

**PRODUCT PURCHASING SPECIFICATION  
TRANSFORMER ENGINEERING DEPARTMENT  
BHEL BHOPAL**

Specification No. **TRE 218**  
Page 1 of 1 Page  
Rev. 01 Dt. : 08.09.2018

**THERMALLY UPGRADED INSULATING KRAFT PAPER**

1. **General** - This specification governs the quality of high density thermally upgraded insulating kraft paper for electrical purposes made entirely from soft-wood pulp manufactured by the sulphate process and upgradation to meet thermal stress. The kraft paper shall be dyed in green colour & shall be free from metallic particles. The material in insulating mineral oil shall have temperature index of at least 120.
2. **Usage** - This paper finds use in power transformer windings.
3. **Compliance with standards** – IEC:60554-3-5 grade 5A4-1M1 + Thermal upgradation.
4. **Sample for test** – 20 sheets of 300 x 300 mm shall be required for testing. Testing shall be as per IEC:60554-2.
5. **Properties** – Shall be as per Table 1 at page 2.
6. **Test certificates** - Unless otherwise stated, test certificates shall be supplied along with each consignment.

In addition, the supplier shall ensure to send one copy of test certificates along with their dispatch documents to facilitate quick clearance of the material.

The test certificates shall bear the information generally as per Table 1 along with nitrogen content.

7. **Packing & marking** - Packing shall be marked legibly at least with the BHEL spec. no., Order No., Quantity, Thickness & width, net/ gross weight & Date of manufacture.

REV	DATE	ALT CHD	REV-01	DATE 8.9.18	ALT CHD.	REV 00	NAME	SIGN	DATE
			COMPLETE SPECIFICATION REVISED.			PREP.	S.Sachdeva	-sd-	17.08.18
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**Table 1 – Properties of thermally upgraded insulating kraft paper**

Property	Unit	Min.	Nominal	Max.
Nominal thickness	micron	45 57 68 90	50 63 75 100	55 69 82 110
Grammage				
50 micron	g/m <sup>2</sup>	47.5	50	52.5
63 micron		62.0	63	68.0
75 micron		71.5	75	78.5
100 micron		95.0	100	105.0
Apparent bulk density	kg/m <sup>3</sup>	950	1000	-
Air permeability	μm/Pa*s	0.05	-	0.10
Moisture content	%	-	-	8.0
Tensile index MD	Nm/g	93.0	-	-
Tensile index CD	Nm/g	35.0	-	-
Elongation MD	%	2.0	-	-
Elongation CD	%	4.0	-	-
Tear index MD			-	-
Up to 75 micron	mN*m <sup>2</sup> /g	5.0		
Above 75 micron	mN*m <sup>2</sup> /g	6.0		
Tear index CMD			-	-
Up to 75 micron	mN*m <sup>2</sup> /g	6.0		
Above 75 micron	mN*m <sup>2</sup> /g	7.0		
Electrical strength in Air	kV/mm	8.0	-	-
Ash content	%	-	-	0.5
Conductivity in aqueous extract	mS/m	-	-	4.0
pH in extract	-	6.0	-	8.0
Nitrogen content	%	1.0	-	-