



Various Densitometers

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TRANSMISSION DENSITOMETERS



Transmission densitometers measure the density values of light transmitted through transparencies, negative and positive films. The densitometer has its own in-built standardised light source which illuminates the photocell by being transmitted through the sample to be measured. An enclosed optical system ensures that only light passing through the sample reaches the photocell. The light signal is processed and converted to a log value which is indicated by a meter or a digital readout display.

The light source emits a white light (consisting of blue, green and red light, the primary colours in additive colour mixing). If a colour transparency is to be measured, a colour transmission densitometer must be used and the measurement is primarily concerned with the subtractive primary colours of cyan, yellow and magenta.

The transparency to be measured affects the light rays like a colour filter (colour filters possess the property of allowing only their own colour to pass through and absorbing the rays of other colours).

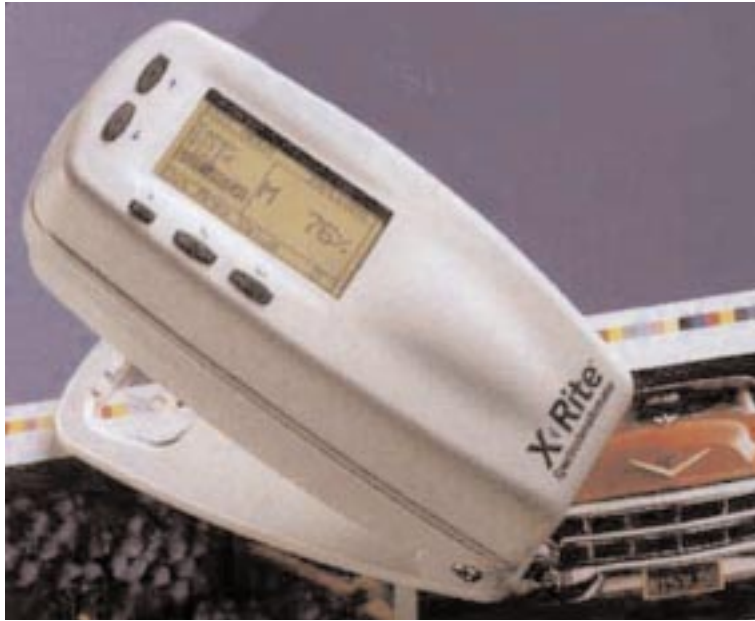
For example, when measuring the cyan content of a transparency, it is the blue and the green lights that pass through the transparency in the cyan areas which are perceived by the human eye as cyan. The red light content is absorbed to a greater or lesser degree in these areas.

When measuring a transparency for its cyan content, only the red content of the light is significant. For this reason a red filter is inserted in the path of the light rays which holds back or absorbs the blue and green light content and allows only the red light content relevant for measuring the cyan colour to reach the photocell.

Depending on the type of instrument involved, the colour filters are placed in the path of the rays either before or after the specimen to be measured. When changing over to a new colour for measurement, the filter of the complementary colour must be used (green for magenta and blue/violet for yellow).

The black of the transparency and negative and positive films are measured using no filter.

REFLECTION DENSITOMETERS



The reflection densitometer measures the density of light being reflected from the ink.

The densitometer has its own built in light source, standardising the illumination light. Part of the illumination light is absorbed by the ink layer and part is reflected back through a filter to the photo cell. The filter is important because the photo cell can only assess varying density of black and white - it does not read colour.

A complementary colour filter of the pigment being printed is used to render the colour viewed in black and white. The reflected light is transformed into arithmetical units known as reflection density units, and indicated on the digital display as a density value. As previously stated, densitometers only help to eliminate human metamerism and illumination. A densitometer measures ink coverage, but cannot make allowances for variables such as paper stock.

This explains why two colours, printed on different stocks and looking far from identical to the naked eye, can give the same densitometer reading. However sophisticated your densitometer, every now and again it will tell you that two colours which your eyes tell you are different, are in fact identical. The effect is called material/substrate metamerism.

Zeroing on White Paper

Before measurement is commenced, densitometers must be calibrated to zero against the paper white of the printed paper (reference white). This is done in order to eliminate the influences of paper colouring and surface characteristics for the evaluation of the printed ink film. For this purpose, the density of the paper white is measured, and this figure is specified as zero, ie. the display is set to $D = 0.00$.

QUESTIONS ON VARIOUS DENSITOMETERS

- (1) Transmission densitometers measure the density values by light transmitted _____ the material.
- (2) What items in the pre-press area are measured using a transmission densitometer?
- (3) Which filter is used to measure the cyan content of a colour transparency?
- (4) Reflection densitometers measure the density values by light being _____ from the ink.
- (5) What items are measured with a reflection densitometer?
- (6) How are densitometers calibrated to zero?