

English

Technical data

Elastic properties

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kuraray

Trosifol® SentryGlas®

Introduction

Interlayer strength, depth and capabilities

Delivering your window into the world of advanced interlayers for laminated safety glass, Kuraray's Advanced Interlayer Solutions Division (AIS) is underpinned by decades of innovation, application knowledge, domain experience and market success.

OUR ADVANCED INTERLAYER PORTFOLIO – comprising Trosifol® PVB and SentryGlas® ionoplast interlayers – has continually revolutionized aesthetic, structural and functional glass design, fabrication and installation in the architectural and automotive/transportation segments.

Designed to benefit consumers, society and industry, our products are advancing the functionality of glass, while our engineers and consultants are setting new application benchmarks by collaborating on solutions that both sustain and inspire.

We are committed to helping you transform your mindset and take your applications to the next level – aesthetically, functionally and structurally. Enjoy greater design freedom and give your glazing strength, clarity, character and purpose with solutions that cover safety, security, sound insulation, UV/solar/energy management, color and print.





Steve Jobs Theater Pavilion - Photo: © Eckerstley O'Callaghan

Steve Jobs Theater Pavilion, Cupertino, USA

OUR DIVERSE PRODUCT RANGE, the broadest on the global market and our domain expertise create strength; and we channel this strength into helping you succeed. We strive to be your strongest ally and supporter and will help you navigate and conquer the ever-changing demands of the global glass industry. Worldwide production, R&D and support, means we are always by your side... no matter where you are.



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Shear Relaxation Modulus G(t)/MPa

Temperature	Product type	Load duration																					
		1 sec	3 sec	5 sec	10 sec	30 sec	1 min	5 min	10 min	30 min	1 hour	6 hours	12 hours	1 day	2 days	5 days	1 week	3 weeks	1 month	1 year	10 years	50 years	
-20°C (-4°F)	Trosifol® Clear/UltraClear	250	230	220	210	180	170	140	120	99	85	53	42	33	25	16	14	7	6	1.5	0.7	0.5	
	Trosifol® SC Monolayer	210	180	160	150	120	100	71	58	41	31	14	9.9	6.8	4.9	3.2	2.7	1.7	1.5	0.66	0.47	0.41	
	Trosifol® SC Multilayer	65	40	31	21	11	7.4	3.4	2.7	2.1	1.8	1.5	1.4	1.3	1.2	1.1	1.0	0.84	0.79	0.45	0.35	0.30	
	Trosifol® Extra Stiff	460	440	420	400	370	350	290	270	220	200	120	100	81	61	38	32	16	13	2.1	1.0	0.78	
	* Trosifol® Extra Stiff Pro																						
	SentryGlas®	291	290	290	289	289	288	285	284	283	281	280	279	278	277	276	276	275	273	268	260	250	
SentryGlas Xtra®	245	243	243	242	240	238	236	233	227	226	221	213	209	192	187	186	184	176	159	139	131		
0°C (32°F)	Trosifol® Clear/UltraClear	180	150	140	120	100	94	67	55	40	32	14	10	7.0	4.7	2.7	2.3	1.3	1.2	0.62	0.48	0.42	
	Trosifol® SC Monolayer	48	32	26	19	12	7.8	3.5	2.6	1.7	1.2	0.7	0.6	0.5	0.5	0.5	0.4	0.4	0.30	0.21	0.14		
	Trosifol® SC Multilayer	2.6	2.0	1.9	1.7	1.5	1.4	1.2	1.1	0.92	0.79	0.50	0.45	0.42	0.39	0.36	0.35	0.31	0.30	0.19	0.090	0.044	
	Trosifol® Extra Stiff	420	390	370	350	310	290	230	200	150	130	70	51	36	24	13	10	4.4	3.5	1.1	0.78	0.69	
	* Trosifol® Extra Stiff Pro																						
	SentryGlas®	260	258	257	256	254	252	249	248	246	244	236	232	231	227	225	224	222	221	210	201	194	
SentryGlas Xtra®	203	199	196	193	186	182	172	169	160	144	124	107	101	95.3	85.1	83.8	75.0	70.6	54.7	42.9	38.9		
10°C (50°F)	Trosifol® Clear/UltraClear	86	66	57	46	31	23	10	6.9	3.5	2.4	0.81	0.69	0.61	0.53	0.52	0.47	0.46	0.37	0.28	0.21		
	Trosifol® SC Monolayer	5.1	3.1	2.5	1.9	1.1	0.90	0.61	0.55	0.48	0.45	0.36	0.34	0.34	0.32	0.28	0.27	0.22	0.21	0.11	0.042		
	Trosifol® SC Multilayer	1.5	1.3	1.3	1.2	1.1	0.94	0.65	0.54	0.45	0.41	0.35	0.32	0.30	0.27	0.23	0.22	0.17	0.16	0.060			
	Trosifol® Extra Stiff	380	350	330	310	270	240	170	150	110	85	36	24	16	9.5	4.7	3.6	1.9	1.6	0.86	0.70	0.62	
	Trosifol® Extra Stiff Pro	420	390	370	350	320	300	250	220	180	160	92	70	52	35	20	15	5.9	4.7	1.1	0.74	0.65	
	SentryGlas®	240	236	235	230	228	225	220	214	217	206	199	194	190	188	178	180	172	171	161	153	146	
SentryGlas Xtra®	181	179	178	176	172	170	161	143	126	120	91.6	85.1	67.2	57.4	46.6	42.6	36.8	34.1	22.6	16.5	13.2		
20°C (68°F)	Trosifol® Clear/UltraClear	12	6.6	4.8	3.2	1.7	1.2	0.74	0.64	0.54	0.50	0.43	0.41	0.39	0.36	0.33	0.32	0.27	0.26	0.14	0.063		
	Trosifol® SC Monolayer	0.86	0.66	0.60	0.54	0.47	0.45	0.39	0.37	0.33	0.30	0.23	0.20	0.17	0.14	0.11	0.10	0.063	0.056				
	Trosifol® SC Multilayer	1.2	1.0	0.91	0.78	0.58	0.50	0.40	0.38	0.34	0.32	0.24	0.21	0.18	0.15	0.11	0.10	0.065	0.057				
	Trosifol® Extra Stiff	280	240	210	190	140	120	67	49	26	17	4.2	2.6	1.8	1.3	1.0	1.0	0.84	0.81	0.66	0.56	0.47	
	Trosifol® Extra Stiff Pro	340	310	290	270	230	205	150	120	83	63	23	14	7.5	4.3	2.2	1.8	1.1	1.0	0.71	0.60	0.52	
	SentryGlas®	217	211	209	205	206	192	188	181	175	169	158	151	146	140	130	127	115	112	96.5	86.6	77.1	
SentryGlas Xtra®	162	155	144	135	131	125	120	115	100	80.1	55.1	50.0	39.9	36.8	29.5	26.9	21.2	18.4	11.1	6.69	5.03		
25°C (77°F)	Trosifol® Clear/UltraClear	2.7	1.5	1.2	0.92	0.69	0.61	0.50	0.47	0.43	0.41	0.34	0.31	0.29	0.26	0.22	0.20	0.15	0.14	0.056			
	Trosifol® SC Monolayer	0.58	0.50	0.47	0.44	0.41	0.38	0.33	0.30	0.26	0.23	0.15	0.12	0.10	0.078	0.054	0.046	0.027	0.024				
	Trosifol® SC Multilayer	1.0	0.75	0.66	0.55	0.45	0.42	0.36	0.33	0.29	0.27	0.18	0.15	0.13	0.10	0.068	0.058	0.034	0.029				
	Trosifol® Extra Stiff	190	150	130	100	70	51	20	13	5.4	3.3	1.3	1.1	0.94	0.85	0.78	0.75	0.69	0.68	0.56	0.43	0.33	
	Trosifol® Extra Stiff Pro	250	210	190	160	120	95	49	32	16	8.7	2.1	1.5	1.1	0.95	0.82	0.79	0.70	0.69	0.56	0.45	0.34	
	SentryGlas®	176	167	163	157	149	142	117	115	106	101	90.6	86.2	80.5	70.8	60.8	55.1	45.1	42.4	32.1	24.3	18.1	
SentryGlas Xtra®	141	136	126	117	115	97.9	80.4	63.3	45.8	37.2	27.0	21.0	18.6	17.9	15.4	14.2	11.1	10.5	5.61	3.31	2.44		
30°C (86°F)	Trosifol® Clear/UltraClear	0.93	0.69	0.63	0.56	0.50	0.47	0.41	0.39	0.35	0.33	0.22	0.19	0.16	0.12	0.11	0.070	0.062					
	Trosifol® SC Monolayer	0.47	0.43	0.41	0.39	0.35	0.33	0.26	0.23	0.19	0.16	0.091	0.070	0.054	0.038	0.025	0.033						
	Trosifol® SC Multilayer	0.71	0.54	0.49	0.44	0.39	0.37	0.31	0.29	0.24	0.21	0.13	0.10	0.078	0.057	0.036	0.031						
	Trosifol® Extra Stiff	73	44	33	21	10	5.8	2.0	1.4	1.0	0.92	0.75	0.71	0.68	0.65	0.61	0.59	0.54	0.53	0.37	0.21	0.12	
	Trosifol® Extra Stiff Pro	120	82	67	49	25	16	4.1	2.4	1.3	1.0	0.78	0.73	0.69	0.65	0.61	0.60	0.54	0.53	0.38	0.22	0.12	
	SentryGlas®	151	141	138	130	119	110	83	75.2	66	60	55.3	52.3	50	35.9	24.7	22.5	12.9	11.6	6.8	5.31	4.05	
SentryGlas Xtra®	106	101	95.6	91.2	84.8	80.1	55.1	50.0	38.2	26.0	16.2	10.6	8.97	8.35	7.13	6.18	5.54	5.17	3.07	1.98	1.51		
35°C (95°F)	Trosifol® Clear/UltraClear	0.59	0.51	0.49	0.46	0.42	0.40	0.35	0.32	0.27	0.24	0.16	0.13	0.10	0.081	0.057	0.049						
	Trosifol® SC Monolayer	0.42	0.38	0.36	0.34	0.30	0.27	0.20	0.17	0.13	0.11	0.052	0.037	0.027									
	Trosifol® SC Multilayer	0.51	0.43	0.41	0.38	0.34	0.32	0.26	0.23	0.18	0.15	0.076	0.056	0.041	0.029								
	Trosifol® Extra Stiff	13	5.7	3.9	2.4	1.4	1.1	0.85	0.79	0.72	0.69	0.60	0.57	0.54	0.50	0.45	0.43	0.36	0.34	0.17			
	Trosifol® Extra Stiff Pro	39	19	13	7.1	3.0	1.9	1.0	0.88	0.75	0.70	0.61	0.59	0.55	0.52	0.47	0.46	0.39	0.37	0.19			
	SentryGlas®	114	102	96.9	89.9	77.7	70.5	53.4	47.7	37.9	34.7	26.4	23.1	20.3	16.5	12.4	11.4	8.31	7.45	4.95	4.11	3.05	
SentryGlas Xtra®	78.7	70.3	65.5	61.5	55.1	44.9	29.0	22.0	13.5	10.0	4.60	3.99	3.31	3.23	2.76	2.63	2.32	2.15	1.51	1.05	0.87		
40°C (104°F)	Trosifol® Clear/UltraClear	0.48	0.44	0.43	0.40	0.37	0.34	0.28	0.25	0.20	0.16	0.10	0.070	0.054									
	Trosifol® SC Monolayer	0.38	0.34	0.32	0.30	0.25	0.22	0.15	0.13	0.089	0.068	0.029											
	Trosifol® SC Multilayer	0.40	0.36	0.35	0.32	0.28	0.25	0.18	0.15	0.10	0.079	0.033	0.023										
	Trosifol® Extra Stiff	2.1	1.3	1.1	1.0	0.83	0.77	0.68	0.65	0.60	0.57	0.47	0.43	0.39	0.34	0.28	0.25	0.18	0.17				
	Trosifol® Extra Stiff Pro	10	4.1	2.7	1.6	1.1	0.85	0.69	0.66	0.60	0.57	0.47	0.44	0.41	0.37	0.32	0.30	0.23	0.21				
	SentryGlas®	77	63	56.4	48.1	37	31	19	15.8	11.4	9.3	5.76	5.06	4.5	4.16	3.6	3.66	3.4	3.3	3.1	2.9	2.31	
SentryGlas Xtra®	50.3	46.3	40.5	35.5	33.1	27.0	15.0	12.0	6.99	5.20	2.64	1.99	1.86	1.84	1.57	1.39	1.19	1.11	0.70	0.47	0.37		
50°C (122°F)	Trosifol® Clear/UltraClear	0.39	0.36	0.34	0.31	0.26	0.23	0.16	0.13	0.089	0.068	0.021	0.17	0.13	0.10								
	Trosifol® SC Monolayer	0.31	0.27	0.25	0.22	0.17	0.14	0.087	0.067	0.041	0.029												
	Trosifol® SC Multilayer	0.32	0.28	0.26	0.23	0.18	0.15	0.084	0.062	0.036	0.025												
	Trosifol® Extra Stiff	0.79	0.72	0.69	0.66	0.61	0.58	0.50	0.45	0.38	0.34	0.21	0.17	0.18	0.13								
	Trosifol® Extra Stiff Pro	0.93	0.78	0.74	0.70	0.64	0.61	0.54	0.50	0.44	0.40	0.27	0.22	0.18	0.13								
	SentryGlas®	36.2	26.4	22.1	18.5	13.5	11.3	7.31	6.19	4.9	4.2	3.24	2.98	2.8	2.67	2.4	2.42	2.2	2.2	2	2	1.82	
SentryGlas Xtra®	22.1	12.7	8.45	5.98	4.90	3.89	2.71	2.45	2.00	1.70	1.20	1.10	1.05	1.00	0.92	0.74	0.61	0.54	0.43	0.23	0.17		
60°C (1																							

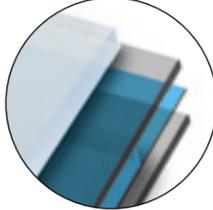
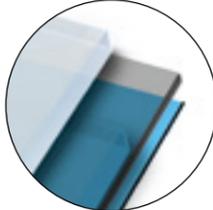
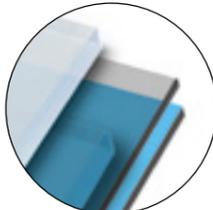
Young Relaxation Modulus E(t)/MPa

Temperature	Product type	Load duration																				
		1 sec	3 sec	5 sec	10 sec	30 sec	1 min	5 min	10 min	30 min	1 hour	6 hours	12 hours	1 day	2 days	5 days	1 week	3 weeks	1 month	1 year	10 years	50 years
-20°C (-4°F)	Trosifol® Clear/UltraClear	750	680	650	610	550	500	400	360	290	250	160	130	99	75	49	41	22	19	4.3	2.0	1.6
	Trosifol® SC Monolayer	610	520	490	430	350	310	210	170	120	93	43	29	20	15	9.4	8.1	5.2	4.9	2.0	1.4	1.2
	Trosifol® SC Multilayer	1400	1300	1200	1200	1100	1000	860	790	660	570	360	300	240	180	110	93	46	38	6.0	2.8	2.3
	Trosifol® Extra Stiff	838	835	835	832	832	829	821	818	815	809	806	804	801	798	795	795	792	786	772	749	720
	* Trosifol® Extra Stiff Pro SentryGlas® SentryGlas Xtra®	725	719	719	716	710	705	699	670	672	669	654	631	619	568	554	551	544	522	471	411	388
0°C (32°F)	Trosifol® Clear/UltraClear	530	450	410	370	310	280	200	160	120	95	42	30	21	14	8.2	6.8	4.0	3.5	1.8	1.4	1.3
	Trosifol® SC Monolayer	140	95	77	58	35	23	11	7.7	4.9	3.6	2.1	1.8	1.6	1.5	1.4	1.3	1.2	1.2	0.91	0.63	0.42
	Trosifol® SC Multilayer	1200	1100	1100	1000	930	850	670	580	450	380	210	150	110	71	38	30	13	10	3.1	2.3	2.0
	Trosifol® Extra Stiff	749	743	740	737	732	726	717	714	708	703	680	668	665	654	648	645	639	636	605	579	559
	* Trosifol® Extra Stiff Pro SentryGlas® SentryGlas Xtra®	601	589	580	571	551	539	512	500	474	426	367	317	299	282	252	248	222	209	162	127	115
10°C (50°F)	Trosifol® Clear/UltraClear	260	200	170	140	92	69	31	21	11	7.0	3.0	2.4	2.1	1.8	1.6	1.5	1.4	1.4	1.1	0.83	0.62
	Trosifol® SC Monolayer	15	9.1	7.4	5.6	3.4	2.7	1.8	1.6	1.4	1.3	1.2	1.1	1.0	0.94	0.83	0.79	0.66	0.62	0.32	0.13	0.13
	Trosifol® SC Multilayer	1100	1000	970	900	780	700	510	430	310	250	110	70	46	28	14	11	5.5	4.7	2.5	2.1	1.8
	Trosifol® Extra Stiff	1240	1150	1090	1030	940	880	740	650	530	470	270	210	150	100	59	44	17	14	3.2	2.2	1.9
	Trosifol® Extra Stiff Pro SentryGlas® SentryGlas Xtra®	693	681	678	664	661	651	638	618	629	597	574	560	553	543	516	519	498	499	467	448	421
20°C (68°F)	Trosifol® Clear/UltraClear	37	20	14	9.4	5.1	3.7	2.2	1.9	1.6	1.5	1.3	1.2	1.2	1.1	0.98	0.94	0.80	0.77	0.42	0.19	
	Trosifol® SC Monolayer	2.6	2.0	1.8	1.6	1.4	1.3	1.2	1.1	0.98	0.90	0.67	0.59	0.50	0.42	0.32	0.28	0.19	0.17			
	Trosifol® SC Multilayer	820	690	630	540	420	350	200	140	77	50	12	7.7	5.4	4.0	3.1	2.9	2.5	2.4	1.9	1.6	1.4
	Trosifol® Extra Stiff	1000	910	850	800	680	600	440	350	240	185	68	41	22	13	6.5	5.3	3.2	2.9	2.1	1.8	1.5
	Trosifol® Extra Stiff Pro SentryGlas® SentryGlas Xtra®	629	612	606	594	602	567	549	525	511	493	458	438	428	406	380	368	336	330	282	256	223
25°C (77°F)	Trosifol® Clear/UltraClear	7.9	4.4	3.5	2.7	2.1	1.8	1.5	1.4	1.3	1.2	1.0	0.94	0.86	0.77	0.65	0.60	0.46	0.42	0.17		
	Trosifol® SC Monolayer	1.7	1.5	1.4	1.3	1.2	1.1	0.97	0.90	0.76	0.68	0.44	0.37	0.30	0.23	0.16	0.14	0.080	0.072			
	Trosifol® SC Multilayer	560	430	370	310	210	150	59	37	16	9.6	3.7	3.1	2.8	2.5	2.3	2.2	2.0	2.0	1.7	1.3	0.96
	Trosifol® Extra Stiff	740	620	560	470	350	280	140	94	47	26	6.2	4.4	3.2	2.8	2.4	2.3	2.1	2.0	1.6	1.3	1.0
	Trosifol® Extra Stiff Pro SentryGlas® SentryGlas Xtra®	511	485	474	456	433	413	340	334	308	294	263	250	234	206	177	160	131	123	93.3	70.6	52.6
30°C (86°F)	Trosifol® Clear/UltraClear	2.8	2.1	1.9	1.7	1.5	1.4	1.2	1.2	1.0	0.97	0.74	0.64	0.56	0.46	0.35	0.31	0.21	0.19			
	Trosifol® SC Monolayer	1.4	1.3	1.2	1.2	1.0	0.97	0.78	0.70	0.56	0.47	0.27	0.21	0.16	0.11	0.075						
	Trosifol® SC Multilayer	210	130	96	63	29	17	5.8	4.2	3.0	2.7	2.2	2.1	2.0	1.9	1.8	1.7	1.6	1.5	1.1	0.62	0.35
	Trosifol® Extra Stiff	350	240	200	140	74	47	12	7.1	3.8	2.9	2.3	2.1	2.0	1.9	1.8	1.8	1.6	1.6	1.1	0.65	0.35
	Trosifol® Extra Stiff Pro SentryGlas® SentryGlas Xtra®	443	413	405	381	349	324	243	220	194	178	162	153	146	105	72	66.0	38	35	20.3	15	11.9
35°C (95°F)	Trosifol® Clear/UltraClear	1.8	1.5	1.5	1.4	1.3	1.2	1.0	0.95	0.81	0.72	0.47	0.38	0.31	0.24	0.17	0.15					
	Trosifol® SC Monolayer	1.2	1.1	1.1	1.0	0.89	0.81	0.61	0.52	0.39	0.31	0.15	0.11	0.081								
	Trosifol® SC Multilayer	39	17	11	7.2	4.1	3.3	2.5	2.3	2.1	2.0	1.8	1.7	1.6	1.5	1.3	1.3	1.0	1.0	0.49		
	Trosifol® Extra Stiff	120	56	38	21	8.8	5.6	2.9	2.6	2.2	2.1	1.8	1.7	1.6	1.5	1.4	1.4	1.1	1.1	0.56		
	Trosifol® Extra Stiff Pro SentryGlas® SentryGlas Xtra®	338	302	287	266	230	209	158	141	122	103	78.2	68.4	60.1	48.9	36.7	33.8	24.6	22.1	14.7	12.2	9.03
40°C (104°F)	Trosifol® Clear/UltraClear	1.4	1.3	1.3	1.2	1.1	1.0	0.82	0.73	0.58	0.49	0.27	0.21	0.16								
	Trosifol® SC Monolayer	1.1	1.0	0.96	0.88	0.75	0.66	0.46	0.38	0.26	0.20	0.15	0.11	0.16								
	Trosifol® SC Multilayer	6.1	3.7	3.2	2.8	2.4	2.3	2.0	1.9	1.8	1.7	1.4	1.3	1.1	1.0	0.81	0.75	0.54	0.49			
	Trosifol® Extra Stiff	29	12	7.9	4.7	3.2	2.5	2.0	1.9	1.8	1.7	1.4	1.3	1.2	1.1	0.94	0.88	0.68	0.62			
	Trosifol® Extra Stiff Pro SentryGlas® SentryGlas Xtra®	229	187	167	143	109	91.6	57	46.9	34	27.8	17.1	15.0	13.5	12.3	11	10.9	10	9.9	9.3	8.84	6.86
50°C (122°F)	Trosifol® Clear/UltraClear	1.2	1.1	1.0	0.92	0.78	0.69	0.48	0.39	0.27	0.20	0.12	0.086									
	Trosifol® SC Monolayer	0.94	0.80	0.74	0.66	0.52	0.43	0.26	0.20	0.12	0.086											
	Trosifol® SC Multilayer	2.3	2.1	2.0	1.9	1.8	1.7	1.5	1.3	1.1	1.0	0.63	0.50	0.4	0.29							
	Trosifol® Extra Stiff	2.7	2.3	2.2	2.1	1.9	1.8	1.6	1.5	1.3	1.2	0.79	0.65	0.53	0.38							
	Trosifol® Extra Stiff Pro SentryGlas® SentryGlas Xtra®	108.6	78	66.3	55.1	40	33.8	21.7	18.57	14.6	12.6	9.72	8.94	8.4	8.01	7.2	7.26	6.5	6.5	6.3	6	5.46
60°C (140°F)	Trosifol® Clear/UltraClear	0.95	0.82	0.75	0.66	0.51	0.42	0.24	0.18													
	Trosifol® SC Monolayer	0.78	0.64	0.58	0.49	0.36	0.29	0.15	0.11													
	Trosifol® SC Multilayer	1.9	1.8	1.7	1.6	1.4	1.3	0.96	0.82	0.60	0.48											
	Trosifol® Extra Stiff	1.9	1.8	1.7	1.6	1.4	1.3	1.0	0.88	0.65	0.53											
	Trosifol® Extra Stiff Pro SentryGlas® SentryGlas Xtra®	35.4	24.5	20.67	17.2	12.8	10.9	7.6	6.75	5.5	5.1	4.26	4.05	3.8	3.78	3.6	3.54	3.3	3.3	3	2.9	2.22
70°C (158°F)	Trosifol® Clear/UltraClear	0.78	0.63	0.56	0.47	0.34	0.26	0.14														
	Trosifol® SC Monolayer	0.61	0.47	0.41	0.33	0.23	0.17	0.080														
	Trosifol® SC Multilayer	1.6	1.4	1.3	1.2	0.97	0.83	0.52	0.40													
	Trosifol® Extra Stiff	1.6	1.4	1.4	1.2	1.0	0.88	0.53	0.41													
	Trosifol® Extra Stiff Pro SentryGlas® SentryGlas Xtra®	11.31	8.8	8.13	7.3	6.3	5.64	4.2	3.45	2.9	2.5	1.95	1.89	1.8	1.74	1.6	1.62	1.5	1.5	1.4	1.3	1.05
80°C (176°F)	Trosifol® Clear/UltraClear	0.62	0.48	0.41	0.33	0.22	0.17															
	Trosifol® SC Monolayer	0.46	0.34	0.29	0.14	0.099																
	Trosifol® SC Multilayer	1.3	1.1	1.0	0.8	0.6	0.48															
	Trosifol® Extra Stiff	4.65	4.0	3.66	3.31	2.9	2.5	1.7	1.35	1.1	1.0	0.9	0.9	0.8	0.87	0.7	0.75	0.6	0.8	0.6	0.5	0.48
	* Trosifol® Extra Stiff Pro SentryGlas® SentryGlas Xtra®	0.92	0.80	0.68	0.53	0.30	0.27	0.18	0.15	0.12	0.12	0.09	0.09	0.06	0.03	0.03	0.03					

TAB 2 • E(t) was calculated according $E(t) = 2 \times G(t) \times (1+\nu)$ for isotropic materials with: $\nu = 0.47$ (Trosifol® Extra Stiff, Trosifol® Extra Stiff Pro), $\nu = 0.49$ (Trosifol® Clear, Trosifol® SC Monolayer); $\nu = 0.48$ (SentryGlas®, SentryGlas® Xtra™). The Poisson ratio ν was measured in accordance to EN ISO 527 (23°C, 30% r. H.). If numerical simulation tools (FEA) require E(t) data for Trosifol® SC Multilayer, these data can be calculated using $E(t) = 2 \times G(t) \times (1+\nu)$ with: $\nu = 0.49$. This is the closest approximation available and validation tests did show that it gives conservative E modulus values.

* Still being tested

Trosifol® Extra Stiff and Trosifol® PVB combinations – Shear Relaxation Modulus G(t)/MPa

Combination	Temperature	Load duration																						
		1 sec	3 sec	5 sec	10 sec	30 sec	1 min	5 min	10 min	30 min	1 hour	6 hours	12 hours	1 day	2 days	5 days	1 week	3 weeks	1 month	1 year	10 years	50 years		
	Trosifol® Extra Stiff 0.76 mm (30 mil)	10°C (50°F)	370	330	310	280	240	210	140	120	81	61	23	15	10	6.4	3.7	3.1	1.7	1.5	0.82	0.66	0.58	
	Trosifol® PVB 0.38 mm (15 mil)	20°C (68°F)	220	180	160	130	92	71	33	22	11	7.0	2.5	1.8	1.4	1.2	0.97	0.92	0.80	0.77	0.63	0.52	0.42	
	Trosifol® Extra Stiff 0.76 mm (30 mil)	25°C (77°F)	98	65	51	36	19	12	4.5	3.0	1.8	1.4	0.93	0.84	0.78	0.73	0.68	0.67	0.62	0.60	0.46	0.31	0.19	
		30°C (86°F)	23	12	8.4	5.5	2.9	2.1	1.2	1.0	0.86	0.79	0.68	0.64	0.61	0.58	0.53	0.51	0.45	0.43	0.25	0.11		
		35°C (95°F)	4.3	2.4	1.9	1.5	1.1	0.95	0.77	0.73	0.67	0.64	0.55	0.51	0.47	0.43	0.36	0.34	0.26	0.24	0.09			
		40°C (104°F)	1.5	1.1	0.99	0.88	0.77	0.73	0.65	0.61	0.56	0.52	0.41	0.36	0.32	0.27	0.20	0.18	0.12	0.11				
		50°C (122°F)	0.76	0.69	0.67	0.63	0.58	0.55	0.45	0.41	0.33	0.28	0.16	0.12	0.093									
		60°C (140°F)	0.62	0.57	0.54	0.50	0.44	0.39	0.28	0.23	0.16	0.12												
		70°C (158°F)	0.51	0.44	0.41	0.36	0.29	0.24	0.14	0.10														
		80°C (176°F)	0.41	0.33	0.29	0.24	0.17	0.13																
	Trosifol® Extra Stiff 0.76 mm (30 mil)	10°C (50°F)	330	290	280	250	210	190	130	100	68	50	17	11	7.0	4.5	2.7	2.3	1.5	1.3	0.78	0.64	0.56	
	Trosifol® PVB 0.38 mm (15 mil)	20°C (68°F)	200	160	140	120	82	62	27	18	8.3	5.2	2.0	1.5	1.2	1.0	0.86	0.82	0.72	0.70	0.58	0.46	0.37	
		25°C (77°F)	89	57	45	31	16	10	3.5	2.4	1.5	1.2	0.83	0.76	0.71	0.67	0.63	0.61	0.56	0.55	0.41	0.27	0.17	
		30°C (86°F)	21	10	6.9	4.4	2.4	1.8	1.1	0.93	0.78	0.73	0.62	0.59	0.57	0.53	0.49	0.47	0.41	0.39	0.22	0.094		
		35°C (95°F)	3.7	2.1	1.7	1.3	1.0	0.88	0.72	0.68	0.62	0.59	0.50	0.47	0.43	0.39	0.33	0.31	0.24	0.22	0.081			
		40°C (104°F)	1.4	1.0	0.92	0.82	0.72	0.68	0.60	0.57	0.52	0.49	0.38	0.33	0.29	0.25	0.19	0.17	0.11	0.096				
		50°C (122°F)	0.71	0.65	0.62	0.59	0.54	0.51	0.42	0.38	0.31	0.26	0.15	0.11	0.083									
		60°C (140°F)	0.58	0.53	0.51	0.47	0.41	0.36	0.26	0.21	0.15	0.11												
		70°C (158°F)	0.48	0.41	0.38	0.34	0.27	0.22	0.13	0.093														
		80°C (176°F)	0.37	0.30	0.27	0.22	0.16	0.12																
	Trosifol® Extra Stiff 0.76 mm (30 mil)	10°C (50°F)	290	260	240	210	170	150	93	73	45	32	11	6.8	4.6	3.1	2.0	1.8	1.3	1.2	0.74	0.61	0.53	
	Trosifol® PVB 0.76 mm (30 mil)	20°C (68°F)	110	77	63	47	27	17	6.3	4.2	2.3	1.8	1.0	0.91	0.82	0.75	0.68	0.66	0.61	0.60	0.47	0.33	0.22	
		25°C (77°F)	35	18	13	8.6	4.4	3.0	1.5	1.2	1.0	0.86	0.68	0.65	0.61	0.58	0.54	0.52	0.47	0.45	0.29	0.14	0.068	
		30°C (86°F)	6.7	3.5	2.7	2.0	1.4	1.1	0.83	0.75	0.67	0.64	0.55	0.52	0.49	0.45	0.39	0.37	0.30	0.28	0.12			
		35°C (95°F)	1.9	1.3	1.2	1.0	0.83	0.75	0.64	0.61	0.56	0.53	0.43	0.39	0.35	0.30	0.24	0.22	0.15	0.13				
		40°C (104°F)	1.1	0.86	0.80	0.73	0.66	0.63	0.55	0.52	0.46	0.42	0.30	0.26	0.21	0.17	0.12	0.10						
		50°C (122°F)	0.66	0.61	0.59	0.55	0.50	0.46	0.37	0.32	0.25	0.20	0.098	0.070										
		60°C (140°F)	0.55	0.50	0.47	0.43	0.36	0.32	0.21	0.16	0.10	0.075												
		70°C (158°F)	0.43	0.37	0.33	0.29	0.21	0.17	0.085															
		80°C (176°F)	0.32	0.25	0.22	0.17	0.11	0.079																

TAB 3

Trosifol® Extra Stiff and Trosifol® PVB combinations – Young Relaxation Modulus E(t)/MPa

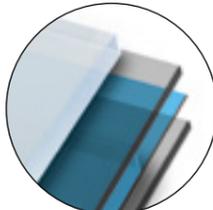
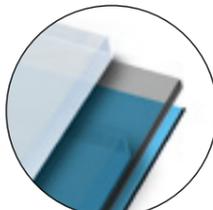
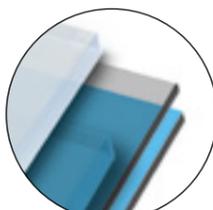
Combination	Temperature	Load duration																						
		1 sec	3 sec	5 sec	10 sec	30 sec	1 min	5 min	10 min	30 min	1 hour	6 hours	12 hours	1 day	2 days	5 days	1 week	3 weeks	1 month	1 year	10 years	50 years		
	Trosifol® Extra Stiff 0.76 mm (30 mil)	10°C (50°F)	1100	970	910	830	700	610	420	350	240	180	68	44	29	19	11	9.1	4.9	4.3	2.4	1.9	1.7	
	Trosifol® PVB 0.38 mm (15 mil)	20°C (68°F)	660	520	460	390	270	210	96	64	32	21	7.3	5.4	4.2	3.5	2.9	2.7	2.3	2.3	1.9	1.5	1.2	
	Trosifol® Extra Stiff 0.76 mm (30 mil)	25°C (77°F)	290	190	150	110	56	36	13	9.0	5.4	4.2	2.7	2.5	2.3	2.2	2.0	2.0	1.8	1.8	1.4	0.90	0.57	
		30°C (86°F)	69	34	25	16	8.6	6.2	3.5	3.0	2.5	2.3	2.0	1.9	1.8	1.7	1.6	1.5	1.3	1.3	0.74	0.33		
		35°C (95°F)	13	7.1	5.6	4.3	3.2	2.8	2.3	2.1	2.0	1.9	1.6	1.5	1.4	1.2	1.1	1.00	0.77	0.71	0.28			
		40°C (104°F)	4.4	3.2	2.9	2.6	2.3	2.1	1.9	1.8	1.6	1.5	1.2	1.1	0.93	0.78	0.60	0.54	0.36	0.31				
		50°C (122°F)	2.2	2.0	2.0	1.9	1.7	1.6	1.3	1.2	0.98	0.83	0.47	0.36	0.27									
		60°C (140°F)	1.8	1.7	1.6	1.5	1.3	1.2	0.82	0.68	0.47	0.36												
		70°C (158°F)	1.5	1.3	1.2	1.1	0.84	0.70	0.40	0.30														
		80°C (176°F)	1.2	0.97	0.86	0.72	0.51	0.39																
	Trosifol® Extra Stiff 0.76 mm (30 mil)	10°C (50°F)	970	860	810	740	620	540	370	300	200	150	51	32	21	13	7.8	6.7	4.3	3.9	2.3	1.9	1.7	
	Trosifol® PVB 0.38 mm (15 mil)	20°C (68°F)	590	480	420	350	240	180	79	52	25	15	5.7	4.4	3.6	3.0	2.5	2.4	2.1	2.1	1.7	1.4	1.1	
		25°C (77°F)	260	170	130	91	46	29	10	7.1	4.5	3.6	2.4	2.2	2.1	2.0	1.8	1.8	1.7	1.6	1.2	0.78	0.49	
		30°C (86°F)	60	29	20	13	7.1	5.3	3.2	2.7	2.3	2.1	1.8	1.7	1.7	1.6	1.4	1.4	1.2	1.1	0.65	0.28		
		35°C (95°F)	11	6.2	5.0	3.9	3.0	2.6	2.1	2.0	1.8	1.7	1.5	1.4	1.3	1.1	0.98	0.91	0.70	0.65	0.24			
		40°C (104°F)	4.0	3.0	2.7	2.4	2.1	2.0	1.8	1.7	1.5	1.4	1.1	0.98	0.86	0.72	0.55	0.49	0.32	0.28				
		50°C (122°F)	2.1	1.9	1.8	1.7	1.6	1.5	1.2	1.1	0.90	0.77	0.43	0.33	0.24									
		60°C (140°F)	1.7	1.6	1.5	1.4	1.2	1.1	0.76	0.63	0.44	0.33												
		70°C (158°F)	1.4	1.2	1.1	0.99	0.78	0.65	0.37	0.27														
		80°C (176°F)	1.1	0.89	0.79	0.66	0.46	0.35																
	Trosifol® Extra Stiff 0.76 mm (30 mil)	10°C (50°F)	860	750	700	620	500	430	270	210	130	95	31	20	14	9.2	5.9	5.2	3.7	3.4	2.2	1.8	1.6	
	Trosifol® PVB 0.76 mm (30 mil)	20°C (68°F)	320	230	190	140	78	51	19	12	6.9	5.2	3.0	2.7	2.4	2.2	2.0	1.9	1.8	1.7	1.4	0.97	0.65	
		25°C (77°F)	100	54	39	25	13	8.8	4.5	3.7	2.8	2.5	2.0	1.9	1.8	1.7	1.6	1.5	1.4	1.3	0.85	0.41	0.20	
		30°C (86°F)	20	10	7.9	5.8	4.0	3.3	2.4	2.2	2.0	1.9	1.6	1.5	1.4	1.3	1.2	1.1	0.88	0.82	0.35			
		35°C (95°F)	5.7	4.0	3.4																			



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4/2024

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