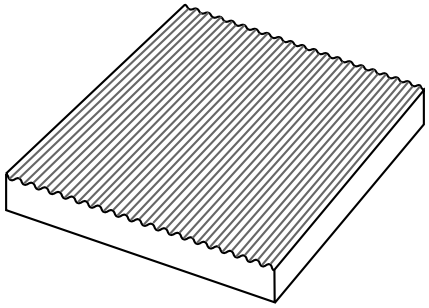
Reflection Measurements on Textured Samples

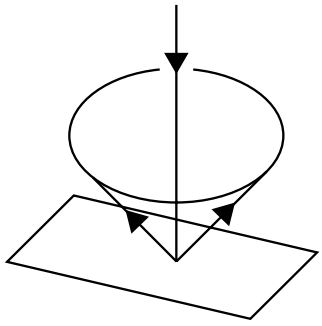
TECHKON APPLICATION NOTE 8

The surfaces of paper, cardboard or foil occasionally have a structure with a pronounced directional bias *(Picture 1)*. This lined texturing originates in the manufacturing process. Textures are surface irregularities because they are caused accidentally and impair the look of a product. Texture causes gloss and color changes at different observation angles. In contrast, fault-free, homogeneous surfaces look the same from all sides.



Picture 1: Texture schematic

Not only our eye, even colorimeters and reflection densitometers react to these textures. Users of these devices in the graphic industry often believe that textured printed products are best measured with a device that features all-round exposure or all-round light assembly *(Picture 2)*.



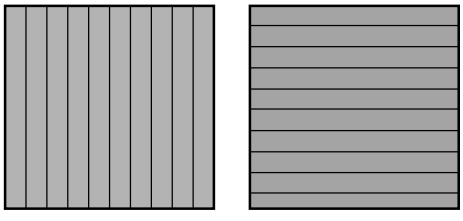
Picture 2: Principle of an all-round light assembly

In fact, this ensures that measured density values or colorimetric values stay approximately equal even when the measurement device is placed in different directions onto the textured sample. Devices with circular exposure or light assembly no longer account for the texture.

The apparent advantage of being able to get consistently equal values regardless of the measurement device's positioning on the sample comes at a price of two significant disadvantages. First, such measurement devices are not designed to even recognize texture and to judge texture according to size and direction through differences in readings. The second and even larger disadvantage is the fact that the measurement device and visual judgement no longer conform.

Whereas a texture causes the visual impression to change with the observation direction, the readings for circular devices remain approximately the same. The gap between visual impression and measurement is especially bothersome for colorimetric readings given that the essential task of colorimetrics is to describe visual perception by measurement.

This problem can be illustrated with a simple example *(Picture 3)* :



Picture 3: The visual color impression differs horizontally and vertically with the texture

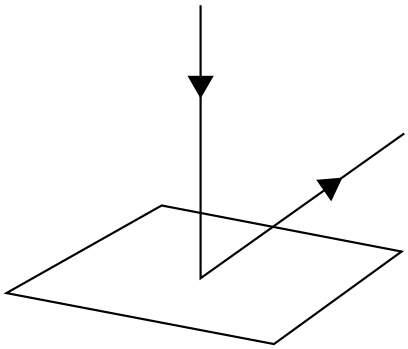
Two print sheets are printed with the same image vertically and horizontally to the paper grain of the paper manufacture. We assume that the paper manufacturing resulted in a texture. Visual examination of the adjacently placed printing sheets will show a differentiation in their colors. A circular measurement device, however, will reveal no difference.

Another problem in ring lens systems is the fact that mesurement devices with polarization filters have an optical bias in direction. This bias causes polarizing and partially polarizing surfaces to supply directionally-dependent readings despite ring lens systems.

Laminated products and printed foils are typical examples for this phenomenon. Polarization filters cause ring lens systems to abandon their independence of measurement direction during such applications. The user, meanwhile, assumes that the ring lens system will provide comparable measurement readings regardless of conditions.

The measurement geometry of TECHKON densitometers and colorimeters is not circular and, thus, recognizes color differentiations due to texture. The measurement reading conforms to the visual impression. TECHKON devices also let you determine the size and direction of a texture by conducting readings in different directions.

TECHKON densitometers and colorimeters are designed to the standardized 0°/45° measurement geometry whereby a sample is exposed vertically and light is assembled at an angle of 45° to the sample in one direction *(Picture 4)*.

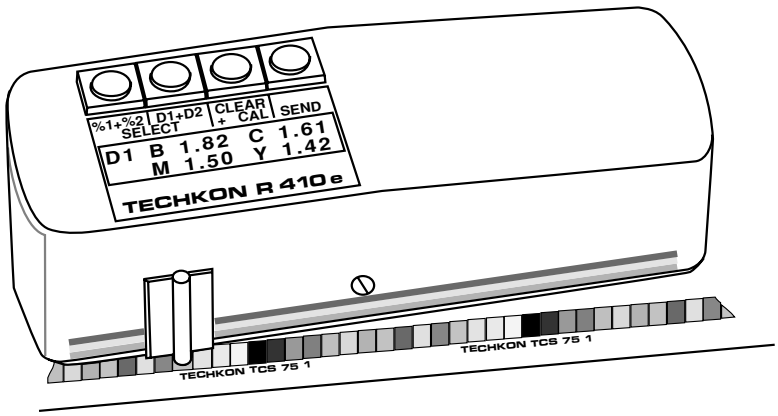


Picture 4: 0°/45° measurement geometry for TECHKON reflection densitometers and colorimeters

TECHKON measurement devices feature a natural bias of direction in the user's hand thanks to shape and placement of measurement head and display. When evaluating print control strips, for instance, the measurement device is always guided nearly parallel to the print control strip *(Picture 5)*.

Scanning measurement devices such as the TECHKON Scan-Densitometer RS 400 are clearly defined in terms of measurement direction. Such measurement devices by principle do not lend themselves to the use of ring lens systems.

A potentially existing texture is always measured at the same or nearly the same angle, therefore resulting in an equal number for the measurement reading. Divergences in measurement readings due to texture are, therefore, excluded. To explicitly confirm a texture, just conduct measurements in different directions.



Picture 5: Biased position of TECHKON reflection densitometers during measurement of print control strips

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