Ultrasint® TPU 90A LT

Rubber like | Stiff | Lightweight | High Rebound

Extended TDS

Complete Technical Documentation and Testing Summary

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Technical Data Sheet

Rubber like material, for lightweight parts that require high rebound and high flexibility.

General Properties	Norm	Typical Values
Appearance	-	Natural white powder
Density (printed part)	DIN EN ISO 1183-1	1.05
Density (Bulk Density) [g/cm³]	DIN EN ISO 60	0.5
Mean Particle Size d50 [µm]	ISO 13320	70-90
Glass Transition Temperature [°C]	ISO 11357 (20 K/min)	-35
Melting Temperature [°C]	ISO 11357 (20 K/min)	120 – 150

Tensile Properties	Norm	Typical Values	
		X-Direction	Z-Direction
Tensile Modulus [MPa]	ISO 527-2, 1A, 1mm/min	110	110
Ultimate Tensile Strength [MPa]	DIN 53504, S2, 200mm/min	9	7
Elongation at Break [%]	DIN 53504, S2, 200mm/min	280	120

Flexural Properties	Norm	Typical Values	
		X-Direction	Z-Direction
Tear Resistance (initiation, Graves) [kN/m]	DIN ISO 34-1, B	52	38
Compression Set B (23°C, 72h) [%]	DIN ISO 815-1	27	27
Rebound Resilience [%]	DIN 53512	66	66
Fatigue Behavior (Rossflex, 100 cycles, 23°C)	ASTM D1052-09	Break after 750.000 cycles	Not tested

Impact Properties	Norm	Typical Values	
		X-Direction	Z-Direction
Charpy Notched, 23°C [kJ/m²]	DIN EN ISO 179-1	No break	No break
Charpy Notched, -10°C [kJ/m²]	DIN EN ISO 179-1	No break	No break
Charpy Notched, -50°C [kJ/m²]	DIN EN ISO 179-1	No break	No break
Charpy Notched, -190°C [kJ/m²]	DIN EN ISO 179-1	2,6	1,9

Hardness and Abrasion	Norm	Typical Values	
		X-Direction	Z-Direction
Shore Hardness A	DIN ISO 7619-1	90	90

Other	Norm	Typical Values
Cytotoxicity - Neutral Red	ISO 10993-5 (2009)	PASSED

Mechanical properties overview

Printing Performance

The combination of 3D printer and material has a huge impact on the quality of the parts produced.

The data contained in this publication are based on our current knowledge and experience. In view of the many factors that may affect processing and application of our product, these data do not relieve processors from carrying out their own investigations and tests; neither do these data imply any guarantee of certain properties, nor the suitability of the product for a specific purpose.

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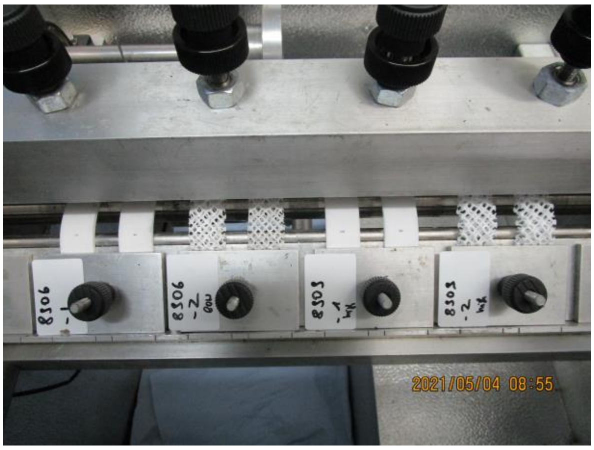
Cyclic Mechanical Testing

When a component operates under conditions where it is repeatedly loaded, it can experience cracking or fracturing which can lead to failure. The goal of any fatigue test is to determine how well a product or material can withstand cyclic fatigue loading forces without failure and is a critical measure for many engineering applications such as automotive suspension system parts or industrial machinery parts among others.

Test method and specimens

The tests have been performed according to ASTM Method D1052, also known as ROSS flex test. All samples were printed in XZ direction for this test.



Test set-up of Ross flex measurement of Ultrasint® TPU 90A LT

Results

The result of this test is measured by the possible growth of the incision that was made before the continuous bending was performed. If the cut grows or a beam in the lattice breaks, that could indicate a limitation for certain applications in the market.

ROSS Flex tests	Results
Plate, 23°C, 90°, 2mm incision, 1mm thickness	Passed >500.000 cycles
Plate, 23°C, 90°,2mm incision, 2mm thickness	Passed >500.000 cycles
Plate, 23°C, 90°,2mm incision, 3mm thickness	Passed >500.000 cycles
Plate, 23°C, 90°,2mm incision, 4mm thickness	Passed >500.000 cycles

Results of fatigue resistance test of Ultrasint® TPU 90A LT

Long-term UV

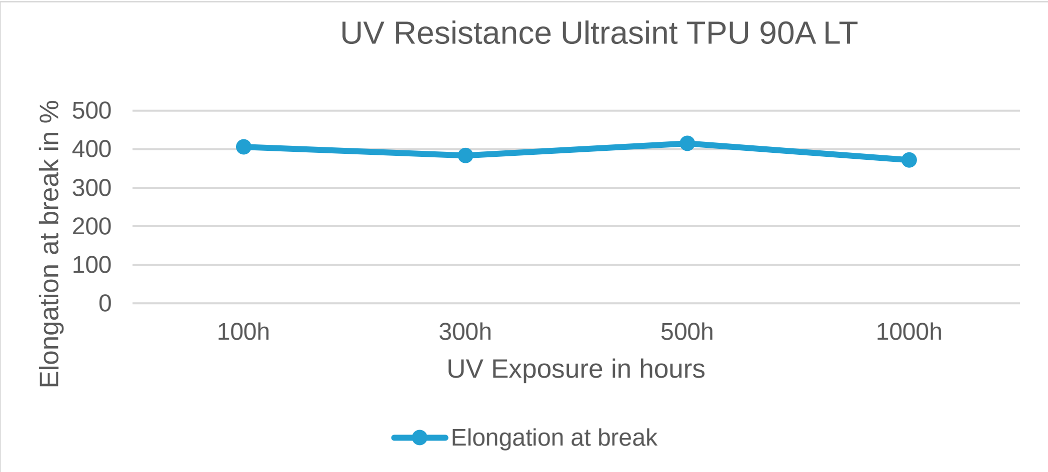
Durability is a key feature for the components in many industries. The materials used in automotive or consumer application for instance, must be put through a variety of severe tests to ensure that they can withstand years of exposure to the elements. Plastics are chemically degraded by the effect of UV radiation. The degree of ageing depends on duration and intensity. In the case of polyurethanes, the effect is seen initially as surface embrittlement. This is accompanied by a yellowing in color and a reduction in mechanical properties. The chemistry behind Ultrasint® TPU 90A LT (aliphatic) has an intrinsically high UV stability in comparison to aromatic materials where degradation is more prominent.

Test method and specimens

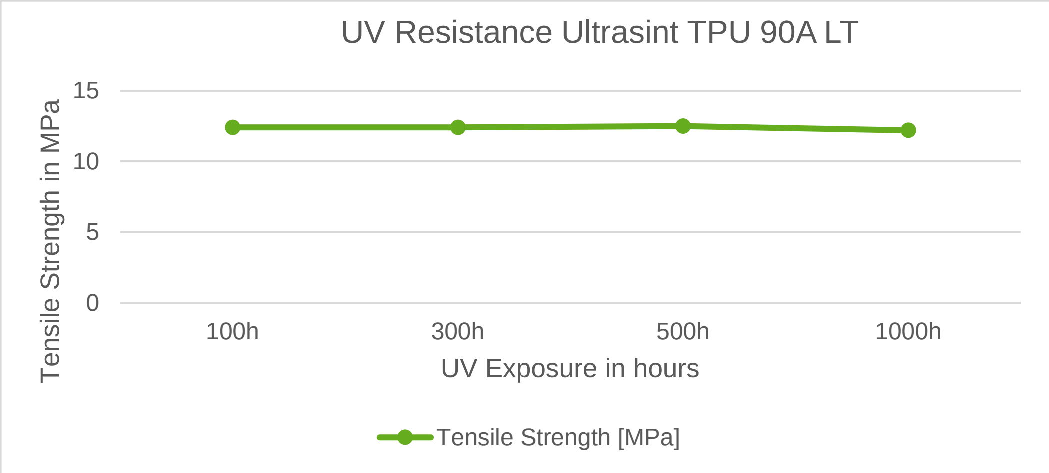
The UV resistance was examined according to Norm ISO 4892-2:2013 Method A.

Mechanical Testing

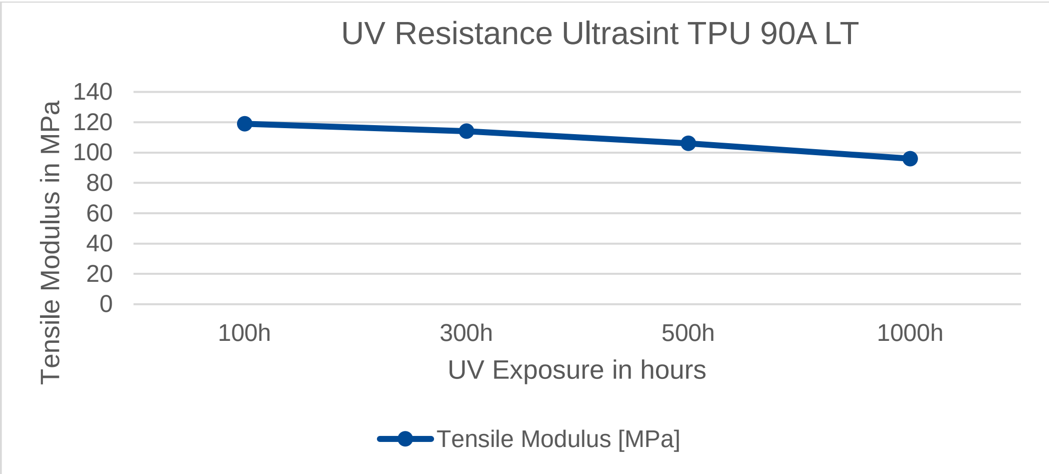
The tensile strength and elongation at break of the tested S2 tensile bars stay fully stable over 1000 hours. A slight shift of the tensile modulus after 500h can be recognized.



UV Resistance of Ultrasint® TPU90A LT according to ISO 4892 – 2A Cycle 1 over 1000h



UV Resistance of Ultrasint® TPU90A LT according to ISO 4892 – 2A Cycle 1 over 1000h



UV Resistance of Ultrasint® TPU90A LT according to ISO 4892 – 2A Cycle 1 over 1000h

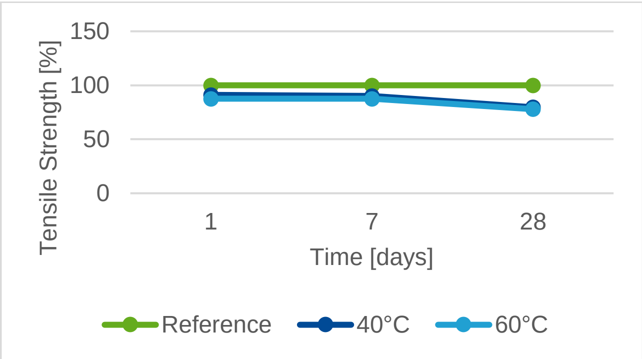
Hydrolysis Resistance

Overall, hydrolysis resistance is important because it helps to ensure the stability, safety, and effectiveness of many different products and materials that are exposed to water.
When TPUs being exposed to hot water, moisture, vapor or tropical climates an irreversible break-down of the polyester chains can occur which would lead to a reduction in mechanical properties.
This effect depends on the chemical nature of the TPU. By chemistry, polyether based polyurethanes such as the Ultrasint® TPU90A LT are more resistant to hydrolysis than polyester bases polyurethanes and better suited for application being in contact with water, moisture our vapor.

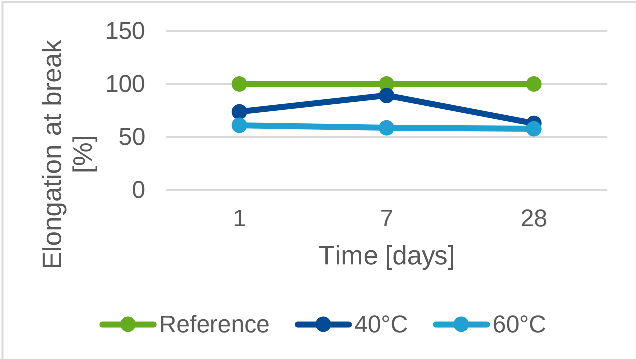
Test method and specimens

Storage of S2 tensile bars (X-direction), immersed in water, at various temperatures (40°C and 60°C)

Results



Change of tensile strength of Ultrasint® TPU90A LT over time of water exposure



Change of elongation at break of Ultrasint® TPU90A LT over time of water exposure

Bio Compatibility: Ultrasint® TPU 90A LT

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Product Information

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Product: Ultrasint TPU90A LT
Revision: 23.10.2023 Version: 1.0

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3D printed test items of the above stated product have fulfilled the requirements of the test as stated below:

Cytotoxicity Testing- Neutral red: Pass
(ISO 10993-5 (2009))

Sampling preparation: The test specimens were dry ice blasted and handled only with disposable medical gloves. The test specimens were wrapped in aluminum foil for shipment to the testing laboratory.

However, the biocompatibility tests were recorded on test specimen of the above referenced product to show compatibility of the material in general. The biocompatibility tests listed are not part of any continuous production protocol. The test assessments reflect only the test specimen and have to be retested on the final product. It remains the responsibility of the device manufacturers and/or end-users to determine the suitability of all printed parts for their respective application.

For notice:
We give no warranties, expressed or implied, concerning the suitability of above-mentioned product for use in any medical device and pharmaceutical applications.

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