

Is This Color Close Enough?



By Dr. Brad Paulson, Thor Engineering, ICMA Standards Representative

It seems like such a simple question, but there does not seem to be an easy answer. The actual measured differences in CIELAB ΔE that are needed to distinguish a colorimetric difference is still an active area of research and debate (remember, ΔE is the metric distance in CIELAB color space between two points expressed mathematically as $\Delta E = \sqrt{\Delta L^2$

+ $\Delta a^2 + \Delta b^2$). Some research indicates that in an image taken out of a real world environment values of less than 2.5 ΔE are not visible to the usual user. Other research indicates that a ΔE of 1.0 is enough for an eye to differentiate between different colors when looking at color patches, such as calibration targets; the photographic industry has found that differences as small as 0.5 ΔE in the paper color are objectionable. Some knowledgeable groups have suggested using specific targets and have an average ΔE of 2, and a maximum of 5 or 6,

between the proof and print is good enough, but since the color patches subtend different fields of vision, these results are not necessarily consistent and can be ambiguous.

So, the question is how to bring a creative industry from the visual craft to a more measureable process. To this end, several specifications have been introduced, such as General Requirements for Applications in Commercial Offset Lithography (GRACOL), Specifications for Newsprint Advertising Production (SNAP), and Specifications for Web Offset Publications (SWOP). The Graphic Technology Technical Committee (TC 130) of the Organisation Internationale

de Normalisation (International Organization for Standardization or ISO) was formed to standardize terminology, test methods and specifications in the field of printing and graphic technology from the originals provided to finished products. (For the purposes of the committee, printing is defined as a process of repetitive reproduction involving the transfer of a usually colored substance (ink, etc.) to a substrate, using relief, planographic, intaglio, stencil or other printing forms or without a permanent printing forme by so-called non-impact printing methods.). The scope of the committee includes in particular: composition; colour separation, colour management; storage of digital image data on electronic data carriers, display of graphical data on monitors and by projection, printing processes; finishing (for example binding); and suitability of inks, substrates and other materials used in graphic technology.

Currently, TC 130 is organized into nine working groups (WG) which are further organized into Task Forces (TF):

- WG1 Terminology
- WG1/TF1 Correction Marks
- WG2 Prepress Data Exchange
- WG2/TF1 Revision to ISO 12639
- WG2/TF2 PDF/X
- WG2/TF3 Variable Data Exchange (VDX)
- WG3 Process Control and Related Metrology
- WG4 Media and Materials
- WG4/TF1 Inks
- WG5 Safety and Ergonomics
- WG5/TF1 Symbology
- WG6 (joint TC130-TC42) Certified reference materials

- WG7 (joint TC130-ICC) Colour management
- WG8 (joint TC130-TC42) Revision of ISO 13655
- WG9 (joint TC130-TC42) Development of ISO 12640-5

and four working groups under the responsibility of another committee:

- TC42/WG21 (joint TC42 - TC130) Density measurements.
- TC42/JWG22 (joint IEC/TC100 - ISO/TC42 - ISO/TC130) Colour management
- TC42/WG23 (joint TC42 - TC130 - CIE WG) Extended colour encodings for digital image storage, manipulation and interchange
- TC171/SC2/WG5 (joint TC171/SC2 – TC42 – TC46/SC1 – TC130) Document management applications – Application issues – PDF/A

ISO TC 130 has a membership of 16 participating and 22 observing countries, and has published, and is directly responsible, for 59 ISO standards in all areas of the graphic arts, including, but not limited to, technologies such as ink, process control, plates, blankets, digital data exchange, safety, and color management.

Presently, ISO 12647 Graphic technology - Process control for the manufacture of half-tone colour separations, proof and production prints, is the color standard of the graphics industry, and is composed of seven parts:

- Part 1: Parameters and measurement methods*
- Part 2: Offset lithographic processes*
- Part 3: Coldset offset lithography on newsprint*
- Part 4: Publication gravure printing*
- Part 5: Screen printing*
- Part 6: Flexographic printing*
- Part 7: Proofing processes working directly from digital data*

However, as with earlier specifications, the standard relies on a small number of solid targets to calibrate the printing process; the concept is to establish tolerances for the printed work by controlling the variance of the printed targets.

At present, color specifications are generally negotiated with customers, and printers and their customers would like a standard to define the appearance of the final image more precisely. Regardless of the specification, discussions of the printed work tend to be based on the customer perception of the color as compared to what they wanted, not necessarily how the quantitatively measured color in question compares with specifications or retained samples. Specifications are an excellent method of process control, but a significant amount of education may be necessary to avoid customer dissatisfaction with colors that may meet measured specifications, but still “just do not feel right” to the customer. 🎯

Brad Paulson, Ph.D., is the ICMA Official Standards Representative and concurrently serves as principal and founder of Thor Engineering, a consulting company he started in 2001 to test and evaluate media and materials to determine failure modes and recommend material and process improvements. Views expressed here are his own. Questions? Contact Brad at Tpaulson@rconnect.com.