




	<b>PRODUCT STANDARD</b> <b>TME DIVISION, BHOPAL</b>		<b>TM 94217</b> <b>REV.06</b>	
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<b>COPYRIGHT AND CONFIDENTIAL</b> The information on this document is the property of <b>BHARAT HEAVY ELECTRICALS LTD.</b> It must not be used directly or indirectly in any way detrimental to the interest of the company	<b><u>SPECIFICATION FOR AIR DRYING PAINT FINISH FOR TRACTION MACHINES</u></b> <b>(THIS SPEC. SUPERSEEDS SPEC. NO. BP0674184)</b>			
	<p>1. <b><u>GENERAL:</u></b></p> <p>This standard details the process to be followed to provide the standard paint finish for traction motors, traction generators/alternators, motor generators, motor alternators &amp; ECC, Auxiliary machines, oil rig motors &amp; alternators for application in Indian Railways/Oil Rigs. This standard also covers the painting requirements of traction machines/oil rig machines for coastal areas/export. The finishing of the outer surfaces of the field coils and armature, including commutators and creepage surfaces, is covered by the appropriate Insulation Process Specifications where a special finish is required, it will be called for on the appropriate drawings and specification sheets.</p> <p>2. <b><u>COMPLIANCE WITH STANDARDS:</u></b></p> <p>This standard to be used along with corporate standard AA0674123.</p> <p>3. <b><u>MATERIALS:</u></b></p> <p>3.1 <b><u>Materials Required:</u></b></p> <p>The finish painting of different traction machines/oil rig machines shall be as per table-4 of the specification unless otherwise mentioned in the drawing/work order/MID.</p> <p><b>Note:</b> The materials shall be used after ensuring that material TC's is as per the requirement of paint specification &amp; expiry date of paint is not crossed.</p> <p>3.1.1 <b>Primer Paint:</b></p> <p>i) Anti Corrosive priming paint to AA56101 (Red).  ii) Inorganic ethyl zinc silicate primer to AA56113.</p> <p>3.1.2 <b>Intermediate Paint:</b></p> <p>i) High build intermediate epoxy paint to AA56112.</p> <p>3.1.3 <b>Finish Paints:</b></p> <p>i) <b>Polyurethane finishing paint to AA56142:</b> For requirements of Industrial, Oil rigs &amp; Traction machines including for coastal areas &amp; export.  ii) <b>Paint to AA56128 (Aluminum):</b> For blower motors.</p>			
Revision : 06 Date: 14.05.2021	Distribution TXM TAM TGM/TNX QTM TME	Qty. 1 1 1 1 2	Approved :  Prepared: (J. Kumar)	14/05/21 (M. Verma) Checked: (R. Chaudhry) Date: 14.05.21

		 <p><b>PRODUCT STANDARD</b> <b>TME DIVISION, BHOPAL</b></p> <p>TME/2021</p>	<p><b>TM 94217</b> <b>REV.06</b></p> <p><b>PAGE 02 OF 09</b></p>																												
<p style="writing-mode: vertical-rl; transform: rotate(180deg);">COPYRIGHT AND CONFIDENTIAL</p> <p style="writing-mode: vertical-rl; transform: rotate(180deg);">The information on this document is the property of BHARAT HEAVY ELECTRICALS LIMITED. It must not be used directly or indirectly in any way detrimental to the interest of the company</p>		<p>iii) Oil Resistant Air Drying Synthetic Enamel to AA56132 (Jasmine Yellow shade): For surfaces in contact with lubricant.</p> <p>iv) Epoxy Red Gel Coat (Base, Hardner &amp; Diluent ) to BP27476 or Anti Tracking Red Insulating Varnish to BP 27599 or Becktol Red- Prop of M/s Dr Beck &amp; Co.Pune: For coils &amp; insulation.</p> <p>v) Anti Tracking Epoxy based finishing paint to CIT-033: For interior surfaces of frame &amp; pole pads.</p> <p>vi) Silicone based finishing paint to CIT-064: For field coils &amp; pole assy. and connections.</p> <p>vii) Grey Insulating Enamel to BP 27595: For terminal box interiors.</p> <p><b>3.1.4 Thinners:</b></p> <p>The application of thinners for different primer/finish paints are as given in clause 3.2.</p> <p>i) White Spirit Gr. 145/205 to AA56701.</p> <p>ii) Xylole-Industrial Solvent Grade to AA56703.</p> <p>iii) Special Thinner for Epoxy Red Gel Coat/MEK.</p> <p>iv) Derusting Solution (hydrochloric acid/sulphuric acid) to BP0690086.</p> <p><b>3.2 Consistency of Materials at normal shop temperature in cup No.4 of IS:3944:</b></p> <table border="1" data-bbox="329 1081 1416 1661"> <thead> <tr> <th>Paint</th> <th>Thinner</th> <th>Applicant</th> <th>Consistency in Seconds to 27° C</th> </tr> </thead> <tbody> <tr> <td>AA56101 (Red)</td> <td>White spirit</td> <td>Spray</td> <td>30±2 sec</td> </tr> <tr> <td>AA56128 (Aluminum)</td> <td>White spirit</td> <td>Spray</td> <td>30±2 sec</td> </tr> <tr> <td>AA56142</td> <td>As recommended by supplier</td> <td>Spray</td> <td>30±2 sec</td> </tr> <tr> <td>AA56132(Jasmine Yellow)</td> <td>White Spirit</td> <td>Spray</td> <td>30±2 sec</td> </tr> <tr> <td>BP25795</td> <td>Xylole</td> <td>Spray</td> <td>30±2 sec</td> </tr> <tr> <td>BP27476/ BP2799 Becktol Red.</td> <td>Special Thinner/ MEK</td> <td>Spray</td> <td>30 – 40 sec</td> </tr> </tbody> </table> <p>For application by spray, the paints shall be obtained ready for use or thinned down to the flow time shown on the chart when measured at the shop temperature. The consistency of the paint require adjustment, the appropriate thinner given in the above chart shall be used.</p>	Paint	Thinner	Applicant	Consistency in Seconds to 27° C	AA56101 (Red)	White spirit	Spray	30±2 sec	AA56128 (Aluminum)	White spirit	Spray	30±2 sec	AA56142	As recommended by supplier	Spray	30±2 sec	AA56132(Jasmine Yellow)	White Spirit	Spray	30±2 sec	BP25795	Xylole	Spray	30±2 sec	BP27476/ BP2799 Becktol Red.	Special Thinner/ MEK	Spray	30 – 40 sec	
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<p style="writing-mode: vertical-rl; transform: rotate(180deg);"> <b>COPYRIGHT AND CONFIDENTIAL</b>          The information on this document is the property of <b>BHARAT HEAVY ELECTRICALS LIMITED</b>          It must not be used directly or indirectly in any way detrimental to the interest of the company       </p>	<b>3.3 Compatibility chart for Primer Paint, Intermediate Paint &amp; Finish Paint:</b>									
	<table border="1"> <thead> <tr> <th>Primer Paint</th><th>Intermediate Paint</th><th>Finish Paint</th></tr> </thead> <tbody> <tr> <td>AA56113</td><td>AA56112</td><td>AA56142</td></tr> <tr> <td>AA56101</td><td>-</td><td>AA56128</td></tr> </tbody> </table>		Primer Paint	Intermediate Paint	Finish Paint	AA56113	AA56112	AA56142	AA56101	-
Primer Paint	Intermediate Paint	Finish Paint								
AA56113	AA56112	AA56142								
AA56101	-	AA56128								
<p>For achieving better quality of painting, the combinations of primer paint, intermediate paint &amp; finish paint as mentioned in above table shall be used.</p>										
<b>3.4 MIXING OF PAINTS:</b>										
	<b>3.4.1</b> Before application, any skin formed on the paint in the tin shall be carefully removed, any settled pigment broken up and loosened, and the paint shall be thoroughly stirred to ensure complete and uniform mixing of the constituents. Care shall be taken to avoid air entry into the paint whilst stirring.									
	<b>3.4.2 AA56113 PRIMER:</b> AA56113 primer as supplied consists of two separate ingredients viz primer base and accelerator. Shortly before use mix together primer base and accelerator in the proportion 1:1 by volume or as recommended by supplier, care being taken not to entrain air while mixing. It is important that only small quantity of primer which can be consumed within 4 hours can be mixed. Further thinning of the paint prepared as above is not required for application by spraying.									
	<b>3.4.3 EPOXY RED GEL COAT (BP27476):</b> This consist of 3 parts viz Epoxy red gel coat, Hardner EH411 and Diluent C. These to be mixed in the ratio 100:40:10 by weight. Should the consistency of the paint require adjustment the same to be done by using special Thinner/MEK.									
	<b>4. APPLICATION :</b> A complete paint (as per Table 1, 2, 3 & 4) should be applied so that the equipment has a well finished appearance & adequate protection against corrosion. It is important that each coat of paint is completely dry before the next is applied. <b>The paint shall be applied by spraying/air less spraying only.</b>									
	<b>5. PROCESS FOR PAINTING OF TRACTION/OIL RIG/INDUSTRIAL MACHINE COMPONENTS:</b> For the painting of Traction/Oil rig/Industrial machines components, the process mentioned in painting scheme no. 8 of annexure-II(a) of corporate standard AA0674123 shall be followed.									



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**TABLE NO. 1**


**FINISHING PAINT FOR NON-ROTATING PARTS OF TRACTION MACHINES**

Part	Traction Motors		Other Machines	
	Paint	Coats	Paint	Coats
Exterior surfaces of machines including gearcase	AA56142 (Black)	2	AA56142 (Traffic Green)	2
	AA56142 (Traffic Green)	2	AA56142 (Light Grey)	2
	AA56142 (Light Grey)	2		2
Interior Surface of machines	CIT-033 (See note-2)	2	CIT-033 (See note-2)	2
Surface in contact with Lubricant	AA56132 (Jasmine Yellow)	2	AA56132 (Jasmine Yellow)	2
		2		2
Terminal Box Interiors	BP27476/ BP27599 Becktol Red.	2	BP 27595	2
Field coils & pole assy. and Connections	CIT-064	2	CIT-064	2
Brush gear and brush gear Insulators	Plant Standard BP0674183 to be followed			

**NOTES:**

1. Light alloy & glass fibre cover and other readily detachable parts in the traction machines shall not be painted.
2. Interior surface of frames & pole pads to be painted with CIT-033 for adjacent coils, cable etc.
3. Epoxy bonded components must not be painted prior to bonding.
4. The paint/colour of finish painting in different traction machines/oil rig machines is mentioned in table-4 of this specification.



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	<b>TABLE-2</b> <b>FINISHING PAINT FOR ROTATING PART OF TRACTION MACHINES</b>	

Part	Paint	Coats	Remarks
<b>Steel Fans:</b>			
1) TM4601, TM4603	AA56142 (Traffic Green)	2	-
2) AG3101, AG2702, TA10102	AA56142 (Light Grey)	2	


<b>TABLE-3</b> <b>FINISHING PAINT FOR MISCELLANEOUS EQUIPMENT</b>			
Equipment	Part	Paint	Coats
Eddy Current Clutch and gear boxes surface	Steel surfaces	AA56142 (Traffic Green)	2
	Coil	See Insulation Spec.	-
	Interior of gear box	AA56132	2

<b>TABLE-4</b> <b>PAINT/COLOUR FOR FINISH PAINTING OF DIFFERENT TRACTION/OIL RIG MACHINES</b>	
Type of machine	Paint/Colour*
<b>A) Traction Motors:</b>	
TM4906AZ	AA56142(Black)
TM4907BZ	
TM4603AZ	
HS15250A	
TM3701AZ	
TM4605AZ	
TM5002AZ	AA56142 (Light grey) (631 export) & Black for WDP2
TM4303CZ/BY & TM4303DY	AA56142 Traffic Green for CZ/BY (EMU & MEMU application) & Black for DY (DEMU application)





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**Annexure-I**

**Acceptance criteria for Painting of Traction Machines**


The acceptance criteria for the check points, which are to be ensured during painting of Traction Machines as per the requirements of specification TM94217, are as given below. The supplier to furnish below mentioned check points for each component in the format as per annexure-II along with consignment.

**1) Checking of Painting Material:**


Sl. no.	To be checked	Acceptance criteria
i.	Expiry date of primer & intermediate paint.	Primer & intermediate paint shall be within expiry date.
ii.	Expiry date of finish paint.	Paint shall be within expiry date.
iii.	Verification of supplier's TC as per paint specification.	Painting material shall be used only after verification of TC.

**2) Surface Preparation (Before Primer Painting):**

Sl. no.	Operation	Acceptance criteria
i.	Dressing & grinding of all flame-cut edges, welds & any major imperfections.	No sharp edges or protrusions.
ii.	Degreasing by using white sprite to AA56701 & removal of varnish in wet condition.	Free from grease & varnish.
iii.	Removal of light rust by hydrochloric acid/sulphuric acid to BP0690086 and removal of heavier localized rust by using emery cloth, steel scratch brush or portable power tool with abrasive tool & then applying hydrochloric acid/sulphuric acid.	Surface should exhibits grey colour in place of red rust.
iv.	In case surface is widely rusted to such an extent that pitting with hard rust flakes is exhibited, the surface shall be sand/shot blasted.	Surface should exhibits clean & grey colour in place of red rust.
v.	Visual inspection of condition of surface of components before application of primer paint.	As per the requirement of clause 5.
vi.	Checking of surface finish of the components.	Surface finish shall be as per IS:3073.

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	<b>3) Measurement of Primer &amp; Intermediate Paint Thickness (As per AA0674105):</b>																			
<table border="1"> <thead> <tr> <th>Sl. no.</th><th>Description of Paint</th><th>Acceptance criteria</th></tr> </thead> <tbody> <tr> <td>i.</td><td>Measurement of primer paint thickness after one coat of primer paint as per clause 2.1.1, 2.1.2 &amp; 2.1.3 of AA0674105.</td><td>60-90 microns</td></tr> <tr> <td>ii.</td><td>Measurement of total paint thickness (primer + intermediate) after one coat of intermediate paint as per clause 2.1.1, 2.1.2 &amp; 2.1.3 of AA0674105.</td><td>120-180 microns</td></tr> </tbody> </table>			Sl. no.	Description of Paint	Acceptance criteria	i.	Measurement of primer paint thickness after one coat of primer paint as per clause 2.1.1, 2.1.2 & 2.1.3 of AA0674105.	60-90 microns	ii.	Measurement of total paint thickness (primer + intermediate) after one coat of intermediate paint as per clause 2.1.1, 2.1.2 & 2.1.3 of AA0674105.	120-180 microns									
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<b>4) Inspection for Process Control (After Finish Painting):</b>																				
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<b>5) Adhesion by Tape Test (As per AA0674105):</b>																				
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<b>Note:</b> The sample size for quality checking of painting of traction machines should be as per IS: 2500 Part-2, Level 4 and AQL 1% as mentioned below:-																				
<table> <thead> <tr> <th><u>Lot size</u></th><th><u>Sample size</u></th></tr> </thead> <tbody> <tr> <td>2 to 8</td><td>3</td></tr> <tr> <td>9 to 15</td><td>3</td></tr> <tr> <td>16 to 25</td><td>4</td></tr> <tr> <td>26 to 50</td><td>5</td></tr> <tr> <td>51 to 100</td><td>7</td></tr> <tr> <td>101 to 150</td><td>10</td></tr> <tr> <td>151 to 300</td><td>15</td></tr> <tr> <td>301 to 500</td><td>20</td></tr> </tbody> </table>			<u>Lot size</u>	<u>Sample size</u>	2 to 8	3	9 to 15	3	16 to 25	4	26 to 50	5	51 to 100	7	101 to 150	10	151 to 300	15	301 to 500	20
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<b>Imp.:</b> When sample size equals or exceeds lot size, every item in the lot shall be inspected.																				



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	<b>Checklist for Painting of Traction Machines</b>		
	Machine type:		Machine/Component no.:
	Date of Painting:		
	Sl. No.	Check points as per the requirement of annexure-I	Checking Remark (100%TP & 20%QC)
	1.	<b>Checking of Painting Material:</b> i. Expiry date of primer & intermediate paint ii. Expiry date of finish paint iii. Verification of supplier's TC as per paint specification	(ok/not ok) (ok/not ok) (ok/not ok)
	2.	<b>Surface Preparation (Before Primer Painting):</b> i. Visual inspection for absence of sharp edges or protrusions ii. Visual inspection for absence of grease & varnish iii. Visual inspection for absence of light rust iv. Visual inspection for absence of widely spread rust v. Visual inspection for condition of surface as per the requirement of clause 5 vi. Surface finish of the component	(ok/not ok) (ok/not ok) (ok/not ok) (ok/not ok) (ok/not ok) .....microns (ok/not ok)
	3.	<b>Measurement of Primer &amp; Intermediate Paint Thickness:</b> i. Paint thickness after one coat of primer paint ii. Total paint thickness (primer + intermediate ) after one coat of intermediate paint	.....microns (ok/not ok) .....microns (ok/not ok)
	4.	<b>Inspection for Process Control (After Finish Painting):</b> i. Visual inspection of finished component for absence of paint film defects ii. Total thickness of paint	(ok/not ok) .....microns (ok/not ok)
	5.	<b>Adhesion by Tape Test (As per AA0674105):</b> i. Adhesion by tape test	(ok/not ok)
<b>Abbreviations:-</b> TP – Task Performer, QC – QTM/BHEL Authorized Quality Inspection Agency <b>Note: 1)</b> For the components supplied by the supplier in finish painted condition, the supplier to furnish dully filled checklist for each component along with consignment. <b>2)</b> The acceptance criteria shall be as per annexure-I.			
(Task performer's signature)		(QC's signature)	