



PAINT MATERIALS ON PLASTIC PARTS, PERFORMANCE REQUIREMENTS

1. SCOPE

1.1 This specification covers specific CNH performance requirements for paint materials applied to plastic parts. Paint materials supplied to this specification shall also comply with all sections of the CNH MAT0101, 86628042, General Paint Requirements and Color Control specification, unless otherwise specified in this document. Approved paint materials for use on CNH plastic parts are shown in CNH MAT0105Q, 87021658, Approved Paint Materials for Plastic Parts. Approval of paint materials for plastic parts is established based on test requirements per Section 6.3.1.

1.2 All CNH or National Standard referenced test methods are to be latest issue unless otherwise specified.

2. APPLICATION

2.1 This specification applies to paint materials applied to plastic parts used in current applications by CNH or their suppliers.

3. RELATED SPECIFICATIONS

- CNH DWGA110 (86641291) Requirements for Painted Parts
- CNH ENS0301 (86620212) Significant Characteristics
- CNH MAT0101 (86628042) General Paint Requirements and Color Control
- CNH MAT1003 (86979049) Metallic Material Designations on Engineering Drawings
- CNH MAT0105P (47646770) Paint Material on Plastic Parts, Processing Suppliers
- CNH MAT0105Q (87021658) Approved Paint Materials for Plastic Parts
- CNH MAT0105S (87021659) Paint Material on Plastic Parts, Initial Supply Requirements
- CNH-SQA-F03Q, Part Approval Process (PAP) Handbook

4. DRAWING SPECIFICATIONS

4.1 Paint performance Class for paint materials on plastic parts (PMOP), color designation, and corresponding part numbers must be specified on the Engineering drawing. Figure 1 provides an example of how to specify the color and performance Class for paint on plastic substrates on engineering drawings.

Figure 1

87021661	Class 3 PMOP PERF. STD 87021657
86609757	AG RED STD 86628042
8xxxxxxx	BASE PART NAME

4.2 The plastic part type (see Table 1) for all plastic parts to be painted per this specification shall be designated in a material note on the engineering drawing as follows:

(Example of note on part drawing)
 Material Note:
 Plastic Part, Type EET per CNH MAT0105

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Table 1 Plastic Part Type and Description		
Type	Description	Location
EET	(1) Exterior part Elevated Temperature	Installed adjacent to or directly exposed to elevated temperature components or heat sources (e.g. engine hood, no thermal insulator).
EST	Exterior part Standard Temperature	Installed away from elevated temperature components, no elevated heat source exposure.
IET	(1) Interior part Elevated Temperature	Installed adjacent to or directly exposed to elevated temperature components or heat sources (Parts close to heater).
IST	Interior part Standard Temperature	Installed away from elevated temperature components, no elevated heat source exposure.

(1) Parts with elevated temperature exposure are those located next to heat sources as described or that are determined to reach a surface temperature of $\geq 90^{\circ}\text{C}$.

4.3 MAT0105 topcoat and primer performance Class descriptions and corresponding part numbers are the following:

Table 2 Performance Class	
Part Number	Description
Topcoat	
87021660	Class 1 PMOP Perf.
87021661	Class 3 PMOP Perf.
87070111	Class 6 PMOP Perf.
Primer	
87021662	Class 2P PMOP Primer Perf.

4.4 Additional details related to specifying paint on Engineering drawings are provided in standard DWGA110 (86641291).

5. PLASTIC PART TYPES

5.1 Four types of plastic parts or components are described in this specification, see Table 1. Interior or exterior parts to be painted that will have elevated temperature exposure when installed on units will require testing of certain properties for approval at higher temperatures as defined in applicable test methods designated in Table 3 and/or 4.

6. REQUIREMENTS

6.1 PREPARATION OF SURFACES

6.1.1 Plastic parts to be painted must be free of any surface faults that may affect the final appearance of the part. These surfaces shall be smooth and continuous without any deep marks or scratches, which could be visual defects after the application of the final coating. Any deviation from this requirement shall be noted on the Engineering drawing

6.1.2 The surface energy of plastic parts to be painted shall be such that it will allow adhesion promoters and/or primer materials to adhere to the surface. This adherence shall be tested by some of the applicable tests per this specification.

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6.2 PAINT PERFORMANCE CLASS

6.2.1 Paint material performance for CNH products is specified based on durability requirements. Performance requirements for paint materials applied to plastic substrates and finished painted plastic parts are provided in Tables 3 and 4 unless otherwise specified.

6.2.2 Paint material applied to exterior (E) type plastic parts or components shall meet Class 3 performance requirements as a minimum unless another performance Class is specified.

6.2.3 Paint material applied to interior (I) type plastic parts or components shall meet Class 1 performance requirements unless another performance Class is specified.

6.2.4 For equipment where CNH controlling design engineering has specified paint as Class 1 or 2 per CNH MAT0103, the performance requirement for paint applied to exterior plastic parts shall be Class 1 per CNH MAT0105 unless otherwise specified.

6.2.5 Class 2P (Table 3) performance requirements apply for primers or primed only plastic parts unless otherwise specified.

6.3 DRY FILM PROPERTIES

6.3.1 Paint Materials over Test Panels

Paint materials supplied to this specification shall meet cured, dry film property requirements established by this specification, see Tables 3 and 4. Paint materials to be tested for approval shall be applied on test panels made from materials comparable to the plastic substrate intended for production use. Test panels shall be cleaned in a manner representative of procedures to be used in production to promote adhesion of the paint materials. Allow paint materials to age at room temperature, $20 \pm 2^\circ\text{C}$ ($68 \pm 4^\circ\text{F}$), for seven (7) days after initial processing prior to testing of performance properties. Test panels submitted shall be 100mm x 300mm (4 in. X 12 in).

6.3.2 Finished Painted Parts

6.3.2.1 Finish painted parts supplied to this specification shall meet all requirements of the specified performance Class. Testing of finish painted part initial samples to verify quality and compliance with specified performance Class requirements is specified in CNH MAT0105S. This testing shall be conducted on panels made from production materials and processed through all steps of the same finishing sequence to be used on production parts. Whenever possible testing should be conducted on actual parts where part geometry or configuration provides enough surface area for testing.

6.3.2.2 All parts should be painted prior to assembly whenever possible. Uniform film build that meets the recommended minimums shall be achieved on all surfaces, including edges and recesses. Parts shall be primed and/or topcoated only with materials that have been approved by CNH Materials Engineering and are listed in the MAT0105Q specification. Finished parts shall be cured per the specified schedule prior to exposure to any detrimental environment.

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6.3.3 Primer Paint Materials

Primer paint materials supplied to this specification shall meet dry film material property requirements listed in Table 3. Primer requirements are the same regardless of whether a primed only part is subsequently topcoated and must also comply with requirements of a finish system performance Class. Testing of primer materials shall follow methods and procedures specified for material on test panels or finish painted parts as specified in Sections 6.3.1 and 6.3.2.

6.3.4 Top Coat Paint Materials

Topcoat paint materials supplied to this specification shall meet dry film material property requirements listed in Table 4 for the appropriate topcoat performance Class specified. Topcoat requirements are determined with the primer coating and/or adhesion promoter as a complete finish system. Testing of topcoat materials shall follow methods and procedures specified for material on test panels or finish painted parts as specified in Sections 6.3.1 and 6.3.2.

7. COMBINED CYCLE TEST

The Combined Cycle test (Table 4) for topcoat performance evaluation is an optional test to be performed when required by CNH controlling design engineering. This determination will be made as part of the engineering design review process. This test will generally be required to verify paint material performance on new plastic materials, complex part designs, or when new paint application processing is involved. The Combined Cycle test result is not required to obtain approval for a paint material to be included in the MAT0105Q Approved Paint Materials for Plastic Parts specification.

8. INITIAL SAMPLE QUALITY

Quality requirements for initial painted plastic part samples submitted by suppliers to ensure compliance with this specification are provided in the CNH MAT0105S Paint Material on Plastic Parts, Initial Supply Requirements specification. CNH MAT0105S requirements apply only to paint material performance on identified substrates and are not intended to replace or supersede any other ISIR supplier quality requirements. The manufacturer of a part is responsible to meet applicable requirements of CNH Engineering Specification ENS0301 (86620212), CNH Supplier Quality Assurance (SQA) Approval of Manufactured Parts - Part Approval Process (PAP) CNH-SQA-F03Q, and any requirements on the Engineering drawing.

9. MATERIAL APPROVAL

Material approval by CNH Materials Engineering is required for materials supplied to this specification. Approval shall be based on laboratory and engineering testing coordinated or conducted by CNH Materials Engineering. Approved formulations and sources are tabulated in CNH MAT0105Q. MAT0105P identifies corresponding processing suppliers that produce plastic parts utilizing paint materials listed in the MAT0105Q specification.

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10. NEW MATERIALS AND SOURCES

No shipments of PMOP materials for production shall be made by a new source until samples of the material they propose to supply to this specification have been approved by CNH Materials Engineering. When CNH Purchasing requests evaluation of a new material, the supplier shall furnish samples for formal qualification which may include performance testing. Material submitted to CNH Materials Engineering for qualification shall be accompanied by detailed test information, certification that the material meets all requirements of this specification, and a completed Material Safety Data Sheet (MSDS). Additional samples may also be required by the receiving CNH location in advance of the first and subsequent production shipments in accordance with the provisions of one or more CNH quality assurance programs.

11. INSPECTION AND REJECTION

Shipments of material against contracts or purchase orders citing this specification shall be equivalent in every respect to samples approved by the purchaser. No changes in formulation, processing, or place of manufacturing are permitted without prior written approval from CNH Materials Engineering. While the purchaser may test samples from incoming shipments for quality assurance purposes, the supplier is responsible for ensuring that shipments meet the stated requirements without depending upon the purchaser's inspection. In this regard, suppliers are directed to the requirements of CNH Supplier Assurance Manual SQAM.

Performance Class and Part Number	Class 2P (87021662)	Test Methods
Test Description	Performance requirements	
Color Visual	Visual Match	ASTM D1729
Thickness, maximum	100µm	CNH MTM0140 (87034337)
Hardness, minimum	100	ASTM D4366-95 Method B
	F	ASTM D3363
Tape Adhesion, min	Ad 1	CNH MTM0120 (87021663)
Chip Resistance, min	7B	CNH MTM0122 (87021664)
Impact, minimum	20 kg cm	ASTM D2794
Recoat Capability	No visible defects allowed. Ad 2 Adhesion, min	CNH MTM0104 (86628046) CNH MTM0120 (87021663)
Flexibility (Flexible Substrates) (Flex mod<1000MPa)	No Cracks	CNH MTM0124 (87021665)
96 Hour Humidity	No visible defects allowed. Ad 3 Adhesion, min	CNH MTM0126 (87021666)
Temp Variation and Humidity	No visible defects allowed. Ad 3 Adhesion, min	CNH MTM0128 (87134331)
Continuous heating	No visible defects allowed. Ad 3 Adhesion, min	CNH MTM0130 (87134332)
Hot Water Resistance	No visible defects allowed. Ad 3 Adhesion, min	CNH MTM0132 (87134333)

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Material Specifications

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Table 4 Topcoat Paint Materials on Plastic Parts						
Performance Class and Part Number		Class 6 (87070111)	Class 3 (87021661)	Class 1 (87021660)	Test Methods	
Property		Performance requirements			Test Methods	
Color Visual		Visual Match			ASTM D1729	
Color Instrumental		$\Delta L, \Delta a, \Delta b = 0.6$ max. $\Delta E = 1.0$, max			ASTM E308 Cie Lab Spherical D65/10deg included	
Thickness, maximum		200 um		100 um	CNH MTM0140 (87034337)	
Cure Test		10 rubs		5 rubs	CNH MTM0138 (87034336)	
Hardness, minimum	PersoZ	150		100	ASTM D4366-95, Method B	
	Pencil	H		B	ASTM D3363	
Chemical		PASS			CNH MTM 0108 (86628048)	
Accelerated Weathering (WOM) and Florida Exposure, (FE)	600 Hrs WOM, 12 Months FE	N/A	Gloss Retention 60° = 90% min 20° = 65% min $\Delta E^* = 3.0$ change, max	Gloss Retention 60° = 65% min 20° = 45% min $\Delta E^* = 4.0$ change, max	CNH MTM0113 (87556294) modified ASTM G155-05a, CYCLE 7A Florida Exposure ASTM D1014	
	1200 Hrs WOM, 24 Months FE	N/A	Gloss Retention 60° = 75% min 20° = 45% min $\Delta E^* = 5.0$ change, max	N/A		
	3600 Hrs WOM, 72 Months FE	Gloss Retention 60° = 90% min 20° = 65% min $\Delta E^* = 3.0$ change, max	N/A	N/A		
	4800 Hrs WOM, 96 Months FE	Gloss Retention 60° = 75% min 20° = 45% min $\Delta E^* = 5.0$ change, max	N/A	N/A		
Tape Adhesion, min		Ad 1			CNH MTM0120 (87021663)	
Chip Resistance, min		7B		6B	CNH MTM0122 (87021664)	
Impact, minimum		30 kg cm			ASTM D2794	
Recoat Capability		No visual defects allowed Ad 2 Adhesion, min			CNH MTM0104 (86628046) CNH MTM0120 (87021663)	
Flexibility (Flexible Substrates) (Flex mod < 1000MPa)		No Cracks			CNH MTM0124 (87021665)	
96 Hour Humidity		No visible defects allowed. Ad 3 Adhesion, min			CNH MTM0126 (87021666)	
Temp Variation and Humidity		No visible defects allowed. Ad 3 Adhesion, min			CNH MTM0128 (87134331)	
Continuos heating		No visible defects allowed. Ad 3 Adhesion, min			CNH MTM0130 (87134332)	
Hot Water Resistance		No visible defects allowed. Ad 3 Adhesion, min			CNH MTM0132 (87134333)	
Thermal Shock Resistance		No visible defects allowed. Ad 3 Adhesion, min			CNH MTM0134 (87134334)	
Combined cycle (1) (Local test) (Optional)		No visible defects allowed. Ad 3 Adhesion, min			CNH MTM0136 (87134335)	

(1) Optional test, performed if required by CNH controlling design engineering as part of the design review process. Generally applies to performance verification on new plastic materials, complex part designs, or for new paint application processing.

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