

# Ultracur3D® ST 45 B

Tough | Fast | Black

## Extended TDS

Complete Technical Documentation  
and Testing Summary

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# Technical Data Sheet

**Multi-purpose resin with optimum toughness and processing speed.**

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

Any descriptions, drawings, photographs, data, proportions, weights etc. given herein may change without prior information and do not constitute the agreed contractual quality of the product. It is the responsibility of the recipient of our products to ensure that any proprietary rights and existing laws and legislation are observed.

The safety data given in this publication is for informational 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 Mass Additive Manufacturing GmbH directly at [sales@forward-am.com](mailto:sales@forward-am.com).

| General Properties     | Method                             | Typical Values         |
|------------------------|------------------------------------|------------------------|
| Appearance             | -                                  | Black                  |
| Viscosity, 25°C        | Cone/Plate Rheometer <sup>1)</sup> | 320 mPas               |
| Viscosity, 30°C        | Cone/Plate Rheometer <sup>1)</sup> | 230 mPas               |
| Density (Printed Part) | ASTM D792                          | 1.2 g/cm <sup>3</sup>  |
| Density (Liquid Resin) | ASTM D4052-18a                     | 1.12 g/cm <sup>3</sup> |

| Tensile Properties <sup>2)</sup> | Method    | Typical Values |
|----------------------------------|-----------|----------------|
| E Modulus                        | ASTM D638 | 2000 MPa       |
| Ultimate Tensile Strength        | ASTM D638 | 53 MPa         |
| Elongation at Break              | ASTM D638 | 21 %           |

| Flexural Properties | Method    | Typical Values |
|---------------------|-----------|----------------|
| Flexural Modulus    | ASTM D790 | 2100 MPa       |
| Flexural Strength   | ASTM D790 | 95 MPa         |

| Impact Properties               | Method     | Typical Values        |
|---------------------------------|------------|-----------------------|
| Notched Izod (Machined), -30°C  | ASTM D256  | 20 J/m                |
| Notched Izod (Machined), 23°C   | ASTM D256  | 30 J/m                |
| Unnotched Izod, 23°C            | ASTM D4812 | 515 J/m               |
| Notched Charpy (Machined), 23°C | ISO 179-1  | 2.6 kJ/m <sup>2</sup> |

| Thermal Properties                         | Method     | Typical Values |
|--------------------------------------------|------------|----------------|
| HDT at 0.45 MPa                            | ASTM D648  | 63°C           |
| HDT at 1.82 MPa                            | ASTM D648  | 54°C           |
| Glass transition temperature (DMA, tan(d)) | ASTM D4065 | 100°C          |

| Fire, Smoke, Toxicity (FST) properties | Method             | Typical Values                         |
|----------------------------------------|--------------------|----------------------------------------|
| Flammability                           | UL 94              | HB (1.5 mm)                            |
| Glow-wire Test                         | IEC 60695-2-12/-13 | GWIT: 625°C<br>GWFI: 600°C<br>(2.0 mm) |

| Dielectric/Electric Properties | Method         | Typical Values |
|--------------------------------|----------------|----------------|
| Dielectric Strength            | DIN EN 60243-1 | 29 kV / mm     |

| Automotive                                  | Norm       | Typical Values |
|---------------------------------------------|------------|----------------|
| Volatile Organic Compounds Automotive (VOC) | VDA 278    | 366 ppm        |
| Fogging Automotive (FOG)                    | VDA 278    | 112 ppm        |
| Fogging Automotive (FOG)                    | DIN 75201B | 0.96 mg        |

| Abrasion                                        | Norm                            | Typical Values                     |
|-------------------------------------------------|---------------------------------|------------------------------------|
| Scratch resistance<br>(in print direction)      | DIN EN ISO 1518-1 <sup>3)</sup> | Up to 35N<br>(no visible abrasion) |
| Scratch resistance<br>(against print direction) | DIN EN ISO 1518-1 <sup>3)</sup> | Up to 25N<br>(no visible abrasion) |

| Biocompatibility           | Method                | Typical Values     |
|----------------------------|-----------------------|--------------------|
| Cytotoxicity – Neutral Red | EN ISO 10993-5 (2009) | PASS <sup>4)</sup> |

| Other                                      | Method     | Typical Values |
|--------------------------------------------|------------|----------------|
| Hardness Shore D                           | ASTM D2240 | 80             |
| Water Absorption,<br>Short-Term (24 hours) | ASTM D570  | >5%            |

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#### Mechanical properties overview

- 1) Determined with TA-Instrument DHR rheometer, cone/plate, diameter 60 mm, shear rate 100 s<sup>-1</sup>
- 2) Tensile type ASTM D638 type IV, Pulling speed 5 mm/min
- 3) Constant-loading method
- 4) For the statement on Biocompatibility data see Chapter: [Biocompatibility](#).
- 5) If not noted otherwise, all specimens are 3D printed. Samples were tested at room temperature, 23°C. ASTM sample size (L x W x H): ASTM D790 80 x 4 x 10 mm, ASTM D256 63 x 3.2 x 12 mm, ASTM D4812 63 x 3.2 x 12 mm, ASTM D648 127 x 3.2 x 13 mm, ISO 179-1 80 x 4 x 10 mm, UL 94 125 x 1.5 x 13 mm, IEC 60695-2-12/-13 60 x 2 x 60 mm.

## Printing Performance

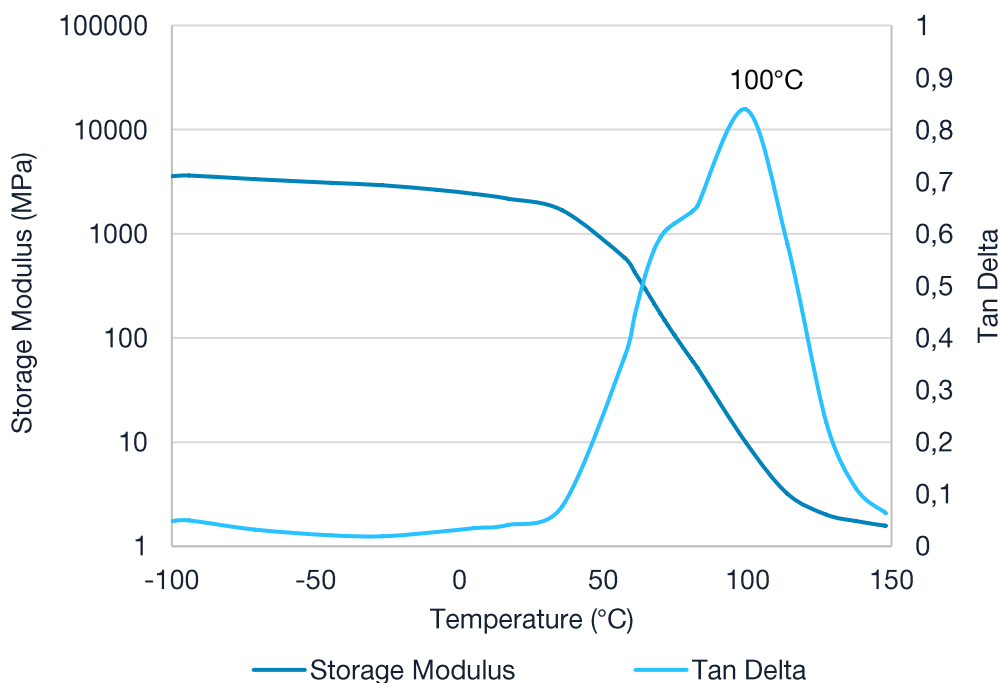
The combination of 3D printer and material has a huge impact on the quality of the parts produced. The measured design characteristics as well as the printing speed can be found in the [Printing Evaluation Guideline of Ultracur3D® Resins.](#)

# Dynamic Mechanical Analysis (DMA)

In this DMA measurement, a cyclic strain is applied to the sample, and the response of the sample is recorded as a function of temperature. This can give a good impression of the changes in material behavior, both at low and high temperatures. The measured Storage modulus is a good indication of the stiffness of the material. The maximum in Tan Delta gives the glass transition temperature.

|                   | Setting                             |
|-------------------|-------------------------------------|
| Measurement       | Strain-controlled                   |
| Temperature sweep | 1°C / min                           |
| Strain            | 0.023% (linear viscoelastic regime) |
| Type of loading   | Dual cantilever                     |
| Frequency         | 1 Hz                                |

Testing conditions DMA



DMA curve

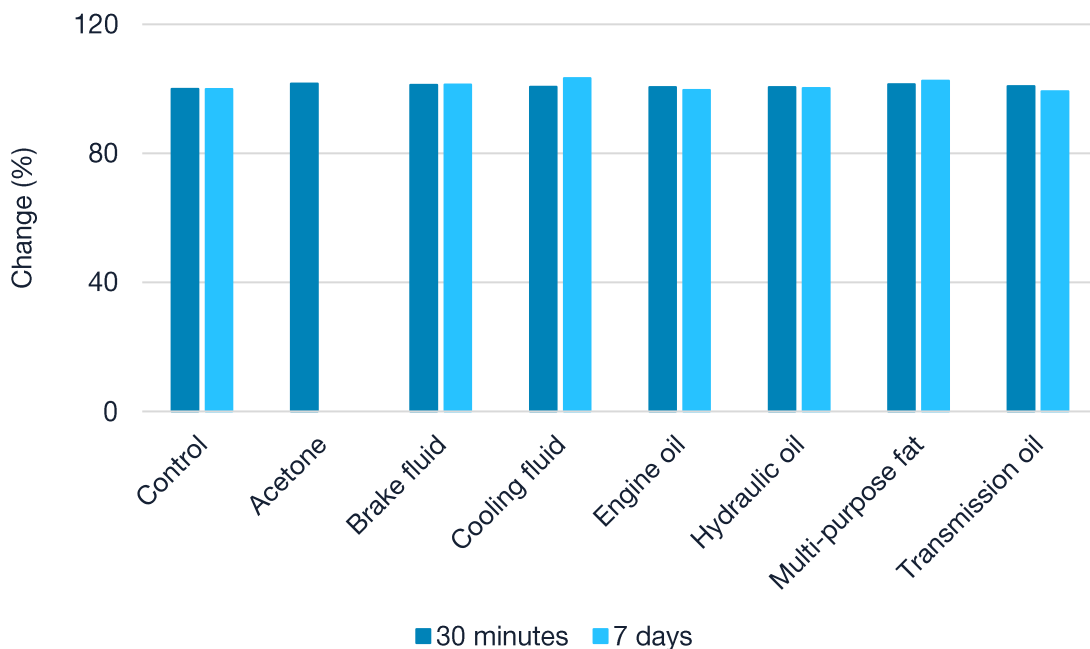
# Industrial Chemical Resistance

The resistance of resin materials against chemicals, solvents and other contact substances is an important criterion of selection for many industrial applications. General chemical resistance depends on the period of exposure, the temperature, the quantity, the concentration and the type of the chemical substance. When exposed to industrial chemicals, the chemical bonds of photopolymers can break or degrade, causing a change in the mechanical properties.

## Test Method and Specimens

ASTM D638 type IV tensile bars were soaked in each fluid at room temperature, one set for 30 minutes and one set for 7 days. Upon completion of the soaking time, the parts were removed from the test fluid and were dried to measure the weight and the mechanical properties.

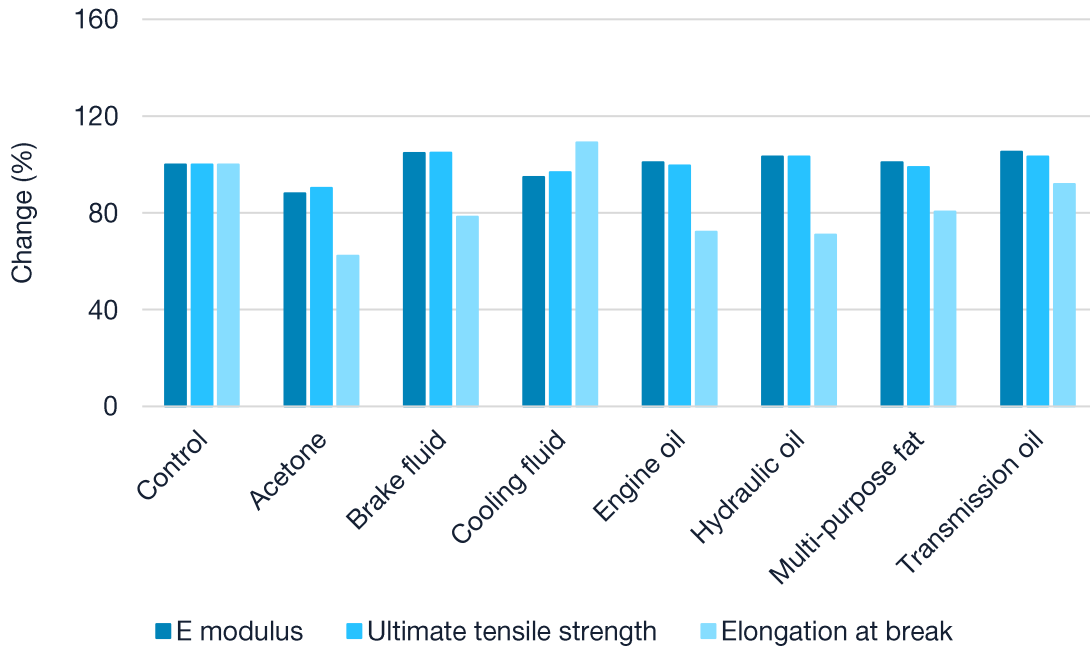
## Weight Measurement



*Change in weight after immersion time*

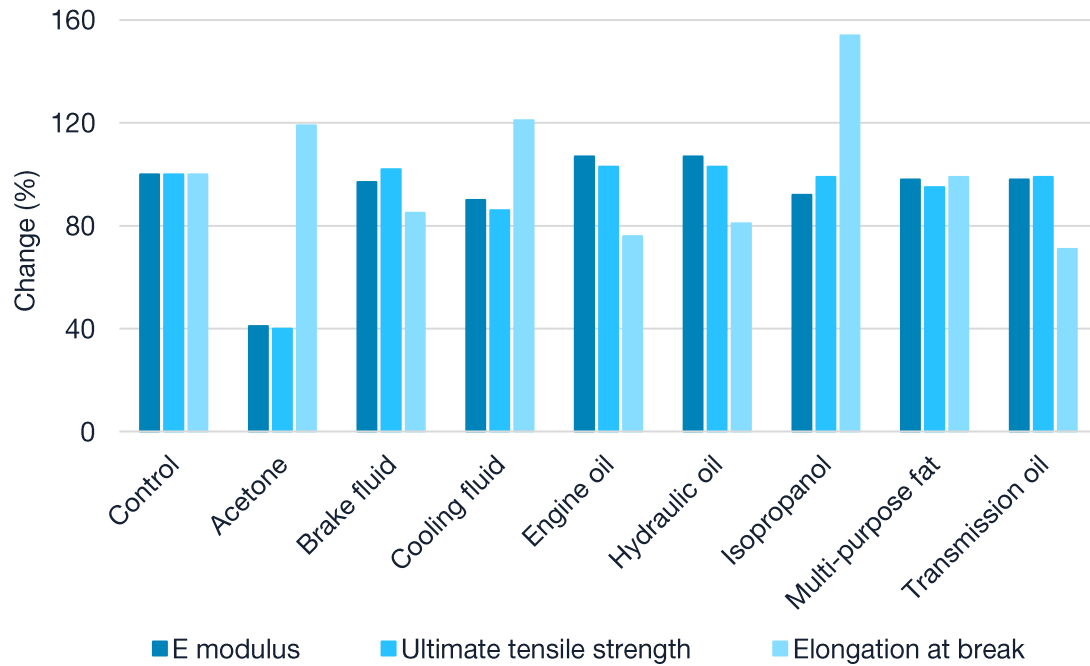
## Mechanical Testing

### 30 minutes



Change in mechanical properties after 30 minutes immersion

### 7 days



Change in mechanical properties after 7 days immersion

# Sterilization

Sterilization is an essential requirement in many applications especially when used in the medical field. Testing not only ensures the material quality but also determines how effectively the chosen sterilization process is eliminating potential microorganisms.

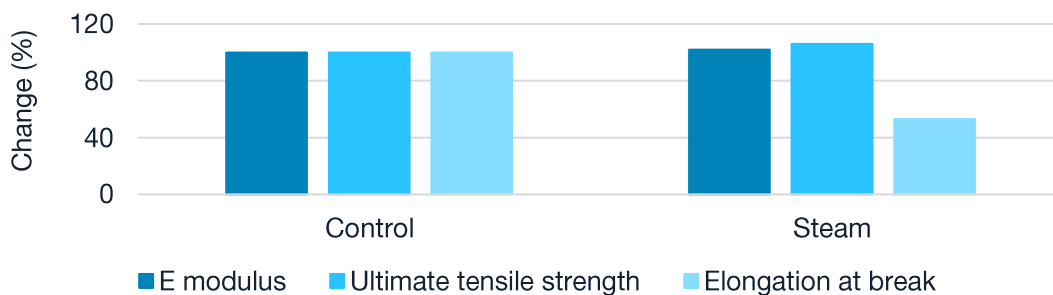
## Test Method and Specimens

### Steam Sterilization

| Steam sterilization parameters | Settings   |
|--------------------------------|------------|
| Vacuum pulses                  | 4          |
| Temperature                    | 134°C      |
| Pressure                       | 210 kPa    |
| Holding time                   | 4 minutes  |
| Drying time                    | 20 minutes |

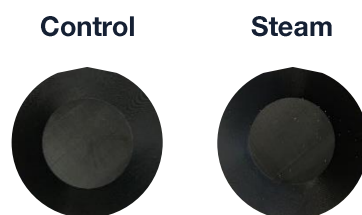
*Testing conditions steam sterilization*

## Mechanical Testing



*Change in mechanical properties after sterilization*

## Coloration



*Color samples before and after sterilization*

# Biocompatibility

**Product: Ultracur3D® ST 45 B**

Revision: 23<sup>rd</sup> of November 2020

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

**Cytotoxicity Testing- Neutral Red:**

(EN ISO 10993-5 (2009))

The biocompatibility tests were recorded on test specimen of the 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 mentioned product for use in any medical device and pharmaceutical applications.

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