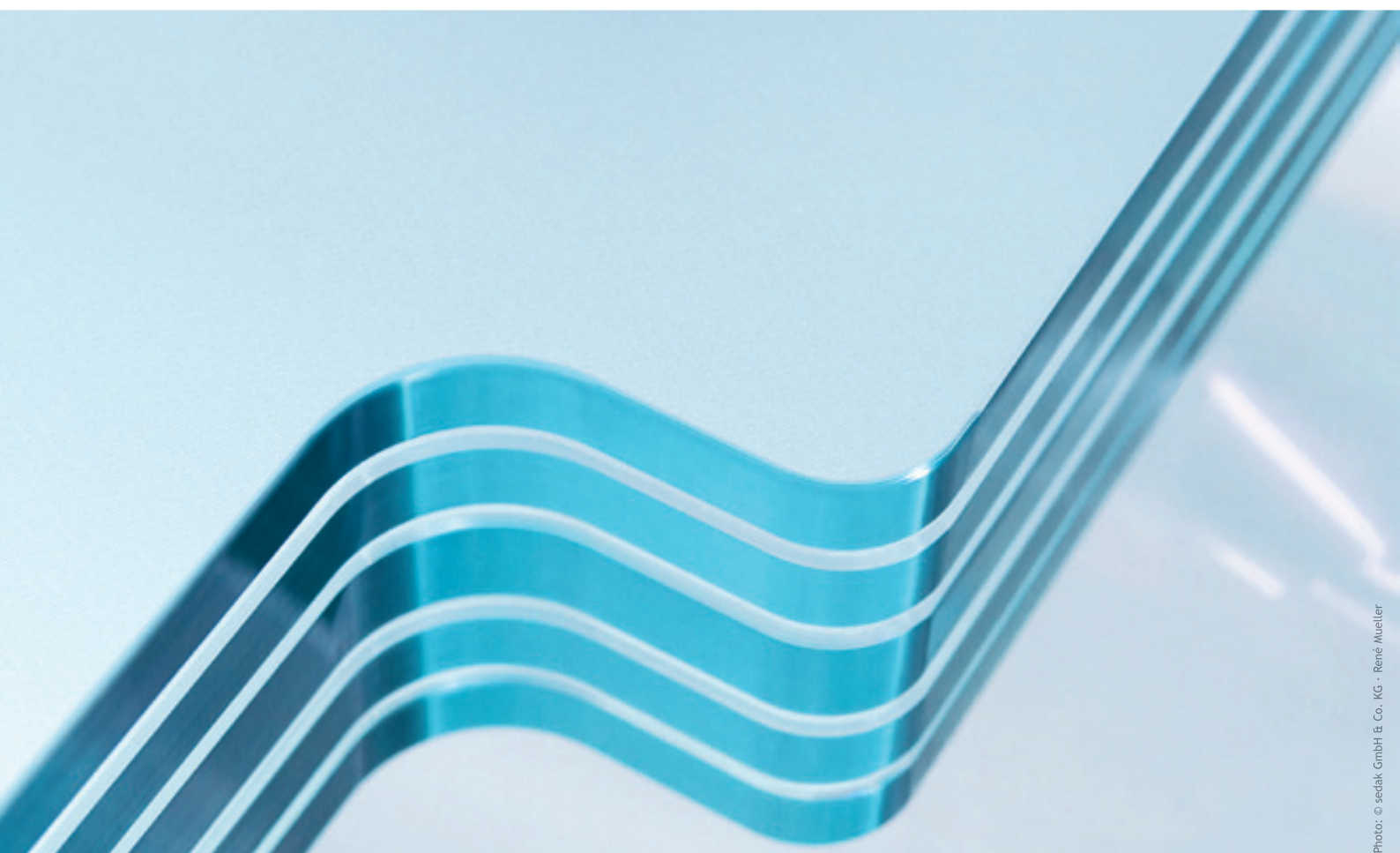


kuraray

trosifol™
world of interlayers



TROSIFOL®

SENTRYGLAS® XTRA™

INTERLAYER

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SENTRYGLAS® XTRA™ (SGX™) INTERLAYER

SentryGlas® Xtra™ (SGX™) is the latest generation SentryGlas® interlayer designed to improve lamination performance and efficiency.

SGX™ has robust adhesion to the air side of glass without the need for primer making lamination of multi ply laminates easier. SGX™ optical performance and haze formation are much less sensitive to the autoclave cooling rate giving peace of mind to the laminator that the final laminate will have consistently high quality. The lower haze also makes producing very thick laminates of outstanding optical quality easily achievable.

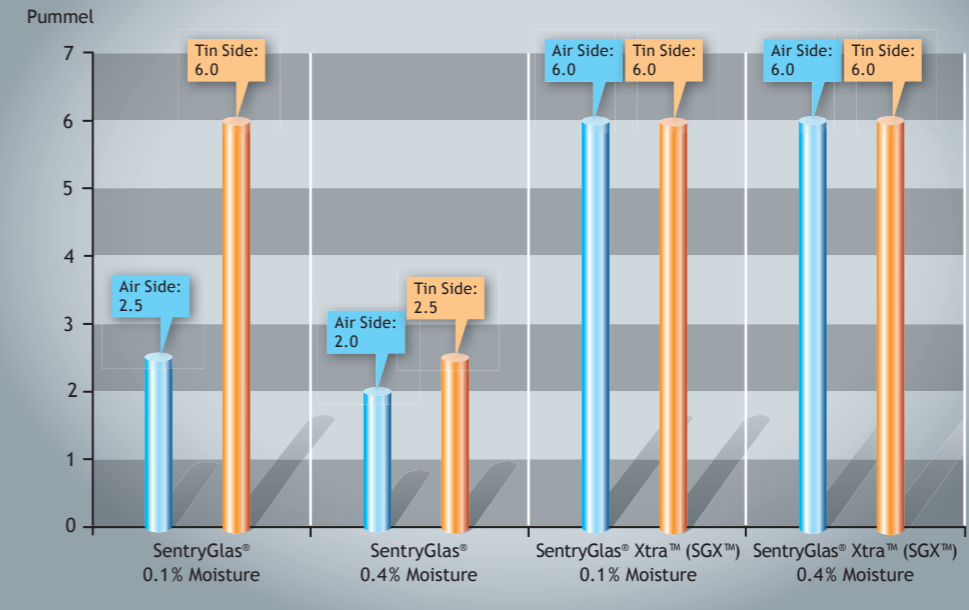
SGX™ complies with global safety glazing codes such as ANSI Z97.1, EN14449, EN12543, EN12600, EN356 and Safety Glazing Certification Council (SGCC). Properly laminated and installed SGX™ laminates of 2.53 mm caliper have been tested and pass the large missile impact test per ASTM E 1996.

Product Offering – Sheet Dimensions

Product	Thickness		Sheet Widths	Sheet Widths	Sheet Lengths	
	[mm]	[mil]	[mm]	[in]	[m]	[ft]
SentryGlas® Xtra™	0.89	35	610-2160*	24-85	6	19
SentryGlas® Xtra™	1.52	60	610-2160*	24-85	6	19
SentryGlas® Xtra™	2.28	90	610-2160*	24-85	6	19
SentryGlas® Xtra™	2.53	100	610-2160*	24-85	6	19

* Oversize shipment possible up to 2530 mm/99 inches

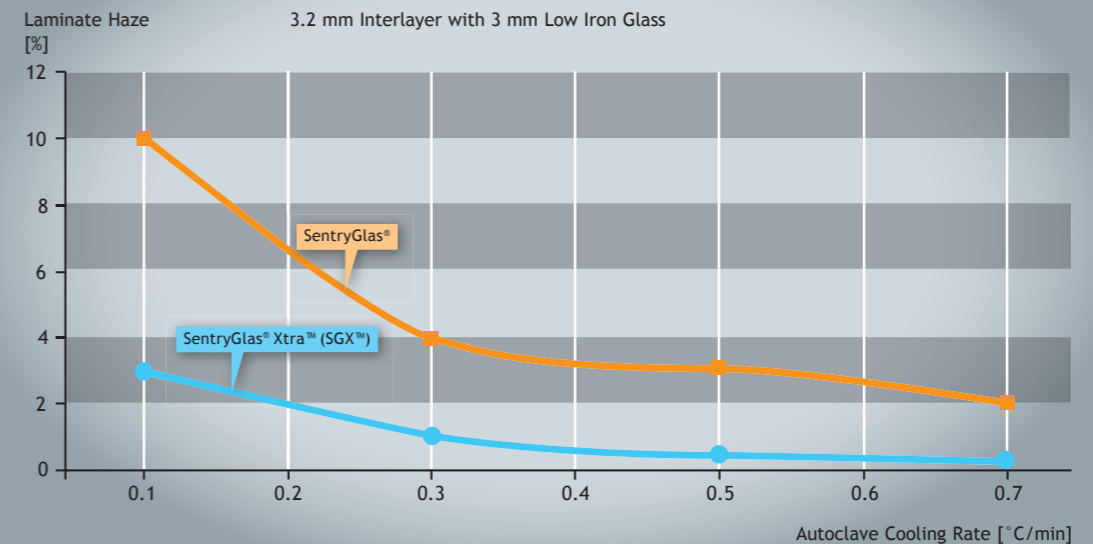
Robust Adhesion – Adhesion less effected by glass orientation and moisture content



Advantages of SGX™

- Less concern for the laminator on interlayer storage condition and higher confidence in final laminate adhesion
- Superior adhesion to air side of glass without the use of primers

Haze less sensitive to Autoclave Cooling Rate SentryGlas® Xtra™ vs. SentryGlas®



Advantages of SGX™

- Haze formation less sensitive to autoclave cooling rate
- Potential to increase autoclave laminate loading
- Greater confidence in consistently achieving the highest quality of optics

Interlayer typical properties

Property	Method	Value	Units Metric (English)
Tensile Strength	ASTM D638 (23°C/50% RH)	43.5 (6.3)	Mpa (Kpsi)
	ISO 527(23°C/50% RH)	42.9 (6.2)	Mpa (Kpsi)
Elongation	ASTM D638(23°C/50% RH)	320	%
	ISO 527(23°C/50% RH)	600	%
Specific Gravity	ASTM D792	0.95	
Coeff. of Thermal Expansion (-20 °C to 32 °C)	ASTM D696	10 X 10 ⁻⁵	mm/mm/ °C
Heat Deflection Temperature	ASTM D648	37 (99)	°C (°F)

Laminate typical properties*

Property	Method	Value [%]
Light Transmission	EN410 (ASTM G 173-03)	90 (90)
UV Transmission	ISO 9050	< 1
Haze	ASTM D1003	< 1
Yellowness	ASTM D313	≤ 0.3

*0.89 mm with 4 mm clear glass

Impact Performance

Test	Laminate Construction	Category	Compliance
ANSI Z97.1	0.89 mm (35 mil)/3mm Annealed Glass	Class A Category II/ Class B Category I	Pass
EN12600	0.76 mm (30 mil)/3 mm Annealed Glass	1B1	Pass
EN356	0.76 mm (30 mil)/3 mm Annealed Glass	P1A	Pass

Weathering Testing

Test	Compliance
ANSI Z97.1 (3,000 hours Xenon)	Pass
EN12543 4000 hours	Pass

ELASTIC PROPERTIES OF SENTRYGLAS® XTRA™

Youngs Relaxation Modulus E(t) / MPa

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
-20°C (-4 °F)	725	719	719	716	710	705	699	670	672	669	654
0°C (32 °F)	601	589	580	571	551	536	512	500	474	426	367
10°C (50 °F)	536	530	527	521	509	503	477	423	373	355	271
20°C (68 °F)	480	459	426	400	389	370	355	340	296	237	163
25°C (77 °F)	417	403	373	346	340	289	238	187	136	110	79.9
30°C (86 °F)	314	299	283	270	250	237	163	148	113	77.0	48.0
35°C (95 °F)	233	208	194	182	163	133	85.8	65.1	40.0	29.6	13.6
40°C (104 °F)	149	137	120	105	98.0	79.9	44.4	35.5	20.7	15.4	7.81
50°C (122 °F)	65.4	37.6	25.0	17.7	14.5	11.5	8.02	7.25	5.92	5.03	3.55
60°C (140 °F)	14.5	11.2	9.86	7.51	6.36	5.57	4.14	3.70	2.96	2.66	2.01
70°C (158 °F)	6.51	5.12	4.23	3.85	3.11	2.66	2.01	1.92	1.33	1.18	0.83
80°C (176 °F)	0.92	0.80	0.68	0.53	0.30	0.27	0.18	0.15	0.12	0.12	0.09

Temperature	Load duration									
	12 hours	1 day	2 days	5 days	1 week	3 weeks	1 month	1 year	10 years	50 years
-20°C (-4 °F)	631	619	568	554	551	544	522	471	411	388
0°C (32 °F)	317	299	282	252	248	222	209	162	127	115
10°C (50 °F)	252	199	170	138	126	109	101	66.9	48.8	39.1
20°C (68 °F)	148	118	109	87.3	79.6	62.8	54.4	32.9	19.8	14.9
25°C (77 °F)	62.2	55.1	53.0	45.6	42.0	32.9	31.4	16.6	9.80	7.22
30°C (86 °F)	31.4	26.6	24.7	21.1	18.3	16.4	15.3	9.09	5.86	4.47
35°C (95 °F)	11.8	9.80	9.56	8.17	7.79	6.87	6.35	4.47	3.11	2.58
40°C (104 °F)	5.89	5.51	5.45	4.65	4.11	3.52	3.28	2.07	1.39	1.10
50°C (122 °F)	3.26	3.11	2.96	2.72	2.20	1.81	1.59	1.27	0.68	0.50
60°C (140 °F)	1.81	1.72	1.27	1.18	1.13	0.92	0.84	0.53	0.36	0.27
70°C (158 °F)	0.77	0.71	0.06	0.49	0.41	0.36	0.32	0.21	0.15	0.12
80°C (176 °F)	0.09	0.06	0.03	0.03	0.03	-	-	-	-	-

Poisson Ratio (ν) = 0.48
E = G*2 (1+ν)

Shear Relaxation Modulus G(t) / MPa

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
-20°C (-4 °F)	245	243	243	242	240	238	236	233	227	226	221
0°C (32 °F)	203	199	196	193	186	182	172	169	160	144	124
10°C (50 °F)	181	179	178	176	172	170	161	143	126	120	91.6
20°C (68 °F)	162	155	144	135	131	125	120	115	100	80.1	55.1
25°C (77 °F)	141	136	126	117	115	97.9	80.4	63.3	45.8	37.2	27.0
30°C (86 °F)	106	101	95.6	91.2	84.8	80.1	55.1	50.0	38.2	26.0	16.2
35°C (95 °F)	78.7	70.3	65.5	61.5	55.1	44.9	29.0	22.0	13.5	10.0	4.60
40°C (104 °F)	50.3	46.3	40.5	35.5	33.1	27.0	15.0	12.0	6.99	5.20	2.64
50°C (122 °F)	22.1	12.7	8.45	5.98	4.90	3.89	2.71	2.45	2.00	1.70	1.20
60°C (140 °F)	4.90	3.78	3.33	2.54	2.15	1.88	1.40	1.25	1.00	0.90	0.68
70°C (158 °F)	2.20	1.73	1.43	1.30	1.05	0.90	0.68	0.65	0.45	0.40	0.28
80°C (176 °F)	0.31	0.27	0.23	0.18	0.10	0.09	0.06	0.05	0.04	0.04	0.03

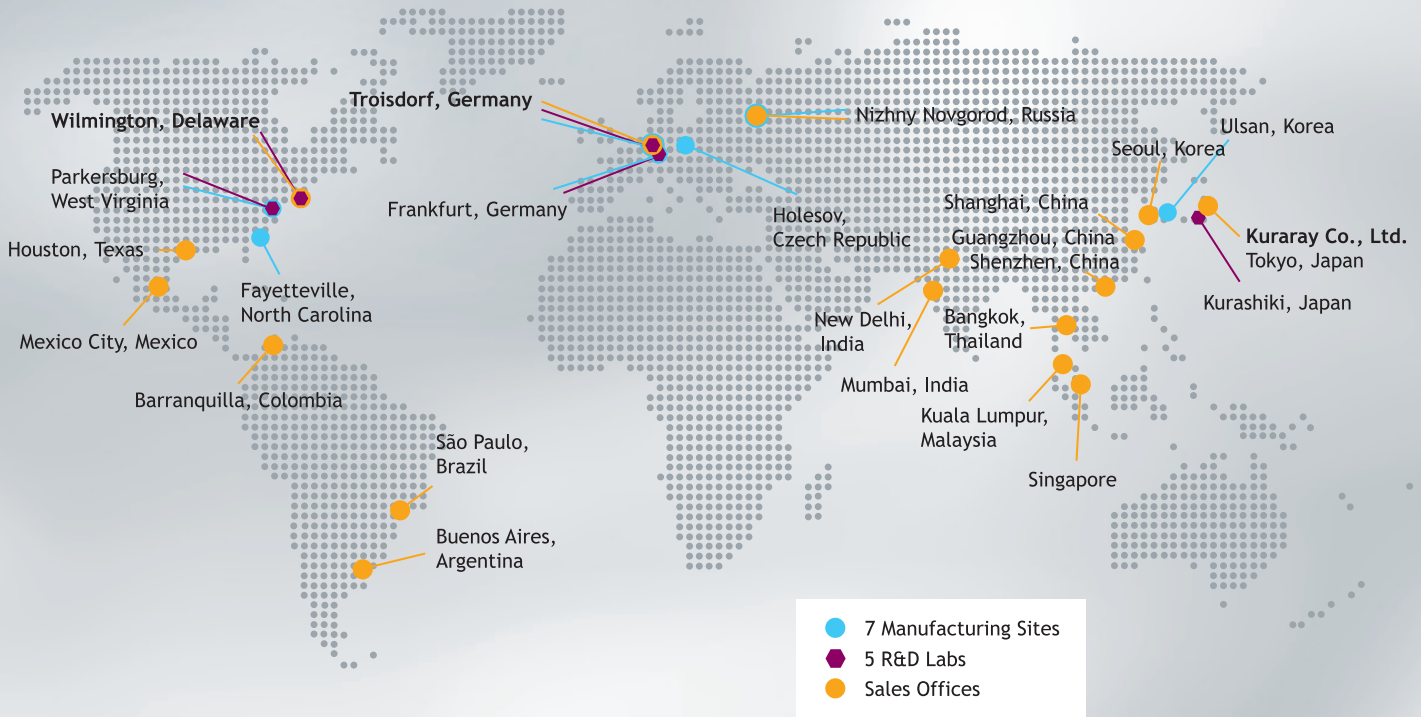
Temperature	Load duration									
	12 hours	1 day	2 days	5 days	1 week	3 weeks	1 month	1 year	10 years	50 years
-20°C (-4 °F)	213	209	192	187	186	184	176	159	139	131
0°C (32 °F)	107	101	95.3	85.1	83.8	75.0	70.6	54.7	42.9	38.9
10°C (50 °F)	85.1	67.2	57.4	46.6	42.6	36.8	34.1	22.6	16.5	13.2
20°C (68 °F)	50.0	39.9	36.8	29.5	26.9	21.2	18.4	11.1	6.69	5.03
25°C (77 °F)	21.0	18.6	17.9	15.4	14.2	11.1	10.5	5.61	3.31	2.44
30°C (86 °F)	10.6	8.97	8.35	7.13	6.18	5.54	5.17	3.07	1.98	1.51
35°C (95 °F)	3.99	3.31	3.23	2.76	2.63	2.32	2.15	1.51	1.05	0.87
40°C (104 °F)	1.99	1.86	1.84	1.57	1.39	1.19	1.11	0.70	0.47	0.37
50°C (122 °F)	1.10	1.05	1.00	0.92	0.74	0.61	0.54	0.43	0.23	0.17
60°C (140 °F)	0.61	0.58	0.43	0.40	0.38	0.31	0.28	0.18	0.12	0.09
70°C (158 °F)	0.26	0.24	0.20	0.17	0.14	0.12	0.11	0.07	0.05	0.04
80°C (176 °F)	0.03	0.02	0.01	0.01	0.01	-	-	-	-	-

Poisson Ratio (ν) = 0.48
E = G*2 (1+ν)

Conversion table MPa to kpsi

MPa	kpsi	MPa	kpsi	MPa	kpsi
10	1.450	50	7.251	400	58.015
15	2.175	60	8.702	500	72.519
20	2.900	70	10.513	600	87.023
25	3.625	80	11.603	700	101.526
30	4.351	90	13.053	800	116.030
35	5.076	100	14.503	900	130.534
40	5.801	200	29.007	1000	145.037
45	6.526	300	43.511	1100	159.542





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