

# LAPOX® L-68 | K-66 | K-13 (FR-4)



Technical Data Sheet | Polymers Business

## Prepregging epoxy system for NEMA FR-4

Lapox L-68	100	pbw
Lapox K-66	32	pbw
Lapox K-13	0.2 - 3.0	pbw

## Description

Lapox L - 68 is a brominated epoxy resin solution and can be used for flame retardant applications particularly for FR-4 grades of laminates and other alike application. The resin along with curing agent Lapox K-66 forms an effective flame retardant system for better electrical and mechanical properties. Accelerator Lapox K-13 is used as an accelerator for faster gel time achievement. Various solvents can be used for prepreg applications. FR-4 laminates are made from continuous filament type glass cloth with a brominated epoxy resin binder. They possess properties similar to those of Grade G-10 but they must be self-extinguishing when the source of ignition is removed.

## Applications

FR-4 grades laminates as per NEMA specification

## Processing

Prepreg

## Typical specifications

### Lapox L-68

Properties	Unit	Test method	Values
Appearance	-	Visual	Clear liquid
Colour	GS	ASTM D1544	Max 4
Viscosity at 25°C	m Pas	ASTM D2196	2,200 - 3,000
Epoxy content	Eq/kg	ASTM D1652	2.0 - 2.2
Solid content	%	-	80 ± 1
Bromine content	%	-	21 ± 2

### Lapox K-66

Properties	Unit	Test method	Values
Appearance	-	Visual	Clear liquid
Viscosity at 25°C	m Pas	ASTM D2196	< 5
Specific gravity at 25°C	-	ASTM D792	1.06 - 1.09
Flash point	°C	ASTM D93	36 - 43
Solid content	%	-	9 - 11
Shelf-life	Years	-	2

### Lapox K-13

Properties	Unit	Test method	Values
Appearance	-	Visual	Clear liquid
Colour	GS	ASTM D1544	Max 2
Viscosity at 25°C	m Pas	ASTM D2196	< 10
Specific gravity at 25°C	-	ASTM D792	0.88 - 0.92
Shelf-life	Years	-	2

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## Processing properties

Properties	Unit	Test method	Values
Mixing ratio (by weight)	-	Visual	Resin: 100 Hardener: 32 Accelerator: 1 - 3
Initial mix viscosity	m Pas	ASTM D2196	3,500 - 5,000 / 25°C
Pot life at 20°C	Weeks	ASTM D2471	3 - 4
Gel time	Minutes	DIN 16945 / 6.3.1	450 - 550 / 150°C 190 - 250 / 172°C
Drying time of Prepreg	°C / hours	-	7 - 9 at 150°C 5 - 6 at 160°C 3 - 5 at 170°C

## Prepreg parameters

Properties	Unit	Test method	Values
Resin content	%	-	38 - 43
Volatile content <sup>1</sup>	%	-	< 0.5
Resin flow at 175°C <sup>2</sup>	%	-	12 - 18
Shelf-life of prepreg at 20°C	Weeks	-	6 - 8
Press temperature	°C	-	170 - 180
Pressure	Kg/cm <sup>2</sup>	-	20 - 40
Pressing time	Minutes	-	30 - 45

<sup>1</sup> Loss of weight after 15 minutes at 180°C

<sup>2</sup> Loss of weight of 6 layers of prepreg, 100 X 100 mm at 170°C and 20 kg / cm<sup>2</sup> immediate pressure.

## Typical electrical properties of cured system

Cured at:

Properties	Unit	Test method	Values
Breakdown strength (50 Hz, 25°C)	kV/cm	IEC 60243	12 - 14
Loss factor (50 Hz, 25°C)	%	IEC 60250	2.5 - 3.0
Dielectric constant (50 Hz, 25°C)	-	IEC 60250	4.5 - 5.2
Volume resistivity at 1,000 V, 25°C	ohm.cm	IEC 60093 / DIN 53482	10 <sup>15</sup>
Tracking resistance	V	IEC 60112	300

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## Typical properties of cured, reinforced system

Cured at:

Properties	Unit	Test method	Values
Tensile strength - lengthwise	m Pa	ISO 527	≥ 315
Tensile strength - crosswise	m Pa	ISO 527	≥ 266
Tensile elongation at break	%	ISO 527	2 - 3
Flexural strength - lengthwise	m Pa	ISO 14125	≥ 525
Flexural strength - crosswise	m Pa	ISO 14125	≥ 455
Flexural elongation at break	%	ISO 14125	2 - 6
Flexural modulus - lengthwise	g Pa	ISO 14125	≥ 18.9
Flexural modulus - crosswise	g Pa	ISO 14125	≥ 16.8
Compressive strength - flatwise	m Pa	ISO 604	> 415
Impact strength - izod - length	J/m	ISO 179	> 54
Impact strength - izod - cross	J/m	ISO 179	> 44
Glass transition temperature	°C	DIN 11357 - 2	130 - 140
Co-efficient of liner thermal expansion	°C <sup>-1</sup>	DIN 53752	10 <sup>-6</sup>
Water absorption 25°C / 24 hours	% w/w	ISO 62	Max 0.15

## Packaging

Lapox L-68 is available in 30 kg, 110 kg and 240 kg carboys. Lapox K-66 and Lapox K-13 are available in 1 kg HDPE bottles. Other packing may be considered on request.

## Storage and handling

Lapox L-68 and hardener Lapox K-66 and Lapox K-13 have shelf-life of 2 years if stored in their original sealed containers. It is recommended to use resin and hardener only when they are clear and free from cloudiness. Hardener is sensitive to moisture. Container must be closed properly immediately after use. Both resin and hardener may cause irritation to sensitive skins. If contact does occur then it should be washed off immediately with soap and warm water, consult physician immediately. Please refer to the Safety Data Sheet (SDS) for detailed instructions on storage and handling.

## Safety

Wear personal protective equipment (PPE). Avoid contact with the eyes and skin. In case of direct contact and irritation, the resin should be washed off immediately with soap and warm water. Avoid breathing vapours, mist or gas. Please refer to the SDS for detailed safety instructions.

## Spills and disposal

In case of spills, sweep up and shovel the spilled material. Keep spilled material in suitable, closed containers for disposal. Soak up with an absorbent such as clay, sand or other suitable material. Flush area with water to remove trace residue. Do not allow the product to reach the sewage system. Waste must be disposed of in accordance with federal, state or local regulations, as applicable.

## Contact

E-mail: [polymers@atul.co.in](mailto:polymers@atul.co.in)  
Website: [www.atul.co.in](http://www.atul.co.in)

## Note

Lapox® is a registered trademark of Atul Ltd.

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## **Manufacturing site**

Atul 396 020, Gujarat, India

Telephone: (+91 2632) 230000 | 233261

E-mail: [contact@atul.co.in](mailto:contact@atul.co.in)

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