



VISUAL APPEARANCE EVALUATION

1. Scope and Field of Application

1.1 Scope

This method agrees in principle with ASTM D1729.

This method covers a subjective procedure for visual comparison of an interior sample's color against a reference under illuminants of different spectral distributions.

Visual assessment in accordance with this method will always override numerical measurement data and is compulsory for any type of appearance approval.

1.2 Field of Application

The application differentiates solid (uni) and effect colors and is recommended, but not limited to the following materials:

Substrate	Solid Colors (uni)	Effect Colors
Plastic	<ul style="list-style-type: none">- solids with or without texture- painted, excluding effect colors- foils, sheets & slush skins- foam films & foams	<ul style="list-style-type: none">- electroplated, galvanized- painted in effect colors- colored foils and films
Metal	<ul style="list-style-type: none">- painted, excluding effect colors	painted in effect colors
Fabric, excluding multi-colored fabrics	<ul style="list-style-type: none">- not pile-direction sensitive without structure- not pile-direction sensitive with structure- pile-direction sensitive without structure	
Leather	<ul style="list-style-type: none">- Natural- Artificial	

2. Definitions

Terms and definitions in terminology ASTM E284 are applicable to this method. Definitions of terms specific to this method are:

2.1 Color

Solid (uni) colors – The appearance is very similar to ideal diffuse reflectors and therefore almost angle-independent, which allows for characterization with basically one evaluation angle, i.e. Face Angle.

Effect colors – The perceived color is strongly depending on the angles of observation and illumination (goniochromatism). Besides the diffuse reflecting color pigments the surface layers also contain directional reflecting effect particles (metallic, pearlescent, interference, etc.), that require multi-angle evaluations, i.e. Near Specular, Flash, Face and Flop angles.

Date	Action	Revisions
2011 09 26	Revised	Replaces BO 109-01 Revised in reference to (inter)national norms C. Starke, FoE
2001 03 14	Revised	Editorial – no technical change A. Cockman
1995 08 25	Activated	



2.2 Equipment

Master equipment – The Master Equipment is an instrument to establish the basic references among various levels of standards and among other equipments. This equipment is the normal arbiter in any situation not adequately resolved at a lower level and is retained by the organization that issues the masters.

Secondary equipment – A Secondary Equipment is any other instrument used for color evaluation of the product by reference to the masters.

2.3 Evaluation Angles

A fixed angle of 45° between illumination and observer is recommended throughout the visual evaluation. Although the mentioned Evaluation Angles are similar to instrumental angles, the results do not need to correlate (compare figures in Appendix 1).

Near Specular Angle – The aspecular (as) angle when a specimen is viewed close to 15° (-15°) from the specular direction and illuminated near 30° (15°). This angle is similar to an instrumental angle of 15° (-15°).

Flash Angle – The aspecular (as) angle when a specimen is viewed close to 25° from the specular direction and illuminated near 35°. This angle is similar to an instrumental angle of 25°.

Face Angle – The aspecular (as) angle when a specimen is viewed close to its surface normal and illuminated near 45°. This angle is similar to an instrumental angle of 45°.

Flop Angle – The aspecular (as) angle when a sample is viewed close to 75° (110°) from the specular direction and illuminated near 60° (77,5°). This angle is similar to an instrumental angle of 75° (110°).

2.4 Graininess

The term describes a light/dark pattern that is to be seen under diffuse illumination and is more or less independent of the viewing angle.

2.5 Masters

Target – A physical Design idea representation (intended to be developed).

Internal Approval – A physical representation approved to the target released to go to testing.

Final Approval – A physical representation approved to the internal approval released to master.

Master – A physical representation meant to define Design Intent, which is distributed.

Regional Standard – A physical representation of a regional level capability to the master; for distribution within the specific region only (must be coded different to master).

Reference Approval – A visual approval to either a master or regional standard to validate Design Intent and verify feasibility of specific materials.

**2.6 Pile-Direction Sensitive**

A fabric appears different after brushing over the surface with the hand.

2.7 Reference

A master or any other physical sample that the evaluation of samples is correlated to. If only compared within a sample lot, the one sample is chosen to be reference that is visually closest to the idea/vision of the evaluator.

2.8 Structure

Structures are imprints or regular sewing lines that generate locally different pile heights and therefore lead to visually perceivable contrast differences.

3. Requirements**3.1 General**

All personnel involved in viewing and evaluating color shall have taken both

- a color vision test (recommended: Ishihara Color-Blindness Test) &
- a vision acuity and discrimination test (recommended: Farnsworth-Munsell 100 Hue Test)

For self-assessment and awareness of capabilities, tests, according to ASTM E1499, shall be repeated at sufficiently frequent intervals.

All evaluators shall be familiar with the appearance difference rating scheme according to EN ISO 3668:

Rating	Degree of difference
0	No perceptible difference
1	Very slightly, i.e. just perceptible, difference
2	Slight, but clearly perceptible, difference
3	Moderate difference
4	Considerable difference
5	Very major difference

3.2 Equipment & Maintenance**3.2.1 Illuminating units**

The spectral distribution of the illuminating units specified below has been established by the CIE (International Commission on Illumination) and is described in ASTM E308.

Daylight illumination (CIE Illuminant D₆₅, daylight) shall simulate average daylight at the test piece substrate with a Color Rendering Index ≥ 95 & class B minimum according to ISO/CIE 23603.

Incandescent illumination (CIE Illuminant A, light bulb) shall simulate incandescent lighting in homes, at offices, early morning sunrise and late afternoon sunset conditions at the test piece substrate.

