RESOLTECH 1410-1417 and Accelerator AC140

Hot curing epoxy system

RST 1410 is a low viscosity cycloaliphatic epoxy resin
RST 1417 is an anhydride hardener
Accelerator AC140 is an imidazole accelerator

Applications
High performance composite parts

Properties
Extremely low-viscosity, anhydride-cured, reactive diluent free matrix system with a long pot life. The reactivity of the system is adjustable by variation of the accelerater content. The system is easy to process, has good fibre impregnation properties and exhibits excellent mechanical, dynamic and thermal properties. It has an excellent chemical resistance especially to acids at temperatures up to 80 °C. Displays very good temperature resistance after post cure.

Processing
Filament Winding, Pultrusion, Pressure Moulding

Key Data

RST 1410

Aspect (visual)	clear yellow liquid
Viscosity at 25 °C (ISO 12058-1)	350 - 450 [mPa s]
Epoxy index (ISO 3001)	7.00 - 7.63 [eq/kg]
Epoxy equivalent (ISO 3001)	131 - 143 [g/eq]
Density at 25 °C (ISO 1675)	1.17 [g/cm3]
Flash point (ISO 2719)	> 150 [°C]
Storage temperature (see expiry date on original container)	2 - 40 °C

RST 1417

Aspect (visual) :	clear liquid
Colour (Gardner, ISO 4630) :	≤2
Viscosity at 25 °C (ISO 12058-1) :	50 - 100 [mPa s]
Density at 25 °C (ISO 1675) :	1.20 - 1.25 [g/cm3]
Flash point (ISO 2719) :	195 [°C]
Storage temperature :	2 - 40 °C [°C]

Accelerator AC140

Aspect (visual) :	clear liquid
Colour (Gardner, ISO 4630) :	≤9
Viscosity at 25 °C (ISO 12058-1) :	≤50 [mPa s]
Density at 25 °C (ISO 1675) :	0.95 - 1.05 [g/cm3]
Flash point (ISO 2719) :	92 [°C]
Storage temperature	2 - 40 °C [°C]

Storage
Provided that RST 1410, RST 1417 and Accelerator AC140 are stored in a dry place in their original, properly closed containers at the above mentioned storage temperatures they will have the shelf lives indicated on the labels. Partly emptied containers should be closed immediately after use. Because RST 1417 is sensitive to moisture, storage containers should be ventilated with dry air only. RST 1410 which has crystallized and looks cloudy can be restored to its original state by heating to 60 - 80 °C.

Processing data

Mix ratio

Components	*Parts by weight*	*Parts by volume*
RST 1410	100	100
RST 1417	115	110
AC140	0.5 – 2	0.6 - 2.4

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.

Initial mix viscosity
(Hoeppler, ISO 9371B)

		[°C]	*[mPa s]*
		at 25	150 - 250
RST 1410	*[pbw]*	100	100
RST 1417	*[pbw]*	115	115
AC140	*[pbw]*	1	2

Pot life

(Tecam, 100 ml, 65 % RH)	*[°C]*	*[days]*	*[days]*
	at 23	≥ 2	≥ 2
	at 40		1.0 - 1.5

Gel time

(Hot plate)	*[°C]*	*[min]*	*[min]*
	at 90	100 - 140	60 - 80
	at 100	55 - 65	25 - 30
	at 120	15 - 17	8 - 10
	at 140	6 - 8	3 - 4

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

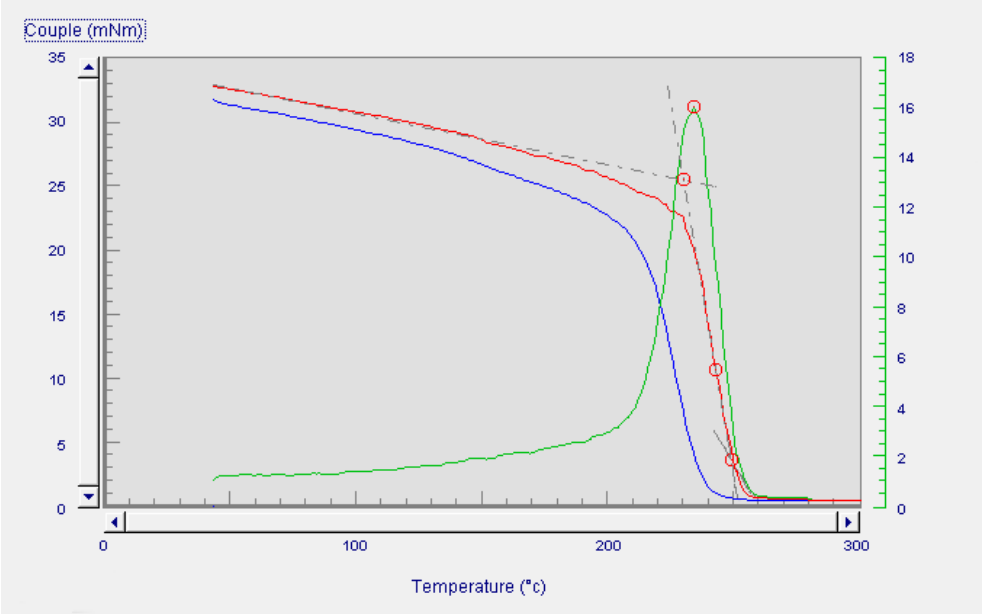
1 - 2 h 100 °C + 6 h 160 °C
or 1 - 2 h 100 °C + 4 - 6 h 180 °C

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

The values below were obtained with a formulation using 2 pbw AC140

Glass transition Temperature (TMA, 10 K/min)	Cure:	TG [°C]
	1 h 100 °C + 4 h 160 °C	189
	1 h 100 °C + 6 h 160 °C	190
	1 h 100 °C + 8 h 160 °C	191
	1 h 100 °C + 2 h 180 °C	200
	1 h 100 °C + 4 h 180 °C	201
	1 h 100 °C + 6 h 180 °C	206
	1 h 120 °C + 4 h 160 °C	191
	1 h 120 °C + 6 h 160 °C	193
	1 h 120 °C + 8 h 160 °C	195
	1 h 120 °C + 2 h 180 °C	202
	1 h 120 °C + 4 h 180 °C	204
	1 h 120 °C + 6 h 180 °C	208
(Kinetech, 3 K/min)	1 h 100 °C + 2 h 180 °C	**230 °C**



Tensile test (ISO 527)		Cure:	2 h 120 °C + 6 h 160°C	1 h 100 °C + 6 h 180 °C	1 h 120 °C + 2 h 180 °C
	Tensile strength	MPa	45 – 65	48 – 60	42 – 53
	Elongation at tensile	%	1.0 - 1.5	1.8 - 2.5	1.6 - 2.1
	strengthTensile modulus	MPa	2950 – 3050	2900 – 3000	2900 – 3000

Flexural test (ISO 178)		Cure:	2 h 120 °C + 6 h 160 °C	1 h 100 °C + 6 h 180 °C
	Flexural strength	MPa	80 – 105	110 – 135
	Elongation at flexural strength	%	2.3 - 3.6	3.8 - 5.0
	Ultimate strength	MPa	80 – 105	110 – 135
	Ultimate elongation	%	2.3 - 3.6	3.9 - 5.2
	Flexural modulus	MPa	2900 – 3100	2980 - 3120
			Cure:	2 h 120 °C + 6 h 160 °C
Fracture properties Bend notch test (PM 258-0/90)	Fracture toughness K1C		MPa	0.5 - 0.54
	Fracture energy G1C		mJ/m2	72 – 84
Water absorption (ISO 62)	Immersion:	Cure:	1 h 120 °C + 6 h 160 °C	
	4 days H2O 23 °C	%	0.50 - 0.65	
	10 days H2O 23 °C	%	0.80 - 1.10	
	30 min H2O 100 °C	%	0.20 - 0.30	
	60 min H2O 100 °C	%	0.35 - 0.45	
Coefficient of linear thermal expansion (DIN 53 752)	Mean value:	Cure:	1 h 100 °C + 6 h 180 °C	1 h 120 °C + 2 h 180 °C
	from 20 - 100 °C	[10^{-6}/K]	62 – 65	63 – 65
	from 100 - 130 °C	[10^{-6}/K]	66 – 68	66 – 69
	from 100 - 170 °C	[10^{-6}/K]	70 – 72	71 - 73

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