

## SR 1280 / SD 477X

### Laminating Epoxy Resin System

Epoxy system for hand laminating, infusion, tooling, casting...

Great flexibility of use thanks to its range of hardeners very fast to very slow.

Hardeners SD 4771, SD 4773 and SD 4775 are certified for shipbuilding by DNV-GL control office.

Refer to the data sheet dedicated to this certification [SR1280 / SD 477X DNV-GL]

		<b>SD 4777</b>	<b>SD 4775</b>	<b>SD 4773</b>	<b>SD 4771</b>	<b>SD 4770</b>
Reactivity level		Very Fast	Standard	Medium	Slow	Ultra slow
Initial viscosity (mPa.s)	@ 20 °C	925	1575	820	510	510
	@ 30 °C	520	695	480	250	250
Pot Life (500 g)	@ 20 °C	3 min	23 min	01 h 05	06 h 00	09 h 00
	@ 30 °C	2 min	13 min	30 min	01 h 40	02 h 20
Mixing ratio	By weight	100 / 27	100 / 27	100 / 27	100 / 27	100 / 27
	By volume	100 / 32	100 / 31	100 / 32	100 / 33	100 / 33
Maximum strength	N/mm <sup>2</sup>	81	75	74	74	74
% Elongation at max strength	%	4,4	5	4,8	5,4	5,3
TG1 max onset	°C	91	98	95	101	95
Gel Time	@ 20 °C	01 h 55	05 h 40	10 h 00	20 h 50	23 h 20
	@ 30 °C	01 h 05	02 h 55	04 h 50	10 h 30	11 h 50
Time to reach 400 mPa.s	@ 20 °C	50 min	02 h 30	04 h 40	11 h 50	13 h 20
	@ 30 °C	30 min	01 h 30	02 h 35	06 h 30	07 h 10
Demold time	@ 20 °C	07 h 45	27 h 00	50 h 00	102 h 30	116 h 00
	@ 30 °C	05 h 15	12 h 45	22 h 30	51 h 30	57 h 30

**SR 1280 Epoxy resin:**

Epoxy matrix

Without classified Toxic products (T)

**SD 477x Hardeners:**

Without classified Toxic products (T)

**SD 4777 :** Fast hardener

**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
Storage (months)	@ Ta	24

## Hardener(s)

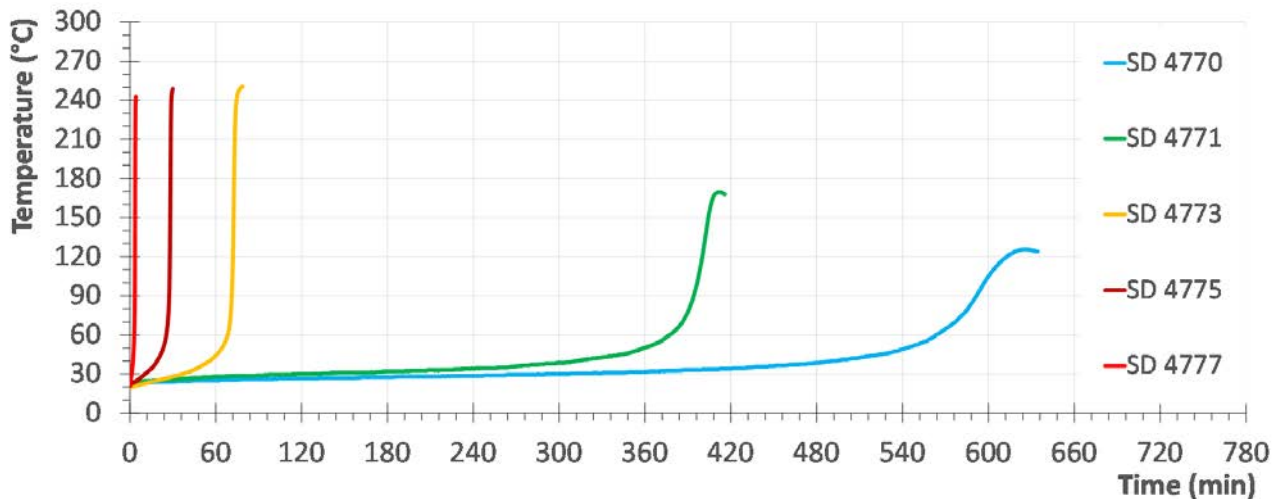
		SD 4777	SD 4775	SD 4773	SD 4771	SD 4770
Appearance		liquid	liquid	liquid	liquid	liquid
Color		yellow-orange	light yellow	yellow	colourless	colourless
Gardner color		≤ 8	≤ 5	≤ 4	≤ 1	≤ 3
Reactivity level		Very Fast	Standard	Medium	Slow	Ultra slow
Viscosity (mPa.s)	@ 15 °C	69 ± 14	275 ± 55	51 ± 10	13 ± 3	12 ± 2
	@ 20 °C	50 ± 10	190 ± 40	41 ± 8	11 ± 2	10 ± 2
	@ 25 °C	38 ± 8	133 ± 27	31 ± 6	9 ± 2	8 ± 2
	@ 30 °C	29 ± 6	93 ± 17	24 ± 5	7 ± 1	7 ± 1
Density	@ 20 °C	0,9800	1,0100	0,9780	0,9440	0,9440
Storage (months)	@ Ta	24	24	24	24	24

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

		SD 4777	SD 4775	SD 4773	SD 4771	SD 4770
Appearance		liquid	liquid	liquid	liquid	liquid
Color		clear	clear	clear	clear	clear
Mixing ratio						
	By weight	100 / 27	100 / 27	100 / 27	100 / 27	100 / 27
	By volume	100 / 32	100 / 31	100 / 32	100 / 33	100 / 33
Initial viscosity (mPa.s)	@ 20 °C	925	1575	820	510	510
Density	@ 20 °C	0	0	0	0	0
PP 50 mm / 10 s <sup>-1</sup>	@ 30 °C	520	695	480	250	250

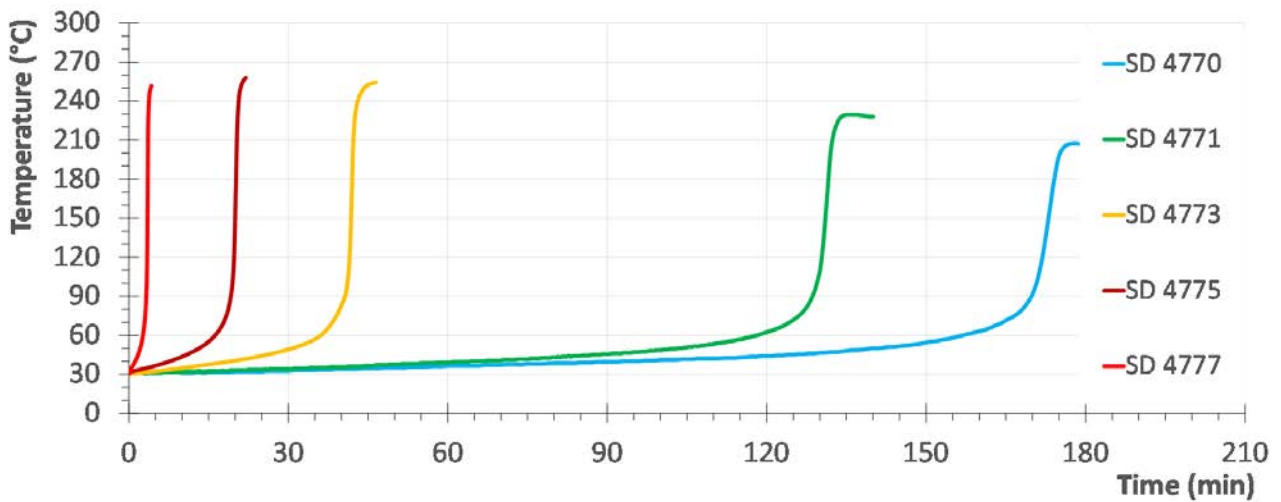
## Reactivity @ 20 °C for 500 g SR 1280 / SD 477X

	SD 4777	SD 4775	SD 4773	SD 4771	SD 4770
Exothermic temperature (°C)	243	249	253	170	130
Exothermic peak time	4 min	30 min	01 h 25	06 h 50	10 h 25
Time to reach 50 °C	3 min	23 min	01 h 05	06 h 00	09 h 00



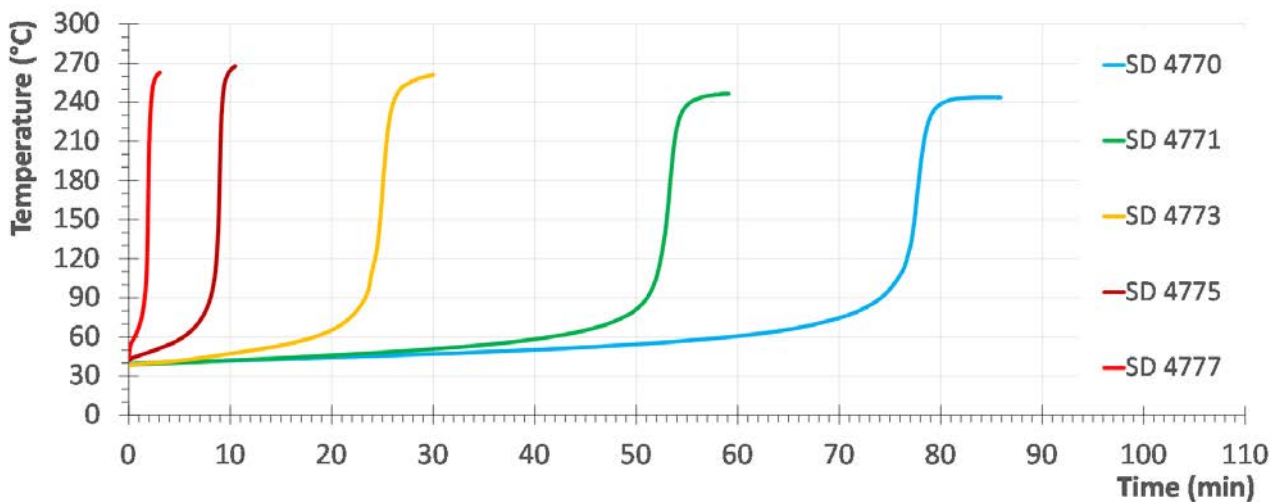
### Reactivity @ 30 °C for 500 g SR 1280 / SD 477X

	SD 4777	SD 4775	SD 4773	SD 4771	SD 4770
Exothermic temperature (°C)	252	258	262	230	210
Exothermic peak time	4 min	22 min	55 min	02 h 15	03 h 00
Time to reach 50 °C	2 min	13 min	30 min	01 h 40	02 h 20



### Reactivity @ 40 °C for 500 g SR 1280 / SD 477X

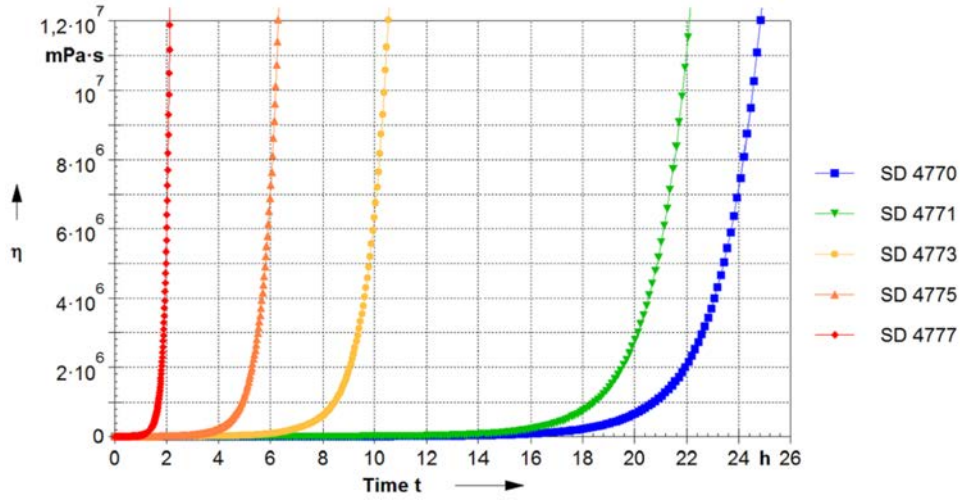
	SD 4777	SD 4775	SD 4773	SD 4771	SD 4770
Exothermic temperature (°C)	263	268	270	247	240
Exothermic peak time	3 min	10 min	40 min	01 h 00	01 h 20
Time to reach 50 °C	1 min	2 min	12 min	28 min	45 min



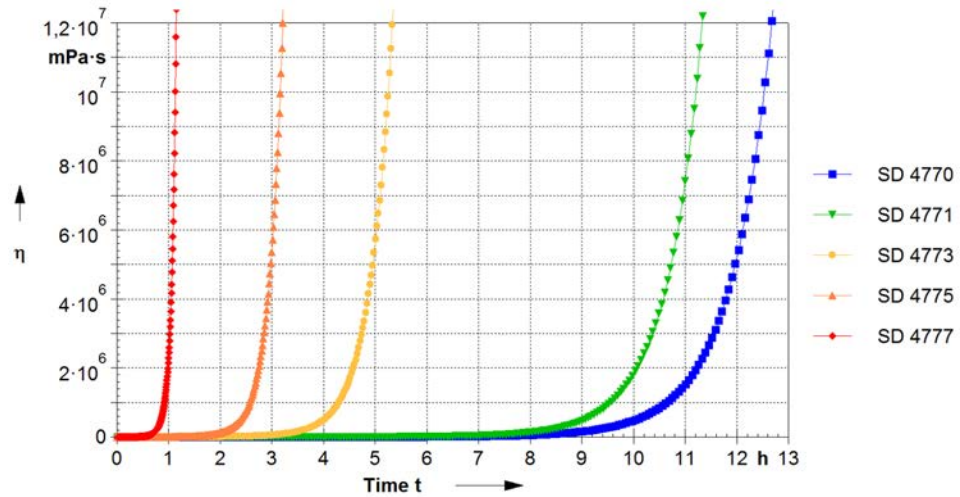


## 1 mm thick layer reactivity

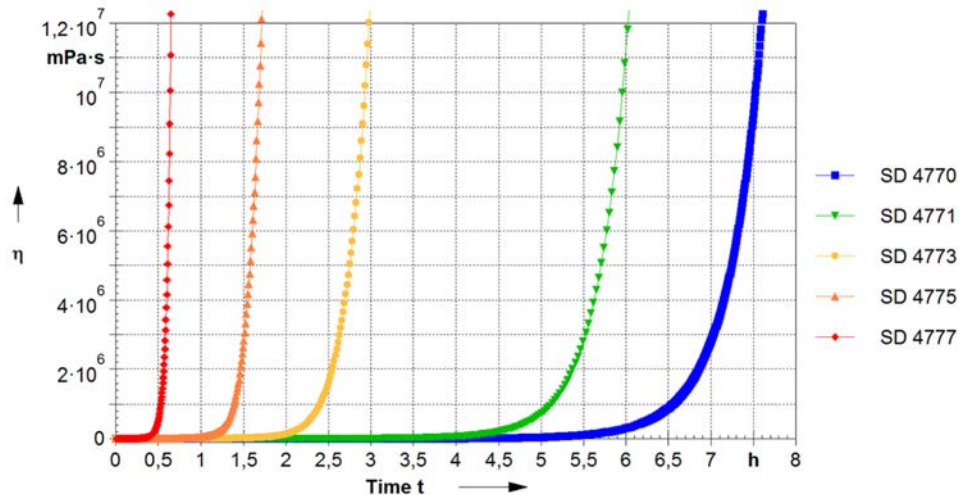
@ 20 °C



@ 30 °C



@ 40 °C



## Mechanical properties on cast resin :

		SR 1280 / SD 4777			SR 1280 / SD 4775		
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>	4 140	3 800	3 960	3 400	3 200	3 050
Maximum strength	N/mm <sup>2</sup>	82	82	81	82	78	75
Breaking Strength	N/mm <sup>2</sup>	75	76	80	81	77	70
Elongation at max strength	%	3,5	4,3	4,4	3,9	4,9	5
Elongation at break	%	4,7	6,3	5,4	4,3	5,8	6
<b>Flexion</b>							
Modulus	N/mm <sup>2</sup>	3 280	3 190	3 190	3 400	3 200	2 900
Maximum strength	N/mm <sup>2</sup>	127	131	133	127	127	125
Breaking Strength	N/mm <sup>2</sup>	85	115	122	96	110	110
Elongation at max strength	%	4,8	5,7	6,2	5	5,6	6,5
Elongation at break	%	8,7	8	8	7,8	8,2	8,5
<b>Shear</b>							
Breaking Strength	N/mm <sup>2</sup>	52	52	53	52	52	53
<b>Compression</b>							
Modulus	N/mm <sup>2</sup>						
Yield strength	N/mm <sup>2</sup>	110	110	110	110	107	104
Offset compression yield	%	12,1	13,5	14,7	7,2	8,5	10,3
<b>Charpy impact strength</b>							
Resilience	kJ/m <sup>2</sup>	57	33	42	25	25	23
<b>DSC glass transition</b>							
TG1 onset	°C	72	85	94	69	90	100
TG1 max onset	°C			91			98
<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 :

		SR 1280 / SD 4773			SR 1280 / SD 4771		
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>	3 450	3 300	3 100	3 300	3 100	2 800
Maximum strength	N/mm <sup>2</sup>	80	78	74	73	74	74
Breaking Strength	N/mm <sup>2</sup>	75	77	73	69	71	70
Elongation at max strength	%	4	4,3	4,8	3,2	4,2	5,4
Elongation at break	%	4,5	4,7	4,8	3,4	5,1	6
<b>Flexion</b>							
Modulus	N/mm <sup>2</sup>	3 500	3 100	2 800	3 250	3 150	280
Maximum strength	N/mm <sup>2</sup>	116	113	106	115	116	117
Breaking Strength	N/mm <sup>2</sup>						
Elongation at max strength	%	4,6	5,7	6,1	4,4	5,3	6,2
Elongation at break	%						
<b>Shear</b>							
Breaking Strength	N/mm <sup>2</sup>	50	52	51	48	48	49
<b>Compression</b>							
Modulus	N/mm <sup>2</sup>						
Yield strength	N/mm <sup>2</sup>	122	112	109	100	100	99
Offset compression yield	%	7,7	8,5	9,8	8,8	9,1	10,2
<b>Charpy impact strength</b>							
Resilience	kJ/m <sup>2</sup>	26	32	18	17	39	21
<b>DSC glass transition</b>							
TG1 onset	°C	68	87	96	71	89	103
TG1 max onset	°C			95			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 cast resin :

		<b>SR 1280 / SD 4770</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>	3 100	2 900	2 800
Maximum strength	N/mm <sup>2</sup>	69	76	74
Breaking Strength	N/mm <sup>2</sup>	66	74	73
Elongation at max strength	%	3,2	4,7	5,3
Elongation at break	%	3,3	5,4	5,6
<b>Flexion</b>				
Modulus	N/mm <sup>2</sup>	3 100	2 800	2 700
Maximum strength	N/mm <sup>2</sup>	113	118	117
Breaking Strength	N/mm <sup>2</sup>			
Elongation at max strength	%	4,3	5,7	6,5
Elongation at break	%			
<b>Shear</b>				
Breaking Strength	N/mm <sup>2</sup>	49	50	50
<b>Compression</b>				
Modulus	N/mm <sup>2</sup>			
Yield strength	N/mm <sup>2</sup>	101	101	101
Offset compression yield	%	7,7	8,4	9
<b>Charpy impact strength</b>				
Resilience	kJ/m <sup>2</sup>	21	29	29
<b>DSC glass transition</b>				
TG1 onset	°C	66	87	93
TG1 max onset	°C			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			

**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: 1 <sup>st</sup> scan at 20 °C/min
	$T_{G1}$ maximum or Onset: 2 <sup>nd</sup> 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)
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%

**LEGAL NOTES:**

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