

M.S.POLYMERS & FORMULATORS

Technical Data Sheet

LAMINATING EPOXY RESIN SYSTEM

LA 12 / HK 06 / HK 05

LA12 is a liquid, unmodified epoxy resin of medium viscosity, which can be used with various hardeners for making glassfibre, reinforced composites. The choice of hardener depends on the processing method to be used and on the properties required of the cured composite.

Hardener HK06 is a low viscosity room temperature curing liquid hardener. It is commonly employed for hand lay-up applications. Being rather reactive, it gives a short pot life and rapid cure at normal ambient temperatures. Laminates can be subjected to operating temperatures of 100 °C.

Hardener HK05 is a beige colored solid hardener. Although it can induce cure to the "B-stage" at room temperature, it requires elevated temperature for full cure to the "C-stage". It can be used for matched die moulding, laminating by the prepreg technique and pultrusion. Laminates made with this hardener can be subjected to operating temperature of 165°C. They also possess good dielectric properties.

Specification of resin and hardeners

Epoxy Resin LA12

Epoxide	g/eq	182 – 192
Epoxy value	eq/kg	5.2 – 5.5
Viscosity at 25 °C	mPa.s	9000-13000

Hardener HK06

Visual appearance	Pale yellow liquid
Refractive Index at 25 °C	1.4940 – 1.5000
Water contents	1 % max.
Shear strength	1.4 kg/mm ² min.
On A1 alloy lap joint	

Hardener HK05

Visual appearance	Beige powder/flakes
Melting point	88 - 92 °C
Solubility in acetone (30g in 25 ml acetone)	Clear solution with no sediment
Gel time with Lapox* L-12 at 80 °C	70 – 90 minutes

Processing parameters

	(1)	(2)
	parts by weight -	
Resin LA12	100	100
Hardener HK06	10-12	--
Hardener HK05	-	27

Viscosity at 20 °C	(mpa.s)	5000-8000	25000-40000
Pot life at 20 °C	(hours)	½ - 1	6 – 8

LA12 and Hardener HK06 can be mixed easily at room temperature

When **Hardener HK05** is used, the resin is first heated to 100 °C and the hardener added. It dissolves to give a clear solution, which must be immediately cooled, to room temperature to get as long a pot life as possible. If processing is to be carried out by the prepreg method, a solvent like methyl ethyl ketone is added to the desired extent so as to obtain a viscosity suitable for the impregnation of the glass fabric.

When using the prepreg technique, the impregnated cloth is passed through the heating zone of a conveyor oven where it is precured.

For 15 mins. At 100 °C or for 3 mins. At 150 °C

The prepreg thus obtained will be dry to touch

Curing

	(1)	(2)
25 °C	14 – 24 hrs	-
80 °C	1 – 2 hrs	10 – 12 hrs
100 °C	15 – 30 mins	3 - 4 hrs
140 °C	5 – 10 mins.	1 – 2 hrs
180 °C	-	10 – 30 mins.

Properties of cured resin without reinforcement

		Cured with	
		<u>Hardener HK06</u>	<u>Hardener HK05</u>
Tensile strength	N/mm ²	50-60	40-70
Compressive strength	N/mm ²	100-120	120-130
Flexural strength	N/mm ²	130-150	110-140
Impact strength	KJ/cm ²	17-20	20-30
Module of elasticity	N/mm ²	4400-4600	3500-4000
Coefficient of linear			
Thermal expansion	10 ⁻⁶ / °C	64-68	65-70
Martens heat	°C	75-80	130-150
Thermal conductivity	kcal/mh °C	0.195	0.25
Water absorption			
20 °C/10 days	% w/w	0.5-0.6	0.5-0.6
100 °C/1 hr	% w/w	0.8 – 1	0.4-0.45
Relative dielectric			
Constant at 25 °C		4.1	4.3
Dielectric loss factor		0.003	0.0035
tan (50 ltz/25 °C)			
Volume resistivity (25 °C)	Ùcm	12	60-80
Traking resistance		KA3c	KA36
Arc resistance		L1	L4
Min. dielectric strength	KV/cm ²	200	220-240
(50ltz/25 °C)			

Properties of cured resin with reinforcement :

Determined on laminates 2.5 mm thick with 12 plies of glasscloth with a volan finish. Glass content: 60-65 % by weight. Curing carried out under pressure of 10 kp/cm.

		Cured with	
		Hardener HK06	Hardener HK05
Flexural strength	N/mm ²	40 - 50	50 - 55
Impact strength	KJ/m ²	100 - 150	100 - 150
Module of elasticity	N/mm ²	2500-3500	3000 - 4000
Water absorption (4Days/20 °C)	% w/w	0.02-0.20	0.02-0.20
Marten's value	° C	100 – 130	130-170

Shelf Life

LA12 , HK 06 , HK 05 will have a minimum shelf life of 6 months when stored in the original container & not exposed to undue heat & humidity.

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MS Polymers & Formulators

No.2 & 3 , Site Nos.7&8 , Dalmia Estate , Chicabiderikallu Village , Widia Post, Tumkur Road, Bangalore – 560 073

Tel : 080 65327343 ; Telefax: 080 28399066 Fax 080 23311262

emails : info@mspolymers.in ; mspolymers@rediffmail.com