



## 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

- Designated ASTM and CNH Test Methods
- 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	CL 3 PMOP PERF. STD 87021657
86609757	COLOR, 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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<b>Table 1 Plastic Part Type and Description</b>		
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:

<b>Table 2 Performance Class</b>	
Part Number	Description
Topcoat	
87021660	CL 1 PMOP PERF STD 87021657
87021661	CL 3 PMOP PERF STD 87021657
48011483	CL 4W PMOP PERF STD 87021657
87070111	CL 6 PMOP PERF STD 87021657
Primer	
87021662	CL 2P PMOP PRIMER PERT STD 87021657.

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 initial sample quality requirements. The manufacturer of a part is responsible to meet applicable requirements of CNH Engineering Specification ENS0301 (86620212), CNH Supplier Quality Engineering (SQE) Approval of Manufactured Parts - Part Approval Process (P-PAP), 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.

<b>Table 3</b>			<b>Primer Paint Materials on Plastic Parts</b>		
<b>Performance Class and Part Number</b>		<b>Class 2P (87021662)</b>		<b>Test Methods</b>	
<b>Test Description</b>		<b>Performance requirements</b>			
Color Visual		Visual Match to Color Standard		ASTM D1729	
Thickness, maximum		100µm		CNH MTM0140 (87034337)	
Hardness, minimum	Persoz Pencil	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

MAT0105

Table 4 Topcoat Paint Materials on Plastic Parts						
Performance Class and Part Number	Class 6 (87070111)	Class 4W (48011483)	Class 3 (87021661)	Class 1 (87021660)	Test Methods	
Property	Performance requirements					
Color Visual	Visual Match to Color Standard: No visible metamerism permitted Evaluate under CIE Illuminant light sources: D65, daylight; A-10, incandescent; and F02-10, (CWF) cool white fluorescent				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	
Cure Test	10 rubs		5 rubs		CNH MTM0138	
Hardness, minimum	PersoZ	150		100	ASTM D4366-95, Method B	
	Pencil	H		B	ASTM D3363	
Chemical	PASS				CNH MTM 0108	
Accelerated Weathering (WOM) and Florida Exposure, (FE)	600 Hrs WOM, 12 Months FE	N/A	N/A	Gloss Retention 60° = 90% min 20° = 65% min $\Delta E^* \leq 3.0$ change	Gloss Retention 60° = 65% min 20° = 45% min $\Delta E^* \leq 4.0$ change	CNH MTM0113 (87556294) modified ASTM G155-05a, CYCLE 7A
	1200 Hrs WOM, 24 Months FE	N/A	N/A	Gloss Retention 60° = 75% min 20° = 45% min $\Delta E^* \leq 5.0$ change	N/A	
	1800 Hrs WOM, 36 Months FE	N/A	Gloss Retention 60° = 90% min 20° = 65% min $\Delta E^* \leq 3.0$ change	N/A	N/A	
	2400 Hrs WOM, 48 Months FE	N/A	Gloss Retention 60° = 75% min 20° = 45% min $\Delta E^* \leq 5.0$ change,	N/A	N/A	Florida Exposure ASTM D1014
	3600 Hrs WOM, 72 Months FE	Gloss Retention 60° = 90% min 20° = 65% min $\Delta E^* \leq 3.0$ change	N/A		N/A	
	4800 Hrs WOM, 96 Months FE	Gloss Retention 60° = 75% min 20° = 45% min $\Delta E^* \leq 5.0$ change,	N/A		N/A	
Tape Adhesion, min	Ad 1				CNH MTM0120	
Chip Resistance, min	7B		6B		CNH MTM0122	
Impact, minimum	30 kg cm				ASTM D2794	
Recoat Capability	No visible defects allowed Ad 2 Adhesion, min				CNH MTM0104 CNH MTM0120	
Flexibility	(Flexible Substrates; Flex mod < 1000MPa) No Cracks				CNH MTM0124	
96 Hour Humidity	No visible defects allowed. Ad 3 Adhesion, min				CNH MTM0126	
Temp Variation and Humidity	No visible defects allowed. Ad 3 Adhesion, min				CNH MTM0128	
Continuos heating	No visible defects allowed. Ad 3 Adhesion, min				CNH MTM0130	
Hot Water Resistance	No visible defects allowed. Ad 3 Adhesion, min				CNH MTM0132	
Thermal Shock Resistance	No visible defects allowed. Ad 3 Adhesion, min				CNH MTM0134	
Combined cycle (1) (Local test) (Optional)	No visible defects allowed. Ad 3 Adhesion, min				CNH MTM0136	

(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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