

Biaxial tensile test on technical membranes

Persons in charge: Dipl.-Ing. Thomas Homm

Date: 20.07.2017

Location: V15R00H01

Customer: HEYtex Bramsche GmbH
 Heywinkelstraße 1
 49565 Bramsche

Subject of order: Biaxial test on technical membranes
 for the project: Biaxial test according to MSAJ/M-02-1995

Test procedure: according to specifications by:
 MSAJ/M-02-1995

Material: clipeum 650 - H5871-0287, Piece No. 1116732023

Test: HY1717

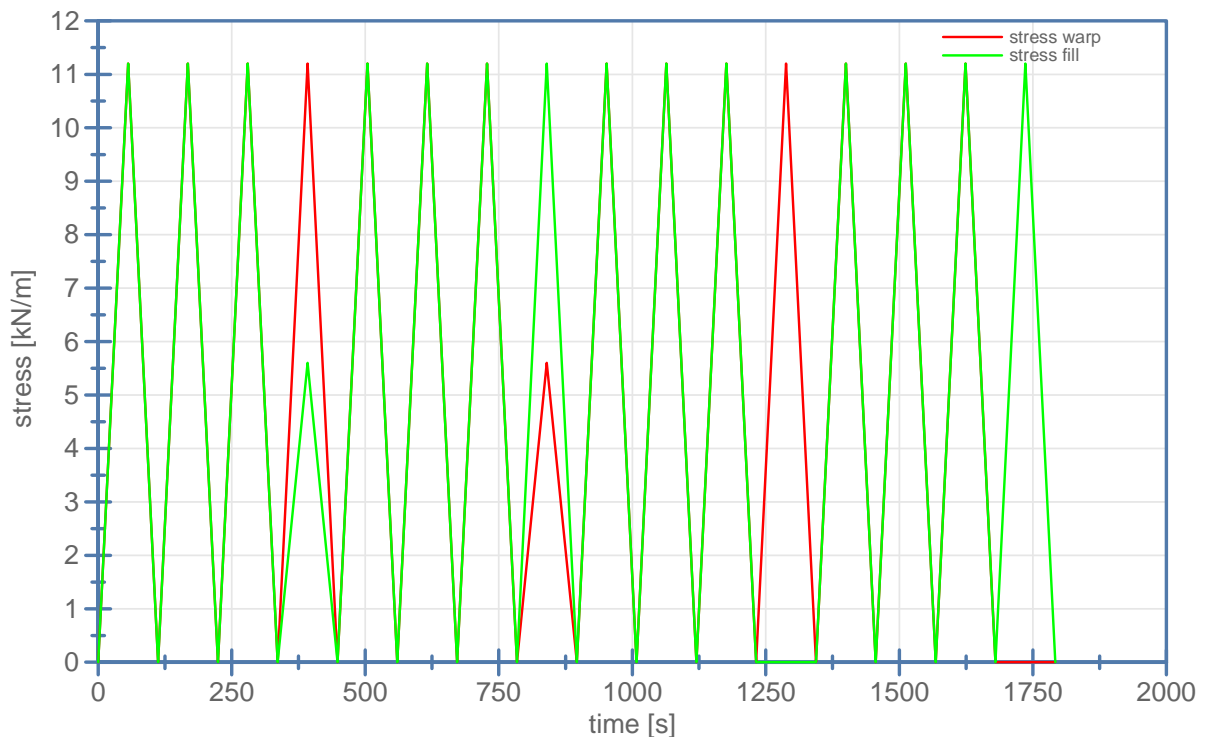
Comments:

Test report on biaxial tensile test

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Load diagram (reference values)



Axis 1: warp direction
 - Minimum: 0.10 kN/m
 - Maximum: 11.20 kN/m

Axis 2: fill direction
 - Minimum: 0.10 kN/m
 - Maximum: 11.20 kN/m

Loading rate: 0,2 (kN/m)/s at the higher gradient

Test temperature: 24.3°C

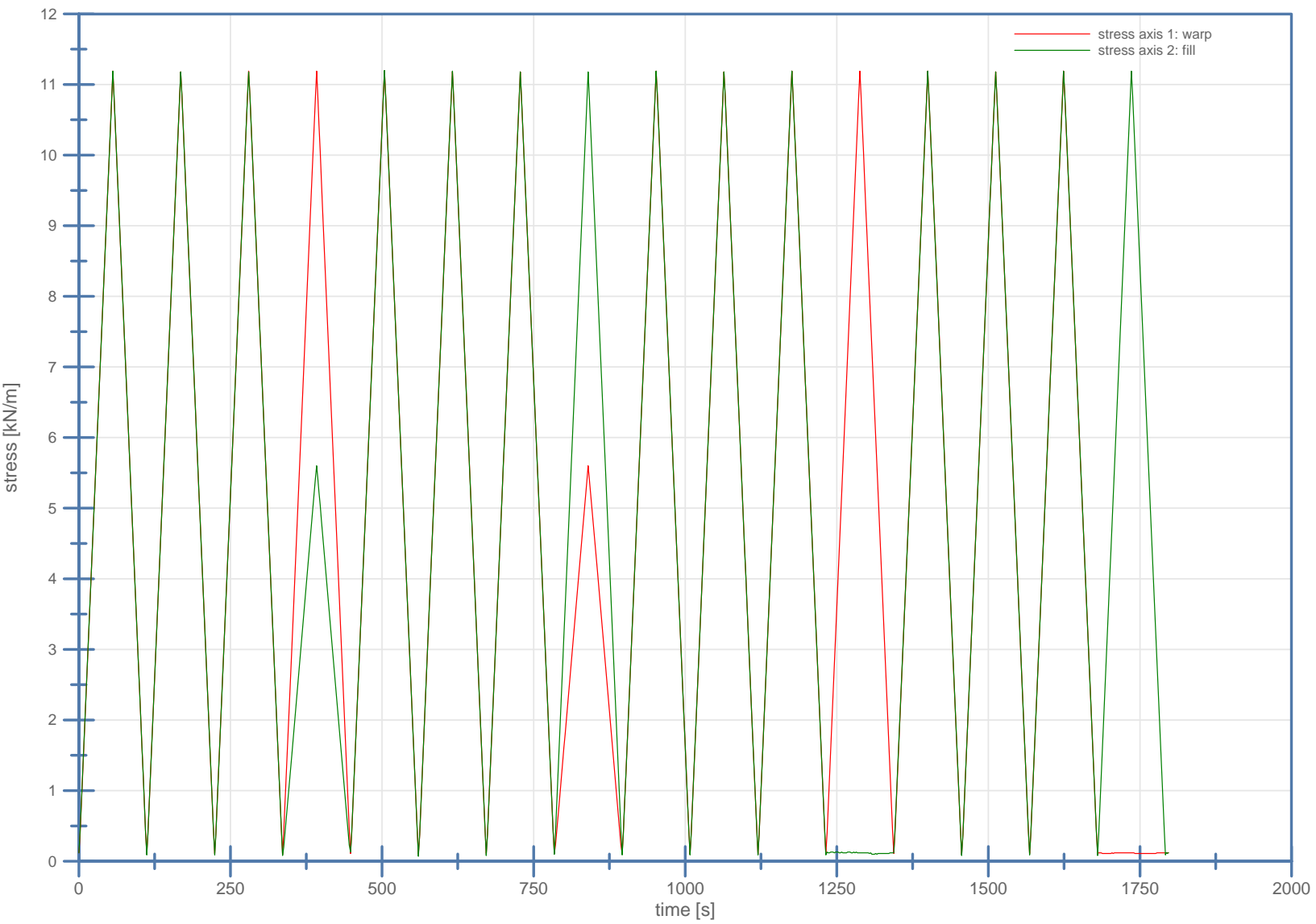
Time interval: 2.0 s

Comments:

Control factor of load

Test: HY17117

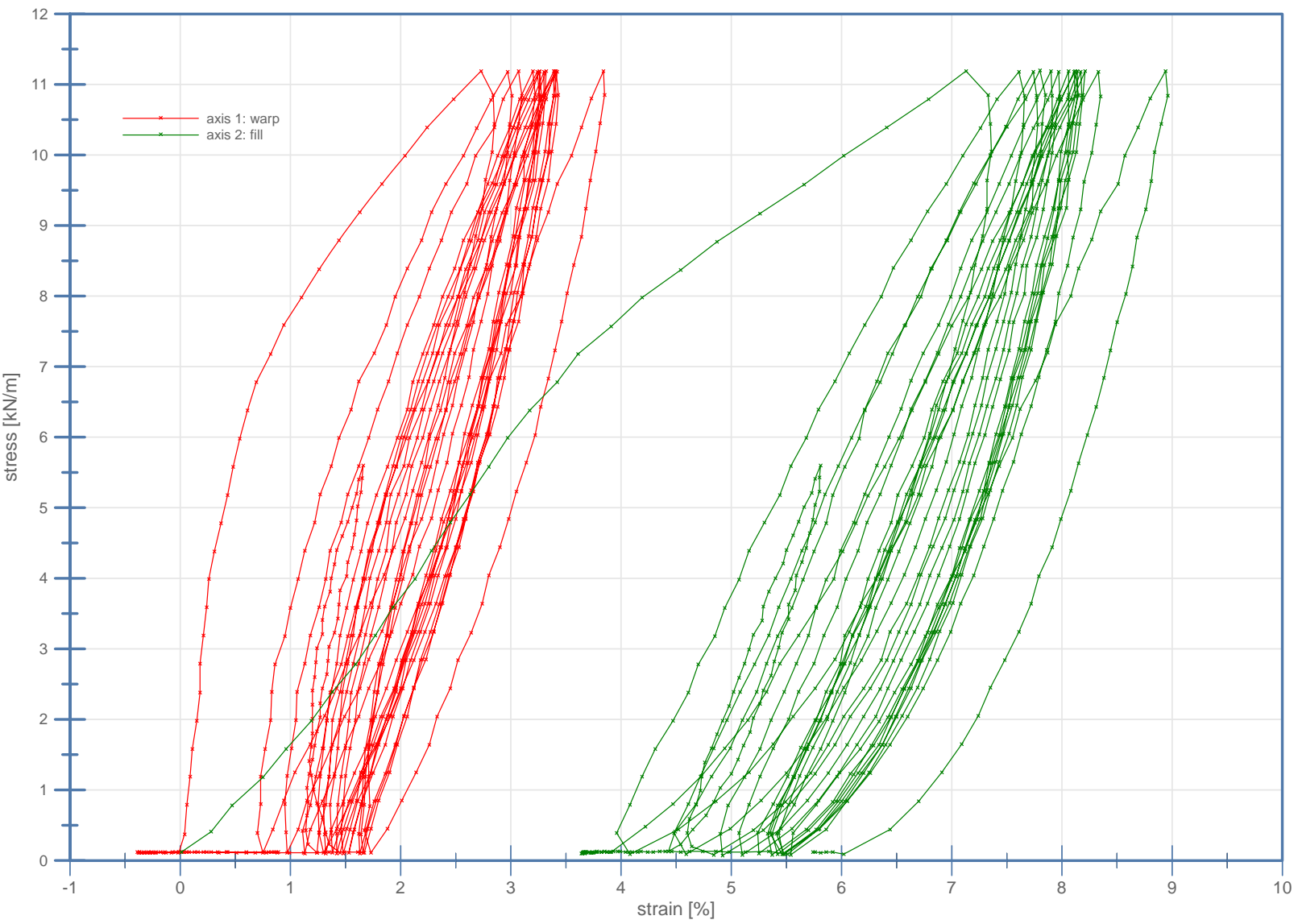
Material: clippeum 650 - H5871-0287, Piece No. 1116732023



Stress-strain diagram to biaxial tensile test

Test: HY1717

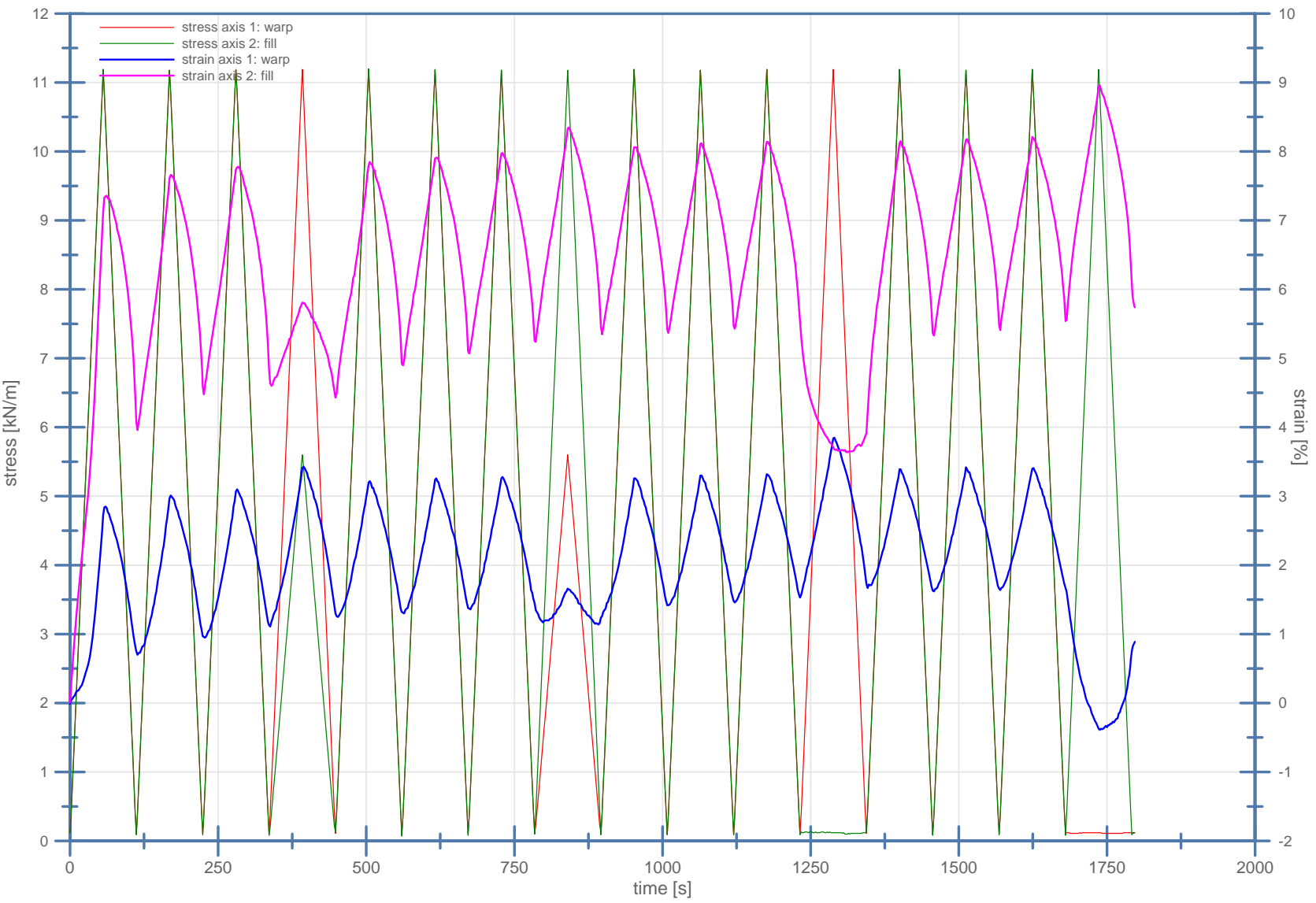
Material: clipeum 650 - H5871-0287, Piece No. 1116732023



Stress-strain-time diagram to biaxial tensile test

Test: HY1717

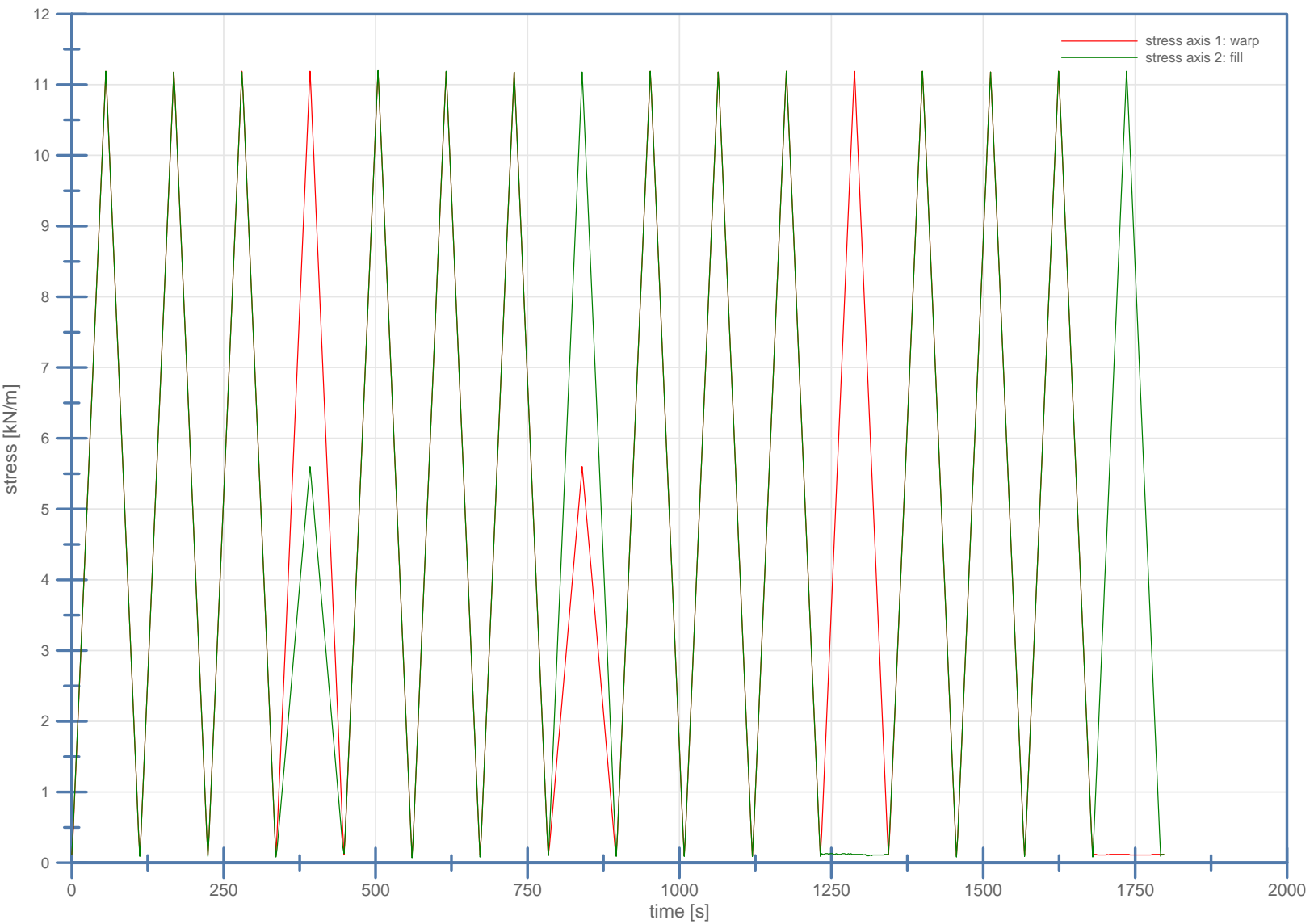
Material: clippeum 650 - H5871-0287, Piece No. 1116732023



Stress-time-diagram to biaxial tensile test

Test: HY1717

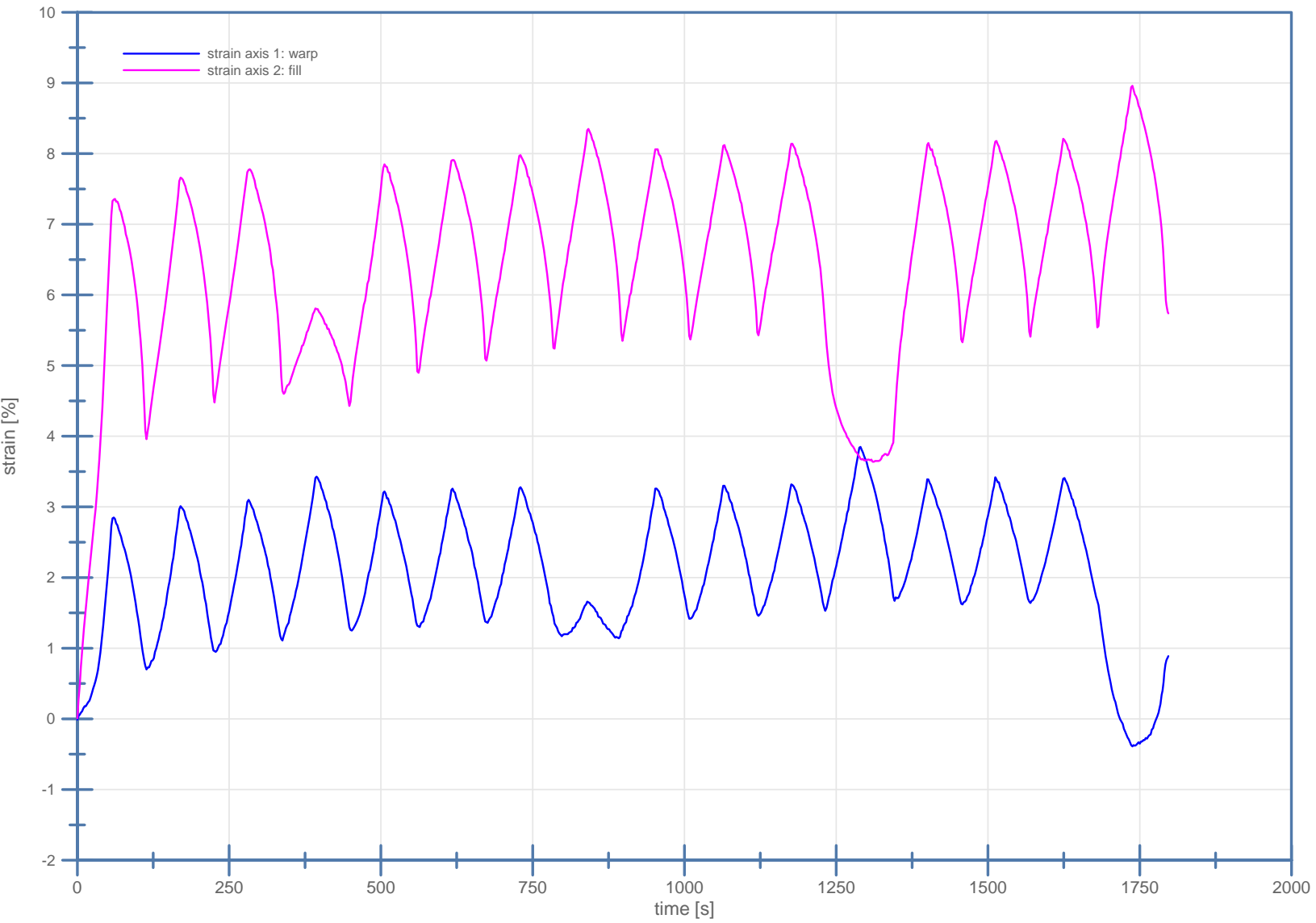
Material: clipeum 650 - H5871-0287, Piece No. 1116732023



Strain-time diagram to biaxial tensile test

Test: HY1717

Material: clipeum 650 - H5871-0287, Piece No. 1116732023



Measured data of biaxial tensile test

Test: HY1717

Material: clipeum 650 - H5871-0287, Piece No. 1116732023

page: 1

time [s]	stress [kN/m] warp	stress [kN/m] fill	strain [%] warp	strain [%] fill
0.0	0.12	0.12	-0.01	0.01
2.0	0.37	0.41	0.04	0.28
4.0	0.79	0.78	0.06	0.47
6.0	1.19	1.18	0.09	0.75
8.0	1.58	1.58	0.11	0.96
10.0	1.98	1.98	0.15	1.19
12.0	2.38	2.39	0.18	1.38
14.0	2.79	2.78	0.18	1.59
16.0	3.19	3.19	0.21	1.77
18.0	3.59	3.59	0.24	1.93
20.0	3.99	3.99	0.26	2.13
22.0	4.38	4.39	0.31	2.28
24.0	4.78	4.79	0.37	2.45
26.0	5.18	5.19	0.43	2.63
28.0	5.58	5.58	0.48	2.80
30.0	5.98	5.99	0.54	2.97
32.0	6.38	6.38	0.61	3.17
34.0	6.78	6.78	0.69	3.42
36.0	7.18	7.18	0.82	3.61
38.0	7.59	7.57	0.94	3.91
40.0	7.98	7.98	1.10	4.19
42.0	8.38	8.37	1.26	4.54
44.0	8.79	8.77	1.44	4.87
46.0	9.19	9.17	1.63	5.26
48.0	9.59	9.58	1.83	5.66
50.0	9.99	9.99	2.04	6.02
52.0	10.39	10.39	2.24	6.41
54.0	10.79	10.79	2.48	6.79
56.0	11.19	11.19	2.73	7.13
58.0	10.85	10.85	2.84	7.33
60.0	10.44	10.44	2.85	7.35
62.0	10.04	10.05	2.83	7.36
64.0	9.65	9.64	2.77	7.32
66.0	9.24	9.24	2.74	7.32
68.0	8.85	8.85	2.68	7.28
70.0	8.45	8.44	2.63	7.21
72.0	8.05	8.05	2.58	7.17
74.0	7.64	7.65	2.51	7.10
76.0	7.24	7.25	2.45	7.03
78.0	6.84	6.85	2.40	6.97
80.0	6.45	6.45	2.34	6.86
82.0	6.04	6.05	2.26	6.80
84.0	5.64	5.65	2.19	6.72
86.0	5.24	5.25	2.11	6.63
88.0	4.85	4.84	2.04	6.54
90.0	4.44	4.45	1.94	6.45
92.0	4.05	4.05	1.85	6.34
94.0	3.65	3.65	1.73	6.18
96.0	3.25	3.24	1.64	6.07
98.0	2.85	2.85	1.52	5.94
100.0	2.44	2.44	1.42	5.76
102.0	2.05	2.04	1.31	5.56
104.0	1.65	1.65	1.18	5.38
106.0	1.25	1.25	1.04	5.16
108.0	0.85	0.84	0.94	4.86
110.0	0.44	0.44	0.84	4.52
112.0	0.11	0.09	0.75	4.08
114.0	0.39	0.39	0.70	3.96
116.0	0.80	0.79	0.73	4.08
118.0	1.19	1.19	0.73	4.19
120.0	1.58	1.58	0.77	4.31
122.0	1.99	1.98	0.82	4.47
124.0	2.39	2.38	0.83	4.61
126.0	2.78	2.78	0.86	4.70
128.0	3.18	3.18	0.95	4.85
130.0	3.58	3.58	1.00	4.94
132.0	3.99	3.98	1.07	5.07
134.0	4.39	4.39	1.13	5.16
136.0	4.79	4.79	1.22	5.30
138.0	5.19	5.18	1.27	5.44

time [s]	stress [kN/m] warp	stress [kN/m] fill	strain [%] warp	strain [%] fill
140.0	5.59	5.59	1.37	5.54
142.0	5.99	5.99	1.44	5.68
144.0	6.39	6.39	1.55	5.79
146.0	6.79	6.79	1.62	5.94
148.0	7.19	7.19	1.76	6.07
150.0	7.59	7.59	1.87	6.21
152.0	7.99	7.99	1.95	6.36
154.0	8.39	8.40	2.06	6.47
156.0	8.79	8.79	2.19	6.63
158.0	9.19	9.20	2.28	6.78
160.0	9.59	9.59	2.41	6.95
162.0	9.99	9.99	2.57	7.10
164.0	10.38	10.38	2.69	7.26
166.0	10.78	10.79	2.82	7.41
168.0	11.18	11.18	2.97	7.61
170.0	10.84	10.84	3.01	7.66
172.0	10.44	10.43	2.99	7.65
174.0	10.03	10.03	2.97	7.63
176.0	9.63	9.63	2.94	7.58
178.0	9.24	9.23	2.87	7.54
180.0	8.84	8.83	2.82	7.47
182.0	8.44	8.43	2.78	7.42
184.0	8.03	8.03	2.70	7.37
186.0	7.63	7.63	2.66	7.31
188.0	7.24	7.24	2.59	7.24
190.0	6.84	6.84	2.52	7.18
192.0	6.45	6.44	2.47	7.09
194.0	6.04	6.04	2.39	7.02
196.0	5.65	5.65	2.33	6.95
198.0	5.24	5.25	2.27	6.86
200.0	4.84	4.84	2.19	6.76
202.0	4.45	4.44	2.08	6.67
204.0	4.05	4.05	2.00	6.57
206.0	3.65	3.65	1.93	6.45
208.0	3.25	3.25	1.83	6.32
210.0	2.85	2.84	1.71	6.18
212.0	2.44	2.45	1.63	6.02
214.0	2.04	2.04	1.49	5.87
216.0	1.64	1.65	1.38	5.70
218.0	1.24	1.24	1.27	5.50
220.0	0.85	0.85	1.15	5.27
222.0	0.44	0.45	1.07	4.99
224.0	0.11	0.09	0.97	4.59
226.0	0.40	0.39	0.96	4.48
228.0	0.80	0.80	0.95	4.61
230.0	1.20	1.19	0.97	4.72
232.0	1.59	1.59	1.01	4.84
234.0	1.99	1.99	1.05	4.96
236.0	2.39	2.39	1.06	5.08
238.0	2.79	2.78	1.13	5.21
240.0	3.19	3.19	1.18	5.34
242.0	3.59	3.59	1.26	5.43
244.0	3.99	3.99	1.32	5.54
246.0	4.39	4.39	1.36	5.64
248.0	4.79	4.79	1.46	5.76
250.0	5.19	5.19	1.52	5.85
252.0	5.59	5.59	1.62	5.97
254.0	5.99	5.99	1.71	6.09
256.0	6.39	6.39	1.79	6.21
258.0	6.79	6.79	1.89	6.32
260.0	7.19	7.19	1.97	6.42
262.0	7.59	7.59	2.06	6.58
264.0	7.99	7.99	2.17	6.69
266.0	8.39	8.39	2.26	6.82
268.0	8.79	8.79	2.37	6.95
270.0	9.19	9.20	2.46	7.07
272.0	9.59	9.60	2.60	7.20
274.0	9.99	10.00	2.68	7.35
276.0	10.39	10.40	2.85	7.49
278.0	10.79	10.79	2.93	7.60

Measured data of biaxial tensile test

Test: HY1717

Material: clipeum 650 - H5871-0287, Piece No. 1116732023

page: 2

time [s]	stress [kN/m] warp	stress [kN/m] fill	strain [%] warp	strain [%] fill
280.0	11.19	11.18	3.07	7.74
282.0	10.84	10.84	3.10	7.77
284.0	10.44	10.43	3.07	7.78
286.0	10.03	10.04	3.03	7.76
288.0	9.64	9.63	2.99	7.72
290.0	9.23	9.23	2.96	7.67
292.0	8.83	8.83	2.89	7.62
294.0	8.43	8.43	2.83	7.52
296.0	8.03	8.03	2.79	7.48
298.0	7.64	7.64	2.73	7.41
300.0	7.24	7.24	2.66	7.33
302.0	6.85	6.84	2.62	7.28
304.0	6.45	6.45	2.55	7.21
306.0	6.05	6.04	2.47	7.15
308.0	5.64	5.65	2.42	7.07
310.0	5.25	5.25	2.34	6.97
312.0	4.85	4.85	2.28	6.88
314.0	4.45	4.45	2.17	6.80
316.0	4.05	4.05	2.11	6.70
318.0	3.64	3.64	2.00	6.59
320.0	3.24	3.24	1.92	6.44
322.0	2.84	2.84	1.83	6.36
324.0	2.44	2.44	1.71	6.20
326.0	2.04	2.04	1.62	6.02
328.0	1.63	1.64	1.50	5.88
330.0	1.23	1.24	1.40	5.72
332.0	0.84	0.83	1.29	5.49
334.0	0.44	0.43	1.18	5.20
336.0	0.10	0.08	1.13	4.84
338.0	0.42	0.20	1.11	4.64
340.0	0.78	0.39	1.18	4.60
342.0	1.19	0.59	1.23	4.62
344.0	1.59	0.79	1.29	4.68
346.0	1.98	0.99	1.33	4.72
348.0	2.38	1.19	1.36	4.73
350.0	2.78	1.39	1.46	4.76
352.0	3.18	1.59	1.52	4.82
354.0	3.58	1.79	1.59	4.87
356.0	3.98	1.98	1.66	4.92
358.0	4.38	2.19	1.72	4.98
360.0	4.78	2.39	1.81	5.02
362.0	5.18	2.59	1.87	5.07
364.0	5.58	2.79	1.96	5.12
366.0	5.98	2.99	2.05	5.16
368.0	6.39	3.20	2.13	5.20
370.0	6.79	3.40	2.25	5.28
372.0	7.19	3.60	2.33	5.29
374.0	7.59	3.81	2.44	5.34
376.0	7.99	4.00	2.52	5.40
378.0	8.39	4.21	2.62	5.47
380.0	8.79	4.40	2.73	5.50
382.0	9.19	4.61	2.82	5.56
384.0	9.59	4.80	2.94	5.61
386.0	9.99	5.01	3.04	5.66
388.0	10.39	5.21	3.16	5.73
390.0	10.79	5.41	3.27	5.76
392.0	11.19	5.60	3.41	5.81
394.0	10.85	5.43	3.43	5.80
396.0	10.44	5.23	3.41	5.80
398.0	10.05	5.04	3.37	5.76
400.0	9.64	4.83	3.34	5.74
402.0	9.24	4.64	3.27	5.71
404.0	8.84	4.43	3.23	5.68
406.0	8.45	4.23	3.17	5.64
408.0	8.04	4.04	3.11	5.59
410.0	7.64	3.83	3.07	5.58
412.0	7.24	3.63	2.98	5.52
414.0	6.84	3.42	2.94	5.52
416.0	6.43	3.23	2.88	5.46
418.0	6.04	3.02	2.81	5.43

time [s]	stress [kN/m] warp	stress [kN/m] fill	strain [%] warp	strain [%] fill
420.0	5.63	2.82	2.71	5.39
422.0	5.23	2.62	2.66	5.36
424.0	4.84	2.41	2.58	5.29
426.0	4.44	2.22	2.50	5.26
428.0	4.03	2.02	2.40	5.20
430.0	3.64	1.82	2.32	5.17
432.0	3.24	1.63	2.22	5.11
434.0	2.84	1.43	2.12	5.06
436.0	2.44	1.23	2.01	5.00
438.0	2.05	1.03	1.91	4.90
440.0	1.65	0.83	1.79	4.84
442.0	1.25	0.64	1.66	4.77
444.0	0.85	0.44	1.55	4.65
446.0	0.45	0.23	1.42	4.54
448.0	0.11	0.13	1.30	4.43
450.0	0.39	0.41	1.26	4.49
452.0	0.79	0.80	1.25	4.68
454.0	1.19	1.19	1.27	4.82
456.0	1.59	1.59	1.30	4.99
458.0	1.99	1.99	1.33	5.10
460.0	2.39	2.39	1.37	5.23
462.0	2.79	2.79	1.42	5.32
464.0	3.19	3.18	1.45	5.42
466.0	3.58	3.58	1.51	5.55
468.0	3.98	3.98	1.57	5.65
470.0	4.38	4.38	1.64	5.75
472.0	4.78	4.78	1.70	5.86
474.0	5.18	5.18	1.78	5.92
476.0	5.58	5.58	1.88	6.03
478.0	5.99	5.98	1.97	6.16
480.0	6.39	6.38	2.06	6.21
482.0	6.78	6.78	2.11	6.35
484.0	7.18	7.18	2.20	6.46
486.0	7.59	7.58	2.30	6.57
488.0	7.99	7.99	2.38	6.72
490.0	8.39	8.39	2.49	6.81
492.0	8.79	8.79	2.57	6.96
494.0	9.19	9.19	2.70	7.08
496.0	9.59	9.59	2.79	7.22
498.0	9.99	9.99	2.88	7.35
500.0	10.39	10.40	2.99	7.50
502.0	10.79	10.79	3.08	7.67
504.0	11.19	11.20	3.20	7.80
506.0	10.85	10.85	3.22	7.85
508.0	10.44	10.44	3.19	7.82
510.0	10.04	10.05	3.12	7.81
512.0	9.65	9.65	3.12	7.74
514.0	9.25	9.25	3.05	7.73
516.0	8.85	8.85	3.02	7.63
518.0	8.45	8.45	2.96	7.58
520.0	8.05	8.05	2.89	7.54
522.0	7.64	7.64	2.84	7.47
524.0	7.25	7.25	2.80	7.40
526.0	6.84	6.84	2.73	7.32
528.0	6.45	6.45	2.65	7.27
530.0	6.05	6.05	2.58	7.19
532.0	5.64	5.64	2.53	7.11
534.0	5.24	5.25	2.45	7.02
536.0	4.84	4.85	2.37	6.94
538.0	4.44	4.45	2.31	6.83
540.0	4.04	4.05	2.23	6.72
542.0	3.64	3.63	2.16	6.63
544.0	3.24	3.24	2.06	6.52
546.0	2.84	2.84	1.96	6.41
548.0	2.44	2.44	1.87	6.26
550.0	2.04	2.04	1.77	6.08
552.0	1.64	1.64	1.70	5.94
554.0	1.24	1.23	1.58	5.76
556.0	0.84	0.83	1.48	5.55
558.0	0.44	0.43	1.37	5.29

Measured data of biaxial tensile test

Test: HY1717

Material: clipeum 650 - H5871-0287, Piece No. 1116732023

page: 3

time [s]	stress [kN/m] warp	stress [kN/m] fill	strain [%] warp	strain [%] fill
560.0	0.10	0.07	1.32	4.92
562.0	0.37	0.38	1.31	4.90
564.0	0.78	0.78	1.30	4.97
566.0	1.19	1.18	1.35	5.12
568.0	1.59	1.58	1.37	5.26
570.0	1.99	1.99	1.38	5.36
572.0	2.39	2.39	1.45	5.48
574.0	2.79	2.79	1.50	5.59
576.0	3.19	3.19	1.55	5.70
578.0	3.59	3.60	1.61	5.77
580.0	4.00	3.99	1.66	5.93
582.0	4.39	4.39	1.71	5.99
584.0	4.79	4.79	1.80	6.11
586.0	5.19	5.19	1.87	6.21
588.0	5.59	5.60	1.96	6.32
590.0	6.00	6.00	2.03	6.43
592.0	6.39	6.40	2.12	6.54
594.0	6.79	6.80	2.20	6.63
596.0	7.19	7.19	2.29	6.74
598.0	7.59	7.59	2.35	6.88
600.0	7.98	7.99	2.47	6.99
602.0	8.38	8.39	2.54	7.08
604.0	8.78	8.79	2.64	7.18
606.0	9.18	9.19	2.72	7.32
608.0	9.58	9.59	2.85	7.43
610.0	9.98	9.99	2.92	7.54
612.0	10.39	10.39	3.02	7.65
614.0	10.79	10.78	3.11	7.77
616.0	11.18	11.19	3.24	7.90
618.0	10.83	10.84	3.26	7.91
620.0	10.44	10.44	3.22	7.91
622.0	10.04	10.04	3.20	7.88
624.0	9.64	9.64	3.13	7.82
626.0	9.23	9.24	3.08	7.77
628.0	8.84	8.84	3.04	7.72
630.0	8.43	8.43	2.98	7.64
632.0	8.04	8.04	2.93	7.59
634.0	7.63	7.63	2.86	7.52
636.0	7.24	7.24	2.82	7.47
638.0	6.84	6.83	2.74	7.40
640.0	6.44	6.44	2.70	7.32
642.0	6.04	6.04	2.62	7.25
644.0	5.64	5.63	2.53	7.16
646.0	5.24	5.23	2.48	7.10
648.0	4.84	4.83	2.43	7.02
650.0	4.44	4.43	2.36	6.91
652.0	4.04	4.04	2.27	6.80
654.0	3.64	3.63	2.16	6.71
656.0	3.24	3.23	2.10	6.59
658.0	2.84	2.83	2.01	6.47
660.0	2.44	2.43	1.94	6.35
662.0	2.04	2.04	1.82	6.20
664.0	1.64	1.64	1.73	6.05
666.0	1.24	1.24	1.64	5.88
668.0	0.84	0.85	1.53	5.69
670.0	0.44	0.45	1.45	5.45
672.0	0.11	0.08	1.38	5.10
674.0	0.39	0.39	1.37	5.07
676.0	0.79	0.79	1.36	5.16
678.0	1.19	1.19	1.40	5.26
680.0	1.59	1.59	1.43	5.38
682.0	1.99	2.00	1.45	5.52
684.0	2.39	2.39	1.51	5.61
686.0	2.79	2.79	1.57	5.75
688.0	3.19	3.19	1.63	5.84
690.0	3.59	3.59	1.68	5.96
692.0	4.00	3.99	1.72	6.04
694.0	4.39	4.39	1.80	6.15
696.0	4.79	4.79	1.87	6.23
698.0	5.19	5.19	1.91	6.35

time [s]	stress [kN/m] warp	stress [kN/m] fill	strain [%] warp	strain [%] fill
700.0	5.59	5.60	2.03	6.45
702.0	5.99	6.00	2.08	6.55
704.0	6.39	6.40	2.19	6.63
706.0	6.79	6.80	2.25	6.76
708.0	7.19	7.20	2.34	6.87
710.0	7.59	7.60	2.41	6.97
712.0	7.99	7.99	2.52	7.08
714.0	8.38	8.39	2.59	7.18
716.0	8.79	8.78	2.70	7.28
718.0	9.19	9.19	2.76	7.40
720.0	9.58	9.59	2.87	7.52
722.0	9.98	9.98	2.95	7.62
724.0	10.38	10.38	3.05	7.74
726.0	10.78	10.78	3.16	7.87
728.0	11.18	11.18	3.26	7.97
730.0	10.83	10.83	3.28	7.98
732.0	10.44	10.43	3.25	7.94
734.0	10.03	10.03	3.21	7.91
736.0	9.63	9.63	3.17	7.87
738.0	9.24	9.23	3.13	7.83
740.0	8.84	8.83	3.04	7.77
742.0	8.43	8.43	2.99	7.68
744.0	8.04	8.03	2.94	7.66
746.0	7.63	7.63	2.90	7.56
748.0	7.24	7.23	2.83	7.52
750.0	6.84	6.82	2.78	7.44
752.0	6.44	6.43	2.71	7.37
754.0	6.04	6.03	2.64	7.30
756.0	5.64	5.63	2.60	7.21
758.0	5.24	5.24	2.51	7.14
760.0	4.84	4.84	2.46	7.07
762.0	4.44	4.45	2.36	6.98
764.0	4.04	4.04	2.29	6.88
766.0	3.64	3.64	2.22	6.78
768.0	3.24	3.24	2.13	6.66
770.0	2.84	2.84	2.04	6.54
772.0	2.45	2.44	1.96	6.42
774.0	2.05	2.04	1.88	6.31
776.0	1.65	1.64	1.78	6.14
778.0	1.25	1.25	1.64	5.98
780.0	0.85	0.85	1.60	5.79
782.0	0.45	0.45	1.51	5.55
784.0	0.11	0.10	1.45	5.25
786.0	0.23	0.40	1.35	5.24
788.0	0.40	0.80	1.32	5.38
790.0	0.61	1.19	1.29	5.51
792.0	0.81	1.60	1.24	5.63
794.0	1.01	1.99	1.21	5.76
796.0	1.21	2.40	1.19	5.91
798.0	1.41	2.79	1.17	6.03
800.0	1.61	3.19	1.19	6.16
802.0	1.80	3.60	1.20	6.25
804.0	2.01	3.99	1.20	6.37
806.0	2.21	4.39	1.20	6.45
808.0	2.41	4.79	1.20	6.59
810.0	2.60	5.19	1.22	6.70
812.0	2.81	5.60	1.23	6.77
814.0	3.01	6.00	1.24	6.90
816.0	3.21	6.39	1.29	7.01
818.0	3.41	6.80	1.29	7.10
820.0	3.60	7.20	1.31	7.21
822.0	3.81	7.60	1.36	7.30
824.0	4.00	7.99	1.37	7.44
826.0	4.20	8.39	1.40	7.53
828.0	4.40	8.79	1.42	7.65
830.0	4.60	9.18	1.47	7.73
832.0	4.80	9.58	1.52	7.85
834.0	5.00	9.99	1.56	7.95
836.0	5.20	10.39	1.60	8.07
838.0	5.40	10.78	1.62	8.19

Measured data of biaxial tensile test

Test: HY1717

Material: clipeum 650 - H5871-0287, Piece No. 1116732023

page: 4

time [s]	stress [kN/m] warp	stress [kN/m] fill	strain [%] warp	strain [%] fill	time [s]	stress [kN/m] warp	stress [kN/m] fill	strain [%] warp	strain [%] fill
840.0	5.60	11.18	1.66	8.33	980.0	5.64	5.64	2.57	7.34
842.0	5.42	10.83	1.65	8.35	982.0	5.24	5.24	2.51	7.25
844.0	5.22	10.43	1.64	8.31	984.0	4.84	4.83	2.43	7.16
846.0	5.02	10.03	1.61	8.27	986.0	4.44	4.43	2.37	7.07
848.0	4.82	9.62	1.60	8.20	988.0	4.03	4.03	2.28	7.00
850.0	4.62	9.23	1.58	8.17	990.0	3.63	3.63	2.19	6.87
852.0	4.43	8.83	1.56	8.10	992.0	3.24	3.23	2.12	6.78
854.0	4.23	8.43	1.52	8.05	994.0	2.84	2.83	2.03	6.69
856.0	4.03	8.04	1.51	7.97	996.0	2.44	2.43	1.95	6.55
858.0	3.83	7.64	1.45	7.94	998.0	2.04	2.03	1.84	6.42
860.0	3.63	7.24	1.44	7.86	1000.0	1.63	1.63	1.75	6.27
862.0	3.43	6.85	1.43	7.79	1002.0	1.24	1.22	1.67	6.11
864.0	3.23	6.44	1.40	7.72	1004.0	0.83	0.84	1.56	5.95
866.0	3.03	6.04	1.35	7.63	1006.0	0.44	0.43	1.48	5.70
868.0	2.83	5.65	1.34	7.56	1008.0	0.10	0.09	1.42	5.42
870.0	2.64	5.24	1.33	7.46	1010.0	0.38	0.38	1.42	5.37
872.0	2.44	4.84	1.29	7.38	1012.0	0.79	0.78	1.43	5.46
874.0	2.23	4.45	1.27	7.29	1014.0	1.19	1.18	1.46	5.57
876.0	2.03	4.04	1.27	7.20	1016.0	1.59	1.58	1.50	5.69
878.0	1.83	3.64	1.24	7.08	1018.0	1.98	1.99	1.53	5.81
880.0	1.63	3.24	1.22	6.99	1020.0	2.38	2.38	1.55	5.90
882.0	1.43	2.84	1.20	6.87	1022.0	2.79	2.79	1.62	6.02
884.0	1.23	2.44	1.17	6.74	1024.0	3.20	3.20	1.68	6.10
886.0	1.03	2.04	1.15	6.60	1026.0	3.59	3.60	1.74	6.22
888.0	0.83	1.64	1.16	6.44	1028.0	3.99	4.00	1.79	6.31
890.0	0.64	1.24	1.15	6.26	1030.0	4.39	4.40	1.87	6.39
892.0	0.43	0.84	1.14	6.05	1032.0	4.79	4.80	1.90	6.51
894.0	0.23	0.45	1.16	5.80	1034.0	5.19	5.19	1.98	6.59
896.0	0.11	0.09	1.24	5.46	1036.0	5.60	5.59	2.07	6.71
898.0	0.40	0.39	1.26	5.35	1038.0	5.99	5.99	2.15	6.80
900.0	0.79	0.79	1.32	5.44	1040.0	6.39	6.39	2.21	6.88
902.0	1.19	1.19	1.35	5.56	1042.0	6.79	6.79	2.30	6.95
904.0	1.59	1.59	1.37	5.66	1044.0	7.19	7.19	2.38	7.09
906.0	1.99	1.99	1.45	5.77	1046.0	7.59	7.60	2.48	7.18
908.0	2.39	2.39	1.47	5.86	1048.0	7.99	7.99	2.54	7.30
910.0	2.79	2.79	1.52	5.99	1050.0	8.39	8.39	2.66	7.38
912.0	3.19	3.19	1.57	6.03	1052.0	8.79	8.79	2.73	7.48
914.0	3.59	3.59	1.60	6.17	1054.0	9.19	9.19	2.80	7.59
916.0	3.99	3.99	1.68	6.24	1056.0	9.59	9.59	2.91	7.68
918.0	4.39	4.39	1.74	6.34	1058.0	9.98	9.99	2.99	7.78
920.0	4.79	4.79	1.79	6.45	1060.0	10.38	10.39	3.08	7.89
922.0	5.19	5.18	1.86	6.51	1062.0	10.78	10.78	3.20	7.99
924.0	5.59	5.59	1.93	6.64	1064.0	11.18	11.18	3.30	8.11
926.0	5.99	5.99	2.00	6.75	1066.0	10.84	10.83	3.30	8.12
928.0	6.39	6.39	2.09	6.82	1068.0	10.43	10.43	3.26	8.06
930.0	6.79	6.79	2.16	6.92	1070.0	10.03	10.03	3.22	8.03
932.0	7.19	7.19	2.24	7.05	1072.0	9.64	9.63	3.20	7.97
934.0	7.59	7.60	2.33	7.13	1074.0	9.23	9.23	3.12	7.93
936.0	7.99	7.99	2.43	7.24	1076.0	8.83	8.82	3.08	7.87
938.0	8.39	8.39	2.54	7.33	1078.0	8.43	8.43	3.05	7.81
940.0	8.79	8.79	2.62	7.44	1080.0	8.04	8.03	2.96	7.75
942.0	9.19	9.19	2.70	7.53	1082.0	7.64	7.63	2.91	7.69
944.0	9.60	9.59	2.83	7.64	1084.0	7.23	7.23	2.84	7.63
946.0	9.99	9.99	2.94	7.73	1086.0	6.84	6.83	2.80	7.55
948.0	10.39	10.39	3.02	7.86	1088.0	6.44	6.43	2.74	7.49
950.0	10.79	10.79	3.13	7.96	1090.0	6.03	6.03	2.68	7.43
952.0	11.19	11.19	3.26	8.06	1092.0	5.63	5.63	2.61	7.34
954.0	10.85	10.85	3.26	8.06	1094.0	5.23	5.24	2.55	7.29
956.0	10.44	10.44	3.24	8.06	1096.0	4.84	4.84	2.46	7.17
958.0	10.05	10.05	3.22	7.99	1098.0	4.43	4.43	2.41	7.09
960.0	9.65	9.65	3.16	7.97	1100.0	4.04	4.04	2.31	7.01
962.0	9.24	9.25	3.13	7.92	1102.0	3.64	3.63	2.25	6.91
964.0	8.84	8.84	3.07	7.84	1104.0	3.24	3.23	2.16	6.81
966.0	8.44	8.44	2.98	7.77	1106.0	2.84	2.83	2.05	6.70
968.0	8.04	8.04	2.94	7.73	1108.0	2.44	2.44	2.00	6.57
970.0	7.65	7.64	2.88	7.66	1110.0	2.04	2.03	1.90	6.45
972.0	7.25	7.25	2.83	7.61	1112.0	1.64	1.64	1.80	6.34
974.0	6.84	6.84	2.75	7.54	1114.0	1.24	1.24	1.73	6.15
976.0	6.44	6.44	2.70	7.48	1116.0	0.84	0.84	1.61	5.97
978.0	6.04	6.04	2.63	7.40	1118.0	0.44	0.44	1.54	5.77

Measured data of biaxial tensile test

Test: HY1717

Material: clipeum 650 - H5871-0287, Piece No. 1116732023

page: 5

time [s]	stress [kN/m] warp	stress [kN/m] fill	strain [%] warp	strain [%] fill
1120.0	0.10	0.09	1.48	5.47
1122.0	0.39	0.39	1.46	5.43
1124.0	0.79	0.79	1.48	5.52
1126.0	1.20	1.20	1.50	5.62
1128.0	1.59	1.60	1.54	5.74
1130.0	1.99	2.00	1.59	5.87
1132.0	2.39	2.39	1.61	5.96
1134.0	2.79	2.80	1.67	6.08
1136.0	3.19	3.20	1.73	6.16
1138.0	3.59	3.59	1.80	6.26
1140.0	3.99	3.99	1.86	6.35
1142.0	4.39	4.40	1.92	6.45
1144.0	4.79	4.80	1.96	6.58
1146.0	5.19	5.20	2.05	6.65
1148.0	5.59	5.59	2.10	6.74
1150.0	5.99	6.00	2.20	6.85
1152.0	6.39	6.39	2.27	6.94
1154.0	6.79	6.79	2.35	7.01
1156.0	7.19	7.19	2.44	7.13
1158.0	7.59	7.59	2.52	7.23
1160.0	7.99	7.99	2.59	7.34
1162.0	8.39	8.39	2.68	7.42
1164.0	8.79	8.79	2.76	7.52
1166.0	9.19	9.19	2.86	7.61
1168.0	9.59	9.60	2.94	7.73
1170.0	9.99	9.99	3.03	7.81
1172.0	10.39	10.39	3.13	7.91
1174.0	10.79	10.79	3.23	8.05
1176.0	11.19	11.19	3.32	8.14
1178.0	10.84	10.84	3.31	8.14
1180.0	10.45	10.45	3.29	8.10
1182.0	10.04	10.03	3.25	8.07
1184.0	9.64	9.64	3.22	7.99
1186.0	9.24	9.24	3.15	7.97
1188.0	8.84	8.84	3.07	7.91
1190.0	8.44	8.44	3.04	7.82
1192.0	8.04	8.04	3.00	7.78
1194.0	7.64	7.64	2.91	7.71
1196.0	7.24	7.24	2.87	7.66
1198.0	6.83	6.83	2.81	7.56
1200.0	6.43	6.42	2.76	7.52
1202.0	6.03	6.03	2.70	7.44
1204.0	5.64	5.63	2.64	7.36
1206.0	5.24	5.23	2.55	7.31
1208.0	4.84	4.83	2.50	7.21
1210.0	4.44	4.43	2.42	7.12
1212.0	4.04	4.03	2.34	7.04
1214.0	3.64	3.64	2.27	6.94
1216.0	3.24	3.24	2.18	6.84
1218.0	2.84	2.83	2.09	6.72
1220.0	2.44	2.44	2.02	6.61
1222.0	2.04	2.04	1.93	6.49
1224.0	1.64	1.64	1.86	6.37
1226.0	1.24	1.24	1.75	6.18
1228.0	0.84	0.84	1.65	6.00
1230.0	0.44	0.44	1.58	5.79
1232.0	0.11	0.09	1.53	5.51
1234.0	0.40	0.13	1.57	5.34
1236.0	0.80	0.12	1.64	5.13
1238.0	1.20	0.12	1.72	4.98
1240.0	1.60	0.13	1.78	4.86
1242.0	2.00	0.13	1.87	4.74
1244.0	2.39	0.13	1.96	4.62
1246.0	2.80	0.12	2.01	4.54
1248.0	3.20	0.13	2.10	4.46
1250.0	3.59	0.13	2.16	4.40
1252.0	3.99	0.13	2.25	4.35
1254.0	4.39	0.12	2.32	4.29
1256.0	4.80	0.12	2.39	4.24
1258.0	5.19	0.13	2.49	4.18

time [s]	stress [kN/m] warp	stress [kN/m] fill	strain [%] warp	strain [%] fill
1260.0	5.59	0.12	2.56	4.15
1262.0	5.99	0.12	2.65	4.10
1264.0	6.39	0.12	2.74	4.07
1266.0	6.79	0.12	2.80	4.04
1268.0	7.19	0.13	2.91	3.99
1270.0	7.60	0.13	2.96	3.97
1272.0	7.99	0.13	3.09	3.93
1274.0	8.39	0.12	3.16	3.90
1276.0	8.79	0.12	3.24	3.87
1278.0	9.19	0.13	3.34	3.85
1280.0	9.59	0.12	3.42	3.82
1282.0	9.99	0.13	3.55	3.78
1284.0	10.39	0.12	3.64	3.77
1286.0	10.80	0.12	3.73	3.74
1288.0	11.19	0.12	3.84	3.71
1290.0	10.85	0.12	3.85	3.68
1292.0	10.45	0.12	3.81	3.67
1294.0	10.05	0.12	3.77	3.68
1296.0	9.64	0.12	3.72	3.66
1298.0	9.24	0.12	3.68	3.66
1300.0	8.84	0.12	3.64	3.66
1302.0	8.44	0.12	3.57	3.67
1304.0	8.04	0.11	3.51	3.67
1306.0	7.64	0.12	3.46	3.66
1308.0	7.23	0.10	3.40	3.67
1310.0	6.83	0.10	3.34	3.64
1312.0	6.43	0.10	3.27	3.64
1314.0	6.03	0.11	3.22	3.65
1316.0	5.64	0.10	3.14	3.65
1318.0	5.23	0.11	3.05	3.65
1320.0	4.84	0.11	2.98	3.65
1322.0	4.44	0.11	2.90	3.66
1324.0	4.04	0.11	2.80	3.68
1326.0	3.64	0.11	2.74	3.72
1328.0	3.23	0.11	2.64	3.73
1330.0	2.84	0.11	2.52	3.75
1332.0	2.44	0.11	2.45	3.75
1334.0	2.04	0.11	2.33	3.73
1336.0	1.64	0.11	2.26	3.74
1338.0	1.25	0.12	2.14	3.78
1340.0	0.85	0.12	2.01	3.82
1342.0	0.45	0.12	1.88	3.87
1344.0	0.11	0.12	1.73	3.91
1346.0	0.43	0.48	1.67	4.22
1348.0	0.77	0.80	1.72	4.47
1350.0	1.19	1.20	1.71	4.73
1352.0	1.60	1.59	1.71	4.94
1354.0	1.99	1.99	1.74	5.15
1356.0	2.39	2.39	1.79	5.32
1358.0	2.79	2.79	1.82	5.44
1360.0	3.19	3.19	1.87	5.61
1362.0	3.59	3.58	1.91	5.77
1364.0	3.98	3.98	1.96	5.86
1366.0	4.38	4.38	2.02	6.01
1368.0	4.78	4.78	2.09	6.13
1370.0	5.18	5.17	2.15	6.24
1372.0	5.58	5.58	2.22	6.39
1374.0	5.98	5.98	2.26	6.52
1376.0	6.38	6.38	2.36	6.64
1378.0	6.78	6.78	2.43	6.76
1380.0	7.19	7.18	2.49	6.88
1382.0	7.58	7.58	2.60	7.00
1384.0	7.98	7.98	2.66	7.15
1386.0	8.38	8.38	2.77	7.27
1388.0	8.78	8.78	2.83	7.37
1390.0	9.18	9.18	2.92	7.52
1392.0	9.58	9.59	3.04	7.64
1394.0	9.98	9.98	3.10	7.74
1396.0	10.39	10.39	3.19	7.87
1398.0	10.79	10.79	3.27	7.99

Measured data of biaxial tensile test

Test: HY1717

Material: clipeum 650 - H5871-0287, Piece No. 1116732023

page: 6

time [s]	stress [kN/m] warp	stress [kN/m] fill	strain [%] warp	strain [%] fill	time [s]	stress [kN/m] warp	stress [kN/m] fill	strain [%] warp	strain [%] fill
1400.0	11.19	11.19	3.39	8.12	1540.0	5.64	5.65	2.70	7.40
1402.0	10.84	10.85	3.39	8.15	1542.0	5.25	5.25	2.64	7.32
1404.0	10.44	10.45	3.34	8.09	1544.0	4.84	4.84	2.59	7.26
1406.0	10.05	10.05	3.31	8.05	1546.0	4.44	4.45	2.53	7.16
1408.0	9.65	9.65	3.26	8.06	1548.0	4.04	4.05	2.44	7.07
1410.0	9.25	9.25	3.20	7.97	1550.0	3.64	3.65	2.37	6.98
1412.0	8.85	8.85	3.16	7.94	1552.0	3.24	3.24	2.30	6.86
1414.0	8.45	8.44	3.11	7.84	1554.0	2.85	2.84	2.20	6.73
1416.0	8.05	8.04	3.03	7.81	1556.0	2.45	2.44	2.12	6.63
1418.0	7.65	7.64	2.99	7.72	1558.0	2.05	2.04	2.03	6.50
1420.0	7.25	7.24	2.96	7.67	1560.0	1.65	1.64	1.96	6.37
1422.0	6.84	6.84	2.90	7.60	1562.0	1.25	1.24	1.88	6.20
1424.0	6.44	6.45	2.84	7.52	1564.0	0.85	0.84	1.78	6.03
1426.0	6.04	6.04	2.78	7.46	1566.0	0.45	0.44	1.70	5.79
1428.0	5.64	5.64	2.70	7.38	1568.0	0.11	0.09	1.66	5.48
1430.0	5.24	5.24	2.65	7.29	1570.0	0.37	0.38	1.64	5.41
1432.0	4.84	4.83	2.57	7.23	1572.0	0.79	0.79	1.67	5.57
1434.0	4.43	4.42	2.50	7.12	1574.0	1.19	1.19	1.68	5.68
1436.0	4.04	4.03	2.42	7.04	1576.0	1.58	1.58	1.71	5.81
1438.0	3.63	3.63	2.35	6.94	1578.0	1.99	1.98	1.75	5.92
1440.0	3.24	3.23	2.27	6.83	1580.0	2.38	2.38	1.79	6.03
1442.0	2.84	2.83	2.18	6.70	1582.0	2.78	2.78	1.84	6.12
1444.0	2.44	2.43	2.12	6.57	1584.0	3.18	3.18	1.90	6.24
1446.0	2.04	2.04	2.03	6.45	1586.0	3.58	3.58	1.95	6.31
1448.0	1.64	1.63	1.95	6.29	1588.0	3.99	3.98	2.02	6.42
1450.0	1.23	1.23	1.86	6.08	1590.0	4.38	4.38	2.08	6.52
1452.0	0.84	0.83	1.76	5.92	1592.0	4.78	4.78	2.14	6.62
1454.0	0.44	0.44	1.69	5.68	1594.0	5.18	5.18	2.19	6.72
1456.0	0.10	0.08	1.63	5.37	1596.0	5.58	5.58	2.27	6.82
1458.0	0.38	0.38	1.62	5.33	1598.0	5.98	5.99	2.34	6.88
1460.0	0.78	0.78	1.65	5.42	1600.0	6.39	6.38	2.41	7.01
1462.0	1.18	1.18	1.66	5.57	1602.0	6.79	6.78	2.49	7.10
1464.0	1.58	1.58	1.68	5.68	1604.0	7.18	7.19	2.56	7.20
1466.0	1.99	1.98	1.73	5.80	1606.0	7.59	7.58	2.63	7.29
1468.0	2.39	2.38	1.76	5.91	1608.0	7.98	7.99	2.71	7.38
1470.0	2.79	2.78	1.80	6.00	1610.0	8.38	8.38	2.79	7.49
1472.0	3.19	3.18	1.88	6.10	1612.0	8.78	8.79	2.90	7.58
1474.0	3.58	3.58	1.92	6.24	1614.0	9.18	9.19	2.96	7.70
1476.0	3.98	3.98	1.99	6.31	1616.0	9.58	9.58	3.05	7.79
1478.0	4.38	4.38	2.03	6.42	1618.0	9.99	9.99	3.15	7.87
1480.0	4.78	4.78	2.10	6.51	1620.0	10.39	10.39	3.23	7.98
1482.0	5.18	5.18	2.17	6.63	1622.0	10.79	10.79	3.32	8.10
1484.0	5.58	5.58	2.24	6.71	1624.0	11.19	11.19	3.40	8.21
1486.0	5.98	5.98	2.32	6.83	1626.0	10.84	10.85	3.41	8.19
1488.0	6.38	6.38	2.41	6.92	1628.0	10.44	10.44	3.37	8.16
1490.0	6.78	6.78	2.45	7.02	1630.0	10.04	10.04	3.34	8.13
1492.0	7.18	7.18	2.54	7.13	1632.0	9.64	9.65	3.29	8.06
1494.0	7.58	7.58	2.61	7.22	1634.0	9.25	9.25	3.23	8.04
1496.0	7.98	7.98	2.71	7.34	1636.0	8.84	8.85	3.19	7.95
1498.0	8.38	8.39	2.81	7.42	1638.0	8.44	8.45	3.12	7.91
1500.0	8.78	8.78	2.87	7.52	1640.0	8.04	8.05	3.10	7.83
1502.0	9.19	9.19	2.95	7.62	1642.0	7.65	7.65	3.02	7.77
1504.0	9.58	9.58	3.03	7.73	1644.0	7.24	7.24	2.99	7.72
1506.0	9.98	9.98	3.12	7.82	1646.0	6.84	6.85	2.90	7.64
1508.0	10.38	10.38	3.22	7.94	1648.0	6.44	6.45	2.84	7.59
1510.0	10.78	10.79	3.29	8.08	1650.0	6.04	6.05	2.80	7.52
1512.0	11.18	11.18	3.42	8.17	1652.0	5.65	5.65	2.72	7.43
1514.0	10.84	10.84	3.39	8.18	1654.0	5.24	5.25	2.65	7.35
1516.0	10.44	10.44	3.35	8.13	1656.0	4.85	4.85	2.59	7.28
1518.0	10.03	10.04	3.35	8.10	1658.0	4.45	4.45	2.51	7.17
1520.0	9.64	9.64	3.28	8.03	1660.0	4.05	4.05	2.45	7.09
1522.0	9.24	9.25	3.23	7.99	1662.0	3.65	3.65	2.38	7.01
1524.0	8.84	8.84	3.19	7.92	1664.0	3.25	3.25	2.30	6.89
1526.0	8.45	8.45	3.12	7.89	1666.0	2.85	2.85	2.23	6.80
1528.0	8.05	8.05	3.06	7.82	1668.0	2.45	2.45	2.12	6.69
1530.0	7.64	7.65	3.03	7.76	1670.0	2.04	2.05	2.06	6.55
1532.0	7.25	7.26	2.95	7.70	1672.0	1.64	1.64	1.97	6.40
1534.0	6.84	6.85	2.88	7.62	1674.0	1.25	1.25	1.90	6.25
1536.0	6.44	6.45	2.85	7.55	1676.0	0.85	0.85	1.80	6.05
1538.0	6.05	6.05	2.79	7.47	1678.0	0.45	0.44	1.73	5.86

