HUNTSMAN

Enriching lives through innovation

Advanced Materials

Araldite® LY 1564* / Aradur® 917-1* / Accelerator 960-1*

HOT CURING EPOXY SYSTEM

Araldite® LY 1564 is a low-viscosity epoxy resin
Aradur® 917-1 is an anhydride hardener
Accelerator 960-1 is used as an amine accelerator

APPLICATIONS	Industrial composites (tubes, pipes, profiles)		
PROPERTIES	Araldite® LY 1564 with Aradur® 917-1 and Accelerator 960-1 exhibits a low mix viscosity at room temperature in combination with a long pot life. Nevertheless very short cure cycles can be achieved at cure temperatures above 120 °C for an economical production. The system shows good fibre impregnation properties and is easy to process. The cured system has excellent mechanical properties.		
PROCESSING	• Filament Winding • Pultrusion • Wet lay-up • Resin Transfer Moulding (RTM)		
PRODUCT DATA	**Araldite® LY 1564**		
	Aspect (visual)	clear liquid	
	Viscosity at 25 °C (ISO 12058-1)	1200 – 1400 **	[mPa s]
	Density at 25 °C (ISO 1675)	1.1 - 1.2	[g/cm^3]
	Epoxy index (ISO 3001)	5.8 - 6.05 **	[Eq/kg]
	Aradur® 917-1		
	Aspect (visual)	clear liquid	
	Viscosity at 25 °C (ISO 12058-1)	50 - 80 **	[mPa.s]
	Density at 25 °C (ISO 1675)	1.20 - 1.25	[g/cm^3]
	Accelerator 960-1		
	Aspect (visual)	Yellow to brown liquid	
	Viscosity at 25 °C (ISO 2555)	120 - 250 **	[mPa s]
	Density at 25 °C (ISO 1675)	0.95 - 0.97	[g/cm^3]

*** 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.*

STORAGE	Provided that Araldite® LY 1564, Aradur® 917-1 and Accelerator 960-1 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. Because Aradur® 917-1 is sensitive to moisture, storage containers should be ventilated with dry air only.

* *In addition to the brand name product denomination may show different appendices , which allows us to differentiate between our production sites: e.g , BD = Germany, US = United States, IN = India, CI = China, etc.. These appendices are in use on packaging, transport and invoicing documents. Generally the same specifications apply for all versions. Please address any additional need for clarification to the appropriate Huntsman contact.*

TYPICAL SYSTEM DATA

PROCESSING DATA

MIX RATIO

Components	*Parts by weight*	*Parts by volume*
Araldite® LY 1564	100	100
Aradur® 917-1	98	93
Accelerator 960-1	3	3.5

PROCESSING RECOMMENDATIONS

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.

INITIAL MIX VISCOSITY
(HOEPPLER, ISO 12058-1B)

[°C]	*[mPa s]*
at 25	400 - 450
at 40	100 - 200

POT LIFE
(TECAM, 100 ML, 65 % RH)

[°C]		
at 23	*[h]*	80 - 90
at 50	*[min]*	210 - 250

GEL TIME
(HOT PLATE)

[°C]	*[min]*
at 80	45 - 50
at 100	12 - 15
at 120	4 - 5
at 140	1 - 2

VISCOSITY BUILD-UP
(HOEPPLER, ISO 12058-1B)

[°C]	[mPas]	***100:90:3***
at 40	to 1500	340 - 360
at 40	to 3000	450 - 470
at 60	to 1500	130 - 145
at 60	to 3000	150 - 170
at 80	to 1500	35 - 45
at 80	to 3000	45 - 55

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.

TYPICAL CURE CYCLES

4 h 100 °C
or 4 h 80 °C + 4 h 120 °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

GLASS TRANSITION TEMPERATURE (ISO 11357-2, DSC, 10 K/MIN)	*Cure:*		*T_G [°C]*
	4 h 80 °C		90 - 100
	4 h 100 °C		110 - 120
	4 h 80 °C + 4 h 120°C		122 - 130

TENSILE TEST (ISO 527)		*Cure:*	*4 h 80 °C + 4 h 120 °C*
	Tensile strength	[MPa]	75 - 91
	Elongation at tensile strength	[%]	4 - 5
	Ultimate strength	[MPa]	75 - 91
	Ultimate elongation	[%]	4.5 - 5.5
	Tensile modulus	[MPa]	3100 - 3200

FLEXURAL TEST (ISO 178)		*Cure:*	*4 h 100 °C*	*4 h 80 °C + 4 h 120 °C*
	Flexural strength	[MPa]	150 - 165	140 - 150
	Elongation at flexural strength	[%]	6 - 7	6 - 7
	Flexural modulus	[MPa]	3250 - 3450	3000 - 3100

FRACTURE PROPERTIES BEND NOTCH TEST (ISO 13586)		*Cure:*	*4 h 80 °C + 4 h 120 °C*
	Fracture toughness K_{1C}	[MPa√m]	0.59 - 0.7
	Fracture energy G_{1C}	[J/m²]	100 - 125

WATER ABSORPTION (ISO 62)	*Immersion:*	*Cure:*	*4 h 80 °C + 4 h 120 °C*
	1 day H_2O 23 °C	[%]	0.13 - 0.15
	10 days H_2O 23 °C	[%]	0.40 - 0.45

FLEXURAL TEST (ISO 178)	Laminate comprising 12 layers unidirectional E-glass fabric (425 g/m²) Fibre volume content: 59 - 64 % Laminate thickness t = 3.0 - 3.3 mm		
		Cure:	*4 h 80 °C + 4 h 120 °C*
	Flexural strength	[MPa]	880 - 980
	Elongation at flexural strength	[%]	2.0 - 2.2
	Flexural modulus	[MPa]	44000 - 46000

INTERLAMINAR SHEAR STRENGTH (ASTM D 2344)	Short beam: Laminate comprising 12 layers unidirectional E-glass fabric (425 g/m²) Fibre volume content: 59 - 64 % Laminate thickness t = 3.0 - 3.3 mm		
		Cure:	*4 h 80 °C + 4 h 120 °C*
	Shear strength	[MPa]	54 - 58

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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