SR 8500 / SD 870X

Versatile epoxy system for composite applications

SR 8500 / **SD 870x** system has been developed for production of technical composite structures using hand layup & vacuum bagging techniques.
We carefully took care in selecting CMR and SVHS free raw materials to improve hazard labelling and assure the best working conditions for users.

		SD 8705	SD 8703	SD 8702	SD 8701
Reactivity level		Very Fast	Standard	Slow	Ultra slow
Initial viscosity (mPa.s)	20 °C	2 980	1 435	1 015	660
	30 °C	1 940	800	590	310
Pot Life (100 g)	20 °C	35 min	01 h 40	04 h 00	05 h 00
	30 °C	15 min	30 min	50 min	02 h 00
Mixing ratio					
	By weight	100 / 35	100 / 35	100 / 35	100 / 35
	By volume	-	-	-	-
Maximum strength	N/mm^2	85	77	72	69
% Elongation at max strength	%	4,3	4,1	4,2	4
Tg max onset	°C	93	88	88	87
Gel Time (1 mm)	20 °C	03 h 40	08 h 20	11 h 30	21 h 20
	30 °C	02 h 00	04 h 20	06 h 30	11 h 40
Time to reach 400 mPa.s	20 °C	01 h 15	03 h 50	05 h 45	11 h 40
	30 °C	58 min	02 h 20	03 h 40	07 h 05
Demold time	20 °C	11 h 00	25 h 00	34 h 30	64 h 00
	30 °C	06 h 00	13 h 00	19 h 30	35 h 00

SR 8500 / **SD 870x** system has been developed for production of technical composite structures using hand layup & vacuum bagging techniques.
We carefully took care in selecting CMR and SVHS free raw materials to improve hazard labelling and assure the best working conditions for users.
Its medium viscosity is formulated from the latest chemistry technologies which allows to reduce drainage of vertical laminates and keep oustanding wetout of heavyweight fabrics.

SR 8500 is available with large range of hardeners mixable in any proportions in order to achieve the wanted reactivities.

SR 8500 / **SD 870x** cures at ambient temperature and give its highest properties after moderate postcures 40-60°C
hardeners

SD 8705
Ultra fast hardener. It is used as **SD 8701** accelerator.
Reactivity adapted for the manufacturing of small parts.
Good mechanical properties after ambient curing.

SD 8701
Ultra Slow Hardener.
Reactivity adapted for big part manufacturing
Recommended post cure at 40 °C before unmoulding

Epoxy resin SR 8500

Appearance		liquid
Color		yellow
Gardner color		≤ 2
Viscosity (mPa.s)	15 °C	28500 ± 5500
	20 °C	10475 ± 2075
	25 °C	4650 ± 950
	30 °C	2450 ± 550
	40 °C	750 ± 200
Density	20 °C	1,18
Storage (months)	23 °C	24

Hardener(s)

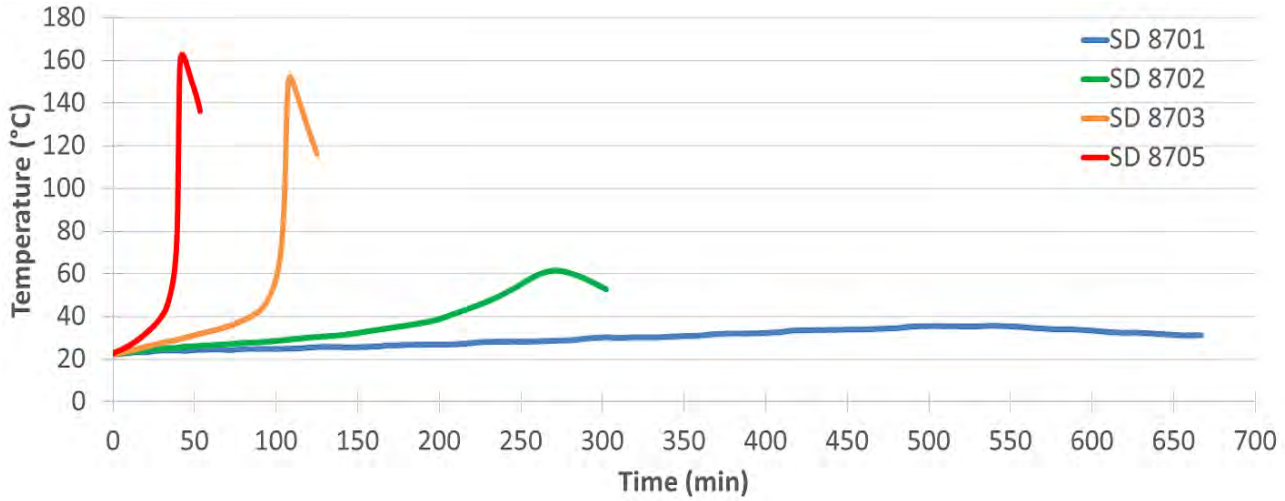
		SD 8705	SD 8703	SD 8702	SD 8701
Appearance		liquid	liquid	liquid	liquid
Color		yellow	light yellow	colourless	light yellow
Gardner color		≤ 6	≤ 5	≤ 4	≤ 2
Reactivity level		Very Fast	Standard	Slow	Ultra slow
Viscosity (mPa.s)	15 °C	475 ± 95	68 ± 14	38 ± 8	18 ± 4
	20 °C	300 ± 60	50 ± 10	28 ± 6	14 ± 3
	25 °C	200 ± 40	38 ± 7	23 ± 4	12 ± 2
	30 °C	140 ± 30	29 ± 6	18 ± 3	10 ± 2
Density	20 °C	1,02	0,98	0,97	0,95
Storage (months)	23 °C	24	24	24	24

Mixe(s) SR 8500 / SD 870x

		SD 8705	SD 8703	SD 8702	SD 8701
Appearance		liquid	liquid	liquid	liquid
Color		yellow	light yellow	light yellow	colourless
Mixing ratio					
	By weight	100 / 35	100 / 35	100 / 35	100 / 35
	By volume	-	-	-	-
Density	20 °C	1,18	1,18	1,17	1,18
Initial viscosity (mPa.s)	20 °C	2 980	1 435	1 015	660
	30 °C	1 940	800	590	310

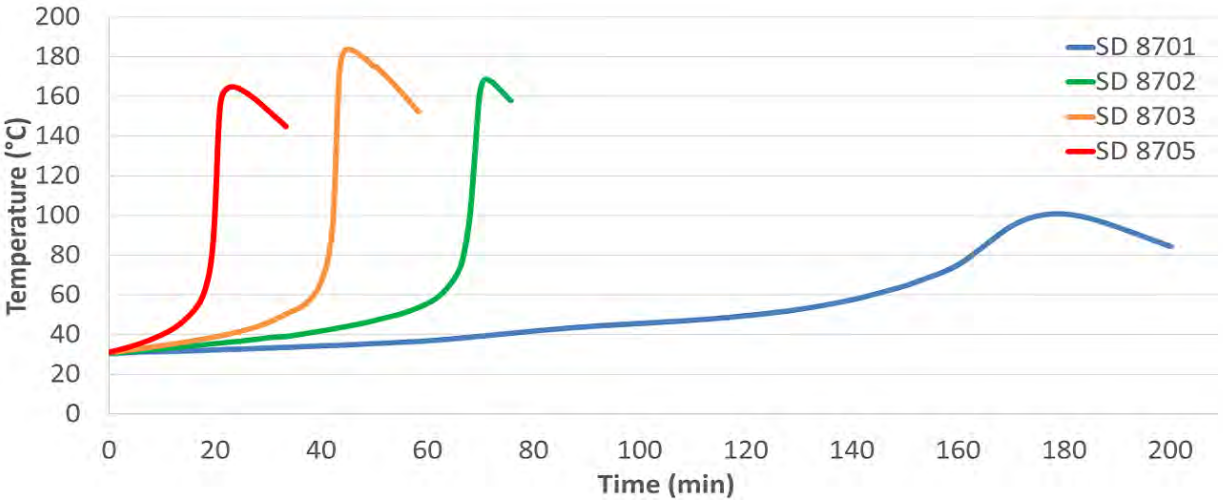
Reactivity 20 °C for 100 g SR 8500 / SD 870x

	SD 8705	SD 8703	SD 8702	SD 8701
Exothermic temperature (°C)	163	152	62	36
Exothermic peak time	40 min	01 h 50	04 h 30	09 h 00
Time to reach 50 °C	35 min	01 h 40	04 h 00	-



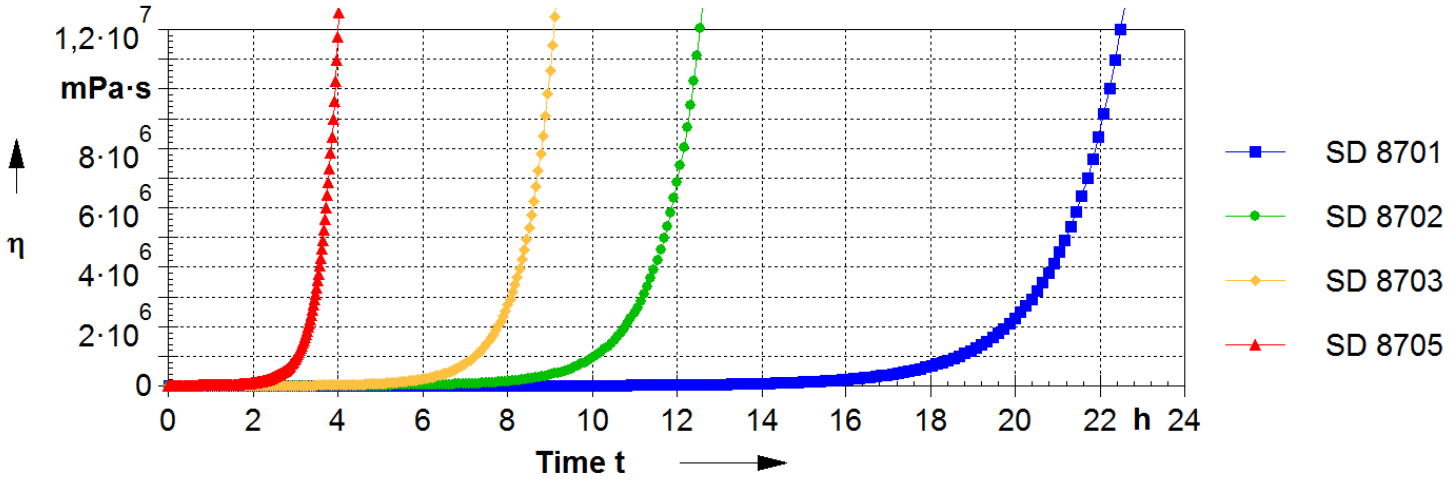
Reactivity 30 °C for 100 g SR 8500 / SD 870x

	SD 8705	SD 8703	SD 8702	SD 8701
Exothermic temperature (°C)	165	184	169	100
Exothermic peak time	20 min	45 min	01 h 10	03 h 00
Time to reach 50 °C	15 min	30 min	50 min	02 h 00

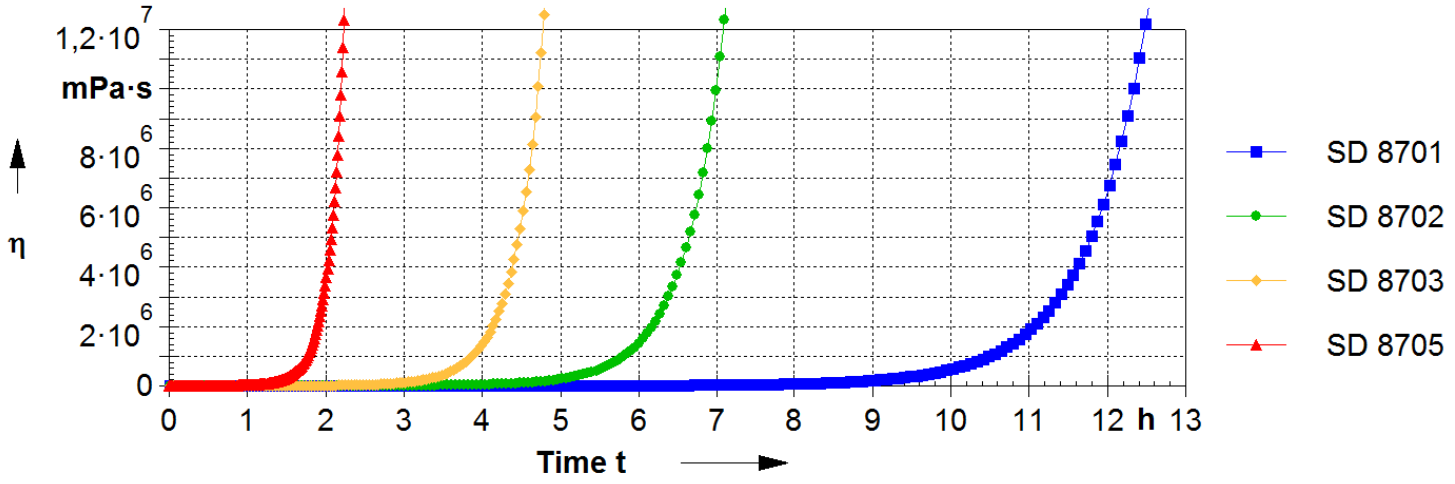


Reactivity on 1 mm thick layer

20 °C



30 °C



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 8500 / SD 8705			SR 8500 / SD 8703		
		24 h TA 48 h 40 °C	24 h TA 16 h 60 °C	24 h TA 8 h 80 °C	24 h TA 48 h 40 °C	24 h TA 16 h 60 °C	24 h TA 8 h 80 °C
Tensile							
Modulus	N/mm²	3 847	3 723	3 659	3 719	3 589	3 399
Maximum strength	N/mm²	72	81	85	78	83	77
Breaking Strength	N/mm²	72	81	79	78	78	73
Elongation at max strength	%	2,5	3,2	4,3	2,7	4	4,1
Elongation at break	%	2,5	3,2	6,2	2,7	5,2	5,3
Flexion							
Modulus	N/mm²	3 649	3 549	3 393	3 531	3 375	3 235
Maximum strength	N/mm²	121	135	135	126	128	122
Breaking Strength	N/mm²	121	123	113	113	97	104
Elongation at max strength	%	3,6	4,9	5,7	4,6	5	5,4
Elongation at break	%	3,7	6,2	8,6	8,1	7,8	8,1
Shear							
Breaking Strength	N/mm²	48	52	55	46	49	47
Compression							
Modulus	N/mm²						
Yield strength	N/mm²	117	117	114	109	110	100
Offset compression yield	%	13,1	13,7	14,4	12,5	13,1	14
Charpy impact strength							
Resilience	kJ/m²	13	21	11	18	26,2	32
DSC glass transition							
Tg onset	°C	70	82	87	70	76	80
Tg max onset	°C			93			88
DTMA glass transition							
Tg tan delta	°C						
TeiG onset G’	°C						
TmG midpoint G’	°C						
TefG endpoint	°C						
TG peak G ‘’	°C						

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 8500 / SD 8702			SR 8500 / SD 8701		
		24 h TA 48 h 40 °C	24 h TA 16 h 60 °C	24 h TA 8 h 80 °C	24 h TA 48 h 40 °C	24 h TA 16 h 60 °C	24 h TA 8 h 80 °C
Tensile							
Modulus	N/mm²	3 630	3 455	3 253	3 700	3 070	2 800
Maximum strength	N/mm²	75	80	72	72	76	69
Breaking Strength	N/mm²	71	76	65	72	72	64
Elongation at max strength	%	2,9	3,9	4,2	2,7	3,9	4
Elongation at break	%	3,4	4,6	6,1	2,7	4,7	4,8
Flexion							
Modulus	N/mm²	3 368	3 278	3 052	3 300	3 280	3 050
Maximum strength	N/mm²	121	123	114	122	120	112
Breaking Strength	N/mm²	108	88	93		-	
Elongation at max strength	%	4,5	5,1	5,4	4,5	5,3	5,4
Elongation at break	%	6,2	8,1	8,7		9,1	10,7
Shear							
Breaking Strength	N/mm²	45	46	44			
Compression							
Modulus	N/mm²						
Yield strength	N/mm²	105	102	94	106	98	91
Offset compression yield	%	11,7	12,8	13,2	11,2	6,2	7,4
Charpy impact strength							
Resilience	kJ/m²	18	23	32	19	54	65
DSC glass transition							
Tg onset	°C	67	77	93	66	76	87
Tg max onset	°C			88			87
DTMA glass transition							
Tg tan delta	°C						
TeiG onset G’	°C						
TmG midpoint G’	°C						
TefG endpoint	°C						
TG peak G ‘’	°C						

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 8500	Resin part + Hardener part (kg)	Resin part (kg)	Hardener part (kg)
SD 8705	270 32,1 7,94 1,62	200 23,74 5,88 1,2	4 x 17,5 8,36 2,06 0,42
SD 8703	270 32,1 7,94 1,62	200 23,74 5,88 1,2	200 23,74 5,88 1,2
SD 8702	270 32,1 7,94 1,62	200 23,74 5,88 1,2	200 23,74 5,88 1,2
SD 8701	270 32,1 7,94 1,62	200 23,74 5,88 1,2	200 23,74 5,88 1,2