



Definition and Identification of the Master Certified Standard and the Color Data for Color Process Control

1 Scope

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 Material Description. This standard describes the process for the selection, labeling and use of a Master Certified color standard for instrumental process control of exterior painted parts and vehicle bodies.

1.2 Symbols. Not applicable.

1.3 Typical Applications. Exterior color process control for painted vehicle bodies and add-on parts. This standard specifies requirements for new corporate colors, but can be applied to support identification of a Master Certified Standard panel for current color programs.

1.4 Remarks. OEM suppliers and GM assembly plants are requested to use GM Gauge R and R-approved spectrophotometers. Use of this equipment and Master Certified standard data is intended to support color process control and GM visual color harmony processes.

2 References

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

2.1 External Standards/Specifications.

DIN 6175-2

2.2 GM Standards/Specifications.

GMW3001

GMW15777

GMW3059

3 Requirements

General

For standardized instrumental measurement of color standard panels, a common (100 x 150) mm or (4 x 6) inch size is required.

3.1 Color Management Process and Definition of Standard Panel Types. Use color standards that have been approved and released by the regionally responsible organization. A panel population analysis is used to determine the Master Certified Standard, using the method outlined in paragraph 3.

3.1.1 Panel Qualification. Panels can be rejected for excessive finish defects and excessive color variation from the approved reference panels. Rejected panels may be destroyed per direction from the GM Paint and Polymer Center (GPPC) Color Engineer.

A GM-approved spectrophotometer is used to measure the approved standard panel population to identify the Master Certified Standard Panel.

3.1.2 Master Certified Standard. The Master Certified Standard designation is given to one approved median standard panel. This panel is deemed to be the single best reference for equipment-based color position management.

3.2 Measurement of Color Standard Panels to determine the Master Certified Standard. Equipment-based color attributes include:

- **Color.** An average Delta-E' (mdE' value) according to DIN 6175-2, which is calculated using individual dE' values as follows:
- **Effect Paint Types:** For each of six specified measuring angles -15°, 15°, 25°, 45°, 75° and 110°.
- **Metallic Paint Types:** For each of five specified measuring angles; 15°, 25°, 45°, 75° and 110°.
- **Solid Paint Types:** Uses only 45° Delta E' data.
- **Sparkle.** This attribute is a direct illumination characteristic for Effect and Metallic paint types only. An average Sparkle value, is calculated from 15°, 45° and 75° values.
- **Graininess.** This is a single, diffuse light measurement of appearance and is a characteristic of Effect and Metallic paint types.

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BASF Colorcare software is recommended to support the data collection and analysis work. GM GPPC Quality retains an STS/TIS document defining standardized work for this process. Measurement for each individual panel shall include a minimum of 5 readings, or more, as required to achieve statistical significance at standardized measurement locations.

3.3 Selection of the Master Certified Standard Panel. For approved color panels, their Delta E' DIN 6175-2 color difference values for each angle specified in paragraph 3.2 shall be averaged to establish a "Mathematical Median" panel. This information, sparkle data and graininess data will be utilized to select the Master Certified Standard Panel (see Appendix A, Figure A2). The final approved Master Certified Standard Panel is held by the GM regional engineering office or supplier designate, and is used to establish color difference for all in-plant color process control. Color data values for this panel are recorded in the Color Data Sheet (see Appendix A, Figure A1) and on the Master Certified Standard panel.

3.4 Master Certified Standard Labels. The Master Certified Standard panel shall be marked with a label. The layout of this release label is shown in Appendix A, Figure A2. This label shall contain the Master Certified Standard Panel's individual color values.

The minimum values required for this label includes the following data:

- All required measuring angles -15°, 15°, 25°, 45°, 75° and 110° readings. CIELab Delta (Δ)(L*, a*, b*, C*, H) values shall be used to calculate weighted Delta E' according to DIN 6175-2.
- Three Sparkle 15°, 45° and 75° readings, as required (measured with approved spectrophotometer).
- Graininess value, as required (measured with an approved spectrophotometer).
- Reference mark (see arrow, Appendix A, Figure A3) for use in defining spray and measuring direction.

3.5 Stamp for Master Certified Standard Panels. See Appendix A, Figure A3. These stamps shall be applied over the top of a normally-labeled standard panel label.

3.6 Periodic Check of Master Certified Standards. Each model year, an annual visual inspection and equipment measurement of color standards shall be utilized to verify integrity for continued process quality control use. This verification procedure shall include:

- Visual inspection to verify cleanliness, uniform color and appearance.
- No physical damage, scratches, bend marks, etc.
- No dirt, haze or mottle.
- No peel.
- No strike-in.
- Equipment measurement with GM-approved spectrophotometer. Data shall be recorded and tracked in a log file that is reported to the GPPC regional engineer. The responsible engineer will resolve any reported changes to original recorded values.

3.7 Cleanliness and Storage of Master Certified Standards. Standards shall be stored in their envelopes when not in use and placed in a clean, dry location. Standards can be cleaned to remove fingerprints and dirt by wiping with a clean (laundered, 100 % cotton cloth and a 1:2 part solution of water and naptha or alcohol). Standards shall not be cleaned with solvent.

3.8 Color Data Sheet. The color data sheet is a record of the absolute values of the Master Certified Standard and the permissible CIELab batch paint color deviations (dL*, da*, db*, dC*, dH). Delta-E' shall be listed as both, CIELab and Delta E' (GM) according to DIN 6175-2 and represents allowable batch color difference from Master Certified Standard. For reference, see Appendix A, Figure A1.

3.9 Batch Paint Color Tolerances. Initial color tolerances for batch paint are calculated using color data values collected during measurement of the approved standard panel population, with the additional qualification that the panels are within a range of:

- Average Delta-E' DIN 6175-2 (mdE' value ≤ 0.5)
- Average Sparkle value difference ≤ 0.4. For Effect and Metallic paint types only.
- Graininess value difference ≤ 0.2. For Effect and Metallic paint types only.

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