

A photograph of a color calibration chart (Munsell Color Services Lab chart) with a magnifying glass resting on it. The chart consists of a grid of various colored squares. The magnifying glass is positioned over the top-left corner of the chart, highlighting a few squares. The background is a light-colored surface.

Color Management & Calibration for variable substrates

ICC COLOR EXPERTS DAY
MAY 24, 2019

Hosted by Barbieri Electronic

Colour Management for
Wider-Format Printing
on Non-Paper
Substrates



HQ Durst Phototechnik AG
Bressanone, Italy



	Color Output Stability	
	Technology	Required
Photography & Fine Art		
Hard Proofing		
Sign & Display		
Sportswear		
Fashion		
Interior Decoration		
Carpet		
Ceramic Tiles		

Digital Print Applications

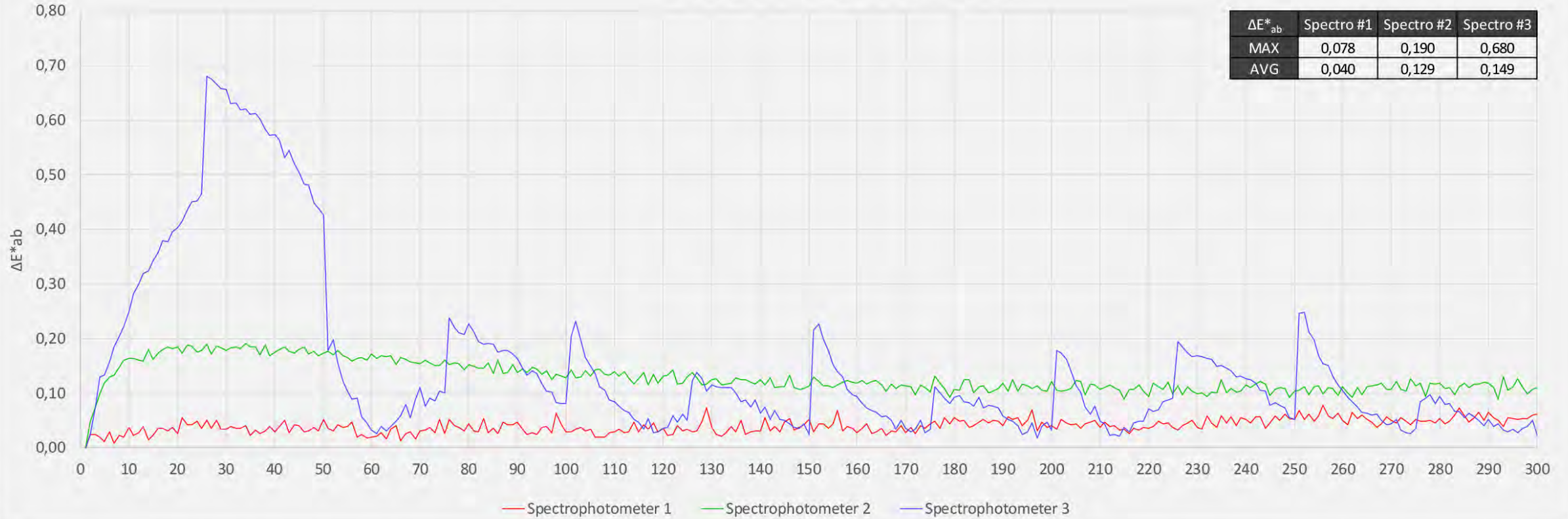


- New calibration
- Quality control + correction
- Color Matching

Color Calibration



Measurement Stability - ΔE^*_{ab}



Spectrophotometer Repeatability



Printer Type	Epson Pro 3880 - Large Format A2+		
Application	Photography / Proofing		
Production Speed	4 m ² /h	Total Patch Count	1170

Patch Nr	Color	L	a	b	ΔE^*ab Nearest	ΔE^*ab 5th Nearest
23		8,017	1,459	-11,673	4,304	7,164
825		8,832	6,921	-9,338	2,818	5,996
853		8,850	-9,184	-13,012	3,362	5,596
866		9,477	-6,082	-11,532	2,046	5,266
465		9,670	4,273	-8,866	2,818	5,952
412		9,886	2,081	-3,151	4,578	6,315
939		10,009	6,442	-18,982	4,373	6,138
826		10,130	1,016	-20,070	2,643	6,579
566		10,133	14,227	-14,914	4,739	7,673
693		10,165	-13,176	-12,080	3,451	5,527
666		10,224	13,197	-5,741	2,402	5,633
959		10,399	-5,087	-9,999	4,263	5,163
733		10,442	-16,577	-5,037	3,581	5,507
146		10,464	14,682	-25,788	5,410	7,181
829		10,527	-7,832	-3,991	3,873	5,323
232		10,547	-10,239	-10,310	2,548	4,614
598		11,117	9,067	-0,099	3,041	5,609
1103		11,129	2,627	-30,702	3,797	8,057
743		11,152	10,981	-5,702	2,402	5,355
710		11,196	-13,080	-4,068	2,442	4,730
482		11,215	-7,492	-21,853	4,302	6,972
95		11,261	18,481	-1,718	1,627	5,975
791		11,262	7,701	-28,000	3,106	7,367
855		11,302	2,356	-18,116	2,643	4,908
1146		11,369	24,059	-31,479	3,655	7,875
64		11,395	-2,232	-9,517	2,676	6,613
109		11,493	36,781	-57,897	4,573	10,275
11		11,558	18,184	-36,720	3,781	7,268
450		11,743	29,147	-43,383	4,095	6,405
731		11,862	22,242	-19,039	4,263	8,260

Average	3,448	6,377
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Printer Type	MS JPK-EVO 320 - High Volume Sublimation		
Application	Interior Decoration / Fashion		
Production Speed	800 m ² /h	Total Patch Count	416

Patch Nr	Color	L	a	b	ΔE^*ab Nearest	ΔE^*ab 5th Nearest
360		16,885	-0,189	-4,031	0,079	2,558
290		16,927	-0,181	-4,097	0,079	2,588
252		16,966	-0,146	-4,163	0,084	2,604
249		17,338	1,980	-2,943	0,330	0,693
278		17,426	4,178	-2,054	0,273	0,545
342		17,451	7,234	-1,388	0,591	2,048
92		17,452	1,997	-2,634	0,141	0,437
322		17,476	2,104	-2,545	0,141	0,470
369		17,495	1,826	-2,519	0,211	0,400
401		17,507	7,142	-2,026	0,477	1,955
245		17,542	1,529	-2,254	0,295	0,647
120		17,543	3,274	-1,811	0,264	0,381
286		17,564	3,536	-2,108	0,054	0,477
134		17,594	4,317	-1,889	0,132	0,401
62		17,612	3,514	-2,099	0,054	0,426
309		17,618	5,300	-1,734	0,092	0,582
285		17,625	7,567	-1,844	0,477	2,352
95		17,648	5,219	-1,701	0,092	0,528
200		17,688	4,098	-1,600	0,189	0,277
317		17,695	3,510	-1,614	0,343	0,471
12		17,704	1,712	-2,418	0,258	0,470
101		17,720	3,125	-1,682	0,182	0,397
289		17,720	4,317	-1,929	0,132	0,356
333		17,728	4,145	-1,403	0,207	0,349
410		17,735	4,800	-2,009	0,189	0,463
236		17,744	5,182	-1,418	0,301	0,585
208		17,798	3,986	-1,706	0,121	0,281
299		17,800	4,524	-1,425	0,145	0,326
171		17,827	4,723	-1,753	0,173	0,283
74		17,840	3,241	-2,042	0,078	0,377

Average	0,206	0,824
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Distance of color points in 3D space

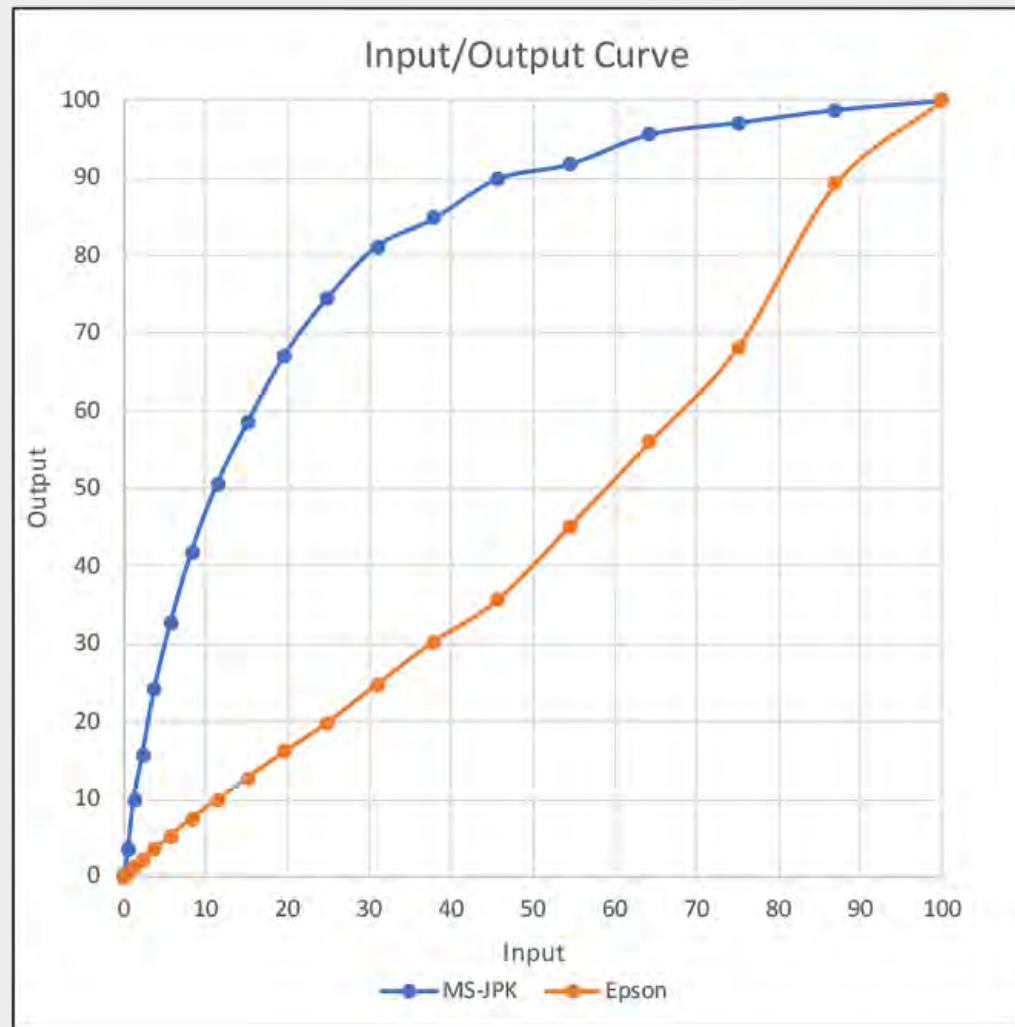


- Long-term repeatability
 - 300+ measurements
 - DeltaE Max < 0.3 : Acceptable
 - DeltaE Max < 0.1 : Good
- Measurement speed & averaging
 - Averaging improves characterization accuracy
 - Measuring 5+ ICC targets requires time
 - Reduction of erroneous data
- Inter-Instrument Agreement
 - Output correction & color matching

Spectrophotometer Requirements

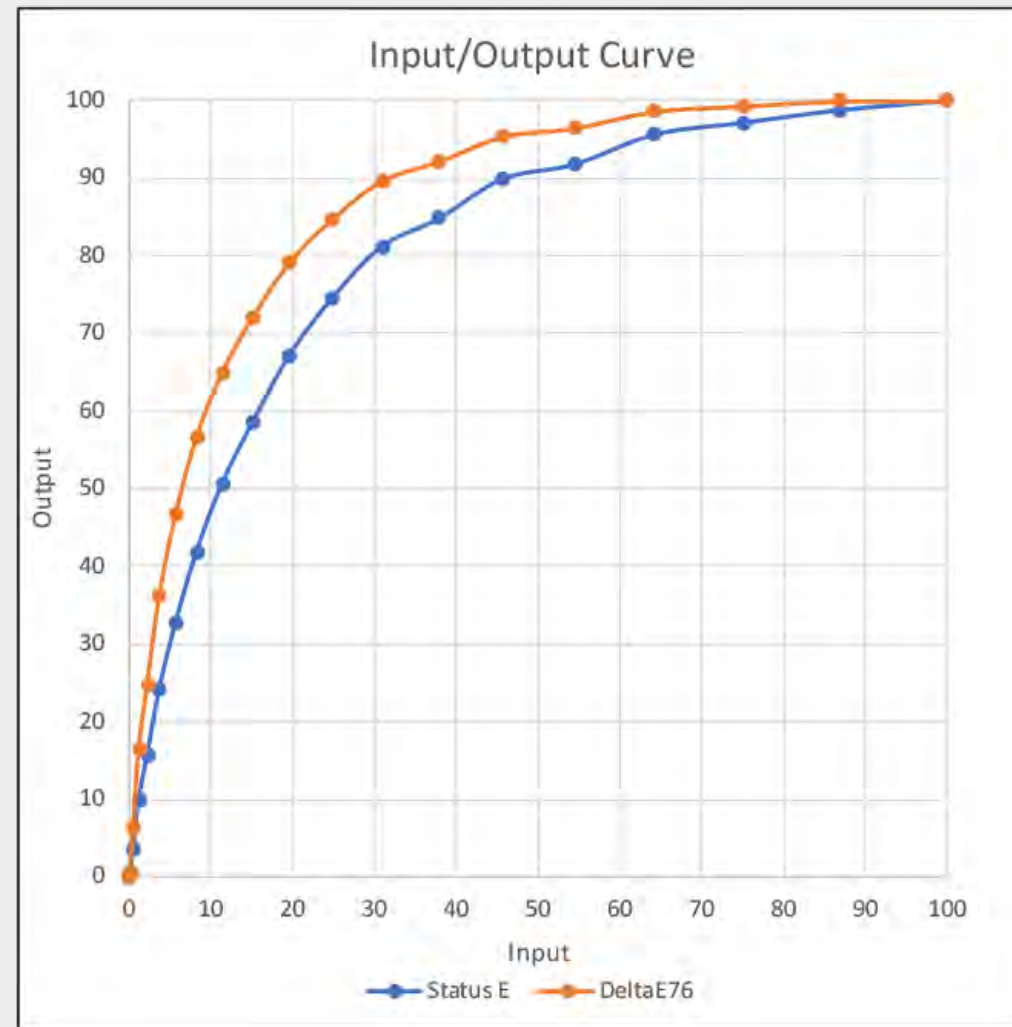


Input	MS-JPK	Epson
0,00	0,00	0,00
0,03	0,22	0,05
0,19	0,34	0,23
0,58	3,60	0,60
1,26	9,98	1,24
2,31	15,65	2,19
3,79	24,25	3,50
5,76	32,69	5,22
8,29	41,77	7,43
11,41	50,55	9,83
15,19	58,59	12,72
19,69	67,23	16,08
24,94	74,64	19,83
31,01	81,25	24,77
37,92	84,84	30,26
45,75	89,95	35,66
54,52	91,83	45,12
64,29	95,68	55,96
75,10	97,19	68,25
86,98	98,82	89,25
100,00	100,00	100,00

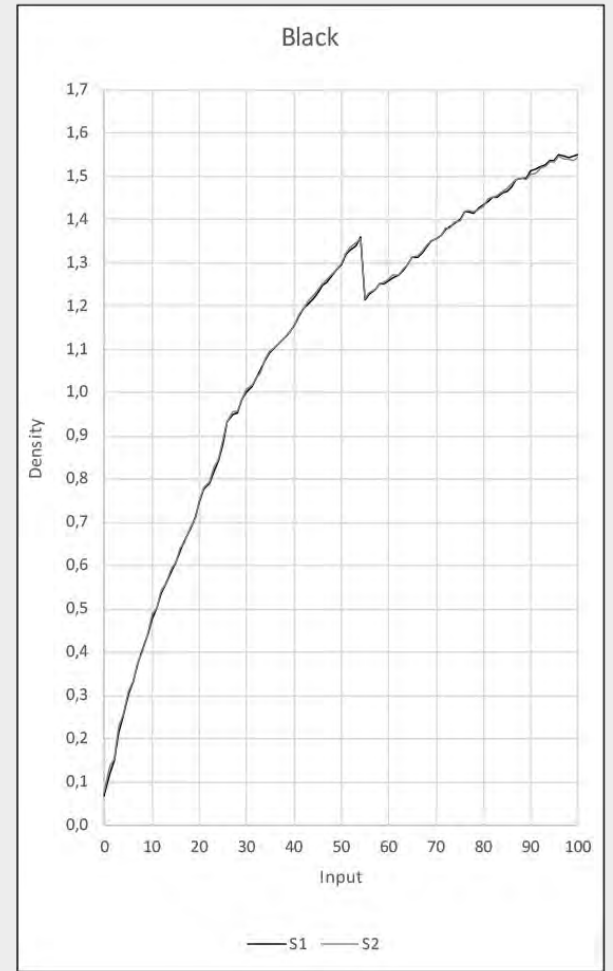
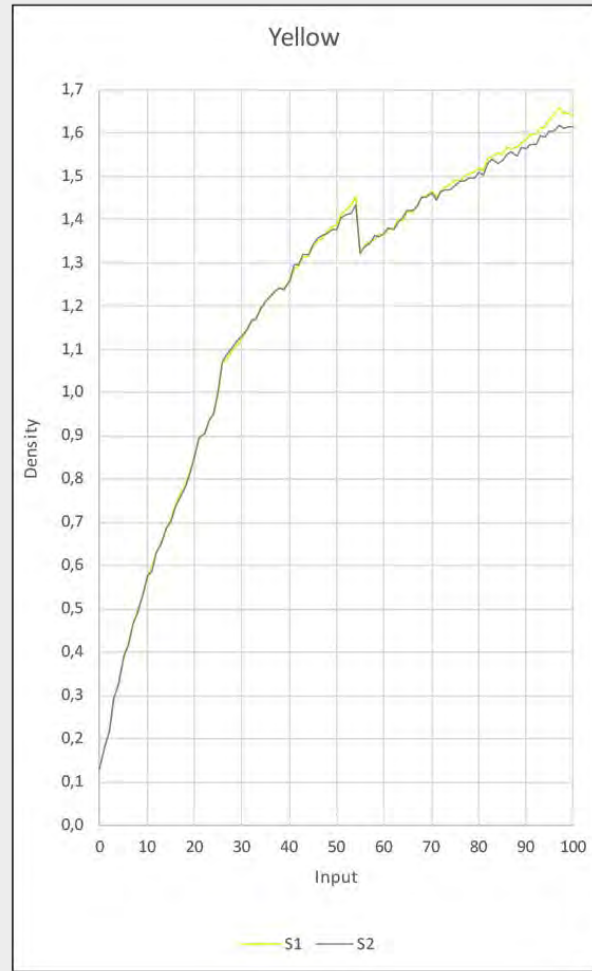
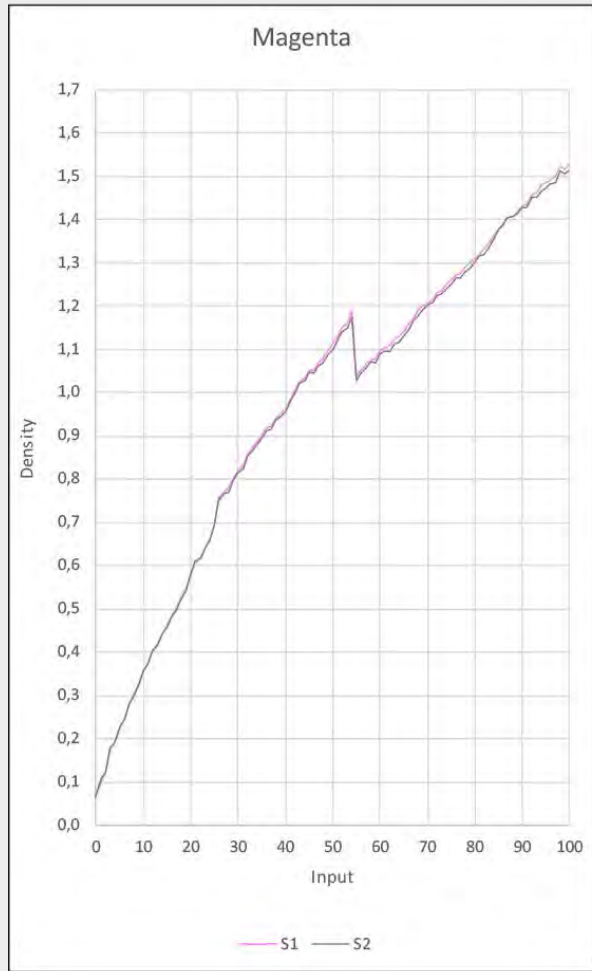
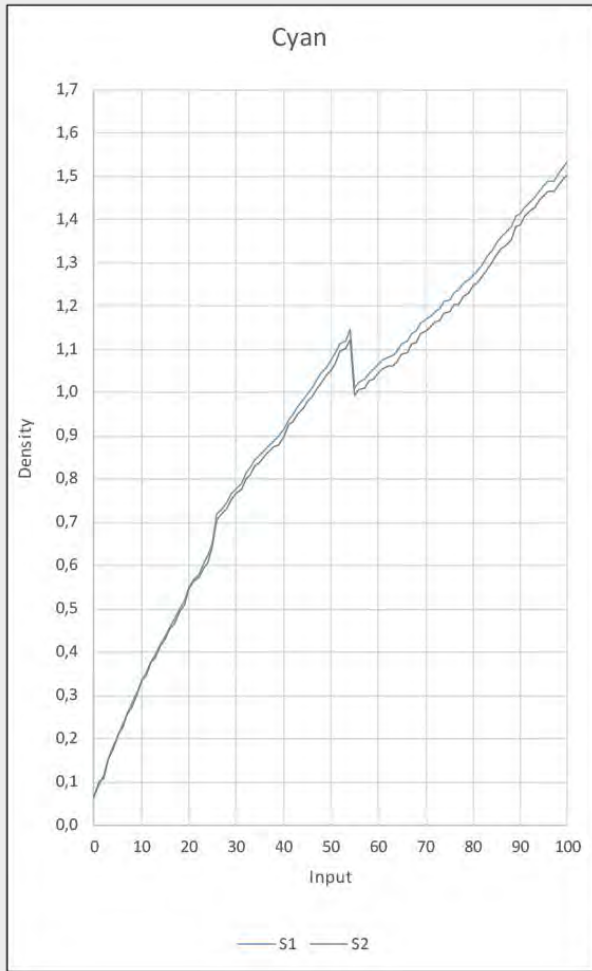


Ink Channel Linearity

Input	Status E	DeltaE76
0,00	0,00	0,00
0,03	0,22	0,32
0,19	0,34	0,46
0,58	3,60	6,20
1,26	9,98	16,37
2,31	15,65	24,77
3,79	24,25	36,29
5,76	32,69	46,61
8,29	41,77	56,57
11,41	50,55	64,88
15,19	58,59	72,12
19,69	67,23	79,16
24,94	74,64	84,77
31,01	81,25	89,72
37,92	84,84	92,20
45,75	89,95	95,41
54,52	91,83	96,52
64,29	95,68	98,65
75,10	97,19	99,36
86,98	98,82	99,98
100,00	100,00	100,00



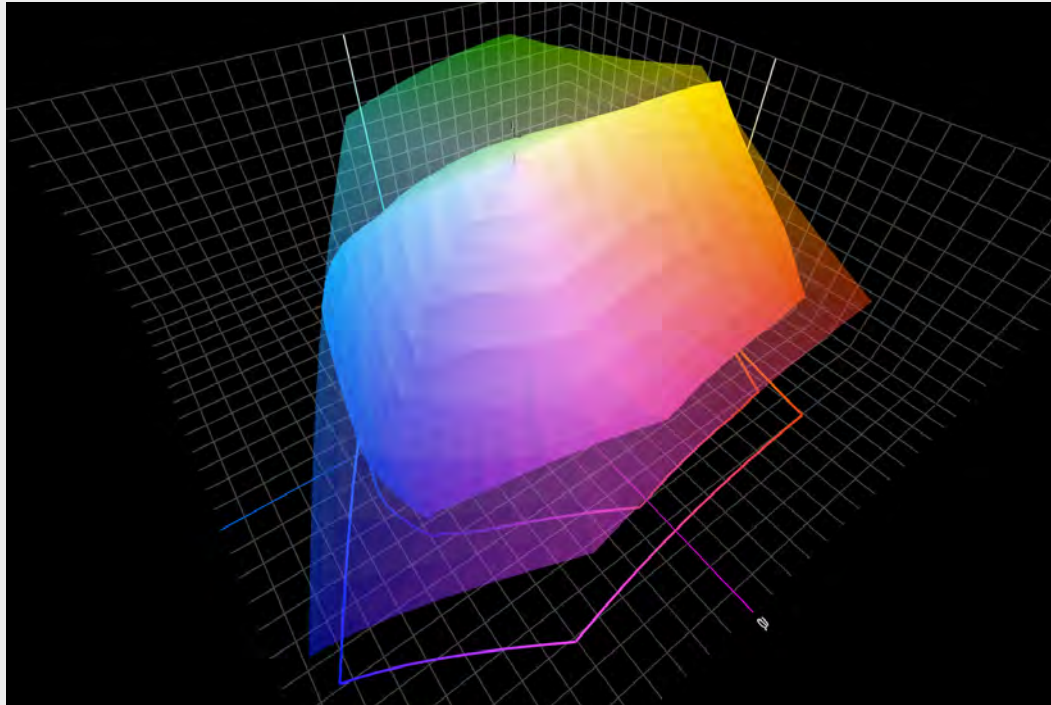
Linearization Methods



Ink Channel Matching

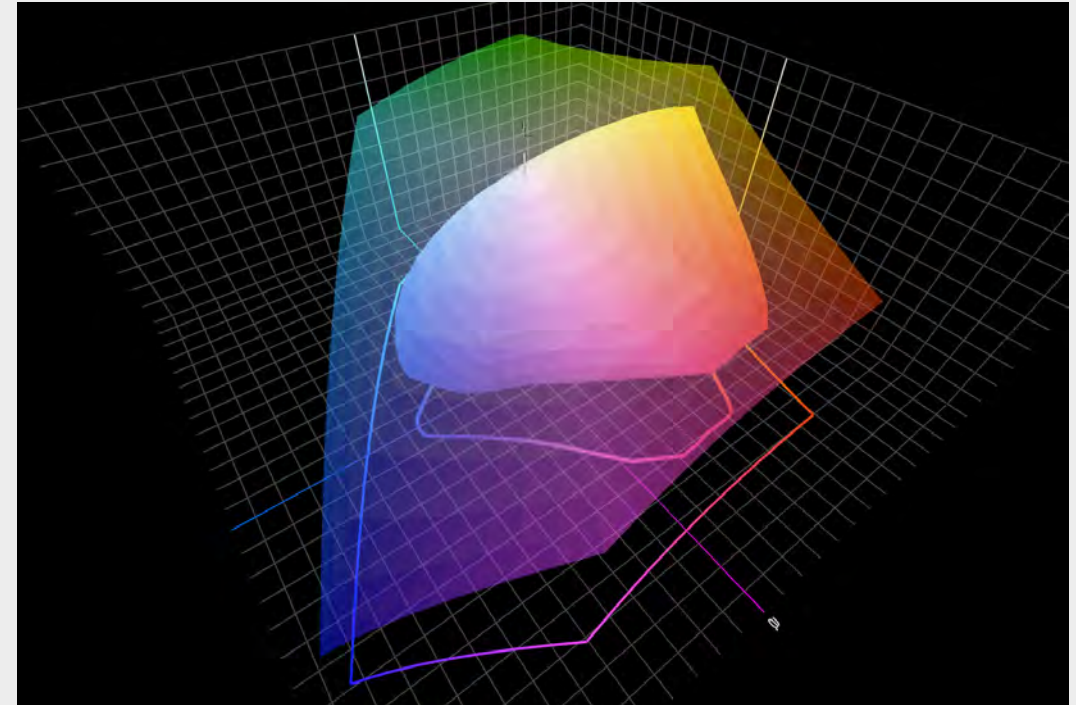


Epson Pro 3880



Performance of
Rendering Intents

MS-JPK Evo 320



Color Gamut & Rendering Intents



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