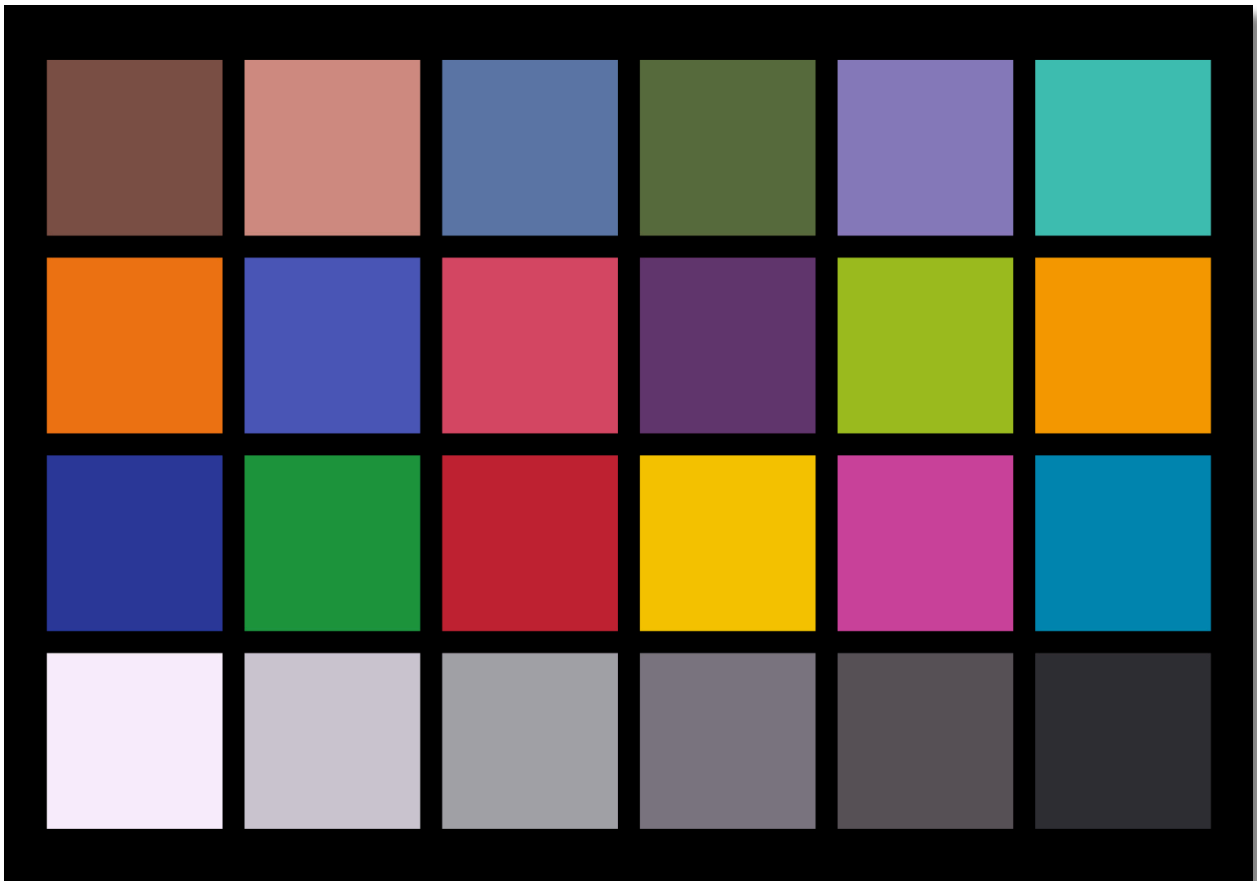


ColorChecker Project

7 August 2026



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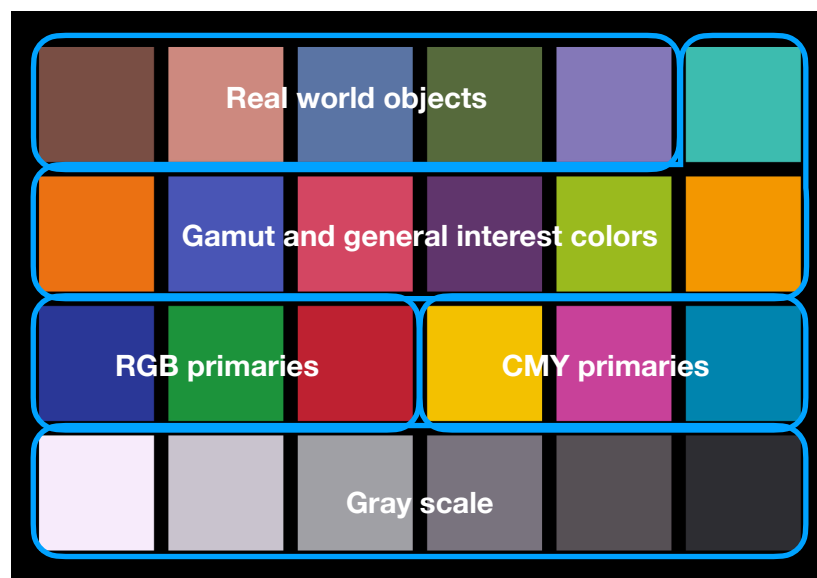
ColorChecker Project

In response to the need for a tool to allow visual and measured evaluation of color reproduction, in 1976 three researchers from the Macbeth division of Kollmorgen Corporation published the specification and availability of a color chart.¹ When released as a product, it was named the ColorChecker® and it was so well designed for its purpose that it has been in continual production for 50 years.

Design Specifications

The chart is an array of 50 mm (2 in.) square patches organized in 4 rows of 6 colors. This resulted in the chart having a 1.5:1 aspect ratio so when photographed on 35 mm film it would fill a single frame. In addition, the rendered patch sizes on the film would be large enough (i.e. around 5 mm square) to allow for measurements with a densitometer or spectrometer. The patches are made of matte paint applied to smooth paper, then glued to a rigid cardboard support. A black frame surrounds each patch and the entire chart. The patches were produced by the Munsell Color Company, purchased in 1971 by the Kollmorgen Corp., which, since 1967, was also the owner of Macbeth.

The first five patches are intended to simulate real objects. Skin color is represented on film in a series from almost white to almost black. The melanin and hemoglobin absorptions produce spectra that form a related series. Instead of a single caucasian skin color, as represented in many early color film publications from companies such as Kodak, a medium light and a medium dark skin were selected to test the ability of systems to reproduce this type of spectrum. The next three colors are important for film to reproduce properly: Blue sky, Foliage and Blue Flower.



The blue flower patch was intended to simulate the spectral response of blue Morning Glories, a flower that presented reproduction difficulties for film due to a high red reflectance that was not apparent visually. Film detected this high red reflectance which often resulted in purple reproduction instead of the desired blue visual appearance. Although the pigments chosen could not reproduce the Morning Glory spectrum, they could achieve a spectrum close to that of Chicory, a flower that had a similar extra high red reflectance issue resulting in a rendering of pink or purple instead of a visible blue appearance.

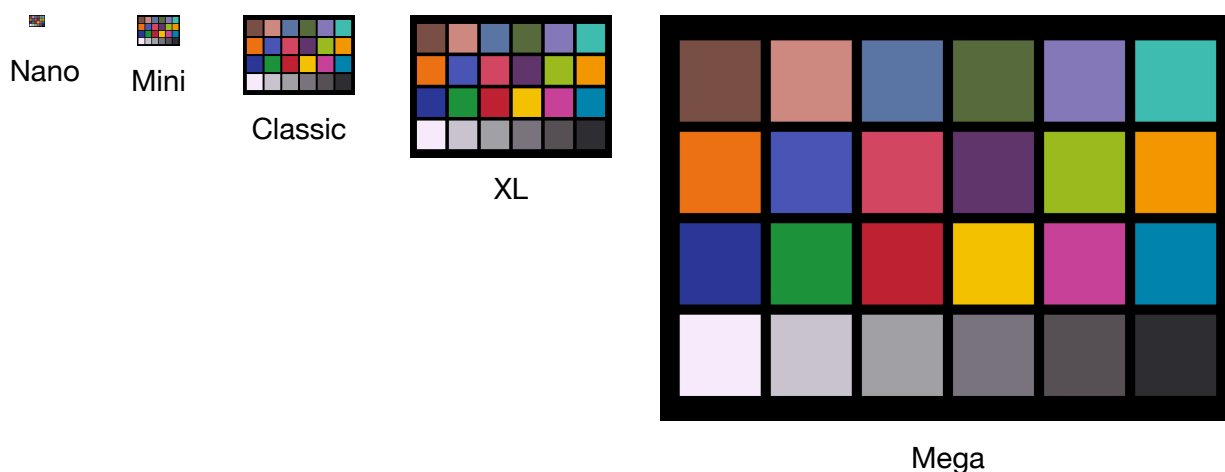
Six primary colors red, green, blue, cyan, magenta and yellow were selected to have high chroma and to have no fine structure in their spectra. Some were chosen to match specific photographic primaries.

A six step gray scale was added to evaluate simulate the typical daylight and studio illumination range.

The remaining seven colors were chosen to fill the chart's color gamut and to be of general interest.

Formats

The original ColorChecker® was produced in a 13.5 x 9 inch format designed to fill a 35 mm film frame when photographed by a 35 mm camera. Over time when the ColorChecker's use was extended into new applications, it became necessary to produce the chart in different sizes.



Note: Chart images shown to scale.

In subsequent years versions have been produced in formats from small ones that would fit in a hand (i.e. Classic Nano, 40 x 24 mm, 1.575 x 0.945 in.) to ones large enough to need two people to hold it (Classic Mega 1.524 x 1.016 m, 60 x 40 in.).

With all the new variations, to understand which chart is being used, the original 24 patch color chart has been renamed the ColorChecker® Classic (CCC).

Some applications did not need all the ColorChecker patches so some versions were made with only a white balance, or a gray balance, or a 3-step grayscale chart.

The 24 patch chart design has served many applications very well. But there were some uses that needed more patches, different patches or more colorful patches. ColorCheckers were adapted to fill these needs.

Here is a list of currently available ColorCheckers.

Model	Patches	Size		Note
		Inches	Centimeters	
Classic Nano	24	1.75 x 1	4.0 x 2.4	
Classic Mini	24	4.25 x 2.5	10.9 x 6.35	
Classic Proof	24	6.25 x 4.5	11.3 x 6	Available in X-Rite Publish package only.
Classic	24	11.5 x 8.25	29.2 x 20.3	
Classic XL	24	21 x 14.75	53.4 x 37.5	
Classic Mega	24	60 x 40	152.4 x 101.6	
Passport Photo 2	52	3.5 x 5	9 x 12.5	
Passport Video 2	52	3.5 x 5	9 x 12.5	Two gloss black patches.
Digital SG	140	11.5 x 8.25	29.2 x 20.3	Semi-gloss patch surfaces.
Video	33	11.5 x 8.25	29.2 x 20.3	
3-Step Grayscale	3	11.5 x 8.25	29.2 x 20.3	
Gray Balance Mini	1	7 x 4	18 x 10	
Gray Balance	1	11.5 x 8.25	29.2 x 20.3	
White Balance	1	11.5 x 8.25	29.2 x 20.3	
Video XL	32	21 x 14.75	53.3 x 37.5	
Video Mega	32	60 x 40	152.4 x 101.6	

Comparing ColorCheckers Through the Years

To examine how the ColorChecker has aged over the years, a group of these charts of different ages were obtained, measured and compared.

In the original 1976 definition of the chart, each patch was measured with an integrating sphere spectrometer (unrecorded) with the specular component excluded (SCE) and the resulting spectra were converted to colorimetric values using the 2-degree observer and CIE Illuminant C. These conditions allowed the conversion of each patch's xyY values to Munsell designations and names were assigned using simplified ISCC-NBS names.²

The colorimetric coordinates were converted from xyY to XYZ then to L*a*b* values to provide the reference color designations for the patches. The calculations were made using one of the author's programs, but there are many online resources for the conversions. One such resource is on Bruce Lindbloom's website.³

Here is a list of the ColorCheckers used for the comparisons and their date of manufacture, if known.

Chart	Date	Manufacturer
ColorChecker	1977-01 #1	Macbeth
ColorChecker	1977-01 #2	Macbeth
ColorChecker	1977-03 #1	Macbeth
ColorChecker	1977-03 #2	Macbeth
ColorChecker	1989-01	Macbeth
ColorChecker	1990-11	Macbeth
ColorChecker	1996-03 #1	GretagMacbeth
ColorChecker	1996-03 #2	GretagMacbeth (new old stock)
ColorChecker	2000-07	GretagMacbeth (new old stock)
ColorChecker	2007-07	GretagMacbeth
ColorChecker	2007	X-Rite
ColorChecker	2010-12	X-Rite
CC Classic	2021 #1	Calibrite
CC Classic	2021 #2	Calibrite
CC Mini	ca. 2010	X-Rite
CC Classic Mini	2021	Calibrite
CC Classic XL	2021	Calibrite

To simulate the original measurement conditions as closely as possible, each chart was measured with a ColorEye XTH integrating sphere instrument using the SpectraShop 6 program. Four measurements were made of each chart, then averaged. Each patch was measured with replacement. The measured spectral range was then reduced from the instrument's 360 to 750 nm span to the range of 400 to 700 nm, to better match the original 1976 published data. This reduced spectral range data was converted to L*a*b* values in Spectrashop.

To provide a visual method for assessing the differences between the charts, a color coded difference chart was created for each comparison.

How close are current charts to the original 1976 definition?

1976 L*a*b* vs. CC Classic 2021 #1

Dark skin 1.41	Light skin 2.52	Blue sky 4.86	Foliage 2.11	Blue flower 1.93	Bluish green 1.50
Orange 2.26	Purplish blue 2.26	Moderate red 1.62	Purple 2.57	Yellow green 1.63	Orange yellow 1.26
Blue 3.77	Green 1.02	Red 4.38	Yellow 1.67	Magenta 1.22	Cyan 1.26
White 1.88	Neutral 8 1.03	Neutral 6.5 0.86	Neutral 5 1.33	Neutral 3.5 0.36	Black 0.51

Average ΔE : 1.88
Peak ΔE : 4.86

1976 L*a*b* vs. CC Classic 2021 #2

Dark skin 1.48	Light skin 2.61	Blue sky 4.99	Foliage 2.18	Blue flower 2.03	Bluish green 1.26
Orange 3.74	Purplish blue 1.24	Moderate red 2.03	Purple 5.42	Yellow green 3.11	Orange yellow 1.45
Blue 4.17	Green 1.07	Red 4.44	Yellow 1.76	Magenta 1.30	Cyan 1.09
White 1.74	Neutral 8 0.98	Neutral 6.5 0.91	Neutral 5 1.38	Neutral 3.5 0.46	Black 0.58

Average ΔE : 2.14
Peak ΔE : 5.42

1976 L*a*b* vs. CC Classic XL 2021

Dark skin 1.35	Light skin 2.97	Blue sky 3.91	Foliage 2.51	Blue flower 2.26	Bluish green 2.39
Orange 5.59	Purplish blue 2.05	Moderate red 2.79	Purple 4.10	Yellow green 3.16	Orange yellow 2.76
Blue 8.79	Green 0.79	Red 4.02	Yellow 2.37	Magenta 1.36	Cyan 1.13
White 2.27	Neutral 8 1.60	Neutral 6.5 1.31	Neutral 5 1.54	Neutral 3.5 0.98	Black 0.90

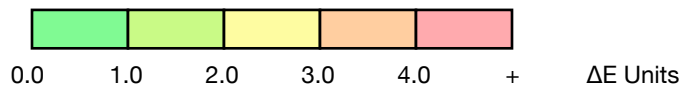
Average ΔE : 2.62
Peak ΔE : 8.79

1976 L*a*b* vs. CC Classic Mini 2021

Dark skin 1.83	Light skin 2.43	Blue sky 5.29	Foliage 2.32	Blue flower 1.98	Bluish green 2.01
Orange 3.55	Purplish blue 2.49	Moderate red 2.40	Purple 2.63	Yellow green 2.74	Orange yellow 2.01
Blue 3.74	Green 1.64	Red 4.85	Yellow 1.64	Magenta 1.54	Cyan 1.67
White 2.23	Neutral 8 1.38	Neutral 6.5 1.47	Neutral 5 1.56	Neutral 3.5 1.18	Black 0.77

Average ΔE : 2.31
Peak ΔE : 5.29

Difference Color Key



The large number of patches in these difference charts that are coded green to yellow, indicates the majority of colors match the original specification within 2 to 3 ΔE units. A difference of 5 ΔE units is considered a reasonable matching criteria in many industries, with an average ΔE about 2-3 units, the current charts match very well.

This is even more remarkable because in 2014 the reference colorimetric values were changed to reflect changes in the patch formulations due to pigment availability.

How close are current charts to each other?

2021 Average vs. CC Classic 2021 #1

Dark skin	Light skin	Blue sky	Foliage	Blue flower	Bluish green
0.11	0.13	0.24	0.06	0.07	0.41
Orange	Purplish blue	Moderate red	Purple	Yellow green	Orange yellow
0.70	0.54	3.33	0.90	0.97	0.38
Blue	Green	Red	Yellow	Magenta	Cyan
0.26	0.24	0.46	0.25	0.16	0.12
White	Neutral 8	Neutral 6.5	Neutral 5	Neutral 3.5	Black
1.56	0.15	0.17	0.12	0.16	0.37

Average ΔE : 0.49
Peak ΔE : 3.33

2021 Average vs. CC Classic 2021 #2

Dark skin	Light skin	Blue sky	Foliage	Blue flower	Bluish green
0.15	0.51	0.23	0.17	0.17	0.45
Orange	Purplish blue	Moderate red	Purple	Yellow green	Orange yellow
1.61	1.58	2.60	2.10	1.43	0.22
Blue	Green	Red	Yellow	Magenta	Cyan
0.20	0.11	0.35	0.27	0.20	0.41
White	Neutral 8	Neutral 6.5	Neutral 5	Neutral 3.5	Black
1.65	0.19	0.24	0.08	0.13	0.47

Average ΔE : 0.65
Peak ΔE : 2.60

2021 Average vs. CC Classic Mini 2021

Dark skin	Light skin	Blue sky	Foliage	Blue flower	Bluish green
0.18	0.29	0.27	0.13	0.24	0.17
Orange	Purplish blue	Moderate red	Purple	Yellow green	Orange yellow
0.56	0.42	3.00	0.93	0.26	0.16
Blue	Green	Red	Yellow	Magenta	Cyan
0.49	0.55	0.48	0.21	0.11	0.12
White	Neutral 8	Neutral 6.5	Neutral 5	Neutral 3.5	Black
1.43	0.23	0.21	0.26	0.20	0.23

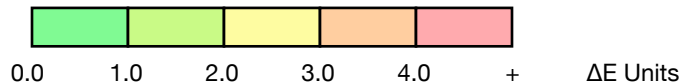
Average ΔE : 0.46
Peak ΔE : 3.00

2021 Average vs. CC Passport 2021

Dark skin	Light skin	Blue sky	Foliage	Blue flower	Bluish green
0.26	0.37	0.31	0.33	0.63	0.29
Orange	Purplish blue	Moderate red	Purple	Yellow green	Orange yellow
2.73	0.68	3.09	0.84	1.15	0.63
Blue	Green	Red	Yellow	Magenta	Cyan
0.53	1.46	0.25	0.88	1.06	1.29
White	Neutral 8	Neutral 6.5	Neutral 5	Neutral 3.5	Black
2.23	0.52	0.68	0.92	0.82	0.36

Average ΔE : 0.93
Peak ΔE : 3.09

Difference Color Key



Almost all the patches are within 2 ΔE of each other which signifies that these charts are made to very tight tolerances.

There are a few exceptions. For example, from the higher difference for the Moderate Red color, we can assume that something in the production of this patch has more variability than the other colors. The reason for this could be the pigment grind, the medium density, the homogeneity of the paint mixture, the thickness of the paint layer on the paper substrate, et cetera. These types of differences, and more, could apply to any of the colors.

It is a testament to the production capabilities of the Munsell Color company that all these colors have remained so consistent for 50 years.

How close are older charts today to the original 1976 definition?

1976 L*a*b* vs. CC Classic 1977-01 #1



Average ΔE : 2.54
Peak ΔE : 6.95

1976 L*a*b* vs. CC Classic 1977-01 #2



Average ΔE : 2.35
Peak ΔE : 7.04

1976 L*a*b* vs. CC Classic 1977-03 #1



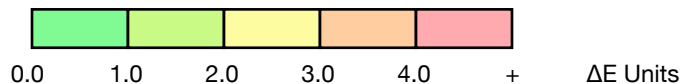
Average ΔE : 3.20
Peak ΔE : 14.22

1976 L*a*b* vs. CC Classic 1977-03 #2



Average ΔE : 2.64
Peak ΔE : 9.11

Difference Color Key



Here there are four charts from the first year of sales, 1977. All of the patches have scrapes and scratches in their surfaces. Each patch was examined using a directional light and a measurement template was carefully placed between surface defects to measure the undamaged portion.

The difference charts are very similar, with each patch having a similar color difference regardless of the chart. The patches with the most blue pigment (Blue sky, Purplish blue, Blue) show the most color change. The white patches also exhibit a large color difference and most of this difference is due to yellowing (i.e. large Δb^*).

1976 L*a*b* vs. CC Classic 1989-01

Dark skin	Light skin	Blue sky	Foliage	Blue flower	Bluish green
0.60	1.55	3.03	2.04	1.64	1.28
Orange	Purplish blue	Moderate red	Purple	Yellow green	Orange yellow
3.53	2.48	1.85	2.46	3.08	3.04
Blue	Green	Red	Yellow	Magenta	Cyan
4.87	0.63	2.90	2.51	1.88	2.26
White	Neutral 8	Neutral 6.5	Neutral 5	Neutral 3.5	Black
5.21	1.35	1.58	1.36	1.04	0.57

Average ΔE : 2.20
Peak ΔE : 5.21

1976 L*a*b* vs. CC Classic 1990-11

Dark skin	Light skin	Blue sky	Foliage	Blue flower	Bluish green
0.64	1.03	4.22	1.78	1.46	1.10
Orange	Purplish blue	Moderate red	Purple	Yellow green	Orange yellow
1.01	3.20	1.07	4.55	2.06	0.71
Blue	Green	Red	Yellow	Magenta	Cyan
5.88	1.29	0.27	0.62	4.45	1.37
White	Neutral 8	Neutral 6.5	Neutral 5	Neutral 3.5	Black
5.49	1.54	1.16	0.86	0.76	1.53

Average ΔE : 2.00
Peak ΔE : 5.88

1976 L*a*b* vs. CC Classic 1996-03

Dark skin	Light skin	Blue sky	Foliage	Blue flower	Bluish green
1.33	1.17	5.13	1.18	1.46	1.92
Orange	Purplish blue	Moderate red	Purple	Yellow green	Orange yellow
2.57	0.66	0.97	3.39	2.59	1.03
Blue	Green	Red	Yellow	Magenta	Cyan
3.49	1.23	1.93	0.74	1.14	1.76
White	Neutral 8	Neutral 6.5	Neutral 5	Neutral 3.5	Black
2.08	1.56	1.83	1.35	1.19	0.60

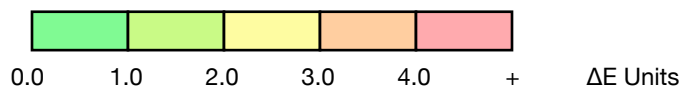
Average ΔE : 1.76
Peak ΔE : 5.13

1976 L*a*b* vs. CC Classic 2007

Dark skin	Light skin	Blue sky	Foliage	Blue flower	Bluish green
0.63	3.24	3.18	1.67	2.50	1.74
Orange	Purplish blue	Moderate red	Purple	Yellow green	Orange yellow
5.30	2.19	3.04	3.78	2.21	2.02
Blue	Green	Red	Yellow	Magenta	Cyan
6.39	1.52	1.82	1.69	2.72	1.23
White	Neutral 8	Neutral 6.5	Neutral 5	Neutral 3.5	Black
2.52	0.97	0.77	1.32	0.96	0.61

Average ΔE : 2.25
Peak ΔE : 6.39

Difference Color Key



The average ΔE from the new and old charts, when compared to the original 1976 values, is 2.15. This is consistent from chart to chart, so it is a tribute to the people at Munsell Color that they have been able to make these charts so reliably for 50 years.

1976 L*a*b* vs. CC Classic 1996-03 #1

Dark skin	Light skin	Blue sky	Foliage	Blue flower	Bluish green
1.33	1.17	5.13	1.18	1.46	1.92
Orange	Purplish blue	Moderate red	Purple	Yellow green	Orange yellow
2.57	0.66	0.97	3.39	2.59	1.03
Blue	Green	Red	Yellow	Magenta	Cyan
3.49	1.23	1.93	0.74	1.14	1.76
White	Neutral 8	Neutral 6.5	Neutral 5	Neutral 3.5	Black
2.08	1.56	1.83	1.35	1.19	0.60

Average ΔE : 1.76
Peak ΔE : 5.13

1976 L*a*b* vs. CC Classic 1996-03 #2

Dark skin	Light skin	Blue sky	Foliage	Blue flower	Bluish green
1.22	2.18	5.20	2.10	1.98	1.21
Orange	Purplish blue	Moderate red	Purple	Yellow green	Orange yellow
2.71	3.21	1.35	3.07	3.01	2.50
Blue	Green	Red	Yellow	Magenta	Cyan
3.84	1.77	2.07	1.23	2.11	2.78
White	Neutral 8	Neutral 6.5	Neutral 5	Neutral 3.5	Black
2.53	1.93	1.64	1.01	1.11	0.72

Average ΔE : 2.19
Peak ΔE : 5.20

1976 L*a*b* vs. CC Classic 2007-07 #1 NOS

Dark skin	Light skin	Blue sky	Foliage	Blue flower	Bluish green
0.77	1.82	5.10	2.16	1.81	1.44
Orange	Purplish blue	Moderate red	Purple	Yellow green	Orange yellow
2.56	0.86	1.40	5.69	2.08	1.91
Blue	Green	Red	Yellow	Magenta	Cyan
6.69	2.74	1.73	1.21	1.39	1.67
White	Neutral 8	Neutral 6.5	Neutral 5	Neutral 3.5	Black
3.88	2.04	1.38	2.01	1.10	1.54

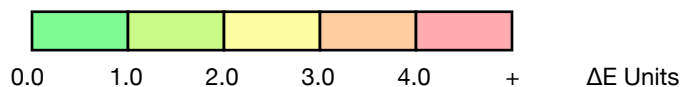
Average ΔE : 2.29
Peak ΔE : 6.69

1976 L*a*b* vs. CC Classic 2007 #2

Dark skin	Light skin	Blue sky	Foliage	Blue flower	Bluish green
0.63	3.24	3.18	1.67	2.50	1.74
Orange	Purplish blue	Moderate red	Purple	Yellow green	Orange yellow
5.30	2.19	3.04	3.78	2.21	2.02
Blue	Green	Red	Yellow	Magenta	Cyan
6.39	1.52	1.82	1.69	2.72	1.23
White	Neutral 8	Neutral 6.5	Neutral 5	Neutral 3.5	Black
2.52	0.97	0.77	1.32	0.96	0.61

Average ΔE : 2.25
Peak ΔE : 6.39

Difference Color Key



The average ΔE from the new and old charts, when compared to the original 1976 values, is 2.15. This is consistent from chart to chart, so it is a tribute to the people at Munsell Color that they have been able to make these charts so reliably for 50 years.

Is there any difference between the differently sized ColorCheckers?

The color paint for the patches is applied to a paper substrate roll using a very precise applicator that insures a consistently uniform layer. Once dry, the paper rolls are cut into sheets about 8 x 10 inches in size. The individual color patches are cut from these sheets. Since all the differently sized charts start with these color sheets, then it is expected that the size of the target does not influence the color of the patches.

This is verified by checking the results for the ColorChecker Classic (standard size) against the Classic XL and the Classic Mini. All of these charts produce an average difference of slightly over 2 ΔE . No size produces any significant variation in this result.

The ColorChecker Passport charts are contained in a plastic protective case. This case does not allow the ColorEye XTH sphere instrument from measuring the patches. However, since the ColorChecker Mini is the same chart contained in the Passports, then we can assume the Mini differences to be similar to the Passport differences.

How did the 2014 reformulation affect the charts?

2014 Reformulation

	Before Nov. 2014			After Nov. 2014			Differences			
	L*	a*	b*	L*	a*	b*	ΔL^*	Δa^*	Δb^*	ΔE
Dark skin	37.99	13.56	14.06	37.54	14.37	14.92	-0.45	0.82	0.86	1.27
Light skin	65.71	18.13	17.81	64.66	19.27	17.50	-1.05	1.14	-0.31	1.58
Blue sky	49.93	-4.88	-21.91	49.32	-3.82	-22.54	-0.61	1.06	-0.64	1.38
Foliage	43.14	-13.10	21.91	43.46	-12.74	22.72	0.32	0.36	0.82	0.95
Blue flower	55.11	8.84	-25.40	54.94	9.61	-24.79	-0.17	0.77	0.61	0.99
Bluish green	70.72	-33.40	-0.20	70.48	-32.26	-0.37	-0.24	1.14	-0.17	1.17
Orange	62.66	36.07	57.10	62.73	35.83	56.50	0.07	-0.24	-0.60	0.65
Purplish blue	40.02	10.41	-45.96	39.43	10.75	-45.17	-0.59	0.34	0.79	1.05
Moderate red	51.12	48.24	16.25	50.57	48.64	16.67	-0.55	0.40	0.42	0.80
Purple	30.33	22.98	-21.59	30.10	22.54	-20.87	-0.23	-0.44	0.72	0.87
Yellow green	72.53	-23.71	57.26	71.77	-24.13	58.19	-0.76	-0.42	0.94	1.28
Orange yellow	71.94	19.36	67.86	71.51	18.24	67.37	-0.43	-1.12	-0.49	1.30
Blue	28.78	14.18	-50.30	28.37	15.42	-49.80	-0.41	1.24	0.50	1.40
Green	55.26	-38.34	31.37	54.38	-39.72	32.27	-0.88	-1.38	0.90	1.87
Red	42.10	53.38	28.19	42.43	51.05	28.62	0.33	-2.33	0.43	2.39
Yellow	81.73	4.04	79.82	81.80	2.67	80.41	0.07	-1.37	0.59	1.49
Magenta	51.94	49.99	-14.57	50.63	51.28	-14.12	-1.31	1.29	0.45	1.89
Cyan	51.04	-28.63	-28.64	49.57	-29.71	-28.32	-1.47	-1.08	0.32	1.85
White	96.54	-0.43	1.19	95.19	-1.03	2.93	-1.35	-0.61	1.74	2.29
Neutral 8	81.26	-0.64	-0.34	81.29	-0.57	0.44	0.03	0.07	0.78	0.78
Neutral 6.5	66.77	-0.73	-0.50	66.89	-0.75	-0.06	0.12	-0.02	0.44	0.46
Neutral 5	50.87	-0.15	-0.27	50.76	-0.13	0.14	-0.11	0.02	0.41	0.42
Neutral 3.5	35.66	-0.42	-1.23	35.63	-0.46	-0.48	-0.03	-0.04	0.75	0.75
Black	20.46	-0.08	-0.97	20.64	0.07	-0.46	0.18	0.15	0.51	0.56
Colorimetry made with Illuminant D50 and 2° observer						Avg.	-0.40	-0.01	0.45	1.23
						Min.	-1.47	-2.33	-0.64	0.42
						Max.	0.33	1.29	1.74	2.39

Early ColorChecker Prototype

Often a tool can trace its origins to an earlier version. So it is with the ColorChecker. In the Fall of 1957, Edwin J. Breneman, of the Kodak Research Laboratories, published a paper describing a color chart to be used for evaluating color rendition.⁴

The Breneman chart was designed using 24 color patches arranged in four rows of six colors. These patches were made with artist's oil colors painted on 4 x 4 inch thin glass plates, then mounted in a wooden frame so the patches were imaged through the glass. The result was a chart with the same proportions as a 35 mm frame.

Nine patches are made with high saturation colors; blue, cyan, green, chartreuse, yellow, orange, red, magenta and dull red.

Breneman considered the most important colors for evaluating color reproduction to be flesh (caucasian), foliage and blue sky. Included in the chart were sand and Morning-glory blue. Morning-glory blue was added to the chart because its petals exhibit high reflectance in the far red/near infrared spectral region where eye sensitivity is low but where most films have a high sensitivity, making it difficult to reproduce by color films.

Included in the chart are a six step achromatic series from white to black and made with artists' oils, and one additional gray which reflects uniformly from the visible into the near-ultraviolet. This patch was included to test some color films with high relative ultraviolet sensitivity.

Low saturation colors are often difficult to reproduce accurately so several were added to the chart to complete the twenty-four colors.

Attempts to find an image of this chart have been unsuccessful, but here is a simulation based on the patch chromaticity coordinates published by Breneman and patch positions selected to be similar to the ColorChecker Classic. These colors are based on Illuminant C and the 2° observer.

Brown	Flesh	Sky blue	Foliage	Morning glory	Light green
Orange	Sand	Dull red	UV gray	Chartreuse	Peach
Blue	Green	Red	Yellow	Magenta	Cyan
White	Neutral II	Neutral III	Neutral IV	Neutral V	Black

Somewhere in his career McCamy became familiar with the rendition chart Breneman created at Kodak. It probably influenced the design of the ColorChecker. While there are many differences between the two charts, there are too many similarities to ignore.

Similarities

	Breneman	McCamy
Aspect ratio	1.5 : 1	1.5 : 1
Number of colors	24	24
Grayscale	6 steps	6 steps
Primaries	RGBCMY	RGBCMY
Memory colors	skin, sky, foliage	skin, sky, foliage
Problem colors	blue flower	blue flower

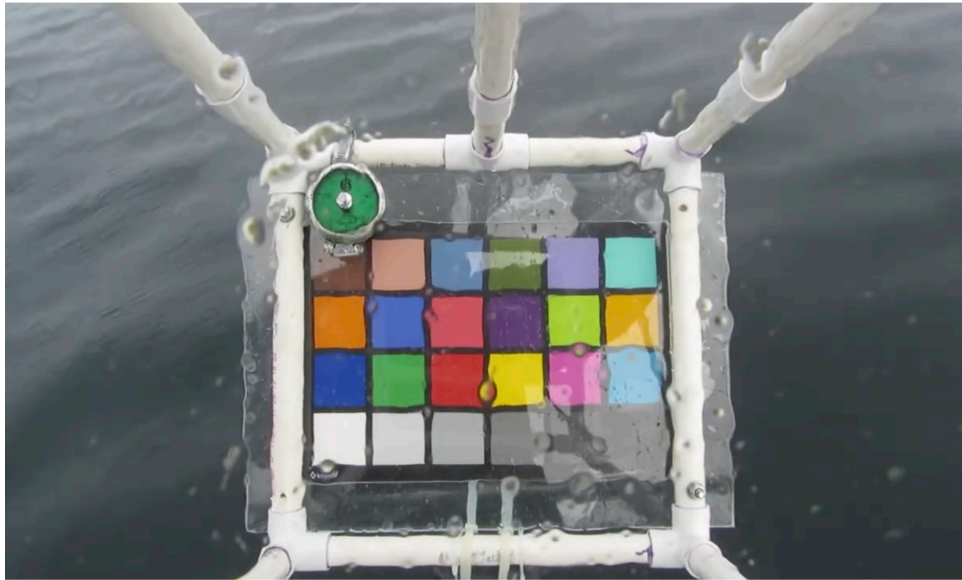
Differences

	Breneman	McCamy
Size	24 x 16 inches	13.5 x 9 Inches
Patch surface	glossy	matte
Grays	7	6
Skintones	1	2

Kodak never released the Breneman target as a product.

Unusual ColorChecker Uses

The ColorChecker has found many uses over the years. Here is an example of a ColorChecker in a waterproof housing and used to estimate water quality and to develop new underwater color correction techniques.⁵



Although the Moon landing program was finished before the ColorChecker was invented, the chart was used to calibrate cameras for Mars landers. Here is a test image containing a ColorChecker, a ColorChecker Semi-gloss, color calibration ceramic tiles, rocks, and more.⁶



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