SR Surf Clear EVO / SD EVO

Epoxy system for surfboards

Sicomin Surf Clear EVO epoxy system is specially formulated for the manufacturing of surf boards.
Surf Clear EVO is suitable for hand lay up of glass, carbon, aramid, natural and synthetic fibers.
Surf Clear EVO is compatible with all commercial foams: polystyrene, polyurethane, cross-linked & linear PVC foams and others.
Surf Clear EVO is compatible with all typical fillers used in the surf industry.

		SD EVO Slow	SD EVO Medium	SD EVO Fast
Reactivity level		Slow	Standard	Fast
Initial viscosity (mPa.s)	20 °C	1 020	1 600	1 600
	30 °C	440	610	600
Pot Life (150 g)	20 °C	01 h 10	10 min	8 min
	30 °C	33 min	6 min	4 min
Mixing ratio				
	By weight	100 / 38	100 / 39	100 / 41
	By volume	100 / 50	100 / 50	100 / 50
Maximum strength	N/mm^2	72	70	68
% Elongation at max strength	%	3,9	4,1	4
Tg max onset	°C	89	84	80
Gel Time (1 mm)	20 °C	09 h 20	03 h 20	02 h 50
	30 °C	05 h 00	01 h 55	01 h 30
Time to reach 400 mPa.s	20 °C	04 h 20	01 h 20	01 h 10
	30 °C	02 h 40	49 min	40 min
Demold time	20 °C	28 h 00	10 h 00	08 h 30
	30 °C	15 h 00	05 h 45	04 h 30

Characteristics:

Ratio per volume 2:1.
High mechanical performance epoxy system recommended for surfboard production.
Yields surfboards with a flexible touch, high temperature and UV stability compared to standard epoxy resin.
High surface and plug finishing, for high gloss requirement.
Other applications: surf repairs, fin boxes & plugs, pattern and model coating, etc...
Low odor and reduced skin aggression for a better work environment.

Advices for application:

Work in a clean environment with heating facility.
Ideal working temperature from 18 °C to 30 °C.
Maintain a constant temperature during lamination.
Avoid high ambient humidity.
Avoid exposure to U.V. during the cure. Laminates and coatings benefitting from a sun free post cure or polymerized for at least 7 days at 18°C will obtain greater U.V. resistance and mechanical properties
Do not dilute with solvents. Please consult our technical assistance.
The use of compatible pigments is possible.
Keep packaging well-sealed as hardeners are sensitive to carbonic gas and humidity.
A polyurethane or other top coat paint can (for best UV protection) be applied, without primer, after sanding the final layer of **Surf Clear EVO**.

Green Technology:

SICOMIN is heavily involved in green chemistry. When technology and availability of raw materials allows, we choose raw materials from biomass sourcing.
Surf Clear EVO epoxy resin is manufactured with
a bio-based carbon content of about 40 % (resin alone)

OH additive, the shiniest Surf resin in the world

Sicomin offers the possibility to use an extra additive to mix with the resin Surf Clear EVO to improve the light radiance of the laminates applied on top of white PS or PU foams. Used for colored board, OH additive can modify the color perception (blue effect with carbon or pink effect with wood or linen fabrics), please test before to avoid any surprises.
Mixing: 1 g of OH for 1 kg of resin SR Surf Clear EVO - First mix resin and OH additive, then mix with hardener

Epoxy resin SR Surf Clear EVO

Appearance		liquid
Color		purple
Viscosity (mPa.s)	15 °C	5500 ± 1100
	20 °C	2925 ± 575
	25 °C	1680 ± 320
	30 °C	1070 ± 220
Density	20 °C	1,18
Bio-based Carbon content (%)		40
Storage (months)	23 °C	24

Hardener(s)

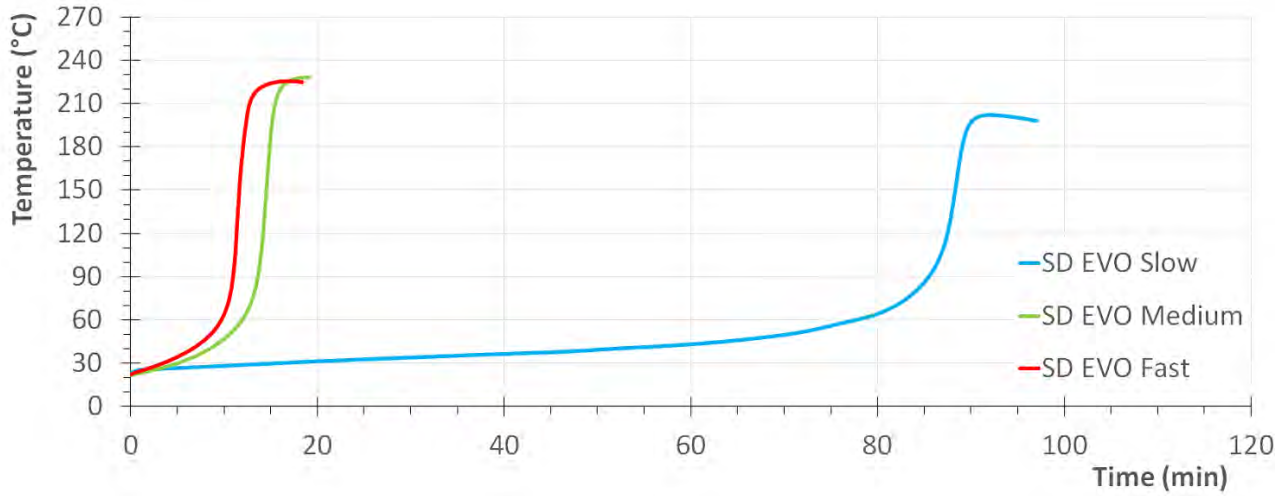
		SD EVO Slow	SD EVO Medium	SD EVO Fast
Appearance		liquid	liquid	liquid
Color		colourless	light yellow	colourless
Gardner color		≤ 2	≤ 1	≤ 1
Reactivity level		Slow	Standard	Fast
Viscosity (mPa.s)	15 °C	80 ± 15	180 ± 40	290 ± 60
	20 °C	60 ± 15	120 ± 25	190 ± 40
	25 °C	45 ± 10	80 ± 20	125 ± 25
	30 °C	32 ± 6	60 ± 12	90 ± 20
Density	20 °C	0,97	0,99	0,98
Storage (months)	23 °C	24	24	24

Mixe(s) SR Surf Clear EVO / SD EVO

		SD EVO Slow	SD EVO Medium	SD EVO Fast
Appearance		liquid	liquid	liquid
Color		purple	purple	purple
Mixing ratio				
By weight		100 / 38	100 / 39	100 / 41
By volume		100 / 50	100 / 50	100 / 50
Initial viscosity (mPa.s)	20 °C	1 020	1 600	1 600
	30 °C	440	610	600
Density	20 °C	1,10	1,10	1,10

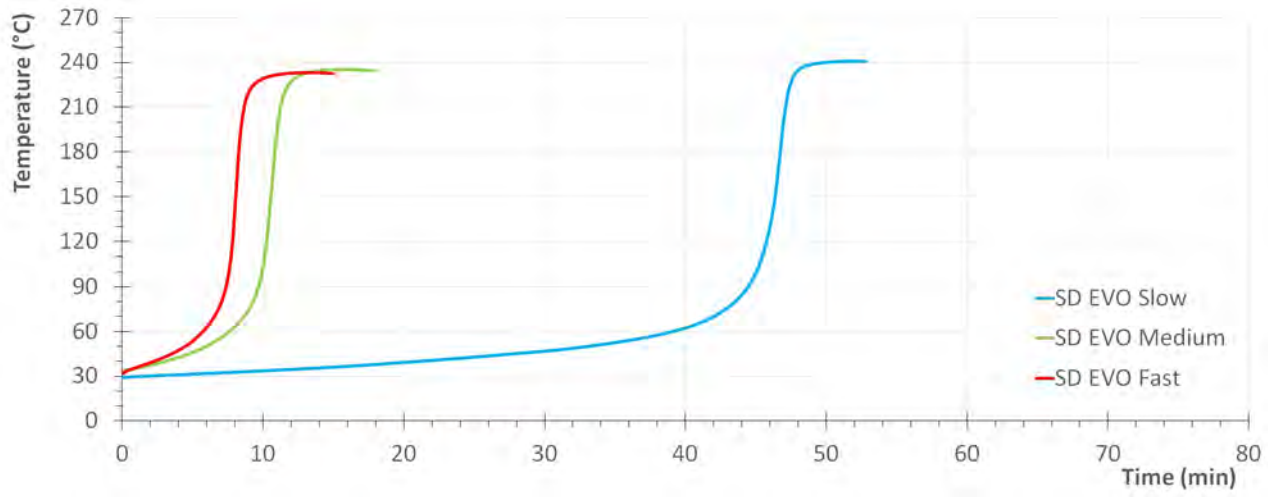
Reactivity 20 °C for 150 g SR Surf Clear EVO / SD EVO

	SD EVO Slow	SD EVO Medium	SD EVO Fast
Exothermic temperature (°C)	202	228	225
Exothermic peak time	01 h 30	18 min	15 min
Time to reach 50 °C	01 h 10	10 min	8 min



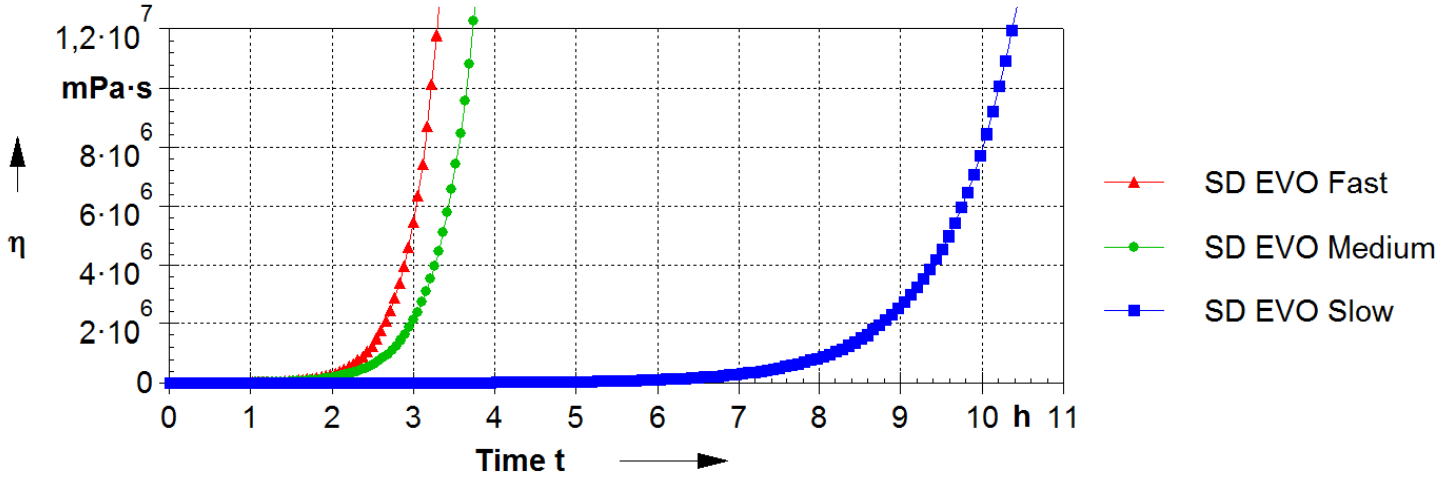
Reactivity 30 °C for 150 g SR Surf Clear EVO / SD EVO

	SD EVO Slow	SD EVO Medium	SD EVO Fast
Exothermic temperature (°C)	241	235	233
Exothermic peak time	53 min	14 min	12 min
Time to reach 50 °C	33 min	6 min	4 min

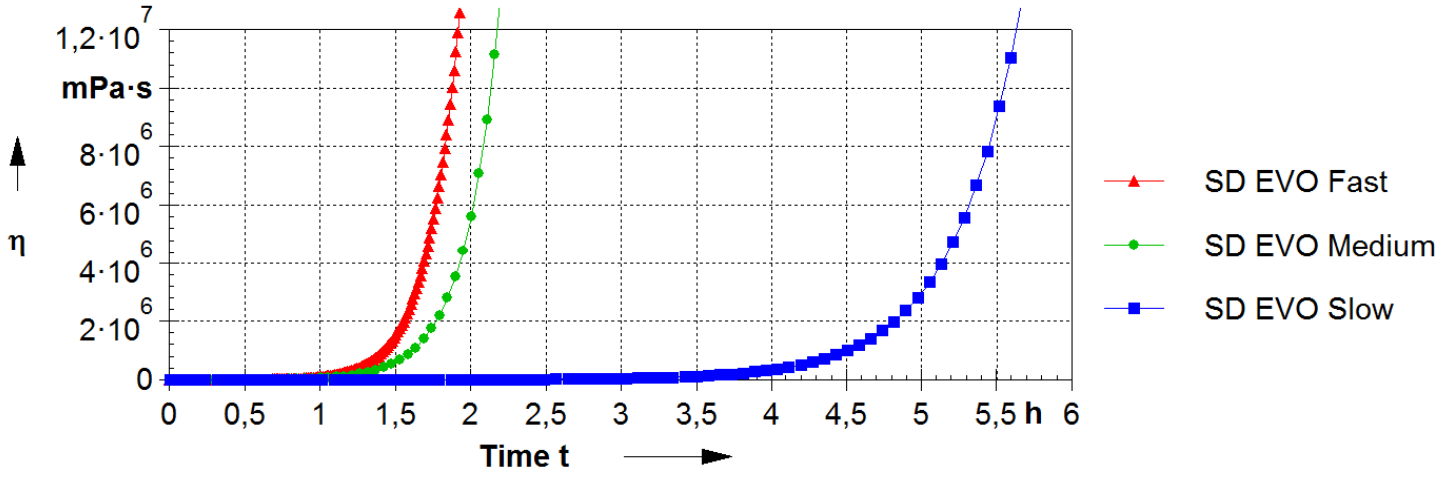


Reactivity on 1 mm thick layer

20 °C



30 °C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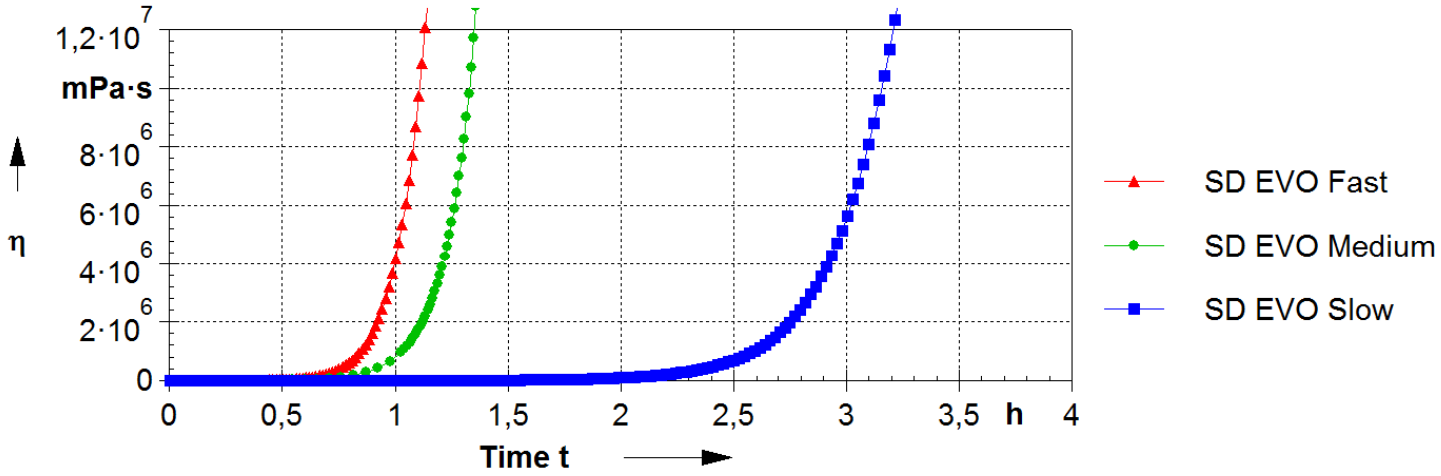
SD EVO Medium
SD EVO Slow

40 °C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SD EVO Medium
SD EVO Slow

Post-curing

The thermomechanical values of an epoxy system can be optimized by implementing a post-curing cycle. The Sicomin laboratory provides several predefined post cure cycles on its data sheets allowing users to compare systems. These experimental cycles are adaptable to your specific applications, taking the following parameters into account:

- Selected epoxy system (Tg max)
- Available heat source
- Room Dimension and Sampling
- Nature of the tooling (thermal conductivity of material)

Many systems can provide good mechanical properties after curing at room temperature and from 18°C for 24 to 48 hours before demolding.
The mechanical properties progress very quickly with a slightly higher temperature of around 40°C for several hours.
Epoxy systems with high Tg and slow and extra-slow hardeners imperatively require post-curing at a higher temperature. It is possible to start the cycle as soon as the exothermic peak passes, but also to start post-curing later after assembly of the various components and before the finishing operations. If the nature of the models and tools is not suitable for high temperatures, we recommend carrying out the first stages up to the maximum admissible temperature then, after cooling and demoulding, continuing the cycle on a suitable former.
For a conventional epoxy system, we recommend carrying out a cycle in steps of 20°C for 4 hours.

Example for an epoxy system Tg max 100°C:
4 hrs at 40°C + 4 hrs at 60°C + 4 hrs at 80°C + cooling to room temperature before unmoulding.

There are many short cycle, high temperature epoxy systems that do not fit into this post-cure scheme (pultrusion, hot press, pre-preg). For these systems, initial curing provides maximum thermomechanical performance without post-curing.

We invite you to contact our technical department for your questions on this subject.

Mechanical properties on cast resin :

		SR Surf Clear EVO / SD EVO Slow			SR Surf Clear EVO / SD EVO Medium		
		16 h 60 ° C			24 h Ta + 16 h 60 °C		
Tensile							
Modulus	N/mm^2	3 400			3 400		
Maximum strength	N/mm^2	72			70		
Breaking Strength	N/mm^2	67			66		
Elongation at max strength	%	3,9			4,1		
Elongation at break	%	5,1			6		
Flexion							
Modulus	N/mm^2	3 100			3 200		
Maximum strength	N/mm^2	120			122		
Breaking Strength	N/mm^2	111			108		
Elongation at max strength	%	5,4			5,7		
Elongation at break	%	7,2			8,2		
Shear							
Breaking Strength	N/mm^2	47			49		
Compression							
Modulus	N/mm^2						
Yield strength	N/mm^2	99			105		
Offset compression yield	%	13,4			15,8		
Charpy impact strength							
Resilience	kJ/m^2	44			40		
DSC glass transition							
Tg onset	°C	86			88		
Tg max onset	°C	89			84		

These curing cycles are applied after a 24-hour hardening period at room temperature, allowing the reaction to freeze and exotherm bevond.

Mechanical properties on cast resin :

		SR Surf Clear EVO / SD EVO Fast		
		24 h Ta + 16 h 60 °C		
Tensile				
Modulus	N/mm^2	3 400		
Maximum strength	N/mm^2	68		
Breaking Strength	N/mm^2	65		
Elongation at max strength	%	4		
Elongation at break	%	6,5		
Flexion				
Modulus	N/mm^2	3 200		
Maximum strength	N/mm^2	117		
Breaking Strength	N/mm^2	103		
Elongation at max strength	%	5,6		
Elongation at break	%	8,5		
Shear				
Breaking Strength	N/mm^2	48		
Compression				
Modulus	N/mm^2			
Yield strength	N/mm^2	103		
Offset compression yield	%	14,3		
Charpy impact strength				
Resilience	kJ/m^2	38		
DSC glass transition				
Tg onset	°C	80		
Tg max onset	°C	80		

These curing cycles are applied after a 24-hour hardening period at room temperature, allowing the reaction to freeze and exotherm bevond.

Tests carried out on samples of pure cast resin, without prior degassing, between steel plates.

Measures undertaken according to the following norms:

Mechanical tests:

Tension:	*NF EN ISO 527-2:2012*
Flexion:	*NF EN ISO 178:2011*
Compression:	*NF EN ISO 604:2004 or NF EN ISO 844:2014 (foam product)*
Charpy impact strength:	*NF EN ISO 179-1:2010*
Shear Strength:	*ASTM D732–17 (Punch Tool)*
Interlaminar shrinkage strength:	*ASTM D5528-13*
Toughness (GIC et KIC) :	*ISO 13586:2000*
Water absorption:	*Internal. Polymerization according to cycle, machining, weighing, time spent in distilled water at 70 °C / 48 hours, weighing 1 hour after emerging,*
Bonding Strength Double lap shear:	*ASTM D3528-96* *ADH = adhesive failure* *COH = cohesive failure* *TLC = thin-layer cohesive failure* *FT = fiber-tear failure.* *LFT = light-fiber-tear failure*

Thermal tests:

Glass transition DSC:	*NF EN ISO 11357-2:2014*	*-5°C to 180 °C under nitrogen gas*
	T_{G1} or Onset:	*1st scan at 20 °C/min*
	T_{G1} maximum or Onset:	*2nd scan at 20 °C/min*
Glass transition DTMA:	*Temperature ramp 0 °C to 180 °C @ 2°C/min under normal atmosphere*	
	NF EN ISO 11357-1:2016	*T_G onset G'*
	ASTM D4065-12	*T_G peak G''*

Physical tests:

Gardner color:	*NF EN ISO 4630:2016*	*Visual method*
Refractive index:	*NF ISO 280:1999*	
Viscosity:	*NF EN ISO 3219:1994*	*Rheometer 50 mm, shear 10 s^{-1}*
Density on liquids:	*ISO 2811-1:2016*	*Pycnometer*
Density on solid:	*NF EN ISO 1183-3:1999*	*Helium Pycnometer*
Density on foam:	*NF EN ISO 845:2009*	
Gel time:	*Cross G' G''*	*Rheometer CP50 - Shear rate 10 s^{-1}*
Green Carbone content:	*ASTM D6866-16 or XP CEN/TS 16640 Avril 2014*	

TA:	*Ambient temperature (20 to 25 °C)*
NC:	*No information Communicated*
NB:	*No Breaking (maximum flexion deformation : 15 %)*

Table 1st page:

Pot Life:	*Time to reach 50 °C or time limit for use*
Gel time:	*Intersection of tangents on the viscosity curve of 1 mm thick layer*
Release time:	*Time required to obtain sufficient mechanical strength to release*
Minimum Vacuum Time:	*Time in which vacuum can be applied (25000 mPa.s)*
Maximum Vacuum time:	*Limit time below which a vacuum can be applied (G'G " crossing)*
Optimum Infusion time:	*Time to reach 400 mPa.s*
Max Infusion Time:	*Time to reach 25000 mPa.s*
Vacuum cut-off time:	*Time to reach G'G " crossover + 20%*

Mix

SR Surf Clear EVO	Resin part + Hardener part (kg)	Resin part (kg)	Hardener part (kg)
SD EVO Slow	1,38 6,90 32,90	1 5 23,84	0,38 1,90 9,06
SD EVO Medium	1,39 2,78 6,95 33,14	1 2 5 23,84	0,39 0,78 1,95 9,30
SD EVO Fast	1,41 2,82 7,05 34,40	1 2 5 23,84	0,41 0,82 2,05 10,56