HUNTSMAN

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Advanced Materials

Araldite® LY 1564* / Aradur® 3486* / Aradur® 3487*

WARM CURING EPOXY SYSTEM

Araldite® LY 1564
Aradur® 3486 (formulated amine hardener)
Aradur® 3487 (formulated amine hardener)

APPLICATIONS	Industrial composites		
PROPERTIES	Laminating system with low viscosity and high flexibility. The reactivity may easily be adjusted to demands through the combination of both hardeners. The long pot life of XB 3486 facilitates the production of very large industrial parts. The systems are qualified by Germanischer Lloyd.		
PROCESSING	• Resin Transfer Moulding (RTM, SCRIMP) • Wet lay-up • Filament Winding		
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® 3486		
	Aspect (visual)	clear colourless to slightly yellow liquid	
	Viscosity at 25 °C (ISO 12058-1)	10 - 20	[mPa s]
	Density at 25 °C (ISO 1675)	0.94 - 0,95	[g/cm^3]
	Amine value (ISO 9702)**	8.55 - 9.30	[Eq/kg]
	Aradur® 3487		
	Aspect (visual)	clear colourless to slightly yellow liquid	
	Viscosity at 25 °C (ISO 12058-1B)	30 - 70	[mPa s]
	Density at 25 °C (ISO 1675)	0,98 - 1,0	[g/cm^3]
	Amine value (ISO 9702)**	9.30 - 10.20	[Eq/kg]
STORAGE	Provided that Araldite® LY 1564 SP and Aradur® 3486 or Aradur® 3487 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.		

*** 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.*

* *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® 3486	34	41
Araldite® LY 1564	100	100
Aradur® 3487	34	41

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]*
	LY 1564 / Aradur® 3486	at 25	200 - 300
	LY 1564 / Aradur® 3487	at 25	220 - 320

POT LIFE (TECAM, 23°C, 65 % RH)		*[g]*	*[min]*
	LY 1564 / Aradur® 3486	100	560 - 620
		1000	180 - 230
	LY 1564 / Aradur® 3487	100	130 - 160
		1000	75 - 100

GEL TIME (HOT PLATE)		*[°C]*	*[min]*
	LY 1564 / Aradur® 3486	at 60	110 - 130
		at 80	33 - 43
		at 100	13 - 17
		at 120	5 - 9
	LY 1564 / Aradur® 3487	at 60	65 - 85
		at 80	18 - 25
		at 100	6 - 10
		at 120	2 - 5

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.

COMBINATION OF THE HARDENERS

Araldite® LY 1564	100	100	100	100	100
Aradur® 3486		8.5	17	25.5	34
Aradur® 3487	34	25.5	17	8.5	
Pot Life (Tecam at 23 °C)	*[min]*	*[min]*	*[min]*	*[min]*	*[min]*
100g	130 - 170	290 - 340	380 - 430	530 - 590	560 - 620
Gel time (Hot plate)	*[min]*	*[min]*	*[min]*	*[min]*	*[min]*
at 80 °C	18 - 25	20 - 27	25 - 33	30 - 39	33 - 43
at 100 °C	6 - 10	7 - 11	9 - 13	11 - 15	13 - 17

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PROPERTIES OF THE CURED, NEAT FORMULATION

GLASS TRANSITION TEMPERATURE	*Cure:*	T_G	*LY 1564 Aradur® 3487*	*LY 1564 Aradur® 3486*
(ISO 11357-2 DSC, 10 K/MIN)	2 days 23 °C	[°C]	42 - 48	33 - 37
	8 days 23 °C	[°C]	54 - 59	49 - 53
	20 h 40 °C	[°C]	63 - 68	52 - 56
	15 h 50 °C	[°C]	68 - 73	66 - 70
	24 h 50 °C	[°C]	71 - 75	66 - 70
	10 h 60 °C	[°C]	72 - 76	67 - 71
	16 h 60 °C	[°C]	75 - 80	68 - 72
	4 h 80 °C	[°C]	81 - 86	77 - 81
	8 h 80 °C	[°C]	81 - 86	80 - 84
	2 h 100 °C	[°C]	81 - 86	78 - 82
	5 h 100 °C	[°C]	82 - 86	80 - 84

TENSILE TEST (ISO 527)	*LY 1564 / Aradur® 3487*		*Cure: 15 h 50 °C*	*Cure: 8 h 80 °C*
	Tensile strength	[MPa]	77 - 81	72 - 76
	Elongation at tensile strength	[%]	3.9 - 4.1	4.5 - 4.9
	Ultimate strength	[MPa]	58 - 64	63 - 68
	Ultimate elongation	[%]	7.2 - 8.0	8.0 - 9.0
	Tensile modulus	[MPa]	3200 - 3350	2940 - 3100

TENSILE TEST (ISO 527)	*LY 1564 / Aradur® 3486*		*Cure: 15 h 50 °C*	*Cure: 8 h 80 °C*
	Tensile strength	[MPa]	74 - 78	70 - 74
	Elongation at tensile strength	[%]	4.0 - 4.2	4.6 - 5.0
	Ultimate strength	[MPa]	62 - 68	60 - 64
	Ultimate elongation	[%]	5.8 - 6,2	8.0 - 8.5
	Tensile modulus	[MPa]	3100 - 3250	2860 - 3000

FLEXURAL TEST (ISO 178)	*LY 1564 / Aradur® 3487*		*Cure: 7 days 23 °C*	*Cure: 15 h 50 °C*	*Cure: 8 h 80 °C*
	Flexural strength	[MPa]	98 - 112	125 - 138	118 - 130
	Elongation at flexural strength	[%]	2.7 - 3.6	5.0 - 5.4	5.5 - 6.5
	Ultimate strength	[MPa]	98 - 112	88 - 95	88 - 100
	Ultimate elongation	[%]	2.7 - 3.6	8.2 - 10.0	10.0 - 12.0
	Flexural modulus	[MPa]	3460 - 3660	3200 - 3400	2950 - 3100

FLEXURAL TEST (ISO 178)	*LY 1564 / Aradur® 3486*		*Cure: 7 days 23 °C*	*Cure: 15 h 50 °C*	*Cure: 8 h 80 °C*
	Flexural strength	[MPa]	80 - 90	120 - 135	118 - 130
	Elongation at flexural strength	[%]	2.1 - 2.5	5.2 - 5.6	5.5 - 6.5
	Ultimate strength	[MPa]	80 - 90	78 - 85	88 - 100
	Ultimate elongation	[%]	2.1 - 2.5	9.0 - 11.5	10.5 - 12.5
	Flexural modulus	[MPa]	3500 - 3700	3100 - 3300	2900 - 3050

FRACTURE PROPERTIES		*Cure: 5 h 100 °C*	*LY 1564 Aradur®3487*	*LY 1564 Aradur®3486*
BEND NOTCH TEST (ISO 13586)	Fracture toughness K_{1C}	[MPa√m]	0.95 - 1.05	0.95 - 1.05
	Fracture energy G_{1C}	[J/m²]	255 - 305	260 - 310

PROPERTIES OF THE CURED, REINFORCED FORMULATION

INTERLAMINAR SHEAR TEST (ASTM D 2344)

Short beam: Laminate comprising 12 layers unidirectional
E-glass fabric (425 g/m²)
Laminate thickness t = 3.0 - 3.2 mm
Fibre volume content: 63 - 65 %

	Cure: 1.5 h 80 °C + 5 h 100 °C	*LY 1564 Aradur®3487*	*LY 1564 Aradur®3486*
Shear strength	[MPa]	53 - 58	53 - 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.

Huntsman Advanced Materials
(Switzerland) GmbH
Klybeckstrasse 200
4057 Basel
Switzerland

Tel: +41 (0)61 299 11 11
Fax: +41 (0)61 299 11 12

www.huntsman.com/advanced_materials
Email: advanced_materials@huntsman.cor

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