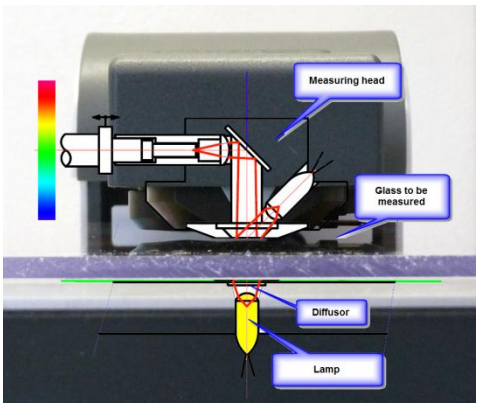
This document assumes a basic understanding of color management in digital printing and the rule of a spectrophotometer as a measuring device for building calibration curves and ICC profiles.

The used measuring device is the Barbieri Spectro LFP RT:

Media thickness

The Spectro LFP RT effects measurement of thin, flexible transparent or translucent material very similar as when measuring paper materials. Measuring thicker material such as glass however does require a basic understanding on the limitations.

The picture below shows the optical situation:



The measuring head touches the glass and is in a distance of the glass thickness to the lamp/ diffusor. In this situation, the measuring head can see also light coming from outside and therefore cause wrong readings. This error does affect only dark colors.

To avoid measuring errors caused by straylight, a **thickness up to 5 mm is acceptable, 3 mm recommended**.

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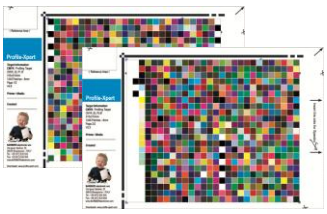
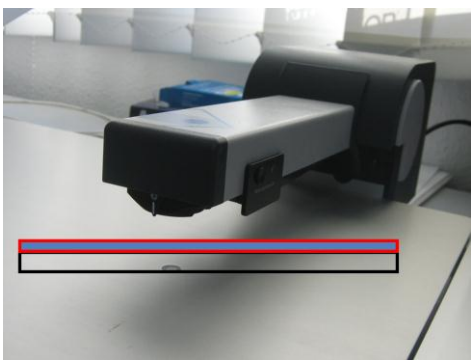
Patch size

The targets to be measured should have patches which are at least 3 times larger than the measuring aperture used. This is necessary to avoid influence of neighbor patches.
For ICC profile creation, we recommend the use of the 2mm measuring aperture of the Spectro LFP RT and the target: Barbieri CMYK_02 available for download at www.Profile-Xpert.com



Printing considerations

Basic rule: Glass should be measured in the same way as the final result will be looked at. The diffusor of the instrument (light source for transmissive readings) should be at the side of the light source and the measuring head at the side of view.
This can cause 2 situations:
Print side towards measuring head: this is the preferred measuring method, as the measuring head only sees the light coming through the patch to be measured.

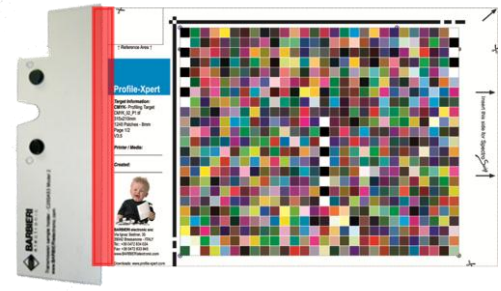


Print side behind (towards diffusor): the thicker the glass, the more light can come sideways into the measuring head causing erroneously dark patches to become lighter.

Preparation

After printing, cut the target on the indicated lines. Glass must be cut neatly.

Use sample holder model 2 supplied with your instrument. Attention to not scratch the measuring table (and diffusor). Fix the glass to the sample holder using a tape. Fix the glass on the top end of the sample holder



Reference area

Barbieri targets have a “reference area” in the upper left corner of the target. Do not cut off this reference area.

If printing with white ink backing, also the reference area must be printed white.

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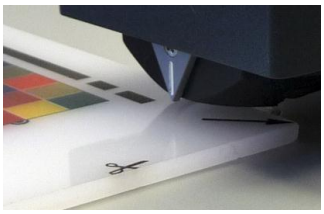
Measurement

Measurement is executed automatically in “fast” measuring mode same as when measuring standard materials.

Opal glass

Opal glass is measured in the same way as fully transparent glass is measured. Measuring time is slower, as the instrument gets lower light level and therefore adjusts measuring time accordingly.



In this lower light condition, the stray light influence is more critical and the thinner the Opal glass is, the better the measuring results.

Colored glass

All measurements described in this document are relative to the “reference area” on the target. This means, the instrument assumes the white point to be at the reference area and gives it a value of L*=100, a*=0, b*=0.

This works great for color management applications which assume a “white background”, as it corresponds to the interpretation of the human eye which also adapts image interpretation to this reference white point.

It must be noted, that when using colored glass, this method makes it impossible for the ICC profile to use the “absolute colorimetric intent” to match colors as “absolute” and “relative” intents are equal.

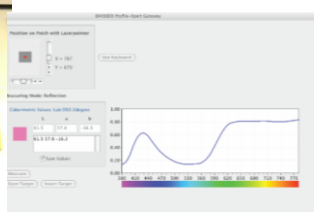
If absolute colorimetric matching is required, the reference area on the target must be substituted with a transparent area of same thickness.

Spot measurement

Single measurement of colored patches is supported by the measuring software Profile-Xpert Gateway. Please refer to the operating manual of this software for detailed information.

When measuring a glass sample, please note that the instrument needs first to calibrate on a clear area:

and then continue spot measurement on the patch to be measured:



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Transmission vs. reflection

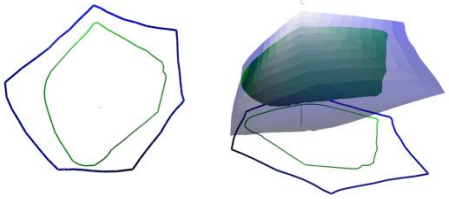
In some applications, pictures are printed with a white backing. These pictures have the advantage, that they have a defined background color and can be viewed also under daylight.

This raises the question: should it be measured/ profiled using transmission or reflection measuring mode?

The possible answers are as follows:

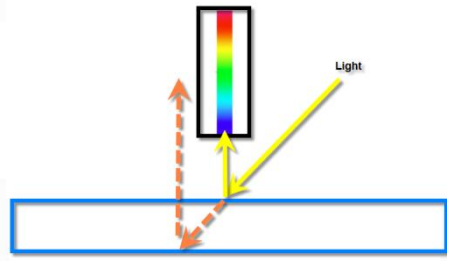
- If the picture is viewed in a dark room through a light table, transmission measurement is the correct answer
- If the picture is viewed in a bright room or under daylight, reflection measurement is the correct answer
- If the picture is viewed during the day under daylight, and during the night under backlit, a mixture of both should be used. The mixture is normally achieved by using the transmission method (giving normally higher saturated values) and printing the picture with lower saturation.

Color space comparison between reflective measurement (green) and transmissive measurement (blue):



Reflection measurement

As long as the printed side is towards the measuring head, reflection measurement on glass is done regularly same as measuring paper.



If the printed side is behind the glass, towards the diffuser, reflection measurement is not possible. The reason is, that the light is not reflected back into the optics.

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The Interior decorations on glass and Plexiglas shown as glass decoration examples in this paper are provided by WP Digital AG and partially by its customer SKARA KG. The prints were done by the WP Digital industrial printing system Virtu RS. Starting from the meeting rooms to interiors of hotels, cafeteria-s, office entrance and cabinets, the decorated glass brings a singular touch of one's person own design in extraordinary saturations and perfect adhesion.
WP Digital AG is technology partner of BARBIERI electronic for glass printing.

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