

		 PRODUCT STANDARD TME DIVISION, BHOPAL TME 2011	TM 20597 REV 00 PAGE: 01 OF 02		
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		<u>SOLVENT LESS SILICONE IMPREGNATING RESIN</u>			
		1.0 General: This specification governs technical requirement of liquid, solvent less, Silicone Impregnating Resin of Class-200 or above. 2.0 Application: Used for vacuum pressure impregnation of traction machines windings. 3.0 Compliance with national standard There is no Indian standard covering this type of material. This is based on BHEL experience. 4.0 Technical Requirement 4.1 Special Features • Resin should be Silicone based preferably transparent yellow in color. • Resin should be very low volatility (suitable for vacuum Pressure impregnation). • Resin should be curable by heat without any formation of cleavage products; Resin should also cure in thick layers, even in contact with air, tack-free and without the formation of bubbles. • The resin should be remarkably insensitive during curing to the influence of various kinds of insulating materials. • The resin can be processed at temperatures up to a maximum of 80°C to reduce viscosity. • The resin should confirm to fire safety requirements defined in UL 94 V0. 4.2 Processing The resin should be capable for following VPI process • The electrical component to be impregnated is dried at elevated temperature under vacuum (0.5-5 mbar) in the impregnation vessel. • To accelerate impregnation, pressure (2-5 bar) is applied until impregnation is completed. • The electrical part is lifted from the impregnation vessel and excessive resin drips off. Thickness of the surface coating should be < 50 µm to exclude cracks due to differing thermal expansion of materials. • Curing is done at 200°C, 12 hours or else recommended by manufacturer.			
	Revision: 00 Date: 19/12/2020	Distribution TXM TNX TME	Qty. 2 1 2	Approved:  (S. P. Singh) Prepared:  (Prasad Telang)	Checked:  (Vikas Rawtiya)



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Below are desired typical properties of resin.

Un cured resin properties			
S. No.	Characteristics	Typical Requirement	Test Method
1	Color	Yellow	-
2	Viscosity, dynamic at 25 °C	1000 mPa.s	DIN 51562
3	Viscosity, dynamic at 80 °C	95 mPa s	DIN 51562
4	Density at 25 °C	1.12 g/cm ³	DIN 51757
5	Refractive index at 25 °C	1.50	-
6	Shelf life at room temperature	More than 9 months	-

Cured resin properties (cured for 16 h at 150°C)			
S. No.	Characteristics	Typical Requirement	Test Method
1	Appearance	clear, transparent	-
2	Density at 25°C	1.16 g/cm ³	-
3	Hardness Shore D	65	DIN 53505
4	Flexural strength at 25 °C	30 N/mm ²	DIN EN ISO 178
5	Thermal conductivity at 50 °C	0.2 W/K m	DIN 52612
6	Specific heat at 0 - 100 °C	1.45 J/(g.K)	-
7	Volume resistivity ρ_v at 23 °C	$1.8 \times 10^{17} \Omega \text{ cm}$	IEC 60093
8	Dielectric strength (50 Hz) at 23 °C a) surrounding medium: electrical insulating mineral oil	27 kV/mm	IEC 60243-1

5.0 Storage & Shelf Life

The shelf life of resin should be more than 9 months or above when stored at room temperature. The 'Best use before end' date should be mentioned on each drum/ container.

6.0 Test certificate

Three copies of test certificates shall be supplied for each lot, unless otherwise specified on order. In addition, the supplier shall ensure to enclose one copy of the test certificate along with their dispatch documents to facilitate quick clearance of the material.

The test certificate shall bear the following information: TM20596, BHEL purchase Order No. , Supplier's Name/Grade/Identification No., Weight, and Packet/Container/Drum No., Properties of test as per this standard.

7.0 Approved Grade

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

1. SILRES H62C of M/s Wacker Chemie AG

Notes:

1. Any other grade can be offered against this specification, subject to meeting material properties as per this specification and prior approval of BHEL.
2. For any other grades supplier to submit Technical data sheet, MSDS, test certificate as per this specification from NABL/ any internationally accredited lab.
