



**PRODUCT STANDARD
TURBOGENERATOR**

TG -60336

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THIS STANDARD SUPERSEDES THE OLD STANDARD UNDER THE SAME NUMBER C/A.NO: ISE-8-93-06 dt. 26/7/93

EPOXY RESIN ADHESIVE PAPER

1. GENERAL

Epoxy resin adhesive paper as per this specification is a paper, varnished with epoxy resin solution and dried. Epoxy resin which is dry at room temperature ($\leq 25^{\circ}\text{C}$) melts on heating and cures through long temperature action.

2. APPLICATION

Epoxy resin adhesive paper is laid in dry condition and is used for gluing and insulation of laminations (Electrotechnical sheet steel of magnetic shunt) for turbogenerators under the application of heat and pressure.

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3. COMPLIANCE WITH NATIONAL STANDARDS: AND BASIS

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There is no Indian standard covering this type of material. However this standard is based on KUN 561.23, issue Sept. '90.

4. DIMENSIONS AND PROPERTIES: (DIMENSION IN mm)

THICKNESS NOMINAL SIZE SUPPLY	1)		WIDTH	WEIGHT g/m ²	COMPOSITION		BREAK DOWN VOLTAGE VOLTS.
	PRESSED				PAPER g/m ²	EP RESIN g/m ²	
≤ 0.09	0.03 to 0.04	≈ 1000	2)	65 to 80	40 to 45	30 \pm 5	≥ 500

1) Pressed for 15 hrs at appx. 0.1 N/mm^2 at 150°C .

2) Minimum dimension 860.

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AGREED DEPTT.	NAME	SIGN & DATE	SUPERVISED	NAME	SIGN & DATE
T.S.X	P.S. SAXENA	<i>P.S. Saxena</i>	DRAWN		
QAX	S.C. JAIN	<i>S.C. Jain</i>	WORKED	R.C. SHRIVASTAVA	<i>R.C. Shrivastava</i>
TGE	D. KUMAR	<i>D. Kumar</i>	CHECKED	V.C. GOYAL	<i>V.C. Goyal</i>
				G.L. ANAND	<i>G.L. Anand</i>

APPROVED
GM (ISM & GRI) *07. embra*
25.8.93

REV. NO. 03	PREPARED : ISM & GRI	ISSUED : ISM & GRI HARDWAR	DATE : 25-8-93
Dr. 20.10.2011			

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5. MATERIALS:

PAPER: Glazed on both sides, hygroscopic insulation paper as per DIN 6740.

EP RESIN: Araldite AZ15 and hardener HZ15 in ratio 100:30 parts by weight of CIBA.

6. FINISH AND FREEDOM FROM DEFECTS:

The paper must be uniformly varnished and thereby must be transparent. The epoxy resin adhesive paper must be free from cracks and blow-holes, particles, folds or wrinkles, scratches and must not be sticky. The epoxy resin must melt when heated upto 100°C and must cure completely at 150°C in 15 hrs. i.e. to attain a softening temperature of $\geq 50^\circ\text{C}$. Also there should be no crystallised particles of the resin inside the paper.

7. STORABILITY:

The material shall conform to properties as per clause 4 and 6 even after 12 months storage at a temperature equal to or less than 12°C. A higher storage temperature by 10°C, reduces the life to half.

8. TEST METHODS:

The purchaser shall perform the acceptance tests as per S.No.6 and 8.1 of this standard. In case of any other test requirement, it will be mentioned in the purchase order. In case of change in properties of the material, prior approval of the sample of new material from the purchaser shall be necessary.

An indication from the point of view of hazardous material in case of new/change in properties, besides the normal safety specification sheet as per DIN 52900, is to be sent along.

8.1. SAMPLING

One roll of every three rolls of a supply is to be unrolled by 3 metres and a sample of an area approx. 0.5m² is to be taken for the following tests. If the results of these tests are not conforming to the requirements of this specification, samples from the remaining rolls, too, are to be taken after unrolling by 3 m in the same way and are to be tested.

REV. No. 3

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EXEMPTIONS
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When 2 of 3 respective results in case of all these tests are not conforming, the whole supply is to be considered as not conforming to the requirements and hence the supply is to be rejected.

8.2 TEST FOR COMPOSITION:

The weight of paper and resin is to be calculated from the weight of a sample of minimum 1 dm² before and after extraction in acetone till a constant weight is attained.

8.3 DETERMINATION OF FLOWABILITY OF RESIN:

A copper plate is to be placed over a continuously variable heating plate. A piece of epoxy resin adhesive paper, being tested, is to be put on the copper plate which is to be heated slowly. A spatula is moved over the sample in short intervals and the temperature at which the resin starts flowing under reduced pressure is ascertained by viewing through a magnifying glass having 10 times magnification.

8.4 TEST FOR CURING :

Several layers of the material are to be stacked together and are to be cured under light pressure as per clause 6. The softening temperature of the resin is determined as per TGEI-1109 on shavings (chips) of so prepared plate or by determining E modulus as a function of temperature, by suitable method.

b
HW 0920626

8.5 TEST FOR THICKNESS:

A few layers of the material are stacked together and pressed for 15 hrs with a pressure of 0.1N/mm² at 150°C. The thickness of one layer is calculated from the thickness of the stack.

8.6 TEST FOR BREAKDOWN VOLTAGE:

One layer of the material is pressed at 0.1N/mm² for 15 hrs and at 150°C. Thereafter BDV is determined with the help of plate electrodes with rounded edges and by gradual rate of rise of voltage.

8.7 DETERMINATION OF THE BINDER:

Through Infrared spectroscopic analysis, use of specified resin is established.

REV. No. 03

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9.0 TEST CERTIFICATE :

Three copies of the test certificate shall be supplied with the consignment giving the following information:

- BHEL Specification Number
- BHEL order Number
- Supplier's reference
- Batch Number

Test values obtained as per clause 4,5,6 and 8.

10. ACCEPTANCE CRITERION

The material shall be accepted on the basis of the following :

- a) Compliance certificate furnished by the supplier ,
- b) Test certificate furnished by the supplier and / or testing carried out at BHEL .

11. SUPPLY FORM

The sheets are to be supplied on card board bobbins having 50 to 70 mm inner diameter. The length of the bobbin must be more than the width of sheet by minimum 30 mm on each side so that none of the layers projects out and gets damaged.

The bobbin shall be suitably supported at both the projected ends so as to avoid any contact of paper surface with box surface.

12. MARKING AND DESIGNATION

Every roll is to be marked on the inside with the manufacturer's mark, manufacturing date and the number of this specification.

A sheet of 0.09 mm thickness, 1000 mm width and a length of 30 m epoxy resin adhesive paper is designated as sheet 0.09 x 1000 x 30 m - HW EP PAPER.

13. PACKING:

Water proof packing shall be provided to protect the material from ingress of moisture and outside contamination. Small silica gel bags shall also be placed inside. The roll shall be provided with thermal insulation and finally kept in sealed sheetmetal box to prevent mechanical damage during transportation, handling and storage. In case the supplier proposes to incorporate any specific change in the package condition while ensuring water

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proof nature, thermal insulation and mechanical protection, the same shall be specifically indicated and got approved beforehand from BMEL.

14. REJECTION

Non observance of the stipulations of this specification entitles the entire lot to rejection. Parts of the lot not included during testing but found later to be deficient and those with hidden defects can be rejected later.

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15. LIST OF CROSSREFERRED STANDARDS:

- i) DIN 6740
- ii) TGEI-1109 / HW 0980626
- iii) DIN 52900

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29.4.95