



**PRODUCT STANDARD**  
**TME DIVISION, BHOPAL**

**TM22603**

**REV 00**

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**Specification for Electrical Insulating Varnish – Polybutadiene**

**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**

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**

- 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**

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  
TAM  
QFD  
MNX  
TME

1  
2  
1  
1  
1

Prepared:

(Prasad Telang)

Checked:

(Shishupal)

(Vikas Rawtiya)

Date:

02.09.2022



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### 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 <sup>16</sup>	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.



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It must not be used directly or indirectly in any way detrimental to the interest of the company**6.0 Approved Grades**

The material shall be ordered on BHEL approved grade only. At present following grade is approved by BHEL:

Polybutadiene Varnish	Sterling® PB 302-LV-2
Diluent	ELAN-Plus™ BS-217
Inhibitor	ELAN-Plus™ BS-6440

**Notes:**

- Any other grade can be offered against this specification, subject to meeting material properties as per this specification and prior approval of BHEL.
- For any other offered grades supplier to submit following details
  - Technical data sheet, MSDS, test certificate as per this specification from NABL/ any internationally accredited lab.
  - VPI procedure (Including Vacuum Pressure & curing schedule) of offered product.
  - Comparative test report of offered product vs Existing Polybutadiene Varnish.
  - Compatibility report of offered product with silicon rubber glass tape/ wrapper (refer specification TM00285) for Vacuum Pressure Impregnation (VPI)/ Dipping indicating that there will be no adverse effect on existing insulation scheme.
  - Details of diluent, inhibitor (or any other additive) if any which are required to be mixed in varnish to maintain viscosity, gel time or any other property.
  - Quantity of diluent, inhibitor (or any other additive) if any which are required to be mixed in varnish to maintain viscosity, gel time or any other property.
  - Details of Thermal Endurance test conducted to establish class of insulation.
  - Sample of Varnish/ Resin for trial/ testing at BHEL.
- If any deviation in product data, firm may seek approval of same submitting detail justification regarding gelling time, viscosity, color, ratio etc.

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