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Abildgaard Pedersen, Michael

Published in:
Advances in printing and media technology

Publication date:
2016

Document Version
Publisher's PDF, also known as Version of record

[Link to publication](#)

Citation for published version (APA):
Abildgaard Pedersen, M. (2016). Why most Brand Manuals fail when it comes to defining Brand Colors: and how to determine acceptable Color Deviations for specific Brand Colors. In *Advances in printing and media technology* (Vol. 43, pp. 91-100). International Association of Research Organizations for the Information, Media and Graphic Arts Industries.

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Why most Brand Manuals fail when it comes to defining Brand Colors; And how to determine acceptable Color Deviations for specific Brand Colors

Michael Abildgaard Pedersen

The Danish School of Media and Journalism (former Graphic Arts Institute of Denmark)
Department of Media Production and Management, Copenhagen.

E-mail: map@dmjx.dk

Short Abstract

From top class Universities and governmental organizations to high-end global brands and well-known local brands, a surprising consistency of inattentiveness has been published in these companies' prestigious Brand Manuals and Brand Guides. When it comes to providing technical guidance, defining and describing their Brand Colors, they all fail. By examining and analyzing more than 300 different Brand Colors from 156 Brand Manuals by reputable local and Global Brands including 28 of the 100 Best Global Brands (Interbrand 2015) and by numerous of visits and interviews with responsible professionals from both sides throughout the years it is obvious that there is an alarming lack of communication between technical experts and design experts. 91 % of the Brand Manuals specifies their Brand Colors as either PANTONE or PANTONE C. 90.4 % of the Brand Manuals also specifies their Brand Colors with supplementary CMYK-values even though only 45.8 % of those Brand Colors are achievable by using the process colors CMYK. This will result in unpredicted color differences of up to $35 \Delta E_{ab}^*$ or $8.3 \Delta E_{2000}$ when some of those Brand Colors are reproduced. Nevertheless, none of the Brand Manuals has neither any remarks, comments or warnings of color deviations nor indications of acceptable color tolerances. Only 1.3 % of the Brand Manuals also define their Brand Colors with device independent CIELAB-values. It appears that when designers and Brand Owners select and specifies Brand Colors they tend to choose colors which cannot be reproduced by using CMYK process colors and therefore the Brand Color cannot be shown in e.g. magazine ads, newspaper ads, digital print and other print media. They are bound to be disappointed. This Paper will present a practical approach to specifying and communication Brand Colors and to determine acceptable color deviation for specific Brand Colors.

Keywords: brand manual, brand color specification, color reproduction, tolerance, graphic design

1. Introduction

Brand Owners care deeply about their Brand and their visual identity. They are as committed as they are concerned about how their Brand appears on all types of different media in the society. A Brand should create recognizability in the marked and the Brand Colors symbolize identity, emotions and inner values for that company.

That is why Brand Owners turn to professionals for help when they wish to produce a good and useful Brand Manual. They put all their trust and confidence in the hands of these professionals and the Brand Owners are willing to pay high prices for a useable and professional Brand Manual.

However, it seems that the first priority of the Art Director or the Designer is to produce a pretty and beautiful Brand Book rather than a Brand Manual, which can actually be used as a manual or a guide. In surpris-

ingly many cases the Brand Manuals contains contradictory and absurd information. The responsibility for this rests on the designers (Drew and Meyer, 2006, pp. 147, 193)

Consequently one may wonder what the purpose really is with these Brand Manuals. Is it the intention that the Brand Manual should serve as a nice prestigious tribute to the Brand's visual identity or is it the intention of the Brand Manual that it should actually serve as a MANUAL for future professionals who need to reproduce those Brand Colors?

1.1 Ten Reasons why Brand Manuals cause Problems

When a Brand Color has been chosen by the Brand Owner and when an Art Director or Graphic Designer subsequently shall specify and describe this colors' technical specifications in the Brand Manual this will in most cases be done by providing four sets of color specifications as shown in Figure 1.



Figure 1: A typical description of a Brand Color in a Brand Manual

However, these simple definitions raise a huge amount of unanswered questions among those professionals who are about to reproduce this Brand Color within their field. Those four color specifications pose more questions and obstructions than helpful guidelines.

For the professional expert who is looking for a precise color recipe or some guidance on how to reproduce this color, this Brand Manual has more the character of an enigmatic book of contradictions than that of a Manual.

Apparently all companies are using the same inexpedient method. All Brand Manuals, Brand Guides, Visual Identity Guidelines and Brand Books are fundamentally designed and structured in the same way, roughly using the same layout and defining and specifying the Brand Colors in the same manner. The design and branding professionals call this "Best Practice".

However, the result is that Brand Colors is being reproduced with unacceptable large color differences while Designers and Brand Owners becomes frustrated and disappointed.

1.1.1 PROBLEM ONE: How are these values derived?

- In none of the Brand Manuals, there is any information on how these color specifications has been generated.
- Since it is typically an Art Director or a Graphic Designer who have read out these values from their Adobe Creative Suite software package then it is crucial to know which Working Space this Art Director have used in his or hers Color Settings.
- The future professionals who shall use this Brand Manual to reproduce this Brand Color must adjust their Working Space and Color Settings to the exact same settings. Otherwise the probability of acceptable color match is minimized. Crucial information on methodology and color management is missing.
- A Brand Manual should contain information on how the displayed values have been found.

1.1.2 PROBLEM TWO: Pantone?

- In 91 % of the Brand Manuals, the Brand Color is specified as Pantone Colors. Either as an unspecified Pantone Color (e.g. Pantone 151) or as a Pantone Color specified as printed on gloss Coated paper (Pantone 151 C) or Uncoated paper (Pantone 151 U).
- In 46.2 % of the Brand Manuals, the Brand Color is specified and specifically defined as “C” meaning the way the Brand Color appears on gloss coated paper. This raises questions on how this Brand Color will appear on other substrates like uncoated paper, matte coated paper, plastic foil, textile, corrugated board, metal etc.
- Since it is not possible to obtain a “C color” on a “U paper” or vice versa (Green, 1995) then the Brand Owner will have to accept an unknown color difference if he choose another substrate than coated paper.
- The differences between Pantone 151 C (Coated) and Pantone 151 U (Uncoated) is $16.7 \Delta E_{ab}^*$ or $6.4 \Delta E_{2000}$ (according to CIELAB-values from PANTONE Color Manager).
- Will this be regarded as an acceptable color difference for this Brand Color? None of the Brand Manuals has any indications on this issue.
- A Brand Manual should contain information on a Brand Color’s “master values” in CIELAB and comments on acceptable deviation tolerances.

1.1.3 PROBLEM THREE: CMYK? – Is this specific Brand Color achievable in CMYK?

- In none of the Brand Manuals, there is any information on whether or not the Brand Colors can be reproduced with an acceptable color match by using the process colors CMYK. However, in 90.4 % of the Brand Manuals specific CMYK values are provided. As shown in Figure 1, the second information tells us that Pantone 151 C can be reproduced by using the CMYK-values: 60 % Magenta + 100 % Yellow.
- Nevertheless, Pantone 151 C is a color, which cannot be reproduced satisfactorily by using the process colors CMYK. This is evidenced by the PANTONE COLOR BRIDGE Coated and in Adobe Creative Suite which gives a gamut warning. If Pantone 151 C is reproduced with the applied CMYK-values from the Brand Manual this would result in a color difference of $18.6 \Delta E_{ab}^*$ or $5.5 \Delta E_{2000}$ (according to CIELAB-values from PANTONE Color Manager). So this Brand Color is destined to have a huge color difference if it is reproduced in CMYK. Does the Brand Owner know that?
- Only 45.8 % of the 300 Brand Colors can be achieved by using the process colors CMYK. However, there are no comments on that issue in none of the Brand Manuals. When a Brand Manual display specific CMYK values for a Brand Color this creates an expectation that this Brand Color can be reproduced in CMYK.
- A Brand Manual should contain information on whether or not a Brand Color is achievable in CMYK.

1.1.4 PROBLEM FOUR: CMYK? – What kind of CMYK?

- In 90.4 % of the Brand Manuals the Brand Colors is also specified with specific CMYK-values. In addition to the aforementioned example another problem with these CMYK-values is that there is no information on what kind of substrate and print technology this applies to.
- Should the provided CMYK values be understood as if this Brand Color is printed on Gloss Coated paper as Pantone 151 C indicate? And if so, in what kind of print technology is it to be printed? (Sheet fed offset? Web Offset/Heatset? Gravure? Flexo?). The Brand Manuals doesn’t tell. But it is of crucial importance for the outcome. There are as many CMYK’s as there are paper types multiplied with the number of different printing technologies.
- Less than 10 % of the Brand Manuals tries to give some kind of information on this. And in those cases most of them just indicate the same CMYK-values for both Coated and Uncoated paper which makes no sense, unless for example a red Brand Color is specified as 0 100 100 0, which would indicate that screening of this color is not acceptable.

- A Brand Manual should contain information on which print conditions (ICC-profile) the displayed CMYK-values refer to.

1.1.5 PROBLEM FIVE: CMYK? – Why specific CMYK-values?

- Another problem with defining a Brand Color with specific values for C, M, Y and K (like Figure 1; C0, M60, Y100, K0) is that this color only accidentally will be produced with those values – for many reasons.
- It is well known in the Graphic Arts Industry, that if you send the same set of CMYK-combination to different printers and printing presses they would all produce different colors (Sharma, 2004; Adams II, Sharma, and Suffoletto, 2008).
- In a normal Color Managed workflow the Brand Color will be converted by using relevant ICC-profiles with different rendering intents, black generation and tone value increase correction curves. In some cases some sort of Ink Saving processing will also be applied. Thus the CMYK-values will be changed to match the current situation. So, why provide specific CMYK-values?

1.1.6 PROBLEM SIX: Specific CMYK values versus variation tolerances

- According to ISO 12647-2:2013, section 4.3.4.2 the ordinary variation tolerance allows a variation of ± 4 percentage points. That means that the CMYK values of the intended magenta of 60 % displayed in Figure 1 would be acceptable between 56 % and 64 %.
- The difference between these two extremes will result in a color difference of $8.6 \Delta E_{ab}^*$, $5.6 \Delta E_{2000}$ and $7.5 \Delta H_{ab}^*$ (according to CIELAB-values from Adobe Photoshop).
- A Brand Manual should contain information on acceptable variation tolerances.

1.1.7 PROBLEM SEVEN: RGB and Hex Values? – Which Color Space?

- In 81.4 % of the Brand Manuals the Brand Colors is specified with additional RGB values. The Brand Manual's attempt to specify color values for websites, mobile platforms and other screen technologies raises the same unanswered questions. Are the stated RGB-values understood to be sRGB, AdobeRGB, eciRGB, AppleRGB or another RGB? No answer is given. And since the Hexadecimal values are directly connected to the chosen RGB color space, the same questions apply here.
- Since the standard RGB for the Internet is sRGB (Stokes, Chandrasekar and Motta, 1996; IEC, 1999) and since most mobile media displays colors through sRGB, it would be natural to expect that the stated RGB-values is to be understood as sRGB.
- However, since most Art Directors and Graphic Designers work in AdobeRGB and since they are the professionals who have made these Brand Manuals it is more likely that the displayed RGB-values are AdobeRGB. The point is that there is no information on this issue in any of the Brand Manuals. In only 1.3 % of Brand Manuals the Brand Colors is specified as a specific RGB (sRGB).
- A Brand Manual should contain information on which color space the displayed RGB-values refer to.

1.1.8 PROBLEM EIGHT: CIELAB? – Why are there no device-independent values?

- Since all the color code values shown in the Brand Manuals are device-dependent color values it is far too risky to rely on the Brand Manual's Pantone-, RGB, Hex- and CMYK-values unless they are followed by specific information on devices and substrates – which they aren't. Furthermore, less than half of all Brand Colors can be reproduced by using the process colors CMYK and a similar amount of Brand Colors cannot be shown on a sRGB a screen which is a problem since sRGB is the standard for the Internet (Stokes, Chandrasekar and Motta, 1996; IEC, 1999) and most mobile devices.
- A Brand Manual should contain information on device independent CIELAB values for the Brand Color.

1.1.9 PROBLEM NINE: Acceptable color deviations?

- In none of the 156 Brand Manuals acceptable deviation tolerances is neither specified nor commented. In spite of all the potential risks of color mismatch described above no guidance on acceptable color difference can be found in any of the Brand Manuals.
- In only two of the 156 Design Manuals (Canon 2015 and Siemens 2008) the Brand Colors was defined with CIELAB-values but not even here were there any indications of acceptable color deviations.
- A Brand Manual should contain information on acceptable deviation tolerances.

1.1.10 PROBLEM TEN: The missing Color specifications

- In Figure 1 which represents a typical example of a Brand Manual's Color specifications it is remarkable that the Brand Color only is specified for reproduction on an unknown screen technology and in an unknown print technology using an unknown print substrate.
- In short, the values in Figure 1 only try to meet the needs of the Printer and the Web Designer, even though it fails. There is no color specifications for the use in other industries, technologies or other color systems like RAL, NCS, Textile etc.
- Only 4.5 % of the Brand Manuals provide NCS-values, only 6.4 % provide RAL-values and only 2.6 % of the Brand Manuals provide values for textile.
- A Brand Manual should contain information for other industries, technologies and color systems.
- In the light of all these potential problems it would be relevant to present a proposal on how a useful and professional Brand Manual should specify and communicate Brand Colors and how to determine specific values for acceptable color deviations for each specific Brand Color.

2. Methodology

In the search for literature on this subject (*how to specify Brand Colors in a Brand Manual*), the TAGA 2005–2014 Proceedings and the IARIGAI proceedings from the 39th to the 42nd conferences where consulted. Although it was possible to find some literature that seems relevant for this paper's subject regarding Color Management, Spot Colors and Brand Colors (Chung et al., 2004; Chung, 2005; Chung et al., 2007; Sperry and O'Hara, 2007; Sangmule et al., 2010; Shendye et al., 2011; Seymour, 2013), they all seem to be focusing on subjects that were in the periphery of this paper's subject. However, some useful points and statements from this literature where used.

Other sources on Spot Colors and Brand Colors where consulted (VIGC, 2008; Fogra, 2010; Meittamo, 2010) and so was textbooks aimed for Graphic Arts Designers regarding selecting and specifying colors where conducted (Eisemann, 2000; Drew and Meyer, 2006; Schmidt, 2013).

It has not yet been possible to find any literature that directly describes how to specify Brand Colors in a Brand Manual or how to precisely communicate a color's technical specifications.

Through an Internet research 156 Design Manuals from major recognized Brands where found and downloaded after which 300 Brand Colors were chosen and analyzed.

Throughout this paper Pantone 151 C is used as a representative example of a Brand Color. This Color where chosen because it is out of CMYK gamut like more than half of all Brand Colors examined.

The CMYK-values, RGB-values, Hex-values and CIELAB-values presented in the tables in this paper were found by using PANTONE COLOR BRIDGE Coated (the Plus Series) 2015. After registration of this prod-

uct the PANTONE COLOR MANAGER Software (version 2.1.0.249 for Windows) were downloaded and installed after which the official Pantone CIELAB values from all Pantone Colors were downloaded to Excel.

All calculated ΔH_{ab}^* , ΔE_{ab}^* and ΔE_{2000} values were found by using those official Pantone CIELAB values.

The official iOS apps: “myPANTONE” and “PANTONE X-ref” were used to find corresponding colors from different Pantone Color fan Decks.

The RAL Colors were found through the official RAL COLOUR iOS App “RAL iCOLOURS” while the NCS Color values were found through the online application “NCS NAVIGATOR Premium”.

The color code values from different RGB and CMYK color spaces were found through Adobe Photoshop where the color settings gradually were changed to different RGB and CMYK ICC-profiles using Absolute Colorimetric Rendering Intend and subsequently the CIELAB values for PMS 151C were entered through color picker each time. No measurements have been carried out.

3. Results and Discussions

For all existing Brands it applies that they have already chosen their Brand Colors whether they are reproducible or not. But when it’s time to produce a new Brand Manual then it is important to initially find the device independent “master values” (CIELAB values) for this specific Brand Color. This can easily be found via Adobe Photoshop, the PANTONE COLOR Manager software or the smartphone app “myPANTONE”. The $L^*a^*b^*$ details for PANTONE 151C are given in Figure 2.

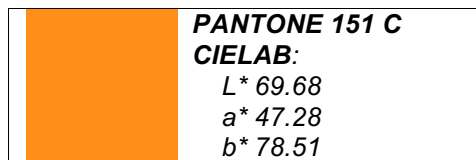


Figure 2: Specification of a Brand Color’s “Master Values”

In principle, a Brand Manual doesn’t need to contain much more color specifications than these. However, if the Brand Manual should be helpful to those professionals who are about to reproduce this color within their discipline, within their color system then a Brand Manual should provide much more information.

3.1 Determination of device dependent CMYK values

In Table 1 below five different CMYK value combinations for PMS 151 C is shown for lithographic offset printing on coated paper. This is to illustrate that they are all different and that they only apply to these five print conditions.

Table 1: Five different CMYK interpretations based on the CIELAB values of PMS 151 C

Color Settings: Working Space (Absolut Colorimetric R.I.)	ISO Coated v2 (FOGRA39)	PSO Coated v3 (FOGRA 51)	Euroscale Coated v2	U.S. Web Coated (SWOP) v2	U.S. Sheet fed Coated v2
PANTONE 151 C					
CIELAB L^*	69.68	69.68	69.68	69.68	69.68
CIELAB a^*	47.28	47.28	47.28	47.28	47.28
CIELAB b^*	78.51	78.51	78.51	78.51	78.51
CMYK:	0 56 97 0	0 55 99 0	0 55 96 0	0 54 100 0	0 52 99 0

Color Settings: Working Space (Absolut Colorimetric R.I.)	ISO Coated v2 (FOGRA39)	PSO Coated v3 (FOGRA 51)	Euroscale Coated v2	U.S. Web Coated (SWOP) v2	U.S. Sheet fed Coated v2
CIELAB values for this CMYK combination of PMS151C by using this CMYK profile	64.00 35.00 63.00	64.00 37.00 64.00	63.00 34.00 62.00	62.00 31.00 58.00	64.00 35.00 63.00
Closest CMYK-match to PMS 151 C	2.8 ΔH^*_{ab} 20.6 ΔE^*_{ab} 7.1 ΔE_{2000}	1.5 ΔH^*_{ab} 18.7 ΔE^*_{ab} 6.0 ΔE_{2000}	3.3 ΔH^*_{ab} 22.2 ΔE^*_{ab} 7.3 ΔE_{2000}	4.0 ΔH^*_{ab} 27.3 ΔE^*_{ab} 8.8 ΔE_{2000}	2.8 ΔH^*_{ab} 20.6 ΔE^*_{ab} 6.4 ΔE_{2000}

So, if the Brand Manual should contain specific CMYK values they should be followed by a reference to an ICC-profile. However, any CMYK reproduction of PMS 151 C will still result in a huge color deviation.

3.2 Determination of device dependent RGB values

In Table 2 below five different RGB value combinations for PMS 151 C is shown. Also in this case, it is seen that they are all different and that they only apply to one RGB color space (ICC-profile).

Table 2: Five different RGB interpretations based on the CIELAB values of PMS 151 C

Color Settings: Working Space (Absolut Colorimetric R.I.)	AdobeRGB	sRGB	AppleRGB	eciRGB v2	CIE RGB
PANTONE 151 C					
CIELAB L^*	69.68	69.68	69.68	69.68	69.68
CIELAB a^*	47.28	47.28	47.28	47.28	47.28
CIELAB b^*	78.51	78.51	78.51	78.51	78.51
RGB	236 131 23	255 132 0	255 109 0	233 146 43	250 146 57
HTML/Hex #	ec8317	ff8400	ff6d00	e9922b	fa9239
CIELAB values for this RGB combination of PMS 151 C by using this RGB profile	70.00 47.00 79.00	69.00 44.00 75.00	70.00 46.00 73.00	70.00 47.00 79.00	70.00 47.00 80.00
Closest RGB-match to PMS 151 C	0.5 ΔH^*_{ab} 0.6 ΔE^*_{ab} 0.4 ΔE_{2000}	1.0 ΔH^*_{ab} 4.9 ΔE^*_{ab} 1.2 ΔE_{2000}	1.8 ΔH^*_{ab} 5.7 ΔE^*_{ab} 1.5 ΔE_{2000}	0.5 ΔH^*_{ab} 0.6 ΔE^*_{ab} 0.4 ΔE_{2000}	1.0 ΔH^*_{ab} 1.5 ΔE^*_{ab} 0.6 ΔE_{2000}

So, if the Brand Manual should contain specific RGB values they should be followed by a reference to an ICC-profile.

3.3 Finding matching colors in other Color Systems

On the basis of the color name “Pantone 151 C” the official Pantone app “PANTONE X-ref” can be used to find corresponding Pantone colors in other Pantone Fan Decks.

On the basis of the CIELAB values of Pantone 151 C the official “RAL iCOLOUR” app can be used to determine the closest RAL color match.

On the basis of the CIELAB values of Pantone 151 C the official online application “NCS NAVIGATOR Premium” can be used to determine the closest NCS color match.

The results can be seen in Table 3 on the following page.

4. Determination of acceptable color deviations

4.1 Closest match within the same process

When measuring Brand Colors and other Spot Colors it is recommendable to use the ΔE_{2000} formula since this is created to display a numeric value for the specific color difference that the human eye perceives, independent of the color hue and saturation.

Since there is no official ISO-standard for Brand Colors or Spot Colors and thus no standard for acceptable color deviation tolerances for specific Brand Colors, then the Brand Owner or the Graphic Arts Designer themselves must determine which color deviations can be accepted in each case – for each Brand Color.

However, some of the process standards within the ISO 12647-family specify some informative deviation tolerances. ISO 12647-2:2013 and ISO 12647-3: 2013 specify informative deviation tolerance of $3.5 \Delta E_{2000}$ for the chromatic solid process colors CMY produced in lithographic offset while ISO 12647-6:2012 specify a variation tolerance of less than $1.5 \Delta E_{2000}$ for Spot Colors produced in flexographic printing.

It should also be taken into account that the inaccuracy between measuring devices and the differences in paper within the same batch alone can cause a deviation of $1-2 \Delta E_{ab}^*$ (BVDM, 2003).

Fogra suggests that the uniform deviation tolerance for Spot Colors in offset printing should be $2.5 \Delta E_{2000}$ (FOGRA, 2010, p. 10).

In Belgium customer demands a maximum ΔE_{ab}^* of 2, for quality print jobs (VIGC, 2008).

Thus, based on the above, it should be possible to expect a maximum color difference of $3 \Delta E_{2000}$ for any Brand Color reproduced within the same process.

4.2 Closest match across substrates and technologies

If the Designer and the Brand Owner only have specified one Brand Color name with no further information and if they expect that this Brand Color is to be reproduced on all substrate types in all reproductive technologies, then the Brand Owner have to accept the closest possible color match between the Brand Color and the chosen substrate and reproduction technology.

In view of the aforementioned studies a method is proposed to determine specific color deviation tolerances for a specific Brand Color:

Table 3: Determination of closest match to the Brand Color Pantone 151 C

	Color Name	CIELAB			Color Differences		
		L^*	a^*	b^*	ΔE_{ab}^*	ΔE_{2000}	ΔH_{ab}^*
PANTONE FORMULA GUIDE Coated	151 C	69.68	47.27	78.51	0	0	0
PANTONE FORMULA GUIDE Uncoated	151 U	72.00	48.07	62.04	16.7	6.4	9.9
PANTONE COLOR BRIDGE Coated	151 CP	67.88	32.91	66.77	18.6	5.5	6.9
PANTONE COLOR BRIDGE Uncoated	151 UP	71.14	30.68	47.58	35.1	8.3	2.2
PANTONE + CMYK Coated	P 24-7 C	66.66	33.70	61.22	22.2	5.6	3.1
PANTONE + CMYK Uncoated	P 17-8 U	69.87	33.02	53.74	28,6	6.4	0.7
PANTONE GoeGuide Coated	13-1-5 C	72.53	44.93	78.49	3.7	2.4	2.0
PANTONE GoeGuide Uncoated	7-1-7 U	74.23	44.39	75.51	6.2	3.6	0.9

	Color Name	CIELAB			Color Differences		
		L*	a*	b*	ΔE_{ab}^*	ΔE_{2000}	ΔH_{ab}^*
PANTONE GoeBridge Coated	13-1-6 CP	64.87	34.15	66.23	18.6	6.1	5.4
PANTONE FASHION+HOME Cotton	15-1263 TCX Autumn Glory	71.60	46.24	76.30	3.1	1.5	0.3
PANTONE FASHION+HOME Nylon Brights	15-1460 TN Orange Clown Fish	74.53	74.18	78.84	27.3	11.8	21.2
PANTONE FASHION+HOME INTERIORS Paper	15-1263 TPX Autumn Glory	71.38	49.05	79.60	2.7	1.4	1.0
RAL Classic For industrial varnish, powder coating and plastics	2003 Pastellorange	64.23	44.09	61.86	17.8	6.6	6.4
NCS For painting	S 0580-Y40R	69.00	43.00	75.00	5.6	1.6	1.9

All color differences are calculated from the CIELAB-values of the reference color Pantone 151 C

5. Proposal for future Brand Color specification

Based on the research of this paper the following Brand Color specification guidelines are proposed (Figure 3). This would be useful to most professionals regardless of industry and technology.

[this is ongoing and future work]

	PANTONE 151 C
	CIELAB: L* 69.68 a* 47.28 b* 78.51
	sRGB 255 132 0 (Warning out of gamut)
	HTML ff8400 (sRGB) Warning out of gamut
	CMYK Coated 0 55 99 0 (FOGRA51) Gamut Warning
	Textile 15-1263 TCX
	Interiors 15-1263 TPX
RAL 2003	
NCS S 0580-Y40R	
<p>This Brand Color should be reproduced by using a Pantone 151 spot color printing ink when possible. In other cases the following color deviation tolerances apply.</p> <p>Acceptable deviations when PMS 151C is reproduced</p> <ul style="list-style-type: none"> • within the same process (technology and substrate) 3 ΔE_{2000} (0.0) • on same substrates (regardless of technology) 3 ΔE_{2000} (0.0) • on different substrates 7 ΔE_{2000} (6.4) • by using process colors CMYK on coated (CP) 6 ΔE_{2000} (5.5) • by using process colors CMYK on uncoated (UP) 9 ΔE_{2000} (8.3) • as cotton products 3 ΔE_{2000} (1.5) • as nylon products 12 ΔE_{2000} (11.8) • as industrial products (RAL) 7 ΔE_{2000} (6.6) • as painted surfaces (NCS) 3 ΔE_{2000} (1.6) 	

Figure 3: Proposal for future Brand Color specification including acceptable color deviations.

Attention: These values only apply for this specific Brand Color.

All other Brand Colors will have other deviation values.

Values in brackets indicates the calculated values from Table 3

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Advances in Printing and Media Technology

Vol. XLIII(III)

*Edited by Patrick Gane
Associate editor: Cathy Ridgway*

Darmstadt
MMXVI

Advances in Printing and Media Technology
Proceedings of the 43rd International Research Conference of **iarigai**
Toronto, Canada, August 2016

Published by the International Association of
Research Organizations for the Information,
Media and Graphic Arts Industries
Darmstadt, Germany, 2016

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Online edition

ISBN 978-3-9870704-2-6

ISSN 2409-4021

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