

DIN EN 438-2:2019-03 (E)

High-pressure decorative laminates (HPL) - Sheets based on thermosetting resins (usually called laminates) - Part 2: Determination of properties (includes Amendment A1:2018)

| Contents | | Page |
|-------------------------|---|-------------|
| European foreword | | 10 |
| 1 | Scope | 11 |
| 2 | Normative references | 11 |
| 3 | Terms and definitions | 12 |
| 4 | Assessment of appearance | 12 |
| 4.1 | Principle | 12 |
| 4.2 | Apparatus | 12 |
| 4.3 | Test specimen | 12 |
| 4.4 | Procedure | 12 |
| 4.5 | Test report | 13 |
| 5 | Determination of thickness | 13 |
| 5.1 | Principle | 13 |
| 5.2 | Apparatus | 13 |
| 5.3 | Test specimen | 13 |
| 5.4 | Procedure | 13 |
| 5.5 | Test report | 14 |
| 6 | Determination of length and width | 14 |
| 6.1 | Principle | 14 |
| 6.2 | Apparatus | 14 |
| 6.3 | Test specimen | 14 |
| 6.4 | Procedure | 14 |
| 6.5 | Expression of results | 14 |
| 6.6 | Test report | 14 |
| 7 | Determination of edge straightness | 15 |
| 7.1 | Principle | 15 |
| 7.2 | Apparatus | 15 |
| 7.3 | Test specimen | 15 |
| 7.4 | Procedure | 15 |
| 7.5 | Expression of results | 15 |
| 7.6 | Test report | 16 |
| 8 | Determination of edge squareness | 16 |
| 8.1 | Principle | 16 |
| 8.2 | Apparatus | 16 |
| 8.3 | Test specimen | 16 |
| 8.4 | Procedure | 16 |
| 8.5 | Expression of results | 17 |
| 8.6 | Test report | 17 |
| 9 | Determination of flatness | 17 |
| 9.1 | Principle | 17 |

| | | |
|--------|---|----|
| 9.2 | Apparatus | 17 |
| 9.3 | Test specimens | 18 |
| 9.4 | Procedure | 18 |
| 9.5 | Expression of results | 18 |
| 9.6 | Test report | 18 |
| 10 | Resistance to surface wear | 18 |
| 10.1 | Principle | 18 |
| 10.2 | Materials | 18 |
| 10.3 | Apparatus | 19 |
| 10.3.1 | Abrasion resistance testing machine | 19 |
| 10.4 | Test specimens | 21 |
| 10.5 | Preparation of specimens and abrasive paper | 21 |
| 10.6 | Procedure | 21 |
| 10.6.1 | Preparation of abrasive wheels | 21 |
| 10.6.2 | Calibration of abrasive paper | 21 |
| 10.6.3 | Abrasion of specimen | 21 |
| 10.7 | Expression of results | 22 |
| 10.8 | Test report | 22 |
| 11 | Resistance to abrasion (flooring grade laminates) | 23 |
| 12 | Resistance to immersion in boiling water | 23 |
| 12.1 | Principle | 23 |
| 12.2 | Apparatus | 23 |
| 12.3 | Test specimens | 23 |
| 12.4 | Procedure | 24 |
| 12.5 | Expression of results | 24 |
| 12.5.1 | Calculation | 24 |
| 12.5.2 | Surface rating scale | 25 |
| 12.5.3 | Edge rating scale | 25 |
| 12.6 | Test report | 25 |
| 13 | Substrate protection against water vapour | 25 |
| 13.1 | Principle | 25 |
| 13.2 | Apparatus | 26 |
| 13.3 | Test specimens | 26 |
| 13.4 | Procedure | 26 |
| 13.5 | Expression of results | 27 |
| 13.6 | Test report | 27 |
| 14 | Resistance to water vapour | 27 |
| 14.1 | Principle | 27 |
| 14.2 | Apparatus | 28 |
| 14.3 | Test specimen | 28 |
| 14.4 | Procedure | 28 |
| 14.5 | Expression of results | 28 |
| 14.6 | Test report | 28 |
| 15 | Resistance to wet conditions (Exterior grade laminates) | 30 |
| 15.1 | Principle | 30 |
| 15.2 | Apparatus | 30 |
| 15.3 | Test specimens | 30 |
| 15.4 | Procedure | 30 |
| 15.5 | Expression of results | 30 |
| 15.5.1 | Calculation | 30 |
| 15.5.2 | Visual examination | 31 |
| 15.6 | Test report | 31 |
| 16 | Resistance to dry heat | 32 |
| 16.1 | Principle | 32 |

| | | |
|--------|--|----|
| 16.2 | Apparatus and materials | 32 |
| 16.3 | Test specimen | 34 |
| 16.4 | Test procedure | 34 |
| 16.5 | Examination of the test specimen | 34 |
| 16.6 | Expression of results | 34 |
| 16.7 | Test report | 35 |
| 17 | Dimensional stability at elevated temperature | 35 |
| 17.1 | Principle | 35 |
| 17.2 | Apparatus | 35 |
| 17.3 | Test specimens | 36 |
| 17.4 | Procedure | 36 |
| 17.5 | Expression of results | 36 |
| 17.6 | Test report | 37 |
| 18 | Resistance to wet heat | 37 |
| 18.1 | Principle | 37 |
| 18.2 | Apparatus and materials | 38 |
| 18.3 | Test specimens | 38 |
| 18.4 | Procedure | 39 |
| 18.5 | Expression of results | 39 |
| 18.6 | Test report | 40 |
| 19 | Resistance to climatic shock (exterior grade laminates) | 40 |
| 19.1 | Principle | 40 |
| 19.2 | Apparatus | 40 |
| 19.3 | Test specimens | 41 |
| 19.4 | Procedure | 41 |
| 19.5 | Expression of results | 42 |
| 19.5.1 | Flexural strength and modulus of elasticity in flexure | 42 |
| 19.5.2 | Appearance | 42 |
| 19.6 | Test report | 42 |
| 20 | Resistance to impact by small-diameter ball | 42 |
| 20.1 | Principle | 42 |
| 20.2 | Materials | 43 |
| 20.3 | Apparatus | 43 |
| 20.4 | Test specimens | 46 |
| 20.5 | Calibration of the impact tester | 46 |
| 20.6 | Procedure | 47 |
| 20.7 | Expression of results | 48 |
| 20.8 | Test report | 48 |
| 21 | Resistance to impact by large diameter ball | 48 |
| 21.1 | Principle | 48 |
| 21.2 | Materials | 49 |
| 21.3 | Apparatus | 49 |
| 21.4 | Test specimens | 49 |
| 21.5 | Procedure | 49 |
| 21.6 | Expression of results | 51 |
| 21.7 | Test report | 52 |
| 22 | Resistance to impact by large diameter ball (flooring grade laminates) | 52 |
| 22.1 | Principle | 52 |
| 22.2 | Materials | 52 |
| 22.3 | Apparatus | 52 |
| 22.4 | Test specimens | 53 |
| 22.5 | Procedure | 53 |
| 22.6 | Expression of results | 53 |
| 22.7 | Test report | 53 |

| | | |
|--------|--|----|
| 23 | Resistance to cracking under stress (laminates 2 mm thick) | 54 |
| 23.1 | Principle | 54 |
| 23.2 | Apparatus | 54 |
| 23.3 | Test specimens | 54 |
| 23.4 | Procedure | 56 |
| 23.5 | Expression of results | 56 |
| 23.6 | Test report | 57 |
| 24 | Resistance to crazing (Compact laminates) | 58 |
| 24.1 | Principle | 58 |
| 24.2 | Apparatus | 58 |
| 24.3 | Test specimens | 58 |
| 24.4 | Procedure | 58 |
| 24.5 | Expression of results | 58 |
| 24.6 | Test report | 59 |
| 25 | Resistance to scratching | 60 |
| 25.1 | Principle | 60 |
| 25.2 | Materials | 60 |
| 25.3 | Apparatus | 60 |
| 25.4 | Calibration of apparatus | 62 |
| 25.5 | Test specimen | 62 |
| 25.6 | Procedure | 62 |
| 25.7 | Expression of results | 66 |
| 25.8 | Test report | 66 |
| 26 | Resistance to staining | 66 |
| 26.1 | Principle | 66 |
| 26.2 | Staining agents | 66 |
| 26.3 | Apparatus and Materials | 68 |
| 26.3.1 | Discs | 68 |
| 26.3.2 | Glass Petri dish | 68 |
| 26.3.3 | Tweezers | 68 |
| 26.3.4 | Absorbent paper or tissue | 68 |
| 26.3.5 | Cleaning cloth | 68 |
| 26.3.6 | Diffuse light source | 68 |
| 26.4 | Test specimens | 69 |
| 26.5 | Test procedure | 69 |
| 26.6 | Examination of the test panel | 70 |
| 26.7 | Assessment of results | 70 |
| 26.8 | Test report | 71 |
| 27 | Light fastness (Xenon arc) | 71 |
| 27.1 | Principle | 71 |
| 27.2 | Apparatus | 71 |
| 27.3 | Test specimen | 72 |
| 27.4 | Procedure | 72 |
| 27.5 | Assessment and expression of results | 73 |
| 27.6 | Test report | 73 |
| 28 | Resistance to UV light (Exterior grade laminates) | 73 |
| 28.1 | Principle | 73 |
| 28.2 | Apparatus | 73 |
| 28.3 | Test specimens | 73 |
| 28.4 | Procedure | 74 |
| 28.5 | Evaluation and expression of results | 74 |
| 28.5.1 | General | 74 |
| 28.5.2 | Contrast | 74 |
| 28.5.3 | Appearance | 74 |
| 28.6 | Test report | 74 |

| | | |
|--------|---|----|
| 29 | Resistance to artificial weathering (Exterior grade laminates) | 75 |
| 29.1 | Principle | 75 |
| 29.2 | Apparatus | 75 |
| 29.3 | Test specimens | 76 |
| 29.4 | Procedure | 76 |
| 29.5 | Examination and expression of results | 76 |
| 29.5.1 | General | 76 |
| 29.5.2 | Contrast | 77 |
| 29.5.3 | Appearance | 77 |
| 29.6 | Test report | 77 |
| 30 | Determination of the microscratch resistance | 77 |
| 30.1 | Principle | 77 |
| 30.2 | Terms and definitions | 77 |
| 30.3 | Apparatus and materials | 78 |
| 30.3.1 | Martindale tester | 78 |
| 30.3.2 | Holder for scrub material | 78 |
| 30.3.3 | Diffuse light source | 78 |
| 30.3.4 | Reflectometer | 78 |
| 30.3.5 | Positioning device | 79 |
| 30.4 | Assembly and maintenance of the Martindale tester | 80 |
| 30.5 | Method for checking the Lissajous figure | 80 |
| 30.6 | Preparation and conditioning | 81 |
| 30.6.1 | Preparation | 81 |
| 30.6.2 | Test surface | 81 |
| 30.7 | Test procedure | 81 |
| 30.7.1 | General | 81 |
| 30.7.2 | Testing | 81 |
| 30.8 | Classification of the image after scratching according to procedure B | 83 |
| 30.9 | Test report | 84 |
| 31 | Formability (Method A) | 84 |
| 31.1 | Principle | 84 |
| 31.2 | Apparatus | 84 |
| 31.3 | Test specimens | 85 |
| 31.4 | Procedure | 85 |
| 31.4.1 | Calibration of test apparatus | 85 |
| 31.4.2 | Test procedure | 86 |
| 31.5 | Test report | 87 |
| 32 | Formability (Method B) | 87 |
| 32.1 | Principle | 87 |
| 32.2 | Apparatus | 88 |
| 32.3 | Test specimens | 88 |
| 32.4 | Procedure | 89 |
| 32.5 | Test report | 90 |
| 33 | Resistance to blistering (Method A) | 91 |
| 33.1 | Principle | 91 |
| 33.2 | Apparatus | 91 |
| 33.3 | Test specimens | 91 |
| 33.4 | Procedure | 91 |
| 33.4.1 | Calibration of test apparatus | 91 |
| 33.4.2 | Test procedure | 91 |
| 33.5 | Test report | 91 |
| 34 | Resistance to blistering (Method B) | 92 |
| 34.1 | Principle | 92 |
| 34.2 | Apparatus | 92 |

| | | |
|---|--|-----------|
| 34.3 | Test specimens | 92 |
| 34.4 | Procedure | 92 |
| 34.4.1 | General | 92 |
| 34.4.2 | Calibration of test apparatus | 92 |
| 34.4.3 | Test procedure | 92 |
| 34.5 | Test report | 92 |
| Annex A (informative) Surface finish and colour influence on surface evaluations | | 94 |
| Annex B (informative) Calibration and maintenance of abrasion equipment | | 95 |
| Annex C (normative) Measurement of shore A hardness | | 99 |