

# COLOUR ASSESSMENT IN COIL COATING

## - EN 13523-3

Within the EN 13523 suite of standards defining test methods for coil coated products, Part 3, "Colour difference – instrumental comparison" deals with numerical assessment of colour difference, principally between a standard panel and a test sample. However, as stated in EN 13523-3 "Establishing a standard as well as the magnitude of an acceptable colour difference are not covered by this method." To understand actual current practice in the European coil coating industry, ECCA carried out a survey, over the 2009/2010 period, of their members.



There are **four key parameters** in colorimetry and measurements taken with differing combinations of these parameters are not directly comparable:

- Geometry
- Observer angle
- Illuminant
- Colour equation

EN 13523-3 defines that calculations should be done according to ISO 7724-3:1984 which essentially fixes the colour equation as being that known as CIE Lab 1976. In the survey of ECCA members, all were found to be using this principle colour equation.

EN 13523-3 goes on to give options for the geometry of colour assessment, but does not indicate which options are preferable. The **options** offered are:

- 45°/0°
- 0°/45°
- Integrating sphere (d/8° or 8°/d)

The survey of ECCA members found that the majority (63%) used spherical geometry, while 44% used 45°/0° geometry and only 13% used 0°/45° geometry (some companies used multiple options). With respect to the spherical geometry, EN 13523-3 specifically states that specular reflection should be excluded, however in the ECCA survey it was found that the most common practice is to include specular reflection in the spherical geometry measurements. 82% of survey respondents who used a spherical geometry used the specular included option, while 36% excluded specular reflections (some companies operated both options).

EN 13523-3 does not specify the illuminant, although this is very important to the eventual result of colour evaluation. In the ECCA

survey, it was found that almost all (94% of) European coil coaters use the D65 illuminant which is a daylight illuminant intended to correspond spectrally to the mid-day sun in Northern and Western Europe. Some coil coaters also had the ability to use A or C illuminants or constant luminosity, with the A illuminant being used specifically for internal applications.

Many colorimeters have the option to choose an observer angle of either 2° or 10° and again, while this may alter the results of colour assessment, it is not specified in EN 13523-3. In the ECCA survey, it was found that all European coil coaters were using the 10° observer angle, although a few also retain the capability to use the 2° observer angle if required.



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It is important to note that **colour assessments such as those techniques described here have their limitations**, including:

- If a single illuminant is used, then such assessments take no account of metamerism, so two samples which may be a match under one light source may not match under a different illuminant. Since the majority of prepainted metal is used in external applications, it is valid to use the D65 illuminant, but it is important to specify a different illuminant if the ambient lighting is intended to be different (e.g. in a different geographical region or under artificial lighting)
- Colour assessment such as described here is only really useful for solid colours and smooth surfaces. Textured or embossed surfaces can bring their own challenges for colour assessment and this should be considered if the prepainted metal product is not fully smooth.
- Metallic colours for prepainted metal are increasingly popular and are being joined by other effect coatings such as pearlescents. However, due to the inhomogeneous nature of these products, the numerical assessment of colour is very difficult. 65% of coil coaters who took part in the ECCA survey do use some form of numerical assessment of colour for metallics, but these are mixed between those using spherical and 45°/0° geometries (the latter generally using a multi-angle approach).

**In summary**, although there is no defined standard for the parameters to use, all European coil coaters use the CIE Lab 1976 colour equation, with a 10° observer angle, while in almost all cases, this will be done using the D65 illuminant. Most companies use spherical geometry, while 45°/0° geometry is used by some and occasionally 0°/45°. The exact details of how a colour assessment is carried out are not necessarily important, but in comparing results, it is important that measurements to be compared are carried out in the same manner.

