Ultrasint® TPU01
Rubber like | High shock absorption | Resistance to fatigue

Extended TDS
Complete Technical Documentation and Testing Summary
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# Technical Data Sheet

Rubber like material, for parts that require shock-absorption, high flexibility and resistance to fatigue.

## General Properties

<table>
<thead>
<tr>
<th>Property</th>
<th>Norm</th>
<th>Typical Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Appearance</td>
<td>-</td>
<td>Natural white powder</td>
</tr>
<tr>
<td>Density (printed part)</td>
<td>DIN EN ISO 1183-1</td>
<td>1.1</td>
</tr>
<tr>
<td>Density (Bulk Density) [g/cm³]</td>
<td>DIN EN ISO 60</td>
<td>0.5</td>
</tr>
<tr>
<td>Mean Particle Size d50 [µm]</td>
<td>ISO 13320</td>
<td>70-90</td>
</tr>
<tr>
<td>Glass Transition Temperature [°C]</td>
<td>ISO 11357 (20 K/min)</td>
<td>-48</td>
</tr>
<tr>
<td>Melting Temperature [°C]</td>
<td>ISO 11357 (20 K/min)</td>
<td>120 – 150</td>
</tr>
</tbody>
</table>

## Tensile Properties

<table>
<thead>
<tr>
<th>Property</th>
<th>Norm</th>
<th>Typical Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tensile Modulus [MPa]</td>
<td>ISO 527-2, 1A, 1mm/min</td>
<td>85</td>
</tr>
<tr>
<td>Ultimate Tensile Strength [MPa]</td>
<td>DIN 53504, S2, 200mm/min</td>
<td>9</td>
</tr>
<tr>
<td>Elongation at Break [%]</td>
<td>DIN 53504, S2, 200mm/min</td>
<td>280</td>
</tr>
</tbody>
</table>

## Flexural Properties

<table>
<thead>
<tr>
<th>Property</th>
<th>Norm</th>
<th>Typical Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flexural Modulus [MPa]</td>
<td>DIN EN ISO 178</td>
<td>75</td>
</tr>
<tr>
<td>Tear Resistance (propagation, Trouser) [kN/m]</td>
<td>DIN ISO 34-1, A</td>
<td>26</td>
</tr>
<tr>
<td>Tear Resistance (initiation, Graves) [kN/m]</td>
<td>DIN ISO 34-1, B</td>
<td>43</td>
</tr>
<tr>
<td>Compression Set B (23°C, 72h) [%]</td>
<td>DIN ISO 815-1</td>
<td>24</td>
</tr>
<tr>
<td>Rebound Resilience [%]</td>
<td>DIN 53512</td>
<td>63</td>
</tr>
</tbody>
</table>

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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The safety data given in this publication is for information purposes only and does not constitute a legally binding MSDS. The relevant MSDS can be obtained upon request from your supplier or you may contact BASF 3D Printing Solutions GmbH directly at sales@basf-3dps.com.
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International Material Data System (IMDS)
This material is listed in the IMDS (International Material Data System), which contains information on materials used in the automotive industry. Access in the database can be granted on request by sharing the IMDS ID with us (sales@basf-3dps.com).

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

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. In some cases, the tests were also performed in post processed parts, both in chemically smoothed samples and coated samples.

<table>
<thead>
<tr>
<th>ROSS Flex tests</th>
<th>Reference</th>
<th>Etched</th>
<th>Coated (Ultracur3D® Coat F)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plate, 23°C, 90°, 2mm incision</td>
<td>No cut growth</td>
<td>No cut growth</td>
<td>No cut growth</td>
</tr>
<tr>
<td>After 100k cycles</td>
<td></td>
<td></td>
<td>------------------------------</td>
</tr>
<tr>
<td>Plate, -10°C, 90°, 2mm incision</td>
<td>No cut growth</td>
<td>No cut growth</td>
<td>No cut growth</td>
</tr>
<tr>
<td>Lattice, 23°C, 90°, no incision</td>
<td>No broken connections</td>
<td>Not tested</td>
<td>Not tested</td>
</tr>
<tr>
<td></td>
<td>After 1mio. cycles</td>
<td></td>
<td></td>
</tr>
<tr>
<td>--------------------------------</td>
<td>--------------------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Plate, 23°C, 60°, 1mm thickness</td>
<td>No cut growth</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Not tested</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Not tested</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Plate, 23°C, 60°, 2mm thickness</td>
<td>No cut growth</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Not tested</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Not tested</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Plate, 23°C, 60°, 3mm thickness</td>
<td>No cut growth</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Not tested</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Not tested</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Plate, 23°C, 60°, 4mm thickness</td>
<td><strong>Broke after 350k cycles</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Not tested</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Not tested</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Results of fatigue resistance test of Ultrasint® TPU01*
Industrial Chemical Resistance

The resistance of plastic materials against chemicals, solvents and other contact substances is an important criterion of selection for many applications. When contacting such substances, the mechanical properties of plastic materials can be affected. This summary table provides a survey in tabular form of the behavior of Ultrasint® TPU01 towards common contact substances.

General chemical resistance depends on the period of exposure, the temperature, the quantity, the concentration and the type of the chemical substance. In the case of chemical degradation of polyurethane, the chemical reaction results in cleavage of the molecular chains. This process is generally preceded by swelling. In the course of degradation, polyurethane loses strength, and in extreme cases this can lead to disintegration of the material.

Test method and specimens
- Test Specimens Standard S2 dumbbells according to DIN 53504

Used hydrocarbons and cleaning chemicals

<table>
<thead>
<tr>
<th>Fluid</th>
<th>Conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td>IRM 901</td>
<td>100°C for 20 hours</td>
</tr>
<tr>
<td>IRM 902</td>
<td>100°C for 20 hours</td>
</tr>
<tr>
<td>IRM 903</td>
<td>100°C for 20 hours</td>
</tr>
<tr>
<td>Fuel</td>
<td>23°C for 42 days</td>
</tr>
<tr>
<td>Lubricating grease Nigrin Mehrzweckfett</td>
<td>23°C for 42 days</td>
</tr>
<tr>
<td>Brake fluid Bosch DOT 4</td>
<td>23°C for 42 days</td>
</tr>
<tr>
<td>Hydraulic fluid (green) febi 46161</td>
<td>23°C for 42 days</td>
</tr>
<tr>
<td>Engine oil - Castrol Edge Professional Long-life III 5W-30</td>
<td>23°C for 42 days</td>
</tr>
<tr>
<td>Gear oil - Valvoline Gear oil Valvoline ATF PRO 236.14</td>
<td>23°C for 42 days</td>
</tr>
<tr>
<td>Engine coolant - BASF Glysantin G48 ReadyMix/50 blue green</td>
<td>23°C for 42 days</td>
</tr>
<tr>
<td>Washing Cycle 10 – With regular soap and softener</td>
<td>1.5h each, 40°C</td>
</tr>
<tr>
<td>Ethanol</td>
<td>24h</td>
</tr>
<tr>
<td>Isopropanol</td>
<td>24h</td>
</tr>
</tbody>
</table>

Mechanical testing

It can be seen from the graphs below that the elongation at break and tensile strength remains stable, for all the specimens after 42 days of exposure. However, Elongation at
break changes almost 50% in case of hydraulic oil, engine oil and brake fluid when the material is exposed to these chemicals. Finally, it is important to underline that the shore hardness also stays constant for all specimens.

Change of mechanical performance of Ultrasint® TPU01 for exposure of chemicals

Volume testing

Slight increase in volume can be seen in some of the chemicals, with the highest change being of almost 9% with IRM 903.

Change of volume of Ultrasint® TPU01 for exposure of chemicals
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® TPU01 (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 both for outdoor weathering condition use and indoor use using conventional accelerated weathering tests at BASF lab as per the Norm ISO 4892-2:2013 Method A and ISO Norm ISO 4892-2:2013 Method B.

Mechanical Testing

When looking at the mechanical properties of the material after performing the test conditions A, the tensile strength stays constant over time while there is a slight drop in the E modulus and elongation at break.

ISO 4892 – 2A Cycle 1 Change of mechanical properties over the course of 1000 hours of UV exposure
When looking at the mechanical properties of the material after performing the test conditions B, the E modulus stays constant over time and so does the elongation at break until exposure time of 500h. The tensile strength drops slightly and then stays constant.

ISO 4892 - 2B Cycle 3 

**Coloration**

In order to measure the coloration variations of the different specimens the CIELAB color model was used. Like geographic coordinates - longitude, latitude, and altitude - in the CIELAB color model L*a*b* color values gives one a way to locate and communicate colors.

- L: Lightness
- a: Red/Green Value
- b: Blue/Yellow Value

As appreciated below, for both test conditions mentioned above, after 1000h, besides some slight staining for the water in method A or some slight darkness in method B, one can confirm that the material plates have good resistance to change its color characteristics, has a good color fastness, since the model L*a*b* color values stay constant. The test results below reflect the durability of Ultrasint® TPU01.
Effect of UV exposure on color of the specimens

<table>
<thead>
<tr>
<th>Time (h)</th>
<th>L-Value</th>
<th>a</th>
<th>b</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>47.6</td>
<td>-0.1</td>
<td>-1.0</td>
</tr>
<tr>
<td>100</td>
<td>43.8</td>
<td>-0.2</td>
<td>-0.8</td>
</tr>
<tr>
<td>300</td>
<td>45.5</td>
<td>-0.2</td>
<td>-0.8</td>
</tr>
<tr>
<td>500</td>
<td>45.2</td>
<td>-0.1</td>
<td>-0.8</td>
</tr>
<tr>
<td>1000</td>
<td>46.1</td>
<td>-0.2</td>
<td>-0.9</td>
</tr>
</tbody>
</table>
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. If polyester based polyurethanes are exposed for lengthy periods to hot water, moisture vapor or tropical climates, an irreversible break-down of the polyester chains occurs through hydrolysis. This results in a reduction in mechanical properties. This effect is more marked in flexible grades, where the polyester content is correspondingly higher than in the harder formulations.

Test method and specimens
Storage of S2 tensile bars (X-direction), immersed in water, at various temperatures (40°C, 60°C, 80°C)

Results

Due to a good stabilization, a degradation of polyester-based Ultrasint® TPU01 is rarely experienced at room temperature, at 40°C the printed parts properties stay constant for over >100 days.

Like for all polyester-based TPU’s, water at high temperature can be a problem, therefore with Ultrasint® TPU01 parts in contact with water at high temperature (>60°C) should be avoided to avoid a decrease in mechanical performance.
Air and Fluid Tightness

Air and fluid tightness are important for many industries and applications because they help to prevent leaks, contamination and loss of efficiency. The goal of this test is to determine how well can Ultrasint® TPU01 parts achieve watertight properties without any additional post processing.

Fluid tightness is key for applications such as ducts, deposits, waterproof covers or hydraulic/ pneumatic systems that work with water, oil, air or other substances, even under pressure. These are the main variables of design, which define the maximum pressure any given part can withstand:

- Wall thickness
- Shape
- Temperature
- Pressure
- Type of fluid

Water Tightness

Certain applications, such as fluid reservoirs or deposits, require a leakage test. The watertightness characterization test has been performed using two different shapes, hollow spheres and vertical cylinders, and seven different wall thicknesses and with water fluid to room temperature.

*Testing conditions for water tightness with hollow spheres*
Testing conditions for water tightness with vertical cylinder

The results after 1 week were the following:

<table>
<thead>
<tr>
<th>Wall thickness</th>
<th>Hollow spheres</th>
<th>Vertical cylinder</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.4 mm</td>
<td>not watertight</td>
<td>watertight</td>
</tr>
<tr>
<td>0.5 mm</td>
<td>not watertight</td>
<td>watertight</td>
</tr>
<tr>
<td>0.6 mm</td>
<td>watertight</td>
<td>watertight</td>
</tr>
<tr>
<td>0.7 mm</td>
<td>watertight</td>
<td>watertight</td>
</tr>
<tr>
<td>0.8 mm</td>
<td>watertight</td>
<td>watertight</td>
</tr>
<tr>
<td>0.9 mm</td>
<td>watertight</td>
<td>watertight</td>
</tr>
<tr>
<td>1.0 mm</td>
<td>watertight</td>
<td></td>
</tr>
</tbody>
</table>

Testing results after 1 week

Burst Pressure

The pressure resistance of components is important in many areas such as security, cost or overall part performance. The results on such test are key to meet the requirements of hydraulic components, automotive components or hoses, pipes and pipe connections for example.

After choosing different geometries to be tested, the pressure is incremented from 25mbar/s = 1.5 bar/min until part breaks. The tested geometries were hollow spheres, plates printed horizontally in XY and vertically in Z, each in two wall thicknesses to obtain good reproducibility.
As can be seen in the graph, good homogeneity between XY and Z directions is accomplished in the plates which can withstand higher burst pressures than plates. This could be due to small inhomogeneities in wall thicknesses and varying overlap of printed layers in the sphere, which leads more easily to weak spots.
Air Tightness

After choosing different geometries to be tested, the pressure is incremented in steps from 25mbar/s = 1.5bar/min until part breaks or up to a maximum of 5 bar. The tested geometries were hollow spheres, plates printed horizontally in XY and vertically in Z in different thicknesses. The main difference between the air tightness test and the burst pressure test is that the first is performed under water and leakage is detected through bubble formation and recorded pressure drop.

![Graph showing pressure over time for different geometries](image)

**Air tightness of various geometries in Ultrasint® TPU01**

<table>
<thead>
<tr>
<th>Wall thickness</th>
<th>Hollow spheres</th>
<th>XY plates</th>
<th>Z plates</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 mm</td>
<td>not airtight</td>
<td>not airtight</td>
<td>airtight up to 2 bar</td>
</tr>
<tr>
<td>1.5 mm</td>
<td>not airtight</td>
<td>airtight up to 2 bar</td>
<td>airtight up to 5 bar</td>
</tr>
<tr>
<td>2 mm</td>
<td>not airtight</td>
<td>airtight up to 2 bar</td>
<td>airtight up to 5 bar</td>
</tr>
<tr>
<td>3 mm</td>
<td>not airtight</td>
<td>airtight up to 4 bar</td>
<td>airtight up to 5 bar</td>
</tr>
</tbody>
</table>

**Results of air tightness measurement**
Flame and Temperature Resistance

Flame Resistance Properties

Ultrasint® TPU01 does not contain any flame retardants, therefore the flammability behavior is in principle comparable to regular plastics.

Two measurements were done for flame resistance, UL 94 and FMVSS 302 specially for car interior applications.

- **UL 94 --> HB rating for t ≥ 1.0mm**

  UL 94 Blue Card

  - **FMVSS 302 (car interior applications)**

  Heat stability tests are of central importance for materials in car interiors and aim to determine the burn resistance capabilities of materials under standardized conditions.

  - Tests are subject to geometry
  - Thin plates or thin/fine lattices are to have the worst results
  - Test plates 356x102mm:
Result of 5 samples:

<table>
<thead>
<tr>
<th>Orientation</th>
<th>Thickness</th>
<th>Max. burning rate (limit ≤ 102mm/min)</th>
</tr>
</thead>
<tbody>
<tr>
<td>XY</td>
<td>1.16 mm</td>
<td>97 mm/min</td>
</tr>
<tr>
<td>Z</td>
<td>1.32 mm</td>
<td>63 mm/min</td>
</tr>
</tbody>
</table>

*Results of flamability resistance test of Ultrasint TPU01*

**Temperature Resistance**

The temperature performance of a material is key to enable a broad range of applications and industries. To validate the temperature performance of Ultrasint® TPU01, different temperature exposure tests were performed and mechanical tests analyzed. Even though the shape and integrity of the 3D printed parts were not compromised, there is a loss in mechanical properties with the increase of temperature. Results of the testing can be seen below:

*Change of mechanical properties in high temperature exposure in X and Z direction*
Vehicle Interior Air Quality

When a component needs to go inside a vehicle interior it is a must that it is important that it passes stringent odor, fogging, and emissions standards required for interior automotive applications. Automotive requirements might differ from company to company.

Standards and General Targets

<table>
<thead>
<tr>
<th>Test Method</th>
<th>Description</th>
<th>General Target*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Odor</td>
<td>VDA 270 Determination of the olfactory characteristics of car materials</td>
<td>&lt; 3</td>
</tr>
<tr>
<td>Formaldehyde</td>
<td>VDA 275 Control of formaldehyde emissions</td>
<td>&lt; 5 mg/kg</td>
</tr>
<tr>
<td>Volatile Organics (VOC)</td>
<td>VDA 276 Determination of organic substances as emitted from automotive interior products using a 1 m³ test cabinet</td>
<td></td>
</tr>
<tr>
<td>Volatile Organics (VOC)</td>
<td>VDA 278 Thermal desorption. Emissions of volatile compounds from materials</td>
<td>&lt; 220 ppm</td>
</tr>
<tr>
<td>Fogging</td>
<td>DIN 75201 Method B Fogging behavior. Condensation of semi-volatile compounds that generate lack of visibility</td>
<td>&lt; 1 mg</td>
</tr>
<tr>
<td>Semi-Volatile Organics (FOG)</td>
<td>VDA 278 Emissions of semi-volatile compounds from materials</td>
<td>&lt; 220 ppm</td>
</tr>
</tbody>
</table>

*Testing standards and general targets for vehicle interior air quality
*Limits are manufacturer dependent, given are just typical limit values as an indication.

Results

The table below displays the results of analysis conducted on interior parts produced from Ultrasint® TPU01. The test specimens have been sandblasted and further processed after printing. Details and further data are available upon request.

SB = Sandblasted
PR = Processing
CS = Chemically Smoothed
CL = Colored with Colored Ultracur3D® Coating
### Results of VDA tests

In terms of certification, Ultrasint® TPU powders contain regulatory documents for Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH), End-of-Life Vehicle (ELV), Global Automotive Declarable Substance List (GADSL) and are listed in the International Material Data System (IMDS) for automotive industry. These and further certifications are available upon request.
Bio Compatibility: Ultrasint® TPU01 and Ultrasint® TPU01

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

- Cytotoxicity Testing: Neutral red: Pass
  (ISO 10993-5 (2009))
- In vitro Skin Irritation Testing: Human Skin Model: Pass
  (OECD Guideline No. 439)
- In vivo Sensitization Testing: Local Lymph Node Assay: Pass
  (ISO 10993-10 (2013); OECD Guideline No. 429)

Sampling preparation: The test specimens were cryo-biobanked 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 manufacturer and/or end-users to determine the suitability of all printed parts for their respective application.

Disclaimer:
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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This product information was generated electronically and is valid without signature.

Please request the official biocompatibility statement to your sales representative.
Bio Compatibility: Ultrasint® TPU01 and Ultrasint® TPU01 + vapour smoothing

Product Information

Product:
Ultrasint TPU01 for HP Jet Fusion printer + vapour smoothing
Revision: 13.02.2023
Version: 1.0

Contact:
BASF 3D Printing Solutions GmbH
Speyer Straße 4
69115 Heidelberg, Germany
sales@basf-3dps.com

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


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 for vapour smoothing externally with an AMT Post Pro 3D.

According to our testing institutes the test result show no indication against the use of the test specimen in skin contact application. Please note, that the biocompatibility tests indicated above 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.

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This product information was generated electronically and is valid without signature.

Please request the official biocompatibility statement to your sales representative.
Food Contact

Ultrasint® TPU01 is not produced according to any food contact guidelines and **does not have food contact approval.** The HP fusing agent does not have food contact approval. Applications close to food, but with no direct contact, e.g. robotic grippers: have to be investigated case-by-case, with a risk analysis. Alternatively, there would be the possibility to use a functional barrier, e.g. FDA accepted functional barriers are aluminum foil, and polyethylene terephthalate film (at least 25µm thick for room-temperature applications).
Material Model & FEA Simulation

3D simulation helps to speed up the engineering process using a digital twin. Backed up by decades of simulation experience in injection molding, we provide material models optimized for 3D printing considering its characteristics (e.g. anisotropy, temperature, strain-rates, etc.) and run FEA simulations to understand part performance.

**Material modeling workflow**

We offer 3 easy methods to get started:

- **Raw Material Data**
  - **Starter:** Get the curves behind our TDS data to start basic simulation work.
  - **Premium:** We run the simulation for you. We help you to speed up your engineering process and increases confidence in part performance using a digital twin of your part.

- **3D Simulation**

- **Material Model as a Service**
  - **Enterprise:** Use our in-house developed material models for 3D-Printing incl. anisotropy of the process and FEA support of our experienced virtual engineers.
  - Anisotropic
  - Nonlinear
  - Strain-rate sensitive
  - Tensile-compression asymmetry
  - Failure modelling
  - Temperature dependent

**Ultrasim® 3D Simulation (FEA)**

<table>
<thead>
<tr>
<th>Available temperatures</th>
<th>Strain rate / loads</th>
<th>Print Orientation / Anisotropy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td>23°C</td>
<td>High Quasi static</td>
</tr>
</tbody>
</table>

**Ultrasint® TPU01**

- Validated, available as Material Data Set (can be converted into a Ultrasim® Material Model)
- Validated, available via Ultrasim® Material Model
- Preliminary

**Simulation material availability**

Support is available on request: ultrasim3d-support@basf-3dps.com