



Documentation for Control of Appearance Aesthetic Quality; Color and Gloss

1 Introduction

Note: Nothing in this standard supercedes applicable laws and regulations.

Note: In the event of conflict between the English and domestic language, the English language shall take precedence.

1.1 Purpose. This procedure shall be followed to allow for a part manufacturer's ongoing control of appearance quality for production parts. Appearance quality pertains to aesthetic properties, specifically color and gloss for this document, to ensure harmony coordination (for interior trim components) as originally approved by the Appearance Approval Report (AAR). The concept of quality control (QC) for aesthetic properties is relevant to exterior trim as well as interior trim. This specification's primary focus is for low gloss interior trim. This procedure defines the instrumental measurement criteria and documentation, as well as a procedure for working standards, required for a supplier of appearance parts to control appearance aesthetic quality.

1.1.1 The following functional areas support this procedure:

- GM Appearance Quality
- Supplier of the production part
- GM Supplier Quality groups

1.1.2 GM continues to specify color and gloss via a visual match to the appropriate master (such as the **Primary Color Master**, **Primary Gloss Master**, or **Production Part Approval Process (PPAP) Master**), as documented on the Color and Trim Design Appearance Release (CTDAR), Design Appearance Release (DAR), or referenced in the part math data file (or drawing).

1.1.3 Visual requirements are used to ensure the color harmony amongst the parts manufactured from different materials and processes is consistent. Parts evaluated using purely instruments may negatively affect the color harmony of the vehicle interiors.

1.2 Applicability. This procedure is relevant to all parts with color and gloss **match-to** requirements.

1.3 Remarks. This procedure is supplemental information to the Pre-texture, Post-texture, and Part AAR procedures specified in the PPAP manual published by the Automotive Industry Action Group (AIAG). These techniques are set forth to ensure vehicle aesthetic appearance harmony through Statistical Process Control (SPC) of appearance attributes.

2 References

Note: Only the latest approved standards are applicable unless otherwise specified.

2.1 External Standards/Specifications.

ASTM D523	ASTM E306	ASTM E1499	SAE J361
ASTM D2244	ASTM E1164	ISO 7727/1	SAE J1545
ASTM D2457			

2.2 GM Standards/Specifications.

GMW3059	GMW6992	GMW15777
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2.3 Additional References.

None.

3 Requirements

3.1 General Requirements for Master and Master Parts.

3.1.1 Visual evaluations of color and gloss shall be made under the conditions detailed in GMW6992 and SAE J361 as specified in the various material specifications. Evaluators of color and gloss must have proven capability as determined by methods such as the Farnsworth-Munsell 100 Hue Color Test and/or Ishihara Test for Color blindness (refer to ASTM E1499 and SAE J361, Section 9 Color Discrimination) on a biennial basis.

3.1.2 Masters shall be cared for in accordance with the directions on the protective sleeve of the GM Primary Master Standard and industry standard practices.

3.1.2.1 All masters shall be handled with extreme care. Protect the masters from becoming contaminated or soiled.

3.1.2.2 Do not clean the masters, if possible, or follow bag instructions if cleaning is absolutely necessary. Ensure that cleaning does not change the appearance attributes of the master.

3.1.2.3 Avoid long exposures to heat and light during use and storage of the masters.

3.1.2.4 Store all masters in a cool, dry, dark place and Primary Master Standards in their protective sleeves.

3.1.2.5 Always wear clean, soft (preferably cotton) gloves when handling the masters.

3.1.3 Masters shall be measured in accordance with the directions on the Master Standard or industry standard practices.

3.1.3.1 Color Measurements.

3.1.3.1.1 Measure and record the numerical color measurements upon receipt of master standard (Primary Color Master and/or PPAP Master). Measure the color on the master plaque's non-grained surface unless directed otherwise by GM. These measurements will be used to verify the integrity of the masters throughout their lifetime.

3.1.3.1.2 Spectrophotometer Measurements for Primary Color Master Color Position. Use CIELab ($L^*a^*b^*$ color space) or Colour Measurement Committee (CMC) color space (DL^* , Da^* , Db^* , DE/DE CMC) with a spectrophotometer capable of taking measurements with the following parameters: Illuminant D65, 10 degree Observer, Specular Included, and Sphere Geometry unless specified otherwise. Refer to conditions specified with the master. Reference GMW15777, ISO 7727/1, ASTM D2244, ASTM E306, ASTM E1164, and SAE J1545 for more information on color science and tolerancing.

3.1.3.1.3 Spectrophotometer Measurement of Color Appearance for Quality Control Purposes. Use a 45 degree/0 degree (circumferential), and respective of inverse, geometry instrument. Use CIELab or CMC color space (DL^* , Da^* , Db^* , DE/DE CMC) with a spectrophotometer capable of taking measurements with the following parameters: Illuminant D65, 10 degree Observer. An integrating sphere geometry (diffuse) spectrometer may also be used. If sphere geometry is used, measurements must be made with specular angle excluded d/8 geometry.

Note: The sphere geometry utilizes specular excluded for quality control purposes of color appearance. Master color matching utilizes Specular Included for a measurement of color position without the effects of gloss and texture.

3.1.3.2 Gloss Measurements.

3.1.3.2.1 Measure and record the gloss meter reading upon receipt of the master standard (Primary Gloss Master and/or PPAP Master). Measure the gloss on the master plaque's non-grained surface unless directed otherwise by GM. These measurements will be used to verify the integrity of the masters throughout their lifetime.

3.1.3.2.2 Gloss Meter Readings. Use a 60 degree geometry gloss meter in accordance with ASTM D523 and ASTM D2457.

Note: The user may determine which measurement methods to use if no color and gloss measurement parameters are described on the master.

3.1.4 Monitor the Primary Master Standard and PPAP Masters for color and gloss regularly to ensure its quality by periodically numerically measuring the color and gloss. Record the data, which shall be available upon request.

3.1.4.1 Replace with a new master if the master shifts in color by more than 0.3 DE (0.5 DE CMC), and/or in gloss > 0.25 units for Primary Gloss C (PGC) or Primary Gloss E (PGE) gloss masters and > 0.5 for Primary Gloss F (PGF), and other higher gloss masters.