SR 1500
Epoxy laminating system

This modified epoxy resin has been formulated to be cristalization free and low toxicity.
This epoxy system has very good wet-out, degazing properties and an excellent adhesion to all type of reinforcements (glass, aramid, carbon, polyester…)
Adjustable working time depending on the choice of the hardener
Respecting the ratio resin / hardener, the hardeners are mixable by weight, to achieve the most adapted reactivity for the application.
Glass transition : 75 - 81°C
The parts can be in service after 7 to 14 days at 23°C for the hardeners **SD 2507**, **SD 2806**, **SD 2505** and **SD 2503**.
Post-cure at a minimum of 40°C for a Tg above 55°C
Developped for : ship building, aeronautic, automotive prototypes, tool making.

Other applications : putty for coating with microspheres, syntactic core material, casting volume depending on the hardeners.

Typical use

SR 1500 / SD 2507, SD 2806 :
Low thickness laminates, low temperature hardening (10 - 15°C).
Rapid repair and bonding, putty…

SR 1500 / SD 2505 , SD 2503:
Standard lamination system, all dimension parts, tooling, fillet joint…

SR 1500 / SD 7561
Big parts, or high thickness laminate parts. Injection, infusion, casting…
Long open time with laminate.
Post curing temperature : 55 °C minimum

SR 1500 based formulations
SR 1500 i : Fireproof autoextinguishing epoxy system
SR 1500 / SD 597.20: Very high thickness casting.
SR 1500 JV : Contains a mix control. Yellow unfilled resin becoming purple in contact with hardener.

Polymerisation and curing conditions

SD 2507, **SD 2806** and **SD 2505** have been developped to offer excellent mechanical properties after a moderate temperature post–cure.

	SR 1500 / SD 2507 **SR 1500 / SD 2806** **SR 1500 / SD 2505**	**SR 1500 / SD 2503**	**SR 1500 / SD 7561**
Time to wait at 20°C before post-cure	2 to 4 hours	12 hours	24 hours
Minimum post-cure cycle	2 to 7 days at 20°C	14 days at 20°C	12 hours at 60 °C
Advised post-cure cycle	2 to 7 days at 20°C Or 12 hours at 40°C Or 6 hours at 60°C	14 days at 20°C Or 24 hours at 40°C Or 8 hours at 60°C	4 hours at 40 °C + 12 hours at 60 °C

Epoxy resin SR 1500

		SR 1500
Aspect		Liquid
Colour		clear
Viscosity (mPa.s)	15 °C	5 300 ± 1 000
Rheometer	20 °C	2 300 ± 500
CP 50 mm	25 °C	1 250 ± 250
Shear rate 10 s^{-1}	30 °C	750 ± 150
	40 °C	300 ± 60
Density **:** Picnometer NF EN ISO 2811-1	20 °C	1.13 ± 0.01
Storage stability:		24 months, do not crystallize

Hardeners SD xxxx

		SD 2507	**SD 2806**	**SD 2505**	**SD 2503**	**SD 7561**
Aspect / colour:		Yellow liquid	Yellow liquid	Yellow liquid	Yellow liquid	Clear liquid
Reactivity		Ultra fast	Intermediate reactivities			Ultra slow
Viscosity (mPa.s)						
Rheometer	20 °C	1 600 ± 300	300 ± 60	350 ± 70	210 ± 40	60 ± 15
CP 50 mm	25 °C	1 000 ± 200	200 ± 40	230 ± 40	150 ± 30	45 ± 10
Shear rate 10 s^{-1}	30 °C	600 ± 100	140 ± 30	150 ± 30	100 ± 20	35 ± 5
Density **:** Picnometer NF EN ISO 2811-1	20 °C	1.09 ± 0.01	1.07 ± 0.01	1.00 ± 0.01	1.00 ± 0.01	0.96 ± 0.01

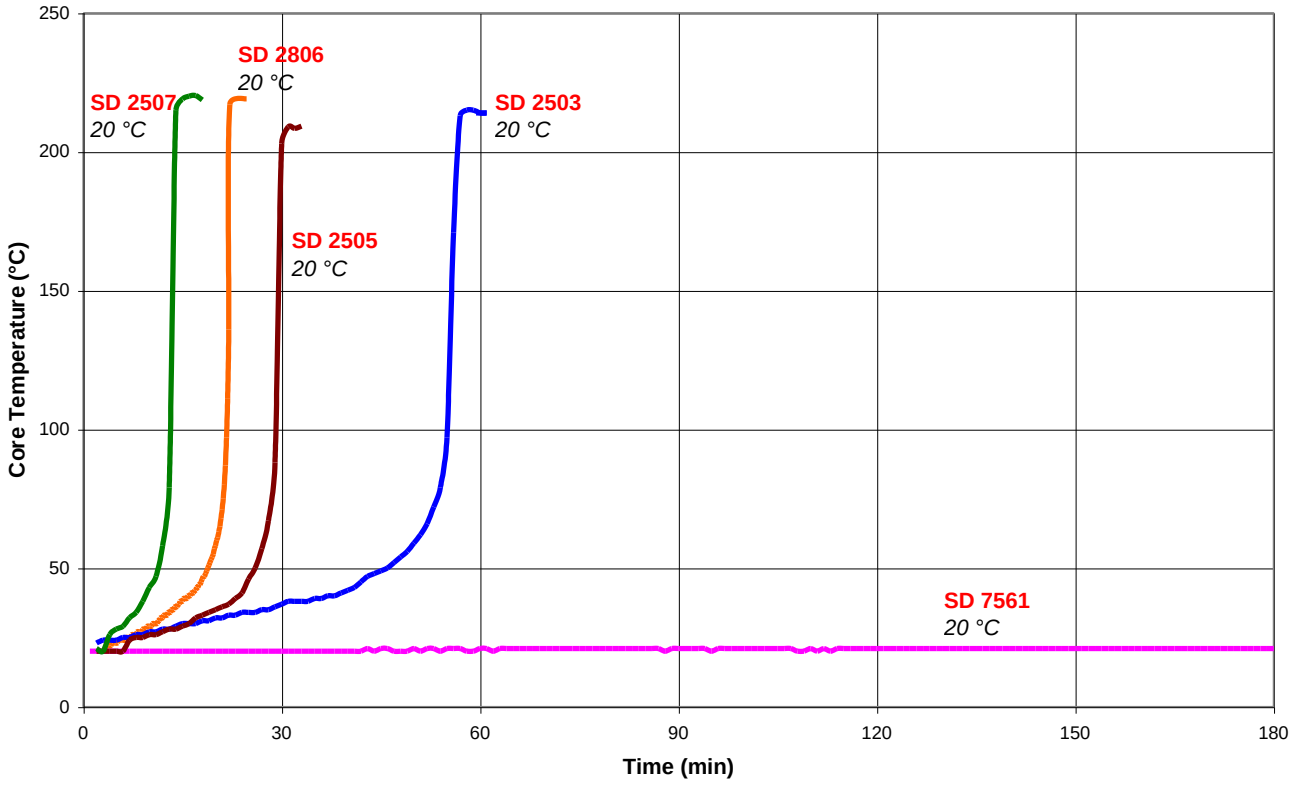
SR 1500 / SD xxxx mix properties

		SR 1500 / SD 2507	SR 1500 / SD 2806	SR 1500 / SD 2505	SR 1500 / SD 2503	SR 1500 / SD 7561
Weight ratio		**100 / 33 g**	**100 / 33 g**	**100 / 33 g**	**100 / 33 g**	**100 / 33 g**
Volume ratio		**100 / 35 ml**	**100 / 35 ml**	**100 / 37 ml**	**100 / 37 ml**	**100 / 39 ml**
Viscosity						
Rheometer	20 °C	2 200 ± 400	1 000 ± 200	800 ± 150	750 ± 150	650 ± 120
PP 50 mm	25 °C	1 500 ± 300	800 ± 150	650 ± 120	600 ± 120	450 ± 100
Shear rate 10 s^{-1}	30 °C	800 ± 150	550 ± 100	500 ± 100	400 ± 80	350 ± 70

Mass reactivity on 500 g mix

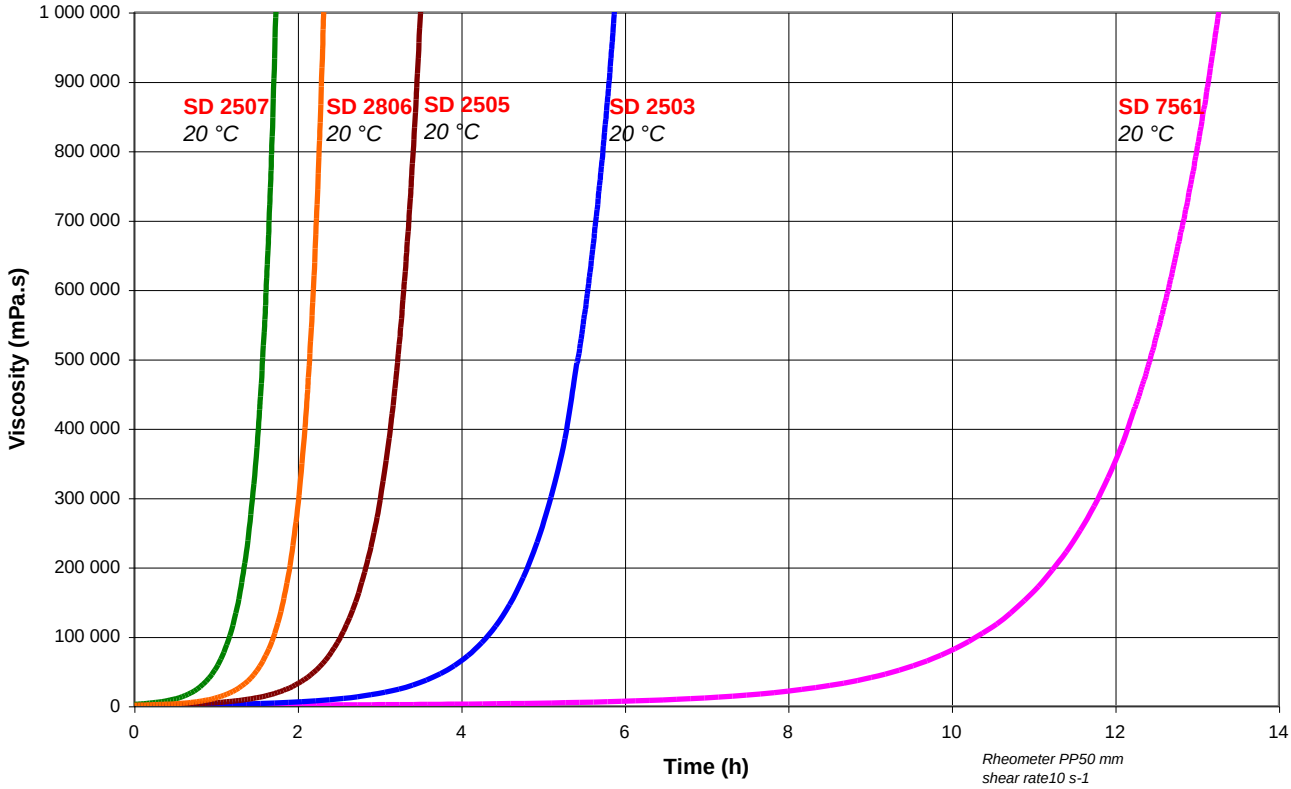
	SR 1500 / SD 2507	SR 1500 / SD 2806	SR 1500 / SD 2505	SR 1500 / SD 2503	SR 1500 / SD 7561
Exothermic peak (°C) on 500 g mix :					
30°C	> 215 °C	> 215 °C	> 215 °C	> 215 °C	190 °C
25°C	> 215 °C	> 215 °C	> 215 °C	> 215 °C	117 °C
20°C	> 215 °C	> 215 °C	> 215 °C	> 215 °C	26 °C
Time to reach exothermic peak on 500 g mix					
30°C	11'	13'	15'	27'	2h 33'
25°C	10'	17'	20'	42'	4h 30'
20°C	13'	22'	30'	57'	8h
Time to reach 50 °C on 500 g mix					
30°C	4'	9'	10'	18'	1h 50'
25°C	5'	12'	14'	33'	4h
20°C	11'	18'	25'	45'	-

Mass reactivity – exothermic peak on a 500 g mix at 20 °C

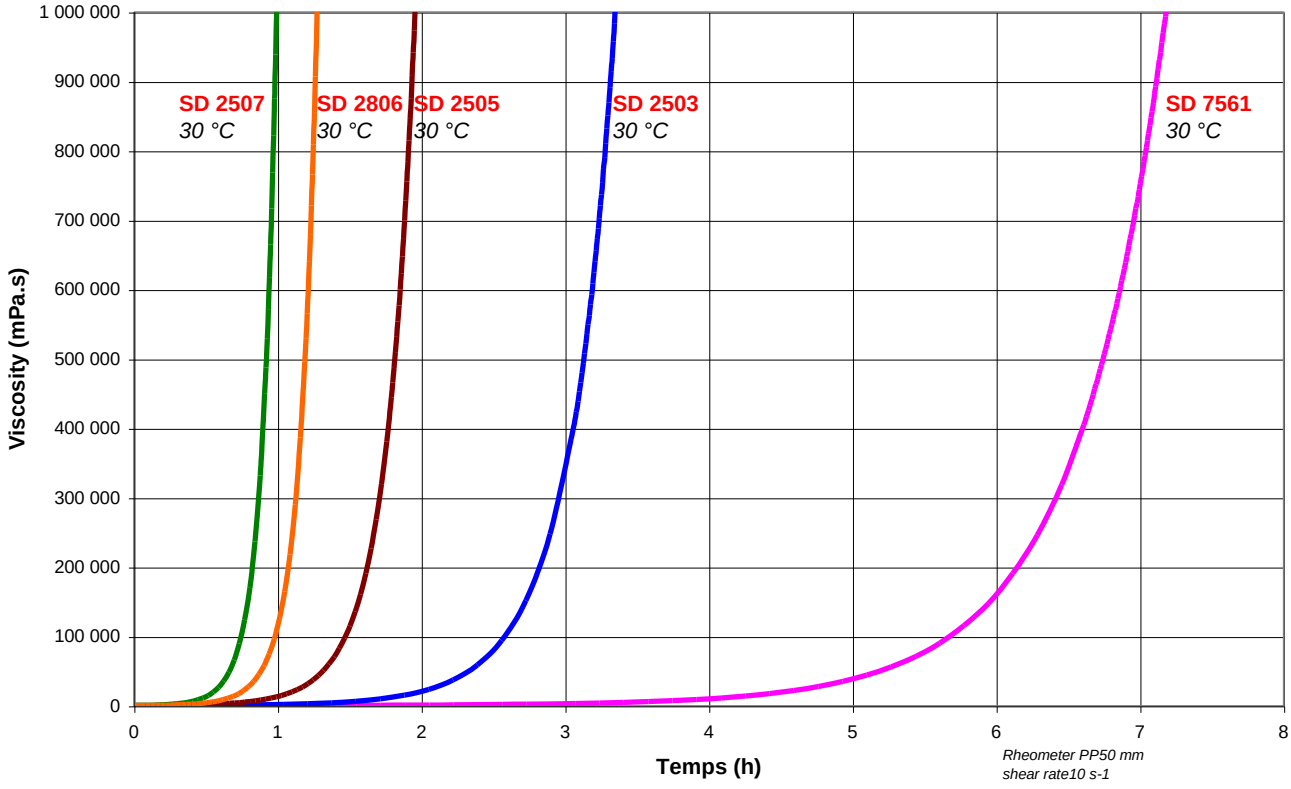


Reactivity – Viscosity evolution on a 1 mm film

- **20 °C**



- **30 °C**



Mechanical properties on pure cast :

Curing cycles		SR 1500 / SD 2507			SR 1500 / SD 2806		
		14 jours 23 °C	24 h 23°C + 24h 40°C	24 h 23°C + 8h 60 °C	14 jours 23 °C	24 h 23°C + 24h 40°C	24 h 23°C + 16h 60 °C
Tension							
Modulus of elasticity	N/mm^2	3300	3200	3140	3490	3340	3250
Maximum resistance	N/mm^2	80	80	80	68	79	81
Resistance at break	N/mm^2	74	72	74	68	66	70
Elongation at max. load	%	3.7	3.9	4.3	2.3	3.7	4.0
Elongation at break	%	4.5	4.7	5.6	2.3	6.0	7.0
Flexion							
Modulus of elasticity	N/mm^2	3450	3400	3300	3580	3480	3420
Maximum resistance	N/mm^2	123	121	123	111	117	118
Elongation at max. load	%	4.8	5.0	5.4	3.9	9.5	5.0
Elongation at break	%	7.8	8.1	8.4	4.7	4.6	8.8
Charpy impact strength							
Resilience	kJ/m^2	19	27	24	13	8	8
Glass Transition / DSC							
Tg1	°C	55	69	73	54	65	62
Tg1 max.	°C			75			72

Tests carried out on samples of pure cast resin, without prior degassing, between steel plates.
Measures undertaken according to the following norms :

Tension:	NF T 51-034
Flexion :	NF T 51-001
Charpy impact strength:	NF T 51-035
Glass transition DSC :	ISO 11357-2 : 1999 -5°C to 180°C under nitrogen gaz Tg1 or Onset : 1st point at 20 °C/mn Tg1 maximum or Onset : second passage

Mechanical properties on pure cast :

		SR 1500 / SD 2505			SR 1500 / SD 2503		SR 1500 / SD 7561		
Curing cycles		14 jours 23 °C	24 h 23°C + 24h 40°C	24 h 23°C + 8h 60 °C	14 jours 23 °C	24 h 23°C + 8h 60 °C	14 jours 23 °C	24 h 23°C + 24h 40°C	24 h 23°C + 16h 60 °C
Tension									
Modulus of elasticity	N/mm^2	3100	2900	2900	3350	2860	3000	3000	2900
Maximum resistance	N/mm^2	77	74	74	77	71	48	67	68
Resistance at break	N/mm^2	71	68	68	72	65	48	67	67
Elongation at max. load	%	3.6	4.4	4.7	3.6	4.7	1.9	2.7	3.8
Elongation at break	%	4.5	6.0	7.4	5.4	8.0	1.9	2.8	4.2
Flexion									
Modulus of elasticity	N/mm^2	3200	3100	3100	3300	2760	3250	3100	3100
Maximum resistance	N/mm^2	115	115	117	125	123	77	112	122
Elongation at max. load	%	4.8	5.4	5.6	4.6	6.4	2.3	3.7	5.3
Elongation at break	%	7.7	8	7.9	7.2	7.5	2.6	3.8	6.9
Charpy impact strength									
Resilience	kJ/m^2	25	30	26	12	30	28	15	24
Glass Transition / DSC									
Tg1	°C	56	68	72	55	70	55	69	89
Tg1 max.	°C			76		76			92

Essais réalisés sur des éprouvettes de résine pure coulée, sans dégazage préalable, entre des plaques en acier.
Mesures effectuées suivant les normes :

Traction :	NF T51-034
Flexion :	NF T51-001
Choc Charpy:	NF T51-501
Transition vitreuse:	ISO 11357-2 : 1999 -5°C/180°C sous azote Tg1 ou Onset : 1er point à 20 °C/mn Tg1 maximum ou Onset : deuxième passage

Mechanical properties of SR 1500 / SD 7561 E glass laminates :

Sampling :		
Matrix		**SR 1500 / SD 7561**
Reinforcement		3300
Layer number		15
Process		Press
Glass weight ratio	%	76.5
Post-cuisson		16 h 60 °C
Flexion		
Modulus of elasticity	N/mm^2	
Maximum resistance	N/mm^2	24 600
Elongation at maximum load	%	625
		2.93
Shear strength		
Shear strength	N/mm^2	
		55
Charpy impact strength		
Resilience	kJ/m^2	211
Water absorption	%weight	0.11
Glass transition / DSC		
Tg 1	°C	81
Tg 1 max.	°C	88

Tests carried out in accordance with the following norms:

Flexion :	NF T 57-105
Shear strength:	NF T 57-104
Charpy Impact Strength:	NF T 57-108
Glass transition DSC :	ISO 11357-2 : 1999 -5°C to 180°C under nitrogen gaz Tg1 or Onset : 1st point at 20 °C/mn Tg1 maximum or Onset : second passage
Water absorption:	Internal. Polymerisation according to cycle, machining, weighting, time spent in distilled water at 70 °C / 48 hours, weighting 1 hour after emerging, drying 24 h at 40°C, weighting, mechanical tests on 10 samples
Reinforcement 3300:	Twill 2/2 E Glass, weight 300 g/m2