

	 PRODUCT STANDARD TME DIVISION, BHOPAL TME 2011	TM22603																															
		REV 00																															
		PAGE: 01 OF 03																															
<u>Specification for Electrical Insulating Varnish – Polybutadiene</u>																																	
COPYRIGHT AND CONFIDENTIAL 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	1.0 General:	This specification governs technical requirements of liquid, unsaturated polybutadiene resin/ varnish in vinyl toluene monomer.																															
	2.0 Application	Used for Vacuum Pressure Impregnation and dipping of Traction Machines Winding.																															
	3.0 Technical Requirements																																
	3.1 Typical Properties of Resin/ varnish as Supplied	<table border="1"> <thead> <tr> <th>S. No.</th> <th>Property</th> <th>Conditions</th> <th>Value</th> <th>Units</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Viscosity</td> <td>25°C / 77°F</td> <td>300 - 500</td> <td>cP</td> </tr> <tr> <td>2</td> <td>Weight per Gallon</td> <td>25°C / 77°F</td> <td>7.6 - 7.9</td> <td>pounds</td> </tr> <tr> <td>3</td> <td>Sunshine Gel Time</td> <td>125°C / 257°F</td> <td>4 - 10</td> <td>minutes</td> </tr> <tr> <td>4</td> <td>Flash Point</td> <td>ASTM D93</td> <td>52 126</td> <td>°C °F</td> </tr> </tbody> </table>			S. No.	Property	Conditions	Value	Units	1	Viscosity	25°C / 77°F	300 - 500	cP	2	Weight per Gallon	25°C / 77°F	7.6 - 7.9	pounds	3	Sunshine Gel Time	125°C / 257°F	4 - 10	minutes	4	Flash Point	ASTM D93	52 126	°C °F				
	S. No.	Property	Conditions	Value	Units																												
	1	Viscosity	25°C / 77°F	300 - 500	cP																												
	2	Weight per Gallon	25°C / 77°F	7.6 - 7.9	pounds																												
	3	Sunshine Gel Time	125°C / 257°F	4 - 10	minutes																												
	4	Flash Point	ASTM D93	52 126	°C °F																												
	3.2 Desirable Features	<ul style="list-style-type: none"> Superior electrical properties at elevated temperature. Resilient to absorb vibration. Excellent for use with glass and mica tape wrapped conductors & silicon rubber glass tape. Moisture and chemical-resistant. 																															
3.2 Typical Mechanical Properties	<table border="1"> <thead> <tr> <th>S. No.</th> <th>Property</th> <th>Conditions</th> <th>Value</th> <th>Units</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Helical Coil Bond Strength ASTM D2519 over MW 35</td> <td>25°C / 77°F 150°C / 302°F</td> <td>22 4</td> <td>Pounds Pounds</td> </tr> <tr> <td>2</td> <td>Hardness</td> <td>Shore D</td> <td>80</td> <td>-</td> </tr> <tr> <td>3</td> <td>Tensile Strength ASTM D638</td> <td>25°C / 77°F</td> <td>3,400</td> <td>psi</td> </tr> <tr> <td>4</td> <td>Tensile Modulus ASTM D638</td> <td>25°C / 77°F</td> <td>121,000</td> <td>psi</td> </tr> <tr> <td>5</td> <td>Elongation to Break ASTM D638</td> <td>25°C / 77°F</td> <td>3.3</td> <td>%</td> </tr> </tbody> </table>			S. No.	Property	Conditions	Value	Units	1	Helical Coil Bond Strength ASTM D2519 over MW 35	25°C / 77°F 150°C / 302°F	22 4	Pounds Pounds	2	Hardness	Shore D	80	-	3	Tensile Strength ASTM D638	25°C / 77°F	3,400	psi	4	Tensile Modulus ASTM D638	25°C / 77°F	121,000	psi	5	Elongation to Break ASTM D638	25°C / 77°F	3.3	%
S. No.	Property	Conditions	Value	Units																													
1	Helical Coil Bond Strength ASTM D2519 over MW 35	25°C / 77°F 150°C / 302°F	22 4	Pounds Pounds																													
2	Hardness	Shore D	80	-																													
3	Tensile Strength ASTM D638	25°C / 77°F	3,400	psi																													
4	Tensile Modulus ASTM D638	25°C / 77°F	121,000	psi																													
5	Elongation to Break ASTM D638	25°C / 77°F	3.3	%																													
Revision: 00	Distribution	Qty	Approved:																														
Dt: 02.09.2022																																	
	CIM	1	Prepared:	Checked:																													
	TAM	2																															
	QFD	1																															
	MNX	1																															
	TME	1	(Prasad Telang)	(Shishupal)																													
				(Vikas Rawtiya) Date: 02.09.2022																													



TME 2011

PRODUCT STANDARD
TME DIVISION, BHOPAL

TM22603

REV 00

PAGE: 02 OF 03

3.3 Typical Electrical Properties

S. No.	Property	Conditions	Value	Units
1	Dielectric Strength ASTM D149	0.9 mils - 25°C / 77°F	4200	volts/mil
2	Dielectric Strength ASTM D149	0.9 mils - 25°C / 77°F After 24 hours in water	3900	-
3	Dissipation Factor ASTM D150	1 kHz - 25°C / 77°F 1 kHz - 100°C / 212°F 1 kHz - 150°C / 302°F 1 kHz - 200°C / 392°F	0.003 0.006 0.003 0.006	-
4	Dielectric Constant ASTM D150	1 kHz - 25°C / 77°F 1 kHz - 100°C / 212°F 1 kHz - 150°C / 302°F 1 kHz - 200°C / 392°F	2.4 2.4 2.3 2.3	-
5	Volume Resistivity ASTM D257	25°C / 77°F	1.0 x 10 ¹⁶	ohm-cm

3.4 Thermal Endurance

Details of Thermal Endurance test conducted by supplier to be submitted.

Note - Typical thermal endurance of present approved grades are as follows.

20,000 hour intercept

Wire Construction	Helical Coil - ASTM D3145	Twisted Pair - ASTM D3251
NEMA MW16	-	227.4°C (Class 220)
NEMA MW35	152.3°C (Class 130)	197.6°C (Class 180)

4.0 Storage & Shelf Life

The material should be suitable for use for six (6) months or more from the date of shipment when stored in the original sealed containers below 25°C / 77°F in a dry controlled environment out of direct sunlight.

5.0 Test Certificate

Test certificates shall be supplied for each lot, unless otherwise specified on order. The test certificate shall bear the following information: BHEL purchase Order No., Supplier's Name/Grade/Identification No., Weight, and Packet/Container/Drum No.

<div>TM22603</div> <div>REV 00</div> <div>PAGE: 03 OF 03</div>		<div><div><div><div>TM22603</div><div>REV 00</div><div>PAGE: 03 OF 03</div></div></div><div><div><div><div>TM22603</div><div>REV 00</div><div>PAGE: 03 OF 03</div></div></div></div></div>	<div><div><div><div>TM22603</div><div>REV 00</div><div>PAGE: 03 OF 03</div></div></div><div><div><div><div>TM22603</div><div>REV 00</div><div>PAGE: 03 OF 03</div></div></div></div></div>	<div><div><div><div>TM22603</div><div>REV 00</div><div>PAGE: 03 OF 03</div></div></div><div><div><div><div>TM22603</div><div>REV 00</div><div>PAGE: 03 OF 03</div></div></div></div></div>	<div><div><div><div>TM22603</div><div>REV 00</div><div>PAGE: 03 OF 03</div></div></div><div><div><div><div>TM22603</div><div>REV 00</div><div>PAGE: 03 OF 03</div></div></div></div></div>	<div><div><div><div>TM22603</div><div>REV 00</div><div>PAGE: 03 OF 03</div></div></div><div><div><div><div>TM22603</div><div>REV 00</div><div>PAGE: 03 OF 03</div></div></div></div></div>	<div><div><div><div>TM22603</div><div>REV 00</div><div>PAGE: 03 OF 03</div></div></div><div><div><div><div>TM22603</div><div>REV 00</div><div>PAGE: 03 OF 03</div></div></div></div></div>	<div><div><div><div>TM22603</div><div>REV 00</div><div>PAGE: 03 OF 03</div></div></div><div><div><div><div>TM22603</div><div>REV 00</div><div>PAGE: 03 OF 03</div></div></div></div></div>	<div><div><div><div>TM22603</div><div>REV 00</div><div>PAGE: 03 OF 03</div></div></div><div><div><div><div>TM22603</div><div>REV 00</div><div>PAGE: 03 OF 03</div></div></div></div></div>	<div><div><div><div>TM22603</div><div>REV 00</div><div>PAGE: 03 OF 03</div></div></div><div><div><div><div>TM22603</div><div>REV 00</div><div>PAGE: 03 OF 03</div></div></div></div></div>	<div><div><div><div>TM22603</div><div>REV 00</div><div>PAGE: 03 OF 03</div></div></div><div><div><div><div>TM22603</div><div>REV 00</div><div>PAGE: 03 OF 03</div></div></div></div></div>	<div><div><div><div>TM22603</div><div>REV 00</div><div>PAGE: 03 OF 03</div></div></div><div><div><div><div>TM22603</div><div>REV 00</div><div>PAGE: 03 OF 03</div></div></div></div></div>	<div><div><div><div>TM22603</div><div>REV 00</div><div>PAGE: 03 OF 03</div></div></div><div><div><div><div>TM22603</div><div>REV 00</div><div>PAGE: 03 OF 03</div></div></div></div></div>	<div><div><div><div>TM22603</div><div>REV 00</div><div>PAGE: 03 OF 03</div></div></div><div><div><div><div>TM22603</div><div>REV 00</div><div>PAGE: 03 OF 03</div></div></div></div></div>	<div><div><div><div>TM22603</div><div>REV 00</div><div>PAGE: 03 OF 03</div></div></div><div><div><div><div>TM22603</div><div>REV 00</div><div>PAGE: 03 OF 03</div></div></div></div></div>	<div><div><div><div>TM22603</div><div>REV 00</div><div>PAGE: 03 OF 03</div></div></div><div><div><div><div>TM22603</div><div>REV 00</div><div>PAGE: 03 OF 03</div></div></div></div></div>	<div><div><div><div>TM22603</div><div>REV 00</div><div>PAGE: 03 OF 03</div></div></div><div><div><div><div>TM22603</div><div>REV 00</div><div>PAGE: 03 OF 03</div></div></div></div></div>	<div><div><div><div>TM22603</div><div>REV 00</div><div>PAGE: 03 OF 03</div></div></div><div><div><div><div>TM22603</div><div>REV 00</div><div>PAGE: 03 OF 03</div></div></div></div></div>	<div><div><div><div>TM22603</div><div>REV 00</div><div>PAGE: 03 OF 03</div></div></div><div><div><div><div>TM22603</div><div>REV 00</div><div>PAGE: 03 OF 03</div></div></div></div></div>	<div><div><div><div>TM22603</div><div>REV 00</div><div>PAGE: 03 OF 03</div></div></div><div><div><div><div>TM22603</div><div>REV 00</div><div>PAGE: 03 OF 03</div></div></div></div></div>	<div><div><div><div>TM22603</div><div>REV 00</div><div>PAGE: 03 OF 03</div></div></div><div><div><div><div>TM22603</div><div>REV 00</div><div>PAGE: 03 OF 03</div></div></div></div></div>	<div><div><div><div>TM22603</div><div>REV 00</div><div>PAGE: 03 OF 03</div></div></div><div><div><div><div>TM22603</div><div>REV 00</div><div>PAGE: 03 OF 03</div></div></div></div></div>	<div><div><div><div>TM22603</div><div>REV 00</div><div>PAGE: 03 OF 03</div></div></div><div><div><div><div>TM22603</div><div>REV 00</div><div>PAGE: 03 OF 03</div></div></div></div></div>	<div><div><div><div>TM22603</div><div>REV 00</div><div>PAGE: 03 OF 03</div></div></div><div><div><div><div>TM22603</div><div>REV 00</div><div>PAGE: 03 OF 03</div></div></div></div></div>	<div><div><div><div>TM22603</div><div>REV 00</div><div>PAGE: 03 OF 03</div></div></div><div><div><div><div>TM22603</div><div>REV 00</div><div>PAGE: 03 OF 03</div></div></div></div></div>	<div><div><div><div>TM22603</div><div>REV 00</div><div>PAGE: 03 OF 03</div></div></div><div><div><div><div>TM22603</div><div>REV 00</div><div>PAGE: 03 OF 03</div></div></div></div></div>	<div><div><div><div>TM22603</div><div>REV 00</div><div>PAGE: 03 OF 03</div></div></div><div><div><div><div>TM22603</div><div>REV 00</div><div>PAGE: 03 OF 03</div></div></div></div></div>	<div><div><div><div>TM22603</div><div>REV 00</div><div>PAGE: 03 OF 03</div></div></div><div><div><div><div>TM22603</div><div>REV 00</div><div>PAGE: 03 OF 03</div></div></div></div></div>	<div><div><div><div>TM22603</div><div>REV 00</div><div>PAGE: 03 OF 03</div></div></div><div><div><div><div>TM22603</div><div>REV 00</div><div>PAGE: 03 OF 03</div></div></div></div></div>	<div><div><div><div>TM22603</div><div>REV 00</div><div>PAGE: 03 OF 03</div></div></div><div><div><div><div>TM22603</div><div>REV 00</div><div>PAGE: 03 OF 03</div></div></div></div></div>	<div><div><div><div>TM22603</div><div>REV 00</div><div>PAGE: 03 OF 03</div></div></div><div><div><div><div>TM22603</div><div>REV 00</div><div>PAGE: 03 OF 03</div></div></div></div></div>	<div><div><div><div>TM22603</div><div>REV 00</div><div>PAGE: 03 OF 03</div></div></div><div><div><div><div>TM22603</div><div>REV 00</div><div>PAGE: 03 OF 03</div></div></div></div></div>	<div><div><div><div>TM22603</div><div>REV 00</div><div>PAGE: 03 OF 03</div></div></div><div><div><div><div>TM22603</div><div>REV 00</div><div>PAGE: 03 OF 03</div></div></div></div></div>	<div><div><div><div>TM22603</div><div>REV 00</div><div>PAGE: 03 OF 03</div></div></div><div><div><div><div>TM22603</div><div>REV 00</div><div>PAGE: 03 OF 03</div></div></div></div></div>	<div><div><div><div>TM22603</div><div>REV 00</div><div>PAGE: 03 OF 03</div></div></div><div><div><div><div>TM22603</div><div>REV 00</div><div>PAGE: 03 OF 03</div></div></div></div></div>	<div><div><div><div>TM22603</div><div>REV 00</div><div>PAGE: 03 OF 03</div></div></div><div><div><div><div>TM22603</div><div>REV 00</div><div>PAGE: 03 OF 03</div></div></div></div></div>	<div><div><div><div>TM22603</div><div>REV 00</div><div>PAGE: 03 OF 03</div></div></div><div><div><div><div>TM22603</div><div>REV 00</div><div>PAGE: 03 OF 03</div></div></div></div></div>	<div><div><div><div>TM22603</div><div>REV 00</div><div>PAGE: 03 OF 03</div></div></div><div><div><div><div>TM22603</div><div>REV 00</div><div>PAGE: 03 OF 03</div></div></div></div></div>	<div><div><div><div>TM22603</div><div>REV 00</div><div>PAGE: 03 OF 03</div></div></div><div><div><div><div>TM22603</div><div>REV 00</div><div>PAGE: 03 OF 03</div></div></div></div></div>	<div><div><div><div>TM22603</div><div>REV 00</div><div>PAGE: 03 OF 03</div></div></div><div><div><div><div>TM22603</div><div>REV 00</div><div>PAGE: 03 OF 03</div></div></div></div></div>	<div><div><div><div>TM22603</div><div>REV 00</div><div>PAGE: 03 OF 03</div></div></div><div><div><div><div>TM22603</div><div>REV 00</div><div>PAGE: 03 OF 03</div></div></div></div></div>	<div><div><div><div>TM22603</div><div>REV 00</div><div>PAGE: 03 OF 03</div></div></div><div><div><div><div>TM22603</div><div>REV 00</div><div>PAGE: 03 OF 03</div></div></div></div></div>	<div><div><div><div>TM22603</div><div>REV 00</div><div>PAGE: 03 OF 03</div></div></div><div><div><div><div>TM22603</div><div>REV 00</div><div>PAGE: 03 OF 03</div></div></div></div></div>	<div><div><div><div>TM22603</div><div>REV 00</div><div>PAGE: 03 OF 03</div></div></div><div><div><div><div>TM22603</div><div>REV 00</div><div>PAGE: 03 OF 03</div></div></div></div></div>	<div><div><div><div>TM22603</div><div>REV 00</div><div>PAGE: 03 OF 03</div></div></div><div><div><div><div>TM22603</div><div>REV 00</div><div>PAGE: 03 OF 03</div></div></div></div></div>	<div><div><div><div>TM22603</div><div>REV 00</div><div>PAGE: 03 OF 03</div></div></div><div><div><div><div>TM22603</div><div>REV 00</div><div>PAGE: 03 OF 03</div></div></div></div></div>	<div><div><div><div>TM22603</div><div>REV 00</div><div>PAGE: 03 OF 03</div></div></div><div><div><div><div>TM22603</div><div>REV 00</div><div>PAGE: 03 OF 03</div></div></div></div></div>	<div><div><div><div>TM22603</div><div>REV 00</div><div>PAGE: 03 OF 03</div></div></div><div><div><div><div>TM22603</div><div>REV 00</div><div>PAGE: 03 OF 03</div></div></div></div></div>	<div><div><div><div>TM22603</div><div>REV 00</div><div>PAGE: 03 OF 03</div></div></div><div><div><div><div>TM22603</div><div>REV 00</div><div>PAGE: 03 OF 03</div></div></div></div></div>	<div><div><div><div>TM22603</div><div>REV 00</div><div>PAGE: 03 OF 03</div></div></div><div><div><div><div>TM22603</div><div>REV 00</div><div>PAGE: 03 OF 03</div></div></div></div></div>	<div><div><div><div>TM22603</div><div>REV 00</div><div>PAGE: 03 OF 03</div></div></div><div><div><div><div>TM22603</div><div>REV 00</div><div>PAGE: 03 OF 03</div></div></div></div></div>	<div><div><div><div>TM22603</div><div>REV 00</div><div>PAGE: 03 OF 03</div></div></div><div><div><div><div>TM22603</div><div>REV 00</div><div>PAGE: 03 OF 03</div></div></div></div></div>	<div><div><div><div>TM22603</div><div>REV 00</div><div>PAGE: 03 OF 03</div></div></div><div><div><div><div>TM22603</div><div>REV 00</div><div>PAGE: 03 OF 03</div></div></div></div></div>	<div><div><div><div>TM22603</div><div>REV 00</div><div>PAGE: 03 OF 03</div></div></div><div><div><div><div>TM22603</div><div>REV 00</div><div>PAGE: 03 OF 03</div></div></div></div></div>	<div><div><div><div>TM22603</div><div>REV 00</div><div>PAGE: 03 OF 03</div></div></div><div><div><div><div>TM22603</div><div>REV 00</div><div>PAGE: 03 OF 03</div></div></div></div></div>	<div><div><div><div>TM22603</div><div>REV 00</div><div>PAGE: 03 OF 03</div></div></div><div><div><div><div>TM22603</div><div>REV 00</div><div>PAGE: 03 OF 03</div></div></div></div></div>	<div><div><div><div>TM22603</div><div>REV 00</div><div>PAGE: 03 OF 03</div></div></div><div><div><div><div>TM22603</div><div>REV 00</div><div>PAGE: 03 OF 03</div></div></div></div></div>	<div><div><div><div>TM22603</div><div>REV 00</div><div>PAGE: 03 OF 03</div></div></div><div><div><div><div>TM22603</div><div>REV 00</div><div>PAGE: 03 OF 03</div></div></div></div></div>	<div><div><div><div>TM22603</div><div>REV 00</div><div>PAGE: 03 OF 03</div></div></div><div><div><div><div>TM22603</div><div>REV 00</div><div>PAGE: 03 OF 03</div></div></div></div></div>	<div><div><div><div>TM22603</div><div>REV 00</div><div>PAGE: 03 OF 03</div></div></div><div><div><div><div>TM22603</div><div>REV 00</div><div>PAGE: 03 OF 03</div></div></div></div></div>	<div><div><div><div>TM22603</div><div>REV 00</div><div>PAGE: 03 OF 03</div></div></div></div>
--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	---

COPYRIGHT AND CONFIDENTIAL

 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