forward am

Ultracur3D® FL 300

Flexible | 40 A | Clear

Extended TDS

Complete Technical Documentation and Testing Summary

Version 2.1

Contents

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Technical Data Sheet

Flexible resin with superior elongation and softness (Shore 40 A).

General Properties	Method	Typical Values
Appearance	-	Clear
Viscosity, 25°C	Cone/Plate Rheometer[1)]	200 mPas
Viscosity, 30°C	Cone/Plate Rheometer[1)]	160 mPas
Density (Printed Part)	ASTM D792	1.07 g/cm³
Density (Liquid Resin)	ASTM D4052-18a	1.01 g/cm³

Tensile Properties[2)]	Method	Typical Values
Ultimate Tensile Strength	ASTM D412 C	5 MPa
Elongation at Break	ASTM D412 C	245%

Mechanical Properties	Norm	Typical Values
Tear Strength (Graves)	ASTM D624 type C	9 N/mm
Rebound Resilience	ASTM D7121	16%
Compression set at 23°C, 72h (constant deflection)	ASTM D395-B	31%
Rossflex, -10°C, 60° angle	ASTM D1052 (2 mm)	>100.000 Cycles (no crack propagation)
Rossflex, 23°C, 60° angle	ASTM D1052 (2 mm)	>100.000 Cycles (no crack propagation)

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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Thermal Properties	Method	Typical Values
Glass transition temperature (DMA, tan(d))	ASTM D4065	-13°C

Biocompatibility	Method	Typical Values
Human Skin Irritation[3)]	EN ISO 10993-10 (2013)	PASS[4)]
In vitro Sensitization Testing-KeratinoSens™	prEN ISO 10993-10 (2020)	PASS[4)]
In Vitro Skin Irritation	OECD Guideline No. 439	PASS[4)]

Other	Method	Typical Values
Hardness Shore A	ASTM D2240	40
Water Absorption, Short-Term (24 hours)	ASTM D570	1.74%
Water Absorption, Long-Term (>400 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) Pulling speed 500 mm/min
3) Patch test on 10 volunteers
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 D1052 150 x 2 x 20 mm

Printing Performance

The combination of 3D printer and material has a huge impact on the quality of the parts produced. The measured lattice design characteristics can be found in the Design Guidelines for Lattice Structures of Ultracur3D® Resins.

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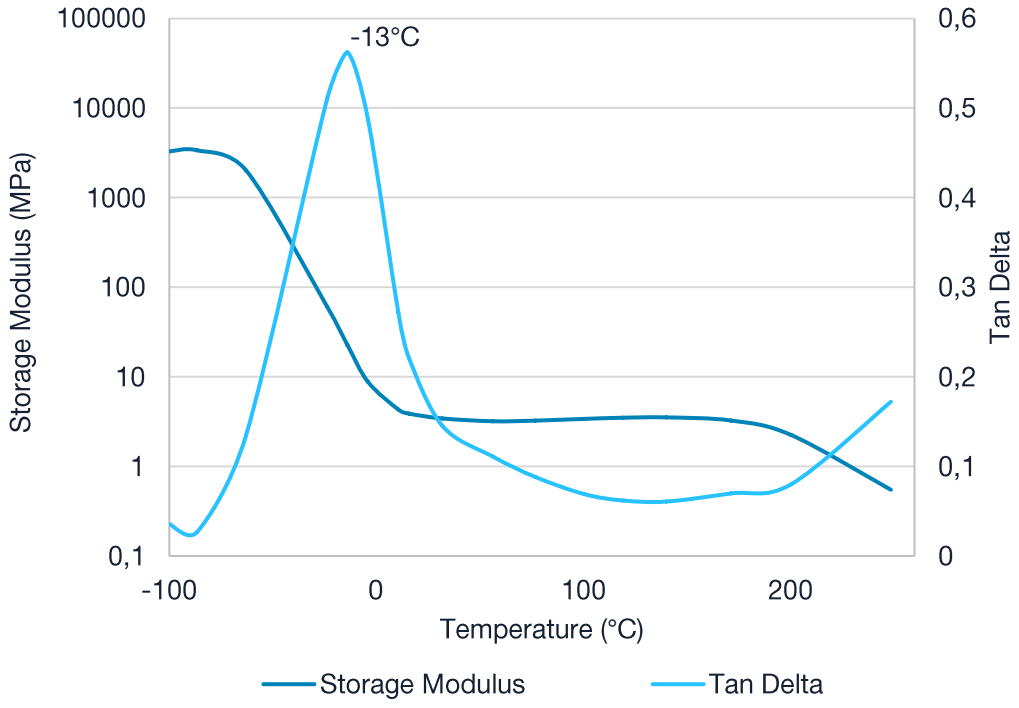
Dynamic Mechanical Analysis (DMA)

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	3°C / min
Strain	0.19% (linear viscoelastic regime)
Type of loading	Single cantilever
Frequency	1 Hz

Testing conditions DMA



DMA curve

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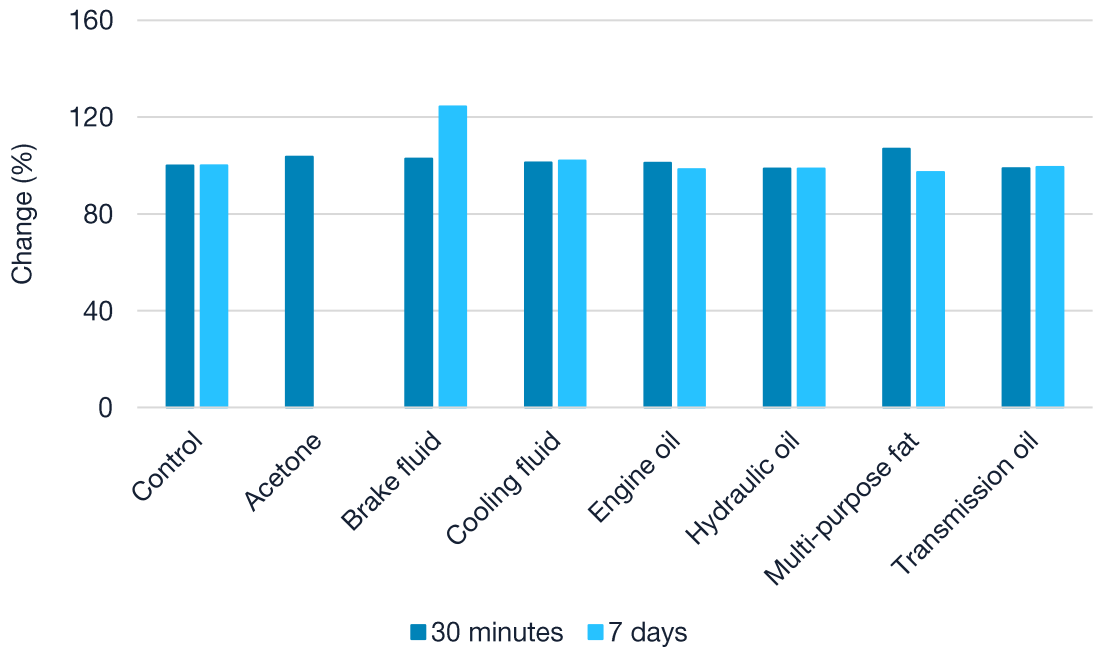
Industrial Chemical Resistance

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 D412 C 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.

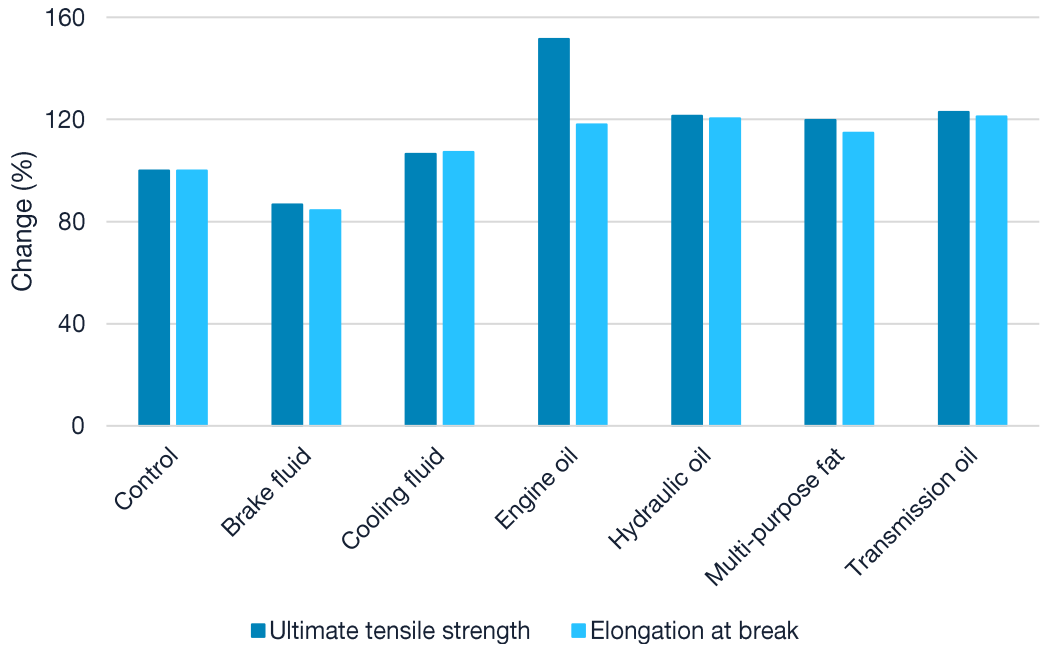
Weight Measurement



Change in weight after immersion time

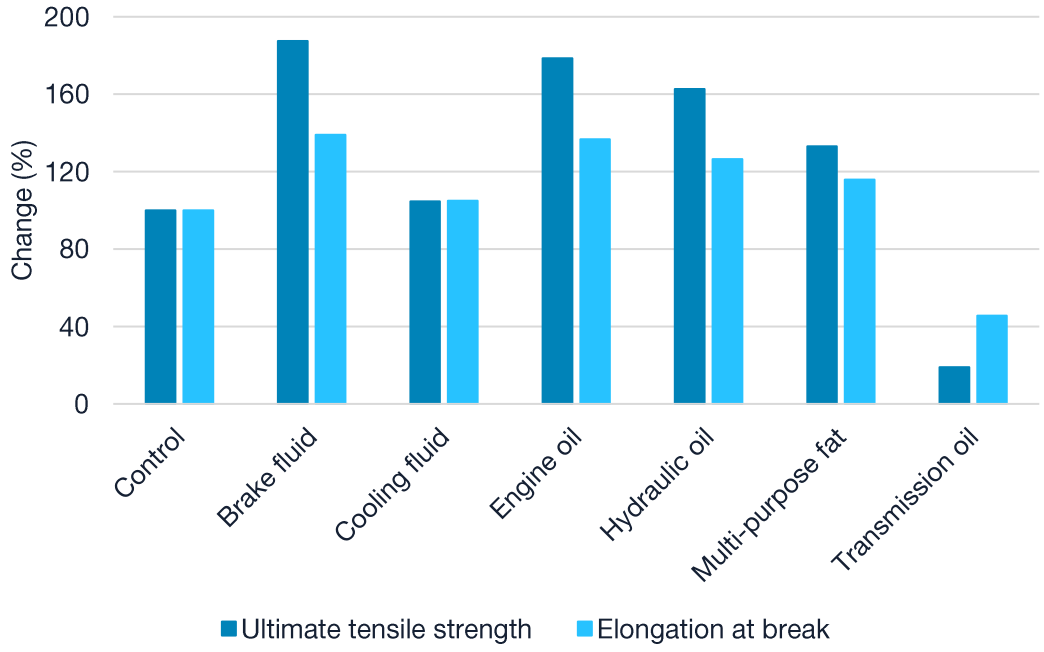
Mechanical Testing

30 minutes



Change in mechanical properties after 30 minutes immersion

7 days



Change in mechanical properties after 7 days immersion

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Long-Term UV

Durability is a key feature for the components utilized within many industries, as they expect the materials used to withstand years of exposure to the elements. Through the effects of UV radiation, photopolymers can degrade over time. The aging can be caused by the influence of UV light, heat and water. The degree of ageing depends on duration and intensity.

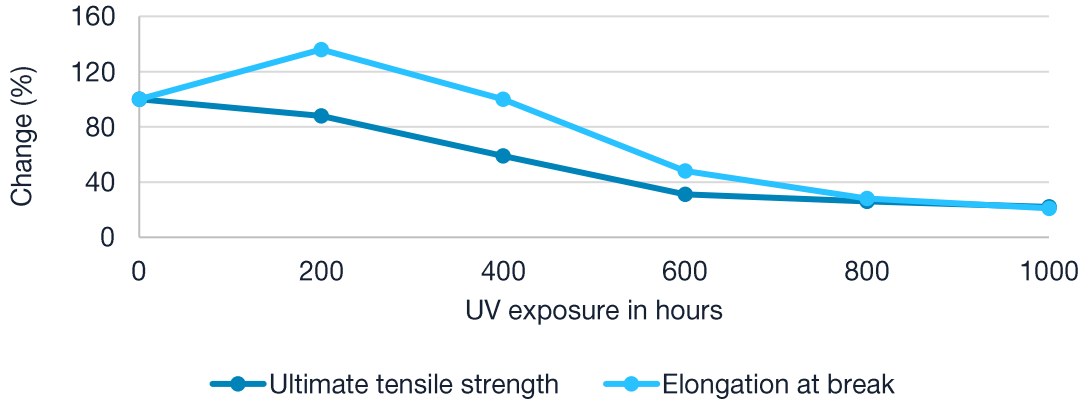
Test Method and Specimens

The ageing tests were performed with ASTM D412 C tensile bars and color cones as per ISO 4892-2:2013 method A, cycle 1.

Cycle No.	Exposure period	Irradiance		Black standard tempera-ture in °C	Chamber tempera-ture in °C	Relative humidity in %
		Broadband (300 nm to 400 nm) in W/m²	Narrowband (340 nm) in W/(m² nm)			
1	102 min dry	60 ± 2	0.51 ± 0.02	65 ± 3	38 ± 3	50 ± 10
	18 min water spray	60 ± 2	0.51 ± 0.02	-	-	-

Testing conditions for ISO 4892-2 method A, cycle 1

Mechanical Testing



Change in mechanical properties after accelerated weathering

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The final values after 1000 hours of long-term UV exposure can be found below.

Property	Before long-term UV exposure	After 1000 hours of UV exposure
Ultimate tensile strength	5 MPa	1 MPa
Elongation at break	245%	50%

Mechanical properties before and after 1000 hours of UV exposure as per ISO 4892:2 method A

Coloration

After being exposed up to 1000 hours, no significant change in color could be detected.

Effect of UV exposure on color of the specimens

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Biocompatibility

Product: Ultracur3D® FL 300

Revision: 14th of December 2021

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

Human Skin Irritation Test:

(EN ISO 10993-10 (2013))[6)]

In vitro Sensitization Testing- KeratinoSens™

(prEN ISO 10993-10 (2020))

In vitro Skin Irritation Testing:

(OECD Guideline No. 439)

Additionally

Cytotoxicity Testing- Neutral red (EN ISO 10993-5 (2009)) was also performed.

The 3D printed test item, Ultracur3D® FL 300, was found to be **not cytotoxic**.

Parts were processed leaving the specimen for 3 days at 50°C and 50% humidity, before carrying out the test.

6) Patch test on 10 volunteers.

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 de-vice manufacturers and /or end-users to deter-mine the suitability of all printed parts for their respective application.

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