Testing methods

The weighed proof – meaning printed solid with a defined quantity (in g/m^2) or a defined film thickness (1 µm = 1/1000 mm) – is the starting point for the tests described later in this section.

When a weighed proof is produced, the printing forme must be weighed before and after printing. The quantity of ink applied (in g/m^2) is calculated from the following formula:

$$M = \frac{(G_1 - G_2) \times 10000}{F}$$

M = Quantity of ink (g/m^2)
G_1 = Weight of ink and forme before printing (g)
G_2 = Weight of ink and forme after printing (g)
F = Area of printing forme (cm^2)

Dividing the quantity of ink M (in grams per square meter) by the density [δ] yields the film thickness [S] (µm):

$$S = \frac{M}{\delta} \qquad 1\,\mu m = \frac{1}{1000}\,mm$$

Weighing requires an analytical balance that can accommodate formes weighing up to 150 g. Accuracy must be +/–0.0001 g. Electronic balances available commercially today have proven highly suitable for this purpose.

Procedure for weighed proofing using a Prüfbau multipurpose printability tester

– Ink quantity in inking unit (to produce approx. 1 µ film thickness)	0.1	cm^3
– Inking time for ink unit	20	sec
– Inking time for ink unit and printing forme	25	sec
– Application pressure for proofing		
Metal forme	250	N/cm
Rubber forme	150	N/cm
– Printing speed	0.5	m/s
– Inking unit temperature	21	°C

To obtain information about the accuracy of the weighed proof, approximately 20 proofs were made with the same quantity of ink, and optical density was measured. Tolerance limits were in the order of 1 g/m^2 at ± 2 %. With almost all colors, a 2 % inking variation is practically impossible for the human eye to perceive.

Testing color and yield

Printing ink color is very strongly influenced by film thickness and quantity of ink. Defined quantities of ink must therefore be used to allow precise evaluations. This influence is especially perceptible with reds.

For example, Euro Magenta was proof-printed at four different film thicknesses: 0.7, 1.0, 1.2, and 2.0 µm (1 µm = 10^{-9} m). The reflection curve can now be measured with colorimetry equipment (see figure 12).

This reflection curve represents the spectral reflectivity plotted against wavelength. The spectral reflectivity indicates the percentage of light of a particular wavelength that is re-emitted; the reflectivity of an ideal matt white surface is assumed to be 100 %. Barium sulfate represents a good approximation to the ideal matt white, and was used in this instance as the white standard.

From the reflection curve one can then calculate the DIN 6164 color parameters: hue (T), saturation (S), and blackness value (D). These provide an exact, quantitative description of a color.

Other countries very often use the CIE 1976 system, with L*, a*, and b* (see also DIN 6174)
L* = Lightness
a* = Red-green axis
b* = Yellow-blue axis

The resulting colorimetric values for the four different film thicknesses are: