ChromaSpot

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ChromaChecker™

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ChromaSpot is a universal color library available to the industry to use and apply to typical tasks without any fees. Built using spectral data, the library provides industrial infrastructure that provides ink manufacturers and pigment creators the ability to communicate color references on the highest industrial level throughout the manufacturing chain.

CxF data exchange provides color definitions for manufacturing systems and exports to Adobe Color Swatch file formats making samples easily accessible to creatives and production professionals.

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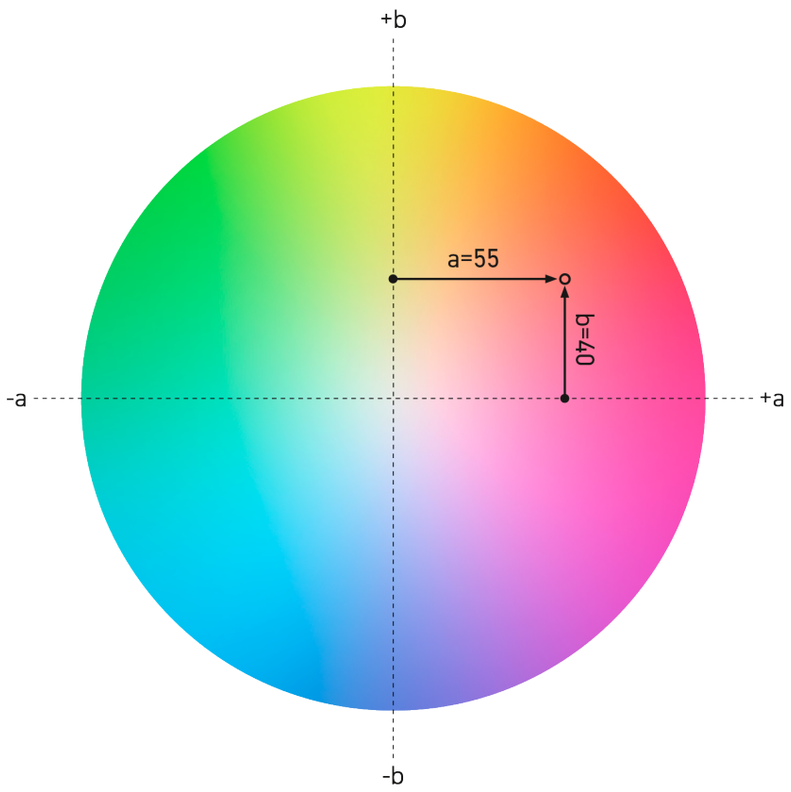
The professional color library where color is not substrate-related.

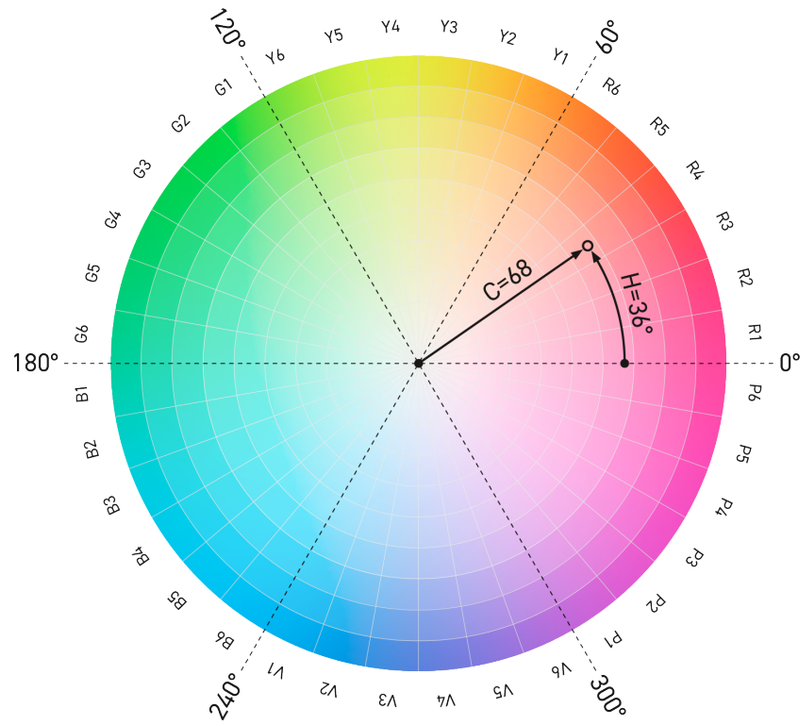
Lab



CIE Lab color space is commonly used by most industry standards, color management, and quality control solutions.

=

LCH$_{ab}$



CIE LCH describes the same space using polar coordinates (radius and angle) — which is much more intuitive for humans.

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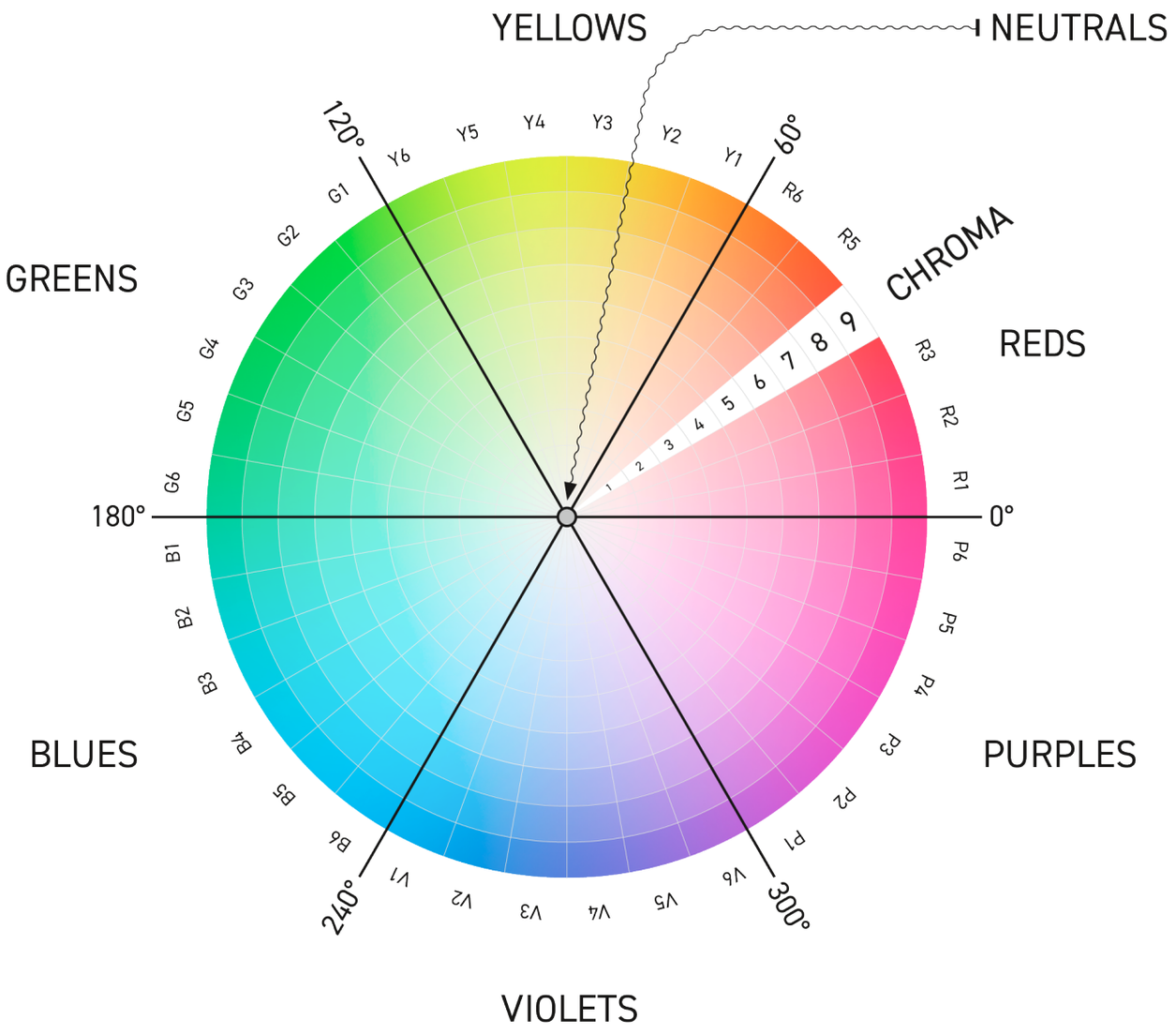
The following diagram helps understand colorimetrical coordinates conversion (one-way) to ChromaSpot code.



CH.L

- L → Lightness — integer of the L (Lab or LCH_{ab})
- H → Hue bin — one of 36 10°-wide segments of the color wheel.
- C → Chroma N, 0-9 (tens of the C value)

LCH_{ab} → **CH.L**

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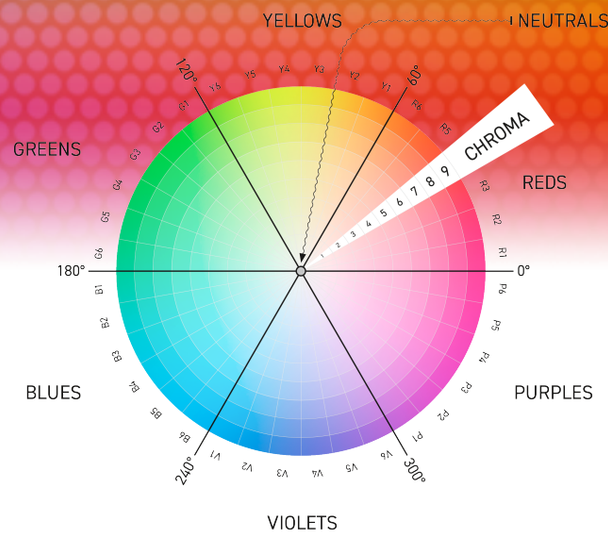

Chroma (C) — the first parameter

determines sample saturation that translates Chroma value based on the simple remember principle.

Chroma	0 - 0.5	0.5 - 10	10 - 20	20 - 30	30 - 40	40 - 50	50 - 60	60 - 70	70 - 80	80 - 90	> 90
code	**N**	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
saturation	neutrals		pale		moderate			high			extreme

Neutrals (shades that seem very neutral) and Grays that can have visible color shade are "isolated" from all other samples where one digit almost directly corresponds to the Chroma's decimals.

Hue angle (H°) — the second parameter

is a range of hue angle values where the color wheel is split into six sectors with three subsectors each. Such a rule makes a single subsector 10° wide.

Hue	0°	10°	20°	30°	40°	50°	60°	70°	80°	90°	100°	110°	120°	130°	140°	150°	160°	170°	180°	190°	200°	210°	220°	230°	240°	250°	260°	270°	280°	290°	300°	310°	320°	330°	340°	350°	0°
code		R1	R2	R3	R4	R5	R6	Y1	Y2	Y3	Y4	Y5	Y6	G1	G2	G3	G4	G5	G6	B1	B2	B3	B4	B5	B6	V1	V2	V3	V4	V5	V6	P1	P2	P3	P4	P5	P6	
		REDS						YELLOWS						GREENS						BLUES						VIOLETS						PURPLES						

Lightness (L) — the third parameter

Lightness is exactly the integer of L from LCH_{ab} (or Lab). The third parameter starts from the dot.

Lightness	0 - 10	10 - 20	20 - 30	30 - 40	40 - 50	50 - 60	60 - 70	70 - 80	80 - 90	90 - 100

The theoretical range is 0-100, howeverChromaSpot Library is based on physical color samples that are manufactured (mostly printed) and then measured in reflectance mode using a spectrophotometer. Very dark blacks have values higher than five, and most light samples have values lower than 94. Typical black printed on common coated paper has normative L= 16, four color overprint (CMYK) L=12, while paperwhite L= 95.

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1. Neutrals — grays where C < 0.5

Neutrals have very short code that consists of the letter N and an integer value of "L" only.
Example:

N.36

It is a Neutral gray (C<0.5) where the L value is rounded to 36.

2. Color samples (when C > 0.5)

Example:

1Y1.78

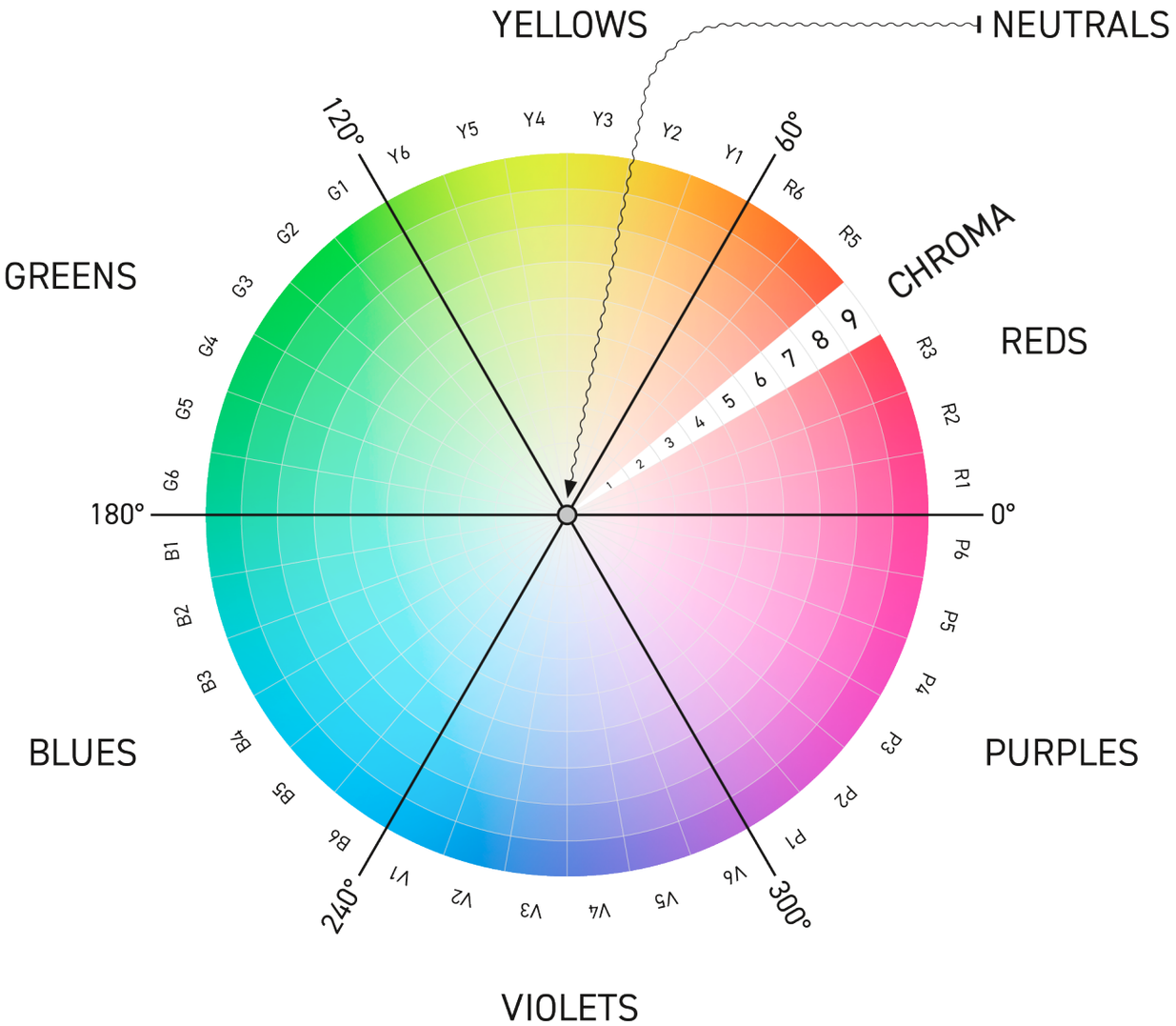
Where:
1 — specifies Chroma as a range 0.5÷ 10 - pale color
Y1 — hue in bin 60°÷ 70°
78 — Lightness rounded to 78

3. The plain English names

Example:

8R4.52 Signal Red

This is 8R4.52 with a unique in-the-system "Signal Red" name.



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Substrate-dependent vs. Substrate-independent Library

A historically justified approach to color from colorant formulation has the major disadvantage that one ink printed on different substrates will look different.

The influence of the substrate is sometimes radical and can make one thing produce vivid, saturated tones (e.g., papers used for photo prints or premium prints), while cheap uncoated papers will make the same ink noticeably different. Contemporary mixing plants, however, are not doomed to use only a balance to prepare paints based on a rigidly defined recipe.

Standard equipment is a spectrophotometer and analytical software enabling the creation of recipes on demand. For printing applications, the system was extended with miniature devices for testing ink printing on a selected substrate.

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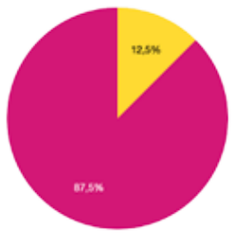
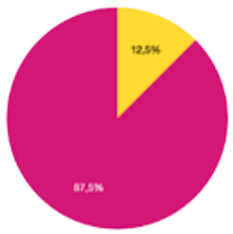
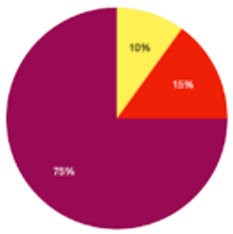
Substrate-dependent vs. Substrate-independent Library

	Substrate-dependent Color Libraries		chromaspot
Substrate	Coated	Uncoated	Coated / Uncoated
Sample	206 C	206 U	8R3.44
Ink formulation			 
sRGB	#D90039	#E34668	#D70039
L	44.2	53.7	44.2
a	76.1	62.4	74.5
b	31.7	16.2	32.1
ΔE_{76}	**22.8**		
ΔE_{00}	**11.5**		

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Substrate-dependent vs. Substrate-independent Library

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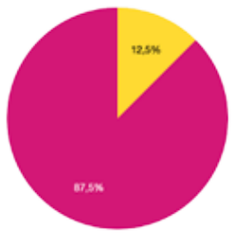
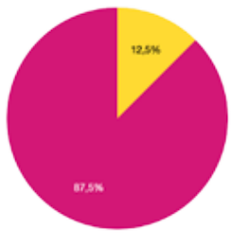
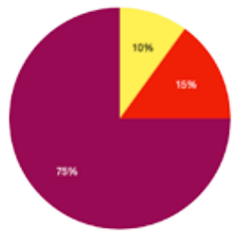
Ink formulation				

This example shows the main difference - ChromaSpot is Substrate independent - ink formulation is adopted to get the best match for Reference for every single color sample/ substrate combination. Real-world substrate-related libraries use substrate more or less but different from the reference substrate used for its definition. Finally, for more demanding jobs, ink formulations are also corrected in the case of substrate-dependant libraries. The initial idea to keep formulation fixed is practically historical only.

chromaspot Benefits

- The substrate-independent color library
- A simple coding convention that is easy to render in the imagination
- Based on measurements of reproducible (printable, paintable, ...) samples
- Optimized for color space homogeneity
- Provides additional reproducibility information
- Designed by designers for designers
- Compliant with the most important industry standards
- Cares about the phenomena of fluorescence and metamerism

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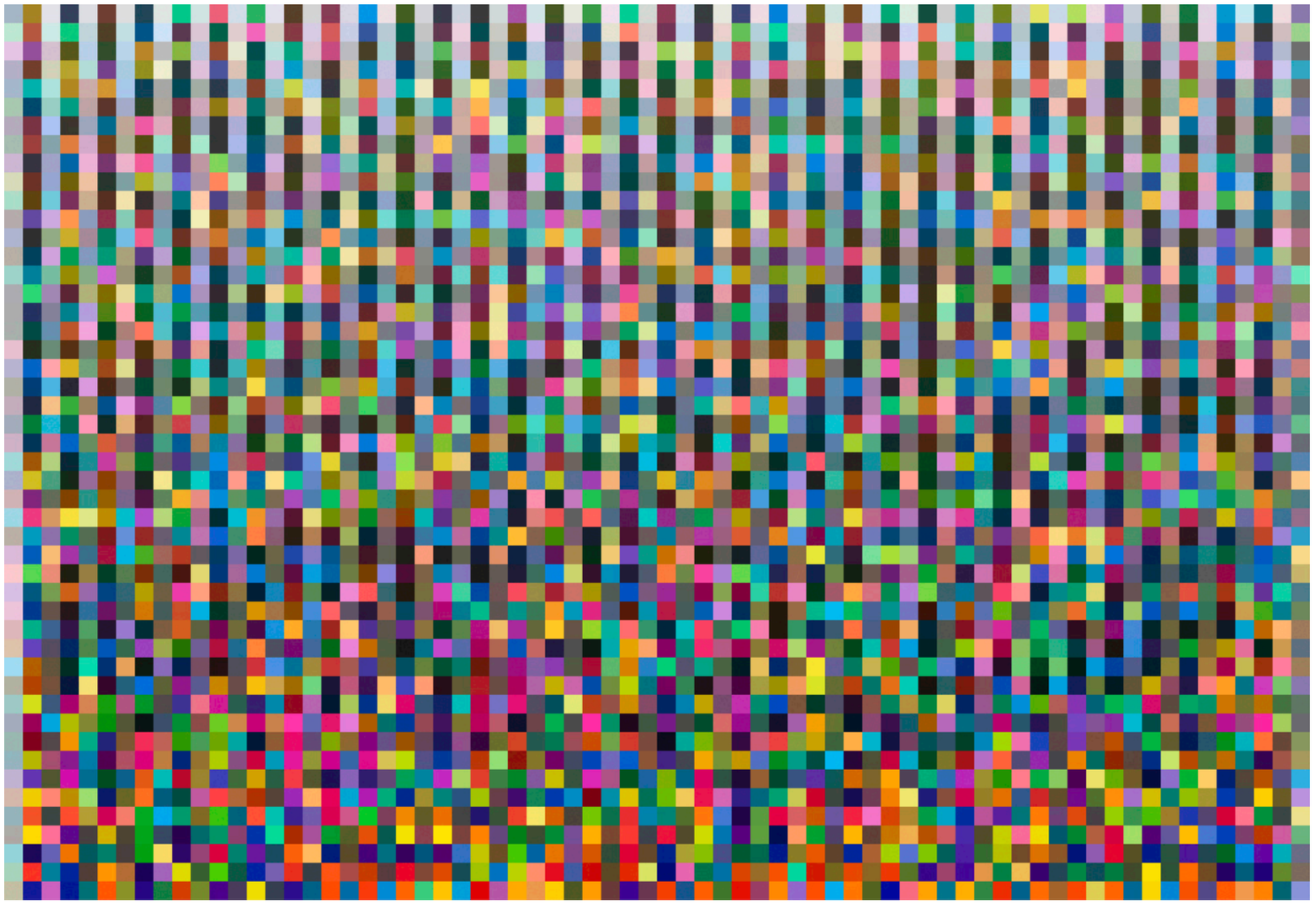
Target

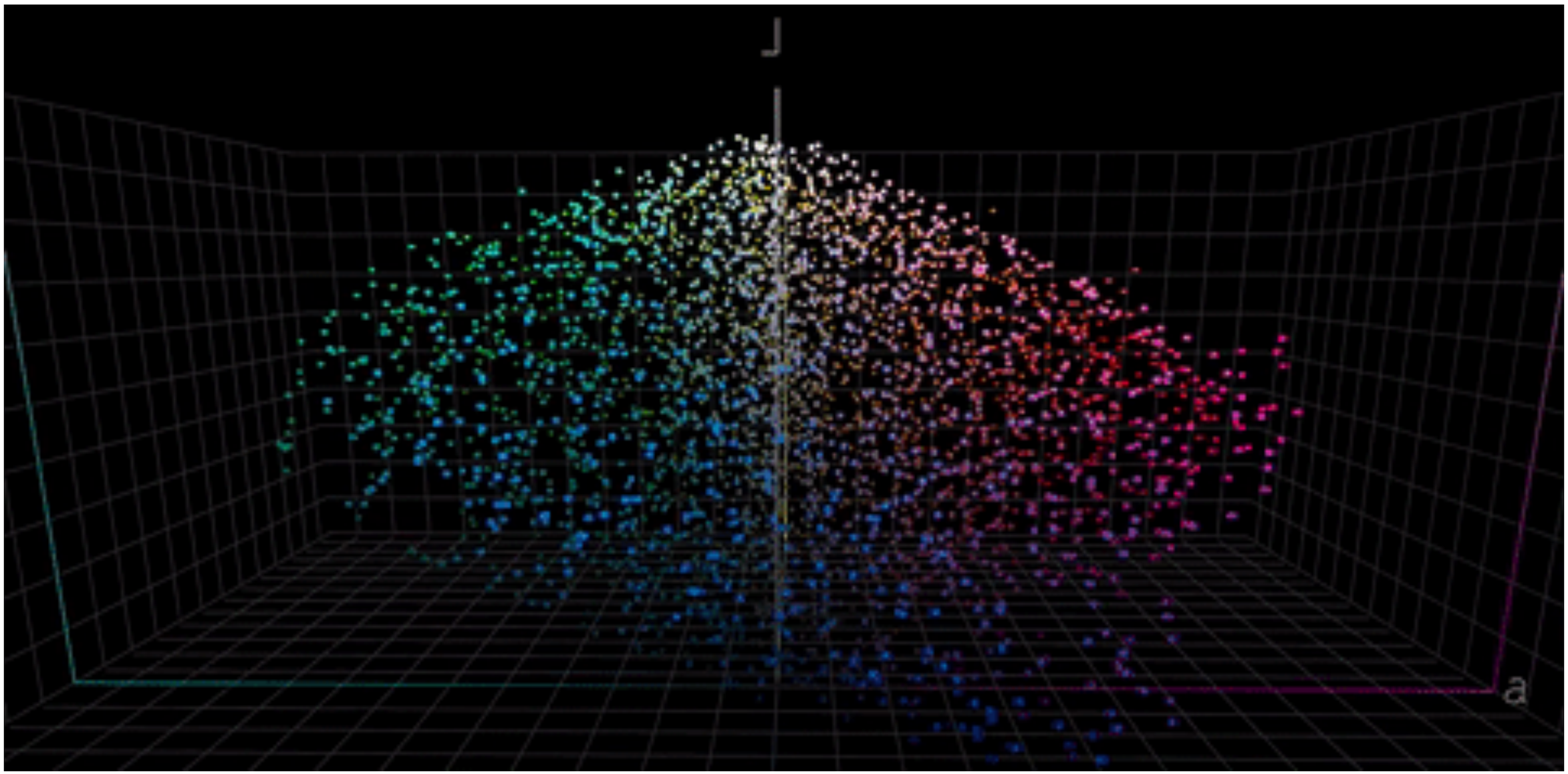


This target contains all current ChromaSpot patches

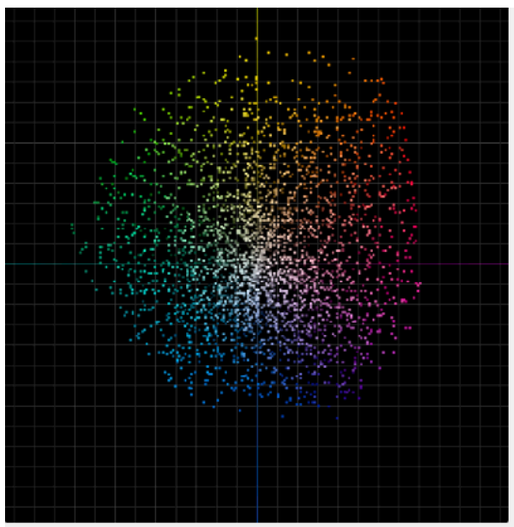
70x48 = 3360 (scrambled)

M1 D50/2°).

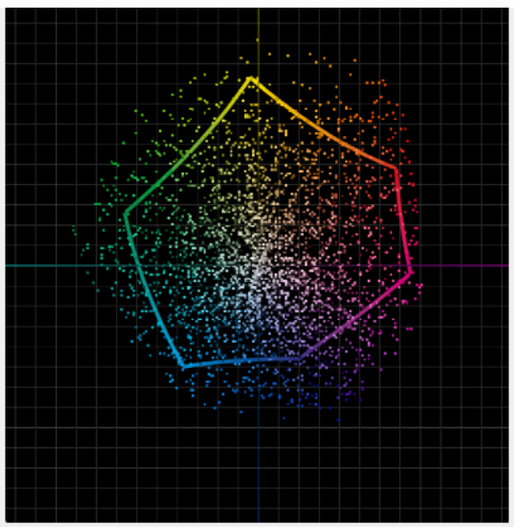
chromaspot Space



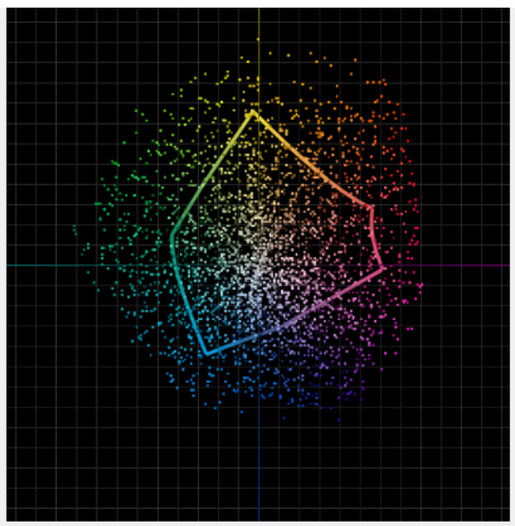
chromaspot Subsets



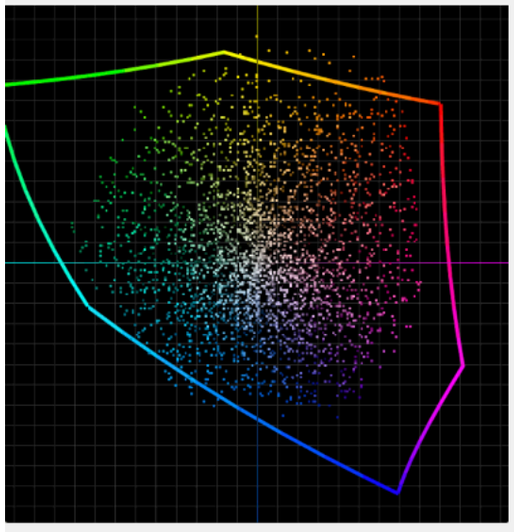
All ChromaSpot samples



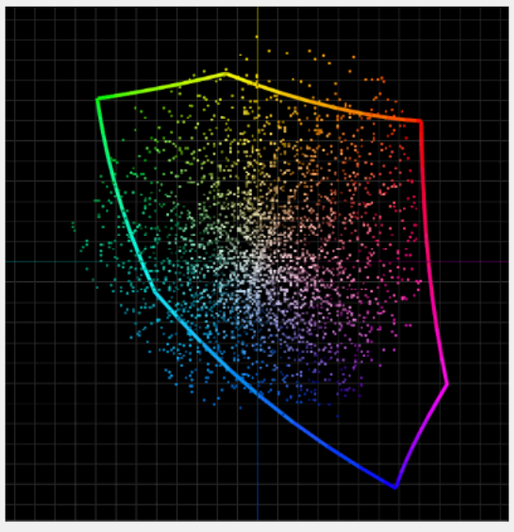
CMYK Coated



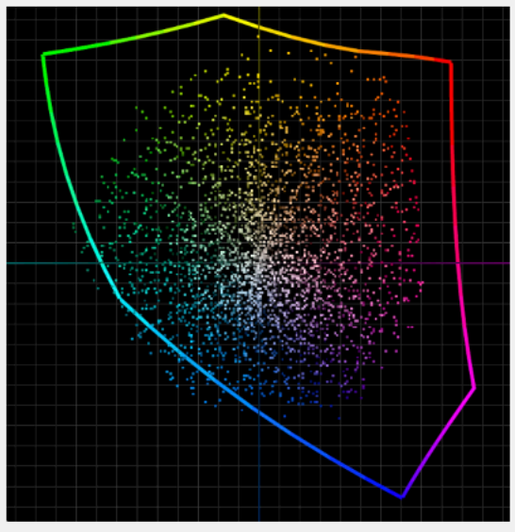
CMYK Uncoated



AdobeRGB



sRBB



P3 Display

CMYK Offset Coated

GRACoL2013_CRPC6 V2
2042 samples
61%

CMYK Offset Unoated

GRACoL2013UNC_CRPC3 V2
1046
31%

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chromaspot color space homogeneity

There is no practical reason to keep two samples less than 1ΔE 2000 as the perceivable difference is too small to make a difference. In addition, the difference should not be higher than 4ΔE as such differences prove that some colors are not represented by Library even if we accept a tolerance of 4

chromaspot color space homogeneity

Sample #1			Sample #2			ΔE	Sample #3			ΔF	Sample #4			ΔE
	ID	Name		ID	Name			ID	Name			ID	Name	
	3287	9R6.65		3288	9R6.66	1.50		3285	9R6.63	1.59		3276	9R5.63	4.36
	3146	8G3.60		3145	8G3.58	1.53		3147	8G3.63	2.75		3144	8G3.57	3.17
	2599	6B4.42		2600	6B4.44	1.54		2598	6B4.40	1.60		2593	6B3.41	2.31
	2735	6P6.63		2733	6P6.61	1.55		2376	5P6.66	3.02		2734	6P6.62	3.03
	3005	7P6.60		3175	8P6.60	1.55		3176	8P6.62	2.56		3174	8P6.57	2.68
	1324	3B6.38		1323	3B6.37	1.56		1823	4B6.40	1.82		1322	3B6.35	3.02
	2923	7G1.81		2924	7G1.83	1.56		2922	7G1.79	1.67		2932	7G1.78	2.97
	1960	4P6.72		1946	4P5.73	1.57		1959	4P6.70	2.63		1968	4R1.75	3.67
	3021	7R3.48		3032	7R4.47	1.57		2754	6R3.50	3.07		2765	6R4.46	3.52
	1971	4R2.31		2388	5R2.32	1.58		1972	4R2.33	2.17		2399	5R3.35	3.68

chromaspot color space homogeneity

Sample #1			Sample #2			ΔE	Sample #3			ΔE	Sample #4			ΔE
	ID	Name		ID	Name			ID	Name			ID	Name	
	1081	2V3.7		1084	2V4.12	4.01		558	1V4.12	5.12		1068	2V2.8	5.21
	2117	4Y2.29		1685	3Y2.34	4.01		1684	3Y2.32	4.18		2118	4Y2.32	5.03
	677	1Y5.16		678	1Y5.17	3.99		666	1Y4.12	4.35		667	1Y4.18	4.37
	36	0G6.38		12	0B4.37	3.97		294	1G4.38	4.02		194	1B2.37	4.38
	42	0P1.72		352	1P1.67	3.92		606	1V6.70	4.01		59	0P5.73	4.02
	401	1P5.42		402	1P5.43	3.92		386	1P4.46	5.72		63	0R1.45	5.91
	195	1B2.42		756	2B4.42	3.91		217	1B4.40	4.55		201	1B3.47	4.63
	339	1G6.8		312	1G6.13	3.90		334	1G6.7	4.36		313	1G6.15	4.61
	3136	8Y6.64		3253	8Y6.68	3.90		3137	8G1.69	4.27		3139	8G1.74	7.86
	499	1V1.38		1033	2V1.34	3.89		247	1B6.33	3.90		1035	2V1.39	3.97

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