

# UMANG BOARDS LIMITED

## PRODUCT DATA SHEET

### DIAMOND DOTTED PAPER



# Diamond Dotted Paper

## AS PER IEC 60641-3-2-2007 TYPE P 4.1A

Umang Boards offers DDP paper in rolls with base paper thickness of 0.075mm (3 mil), 0.125mm (5 mil), 0.175mm (7 mil) and 0.25mm (10 mil). The standard width of rolls is 975 and Standard roll diameter of 350mm. Rolls are supplied on 76mm ID core. Other thicknesses are available on request, with a minimum quantity of 1.0 MT.



### DIAMOND PATTERN SPECIFICATION

The epoxy resin is coated in squares of dimension 9.5mm and is spaced at a distance of 6.7mm between squares. The squares are arranged in a manner that their diagonals lie parallel and perpendicular to machine direction.

The epoxy dots are arranged in such a pattern that ensures an offset relationship exists between the dots on concentric paper layers, thus creating the maximum bonding surface. The thickness of the epoxy resin coating is 0.01mm on each side,  $\pm 0.002$ mm tolerance and is independent of the base paper thickness. The size, shape thickness and placement of the dots ensure effective vacuum drying and oil impregnation.

The epoxy resin is maintained in reactive "B stage" dry and tacks free will melt upon increasing the curing temperature to 120 to 140°C this facilitates firm and permanent bonding with the conductor. The nonreactive "C stage" is reached after a curing time of 6-8 hours. The insulation is then in the stable duroplastic condition, unaffected by further heating which will occur during service.

The advantage in use of partially coated insulation press paper lies in the internal strengthening of the coil due to adhesion to conductor provides passage for quick evacuation of air and moisture during drying process thereby minimising risks of partial discharge, quick impregnation and flow of oil through the channels.



## SHELF LIFE

Shelf life is the length of time a product / item is usable or fit for consumption. The UBPL Diamond dotted pattern paper rolls is believed to have a shelf life of about 12 months which is dependent on its proper storage and handling.

## STORAGE AND HANDLING

Umang Boards recommends that the Diamond Dotted Pattern paper roll be stored in warehouse conditions away from direct sunlight and moisture to prevent bonding between layers. This will help to achieve an expected shelf life of 12 months.

## PROCEDURE FOR DETERMINING BOND STRENGTH

UMANG Diamond Dotted Paper should bond firmly and evenly to the conductor. The bonding strength or tensile shear strength can be checked as follows: -

- 1** Prepare four layers of specimens of Umang Diamond Dotted Paper of size 50 x 50 mm.
- 2** Take two flattened Aluminium or copper plates with dimension of 150mm x 50mm and thickness of 0.5 mm.
- 3** Clean using solvent followed by an hot air oven drying for one hour at 100 Deg C.
- 4** Place the paper specimen in between aluminium or copper plates for 6 hours at 1400C and 2 psi pressure.  
The bonded samples are then tested for tensile shear strength with a pull rate of 110mm per minute at this stage separation must take place in the paper layer and not on the adhesion surface.
- 5**

## TOLERANCE TABLE

Thickness, (%) range	± 10.0
On Roll Width, ( mm)	± 5.0





# TECHNICAL SHEET

<b>TECHNICAL SPECIFICATION EPOXY DOTTED PAPER (SPECIFICATION: IEC60641-3-2 P4.1)</b>					
Properties	Units	3 mil	5 mil	8 mil	10 mil
Thickness	mm	<b>0.075</b>	<b>0.125</b>	<b>0.200</b>	<b>0.250</b>
Thickness, Range	mm	0.068 to 0.082	0.112 to 0.138	0.18 to 0.22	0.23 to 0.28
Apparent Density (Range)	g/cc	1.0 – 1.2	1.0 – 1.2	1.0 – 1.2	1.0 – 1.2
Tensile strength (min) MD CD	Mpa	75 35	75 35	75 35	80 40
Elongation (min) MD CMD	%	1.5 6.0	1.5 6.0	1.5 6.0	2.0 7.0
Shrinkage (min) MD CD PD	%	1 1.5 7	1 1.5 7	1 1.5 7	1 1.5 7
Shrinkage (min) MD CD PD	%	8	8	8	8
Oil Absorption, (Min)	%	10.0	10.0	10.0	10.0
Ash content ( max)	%	1	1	1	1
Conductivity of aqueous extract(max)	mS/m	8	8	8	8
pH of aqueous extract (Range)	6 - 9	6 - 9	6 - 9	6 - 9	6 - 9
Electric strength in Air, (min)	kV/mm	9	9	9	10
Electric strength in Oil, (min)	kV/mm	60	60	60	60
Recommended curing temperature	°C	120 to 140	120 to 140	120 to 140	120 to 140
Recommended curing time	Hrs	6 - 8	6 - 8	6 - 8	6 - 8
Bonding Shear Strength @ 140 Deg C for 6 hours & load 2 psi	psi	60 - 70	80 - 90	80 - 90	70 - 80

*Note : These values do not constitute specification of our products and also provided are values in accordance with the IEC specification. Since test conditions cannot always duplicate actual field installations or end use, Umang Boards make no warranties with respect to such data and assume no responsibility for performance characteristics resulting from conditions which may differ from those used in laboratory tests.*



## REFERENCE TABLE

Reference Grade & Standard	Tests conducted as per IEC 60641-2, Methods of Test
Color	Natural Brown
Appearance	Matte with mesh mark on both sides

