

Ultracur3D® ST 45 B

Tough | Fast | Black

Extended TDS

Complete Technical Documentation
and Testing Summary



Version: 2.2

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Technical Data Sheet

Multi-purpose resin with optimum toughness and processing speed.

General Properties	Norm	Typical Values
Appearance	-	Black
Viscosity, 25°C	Cone/Plate Rheometer ¹⁾	320 mPas
Viscosity, 30°C	Cone/Plate Rheometer ¹⁾	230 mPas
Density (Printed Part)	ASTM D792	1.2 g/cm ³
Density (Liquid Resin)	ASTM D4052-18a	1.12 g/cm ³
Tensile Properties ²⁾	Norm	Typical Values
E Modulus	ASTM D638	2000 MPa
Ultimate Tensile Strength	ASTM D638	53 MPa
Elongation at Break	ASTM D638	21%
Flexural Properties	Norm	Typical Values
Flexural Modulus	ASTM D790	2100 MPa
Flexural Strength	ASTM D790	95 MPa
Impact Properties	Norm	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 D256	515 J/m
Notched Charpy (Machined), 23°C	ISO 179-1	2.6 kJ/m ²
Thermal Properties	Norm	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

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.

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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 Forward AM directly at sales@forward-am.com.

Thermal Properties	Norm	Typical Values
Flammability	UL 94 (1.5 mm)	HB
Glow-wire Test	IEC 60695-2-12/-13 (2 mm)	GWIT: 625°C GWFI: 600°C
Dielectric/Electric Properties	Norm	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
Biocompatibility	Norm	Typical Values
Cytotoxicity – Neutral Red	ISO 10993-5 (2009)	PASS ³⁾
Abrasion	Norm	Typical Values
Scratch resistance (in print direction)	DIN EN ISO 1518-1 ⁴⁾	Up to 35N (no visible abrasion)
Scratch resistance (against print direction)	DIN EN ISO 1518-1 ⁴⁾	Up to 25N (no visible abrasion)
Other	Norm	Typical Values
Hardness Shore D	ASTM D2240	80
Water Absorption, Short-Term (24 hours)	ASTM D570	>5%

Mechanical properties overview

- 1) Determined with TA-Instrument DHR rheometer, cone/plate, diameter 60 mm, shear rate 100 s⁻¹
- 2) Tensile type ASTM D638 type IV, Pulling speed 5 mm/min
- 3) For the statement on Biocompatibility data see Chapter: [Biocompatibility](#).
- 4) Constant-loading method
- 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 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.

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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](#).

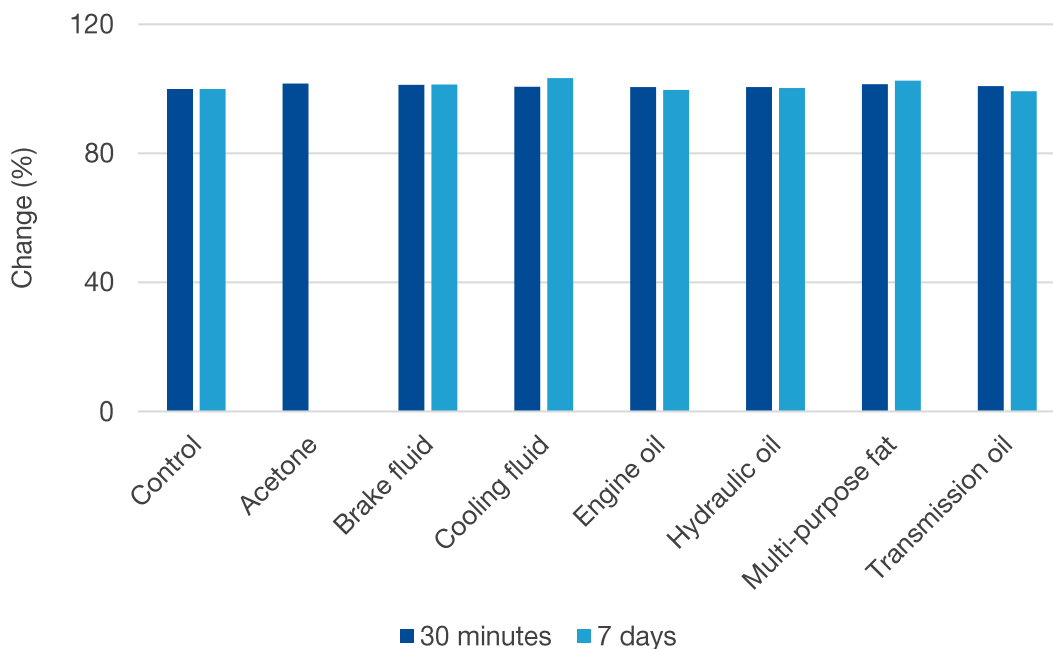
Industrial Chemical Resistance

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.

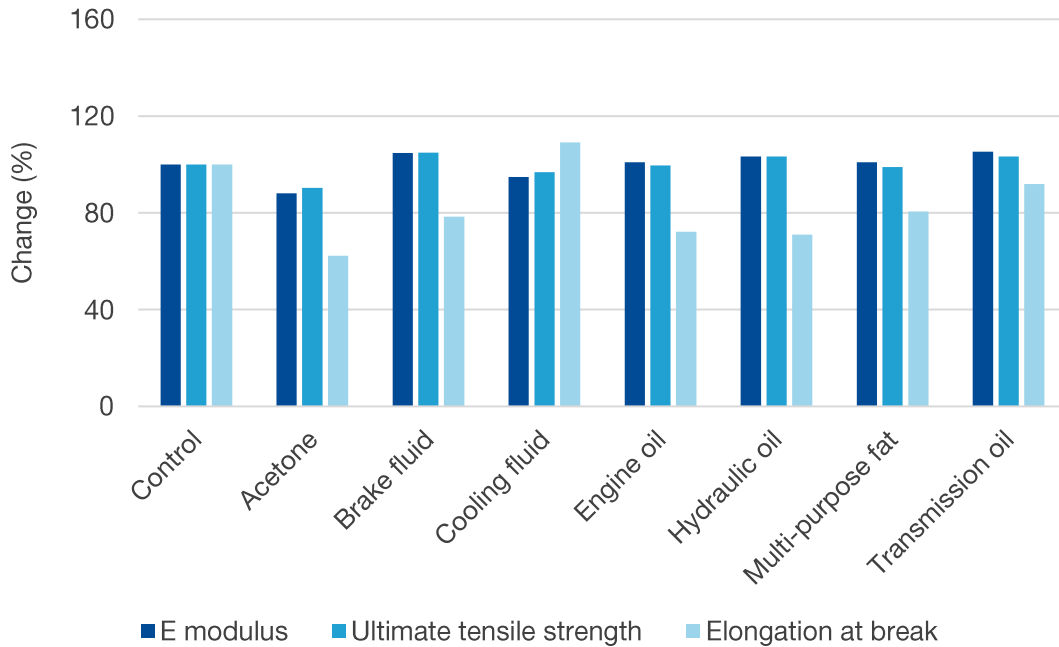
Weight Measurement



Change in weight after immersion time

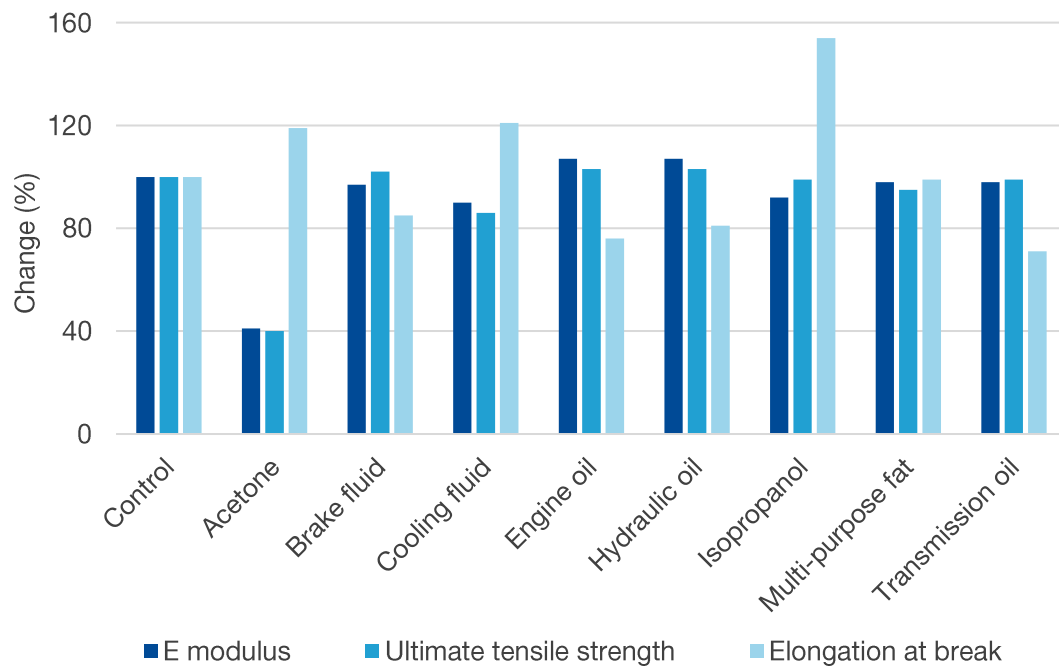
Mechanical Testing

30 minutes



Change in mechanical properties after 30 minutes immersion

7 days



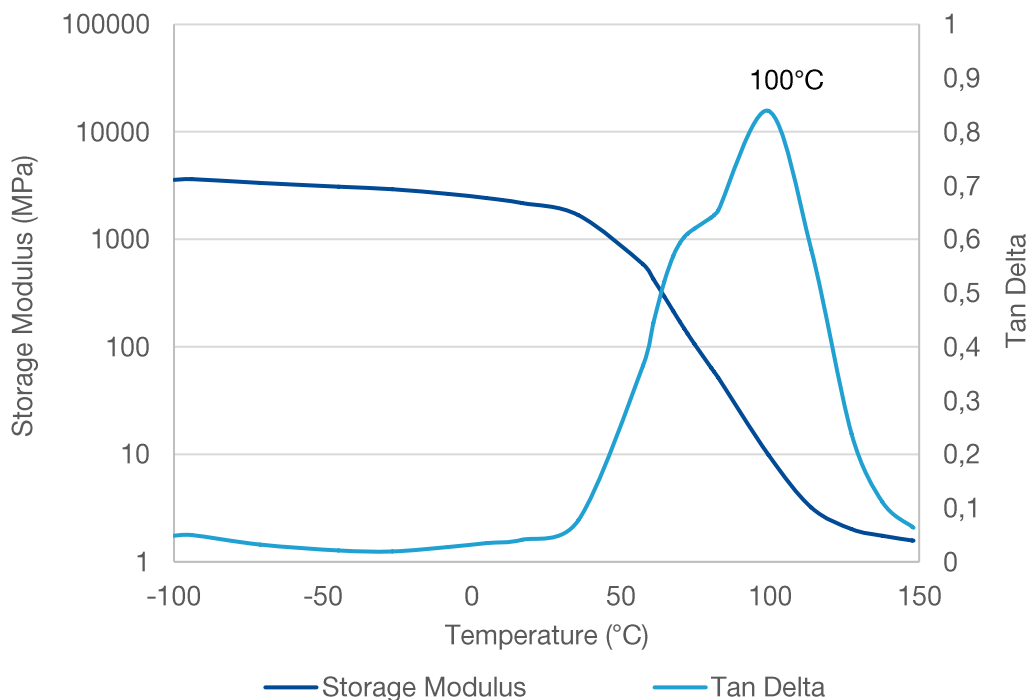
Change in mechanical properties after 7 days immersion

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

Biocompatibility

Product: Ultracur3D® ST 45 B

Revision: 23rd of November 2020

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

Cytotoxicity Testing- Neutral Red:

(ISO 10993-5 (2009))

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:

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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.

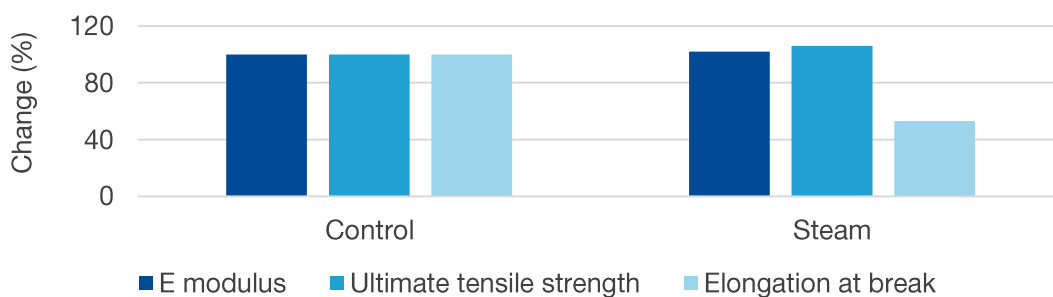
Test Method and Specimens

Steam Sterilization

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

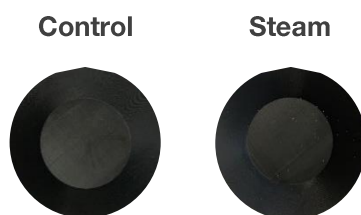
Testing conditions steam sterilization

Mechanical Testing



Change in mechanical properties after sterilization

Coloration



Color samples before and after sterilization