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Advanced Materials

RenLam® LY 120 / Ren® HY 99

HOT CURING EPOXY SYSTEM

RenLam LY 120 is a low-viscosity epoxy resin
Ren HY 99 is a cycloaliphatic polyamine

APPLICATIONS

Infusion system for Composite Tooling, wide range of industrial composite parts

PROPERTIES

Due to the excellent handling behaviour the system is suitable for various production processes. It combines low viscosity with long pot life at elevated temperatures.

PROCESSING

- Resin Infusion
- Resin Transfer Moulding (RTM)
- Pressure Moulding
- Wet lay-up

PRODUCT DATA

RenLam LY 120

Aspect (visual)	clear liquid	
Viscosity at 25 °C (ISO 2555)	800 - 1300	[mPa s]
Density at 25 °C (ISO 1675)	1.16	[g/cm^3]
Epoxy index (ISO 3001)*	6.1 - 6.6**	[Eq/kg]

Ren HY 99

Aspect (visual)	clear liquid	
Viscosity at 25 °C (ISO 12058-1)	50 - 150	[mPa s]
Density at 25 °C (ISO 1675)	0.95	[g/cm^3]
Amine Value (ISO 9702)	750 - 850**	[mol/kg]

STORAGE

Provided that RenLam® LY 120 and Ren® 99 are stored in a dry place in their original, properly closed containers at the storage temperatures mentioned in the MSDS they will have the shelf lives indicated on the labels.
Partly emptied containers should be closed immediately after use.

Warning: Crystallisation of the resin may occur if stored for an extended period of time at cold temperatures. In case of crystallisation, heat up the resin at 60°C until crystals are dissolved.

** *Specified data are on a regular basis analysed. Data which is described in this document as 'typical' is not analysed on a regular basis and is given for information purposes only. Data values are not guaranteed or warranted unless if specifically mentioned.*

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TYPICAL SYSTEM DATA

PROCESSING DATA

MIX RATIO

Components	*Parts by weight*	*Parts by volume*
RenLam LY 120	100	100
Ren HY 99	23	28

We recommend that the components are weighed with an accurate balance to prevent mixing inaccuracies which can affect the properties of the matrix system. The components should be mixed thoroughly to ensure homogeneity. It is important that the side and the bottom of the vessel are incorporated into the mixing process.
When processing large quantities of mixture the pot life will decrease due to exothermic reaction. It is advisable to divide large mixes into several smaller containers.

INITIAL MIX VISCOSITY (HOEPPLER, ISO 12058-1B)	*[°C]*	*[mPa s]*
	at 25	300 - 350
	at 40	80 - 100

VISCOSITY BUILD- UP (HOEPPLER, ISO 12058-1B)	*[°C]*	*[mPa s]*	*[min]*
	at 25	to 1500	65 - 70
	at 40	to 1500	

POT LIFE (TECAM, 100 ML, 65 % RH)	*[°C]*	*[min]*
	at 23	210 - 230

GEL TIME (HOT PLATE)

[°C]	*[min]*
at 40	100 - 105
at 60	50 - 55
at 80	20 - 25
at 100	8 - 10
at 120	2 - 3

The values shown are for small amounts of pure resin/hardener mix. In composite structures the gel time can differ significantly from the given values depending on the fibre content and the laminate thickness.

PROCESSING RECOMMENDATION

The temperature where gelation is being carried out should not be higher than necessary. A high gelation temperature induces shrinkage and generates internal stress within the part.

TYPICAL CURE CYCLES

8 h at 40 °C + 4 at h 80 °C + 4h at 120° + 8h at 150°C

The optimum cure cycle has to be determined case by case depending on the processing and the economic requirements.

PROPERTIES OF THE CURED, NEAT FORMULATION

	Cure:	*T_G (DMA) [°C]*	*T_G (DSC) [°C]*
GLASS TRANSITION TEMPERATURE (T_G) (ISO 11357-2 DSC, 10 K/MIN)	8 h 40 °C	50 - 73	53 - 57
	2 h 80 °C + 4 h 120 °C	120 - 135	135 - 140
	2 h 80 °C + 4 h 140 °C	135 - 145	145 - 150
	2 h 80 °C + 4 h 150 °C	135 - 150	145 - 150
	8 h 40 °C + 8 h 150 °C	135 - 150	150 - 155

		Cure:	*8 h 40 °C*	*8 h 40 °C + 8 h 150 °C*
TENSILE TEST (ISO 527)	Tensile strength	[MPa]	64 - 65	62 - 64
	Elongation at tensile strength	[%]	2.5 - 2.7	3.1 - 3.3
	Ultimate strength	[MPa]	64 - 65	62 - 64
	Ultimate elongation	[%]	2.7 - 2.8	3.1 - 3.3
	Tensile modulus	[MPa]	3350 - 3450	2600 - 2700

		Cure:	*8 h 40 °C*	*8 h 40 °C + 8 h 150 °C*
FLEXURAL TEST (ISO 178)	Flexural strength	[MPa]	115 - 117	120 - 126
	Ultimate elongation	[%]	4.2 - 4.3	7.0 - 7.1
	Flexural modulus	[MPa]	3500 - 3600	2700 - 2800

		Cure:	*8 h 40 °C + 8 h 150 °C*
FRACTURE PROPERTIES BEND NOTCH TEST (ISO 13586)	Fracture toughness K_{1C}	[MPa√m]	0.65 - 0 68
	Fracture energy G_{1C}	[J/m^2]	175 - 181

	Immersion:	*Cure:*	*8 h 40 °C + 8 h 150 °C*
WATER ABSORPTION (ISO 62)	10 days H_2O 23 °C	[%]	0.55 - 0.60
	1 h H_2O 100 °C	[%]	0.30 - 0.40

		Cure:		*8 h 40 °C + 8 h 150 °C*
COEFFICIENT OF LINEAR THERMAL EXPANSION (DIN 53 752)	Mean value up to 149.2 °C	[10^{-6}/K]	A1< Tg	63 - 65
		[10^{-6}/K]	A2 > Tg	150 - 152

POISON'S RATIO	[ν]	0.35

INTERLAMINAR SHEAR STRENGTH (ASTM D 2344)

Short beam: E-glass unidirectional specimen
Laminate thickness t = 3.2 mm
Fibre volume content: 60 %

	Cure:	*8 h 40 °C + 8 h 150 °C*
Shear strength	[MPa]	58 - 60

HANDLING PRECAUTIONS

Personal hygiene

Safety precautions at workplace	
protective clothing	yes
gloves	essential
arm protectors	recommended when skin contact likely
goggles/safety glasses	yes
Skin protection	
before starting work	Apply barrier cream to exposed skin
after washing	Apply barrier or nourishing cream
Cleansing of contaminated skin	
	Dab off with absorbent paper, wash with warm water and alkali-free soap, then dry with disposable towels. Do not use solvents
Disposal of spillage	
	Soak up with sawdust or cotton waste and deposit in plastic-lined bin
Ventilation	
of workshop	Renew air 3 to 5 times an hour
of workplaces	Exhaust fans. Operatives should avoid inhaling vapours

FIRST AID

Contamination of the *eyes* by resin, hardener or mix should be treated immediately by flushing with clean, running water for 10 to 15 minutes. A doctor should then be consulted.
Material smeared or splashed on the *skin* should be dabbed off, and the contaminated area then washed and treated with a cleansing cream (see above). A doctor should be consulted in the event of severe irritation or burns. Contaminated clothing should be changed immediately.
Anyone taken ill after *inhaling* vapours should be moved out of doors immediately.
In all cases of doubt call for medical assistance.

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