

## 6. Evaluation of print products

### 6.5.1 OK-Sheet: Side-by-Side Evaluation

The deviation tolerances are derived by comparing the OK-print with the corresponding values of the reference printing condition. It could be thought of the ability of a printing system to be successfully calibrated as demonstrated by the colour difference between the "first" sheet (OK-sheet) and the reference characterization data set. Table 6.3 lists the tolerances for the three tolerance bands A, B and C for the practical evaluation (print check). The PSD Print Check colour accuracy evaluation is limited on the Fogra Media Wedge V3.0. An extended scrutiny, e.g. based on large test charts, is subject for the system check.

Patch in digital printing form	Quality Type C	Quality Type B	Quality Type A
Substrate	$\Delta E_{00}^* < 3.5$	$\Delta E_{00}^* < 3.5$	$\Delta E_{00}^* < 3.5$
All patches	95% Quantile $\Delta E_{00}^* < 6.5$ Average $\Delta E_{00}^* < 6.5$	95% Quantile $\Delta E_{00}^* < 5.5$ Average $\Delta E_{00}^* < 4.5$	95% Quantile $\Delta E_{00}^* < 4.5$ Average $\Delta E_{00}^* < 2.5$
Grey Balance patches	Maximum $\Delta C_h \leq 5.5^b$	Maximum $\Delta C_h \leq 4.5^b$	Maximum $\Delta C_h \leq 3.5^b$
<sup>a</sup> Due to the sign character of $\Delta H$ the absolute values ought to be used before averaging. <sup>b</sup> $\Delta C_h$ is explained in chapter 2.3.			

Tab. 6.3: Deviation tolerances for Side-by-Side reproductions. As 2016 the criteria are made identical to the media-relative evaluation, see 6.5.2.

The reproduction of spot colours shall meet the requirements stipulated in Table 6.4.

	Quality Type C	Quality Type B	Quality Type A
Maximum colour difference	$\Delta E_{00}^* < 5.5$	$\Delta E_{00}^* < 3.5$	$\Delta E_{00}^* < 2.5$

Tab. 6.4: CIEDE2000 tolerances for spot colours.

It is recommended to check the spot colours coverage of the typical production printing combinations in order to identify and use a combination that allows for an appropriate spot colour match.

Note: Spot colours are typically distinguished between "process ink emulation" and "real spot colours" using an additional ink. The latter one often results in a more uniform reproduction since there are no screening effects. Spot colours not within the gamut of the chosen printing combination are handled the same way as CMYK content which lies out of gamut. The benefit of using "real spot colours" will automatically become obvious when saturated spot colours ought to be reproduced to a high degree, i.e. comprising a small colour difference.



#### Hint:

New tolerances for side-by-side and media relative evaluation!

The new tolerances shall be denoted "PSD 2016" and the old ones "PSD 2011".

### 6.5.2 OK-Sheet: Media Relative Evaluation

The control strip shall be the Fogra MediaWedge CMYK V.3. The media-relative evaluation is only applicable for actual printing gamuts similar in size and shape to the gamut of the reference printing condition, see Table 6.5. In order to evaluate the gamut difference the following 10 patches need to be measured for both the reference and the actual printing condition:

- Process colour black for the reference (Ref\_K100) and actual (Act\_K100),
- Composed Grey for the reference (Ref\_CMY100) and actual (Act\_CMY100) and
- Overprints of the chromatic process colours for the reference (Ref\_CK100, Ref\_MK100, Ref\_YK100) and actual (Act\_CK100, Act\_MK100, Act\_YK100).

Based on the minimum CIEL\* lightness values for the reference (Ref\_Min\_CIEL\_Dark) and the actual printing condition (Act\_Min\_CIEL\_Dark) it will be checked if the shadow parts are comparable. In order to compare the highlight areas, the CIEL\* lightness difference of the measurements of the substrate patch of the reference (Ref\_paper) and the actual printing condition (Act\_paper) will be computed.

	Black point difference	White Point difference
<b>Tolerance Quality A</b>	$ \text{Act\_Min\_CIEL\_Dark}, \text{Ref\_Min\_CIEL\_Dark}  < 3.5$	$\Delta E_{00}^* (\text{Ref\_paper}, \text{Act\_paper}) < 6.5$ (5.5)
<b>Tolerance Quality B</b>	$ \text{Act\_Min\_CIEL\_Dark}, \text{Ref\_Min\_CIEL\_Dark}  < 10.5$	$\Delta E_{00}^* (\text{Ref\_paper}, \text{Act\_paper}) < 8.5$ (7.5)
<b>Tolerance Quality C</b>	$ \text{Act\_Min\_CIEL\_Dark}, \text{Ref\_Min\_CIEL\_Dark}  < 15.5$	$\Delta E_{00}^* (\text{Ref\_paper}, \text{Act\_paper}) < 11.5$ (10.5)

Tab. 6.5: CIELAB tolerances for gamut differences to check if media-relative is applicable. The colour differences for the white colour are very similar when using  $\Delta E_{00}^*$  or CIEDE2000. The CIEDE2000 tolerances shall take precedence. CIELAB 1976 colour differences are given in brackets.

Only if the criteria of Table 6.5 have been met, the media relative evaluation shall be conducted. For the PSD print check evaluation, the 72 patches of the Fogra Media Wedge V3.0 shall be used. The colour differences shall agree with Table 6.6.

Patches in digital printing form	Quality Type C	Quality Type B	Quality Type A
<b>All Patches</b>	95% Quantile $\Delta E_{00}^* < 8.5$ Average $\Delta E_{00}^* < 6.5$	95% Quantile $\Delta E_{00}^* < 6.5$ Average $\Delta E_{00}^* < 4.5$	95% Quantile $\Delta E_{00}^* < 4.5$ Average $\Delta E_{00}^* < 2.5$
<b>Grey Balance patches</b>	Maximum $\Delta C_h \leq 4.5$	Maximum $\Delta C_h \leq 3.5$	Maximum $\Delta C_h \leq 2.5$

Tab. 6.6: Deviation tolerances for media-relative reproductions.

There is no media-relative evaluation for the reproduction of spot colours.



**Hint:**

Use the free Excel spread-sheet: [www.fogra.org/en/fogra-standardization/digital-printing-2-48/digital-printing-standardization.html](http://www.fogra.org/en/fogra-standardization/digital-printing-2-48/digital-printing-standardization.html)



**Hint:**

Media relative CIELAB-colour values can be detected easily when the paper has a CIELAB value of 100,0,0.

## 6. Evaluation of print products

### 6.5.3 Stability within the run (production variation)

Contrary to deviation tolerances, that define the difference between an OK-sheet and tabulated data, the variation tolerances refer to the differences within one print run. In ISO 12647-2 and hence PSO the variation tolerances we evaluated by taking the OK-sheet (or set-up sheet) as the reference. Print buyers look for consistent colour printed in different locations and at different times. The best way to achieve within-run color consistency is to use the average value of the print run, and not the OK sheet, as the reference. The tolerances are depicted in Table 6.7.

In addition the variation tolerance, i.e. the ability of a printing system to maintain consistency between the same colour patches printed in the same locations on the sheet over the press run, is assessed by checking that at least 70% of the randomly picked sheets are in conformance to the deviation tolerances. In order to evaluate a print run at least 20 samples must be randomly selected. The following patches needs to be taken into consideration.

- Primary and secondary colours („CMYKRGB“)
- Midtones (40% to 50%) of primary colours („50% CMYK“)

	Quality Type C	Quality Type B	Quality Type A
<b>CMYKRGB, 50% CMYK</b>	max (95% quantile $\Delta E_{00}^*$ ) < 5.5	max (95% quantile $\Delta E_{00}^*$ ) < 3.5	max (95% quantile $\Delta E_{00}^*$ ) < 1.5

Tab. 6.7: CIEDE2000 tolerances of primary and secondary colour solids and primary colour mid-tones – between any print sample and the average of the 20 samples.

The "PSD PrintCheck Digital" is also available as a separate Fogra certification. Please consult the webpage for more information.