

Traction Machine Engineering

TME/PQR/Polyester Varnish

Date: 21.06.25

Technical Pre-Qualification Requirement for polyester/polyeterimide based varnish system for VPI of Traction Machines

The Pre-Qualification Criteria for polyester/polyeterimide based varnish system for VPI of Traction Machines is as under:

Sl. No.	Description	Vendor to comment	
		Complied / Not complied	Supporting relevant document to be submitted
1.	Impregnating varnish should be polyester/polyeterimide based only	Yes/No	-
2.	Acceptable grades (as per RDSO document MPMI NO. 153/92) are : i) RE009 of M/s Rotomac Electricals ii) Dobeckan FT 2005/500 EK of M/s Elantas – Beck	-	Name of the grade to be informed

Note:

- 1) Any other equivalent grade of polyester based class-200 VPI varnish as referred at S.No. 2 above, shall be taken up for development separately.**

Prepared By	Approved By
 Shishu Pal (Sr.Mgr./ TME)	 Vikas Rawtiya (Sr.DGM./ TME)



**भारत सरकार
रेल मंत्रालय**

**GOVERNMENT OF INDIA
MINISTRY OF RAILWAYS**

**डीजल विद्युत लोकोमोटिव के कर्षण मशीनों में
प्रयोग होने वाले
रेसिन एवं वार्निश**

RESINS & VARNISHES FOR TRACTION MACHINES

USED ON

DIESEL ELECTRIC LOCOMOTIVES

**च.य.एम.आई. संख्या १५३/९२ (संशोधन - ०४)
सितम्बर, २०१४**

**MPMI NO. 153/92 (Revision-04)
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**अनुसंधान अभिकल्प एवं मानक संगठन
लखनऊ - २२६०११**

**RESEARCH DESIGNS & STANDARDS ORGANISATION
MANAK NAGAR, LUCKNOW – 226011.**

RESINS & VARNISHES FOR TRACTION MACHINES USED ON DIESEL ELECTRIC LOCOMOTIVES

1. OBJECT

Periodic overhaul of traction machines, which is done by Diesel locomotive sheds and workshops, is a very important aspect of regular diesel locomotive maintenance. In addition, there are a number of Railway units, which undertake rehabilitation/rewinding of traction machines, viz., DMW/Patiala and the workshops at Golden Rock, Parel, Jamalpur, Kharagpur and Jaipur. Use of unsuitable/incorrect varnishes during overhaul or rewinding can lead to failure of insulation. MP.MI.-153/92 was compiled in November '92 with a view to informing various units about the standard varnishes and their application details. The standardization carried out in this MI was based on laboratory evaluation tests done by BHEL and subsequent evaluation in the field by RDSO and users.

The insulation scheme has been upgraded in many traction machines since the issue of the said MI. Many new and improved varnishes/resins have been tried out successfully, thus necessitating that this MI be revised. Fourth revision of MP.MI.-153/92 is therefore, being issued to bring out the latest recommendations in respect of varnishes and resins to be used on traction machines.

2. PROPERTIES REQUIRED FROM VARNISHES

2.1 Mica Bonding Varnishes

- Complete flexibility in C-stage.
- Flexibility retention even on prolonged aging.
- Good adhesive strength.
- Quick drying and curing property.
- Used as binder in glass mica or Nomex mica tapes, flexible mica sheets and wrappers.

2.2 Laminating Varnishes

- High bonding strength.
- Semi rigid cured film.
- Thermosetting properties - used for moulding under heat and pressure.
- Some flexibility after curing to take-up twisting of coils during armature winding.
- Used for binding the conductors in a coil and for providing a void free compact interturn in the slot portion.

2.3 Impregnating Resins

- Short and lower temperature curing.
- Tough elastic bonding.
- Long activated resin (useful) life.
- Excellent dielectric properties.
- Good resistance to chemicals.
- Long storage and pot life.
- Negligible losses during VPI processing.

Impregnating resins could be of solvent or solventless type. Use of solvent type impregnating varnishes on traction machines should however, be discontinued.

2.4 Finishing Varnishes

- Excellent resistance to moisture, mild acids and alkalis.
- Fast curing properties.
- Good adhesion to most organic and inorganic materials.
- Good mechanical and electrical properties.
- High arc resistance and track resistance.

These varnishes are employed for providing a final coating on the surface of end windings and other insulated portions of the wound armature.

2.5 Filling Putty

- Quick drying and curing property in thick sections.
- High electrical strength.
- Non-conducting filters.
- Consistency.

3. RECOMMENDED PRODUCTS

The evaluation tests show that amongst the indigenously available class H (or higher class) varnishes, which are commonly used for such applications, no varnish meets all the requirements simultaneously. The best available alternatives, which are compatible with the insulation scheme of the machine, have therefore, been selected for adoption.

- 3.1 The recommendations are detailed in **Annexure A** along with brief application and curing details. It may be added that certain precautions have to be taken by the staffs while using these products. It is therefore, necessary that manufacturers' recommendations for use must be followed while using these products.
- 3.2 For complete curing, the armatures/coils should be maintained at the prescribed temperature for the prescribed time and therefore, the time required to raise the temperature of the armatures/coils to its prescribed value has not been included in this table. This period can be as high as 4 to 6 hours and should be allowed over and above the curing time.
- 3.3 In most baking ovens, the job temperature is lower than the thermostat setting. Correct armature/coil temperature should be ensured by conducting trials on each oven and for each type of armature.
- 3.4 Proper curing of varnishes at each stage is very essential to obtain their declared properties. Whereas it is the duty of the manufacturers of built up mica products, like glass mica tapes, kapton mica tapes to ensure proper solvent removal, it is for the rewinding shops to ensure that correct moulding cycle is followed in manufacture of armatures/coils and prescribed baking schedule is followed for curing of impregnating varnishes after winding and Vacuum Pressure Impregnation (VPI).
4. The declared properties, which have been tested and established, and test methods of varnishes are given in the attached format (**Annexure B**) for guidance. Rewinding shops should test these products and ensure that the properties match with these values. Acceptance tests for varnishes & resins are added at **Annexure-E**. The test may be conducted at the manufacturer's premises for each lot supplied, as facilities in Railway workshops may not be available.
5. Addresses, phone and fax numbers of the authorized distributors of manufacturers of varnishes & resins are given in **Annexure – D**.

MPMI NO. 153/92 (Revision-04) Annexure - A

S.N.	TYPE	APPROVED BRANDS (Manufacturer)	HOW TO USE	CURING SCHEDULE
1.	Mica bonding for insulating tapes	- Xiameter RSN 0994 Resin - RE 3440 (Rotomac)	For conveyorised impregnation & coating of machine for glass mica tapes. Apply by brush on dried Nomex paper. Apply by brush for inter layer. Apply by dip & bake	<u>Xiameter RSN 0994 Resin:</u> General application Initial: 1 hr. at 135 - 140°C Final: 6 – 8 hrs. at 200 to 220°C Or: 6 hrs. at 250°C
	Mica bonding for V-cone & segment	- RE 3440 (Rotomac) - Sahney AV resin	Conveyor belt system – varnish is allowed to drip on a bed of mica flakes Conveyor belt system – varnish is allowed to drip on a bed of mica flakes	<u>RE 3440 (Rotomac):</u> 3 to 5 hrs. at 160 to 180° C <u>Sahney AV resin:</u> 3 to 5 hrs. at 170 to 195° C
2.	Laminating and coil moulding	- Xiameter RSN 2104 Resin (For laminating) - Xiameter RSN 0996 Resin (For coil moulding)	Brush application	<u>Xiameter RSN 2104 Resin:</u> Pre curing : at 160°C for 2 hrs. Final curing : at 160°C for 1 hr. Post curing : at 200°C for 24 hrs. depending upon section. <u>Xiameter RSN 0996 Resin:</u> Slot section coil 170°C to 180°C – 15 to 20 min. Cool down to 40 to 50°C before releasing the pressure.
3.	Putty for application behind commutator riser	- Putty 015 (Rotomac) - Putty H 200 (Intaf)	Apply by hand using a flat wooden strip	90°C for 8 hrs. 150°C for 4 hrs.
4.	Putty/compound between split field coils and gaps at lead/coil turns	RTV 1080 (Dow Corning)	RTV 1080: Apply by brushing or spraying before VPI.	No separate curing required if job is heated before VPI. Else, cure at 150°C - 160°C for 4 - 6 hrs.

MPMI NO. 153/92 (Revision-04) **Annexure - A**

S.N.	TYPE	APPROVED BRANDS (Manufacturer)	HOW TO USE	CURING SCHEDULE				
5.	Impregnating (solventless)	- Dobeckan FT 2005/ 500 EK (Elantas-Beck) Diluent V Inhibitor UP 1 - RE – 009 (Rotomac) - Elmotherm H-71A (Elantas - Beck)	- Dobeckan FT 2005/ 500 EK : Can be applied by dipping but suitable particularly for VPI. - RE 009 (Rotomac): Resin must be thoroughly blended with catalyst before use. The measured quantity of (1% by wt.) should be added. Can be applied by dipping but suitable for VPI. - Elmotherm H-71A (Elantas -Beck): Can be applied by dipping but suitable particularly for VPI. Thinner 218 addition is necessary to adjust the viscosity for this application.	- Dobeckan FT – 2005/500 EK (Elantas -Beck): 10-12hrs. at 160°C - RE – 009 (Rotomac): 2 to 3hrs. at 160°C or, 4 to 6hrs. at 150°C or, 6 to 8hrs. at 135°C - Elmotherm H-71A (Elantas -Beck): 8 hrs. at 150°C				
6a.	Finishing (Anti Tracking) (All armatures & main field / interpole coils of DC traction machines & stator / rotor of traction alternators)	<table><tr><th>Oven Curing</th><th>Room Temp. Curing</th></tr><tr><td> - RE-118 (Red) (Rotomac) - Ultimeg 2000-372RH (PRS Permacel) - RE-120 (Rotomac) in two packs </td><td> - SI 620 (Dow Corning) in single pack - DC 1-2620 (Dow Corning) - Ultimeg 2000-372RH (PRS Permacel) - RE-120 (Rotomac) in two packs </td></tr></table>	Oven Curing	Room Temp. Curing	- RE-118 (Red) (Rotomac) - Ultimeg 2000-372RH (PRS Permacel) - RE-120 (Rotomac) in two packs	- SI 620 (Dow Corning) in single pack - DC 1-2620 (Dow Corning) - Ultimeg 2000-372RH (PRS Permacel) - RE-120 (Rotomac) in two packs	- RE 118 (Red) (Rotomac): Preheat armatures to 60-80°C in an air circulated oven then remove. Contents of supplied anti-tracking varnish [RE 118 (Red)] should be mixed thoroughly before application. Brush or spray the contents on armatures to give a good coat and cure in an air circulated oven as per curing schedule mentioned. - SI 620 (Dow Corning): Can be applied by spraying, dipping, brushing or flow coating. For spraying, thinner coatings can be achieved by diluting SI 620 Silicone Varnish with dry xylene or toluene. - DC 1-2620 (Dow Corning): To be applied by brushing or spraying. For spraying thinner coatings can be achieved by diluting DC 1-2620 Silicone Varnish with dry xylene or toluene. - Ultimeg 2000-372RH (PRS Permacel): It is a single component and can be applied by applied by spraying, dipping or brushing directly. Shake the container well before opening.	- RE – 118 (Red) (Rotomac): 2 to 3 hrs. at 100°C Followed by 4 – 5 hrs. at 150°C-160°C - SI 620 (Dow Corning): 1Hr. at room temperature - DC 1-2620 (Dow Corning) : 1. Dry touch @ RT: - 25 minutes. 2. Final cure @ RT: – 72 Hrs. - Ultimeg 2000-372RH (PRS Permacel): Curing time @ 21°C - 1. Touch dry: - 45 mins. 2. Hard dry: - 60-90 mins. 3. Full dry: - 24-48 hrs. Or, Curing time can be accelerated by heating for 2-3 hrs at 80°C. - RE120 (Rotomac) in two packs:
Oven Curing	Room Temp. Curing							
- RE-118 (Red) (Rotomac) - Ultimeg 2000-372RH (PRS Permacel) - RE-120 (Rotomac) in two packs	- SI 620 (Dow Corning) in single pack - DC 1-2620 (Dow Corning) - Ultimeg 2000-372RH (PRS Permacel) - RE-120 (Rotomac) in two packs							

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➤ Manufacturers' addresses at Annexure – C

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S.N.	TYPE	APPROVED BRANDS (Manufacturer)	HOW TO USE	CURING SCHEDULE
			RE-120 (Rotomac) in two packs: It is a two component modified polyester air drying, class 180 ° C varnishes. It can be applied by spraying, dipping or brushing after mixing 100 parts by wt. of component A and 23 parts by wt. of component B. Varnish may be thinned after mixing the two components, if necessary, with MAC COAT® Thinner TH-02 in very small proportions.	Curing time @ 30°C – - Dust free dry :- 2 hours - Touch dry :- 6 hours - Thorough Cure:- 72 hours Or, Curing time @ 80°C – - Dust free dry: - 10 mins. - Touch dry: - 20 mins. - Thorough Cure:- 1 hours
6b.	Finishing (Anti Tracking) (AGs & field coils of TM 4601/ TM 4603)	- Epoxy Gel Coat (Red) (Elantas -Beck) - Bectol (Red) (Elantas -Beck) - DC 1-2620 (Dow Corning) - SI 620 (Dow Corning) in single pack - Ultimig 2000-372 RH (PRS Permacel)	RE-120 (Rotomac) in two packs: It is a two component modified polyester air drying, class 180 ° C varnishes. It can be applied by spraying, dipping or brushing after mixing 100 parts by wt. of component A and 23 parts by wt. of component B. Varnish may be thinned after mixing the two components, if necessary, with MAC COAT® Thinner TH-02 in very small proportions.	Curing time @ 30°C – - Dust free dry :- 2 hours - Touch dry :- 6 hours - Thorough Cure:- 72 hours Or, Curing time @ 80°C – - Dust free dry: - 10 mins. - Touch dry: - 20 mins. - Thorough Cure:- 1 hours

MPMI NO. 153/92 (Revision-04) Annexure - A

S.N.	TYPE	APPROVED BRANDS (Manufacturer)	HOW TO USE	CURING SCHEDULE
7.	Epoxy based potting compound (Field coils of TM 4601 & 4603)	SIB4302A + SIB4302B (ISOLA)		4 – 6 hrs. at 160 ± 5

Dobekan FT 2005/500 EK (Elantas – Beck)			
S.No	PROPERTY	VALUE	TEST METHOD
1	Density	1.054	IS:10026 - 2
2	Viscosity at 27°C + 2°C / 23°C (Brookfield)	480-520 mPa.s	IS:10026 – 2 / IS:3944 – 1966 Cup 4
3	Flash point	32°C	IS:10026 - 2
4	Ability to cure	OK	IS : 10026 - 2
5	Gelling time at 118 °C / 120 °C	20-40 min	ISO:2535 / IEC:455-2-2
6	Drying in thin film at 120 °C / 1 h	Tackfree	IS : 10026 – 2
7	Electric strength at 27°C+2°C KV/mm After immersion in water for 24 hrs.	115 68	IS:10026 - 2
8	Dissipation factor	0.004	IEC : 464 – 2 & IEC:455-2
9	Pot life	Six months	IEC : 455 - 2
10	Bond Strength	215	IS:10026-2
11	Thermal Endurance	180 °C	IEC:216 (Part 1&3)
12	Volume Resistivity in air at 25°C at 155°C & after immersion in water	10E15 10E12 10E15	IS:10026-2

Elmotharm H 71A (Elantas – Beck)			
S.No	PROPERTY	VALUE	TEST METHOD
1	Colour and appearance	Brown clear	
2	Viscosity at 27°C ± 2°C Viscosity at 23°C	65 – 75 secs	DIN 53211 Cup 4 /IS 3944-1966 Cup 4
3	Solids content(1.5 g/150°C?2h)	45 – 47%	----

Epoxy Gel Coat (Red) (Elantas – Beck)			
S.No	PROPERTY	VALUE	TEST METHOD
	Colour appearance	Reddish brown opaque, thixotropic	----
1	Density	1.1	IS:10026 - 2
2	Viscosity at 27°C ± 2°C / 25°C (Brookfield)	45000- 55000mPa.s 85000mPa.s	IS:10026 – 2 / IS:3944 – 1966 Cup 4
3	Ability to cure	OK	IS:10026 – 2
4	Gelling time at 25°C with hardener 758 (100 ; 10pbw)	55-65 min.	ISO 2535 / IEC:455-2-2
5	Drying in thin film	Hard, Tackfree	IS : 10026 – 2
6	Pot life (hrs)	1.5	IEC : 455 - 2
7	Curing in thick layer 10g/25°C/24 h Resin : hardener 758 (100 : 10 pbw)	Hard, tackfree	

Hardener EH 411 (Elantas– Beck)			
S.No	PROPERTY	VALUE	TEST METHOD
1	Density		IS : 10026 - 2
2	Viscosity at 27°C ± 2°C / 25°C (Brookfield)	10000- 30000mPa.s	IS:10026 – 2 / IS:3944 – 1966 Cup 4
3	Ability to cure	OK	IS : 10026 - 2
4	Pot life at 25°C with Dobeckot 505 C (100 : 50 pbw)	80-120 min.	IEC : 455 - 2

Hardener EH 758 (Elantas– Beck)			
S.No	PROPERTY	VALUE	TEST METHOD
1	Density	----	IS : 10026 - 2
2	Viscosity at 25°C (Brookfield)	15 - 35mPa.s	IS:10026 – 2 / IS:3944 – 1966 Cup 4
3	Ability to cure	OK	IS : 10026 - 2
4	Pot life at 25°C with Dobeckot 505 C (100 : 10 pbw)	30 min.	IEC : 455 - 2

Bectol (Red) (Elantas– Beck)			
S.No	PROPERTY	VALUE	TEST METHOD
1	Colour and appearance	Red opaque	IS : 10026 - 2
2	Viscosity at 23°C	50 –150 secs	DIN 53211 / 4 mm cup / IS 3944-1966 Cup 4
3	Solids content 1.5 g/150°C/2h	53 –57%	

RE 3440 (ROTOMAC)			
S.No	PROPERTY	VALUE	TEST METHOD
1	Density	0.963+0.980	IS : 10026 - 2
2	Viscosity at 27°C ± 2°C CPS	600-1000	IS : 10026 – 2 / IS : 3944-1966 Cup 4
3	Flash point	22°C	IS : 10026 - 2
4	Ability to cure	OK	IS : 10026 - 2
5	Non volatile content	40 + 2	IS : 10026 - 2
6	Thermal Endurance	155°C	IEC:216 (Part 1&3)

RE – 009 (Rotomac)			
S.No	PROPERTY	VALUE	TEST METHOD
1.	Density	1.09 + 0.02	IS:10026 - 2
2.	Viscosity at 27°C ± 2°C (CPS)	660 + 260	IS:10026 – 2 / IS:3944 – 1966 Cup 4
3.	Flash point	93°C	IS:10026 - 2
4.	Ability to cure	OK	IS:10026 - 2
5.	Gelling time	15 –25 minutes	ISO 2535 / IEC:455-2-2
6.	Drying in thin film	2 – 3 hrs.	IS:10026 - 2
7.	Electric strength at 27°C±2°C KV/mm	100 min.	IS:10026 - 2
8.	Dissipation factor P.C.	0.9 max.	IEC : 464 – 2 & IEC:455-2
9.	Non volatile content P.C.	100	IS:10026 - 2
10.	Pot life	6 months	IEC : 455 - 2
11.	Bond Strength	25	IS:10026-2
12.	Thermal Endurance	220°C	IEC:216 (Part 1&3)
13.	Volume Resistivity in air & after immersion in water	4 x 10 ⁹	IS:10026-2

Putty – 015 (Rotomac)			
S.No	PROPERTY	VALUE	TEST METHOD
1.	Density	1.19 + 0.01	IS:10026 - 2
2.	Viscosity at 27°C ± 2°C cps	320 - 380	IS:10026 – 2 / IS:3944 – 1966 Cup 4
3.	Flash point	91°C	IS:10026 - 2
4.	Ability to cure	OK	IS:10026 - 2
5.	Gelling time	15 –30 minutes	ISO 2535 / IEC:455-2-2
6.	Electric strength at 27°C ± 2°C KV/mm	10 - 14	IS:10026 - 2
7.	Pot life	6 hrs.	IEC : 455 - 2
8.	Dissipation factor P.C.	0.012	IEC : 464 – 2 & IEC:455-2
9.	Thermal Endurance	155 - 160°C	IEC:216 (Part 1&3)
10.	Volume Resistivity in air & after immersion in water	2.2*10 ¹³ 1.2*10 ¹²	IS:10026-2

RE – 118 (Red) (Rotomac)			
S.No	PROPERTY	VALUE	TEST METHOD
1.	Density	1.12 + 0.02	IS:10026 - 2
2.	Viscosity at 27°C ± 2°C (CPS)	150 -225	IS:10026 – 2 / IS:3944 – 1966 Cup 4
3.	Flash point	40°C	IS:10026 - 2
4.	Ability to cure	OK	IS:10026 - 2
5.	Drying in thin film	4 – 5 hrs.	IS:10026 - 2
6.	Electric strength at 27°C ± 2°C KV/mm	90 min.	IS:10026 - 2
7.	Dissipation factor P.C.	0.8	IEC : 464 – 2 & IEC:455-2
8.	Non volatile content P.C.	58 + 2	IS:10026 - 2
9.	Pot life	1 month	IEC : 455 - 2
10.	Bond Strength Kgs.(lbs)	12	IS:10026-2
11.	Thermal Endurance	200	IEC:216 (Part 1&3)
12.	Volume Resistivity in air & after immersion in water	1.3*10 ¹⁷ 1.5*10 ¹⁶	IS:10026-2

Putty H200 (INTAF)			
S.No	PROPERTY	VALUE	TEST METHOD
1	Density	1.19 ± 0.01	IS:10026 - 2
2	Viscosity at 27°C ± 2°C CPS	300-400	IS:10026 – 2 / IS:3944 – 1966 Cup 4
3	Flash point	>200°C	IS:10026 - 2
4	Gelling time	15 –30 minutes	ISO 2535 / IEC:455-2-2
5	Ability to cure	OK	IS:10026 - 2
6	Hardness, Typical Shore D	75 - 80	JIS K-6911-1979, Clause 5.16.1
7	Electric strength at 27°C ± 2°C KV/mm	10 - 15	IS:10026 - 2
8	Dissipation factor at room temp. at 125°C	0.012 0.020	IEC : 464 – 2 & IEC:455-2

Xiameter RSN 2104 Resin			
S.No	PROPERTY	VALUE	TEST METHOD
1.	Density	1.04	IS:10026 - 2
2.	Viscosity at 27°C ± 2°C	19	IS:10026 – 2 / IS:3944 – 1966 Cup 4
3.	Ability to cure	OK	IS:10026 - 2
4.	Gelling time	11	ISO 2535 / IEC:455-2-2
5.	Dissipation factor	0.006	IEC : 464 – 2 & IEC:455-2
6.	Non volatile content	59	IS:10026 - 2
7.	Pot life (hrs.)	20	IEC : 455 - 2
8.	Shelf life: A) from the date of receipt of material at store B) from the date of manufacture whichever is latest	9 months 12 months	---

Xiameter RSN 0994 Resin			
S.No	PROPERTY	VALUE	TEST METHOD
1.	Density	1.02	IS:10026 - 2
2.	Viscosity at 27°C ± 2°C	46	IS:10026 – 2 / IS:3944 – 1966 Cup 4
3.	Ability to cure (minutes)	OK	IS:10026 - 2
4.	Gelling time (minutes)	25	ISO 2535 / IEC:455-2-2
5.	Electric strength at 27°C ± 2°C KV/mm	61.9	IS:10026 - 2
6.	Dissipation factor	0.008	IEC : 464 – 2 & IEC:455-2
7.	Non volatile content (%)	51	IS:10026 - 2
8.	Shelf life: A) from the date of receipt of material at store B) from the date of manufacture whichever is latest	9 months 12 months	---

SI 620 (Dow Corning)			
S.No	PROPERTY	VALUE	TEST METHOD
1.	Viscosity at 27°C ± 2°C	20	IS:10026 – 2 / IS:3944-1966 Cup 4
2.	Flash point	32°C	IS:10026 - 2
3.	Ability to cure	OK	IS:10026 - 2
4.	Pot Life	1 year	IEC:455 - 2

Xiameter RSN 0996 Resin			
S.No	PROPERTY	VALUE	TEST METHOD
1.	Density	1.01	IS:10026 - 2
2.	Viscosity at 27°C ± 2°C	1.50 poises	IS:10026 – 2 / IS:3944-1966 Cup 4
3.	Flash point	32°C	IS:10026 - 2
4.	Ability to cure	OK	IS:10026 - 2
5.	Electric strength at 27°C ± 2°C	1600 v/mil	IS:10026 - 2
6.	Dissipation factor • At 100 Hz. • At 1 M Hz.	0.008 0.005	IEC:464 – 2 & IEC: 455-2
7.	Shelf life at ambient temp.	12 months	IEC:464 - 1
8.	Volume Resistivity in air & after immersion in water	2.0*10 ¹⁴	IS:10026-2

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9.	Shelf life: A) from the date of receipt of material at store B) from the date of manufacture whichever is latest	9 months 12 months	---
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DC 1 - 2620 (Dow Corning)			
S.No	PROPERTY	VALUE	TEST METHOD
1.	Density	1.11 (SG)	CTM0768
2.	Viscosity at 27°C ± 2°C (CPS)	144	CTM004
3.	Flash point	27°C	CTM0021A
4.	Ability to cure	Air drying	NA
5.	Drying in thin film	72 Hr.@RT	CTM021A
6.	Electrical strength at 27°C ± 2°C KV/mm	17	CTM0114
7.	Dissipation factor @ 100 Hz.	0.0025	CTM0112
8.	Non-Volatile content	60	CTM0208
9.	Volume Resistivity in air & after immersion in water	8.6 X 10 ¹³	CTM0249

Sahney AV resin			
S.No	PROPERTY	VALUE	TEST METHOD
1.	Specific gravity @ 25°C (avg.)	1.009	IS:10026 - 2
2.	Viscosity @ 25°C (Brookfield), CPS, avg.	600 -1000	IS:10026 - 2
3.	Flash point (Pensky-Martens closed cup)	22°F	IS:10026 - 2
4.	Ability to cure	OK	IS:10026 - 2
5.	Solids % by weight	40 ± 4	IS:10026 - 2
6.	Thermal Endurance	155 deg. C	IEC: 60216 (Part 1&3)
7.	Shelf life @ 25°C	12 months	IEC:464 - 1

Ultimeg 2000-372 RH (PRS Permcel)			
S.No	PROPERTY	VALUE	TEST METHOD
1.	Specific gravity	<1.00	IS:10026 - 2
2.	Viscosity @ 25°C (Sec.)	16+/- -2 seconds	BS3900 PTA6 B4 flow cup
3.	Flash Point	27°C Nominal	IS:10026 - 2
4.	Drying time		IS:10026 - 2
	a) Touch dry (minutes)	45	
	b) Hard dry (minutes)	60-90	
	c) Full / thorough dry (hours)	24	
5.	Dielectric strength @ RT	75 KV / mm	IS:10026 - 2
6.	Non-volatile matter	35 +/- 3 %	IS:10026 - 2

RE-120 (Rotomac)			
S.No	PROPERTY	VALUE	TEST METHOD
1.	Density at 27± 2°C (in gms/ml) Component A	1.00 ± 0.02	IS:101 (Part 1/Sec. 7) - 1987
	Component B	0.99 ± 0.02	
2.	Viscosity at 27± 2°C, Ford cup B4, seconds Component A	60 - 100	IS:10026 – 2 / IS:3944 -1966 Cup 4
	Component B	25 - 45	
3.	Flash Point (Closed Cup); after mixing component A and B	30°C, minimum	IS:101 (Part 1/Sec 6) - 1987
4.	Dielectric strength, KV/mm; tested after 1 hr. force drying at 80 °C a) At room temperature b) After 24 hrs. water immersion	80, minimum 50, minimum	IS:10026 (Part -2) - 1999
5.	Tracking resistant at 200 V; tested after 1 hr. force drying at 80 °C	100 drops, minimum	IS:10026 (Part – 2) - 1999
6.	Flexibility (1/8" mandrel); tested after 1 hr. force drying at 80 °C	Passes without any visual damage.	IS:10026 (Part – 2) - 1999

MPMI NO. 153/92 (Revision-04) Annexure - C**ADDRESSES OF THE APPROVED MANUFACTURERS OF VARNISHES & RESINS**

S. No.	Approved Manufacturers	Address
1.	Dow Corning	M/s Dow Corning India Pvt. Ltd., Wockhardt Towers, East Wing, Level 2, Bandra-Kurla Complex, Bandra-East, Mumbai – 400 051.
2.	ROTOMAC	- M/S Rotomac Electricals Pvt. Ltd., 1-1624, Chittaranjan Park, New Delhi. PIN – 110019. - M/S Rotomac Electricals Pvt. Ltd., 105, Park Street, Calcutta – 700016.
3.	INTAF	M/s Industrial Tapes & Fabrics Pvt. Ltd., 1/1, Vansittart Row, 3 rd Floor, Opp. Telephone Bhawan, Calcutta – 700001.
4.	Elantas -Beck	M/s Elantas Beck India Ltd., 147, Mumbai Pune Road, Pimpri, Pune – 411018.
5.	ISOLA	M/s VON ROLL ISOLA S.P.A. Fabbricazione Isolanti Elettrici, 20121, Milano, ITALIA.
6.	Sahney	M/s Sahney Kirkwood Pvt. Ltd., E-81, MIDC Ambad, Nashik – 422 010.
7.	PRS Permacel	M/s PRS Permacel Pvt. Ltd., 63, Bombay Samachar Marg, Mumbai-400 001.

MPMI NO. 153/92 (Revision-04) **Annexure - D****ADDRESSES OF THE AUTHORISED DISTRIBUTORS OF MANUFACTURERS OF
VARNISHES & RESINS**

S.No.	Approved Manufacturers	Address of Authorised Agents
1.	Dow Corning Co, USA	- Mr. Praful Modi, Electrical Micanite Corporation, 7th floor, 11 Pollock Street, Kolkata – 700001. - Mr. Mahesh Mehta, Oriental Enterprises, 45, Abdul Rehman Street, 1st floor, P.O. BOX No. 3205, Mumbai – 400003.
2.	Elantas Beck India Ltd., Pune	<u>NORTHERN REGION</u> i) Bindra Automotive Systems Pvt. Ltd., 707, Bhikaji Cama Bhawan, Bhikaji Cama Place, New Delhi-110066. Phone/Fax: 011-26100322, 26191170, 26170686. ii) Vishal Enterprises, S.C.O. 265,, 2nd floor, Sector-32-D, Chandigarh-160009. Phone/Fax: 0172-3919206 / 2603082. iii) Shreekrishna Electrical Sales, Shop No. 3, New Market, Shastri Nagar Crossing, Sigra, Varanasi-221002. Phone/Fax: 0542-2222873 / 2585756. iv) La Nova, 110/232, Jawar Nagar. Kanpur-208001. Phone: 0512-2543165. v) Allied Agencies, Mirza Ismail Road, Opp All India Radio, Jaipur- 302001. Phone/Fax: 0141-374204, 366455 / 368164. <u>EASTERN REGION</u> i) British Electric manufacturing Co., 31, Ezra Street, Kolkata-700001. Phone/Fax: 033-22218015, 22150931 / 2215632. ii) CMD Techno, Shop No. 10A, Ground Floor, 55 Ezra Street, Kolkata-700001. Phone/Fax: 033-30286856, 30286859 / 22155231, 22157472. iii) Hatim & Co., 90 Ripon Street, Kolkata-700016. Phone/Fax: 033-22298429, 22298369 / 2229982. iv) Component Engineers, 9/9, New Market, Prajapati Bhawan, Rourkela- 769001. Phone/Fax: 0661-2506291, 2507657 / 2506291.

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2.	Elantas Beck India Ltd., Pune	<u>WESTERN REGION</u> i) Mahesh Vidut Udyog / Mahesh Enterprises, 'Kabra House' Laheripura New Road, Vadodara-390001. Phone/Fax: 0265-2553788, 2424714 / 2427615. ii) Jjagruti Electric Stores, 1053, Kothari Pole, Gandhi Road, Ahmedabad-380001. Phone/Fax: 079-22147241 / 22143765. iii) Basant Electricals, 564/2, M.G. Road, Basant Niwas, Gandhi Statue, Indore-452001. Phone/Fax: 0731-22431808, 22433429, 22431606 / 22434790. iv) Engineering Services, A-42, T-Market, Nandini Road, Post Office Khusipar, Bhilai-490011. Phone/Fax: 0788-2296893, 2223571 / 2355241. v) Indian Monitor Company, 1049, Shukrawar Peth, Tilak Road, Opp Hira Baug, Pune-411002. Phone/Fax: 020-4471561, 4476111 / 4490762. vi) G R Traders, 63 Trikamji Gheeya Marg,(Kitchen Garden Road), Mangaldas Road, Lohar Chawl, Post Box No. 2779, Mumbai-400002. Phone/Fax: 022-22082487, 22018316 / 22065184. vii) Magnet Wires & Insulation, 358, Kaliandas Udyog Bhawan, Mumbai-400025. Phone/Fax: 022-24228113, 24220983 / 24306596. viii)Shree Marketeers, 714 B, Raviwar Peth, Pune-411002. Phone/Fax: 020-24471583, 2712564 / 24467656. ix) Shriniwas Enterprises, 5/1, Bhagyanagar Society, Behind Market Yard, Bibewadi, Pune-411037. Phone/Fax: 020-4268569, 4260528 / 4268569. <u>SOUTHERN REGION</u> i) Hyderabad Electric Syndicate, 4-1-314, Bank Street, Hyderabad-500001. Phone/Fax: 040-24753834, 24753779 / 24753834 ii) Shahani India Company, No 3, 5th Cross, Kilari Road, Bangalore-560053. Phone/Fax: 080-2281808, 2380170. iii) Sri Vijaydurga Investments & Agencies Pvt. Ltd., Flat No. 13, A Block, navrathna Apts., 17th Cross Malleswaram, Bangalore-560055. Phone/Fax: 080-3311509, 3347043. iv) Modi & Modi, Modi Enterprises, First Floor, New 300(Old 172), Linghi Chetty Street, Madras-600001. v) Hi-Tech Insulation, No. 14, Old No.11, Francis Joseph Street, Chennai-600001. Phone/Fax: 044-5387786, 5361218. vi) Arvind Elect & Machine Tools, 335, Ramachandra Layout, Ramnagar, Coimbatore-641009. Phone/Fax: 0422-2235373, 2236438 / 2236438.
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2.	Elantas Beck India Ltd., Pune	vii) Packs Sales Corporation, XLI/1929, Banerji Road, Emakulam North, Cochin-682018. Phone/Fax: 0484-2369036 / 2360967. viii) Southern Packeging, #41 jainagar, 3rd Street, Valsarvakkam, Chennai-660087. Phone/Fax: 044-24760077.
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Acceptance Tests for Resins & Varnishes

Dobeckan FT 2005/500 EK (Elantas – Beck)			
S.No	PROPERTY	VALUE	TEST METHOD
1	Density	1.054	IS:10026 - 2
2	Viscosity at 27°C $\pm$ 2°C / 23°C (Brookfield)	480-520 mPa.s	IS:10026 – 2 / IS:3944 – 1966 Cup 4
3	Flash point	32°C	IS:10026 - 2
4	Ability to cure	OK	IS : 10026 - 2
5	Gelling time at 118 °C / 120 °C	20-40 min	ISO:2535 / IEC:455-2-2
6	Drying in thin film at 120 °C / 1 h	Tackfree	IS : 10026 – 2

Elmotherm H 71A (Elantas – Beck)			
S.No	PROPERTY	VALUE	TEST METHOD
1	Colour and appearance	Brown clear	
2	Viscosity at 27°C $\pm$ 2°C Viscosity at 23°C	65 –75 secs	DIN 53211 Cup 4 /IS 3944-1966 Cup 4
3	Solids content(1.5 g/150°C?2h)	45 – 47%	----

Epoxy Gel Coat (Red) (Elantas – Beck)			
S.No	PROPERTY	VALUE	TEST METHOD
1	Colour appearance	Reddish brown opaque, thixotropic	----
2	Density	1.1	IS:10026 - 2
3	Viscosity at 27°C $\pm$ 2°C / 25°C (Brookfield)	45000-55000mPa.s 85000mPa.s	IS:10026 – 2 / IS:3944 – 1966 Cup 4
4	Ability to cure	OK	IS:10026 – 2
5	Gelling time at 25°C with hardener 758 (100 ; 10pbw)	55-65 min.	ISO 2535 / IEC:455-2-2

Hardener EH 411 (Elantas– Beck)			
S.No	PROPERTY	VALUE	TEST METHOD
1	Density		IS : 10026 - 2
2	Viscosity at 27°C $\pm$ 2°C / 25°C (Brookfield)	10000-30000mPa.s	IS:10026 – 2 / IS:3944 – 1966 Cup 4
3	Ability to cure	OK	IS : 10026 - 2

Hardener EH 758 (Elantas– Beck)			
S.No	PROPERTY	VALUE	TEST METHOD
1	Density	----	IS : 10026 - 2
2	Viscosity at 25°C (Brookfield)	15 - 35mPa.s	IS:10026 – 2 / IS:3944 – 1966 Cup 4
3	Ability to cure	OK	IS : 10026 - 2

Bectol (Red) (Elantas– Beck)			
S.No	PROPERTY	VALUE	TEST METHOD
1	Colour and appearance	Red opaque	IS : 10026 - 2
2	Viscosity at 23°C	50 –150 secs	DIN 53211 / 4 mm cup / IS 3944-1966 Cup 4
3	Solids content 1.5 g/150°C/2h	53 –57%	

RE 3440 (ROTOMAC)			
S.No	PROPERTY	VALUE	TEST METHOD
1	Density	0.963+0.980	IS : 10026 - 2
2	Viscosity at 27°C $\pm$ 2°C CPS	600-1000	IS : 10026 – 2 / IS : 3944-1966 Cup 4
3	Flash point	22°C	IS : 10026 - 2
4	Ability to cure	OK	IS : 10026 - 2
5	Non volatile content	40 $\pm$ 2	IS : 10026 - 2

RE – 009 (Rotomac)			
S.No	PROPERTY	VALUE	TEST METHOD
1.	Density	1.09 + 0.02	IS:10026 - 2
2.	Viscosity at 27°C + 2°C (CPS)	660 + 260	IS:10026 – 2 / IS:3944 – 1966 Cup 4
3.	Electric strength at 27°C+2°C KV/mm	100 min.	IS:10026 - 2
4.	Ability to cure	OK	IS:10026 - 2
5.	Gelling time	15 – 25 minutes	ISO 2535 / IEC:455-2-2
6.	Drying in thin film	2 – 3 hrs.	IS:10026 - 2

Putty – 015 (Rotomac)			
S.No	PROPERTY	VALUE	TEST METHOD
1.	Density	1.19 + 0.01	IS:10026 - 2
2.	Viscosity at 27°C + 2°C cps	320 - 380	IS:10026 – 2 / IS:3944 – 1966 Cup 4
3.	Flash point	91°C	IS:10026 - 2
4.	Ability to cure	OK	IS:10026 - 2
5.	Gelling time	15 – 30 minutes	ISO 2535 / IEC:455-2-2

RE – 118 (Red) (Rotomac)			
S.No	PROPERTY	VALUE	TEST METHOD
1.	Density	1.12 + 0.02	IS:10026 - 2
2.	Viscosity at 27°C + 2°C (CPS)	150 -225	IS:10026 – 2 / IS:3944 – 1966 Cup 4
3.	Flash point	40°C	IS:10026 - 2
4.	Ability to cure	OK	IS:10026 - 2
5.	Drying in thin film	4 – 5 hrs.	IS:10026 - 2

Putty H200 (INTAF)			
S.No	PROPERTY	VALUE	TEST METHOD
1	Density	1.19 + 0.01	IS:10026 - 2
2	Viscosity at 27°C + 2°C CPS	300-400	IS:10026 – 2 / IS:3944 – 1966 Cup 4
3	Flash point	>200°C	IS:10026 - 2
4	Gelling time	15 – 30 minutes	ISO 2535 / IEC:455-2-2
5	Ability to cure	OK	IS:10026 - 2

Xiameter RSN 2104 Resin			
S.No	PROPERTY	VALUE	TEST METHOD
1.	Density	1.04	IS:10026 - 2
2.	Viscosity at 27°C + 2°C	19	IS:10026 – 2 / IS:3944 – 1966 Cup 4
4.	Ability to cure	OK	IS:10026 - 2
5.	Gelling time	11	ISO 2535 / IEC:455-2-2

Xiameter RSN 0994 Resin			
S.No	PROPERTY	VALUE	TEST METHOD
1.	Density	1.02	IS:10026 - 2
2.	Viscosity at 27°C + 2°C	46	IS:10026 – 2 / IS:3944 – 1966 Cup 4
3.	Ability to cure (minutes)	OK	IS:10026 - 2
4.	Gelling time (minutes)	25	ISO 2535 / IEC:455-2-2

SI 620 (Dow Corning)			
S.No	PROPERTY	VALUE	TEST METHOD
1.	Viscosity at 27°C + 2°C	20	IS:10026 – 2 / IS:3944-1966 Cup 4
2.	Flash point	32°C	IS:10026 - 2
3.	Ability to cure	OK	IS:10026 - 2

Xiameter RSN 0996 Resin			
S.No	PROPERTY	VALUE	TEST METHOD
1.	Density	1.01	IS:10026 - 2
2.	Viscosity at 27°C + 2°C	1.50 poises	IS:10026 – 2 / IS:3944-1966 Cup 4
3.	Flash point	32°C	IS:10026 - 2
4.	Ability to cure	OK	IS:10026 - 2

DC 1 - 2620 (Dow Corning)			
S.No	PROPERTY	VALUE	TEST METHOD
1.	Density	1.11 (SG)	CTM0768
2.	Viscosity at 27°C $\pm$ 2°C (CPS)	144	CTM004
3.	Flash point	27°C	CTM0021A
4.	Ability to cure	Air drying	NA
5.	Drying in thin film	72 Hr.@RT	CTM021A

Sahney AV resin			
S.No	PROPERTY	VALUE	TEST METHOD
1.	Specific gravity @ 25°C (avg.)	1.009	IS:10026 - 2
2.	Viscosity @ 25°C (Brookfield), CPS, avg.	600 -1000	IS:10026 – 2
3.	Flash point (Pensky-Martens closed cup)	22°F	IS:10026 - 2
4.	Ability to cure	OK	IS:10026 - 2

Ultimig 2000-372 RH (PRS Permcel)			
S.No	PROPERTY	VALUE	TEST METHOD
1.	Specific gravity	<1.00	IS:10026 - 2
2.	Viscosity @ 25°C (Sec.)	16+/- 2 seconds	BS3900 PTA6 B4 flow cup
3.	Flash Point	27°C Nominal	IS:10026 - 2
4.	Dielectric strength @ RT	75 KV / mm	IS:10026 - 2

RE-120 (Rotomac)			
S.No	PROPERTY	VALUE	TEST METHOD
1	Density at 27 $\pm$ 2°C (in gms/ml) Component A	1.00 $\pm$ 0.02	IS:101 (Part 1/Sec. 7) - 1987
	Component B	0.99 $\pm$ 0.02	
2	Viscosity at 27 $\pm$ 2°C, Ford cup B4, seconds Component A	60 - 100	IS:10026 – 2 / IS:3944 -1966 Cup 4
	Component B	25 - 45	
3	Flash Point (Closed Cup); after mixing component A and B	30°C, minimum	IS:101 (Part 1/Sec 6) - 1987
4	Dielectric strength, KV/mm; tested after 1 hr. force drying at 80 °C	80, minimum 50, minimum	IS:10026 (Part -2) - 1999
	a) At room temperature b) After 24 hrs. water immersion		