

Test Report No. 7191299197-MEC23/01-AY
dated 01 FEB 2023



PSB Singapore

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SUBJECT:

Testing of High-Pressure Laminates

TESTED FOR:

Virgo Laminates Limited
Plot No. 828, Industrial Area, Phase-II,
Chandigarh 160002
India

Attn: Ms Sharon Tan

SAMPLES DESCRIPTION:

The following high-pressure laminates test specimens, typical as shown in Figure 1 were submitted by Virgo Laminates Limited for testing.

Brand Name : Virgo

Model Number : DM 1209 S

Approximate Dimensions	Quantity	Date Received
2440 mm x 1220 mm x 0.8 mm (full size panel)	1 piece	03 January 2023
230 mm x 230 mm x 20 mm (Bonded on Wood Particleboard)	20 pieces	03 January 2023
200 mm x 50 mm x 0.8 mm (Cross Fibre)	8 pieces	03 January 2023
200 mm x 50 mm x 0.8 mm (Fibre Cross)	8 pieces	03 January 2023
150 mm x 50 mm x 0.8 mm	8 pieces	12 January 2023
120 mm x 40 mm x 0.8 mm	4 pieces	03 January 2023
100 mm x 100 mm x 0.8 mm	20 pieces	03 January 2023
70 mm x 70 mm x 0.8 mm	10 pieces	03 January 2023
50 mm x 50 mm x 0.8 mm	6 pieces	03 January 2023
50 mm x 25 mm x 0.8 mm	3 pieces	03 January 2023



Laboratory:
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Singapore 609937
TUV®

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TEST METHODS:

BS EN 438-2 : 2016

High-pressure decorative laminates (HPL) - Sheets based on thermosetting resins (usually called laminates)

Part 2: Determination of properties

1. Assessment of appearance, Clause 4

Nominal specimen dimensions : 2440 mm x 1220 mm x 0.8 mm
No. of determination : 1

2. Determination of thickness, Clause 5

Nominal specimen dimensions : 2440 mm x 1220 mm x 0.8 mm
No. of determinations : 4

3. Determination of length and width, Clause 6

Nominal specimen dimensions : 2440 mm x 1220 mm x 0.8 mm
No. of determinations : 4

4. Determination of edge straightness, Clause 7

Nominal specimen dimensions : 2440 mm x 1220 mm x 0.8 mm
No. of determinations : 6

5. Determination of edge squareness, Clause 8

Nominal specimen dimensions : 2440 mm x 1220 mm x 0.8 mm
No. of determinations : 4

6. Determination of flatness, Clause 9

Nominal specimen dimensions : 2440 mm x 1220 mm x 0.8 mm
No. of determinations : 5

7. Resistance to surface wear, Clause 10

Nominal specimen dimensions : 100 mm x 100 mm x 0.8 mm
(a 6.7 mm hole at centre)
No. of determinations : 3

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TEST METHODS (CONT'D):

8. Resistance to immersion in boiling water, Clause 12

Nominal specimen dimensions : 50 mm x 50 mm x 0.8 mm
No. of determinations : 3

9. Resistance to water vapour, Clause 14

Nominal specimen dimensions : 100 mm x 100 mm x 0.8 mm
No. of determination : 1

10. Resistance to dry heat, Clause 16

Nominal specimen dimensions : 230 mm x 230 mm x 20 mm
No. of determination : 1

11. Dimensional stability at elevated temperature, Clause 17

Nominal specimen dimensions : 200 mm x 50 mm x 0.8 mm
No. of determinations : 4 per direction

12. Resistance to wet heat, Clause 18

Nominal specimen dimensions : 230 mm x 230 mm x 20 mm
No. of determination : 1

13. Resistance to impact by small-diameter ball, Clause 20

Nominal specimen dimensions : 230 mm x 230 mm x 20 mm
No. of determinations : 5

14. Resistance to impact by large-diameter ball, Clause 21

Nominal specimen dimensions : 230 mm x 230 mm x 20 mm
No. of determinations : 5

15. Resistance to cracking under stress (laminates ≤ 2 mm thick, Clause 23)

Nominal specimen dimensions : 150 mm x 50 mm x 0.8 mm
No. of determinations : 3

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TEST METHODS (CONT'D):

16. Resistance to scratching, Clause 25

Nominal specimen dimensions : 100 mm x 100 mm x 0.8 mm
(a 6.7 mm hole at centre)
No. of determinations : 2

17. Resistance to staining, Clause 26

Nominal specimen dimensions : 70 mm x 70 mm x 0.8 mm
No. of determination : 1 per reagent

18. Light fastness (Xenon arc), Clause 27

Nominal specimen dimensions : 120 mm x 40 mm x 0.8 mm
Apparatus used : Xenotest 440
Operating cycle : Continuous irradiation
Light source : Air-cooled xenon-arc lamps
Filter system : Xenochrome 300 in Suprax cylinder
UV irradiance : $60 \pm 2 \text{ W/m}^2$ at 300 to 400 nm
Black standard temperature : $65 \pm 3^\circ\text{C}$
Air temperature in test enclosure : $38 \pm 3^\circ\text{C}$
Relative humidity in test enclosure : $50 \pm 5\%$
Test duration : 170 light hours (36720 KJ/m^2 at 300 to 400 nm)
No. of determinations : 2

Method of Evaluation

BS EN ISO 105-A02 : 1993

"Textiles - Tests for colour fastness - Grey Scale for assessing change in colour"

The Grey scale for assessing color change ranges from 1 to 5:

5 : No perceived difference in color between the exposed and unexposed specimens

1 : Greatest contrast in color between the exposed and unexposed specimens

19. Density

ISO 1183-1 : 2019

Plastics - Methods for determining the density of non-cellular plastics -

Part 1: Immersion method, liquid pycnometer method and titration method

Nominal specimen dimensions : 50 mm x 25 mm x 0.8 mm
No. of determinations : 3

DATE OF TEST:

03 January 2023 - 16 February 2023

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TEST RESULTS:

S/no.	Characteristics	Unit	Results / Observations	BS EN 438-3 : 2016 Requirements (VGS)
1	Assessment of appearance	-	No defects were observed	-
2	Determination of thickness	mm	0.84, 0.81, 0.83 and 0.84 mm	$0.5 \leq t \leq 1.0$ mm: ± 0.1 mm max. variation
3	Determination of length and width, average a) Length b) Width	mm	2447 1225	+ 10 mm / - 0 mm
4	Determination of edge straightness, average	mm / m	0	1.5 mm/m max. deviation
5	Determination of edge squareness, average	mm / m	1.0	1.5 mm/m max. deviation
6	Determination of flatness, (max)	mm / m	0.1	60 mm/m max. deviation
7	Resistance to surface wear, average Initial wear point, IP	Revolutions Initial point	950	50 (min.)
8	Resistance to immersion in boiling water a) Appearance b) Mass of boiling water absorbed by the laminate under test c) Increase in thickness of the laminate under test	- % %	Rating 4 (Surface) Rating 5 (Edge) 3.9 4.1	Gloss finish - Rating 3 (min.) -
9	Resistance to water vapour Appearance	-	Rating 5	Gloss finish - Rating 3 (min.)

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TEST RESULTS (CONT'D) :

S/no.	Characteristics	Unit	Results / Observations		BS EN 438-3 : 2016 Requirements (VGS)
10	Resistance to dry heat Appearance	-	Rating 5		Gloss finish - Rating 3 (min.)
11	Dimensional stability at elevated temperature Cumulative Dimensional Change a) Longitudinal Direction (Cross Fibre)	%	0.19		0.75 % (max.)
	b) Transverse Direction (Fibre Cross)		0.37		1.25 % (max.)
12	Resistance to wet heat Appearance	-	Rating 5		Gloss finish - Rating 3 (min.)
13	Resistance to impact by small-diameter ball	N	25		15 N (min.)
14	Resistance to impact by large-diameter ball				
	Drop height	mm	1500		Drop height : 600 mm (min.)
	Indent diameter	mm	9.5		Indent diameter : 10 mm (max.)
15	Resistance to cracking under stress	-	Rating 5		Rating 4 (min.)
16	Resistance to scratching	-	Rating 3 (Appendix 1)		Rating 2 (min.)
17	Resistance to staining		10 min	16 hrs	
	a) Acetone		-	Rating 5	Rating 5 (min.)
	b) Coffee		-	Rating 5	Rating 5 (min.)
	b) Sodium Hydroxide (25% solution)	-	Rating 5	-	Rating 4 (min.)
	c) Hydrogen Peroxide (30% solution)	-	Rating 5	-	Rating 4 (min.)
	Carbon black suspension in paraffin oil (Shoe polish simulant)		Rating 5	-	Rating 4 (min.)
18	Light fastness (Xenon arc) Visual appearance after 170 hours	-	Slight contrast between the exposed and unexposed test specimen (equal to grey scale grade 4/5)		Grey scale rating 4 to 5
19	Density, average	g/cm ³	1.43		1.35 g/cm ³ (min.)

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REMARKS:

1. For Resistance to immersion in boiling water (Surface) test, rating scale ranges from 1 to 5:
Rating 5 : No visible change
Rating 4 : Slight change of gloss and/or colour, only visible at certain viewing angles.
2. Resistance to immersion in boiling water (Edge) test, rating scale ranges from 1 to 5:
Rating 5 : No visible change
3. For Resistance to water vapour test, rating scale ranges from 1 to 5:
Rating 5 : No visible change
4. For Resistance to dry heat and Resistance to wet heat tests, Rating scale 5 denotes No change
- test area indistinguishable from adjacent surrounding area.
5. For Resistance to scratching, Scratch Resistance Rating Scale was shown in Appendix 1.
6. For Light fastness test, the result is obtained from Report No. : 7191299197-CHM23-02-LZS (MEC)
dated 20 February 2023. Reference specimen before exposure (Left), Specimens 1 and 2 (Centre
and Right respectively) after 170 hours of xenon-arc exposure were shown in Figure 1.
7. The results were found to be complied to BS EN 438-3 : 2016 VGS requirements.

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Aaron Yang
Associate Engineer

Hu Guangxia

Dr Hu Guangxia
Senior Consultant
Polymer Products
Mechanical Centre

Figure 1: Photograph of test specimens



Figure 1a: 1 roll of full size panel

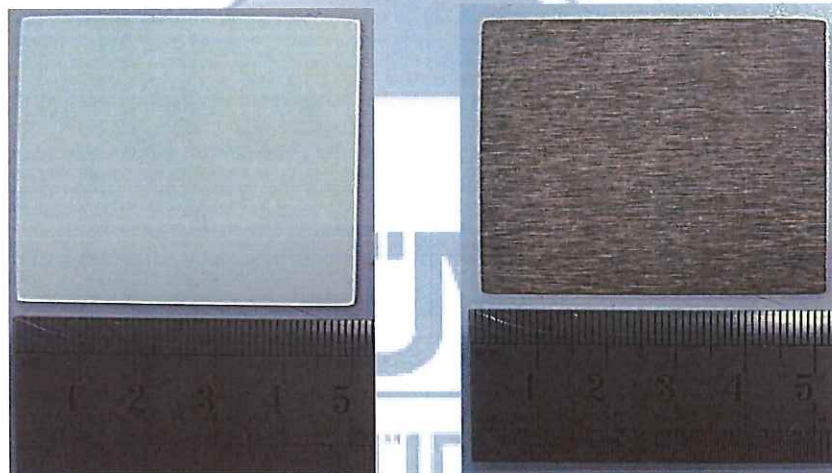


Figure 1b: Typical top view

Figure 1b: Typical bottom view

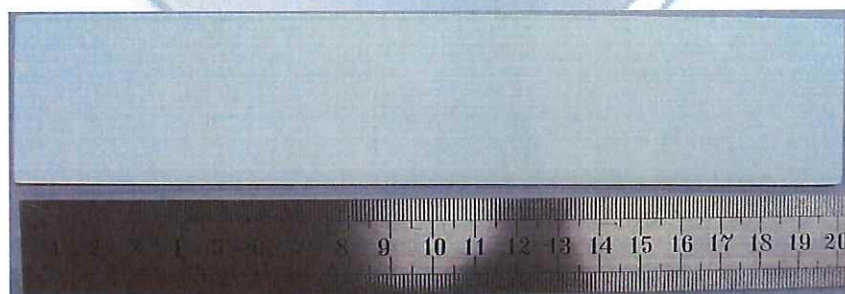


Figure 1c: Typical top view (Longitudinal Direction (Cross Fibre))

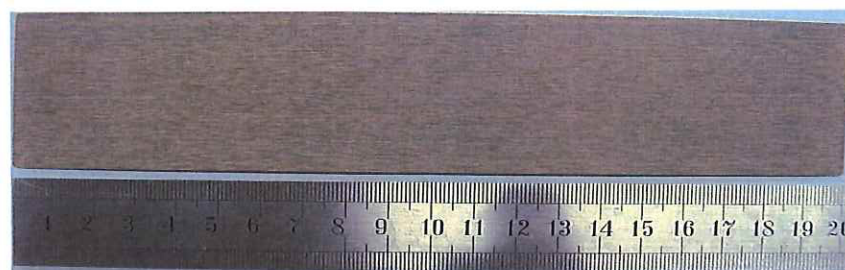


Figure 1c: Typical bottom view (Longitudinal Direction (Cross Fibre))

Figure 1: Photograph of test specimens (CONT'D)

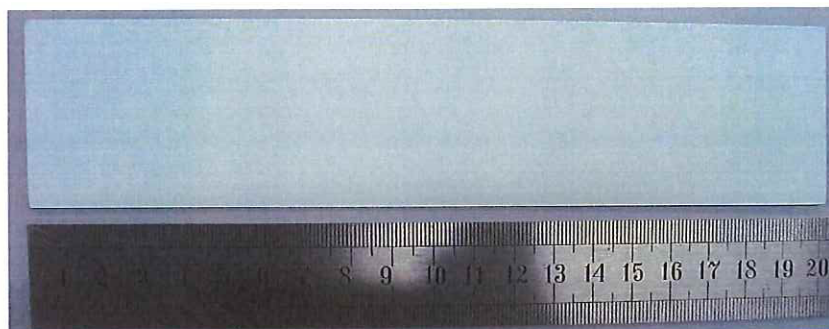


Figure 1d: Typical top view (Transverse Direction (Fibre Cross))

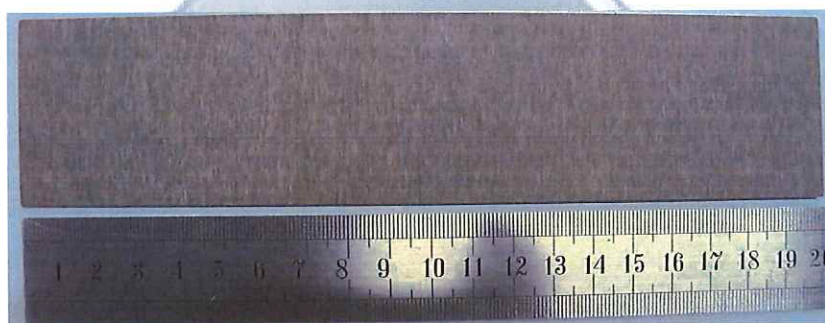


Figure 1d: Typical bottom view (Transverse Direction (Fibre Cross))

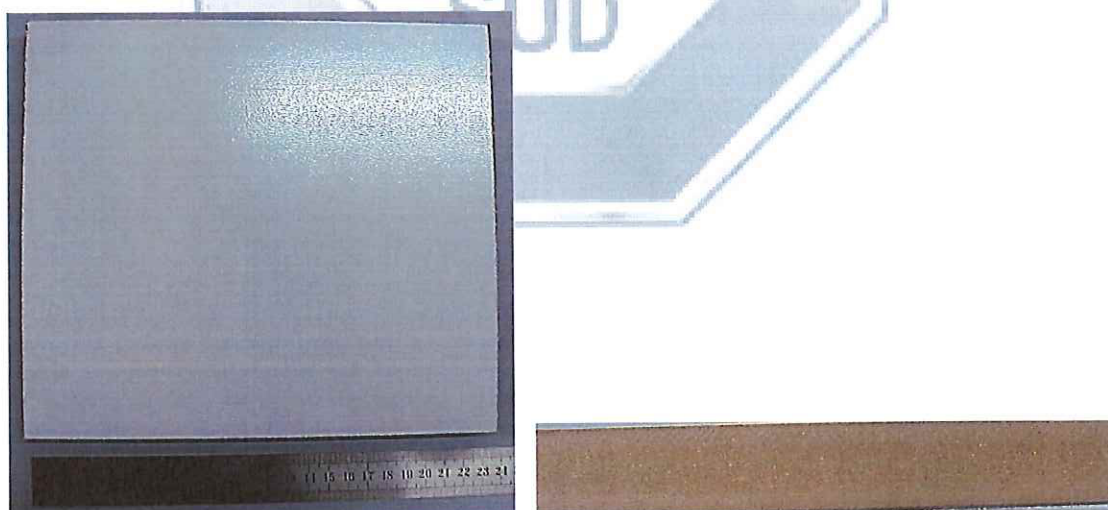


Figure 1e : Top view and End view (Typical Bonded on Wood Particleboard)

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Figure 1: Photograph of test specimens (CONT'D)

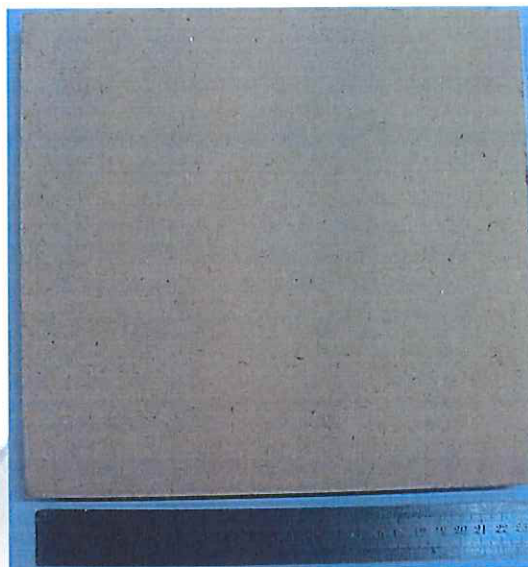


Figure 1e: Bottom view (Typical Bonded on Wood Particleboard)

Appendix 1: Scratch resistance rating scale

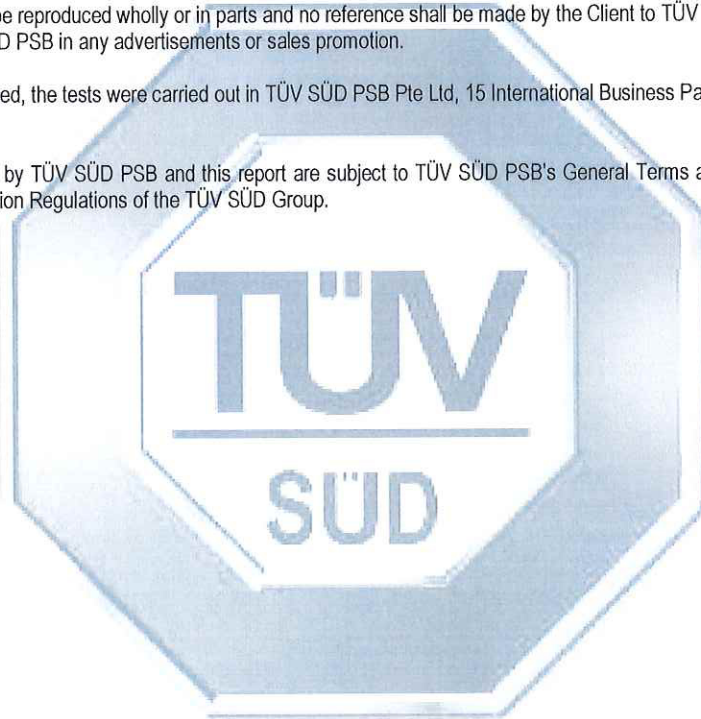
Rating scale	Discontinuous scratches, or faint superficial marks, or no visible marks	$\geq 90\%$ continuous double circle of scratch marks clearly visible
Rating 5	6N	$> 6N$
Rating 4	4N	6N
Rating 3	2N	4N
Rating 2	1N	2N
Rating 1	-	1N

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Effective 26 January 2021



Entwicklungs- und Prüflabor Holztechnologie GmbH · Zellescher Weg 24 · 01217 Dresden · Germany

VIRGO LAMINATES LIMITED

Block No- 342/P1, 347, 349, 352, 353, 363/4, 381

N.H No. 48, Ahmedabad - Nadiad Road,

Taluka: Matar, District: Kheda

GUJARAT 387570

INDIEN



Dresden, 05/06/2025
simone.wenk@eph-dresden.de

Test Report Order No. 2725040/1

Client: VIRGO LAMINATES LIMITED
Block No- 342/P1, 347, 349, 352, 353, 363/4, 381
N.H No. 48, Ahmedabad - Nadiad Road, Taluka: Matar,
District: Kheda
GUJARAT 387570
INDIA

Order: Determination of selected tests for High Pressure Laminates
according to EN 438-2:2016-02 / EN 438-3:2016-02

Contractor: Entwicklungs- und Prüflabor Holztechnologie GmbH
Laboratory Unit Surface Testing
Zellescher Weg 24
01217 Dresden
Germany

Engineer in charge: Dipl.-Ing. Simone Wenk

Dipl.-Ing. Andreas Möschner
Head of Laboratory Unit Surface Testing

The test report contains 5 pages. Any duplication of extracts requires the written permission of EPH.
The test results refer exclusively to the material tested.
All numerical values within this document are given with a comma as decimal.

3.3 Resistance to blistering (Method B)

The determination of the resistance to blistering was carried out in accordance with EN 438-2:2016-02, part 34 method B.

With the configured test device and continuous heating, the time between:

time T1 = reaching the processing temperature of 160 °C (manufacturer's specification)

and the time T2 (registration of bubble formation)

was determined.

The test was carried out: 04/06/2025

5 Evaluation

The tested variant of a HPL can be evaluated for the several properties according to (General requirements) and EN 438-3:2016-02, Table 6 (Additional requirements for type P laminates with a thickness $\leq 1,5$ mm).

Grey marking: Requirements for the property

Property	Result	Assessment* regarding Requirements according to EN 438-3:2016-02, Table 5		
		Laminate		
		HDS HDF HDP	HGS HGF HGP	VGS VGF VGP
		444	333	222
Resistance to impact with a small diameter ball (EN 438-2:2016-02, p. 20)	Spring force [N]	≥ 25	≥ 20	≥ 15
	> 30	fulfilled	fulfilled	fulfilled
Resistance to scratching (EN 438-2:2016-02, p. 25)	Force (min.) smooth surface / structured surface	$\geq$ Grade 3 $\geq$ Grade 4	$\geq$ Grade 3 $\geq$ Grade 4	$\geq$ Grade 3 $\geq$ Grade 4
	Grade 4	fulfilled	fulfilled	fulfilled
Property	Results	Assessment* regarding Additional Requirements according to EN 438-3:2016-02, Tables 6 for type P laminates with a thickness $\leq 1,5$ mm		
Resistance to blistering (Method B) (EN 438-2:2016-02, p. 34)	Duration until bubble formation ($t_2 - t_1$) Nominal thickness $\leq 0,8$ mm Nominal thickness $\geq 0,8$ mm	≥ 10 ≥ 15		
	70,6 s	fulfilled		

* Statements on conformity assessment/classification were made on the basis of the measurement results obtained. Measurement uncertainties were not included in the assessment (ILAC G8 03/2009 "Guidelines on the Reporting of Compliance with Specification" Section 2.7).


Dipl.-Ing. Simone Wenk
Engineer in charge



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CSI Division – Centre of Civil Engineering

Construction Testing Laboratory Zlín, K Cihelně 304, Louky 763 02 Zlín



Page: 1/3

No. 415601602-01

TEST REPORT

ref. No. 415601602-01

Client: GLAMIVA OVERSEAS PRIVATE LIMITED
VAT: 24AAKCG3380Q1Z2

Address: Block / Survey No. 342/1, 345, 347 & 349
Village Sokhda, Taluka Matar, District Kheda
Gujarat – India: 387570

Subject of the test: HPL Thin Laminates

Sample received on: 8. 1. 2025

Tested: From March 3, 2025 to May 19, 2025

Report elaborated by: Ing. Radim Mikač

Place and date of issue: Zlín, June 23, 2025

Annex: -




Ing. Jiří Růžička
Head of Construction Testing Laboratory Zlín


Ing. Petra Hrdinová
Head of Testing Laboratory

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7. The nominal thickness of the product 0.8 mm, tested from March 10, 2025 to March 11, 2025, agents: acetone, wine vinegar and sodium hydroxide
8. The nominal thickness of the product 0.8 mm, tested on May 19, 2025, irradiation intensity $(60 \pm 3) \text{ W/m}^2$, black standard temperature $(65 \pm 3) ^\circ\text{C}$
9. Method A - immersion method, immersion liquid - distilled water, test temperature $23 ^\circ\text{C}$, no buoyancy correction, tested on March 3, 2025

The laboratory is not responsible for information received from customer, which could have influence on the validity of the results. Further information required by the standard/standards and not given in this Test Report are available at a request at the Laboratory.

Testing laboratory:

The tests were performed in the workplace no.2: Třída Tomáše Bati 5264, areal Svit, Building No. 113, 760 01 Zlín

Test results:

The test results are given in the following table:

Table No. II – HPL Thin Laminates, ref. No. 415601602/1

Test No.	Characteristics measured	Unit	Separate values	Test results	Uncertainty ¹⁾
1	Initial wear point	Revolutions	150; 150; 150	150	-
	Increase at weight	%	6.1; 5.8; 5.9	5.9	0.3
2	Increase in thickness	%	0.57; 0.57; 0.49; 0.57; 0.81; 0.89; 0.73; 0.73; 0.73; 0.65; 0.65; 0.73	0.68	0.07
	Surface and edge evaluation	-	Change of appearance: Degree 5: No visible change	-	-
3	Resistance to water vapour	-	Change of appearance: Degree 5: No visible change	-	-
4	Effect on the surface after exposure to dry heat	-	Change of appearance: Degree 5: No visible change	-	-
	Cumulative dimensional change in the longitudinal direction	%	0.43	-	-
5	Cumulative dimensional change in the longitudinal direction	%	0.91	-	-
6	Resistance to wet heat	-	Change of appearance: Degree 5: No visible change	-	-
7	Resistance to staining	Degree	Acetone – 5 Wine vinegar – 5 Sodium hydroxide – 5	5	-
8	Light Fastness	-	Change of appearance: Degree 5: No visible change	-	-
9	Density	g.cm^{-3}	1.49; 1.49; 1.49	1.49	0.02

¹⁾ expanded uncertainty for coverage factor $k = 2$, which for a normal distribution corresponds to a coverage probability of approximately 95%

..... End of the test report.....

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