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PRINTERS' GUIDE

Training Information & News in Printing and Paper Converting Technology

Determination of target colour values according to ISO 12647-2

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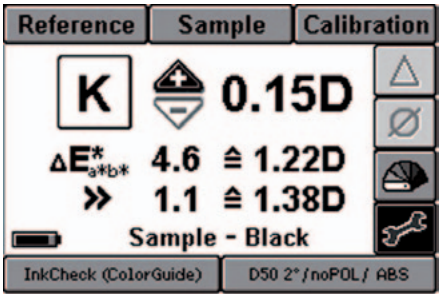
Much has already been published about the International Standard for offset printing, the ISO 12647-2, and there are various sources on the Internet offering the possibility to get information. This Printers' Guide shall now have a closer look at the target colour values.

L*a*b* and density value

The density values which are so important for the printing press operator for inking metering are not part of the international standard. It is true, some printing services providers give recommendations for the observance of density values on different types of paper, but these recommendations are not binding. The reason is obvious: While offset inks are produced in compliance with ISO 2846-1, most of the parameters specified therein cannot be applied in practice. The specifications as, for instance, transparency figures and colour co-ordinates of a defined ink layer thickness can only be determined in the laboratory. In addition, it is a known fact that various inks produced in accordance with ISO 2846-1 have different L*a*b* values even if the density values are the same. This is the reason why ISO 12647-2 only gives L*a*b* target colour values irrespective of the required density. This, however, means in practice that the density values which are required for printing must be determined afterwards.

Determination of optimum inking

The maximum tolerance allowed in accordance with the ISO standard is Delta E 5 for the primary colours in the target colour value. In order to determine the optimum target colour value, at least a densitometer and a spectrophotometer are needed (if possible, combined in one device).



ColorGuide

Ideally, a measuring device with a link to evaluation software, as e.g. the SpectroDens with "ColorGuide" from Techkon, is available.

The first step is to print a "colour fan". This means that the printer starts printing the individual colour (e.g. magenta) with a very high ink film thickness and gradually reduces the ink film thickness during printing to a very low level. This enables to cover a wide density spectrum of the ink on the test sheets.

This spectrum must then be used to find best possible colour co-ordinates in accordance with ISO 12647-2. This, however, is a bit complicated. First of all, a relatively wide density range is chosen from this colour fan (e.g. 1.20 – 1.75 for magenta), from this range, the density values with the smallest possible gradation (e.g. 0.02) and the appertaining L*a*b* values are measured. These pairs of values (density / L*a*b* value) are entered into a form by hand or by a software.

Afterwards the Delta E colour differences between the measured values and the related target value of ISO 12647-2 are calculated. The corresponding density value

	L*a*b*- color values for black backing according to ISO 12647-2											
	paper type 1 and 2			paper type 3			paper type 4			paper type 5		
	L*	a*	b*	L*	a*	b*	L*	a*	b*	L*	a*	b*
Black	16	0	0	20	0	0	31	1	1	31	1	2
Cyan	54	-36	-49	55	-36	-44	58	-25	-43	59	-27	-36
Magenta	46	72	-5	46	70	-3	54	58	-2	52	57	2
Yellow	88	-6	90	84	-5	88	86	-4	75	86	-3	77
Red	47	66	50	45	65	46	52	55	30	51	55	34
Green	49	-66	33	48	-64	31	52	-46	16	49	-44	16
Blue	20	25	-48	21	22	-46	36	12	-32	33	12	-29

Lab targets

Black

Evaluation test print XX.XX.XXXX
Client: XXXXX

Paper: BVS matt coated
Ink: black PSO Exact by SunChemical
Measuring device: SpectroDens (Techkon)

Wet density	Delta E, wet	Delta E, dry
1.95	4,8	5,6
1.75	3,8	4,9
1.74	3,6	4,5
1.72	3,3	5,0
1.70	3,2	6,0
1.66	3,0	6,9
1.64	2,4	6,2
1.57	2,8	8,7
1.52	3,1	9,2

Example for influence of ink drying

No.	Wet density	Delta E (measured dry)			E
		L*	a*	b*	
1	0.70	71.72	-30.34	-32.10	25.1325
2	0.75	70.28	-31.24	-33.48	22.9906
3	0.80	68.81	-32.32	-35.35	20.4744
4	0.85	67.69	-33.24	-36.66	18.6362
5	0.90	66.58	-33.99	-38.19	16.7079
6	0.95	65.41	-34.67	-39.37	14.9898
7	1.00	64.23	-35.25	-40.78	13.1447
8	1.05	63.31	-35.90	-41.79	11.7758
9	1.10	62.24	-36.32	-42.90	10.2572
10	1.15	61.16	-36.66	-43.99	8.7636
11	1.20	59.63	-36.90	-44.69	7.1472
12	1.25	59.71	-37.18	-45.51	6.7953
13	1.30	58.76	-37.47	-46.59	5.5341
14	1.35	57.00	-37.43	-47.64	3.5909
15	1.40	57.01	-37.55	-48.45	3.4300
16	1.45	56.03	-37.42	-49.35	2.5020
17	1.50	55.21	-37.35	-50.10	2.1205
18	1.55	54.58	-37.19	-50.41	1.9341
19	1.60	53.65	-37.04	-51.03	2.3076
20	1.65	53.26	-36.66	-51.78	2.9515
21	1.70	52.44	-36.61	-52.03	3.4622
22	1.75	51.80	-36.00	-52.86	4.4429
23	1.80	50.86	-35.11	-53.48	5.5428
24	1.85	50.35	-34.84	-53.92	6.2349
25	1.90	49.52	-34.30	-54.37	7.1970
26	1.95	48.94	-33.89	-54.49	7.7586
27	2.00	47.43	-32.16	-54.80	9.5682
28	2.05	47.30	-32.52	-55.94	10.2550
29	2.10	47.10	-31.97	-56.14	10.7159
30	2.15	46.42	-31.15	-56.84	11.9350
31	2.20	44.86	-29.82	-57.17	13.7288
32	2.25	44.83	-29.77	-57.17	13.7714
33	2.30	44.58	-29.70	-57.10	13.9297

Example for determinationof target density value (1,55)

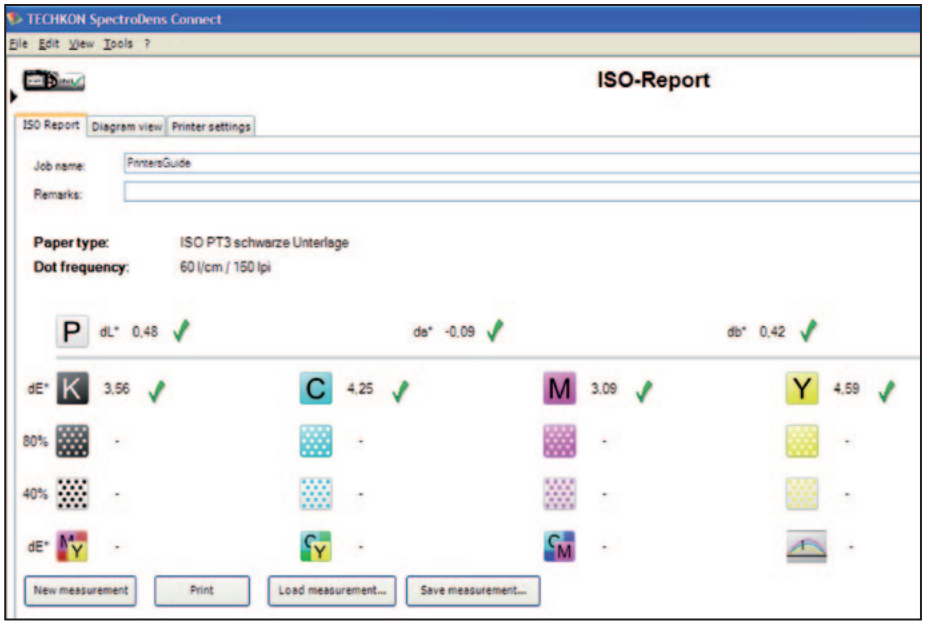
with the lowest Delta E value should be the target density value used for this colour in future. This test must be done for all four process colours. The entire process must be repeated if any other type of inks or other types of paper are used.

Influence of ink drying

An especially difficult aspect in the determination of the target colour value is ink drying. Experience in practical applications has shown that the colour co-ordinates may change substantially after ink drying. In this case, the L*a*b* value of the wet ink and of the dry condition must be analyzed in great detail as a preparatory operation. The criteria according to the ISO standard are exclusively dry values. This means that the ISO compliant dry values and the respective wet values must be known. For print production, the previously determined wet values must be used.

To sum it up

Press operators using ISO 2846-1 compliant inks should be able to achieve the target colour tones required by ISO 12647-2. Only the drying behaviour of an ink should be analyzed very carefully, and then the right conclusions should be drawn.



Check of ISO conformity

Suggestion for further reading: PrintPromotion Newsletter No 81 / March 2008: Print quality and standardization – dot gain (tonal value increase – TVI)