

SR 1688 / SD 4773

The syntactic casting system SR 1688 / SD 4773 is suitable for the production of lightweight structures where high compressive strengths do not allow the use of a conventional foam.

- Low density with shore D ~ 75
- High compressive strengths
- Good storage stability (no sedimentation)

		SD 4773
Reactivity level		Medium
Initial viscosity (mPa.s)	20 °C	10 700
	30 °C	6 800
Pot Life (200 g)	20 °C	01 h 15
	30 °C	17 min
Mixing ratio	By weight	100 / 24
	By volume	100 / 15
Density		0,66
Tg max onset	°C	68
Gel Time (1 mm)	20 °C	09 h 50
	30 °C	04 h 58
Demold time	20 °C	29 h 30
	30 °C	14 h 54

Mixing, especially if done manually, requires special attention because of big difference of viscosity between resin and hardener. That requires slow speed mixing until the mixture is homogeneous. Then you can increase the speed mixing.

This system allows casting from 20°C, but it is recommended to cast at temperature of 40-50°C to ensure good fitting of the part shape as well as good degassing of the mix.

Epoxy resin SR 1688

Appearance		thick liquid
Color		grey
Viscosity (mPa.s)	15 °C	104840 ± 20970
	20 °C	60925 ± 10075
	25 °C	42320 ± 7680
Density	20 °C	0,60
Bio-based Carbon content (%)		35 ± 2
Storage (months)	23 °C	12

Rehomogenize before each use..

Hardener(s)

		SD 4773
Appearance		liquid
Color		yellow
Gardner color		≤ 4
Reactivity level		Medium
Viscosity (mPa.s)	15 °C	51 ± 10
	20 °C	41 ± 8
	25 °C	31 ± 6
	30 °C	24 ± 5
Density	20 °C	0,98
Storage (months)	23 °C	24

Mixe(s) SR 1688 / SD 4773

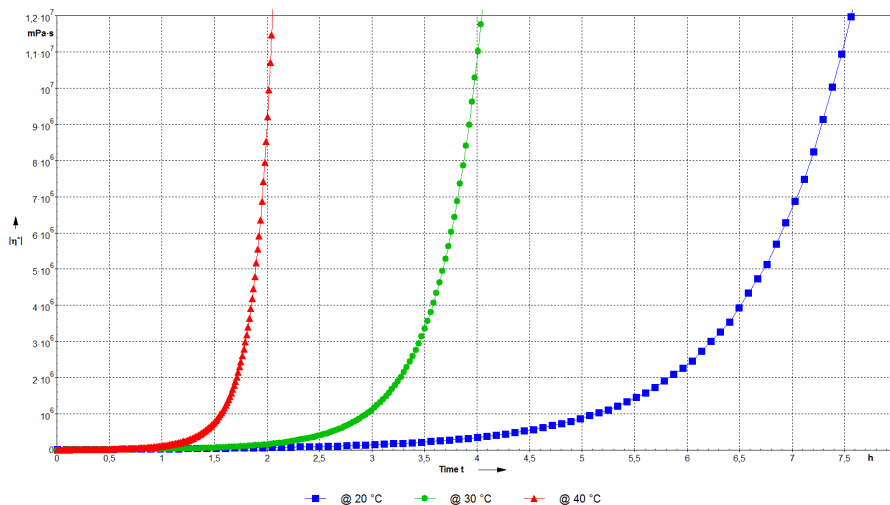
		SD 4773
Appearance		paste
Color		grey
Mixing ratio		
	By weight	100 / 24
	By volume	100 / 15
Initial viscosity (mPa.s)	20 °C	10 700
	30 °C	6 800
Density	20 °C	0,66

Reactivity for 200 g

	20 °C	30 °C	40 °C
Exothermic temperature (°C)	67	182	197
Exothermic peak time	01 h 29	30 min	15 min
Time to reach 50 °C	01 h 15	17 min	5 min

Reactivity on 2 mm thick layer

20, 30, 40 °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 (T_g 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 T_g 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 T_g 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 1688 / SD 4773		
		7j TA	16h 60 °C	
Tensile				
Modulus	N/mm ²	2 200	2 200	
Maximum strength	N/mm ²	19	22	
Breaking Strength	N/mm ²	19	22	
Elongation at max strength	%	0,9	1,1	
Elongation at break	%	0,9	1,1	
Flexion				
Modulus	N/mm ²	1 900	1 900	
Maximum strength	N/mm ²	38	42	
Breaking Strength	N/mm ²	38	42	
Elongation at max strength	%	2	2,2	
Elongation at break	%	2	2,2	
Shear				
Breaking Strength	N/mm ²	20	20	
Compression				
Modulus	N/mm ²			
Yield strength	N/mm ²	38	40	
Offset compression yield	%	6,4	8,8	
Charpy impact strength				
Resilience	kJ/m ²	6,6	7,1	
DSC glass transition				
Tg onset	°C	60	63	
Tg max onset	°C	65	68	
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 beyond.

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
 ASTM D4065-12

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%

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