

# LAPOX® C-17 | K-12 | K-112 | K-14 | FILLER



Technical Data Sheet | Polymers Business

## Hot cure Class-F epoxy casting system

Lapox C-17	100	pbw
Lapox K-12	100	pbw
Lapox K-112	1	pbw
Lapox K-14	00 - 20	pbw
Silica	Max 410	pbw

## Description

Lapox C-17 is a liquid, modified bisphenol-A based epoxy resin for electrical application. Lapox K-12 is a liquid modified anhydride hardener, suitable to cure epoxy resin at elevated temperature. Lapox K-112 is an accelerator to adjust reactivity at elevated temperature. And Lapox K-14 is a plasticiser to impart flexibility in casted components.

## Advantages

The components casted by this system exhibits good mechanical, electrical end properties and are able to provide high thermal shock resistance.

## Applications

Medium and high voltage indoor application such as post insulators, switch components, bushings, instrument transformer and dry type distribution transformers

## Processing

Automatic pressure gelation (APG)  
Conventional vacuum casting (CVC)

## Typical specifications

### Lapox C-17

Properties	Unit	Test method	Values
Appearance	-	Visual	Clear, viscous liquid
Colour	GS	ASTM D1544	Max 1
Viscosity at 25°C	m Pas	ASTM D2196	9,000 - 13,000
Epoxy content	Eq/kg	ASTM D1652	5.2 - 5.5
Specific gravity at 25°C	-	ASTM D792	1.15 - 1.20
Flash point	°C	ASTM D93	> 200
Vapour pressure at 20°C	Pa	ASTM D323	< 0.01
at 60°C			1
Shelf-life	Years	-	2

### Lapox K-12

Properties	Unit	Test method	Values
Appearance	-	Visual	Clear, yellow liquid
Colour	GS	ASTM D1544	Max 8
Viscosity at 25°C	m Pas	ASTM D2196	150 - 250
Specific gravity at 25°C	-	ASTM D792	1.15 - 1.22
Flash point	°C	ASTM D93	150
Vapour pressure at 20°C	Pa	ASTM D323	0.3
at 60°C			50
Shelf-life	Year	-	1

## Lapox K-112

Properties	Unit	Test method	Values
Appearance	-	Visual	Brown to dark-brown liquid
Viscosity at 25°C	m Pas	ASTM D2196	1,000 - 1,800
Specific gravity at 25°C	-	ASTM D792	0.97 - 1.02
Flash point	°C	ASTM D93	> 95
Vapour pressure at 20°C	Pa	ASTM D323	1
Vapour pressure at 60°C			50
Shelf-life	Year	-	1

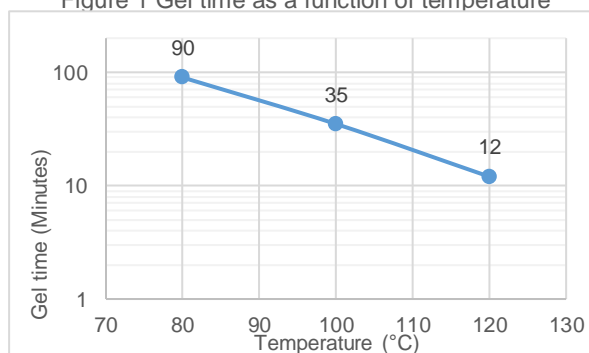
## Lapox K-14

Properties	Unit	Test method	Values
Appearance	-	Visual	Clear liquid
Colour	GS	ASTM D1544	Max 1
Viscosity at 25°C	m Pas	ASTM D2196	60 - 90
Specific gravity at 25°C	-	ASTM D792	0.95 - 1.05
Flash point	°C	ASTM D93	82
Vapour pressure at 20°C	Pa	ASTM D323	0.03
Vapour pressure at 60°C			1
Shelf-life	Year	-	1

## Processing properties

Properties	Unit	Test method	Values
Mixing ratio (by weight)	-	Visual	Resin: 100 Hardener: 100 Accelerator: 1 Additive: 10 Filler: 400
Initial mix viscosity	m Pas	ASTM D2196	41,500 / 40°C 16,000 / 60°C 10,000 / 80°C
Pot life (5 kg mix)	Hours / °C	ASTM D2471	1 day / 25°C 14 / 40°C 1.5 / 80°C
Gel time	Minutes	DIN 16945 / 6.3.1	See figure 1

Figure 1 Gel time as a function of temperature



## Processing recommendations

The resin, hardener, flexibiliser and pre-dried filler are blended at 60°C under a vacuum of approximate 0.5 mbar to 5.0 mbar. Intensive wetting of the filler is extremely important to achieve better flow and reduce tendency to shrinkage.

Silica filler should be thoroughly pre-dried at 150°C for 24 hours in air circulating oven. The use of good fillers has no significant effect on cure times, but results in slightly longer gel times. Filler impurities and high moisture content may reduce pot life and considerably increase the reactivity of the mix. This could lead to a strong exothermic reaction resulting in higher shrinkage and cracking of castings. Mix must be thoroughly degassed if the castings are intended for application in high voltage engineering.

The accelerator is then added to the resin-hardener-filler mix under a vacuum of about 5 mbar for 10 minutes to 20 minutes with intensive stirring just prior to the casting operation. The addition of accelerator facilitates shorter cycle times and higher output. It slightly increases the initial viscosity of the system and reduces its pot life, gelling and cure times. But care must be taken to keep the exothermic temperature rise within limits. Lapox K-14 is a liquid plasticiser, which is used to impart flexibility and to control shrinkage of the system during cure. Higher loadings of plasticiser shall reduce the glass transition temperature. The quantity of Lapox K-14 to be added must be decided by the user according to the requirements of glass transition temperature and flexibility.

Then the complete mix is cast in preheated moulds (containing the parts to be encapsulated) under a vacuum of 5 mbar to 20 mbar. Uniform thin layer of a good release agent like Lapox K-28 must be applied on the surface of the mould before casting to ensure a smooth release product.

## Typical moulding conditions

Particulars		Unit	Value
Mould temperature	APG process	°C	140 - 160
	CVC process	°C	80 - 100
De-moulding	APG process	Minutes	10 - 40
	CVC process	Hours	6 - 12
Minimum post curing	APG process	Hours / °C	12 / 140°C
	CVC process	Hours / °C	80°C / 6 hours + 130°C / 10 hours or 80°C / 6 hours + 140°C / 8 hours

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## Typical properties of filled cured system

Composition (pbw): Lapox C-17 (100) + Lapox K-12 (100) + Lapox K-112 (1) + Lapox K-14 (10) + Silica (400)

Curing schedule: 80°C / 6 hours + 130°C / 10 hours

Determined on standard test specimen at 25°C

Properties	Unit	Test method	Values
Filler loading	%	-	65
Cured density	g/cm <sup>3</sup>	DIN 55990	1.8 - 1.9
Tensile strength	m Pa	ISO 527	75 - 85
Elongation at break	%	ISO 527	0.9 - 1.1
Elastic modulus in tension	g Pa	ISO 527	12 - 13
Flexural strength	m Pa	ISO 178	125 - 135
Flexural elongation at break	%	ISO 178	1.1 - 1.5
Elastic modulus in flexural	g Pa	ISO 178	11.6 - 12.0
Compressive strength	m Pa	ISO 604	140 - 150
Compression set	%	ISO 604	6 - 7
Impact strength	kJ/m <sup>2</sup>	ISO 179	10 - 12
Glass transition temperature (DSC)	°C	ISO 11357 - 2	90 - 100
Co-efficient of linear thermal expansion (Mean value for temperature range 20°C to 60°C)	K <sup>-1</sup>	DIN 53752	31 - 36 X 10 <sup>-6</sup>
Thermal conductivity	W/mk	ISO 8894 - 1	0.8 - 0.9
Water absorption 25°C / 10 days	% w/w	IEC 60062	0.1 - 0.2

## Typical electrical properties of filled cured system

Cured at 80°C / 6 hours + 130°C / 10 hours

Properties	Unit	Test method	Values
Breakdown strength (50 Hz, 25°C)	kV/mm	IEC 60243	18 - 22
Loss factor (50 Hz, 25°C)	%	IEC 60250	1.5 - 2.0
Dielectric constant (50 Hz, 25°C)	-	IEC 60250	3.8 - 4.2
Volume resistivity at 1,000 V, 25°C	ohm.cm	IEC 60093	> 10 <sup>15</sup>
Arc resistance	Seconds	ASTM D495	185 - 195
Tracking resistance	V	IEC 60112	> 600 - 0.0

## Packaging

Lapox C-17 and Lapox K-12 are available in 30 kg and 110 kg carboys, 200 kg MS drums and 1,000 kg IBC. Lapox K-112 and K-14 are available in 1 kg and 5 kg HDPE bottles and 30 kg carboys. Other packing may be considered on request.

## Storage and handling

Lapox C-17, Lapox K-12, Lapox K-112 and Lapox K-14 should be stored in a cool and dry place, preferably in an original sealed container and should not be exposed to direct sunlight. These products can be stored at room temperature (RT), away from humidity and excessive heat. Under these conditions, the shelf-life will correspond to the time stated in respective table in current TDS. Partly used containers should be closed immediately after use. Lapox C-17 has tendency to crystallise if store below 15°C. Crystallisation can be reversed if heated at 60°C for appropriate time. Lapox K-12 and Lapox K-112 are sensitive to moisture, storage containers should be ventilated with dry air only. Please refer to the Safety Data Sheet (SDS) for detailed instructions on storage and handling.

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<b>Safety</b>	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.
<b>Spills and disposal</b>	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.
<b>Contact</b>	E-mail: <a href="mailto:polymers@atul.co.in">polymers@atul.co.in</a> Website: <a href="http://www.atul.co.in">www.atul.co.in</a>
<b>Note</b>	Lapox <sup>®</sup> is a registered trademark of Atul Ltd.

## Manufacturing site

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