

**Optimat Blades**  
Results of lab. test

Identity of laminates	Density		Fibre content		Fiber content		Resin content		Void content		DSC analysis	
	Average g/cm <sup>3</sup>	Std.diviation g/cm <sup>3</sup>	Average W/W%	Std.diviation W/W%	Average V/V%	Std. diviation V/V%	Average V/V%	Std. diviation V/V%	Average V/V%	Std. diviation V/V%	Middel point Tg °C	Final Tg °C
Laminate No. 1	1.89	0.04	73.23	0.27	53.31	1.10	44.13	0.77	2.56	1.75		
Laminate No. 2	1.87	0.02	71.96	0.27	51.84	0.72	45.76	0.40	2.40	0.95		
Laminate No. 3	1.91	0.01	72.73	0.32	53.48	0.41	45.41	0.43	1.11	0.30		
Laminate No. 4	1.91	0.01	73.70	0.32	54.15	0.51	43.77	0.39	2.08	0.40	74.27	87.03
Laminate No. 5	1.86	0.02	71.94	0.69	51.45	1.13	45.44	0.64	3.11	0.78	71.82	85.43
Laminate No. 6	1.90	0.02	72.59	0.58	53.11	0.89	45.41	0.73	1.48	0.78	71.31	86.66
Laminate No. 7	1.89	0.02	72.58	0.84	52.73	1.27	45.10	0.86	2.17	0.64	73.66	86.95
Laminate No. 8	1.88	0.01	70.88	0.22	51.37	0.33	47.79	0.20	0.84	0.18	72.79	88.30
Laminate No. 9	1.91	0.01	72.70	0.96	52.86	0.98	44.93	1.37	2.21	0.48	74.71	85.94
Laminate No. 10	1.83	0.02	70.36	0.33	49.60	0.58	47.33	0.88	3.08	1.30	72.77	87.33
Laminate No. 11	1.86	0.02	72.19	0.37	52.52	0.42	45.81	0.48	1.68	0.47	75.11	86.64
Laminate No. 12	1.89	0.01	71.74	0.33	52.06	0.29	46.43	0.51	1.50	0.48	76.00	86.10
Laminate No. 13	1.90	0.02	71.53	0.60	51.59	0.86	46.46	0.61	1.95	0.27	76.55	88.77
Laminate No. 14	1.90	0.02	72.50	0.49	53.04	0.53	45.57	1.00	1.39	1.12	74.23	87.09
Laminate No. 15	1.90	0.02	74.56	0.29	54.57	0.44	42.17	0.74	3.26	1.03	74.20	88.44
Laminate No. 16	1.87	0.01	71.79	0.75	51.70	0.90	46.01	0.92	2.29	0.29	72.23	86.47
Laminate No. 17	1.86	0.02	70.42	0.51	50.46	0.74	48.00	0.63	1.54	0.65	74.68	86.89
Laminate No. 18	1.87	0.01	73.00	0.19	52.58	0.21	44.04	0.17	3.38	0.38	74.96	86.46
Laminate No. 19	1.86	0.02	72.18	0.25	51.64	0.31	45.07	0.32	3.29	0.33	74.86	87.91
Laminate No. 20	1.84	0.01	70.26	0.40	49.85	0.32	47.78	0.88	2.36	0.95	74.42	87.97
Laminate No. 21	1.84	0.02	70.97	0.78	50.14	1.05	46.44	0.81	3.43	0.38	72.48	87.21
Laminate No. 22	1.85	0.02	71.74	0.71	51.07	0.90	45.55	0.88	3.38	0.58	71.60	84.85
Laminate No. 23												
Laminate No. 24	1.85	0.02	71.37	0.39	50.92	0.54	46.26	0.71	2.82	0.86	78.45	87.41
Laminate No. 25	1.83	0.02	71.99	0.75	50.81	0.96	44.77	1.15	4.42	1.14	74.45	86.50
Laminate No. 26	1.87	0.03	72.84	0.36	52.32	0.79	44.19	0.98	3.49	1.58	73.61	87.67
Laminate No. 27	1.83	0.03	71.98	1.07	50.66	1.56	44.63	1.17	4.71	1.09	69.75	88.08
Laminate No. 28	1.82	0.02	71.86	0.63	50.29	0.89	44.60	0.89	5.11	1.02	72.27	88.20
Laminate No. 29	1.86	0.04	71.90	0.42	51.47	1.17	45.56	0.90	2.97	1.81		
Laminate No. 30	1.79	0.00	71.99	0.98	49.49	0.78	43.62	1.45	6.90	0.68	73.82	84.40
Laminate No. 31	1.85	0.02	71.47	0.48	50.84	0.65	45.97	1.14	3.19	1.50	76.26	84.10
Laminate No. 32	1.82	0.05	71.16	0.54	49.69	1.54	45.60	0.78	4.71	2.05	77.15	85.14
Laminate No. 33	1.78	0.02	71.04	0.56	48.77	0.47	45.03	1.06	6.20	1.07	76.97	86.84
Laminate No. 34	1.91	0.01	71.38	0.61	52.31	0.70	47.49	0.80	0.20	0.14	72.34	85.87
Laminate No. 35	1.92	0.01	72.14	0.41	53.15	0.56	46.47	0.53	0.38	0.36	69.22	85.87
Laminate No. 36	1.90	0.02	71.83	0.60	52.42	0.98	46.56	0.56	1.02	0.57	75.48	85.18
Laminate No. 37	1.88	0.01	71.38	0.21	51.64	0.50	46.90	0.16	1.47	0.51	77.70	85.68
Laminate No. 38	1.90	0.01	72.11	0.18	52.83	0.29	46.27	0.40	0.90	0.55	72.48	87.58
Laminate No. 39	1.87	0.03	70.38	0.79	50.68	1.23	48.30	0.81	1.02	0.86	73.09	83.99
Laminate No. 40	1.90	0.01	71.82	0.10	52.49	0.26	46.64	0.26	0.87	0.46	69.41	84.59
Laminate No. 41	1.88	0.01	71.40	0.91	51.61	0.81	46.82	1.39	1.57	0.73	73.39	86.21
Laminate No. 42	1.89	0.01	72.11	0.53	52.55	0.45	46.04	0.84	1.41	0.48	68.94	86.96
Laminate No. 43	1.83	0.05	72.28	0.88	50.87	1.50	44.18	1.75	4.95	2.56	69.89	87.23
Laminate No. 44	1.84	0.02	71.69	0.51	50.82	0.73	45.46	1.03	3.72	1.33		
Laminate No. 45	1.86	0.04	71.59	0.53	51.22	1.25	46.02	0.84	2.77	1.68	66.02	84.74
Laminate No. 46	1.75	0.02	62.38	0.95	42.02	1.08	57.38	0.85	0.60	0.31	70.34	85.29
Laminate No. 47	1.78	0.03	65.33	1.67	44.80	1.82	53.81	1.77	1.39	0.14	66.03	85.55
Laminate No. 48	1.89	0.01	71.30	0.42	51.87	0.51	47.30	0.59	0.83	0.43	64.43	86.80
Laminate No. 49	1.91	0.01	72.77	0.57	53.54	0.54	45.38	0.52	1.09	0.70	65.51	86.30
Laminate No. 50	1.91	0.01	72.27	0.07	53.09	0.24	46.12	0.08	0.79	0.31	67.76	87.20
Laminate No. 51	1.91	0.03	72.87	0.64	53.50	1.03	45.09	0.99	1.41	1.24	65.07	82.87
Laminate No. 52	1.91	0.00	72.55	0.32	53.28	0.24	45.66	0.56	1.06	0.39	67.41	86.75
Laminate No. 53	1.91	0.00	72.84	0.68	53.40	0.38	45.10	1.22	1.50	0.84	66.08	85.89
Laminate No. 54	1.89	0.02	72.27	0.61	52.41	0.84	45.53	0.75	2.05	0.57	69.05	86.32
Laminate No. 55	1.88	0.00	71.88	0.29	51.94	0.27	46.02	0.42	2.04	0.17	65.40	87.76
Laminate No. 56	1.89	0.01	71.65	0.48	52.16	0.57	46.73	0.59	1.11	0.08	66.31	88.30
Laminate No. 57	1.92	0.01	71.76	0.17	52.98	0.25	47.22	0.34	-0.20	0.35	72.91	86.52
Laminate No. 58	1.91	0.01	71.43	1.08	52.54	1.03	47.59	1.61	-0.13	0.68	69.75	87.69
Laminate No. 59	1.90	0.01	70.10	0.39	51.22	0.49	49.49	0.52	0.00	0.00	73.34	86.82
Laminate No. 60	1.89	0.01	71.39	0.33	51.79	0.49	46.99	0.34	1.22	0.26	69.91	87.44
Laminate No. 61	1.90	0.01	71.00	0.56	51.88	0.65	47.99	0.71	0.13	0.17	67.91	84.40
Laminate No. 62	1.89	0.01	72.01	0.58	52.28	0.65	46.03	0.77	1.69	0.29	62.88	84.87

Laminate No. 63	1.90	0.02	72.79	1.09	53.26	1.10	45.09	1.69	1.65	1.04	72.29	86.63
Laminate No. 64	1.85	0.02	70.87	0.75	50.33	0.91	46.86	1.10	2.81	1.03	68.07	86.75
Laminate No. 65	1.85	0.03	72.04	0.63	51.20	1.13	45.00	0.76	3.81	1.15	70.11	87.64
Laminate No. 66	1.79	0.03	71.14	0.87	49.07	1.15	45.08	1.30	5.86	1.47	66.89	87.44
Laminate No. 67	1.84	0.02	70.08	0.34	49.52	0.67	47.87	0.17	2.61	0.57	71.50	88.93
Laminate No. 68	1.81	0.03	71.07	0.34	49.45	0.84	45.59	0.67	4.96	1.29	69.83	88.02
Laminate No. 69	1.85	0.01	71.09	0.19	50.65	0.43	46.66	0.38	2.70	0.67	69.02	87.57
Laminate No. 70	1.89	0.01	71.06	0.37	51.62	0.55	47.61	0.35	0.77	0.24	66.16	84.98
Laminate No. 71	1.89	0.01	71.85	0.87	52.28	0.81	46.38	1.30	1.34	0.55	75.28	93.20
Laminate No. 72	1.92	0.01	71.68	0.52	52.97	0.55	47.39	0.72	0.00	0.00	71.32	88.17
Laminate No. 73	1.93	0.01	72.31	0.56	53.62	0.72	46.51	0.71	-0.02	0.31	76.81	87.43
Laminate No. 74	1.90	0.01	71.52	0.64	52.38	0.74	47.24	0.83	0.38	0.19	69.44	85.54
Laminate No. 75	1.90	0.01	71.32	0.08	52.06	0.31	47.41	0.25	0.53	0.52	67.63	85.85
Laminate No. 76	1.89	0.01	70.74	0.43	51.51	0.59	48.24	0.46	0.26	0.20	65.66	85.31
Laminate No. 77	1.91	0.01	72.03	0.22	52.96	0.29	46.57	0.29	0.47	0.21	68.36	87.50
Laminate No. 78	1.89	0.00	70.72	0.52	51.43	0.50	48.23	0.75	0.35	0.27	67.64	86.20
Laminate No. 79	1.89	0.01	71.22	0.50	51.71	0.68	47.32	0.56	0.97	0.24	66.13	83.94
Laminate No. 80	1.89	0.01	71.24	0.73	51.76	0.93	47.32	0.84	0.93	0.22	68.14	88.57
Laminate No. 81	1.90	-0.02	72.27	-0.70	52.89	-1.01	45.96	-0.74	1.15	-0.35	69.49	88.46
Laminate No. 82	1.88	0.03	71.31	0.45	51.54	1.01	46.96	0.45	1.51	1.09	65.32	82.62
Laminate No. 83	1.86	0.02	70.66	0.24	50.61	0.58	47.59	0.21	1.80	0.64	65.63	84.27
Laminate No. 84	1.89	0.01	72.21	0.52	52.47	0.71	45.73	0.62	1.80	0.39	67.70	87.31
Laminate No. 85	1.81	0.02	71.63	0.54	49.79	0.53	44.67	1.28	5.54	1.56	68.57	86.45
Laminate No. 86	1.85	0.01	71.79	0.51	51.11	0.43	45.50	0.87	3.39	0.70	69.24	87.24
Laminate No. 87	1.90	0.00	72.94	0.27	53.26	0.27	44.75	0.42	1.99	0.29	72.30	87.78
Laminate No. 88	1.93	0.01	72.90	0.47	54.11	0.51	45.55	0.69	0.35	0.34	77.48	89.22
Laminate No. 89	1.91	0.01	72.36	0.54	53.23	0.54	46.05	0.83	0.72	0.50	69.21	87.96
Laminate No. 90	1.86	0.02	70.67	1.19	50.66	1.37	47.61	1.47	1.74	0.39	70.98	87.83
Laminate No. 91	1.89	0.02	70.90	0.98	51.59	1.38	47.94	1.04	0.48	0.51	71.09	87.80
Laminate No. 92	1.89	0.01	71.71	0.68	52.09	0.74	46.54	0.93	1.37	0.35	69.01	88.07
Laminate No. 93	1.88	0.00	71.34	0.39	51.66	0.34	47.01	0.61	1.33	0.31	71.92	88.09
Laminate No. 94	1.86	0.01	71.37	0.44	51.10	0.42	46.42	0.91	2.48	0.98	69.47	85.37
Laminate No. 95	1.88	0.02	71.73	0.58	51.94	0.87	46.34	0.56	1.71	0.40	70.84	87.67
Laminate No. 96												
Laminate No. 97												
Laminate No. 98	1.89	0.01	71.52	0.48	51.87	0.44	46.78	0.75	1.35	0.47	69.57	89.21
Laminate No. 99	1.94	0.03	73.35	0.77	54.62	1.44	44.94	0.64	0.44	0.95	74.17	89.14
Laminate No. 100	1.93	0.01	72.59	0.30	53.78	0.57	45.98	0.20	0.34	0.42	75.19	87.29
Laminate No. 101	1.87	0.02	71.39	0.61	51.88	0.81	46.63	0.78	1.49	0.60		
Laminate No. 102	1.91	0.01	72.56	0.27	53.84	0.37	45.29	0.41	0.86	0.43		
Laminate No. 103	1.92	0.01	72.91	0.43	54.31	0.66	44.88	0.52	0.81	0.44		
Laminate No. 104	1.92	0.01	72.75	32.00	53.73	0.47	45.59	0.58	0.68	0.72	67.46	87.32
Laminate No. 105	1.91	0.01	71.67	0.43	52.79	0.50	47.25	0.74	0.49	0.55	64.22	87.08
Laminate No. 106	1.89	0.01	71.65	0.35	52.04	0.56	46.64	0.46	1.32	0.57	72.16	88.85
Laminate No. 107												
Laminate No. 108	1.97	0.01	74.69	0.71	56.66	0.83	43.49	1.00	0.10	0.19	67.49	86.45
Laminate No. 109	1.94	0.01	73.21	0.42	54.75	0.52	45.38	0.53	0.00	0.10	71.47	87.83
Laminate No. 110	1.96	0.01	74.18	0.34	56.05	0.43	44.18	0.46	0.00	0.12	74.97	86.77
Laminate No. 111	1.95	0.02	74.00	0.58	55.40	1.07	44.07	0.54	0.53	0.72	74.85	89.22
Laminate No. 112	1.94	0.03	73.68	0.59	55.05	1.16	44.51	0.49	0.44	0.84	73.45	87.44
Laminate No. 113	1.88	0.02	71.82	0.19	52.38	0.52	46.10	0.64	1.52	1.08		
Laminate No. 114	1.91	0.01	72.21	0.67	53.15	0.66	46.31	0.99	0.54	0.36	78.32	88.81
Laminate No. 115	1.90	0.02	71.93	0.19	52.89	0.64	46.31	0.48	0.80	1.02		
Laminate No. 116	1.90	0.02	71.05	0.74	52.30	1.02	47.39	0.82	0.31	0.33		
Laminate No. 117	1.91	0.00	72.35	0.34	53.19	0.13	46.03	0.66	0.78	0.54	73.48	87.62
Laminate No. 118	1.92	0.01	71.99	0.67	53.25	0.90	46.92	0.78	0.00	0.12	73.94	88.29
Laminate No. 119	1.94	0.02	72.95	0.81	54.42	1.08	45.69	0.98	0.00	0.22	70.81	86.30
Laminate No. 120	1.94	0.01	72.97	0.26	54.59	0.35	45.79	0.31	0.00	0.02	72.92	86.80
Laminate No. 121												
Laminate No. 122	1.96	0.01	74.36	0.77	56.59	0.96	43.39	1.00	0.12	0.02		
Laminate No. 123	1.93	0.01	73.93	0.45	55.43	0.56	43.84	0.60	0.73	0.13		
Laminate No. 124	1.89	0.01	69.35	0.56	49.66	0.70	49.71	0.62	0.63	0.10	69.50	88.09
Laminate No. 125	1.91	0.01	71.88	0.63	52.78	0.85	46.76	0.71	0.47	0.22	68.48	86.47
Laminate No. 126	1.91	0.01	71.80	0.32	52.83	0.46	47.00	0.33	0.16	0.16	77.23	86.23
Laminate No. 127	1.96	0.01	74.22	0.26	55.84	0.49	43.93	0.21	0.35	0.25	75.39	87.22
Laminate No. 128	1.95	0.02	73.90	0.80	55.43	1.05	44.32	1.01	0.25	0.14	76.13	86.83
Laminate No. 129	1.90	0.03	71.25	1.32	52.12	1.69	47.60	1.53	0.28	0.27	76.90	86.53
Laminate No. 130	1.92	0.01	72.27	0.59	53.50	0.83	46.49	0.64	0.03	0.29	73.88	85.80
Laminate No. 131	1.90	0.01	70.94	0.84	51.77	1.01	48.03	1.03	0.20	0.07	73.64	86.77

Laminate No. 132	1.93	0.01	72.33	0.61	53.64	0.80	46.46	0.74	0.00	0.17	74.91	86.16
Laminate No. 133	1.93	0.01	72.62	0.31	53.99	0.38	46.09	0.40	0.00	0.00	77.89	88.50
Laminate No. 134	1.94	0.01	73.05	0.64	54.57	0.76	45.60	0.86	0.00	0.19	77.87	87.24
Laminate No. 135												
Laminate No. 136												
Laminate No. 137												
Laminate No. 138	1.89	0.02	71.53	1.02	52.38	1.28	46.76	1.31	0.86	0.76		
Laminate No. 139	1.88	0.01	70.76	0.53	51.54	0.68	47.48	0.59	0.68	0.15		
Laminate No. 140	1.71	0.06	72.17	0.62	47.92	1.65	41.47	1.62	10.61	2.96		
Laminate No. 141	1.89	0.01	71.38	0.29	52.39	0.45	47.12	0.29	0.49	0.26		
Laminate No. 142	1.89	0.03	71.47	1.26	52.34	1.64	46.83	1.43	0.83	0.38		
Laminate No. 143	1.89	0.03	71.04	1.65	51.99	2.14	47.49	1.84	0.52	0.37		
Laminate No. 144	1.90	0.02	71.91	0.15	53.07	0.49	46.50	0.34	0.43	0.74		
Laminate No. 145												
Laminate No. 146												
Laminate No. 147												
Laminate No. 148												
Laminate No. 149												
Laminate No. 150	1.90	0.01	71.81	0.42	52.82	0.71	46.51	0.38	0.67	0.43		
Laminate No. 151	1.89	0.02	72.39	0.12	52.97	0.60	45.32	0.40	1.72	0.96		
Laminate No. 152	1.79	0.01	71.74	0.42	52.44	0.42	46.35	0.64	1.21	0.37		
Laminate No. 153	1.88	0.01	71.92	0.51	52.53	0.53	46.02	0.70	1.45	0.22		
Laminate No. 154	1.89	0.01	72.18	0.83	52.78	0.86	45.65	1.17	1.57	0.42		
Laminate No. 155	1.88	0.02	72.04	0.31	52.48	0.53	45.70	0.71	1.83	1.02		
Laminate No. 156	1.86	0.01	71.28	0.53	51.25	0.34	46.33	0.92	2.42	0.66		
Laminate No. 157	1.93	0.02	73.06	0.88	54.61	1.11	45.16	1.11	0.23	0.21		
Laminate No. 158												
Laminate No. 159												
Laminate No. 160												
Laminate No. 161	1.94	0.01	73.55	0.31	55.44	0.29	44.73	0.56	0.16	0.55		
Laminate No. 162	1.94	0.03	73.75	0.96	55.40	1.72	44.21	0.84	0.75	0.65		
Laminate No. 163	1.96	0.02	74.48	0.26	56.53	0.56	43.46	0.48	0.01	0.79		
Laminate No. 164	1.94	0.01	73.68	0.40	55.46	0.55	44.44	0.49	0.00	0.00		
Laminate No. 165	1.95	0.01	73.27	0.66	55.37	0.87	45.30	0.82	0.00	0.00		
Laminate No. 166	1.96	0.01	74.02	0.48	56.29	0.58	44.31	0.64	0.00	0.00		
Laminate No. 167	1.95	0.02	73.57	0.84	55.59	1.11	44.78	1.04	0.00	0.00		
Laminate No. 168	1.95	0.02	73.63	1.09	55.59	1.38	44.64	1.38	0.00	0.00		
Laminate No. 169	1.97	0.01	74.66	0.39	56.91	0.55	43.34	0.47	0.00	0.00		
Laminate No. 170	1.93	0.02	73.43	0.68	55.07	1.06	44.68	0.69	0.00	0.00		
Laminate No. 171	1.90	0.02	72.14	0.46	53.25	0.81	46.12	0.38	0.62	0.52		
Laminate No. 172												
Laminate No. 173												
Laminate No. 174	1.94	0.01	73.05	0.28	54.96	0.37	45.49	0.37	0.00	0.00		
Laminate No. 175	1.93	0.01	73.24	0.24	54.71	0.31	44.84	0.39	0.45	0.38		
Laminate No. 176	k											
Laminate No. 177	k											
Laminate No. 178	k											
Laminate No. 179	1.85	0.04	71.98	0.59	51.63	1.38	45.08	0.69	3.29	1.61	74.12	82.56
Laminate No. 180	1.87	0.00	70.63	0.30	51.13	0.16	47.70	0.54	1.17	0.38	78.74	84.98
Laminate No. 181	1.88	0.01	71.13	0.34	51.73	0.16	47.11	0.71	1.17	0.66	76.92	84.39
Laminate No. 182	1.98	0.03	72.85	1.33	53.30	1.74	44.54	1.67	2.16	0.91	76.05	83.91
Laminate No. 183	1.92	0.01	73.29	0.11	54.43	0.34	44.50	0.49	1.07	0.82	80.69	86.13
Laminate No. 184	1.90	0.01	72.07	0.74	53.10	0.87	46.17	0.95	0.73	0.14	78.53	85.23
Laminate No. 185	k											
Laminate No. 186	k											
Laminate No. 187	k											
Laminate No. 188	1.91	0.01	71.91	0.59	53.34	0.83	46.33	0.63	0.33	0.22	90.04	99.29
Laminate No. 189	1.89	0.01	70.58	0.73	51.71	0.87	47.93	0.90	0.36	0.26	89.58	100.09
Laminate No. 190	1.91	0.00	72.06	0.38	53.47	0.37	46.11	0.56	0.42	0.24	88.89	99.29
Laminate No. 191	1.91	0.01	71.55	0.20	52.84	0.33	46.74	0.21	0.42	0.25	91.16	101.13
Laminate No. 192	1.88	0.01	70.52	0.22	51.37	0.27	47.75	0.35	0.88	0.35	76.37	97.40
Laminate No. 193												
Laminate No. 194												
Laminate No. 195												
Laminate No. 196	1.89	0.07	72.04	0.65	52.84	1.98	45.61	1.91	2.12	4.11	86.83	98.07
Laminate No. 197	1.93	0.01	72.34	0.44	53.98	0.58	45.90	0.52	0.12	0.10	84.05	97.30
Laminate No. 198	1.88	0.06	72.53	0.34	52.95	1.88	44.59	1.22	2.45	3.02	84.82	97.42
Laminate No. 199	1.85	0.02	68.23	1.29	48.98	1.36	50.70	1.59	0.33	0.33	89.51	100.38
Laminate No. 200	1.89	0.18	68.59	5.45	50.41	8.60	50.45	3.94	-1.02	6.02	89.58	99.04



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