Ultrafuse® PC/ABS FR Black

EN45545-2 certified | flame retardant UL94 V-0 | UV-stabilized

Extended TDS

Complete Technical Documentation and Testing Summary

Version 1.4

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Technical Data Sheet

Ultrafuse® PC/ABS FR Black is a halogen free flame retardant blend of Polycarbonate and ABS with increased mechanical properties compared to standard ABS.

Filament Properties		
Filament Diameter	1.75 mm	2.85 mm
Average diameter Tolerance	±0.050 mm	±0.1 mm
Average ovality	<0.050 mm	<0.050 mm
Available Spool size	1.0 kg, 2.0 kg	1.0 kg
Available colors	black	

Spool Properties				
Spool size	1.0 kg	2.0 kg	4.0 kg	8.0 kg
Outer diameter	200 mm	300 mm	350 mm	355 mm
Inner diameter	52 mm	51.5 mm	51.7 mm	36 mm
Width	68 mm	103 mm	103 mm	167 mm

Recommended 3D-Print processing parameters		Used for test specimens
Printer	FFF printer	Ultimaker S5
Nozzle Temperature[1)]	260 – 280°C	270°C
Build Chamber Temperature	Closed Chamber, passively heated	Closed Chamber, passively heated
Bed Temperature	90 – 110°C	100°C
Bed Material	Glass/PEI + PC Adhesive	Glass + Magigoo PC
Nozzle Diameter	≥ 0.4 mm	0.4 mm
Print Speed	30 - 300 mm/s	40 mm/s
Max Volumetric Speed[2)]	28 mm^3/s	-

Please check your standard and/or high speed print profile availability for an easy start at www.forward-am.com.

[1] Fast printing might require an additional increase of the nozzle temperature; the stated printing speed is based on current validations. As equipment and technology continues to evolve, it is possible that even higher printing speeds may be attainable in the future.
[2] Based on Bambu Lab X1C with a nozzle diameter of 0.4 mm

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Please contact us for further product information, like for example REACH, RoHS, FCS.

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Process materials in a well-ventilated room, or use professional extraction systems.

Further Recommendations	
Drying recommendations to ensure printability and best mechanical properties[3)]	Ultrafuse® PC/ABS FR Black can be dried at 60°C in a hot air dryer or vacuum oven for 4 to 16 hours
Support material compatibility	Single material breakaway, Ultrafuse® HiPS, XIONEER® VXL 90, XIONEER® VXL 111
Warehousing	Ultrafuse® PC/ABS FR filament should be stored at 15 - 25°C in its originally sealed package in a clean and dry environment. If the recommended storage conditions are observed the products will have a minimum shelf life of 24 months.

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[3] Please note: To ensure constant material properties the material should always be kept dry.

General Properties	Standard	Average Values
Filament Density[4)]	ISO 1183-1	1193 kg/m³

Tensile Properties[5)]	Standard	Average Values		
		XY-Direction	XZ-Direction	ZX-Direction
Tensile strength[6)]	ISO 527	50.1 MPa	-	17.3 MPa
Elongation at Break[6)]	ISO 527	10.7%	-	0.8%
Young's Modulus[7)]	ISO 527	2545 MPa	-	2188 MPa

Flexural Properties[5) 8)]	Standard	Average Values		
		XY-Direction	XZ-Direction	ZX-Direction
Flexural Strength	ISO 178	88.1 MPa	90.6 MPa	24.7 MPa
Flexural Modulus	ISO 178	2550 MPa	2200 MPa	1810 MPa
Flexural Elongation at Break	ISO 178	5.6%	6.1%	1.3%

Impact Properties[5)]	Standard	Average Values		
		XY-Direction	XZ-Direction	ZX-Direction
Impact Strength Charpy (notched)	ISO 179-2	13.3 kJ/m²	31.2 kJ/m²	0.9 kJ/m²
Impact Strength Charpy (unnotched)	ISO 179-2	49.8 kJ/m²	65.4 kJ/m²	2.9 kJ/m²
Impact Strength Izod (notched)	ISO 180	16.8 J/m	28.4 J/m	1.8 J/m
Impact Strength Izod (unnotched)	ISO 180	57.0 J/m	87.9 J/m	3.0 J/m

For the diagrams on mechanical properties see Chapter: Mechanical Properties Diagrams

[4] measured on filament
[5] Samples were conditioned in standard climate (23°C, 50% RH 72h)
[6] Testing speed: 5 mm/min
[7] Testing speed: 1 mm/min
[8] Testing speed: 2 mm/min

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Thermal Properties[6)]	Standard	Average Values
HDT A at 1.8 MPa	ISO 75-2	81 °C
HDT B at 0.45 MPa	ISO 75-2	89 °C
Vicat softening point at 50 N	ISO 306	90 °C
Vicat softening point at 10 N	ISO 306	97 °C
Glass Transition Temperature	ISO 11357-2	94 °C
Melting Temperature	ISO 11357-3	227 °C
Melt Volume-Flow Rate (MVR)	ISO 1133	46.6 cm^3/10 min (260 °C, 5 kg)
Melt Mass-Flow Rate (MFR)	ISO 1133	48.4 g/10 min (260 °C, 5 kg)

For the diagrams on thermal properties see Chapter: Thermal Properties Diagrams.

Fire, Smoke, Toxicity (FST) properties[6)]	Standard	Average Values
Fire protection on railway vehicles	EN45545-2-2016	R26 HL1-3 (1.5 mm) R26 HL1-3 (3.0 mm)
Flame class rating	UL 94	V-0 (1.5 mm) V-0 (3.0 mm)
Glow wire test (GWEPT)	IEC 60695-2-11	725°C (1.5 mm) 960°C (3.0 mm)

For the statement on Fire protection on railway vehicles, see Chapter Fire protection on railway vehicles data

Electrical Properties[6)]	Standard	Average Values		
		XY-Direction	XZ-Direction	ZX-Direction
Dielectric Strength (orthogonal)	IEC 60243-1	33 [kV/mm]	-	24 [kV/mm]
Volume Resistivity	IEC 62631-3-1	3.20E+14 [Ω cm]	-	6.00E+15 [Ω cm]
Surface resistivity	IEC 62631-3-2	5.50E+12 [Ω]	-	9.30E+15 [Ω]
Comparative Tracking Index	IEC 60112	325-0.7	-	300-0.7

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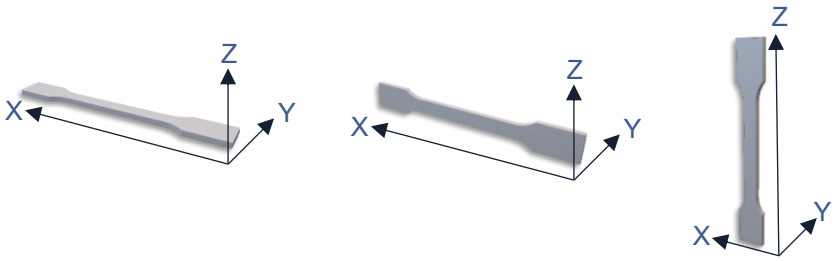
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Hardness and Abrasion	Standard	Typical Values
Shore Hardness D (15s)	DIN ISO 7619-1	77

Print direction explanation

The orientation of the 3D printed part in the printer is always aligned with the longest axis first. The print direction is consistently along the Z-axis.



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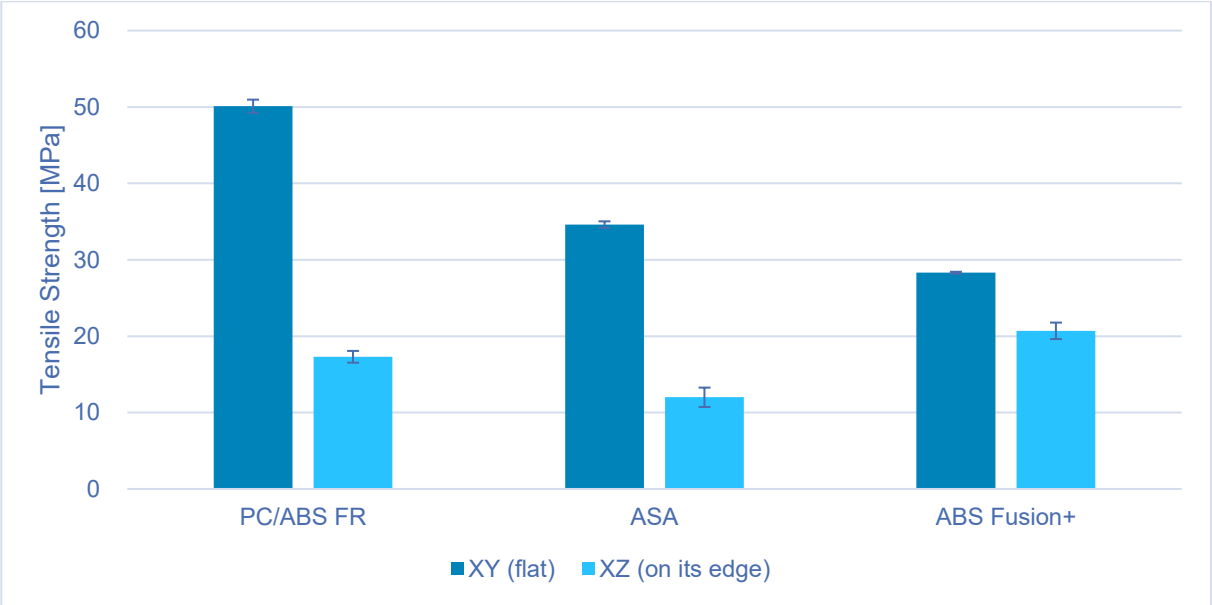
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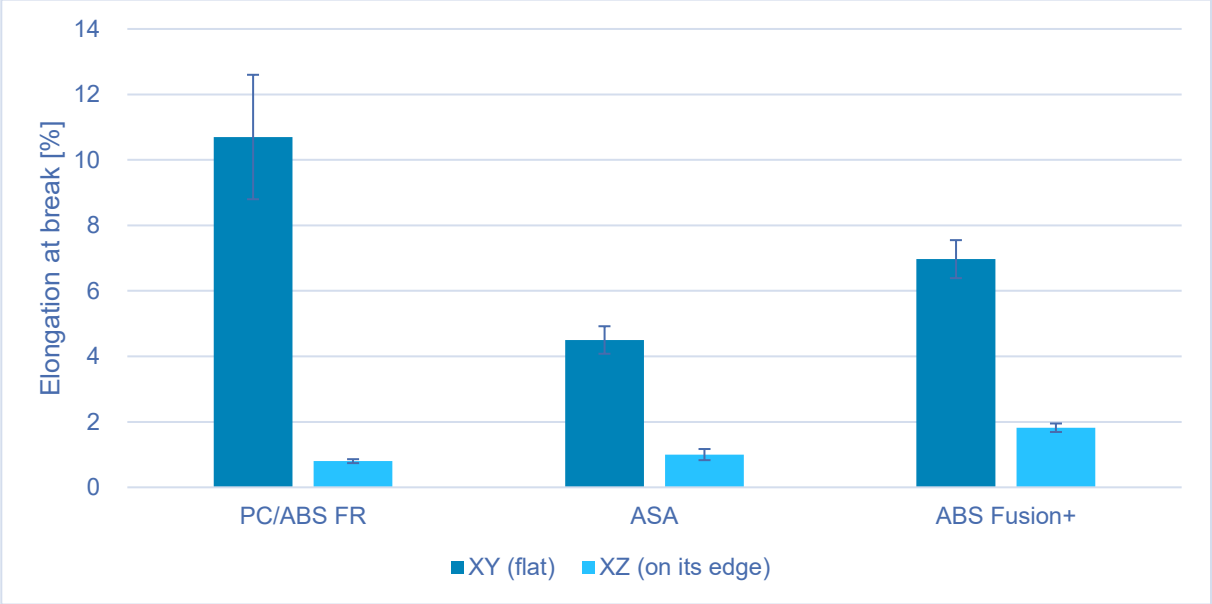
Mechanical Properties Diagrams

Tensile Strength according to DIN EN ISO 527



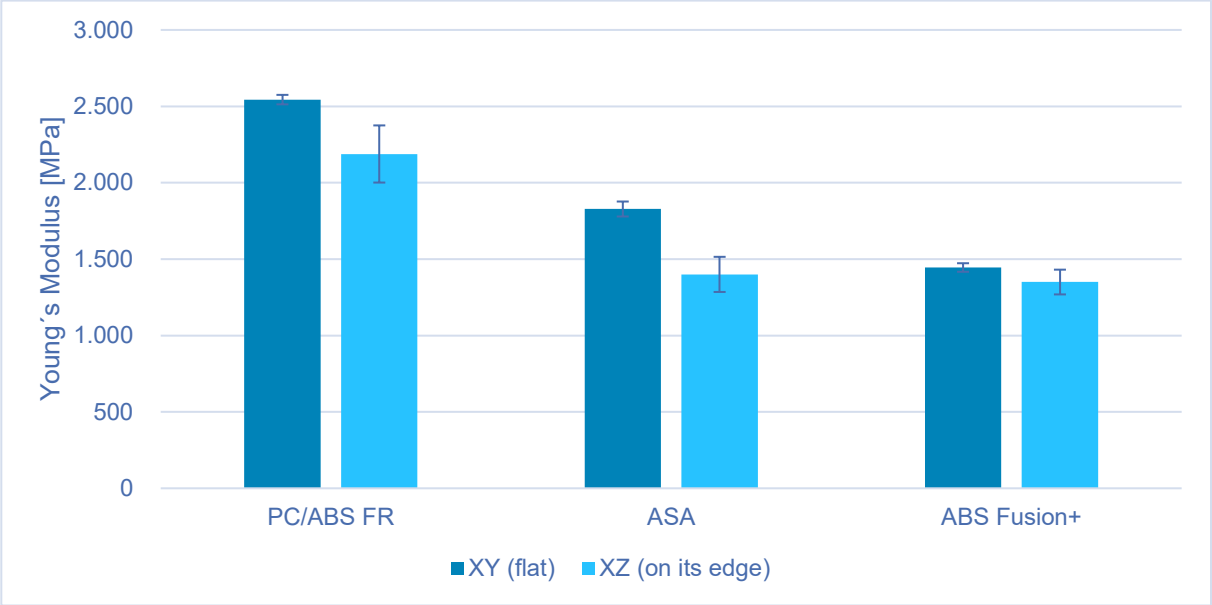
Comparison of Tensile Strength data for Ultrafuse PC/ABS FR Black, ASA and ABS Fusion+.

Elongation at break according to DIN EN ISO 527



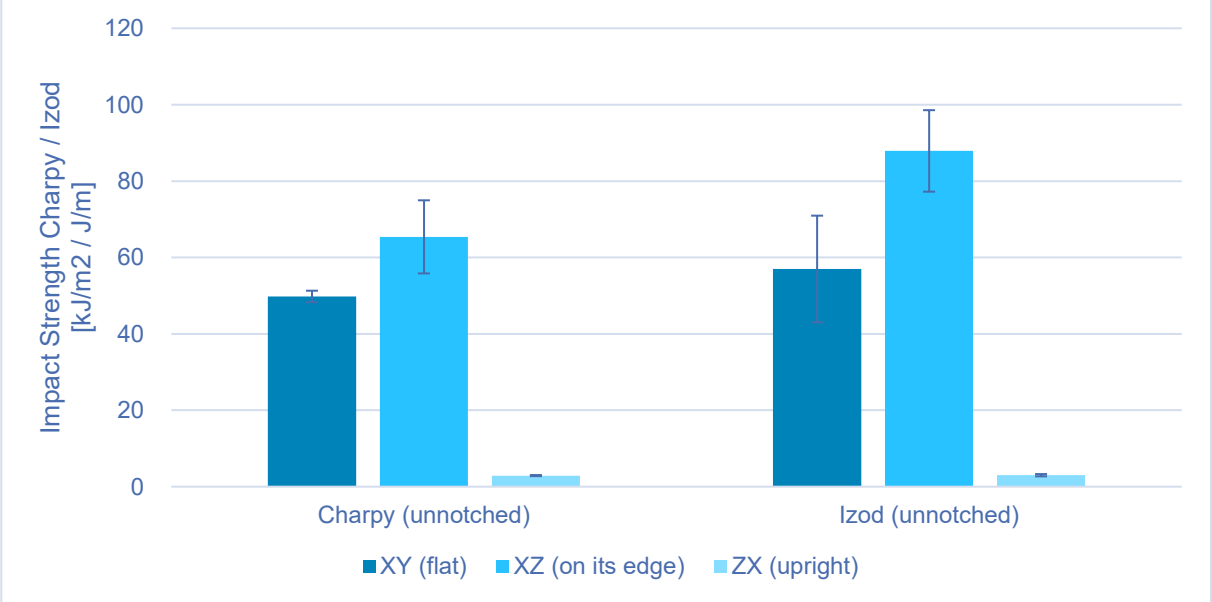
Comparison of Elongation at break data for Ultrafuse PC/ABS FR Black, ASA and ABS Fusion+.

Young´s Modulus according to DIN EN ISO 527



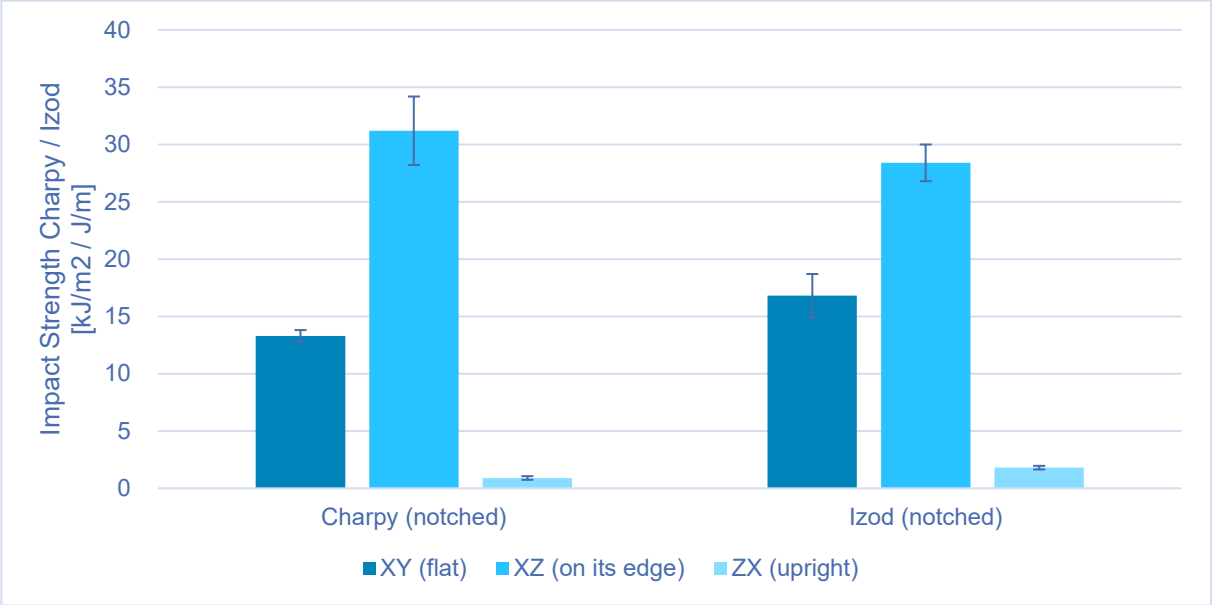
Comparison of Young´s Modulus data for Ultrafuse PC/ABS FR Black, ASA and ABS Fusion+.

Impact Strength unnotched



Comparison of unnotched impact strength data for different build orientations.

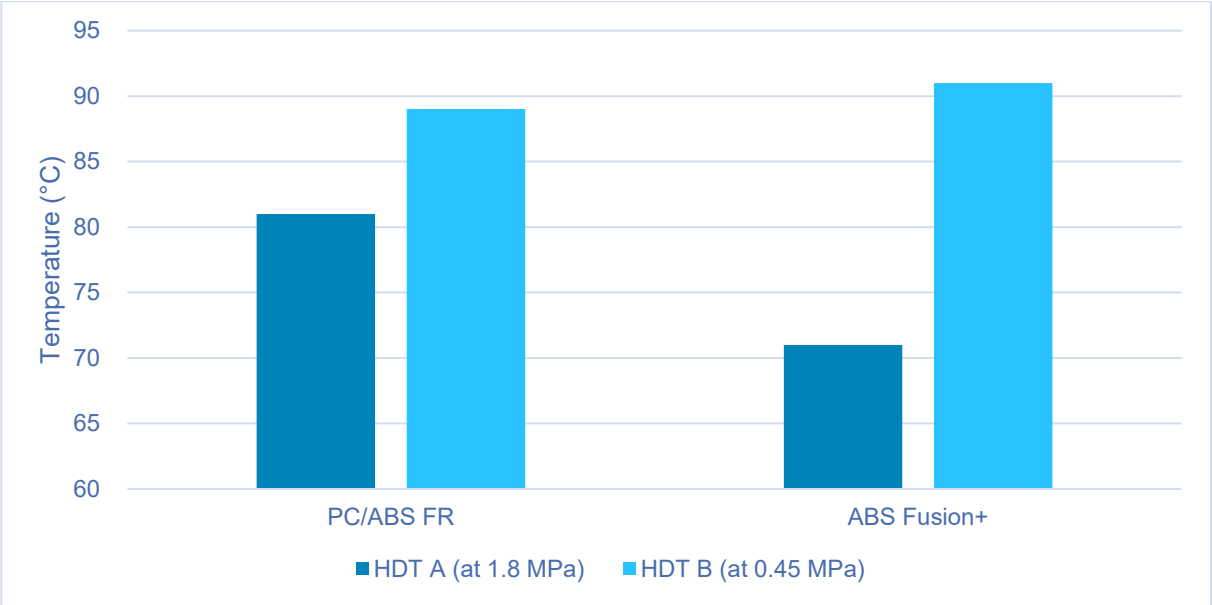
Impact Strength notched



Comparison of notched impact strength data for different build orientations.

Thermal Properties Diagrams

Heat Deflection Temperature (HDT) according to ISO 75-2



Comparison of Heat Deflection Temperatures for Ultrafuse PC/ABS FR and ABS Fusion +.

Fire protection on railway vehicles Data

Classification Report EN45545-2 R26

Formblatt MA4.5_F003, Revision: 3.4, gültig ab: 05.01.2021

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TEST REPORT according to ISO/IEC 17025 No. AVS: 2006115 Date: 2022-02-15 File: 2006115_V_EN.DOCX	DAkkS Deutsche Akkreditierungsstelle D-PL-14121-04-00
Testing laboratory BASF SE RBU Performance Materials Europe Materials and Parts Testing PMD/EX-H201 67056 Ludwigshafen Deutschland	**Contact at laboratory** Name: [redacted] Phone: [redacted] E-Mail: [redacted] Position: [redacted] Signature: [redacted]
Client Company: BASF 3D Printing Solutions GmbH Speyerer Strasse 4 69115 Heidelberg Germany	**Contact at client** Name: [redacted] Phone: [redacted] E-Mail: [redacted]
Test specimen / Material A2020-2248 PC-ABS (FR) black	**Test methods (Standard and publication date)** - IEC 60695-11-10:2014 vertical (equivalent to UL94:2020)
Order received on: 2021-01-04 Specimen received on: 2021-01-04 Tests conducted on: 2021-01-12	This report contains: Pages: 3 Diagrams: 0 Tables: 2 Photos: 0 Attachments: 2

Decision rule
EN45545-2:2016, R26 (EL 10): HL1-3 (V0)

Result
Test specimen of nominal thickness 1.5 and 3 mm were subjected to vertical flammability testing according to DIN EN 60695-11-10:2014 (equivalent to UL94:2018). The test result is V-0. This result provides evidence for conformity with EN45545-2:2016, R26 for HL1, HL2 and HL3.

Note
This report replaces a previous report dated 2021-11-15 due to editorial corrections.

The test results of this report are only valid for the specimens tested and only describe the results achieved by the application of the particular tests methods to these specimens. They do not imply any guarantee nor any agreement on a contractual quality or a suitability of the product for a specific purpose. In view of the many factors that may affect processing and application of the product, the test results do not relieve processor from carrying out own investigations and tests. The report does not imply any recommendation for a product. The report shall only be reproduced and passed on in full.
The testing laboratory is accredited by DAkkS Deutsche Akkreditierungsstelle GmbH (German Accreditation Body) according to ISO 17025 for mechanical, thermal, physical-chemical and flammability tests. The accreditation is valid only for the scope of accreditation listed in the Annex to the accreditation certificate (Registration No. D-PL-14121-04-00).

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