

Ultrasint® PP 1400 Black

**Isotropic | Solid black material |
Easy to use**

Extended TDS

**Complete Technical Documentation
and Testing Summary**

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Are you looking for an updated TDS version? [Check out the latest online version here.](#)

Technical Data Sheet

Black material for functional SLS parts and suitable for desktop machines. Ally for sustainability & Cost per value - Excellent plasticity, high elongation, low moisture absorption and high durability.

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.

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General Properties	Method	Typical Values
Appearance	-	Black powder
Density (printed part)	DIN EN ISO 1183-1	0.89 g/cm ³
Density (Bulk Density)	DIN EN ISO 60	0.33 g/cm ³
Mean Particle Size d50	ISO 13320	60-70 µm
Melting Temperature	ISO 11357 (10 K/min)	140°C
Crystallization Temperature	ISO 11357 (10 K/min)	98°C
Melting Volume Flow Rate	ISO 1133 (220°C, 2.16 kg)	10 cm ³ /10min

Tensile Properties	Method	Typical Values	
		X-Direction	Z-Direction
E Modulus	ISO 527-2, 23°C	1250 MPa	1300 MPa
Ultimate Tensile Strength	ISO 527-2, 23°C	29 MPa	29 MPa
Elongation at Break	ISO 527-2, 23°C	25%	25%
E Modulus	ISO 527-2, 80°C	300 MPa	300 MPa
Ultimate Tensile Strength	ISO 527-2, 80°C	12 MPa	11 MPa
Elongation at Break	ISO 527-2, 80°C	>100%	>100%

Flexural Properties	Method	Typical Values	
		X-Direction	Z-Direction
Flexural Modulus	DIN EN ISO 178	1350 MPa	1250 MPa
Impact Properties	Method	Typical Values	
		X-Direction	Z-Direction
Charpy Notched, 23°C	DIN EN ISO 179-1	4 kJ/m²	4 kJ/m²
Charpy Unnotched, 23°C	DIN EN ISO 179-1	34 kJ/m²	28 kJ/m²
Izod Notched, 23°C	ISO 180	4 kJ/m²	4 kJ/m²
Izod Unnotched, 23°C	ISO 180	26 kJ/m²	22 kJ/m²
Thermal Properties	Method	Typical Values	
HDT/A (1.8 MPa)	ISO 75-2	62°C	
HDT/B (0.45 MPa)	ISO 75-2	102°C	
Vicat/A (10 N)	DIN EN ISO 306	131°C	
Vicat/A (10 N)	DIN EN ISO 306	90°C	
Fire, Smoke, Toxicity (FST) properties	Method	Typical Values	
Flammability	UL 94	HB (0.9 mm)	
Electrical Properties	Method	Typical Values	
Dielectric Strength	IEC 60243-1	42 kV/mm (1mm)	
Specific Volume Resistivity	IEC 62631-3-1	2.10E+16 Ωcm	
Specific Surface Resistivity	IEC 62631-3-2	2.40E+16 Ω	

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Biocompatibility	Method	Typical Values
Cytotoxicity - Neutral Red	EN ISO 10993-5 (2009)	PASS ¹⁾
Human Skin Irritation ²⁾	EN ISO 10993-23 (2021)	PASS ¹⁾
In vitro Sensitization Testing- KeratinoSens™	EN ISO 10993-10 (2023); OECD 442D	PASS ¹⁾

Mechanical properties overview

- 1) For the statement on Biocompatibility data see Chapter: [Biocompatibility](#).
- 2) Patch test on 10 volunteers
- 3) If not noted otherwise, all specimens are 3D printed. Samples were tested at room temperature, 23°C. All values measured with virgin material.

Printing Performance

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

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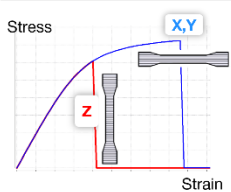
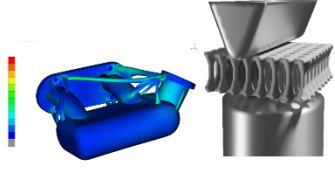
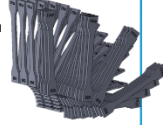
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Material Model & FEA Simulation

FEA simulation can be used to predict how different parameters such as temperature and mechanical stress affect the final printed parts. This information can be used to significantly expedite application development, and to optimize the part design to ensure all performance requirements for the application are met. In order to run simulations with a specific material, a material model is required. This model is generated based on a wide range of testing data under different loads and at different temperatures and other relevant conditions.

We can support you with 3D simulation in different ways, ranging from simply supplying you with raw test data, to doing the full simulation for you. These are the 3 options we offer:

Raw Material Data	3D Simulation	Material Model as a Service
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. 	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 

Specifically for Ultrasint® PP 1400 Black, below you can find some of the data (at specific temperatures / mechanical loads) we have available in our Ultrasim® Material Model or that we could provide to you for your own simulations. More information is available on request (sales@forward-am.com).

	Available temperatures			Strain rate / loads		Print Orientation / Anisotropy
	Low	23°C	High	Quasi static	High speed	
Ultrasint® PP 1400 Black		●		●		

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

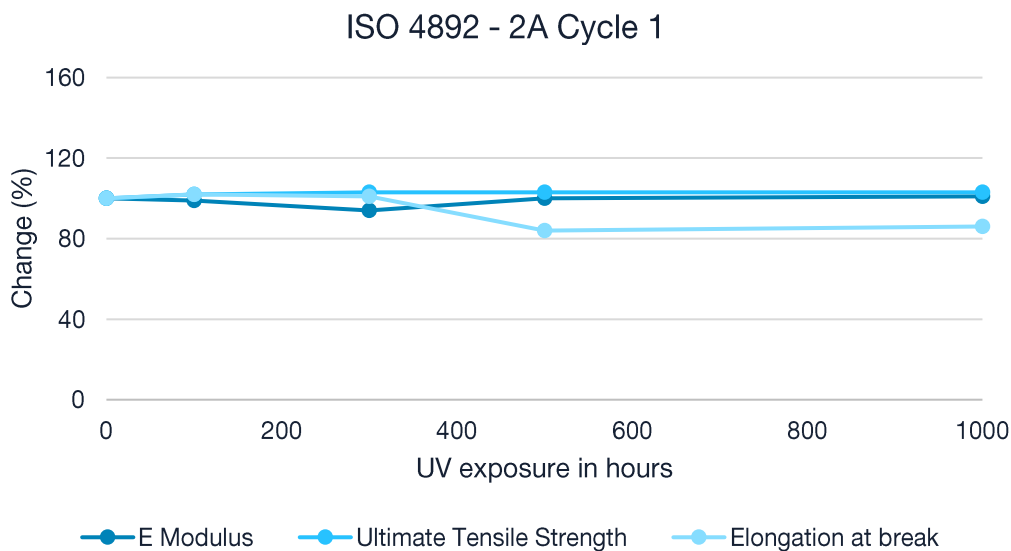
Long-Term UV

Durability is a key feature for components across many industries. The materials used in automotive or consumer applications 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.

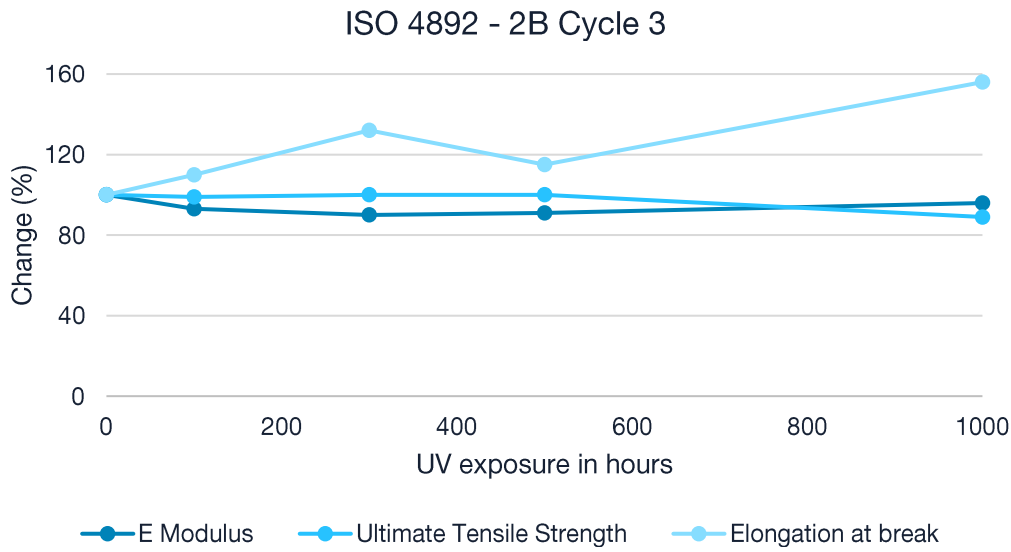
Test method and specimens

The UV resistance was examined both for outdoor weathering condition use and indoor use using conventional accelerated weathering tests as per the Norm ISO 4892-2:2013 Method A and ISO Norm ISO 4892-2:2013 Method B.

Mechanical Testing



ISO 4892 – 2A Cycle 1 Change of mechanical properties over the course of 1000 hours of UV exposure



ISO 4892 – 2B Cycle 3 Change of mechanical properties over the course of 1000 hours of UV exposure

UV resistance; 2A Cycle 1 indoor & 2B Cycle 3 outdoor (weathering) use:

- Condition A: E modulus and tensile strength stays constant over time while there is a drop in elongation at break after 500h.
- Condition B: E modulus and tensile strength stays constant while elongation at break shows increases by up to 150% at 1000h.

Flame and Temperature Resistance

Flame Resistance Properties

Ultrasint® PP 1400 Black does not contain any flame retardants, therefore the flammability behavior is in principle comparable to regular plastics.

UL 94 --> HB rating for $t \geq 0,9\text{mm}$

Information about test procedure and test specimens

M 0 0322			Measurements & observations after application of flame (30 s)					Flame class
Dimensions of test specimens 127 * 12,7 * d mm³			Flame front ceases before 25mm mark	Flame front ceases before 100mm mark	Damaged length beyond 25mm mark [mm]	Burning time beyond 25mm mark [s]	Burning rate [mm/min]	
Requirements for d < 3 mm			—	—	—	>= 60	<= 75	= HB
for d >= 3 mm			—	—	—	>= 112,5	<= 40	= HB
Pre-conditioning	Spec. no.	Thickn. [mm]						HB HB HB
Conditioning (2d / 23°C / 50%)	1	0.91	No	No	75	86	52	
	2	0.89	No	No	75	68	66	
	3	0.93	No	No	75	63	72	
Comments			First test 2023-03-28 13:01 - 2023-03-28 13:12					HB @0.9mm
Conditioning (2d / 23°C / 50%)	1							
	2							
	3							
Comments			Repeated test -					

UL94 HB Results

Biocompatibility

Product: Ultrasint® PP 1400 Black

Revision: 17th of March 2023

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))

Human Skin Irritation Test:

(EN ISO 10993-23 (2021))⁴⁾

In vitro Sensitization Testing- KeratinoSens™

(EN ISO 10993-10 (2021); OECD 442D)

⁴⁾ Patch test on 10 volunteers

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.

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:

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