

## **SR 1280 / SD 477X**

### **Laminating Epoxy Resin System**



DNV-GL class program DNVGL-CP-0089 approved (TAK00001GV)

#### **SR 1280 Epoxy resin:**

Epoxy matrix

Without classified Toxic products (T)

#### **SD 477x Hardeners:**

Without classified Toxic products (T)

**SD 4773, SD 4775 :** Intermediate, medium hardener

**SD 4771 :** Ultra slow hardener

#### **Profile:**

Implementation from 15 °C and with a hygrometry of less than 70%.

Choose the hardener according to ambient temperature, implementation and size of the part to be made.

Cure at Ambient temperature and post cure at 40 to 100 °C

#### **Applications:**

Hand laminating, infusion, tooling, casting, laminates...

## Epoxy resin SR 1280

Appearance		liquid
Color		colourless
Gardner color		≤ 2
Viscosity (mPa.s)	@ 15 °C	6850 ± 1350
	@ 20 °C	3410 ± 690
	@ 25 °C	1770 ± 370
	@ 30 °C	1100 ± 220
Density	@ 20 °C	1,1530
Refractive index	@ 25 °C	1,556 ± ,002
Storage (months)	@ Ta	24

## Hardener(s)

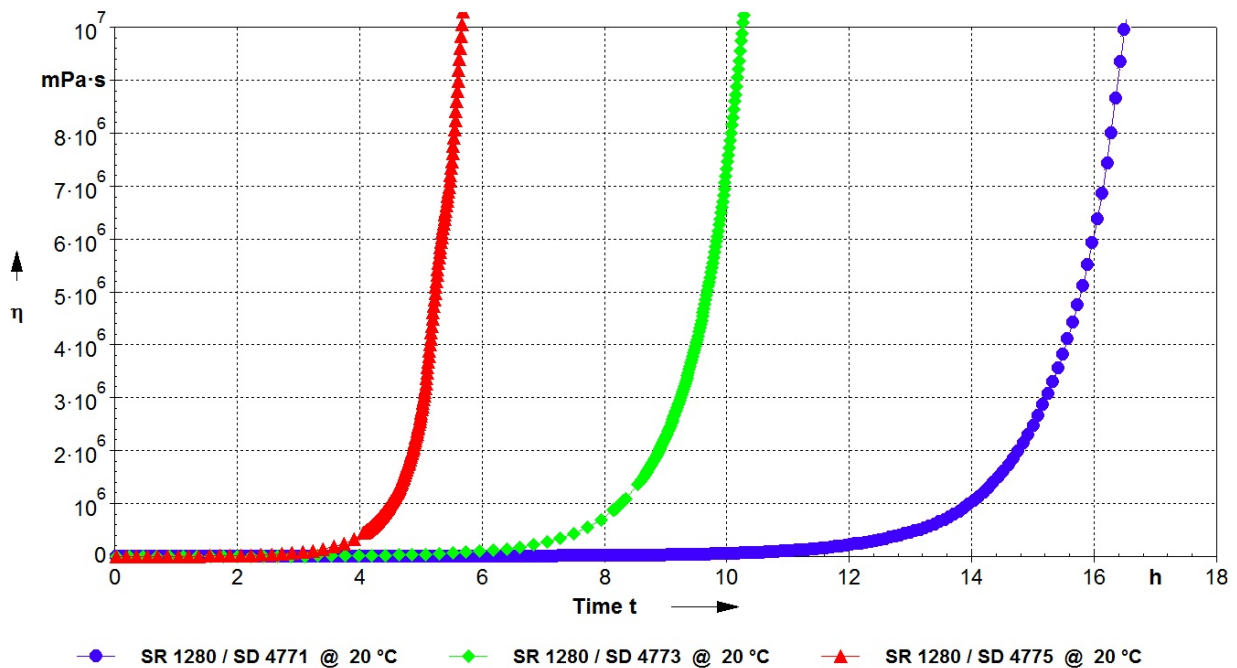
		SD 4775	SD 4773	SD 4771
Appearance		liquid	liquid	liquid
Color		light yellow	yellow	colourless
Gardner color		≤ 5	≤ 4	≤ 1
Reactivity level		Ultra slow	Standard	Ultra slow
Viscosity (mPa.s)	@ 15 °C	275 ± 55	51 ± 10	13 ± 3
	@ 20 °C	190 ± 40	41 ± 8	11 ± 2
	@ 25 °C	133 ± 27	31 ± 6	9 ± 2
	@ 30 °C	93 ± 17	24 ± 5	7 ± 1
Density	@ 20 °C	1,0100	0,9780	0,9440
Refractive index	@ 25 °C	1,4979 ± ,002	1,4779 ± ,002	1,459 ± ,002
Storage (months)	@ Ta	24	24	24

## Mixe(s) SR 1280 / SD 477x

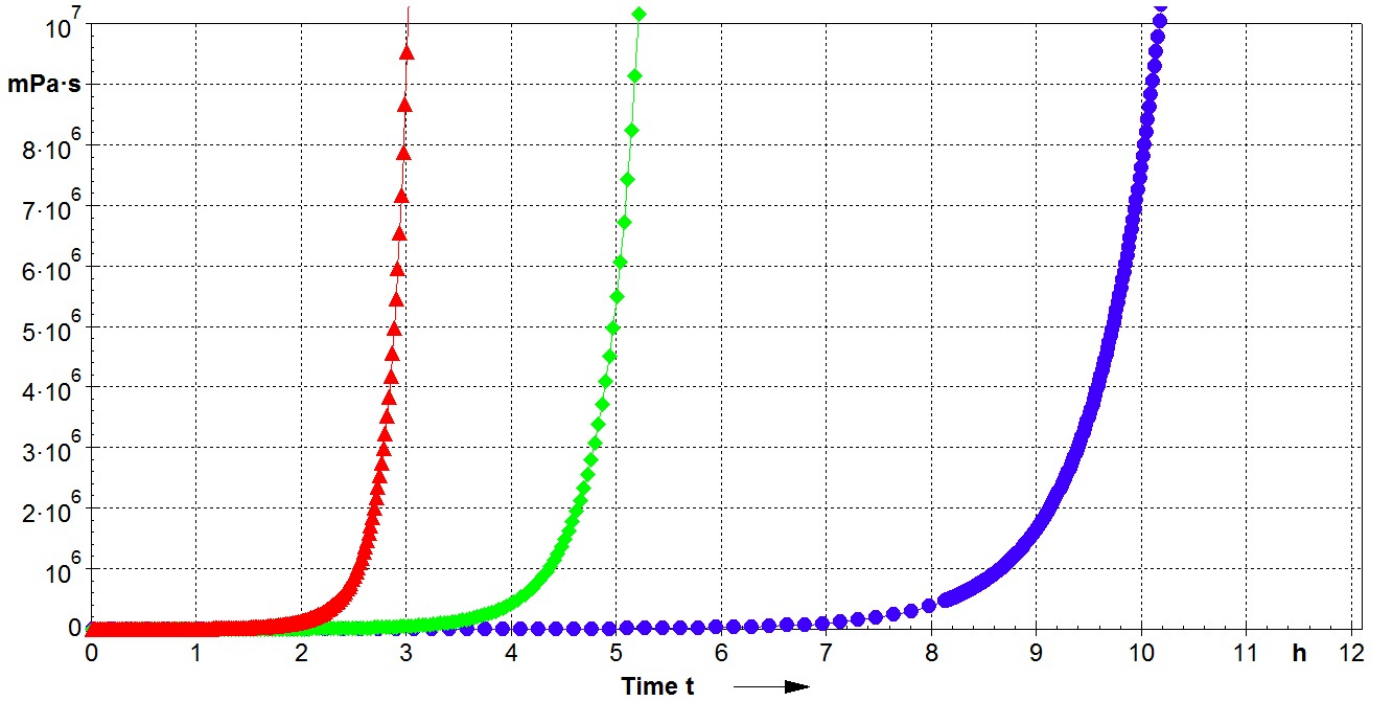
	SD 4775	SD 4773	SD 4771
Appearance	liquid	liquid	liquid
Color	clear	clear	clear
Mixing ratio			
By weight	100 / 27	100 / 27	100 / 27
By volume	100 / 31	100 / 32	100 / 33
Initial viscosity @ 20 °C	1300	1000	800
PP 50 mm / 10 s <sup>-1</sup> (mPa.s) @ 30 °C	540	500	260
Density @ 20 °C			

## Reactivity on 1 mm thick layer

@ 20 °C

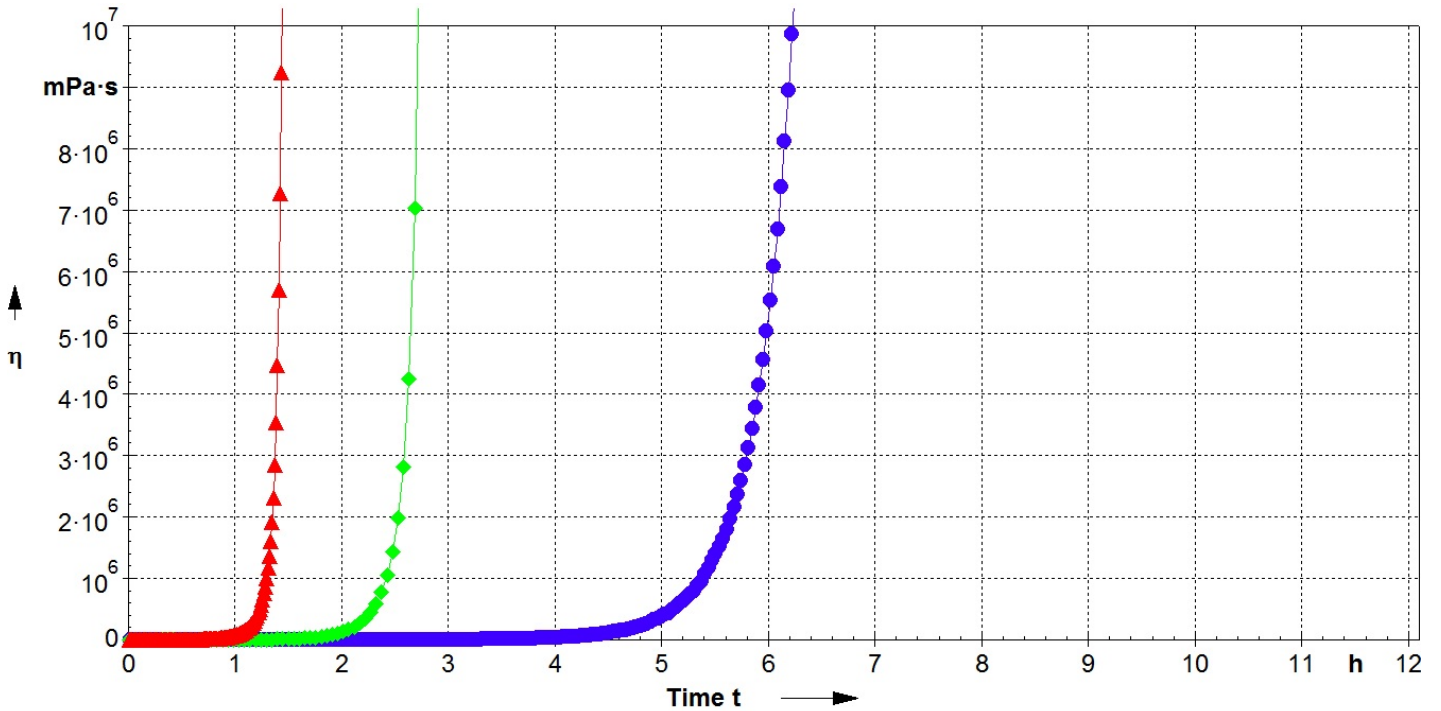


**@ 30 °C**



● SR 1280 / SD 4771 @ 30 °C    ◆ SR 1280 / SD 4773 @ 30 °C    ▲ SR 1280 / SD 4775 @ 30 °C

**@ 40 °C**



● SR 1280 / SD 4771 @ 40 °C    ◆ SR 1280 / SD 4773 @ 40 °C    ▲ SR 1280 / SD 4775 @ 40 °C

## Mechanical properties on cast resin :

		SR 1280 / SD 4775			SR 1280 / SD 4773		
Curing cycles		24 h @ Ta + 24 h @ 40°C	24 h @ Ta + 16 h @ 60°C	24 h @ Ta + 8 h @ 80°C	24 h @ Ta + 24 h @ 40°C	24 h @ Ta + 16 h @ 60°C	24 h @ Ta + 8 h @ 80°C
<b>Tensile</b>							
Modulus	N/mm <sup>2</sup>	3 400	3 200	3 050	3 450	3 300	3 100
Maximum strength	N/mm <sup>2</sup>	82	78	75	80	78	74
Breaking Strength	N/mm <sup>2</sup>	81	77	70	75	77	73
Elongation at max strength	%	3,9	4,9	5	4	4,3	4,8
Elongation at break	%	4,3	5,8	6	4,5	4,7	4,8
<b>Flexion</b>							
Modulus	N/mm <sup>2</sup>	3 400	3 200	2 900	3 500	3 100	2 800
Maximum strength	N/mm <sup>2</sup>	127	127	125	116	113	106
Breaking Strength	N/mm <sup>2</sup>						
Elongation at max strength	%	5	5,6	6,5	4,6	5,7	6,1
Elongation at break	%						
<b>Shear</b>							
Breaking Strength	N/mm <sup>2</sup>	52	52	53	50	52	51
<b>Compression</b>							
Modulus	N/mm <sup>2</sup>						
Yield strength	N/mm <sup>2</sup>	110	107	104	122	112	109
Offset compression yield	%	7,2	8,5	10,3	7,7	8,5	9,8
<b>Charpy impact strength</b>							
Resilience	kJ/m <sup>2</sup>	25	25	23	26	32	18
<b>DSC glass transition</b>							
TG1 onset	°C	69	90	100	68	87	96
TG1 max onset	°C			98			95
<b>DTMA glass transition</b>							
TG tan delta	°C						
TeiG onset G'	°C						
TmG midpoint G'	°C						
TefG endpoint	°C						
TG peak G''	°C						

## Mechanical properties on cast resin :

		<b>SR 1280 / SD 4771</b>		
Curing cycles		24 h @ Ta + 24 h @ 40°C	24 h @ Ta + 16 h @ 60°C	24 h @ Ta + 8 h @ 80°C
<b>Tensile</b>				
Modulus	N/mm <sup>2</sup>	3 300	3 100	2 800
Maximum strength	N/mm <sup>2</sup>	73	74	74
Breaking Strength	N/mm <sup>2</sup>	69	71	70
Elongation at max strength	%	3,2	4,2	5,4
Elongation at break	%	3,4	5,1	6
<b>Flexion</b>				
Modulus	N/mm <sup>2</sup>	3 250	3 150	280
Maximum strength	N/mm <sup>2</sup>	115	116	117
Breaking Strength	N/mm <sup>2</sup>			
Elongation at max strength	%	4,4	5,3	6,2
Elongation at break	%			
<b>Shear</b>				
Breaking Strength	N/mm <sup>2</sup>	48	48	49
<b>Compression</b>				
Modulus	N/mm <sup>2</sup>			
Yield strength	N/mm <sup>2</sup>	100	100	99
Offset compression yield	%	8,8	9,1	10,2
<b>Charpy impact strength</b>				
Resilience	kJ/m <sup>2</sup>	17	39	21
<b>DSC glass transition</b>				
TG1 onset	°C	71	89	103
TG1 max onset	°C			101
<b>DTMA glass transition</b>				
TG tan delta	°C			
TeiG onset G'	°C			
TmG midpoint G'	°C			
TefG endpoint	°C			
TG peak G''	°C			

## Mechanical properties on laminate :

		SR 1280 / SD 4775			SR 1280 / SD 4773		
Matrix		15 layers of 2/2 300 g/m <sup>2</sup> twill glass (Mf = 68 %)					
Reinforcement							
Number of layers							
Process							
Reinforcement rate by weight	%	69 %			69 %		
Post curing	→	24 h @ Ta + 24 h @ 40°C	24 h @ Ta + 16 h @ 60°C	24 h @ Ta + 8 h @ 80°C	24 h @ Ta + 24 h @ 40°C	24 h @ Ta + 16 h @ 60°C	24 h @ Ta + 8 h @ 80°C
<b>Tensile</b>							
Modulus	N/mm <sup>2</sup>						
Maximum strength	N/mm <sup>2</sup>						
Breaking Strength	N/mm <sup>2</sup>						
Elongation at max strength	%						
Elongation at break	%						
<b>Flexion</b>							
Modulus	N/mm <sup>2</sup>						
Maximum strength	N/mm <sup>2</sup>						
Breaking Strength	N/mm <sup>2</sup>						
Elongation at max strength	%						
Elongation at break	%						
<b>Toughness</b>							
G1c interlaminar (J/m <sup>2</sup> -CBT)							
<b>Shearing in flexion</b>							
Shear strength	N/mm <sup>2</sup>	51	50	52	52	52	54
<b>Charpy impact strength</b>							
Resilience	kJ/m <sup>2</sup>						
Water absorption	% Weight						

## Mechanical properties on laminate :

		SR 1280 / SD 4771		
Matrix				
Reinforcement				
Number of layers				
Process				
Reinforcement rate by weight	%	69 %		
Post curing	→	24 h @ Ta + 24 h @ 40°C	24 h @ Ta + 16 h @ 60°C	24 h @ Ta + 8 h @ 80°C
<b>Tensile</b>				
Modulus	N/mm <sup>2</sup>			
Maximum strength	N/mm <sup>2</sup>			
Breaking Strength	N/mm <sup>2</sup>			
Elongation at max strength	%			
Elongation at break	%			
<b>Flexion</b>				
Modulus	N/mm <sup>2</sup>			
Maximum strength	N/mm <sup>2</sup>			
Breaking Strength	N/mm <sup>2</sup>			
Elongation at max strength	%			
Elongation at break	%			
<b>Toughness</b>				
G1c interlaminar (J/m <sup>2</sup> -CBT)				
<b>Shearing in flexion</b>				
Shear strength	N/mm <sup>2</sup>	51	48	50
<b>Charpy impact strength</b>				
Resilience	kJ/m <sup>2</sup>			
Water absorption	% Weight			



**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,

**Thermal tests:**

Glass transition DSC:	NF EN ISO 11357-2:2014 -5°C to 180 °C under nitrogen gas
	$T_{G1}$ or Onset: 1 <sup>st</sup> 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 <sup>-1</sup>
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 <sup>-1</sup>
Green Carbone content:	ASTM D6866-16 or XP CEN/TS 16640 Avril 2014	

TA: Ambient temperature (20 to 25 °C)

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