Novo-Shade Duo+ Application Notes

DETERMINATION OF THE OPACITY OF OPAQUE AND/OR WHITE PIGMENTED PACKAGING FILMS ACCORDING TO DIN 6125:2021

Packaging films are used in a huge variety of different applications

The grade of opacity of a product depends on its use case. Packaging films either require complete transparency in order to clearly view objects or surfaces underneath them, whilst others use cases require them to be opaque in order to hide or obscure.

For example, blister packs and food films require clear visibility of the product they are protecting whilst films used for shopping bags need to hide the contents they are holding.

RHOPOINT NOVO-SHADE DUO+

Novo-Shade Duo+

- Opacity
- Shade
- Cleanliness

What is Opacity and how is it measured?

The opacity of a film (sometimes also referred to as contrast ratio and hiding power) is its ability to hide the surface or contents over which it is placed, and is directly influenced by the film thickness as well as quantity and degree of dispersion of pigments within the material.

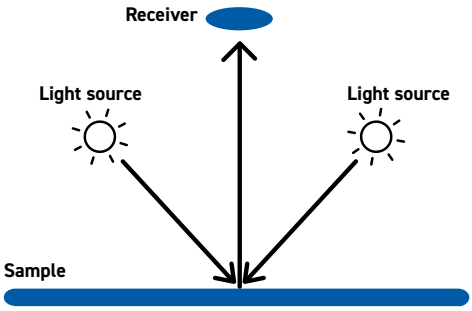
Opacity is expressed as the ratio of reflectance of the material over a black background to the reflectance over a white background.

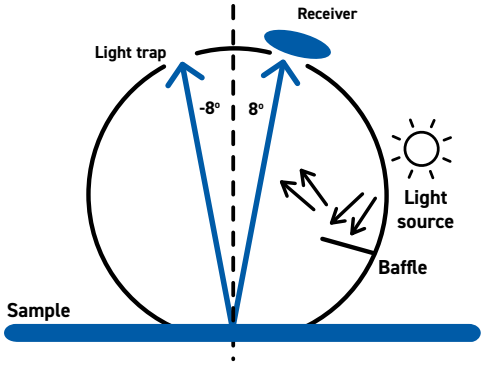
$$\text{Opacity (\%)} = \frac{R_{Black}}{R_{White}} * 100$$

Until 2021, DIN 6125 “Packaging test - Opaque and/or white pigmented films - Determination of opacity” exclusively specified the use of a spectrophotometer for measuring hiding power/opacity of white pigmented films.

The latest revision DIN 6125:2021, now specifies a reflectometer as a suitable (and thus cost-effective) alternative to a spectrophotometer as the measurement results closely correlate.

Measurement principles, schematic overview of geometrical setups according to DIN 5033-7 and DIN EN ISO 18314-1 requirements





45°:0° Spectrophotometer

The most common angular configuration used in a spectrophotometer for the printing industry is the 45°:0° (or its reverse 0°:45°) geometry.

Using this configuration, the surface is illuminated by a single or multiple light sources at 45° and the reflected light measured at 0° from the surface.

As gloss is excluded using this method it more closely correlates to visual evaluation on smooth or matt surfaces.

d:8° Sphere Spectrophotometer

Whilst 45°:0° is a popular angular configuration for most printing applications, many industries work by using the d:8° (diffuse illumination, 8° viewing) sphere-based geometrical system instead.

In this setup, light is diffusely reflected at all angles from inside the sphere surface onto the sample surface, and can be collected to calculate reflection data with gloss included (di:8° / “SCI”) or excluded (de:8° / “SCE”).

Spectrophotometers using this configuration are commonly used for measuring color of textured surfaces such as textiles and plastics as well as shiny or mirror-like surfaces, including metallic inks, printing over foil, and other highly glossy surfaces.

No matter what geometrical setup is used - due to their more complex technology, spectrophotometers are generally higher in cost than reflectometer systems.

Measuring opacity with Novo-Shade Duo+ vs. Spectrophotometer

The Novo-Shade Duo+ follows the same optical 45°:0° principal as the above mentioned spectrophotometer, but unlike those simply measures the intensity of reflection in the direction of the normal.

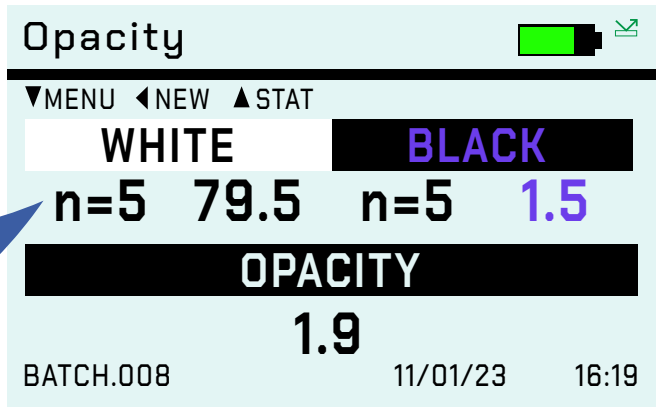
Thus, it will not measure colour, but simply compare the lightness intensities received from a surface.

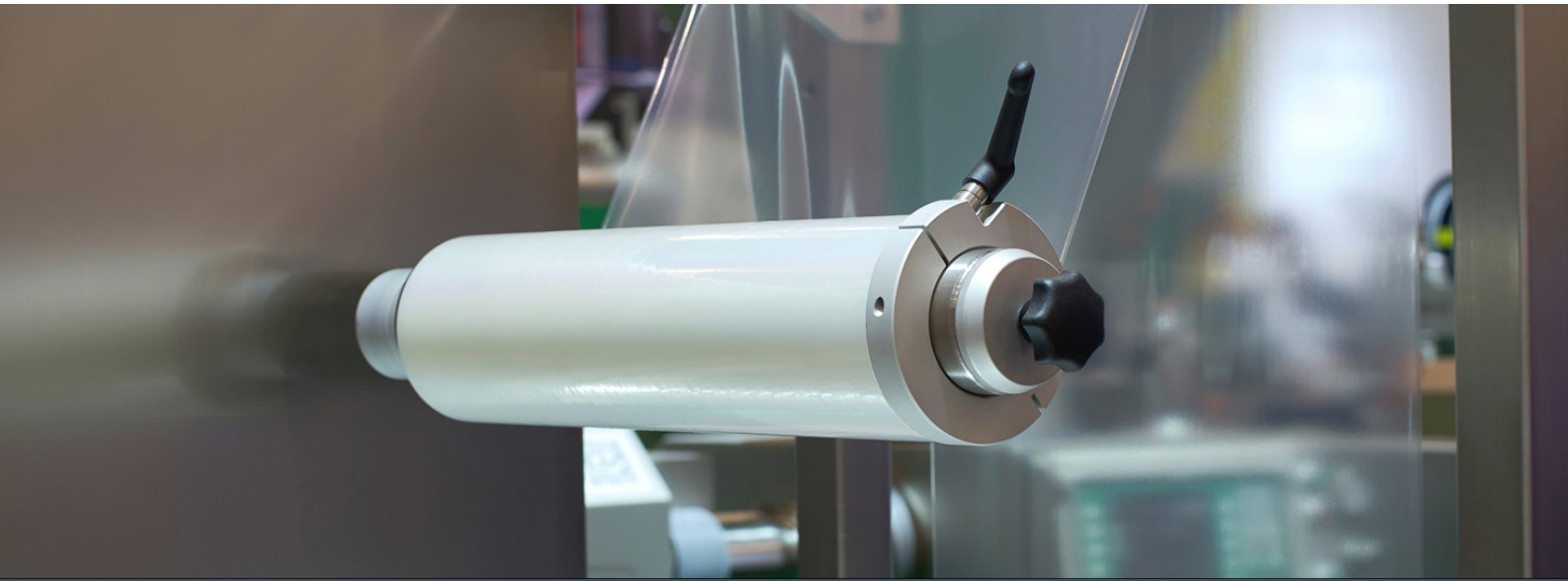
Measurement method

STEP 1: To calculate opacity, an opacity test chart (black and white) similar to the one shown in the image below is used to perform the test. A representative sample of film of sufficient size is placed on top of the chart to cover both the black and white areas.

NOTE: Care must be taken to ensure that no damage, e.g., kinks, wrinkles, scratches are present on the sample before and during sampling. Note that to further avoid faulty readings, the test chart shall not contain optical brighteners.

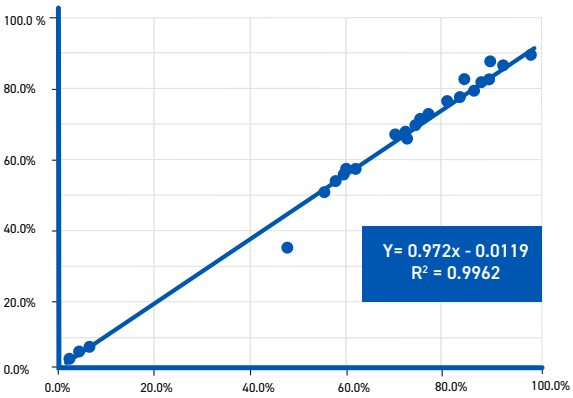
STEP 2: Three measurements of the film sample are then made at three different locations over the white and over the black background and the opacity is directly calculated.



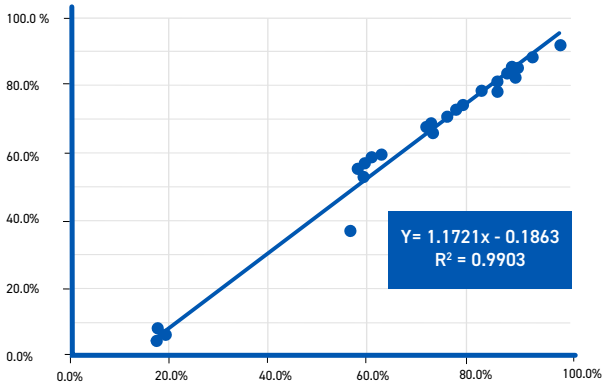


Example Results

Novo-Shade Duo+ vs 45°:0° Spectrophotometer



Novo-Shade Duo+ vs d:8° Sphere Spectrophotometer



Results between Novo-Shade Duo+ and a 45°:0° spectrophotometer are highly correlated.

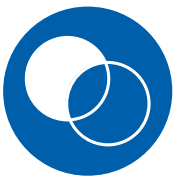
Between Novo-Shade Duo+ and a d:8° spectrophotometer, the results are indistinguishable for samples >60% opacity. More transparent materials <10% opacity measure higher on d:8° geometry compared with 45°:0° geometry devices (Novo-Shade Duo+ and 45°:0° spectrophotometer).

Conclusion

Rhopoint Instruments recommends the Novo-Shade Duo+ 45°:0° reflectometer as a cost-effective alternative to a spectrophotometer for the DIN 6125 compliant measurement of opacity in packaging films quality control.

Much lower cost of acquisition and maintaining

Most simple to operate – just click and see result



Automated opacity operation (opacity mode)

Highly correlated results to Spectrophotometers

Measurement of shade on a greyscale or substrate cleanliness

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TRY BEFORE YOU BUY

We offer two options for you to try out the Novo-Shade Duo+ before buying

1. **Online demonstration:** Online presentation of the Novo-Shade Duo+ with your samples measured LIVE on Zoom, Microsoft Teams or Skype. Includes a consultation with an application specialist.

2. **Factory sample testing:** Send in samples of your material for testing and receive a comprehensive test report.

Arrange a demo

Ready to receive a quote? **Click here**

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