Ultrafuse® ASA

UV resistant | temperature stability | outdoor weather resistant

Extended TDS

Complete Technical Documentation and Testing Summary

Version 2.1

Contents

Are you looking for an updated TDS version? Check out the latest online version here.

Technical Data Sheet

Ultrafuse® ASA is with its UV resistance and good temperature stability an ideal material for outdoor applications.

Filament Properties		
Filament Diameter	1.75 m	2.85 mm
Diameter Tolerance	±0.050 mm	±0.1 mm
Average ovality	<0.050 mm	<0.050 mm
Available Spool size	750 g (Phase Out), 1.0 kg, 2.0 kg, 4.0 kg	1.0 kg, 2.0 kg, 4.0 kg
Available colors:		
	Natural	N.A.
	Black	RAL ca. 9005
	Army Green	RAL ca. 6003

Spool Properties					
Spool size	750 g	1.0 kg	2.0 kg	4.0 kg	8.0 kg
Outer diameter	200 mm	200 mm	300 mm	350 mm	355 mm
Inner diameter	52 mm	52 mm	51.5 mm	51.7 mm	36 mm
Width	68 mm	68 mm	103 mm	103 mm	167 mm

Recommended 3D-Print processing parameters		Used for test specimens
Printer	FFF printer	Bambu Lab H2D
Nozzle Temperature[1)]	260 – 280°C	Initial 270°C, then 275°C
Build Chamber Temperature	At least closed chamber, passively heated	65°C active heated
Bed Temperature	100 – 120°C	100°C
Bed Material	Glass/PEI + PC adhesive	PEI plate + Magigoo PC
Nozzle Diameter	≥ 0.4 mm	0.4 mm
Print Speed	30 - 60 mm/s	Initial 50 mm/s, then 100 mm/s
Max Volumetric Speed[2)]	18 mm^3/s	

Please check your standard and/or high speed print profile availability for an easy start at www.forward-am.com

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Further Recommendations	
Drying recommendations to ensure printability and best mechanical properties[3)]	Ultrafuse® ASA can be dried at 60°C in a hot air dryer or vacuum oven for 4 to 16 hours
Support material compatibility	Single material breakaway, XIONEER® VXL 90, XIONEER® VXL 111
Warehousing	Ultrafuse® ASA filament should be stored at 15 - 25°C in its originally sealed package in a clean and dry environment. If the recommended storage conditions are observed the products will have a minimum shelf life of 24 months.

[1] Fast printing might require an additional increase of the nozzle temperature; the stated printing speed is based on current validations. As equipment and technology continues to evolve, it is possible that even higher printing speeds may be attainable in the future.
[2] Based on Bambu Lab X1C with a nozzle diameter of 0.4 mm
[3] Please note: To ensure constant material properties the material should always be kept dry.

General Properties	Standard	Average Values
Filament Density[4)]	ISO 1183-1	TBD

Tensile Properties[5)]	Standard	Average Values		
		XY-Direction	XZ-Direction	ZX-Direction
Tensile strength[6)]	ISO 527	37.0 MPa	-	26.6 MPa
Elongation at Break[6)]	ISO 527	5.2 %	-	1.9 %
Young's Modulus[7)]	ISO 527	2120 MPa	-	1940 MPa

Flexural Properties[5) 8)]	Standard	Average Values		
		XY-Direction	XZ-Direction	ZX-Direction
Flexural Strength	ISO 178	TBD	67.4 MPa	44.0 MPa
Flexural Modulus	ISO 178	TBD	2050 MPa	1820 MPa
Flexural Elongation at Break	ISO 178	TBD	No break	2.7 %

Impact Properties[5)]	Standard	Average Values		
		XY-Direction	XZ-Direction	ZX-Direction
Impact Strength Charpy (notched)	ISO 179-2	8.6 kJ/m^2	7.8 kJ/m^2	-
Impact Strength Charpy (unnotched)	ISO 179-2	31.3 kJ/m^2	41.0 kJ/m^2	8.3 kJ/m^2
Impact Strength Izod (notched)	ISO 180	8.7 J/m	8.5 J/m	-
Impact Strength Izod (unnotched)	ISO 180	23.2 J/m	40.0 J/m	8.2 J/m

For the diagrams on mechanical properties see Chapter: Mechanical Properties Diagrams

[4] measured on filament
[5] Samples were conditioned in standard climate (23°C, 50% RH 72h)
[6] Testing speed: 5 mm/min
[7] Testing speed: 1 mm/min
[8] Testing speed: 2 mm/min

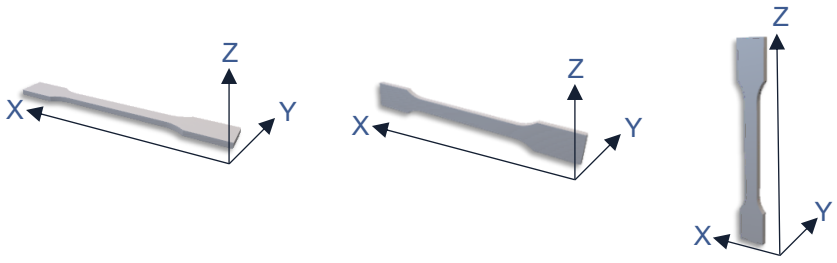
Thermal Properties[5)]	Standard	Average Values
HDT A at 1.8 MPa	ISO 75-2	TBD
HDT B at 0.45 MPa	ISO 75-2	TBD
Glass Transition Temperature	ISO 11357-2	TBD
Melt Volume-Flow Rate (MVR)	ISO 1133	TBD

For the diagrams on thermal properties see Chapter: Thermal Properties Diagrams.

Hardness and Abrasion	Standard	Typical Values
Shore Hardness D (15s)	DIN ISO 7619-1	TBD

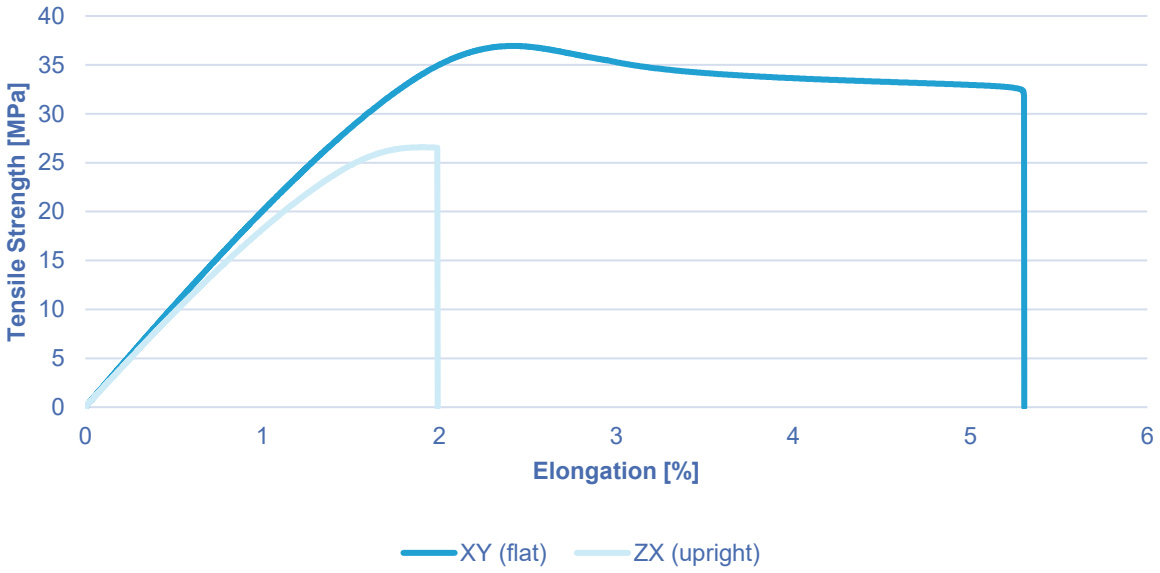
Print direction explanation

The orientation of the 3D printed part in the printer is always aligned with the longest axis first. The print direction is consistently along the Z-axis.



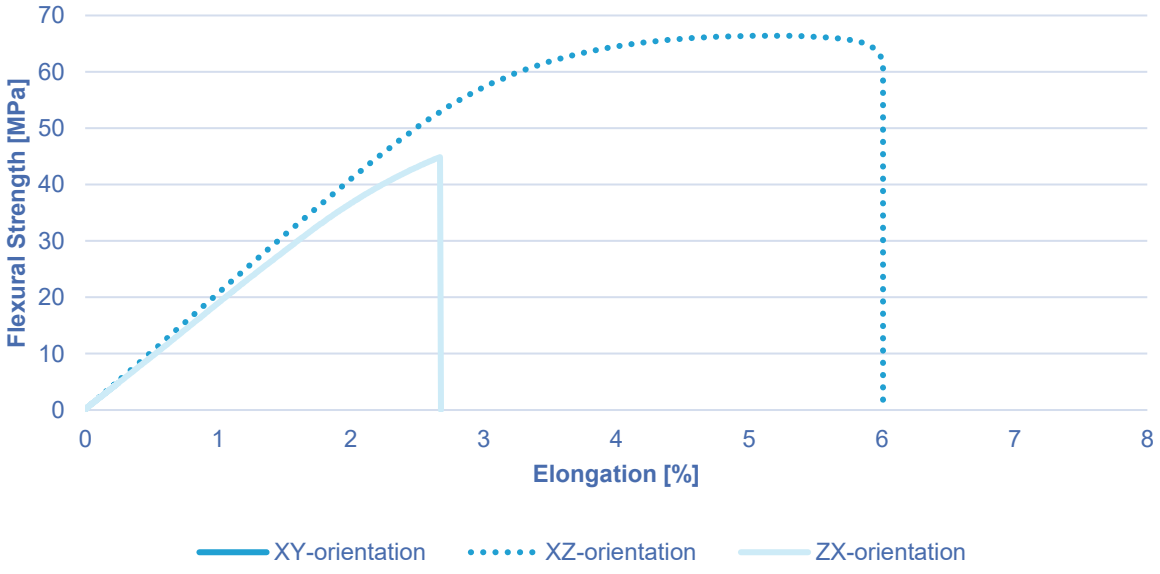
Mechanical Properties Diagrams

Typical Tensile Stress-Strain curves



Typical Tensile Stress-Strain curves for the XY and ZX print orientation.

Typical Flexural Stress-Strain curves



Typical Flexural Stress-Strain curves for the XY, XZ and ZX print orientation.

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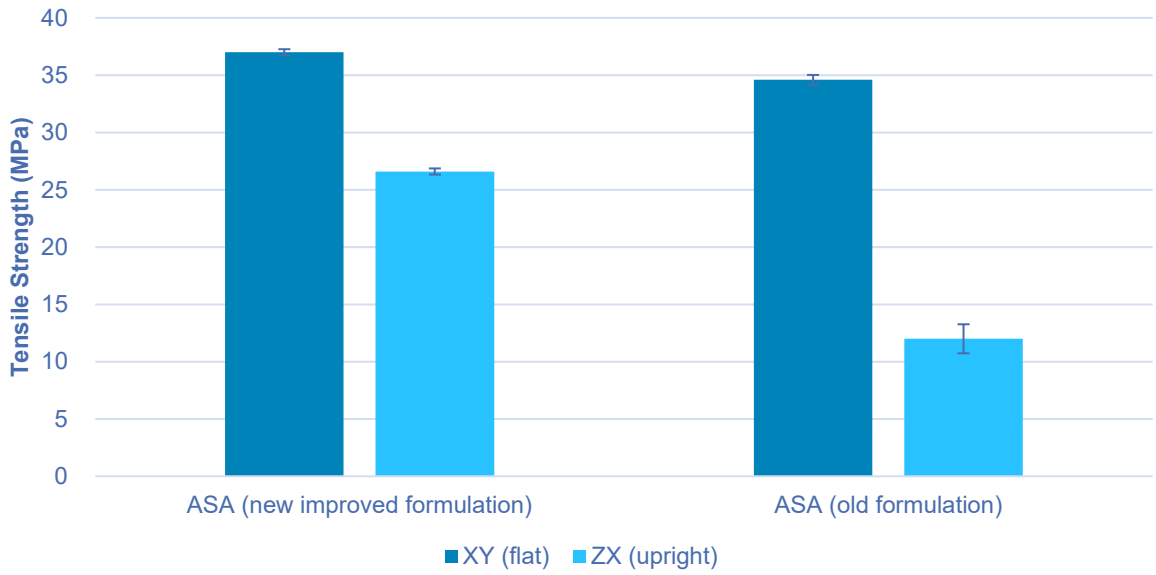
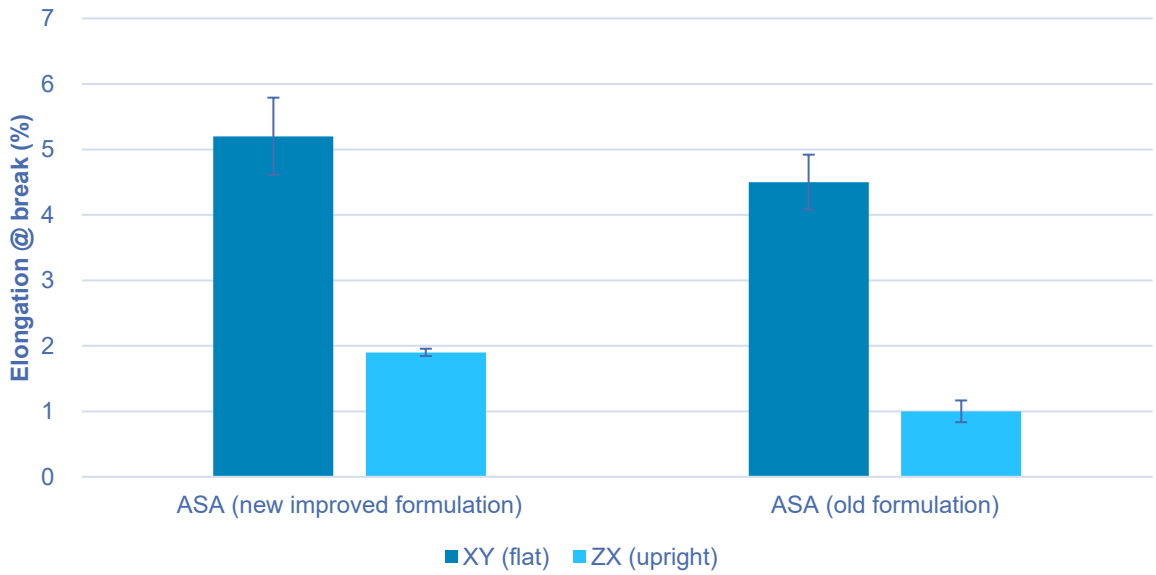
Tensile Strength according to DIN EN ISO 527



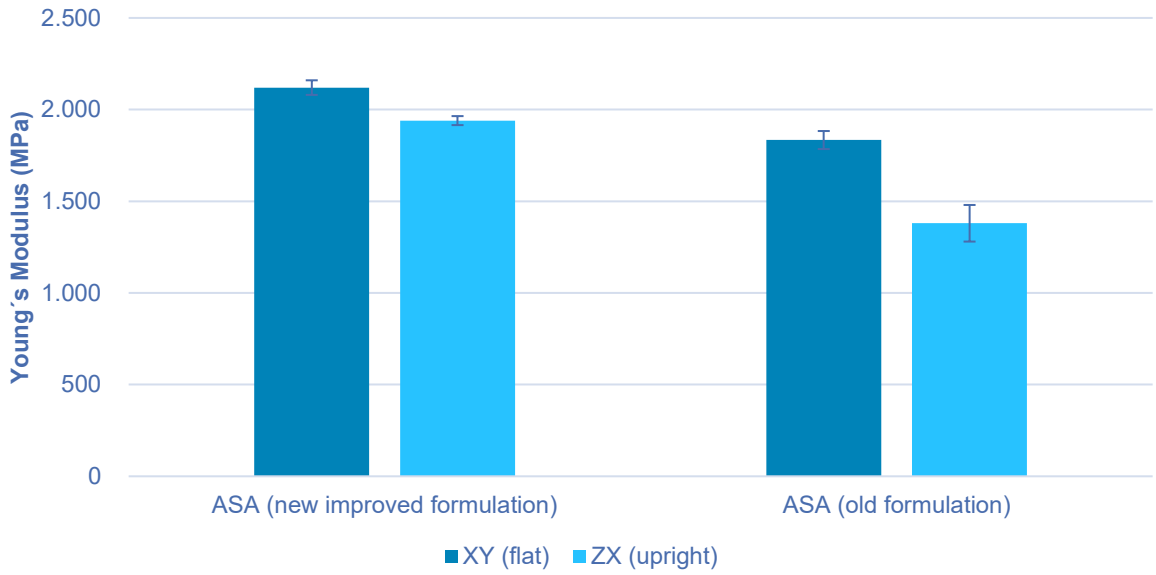
Comparison of Tensile Strength data for the old and improved Ultrafuse ASA formulation.

Elongation at break according to DIN EN ISO 527



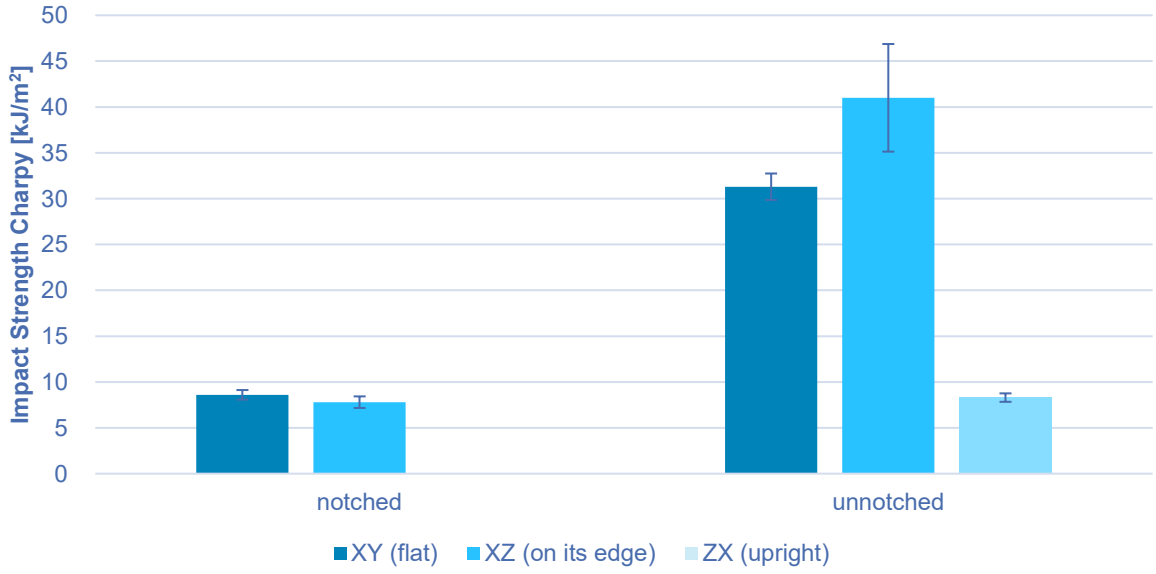
Comparison of Elongation at break data for the old and improved Ultrafuse ASA formulation.

Young´s Modulus according to DIN EN ISO 527



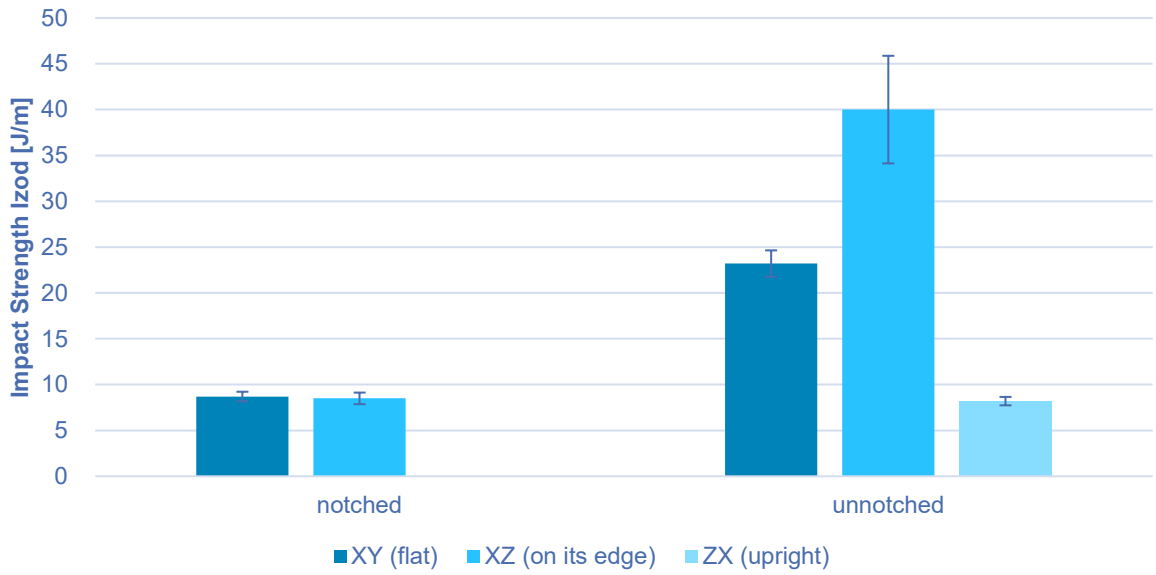
Comparison of Young´s Modulus data for the old and improved Ultrafuse ASA formulation.

Impact Strength Charpy according to ISO 179-2



Comparison of notched & unnotched Impact Strength Charpy data for different build orientations.

Impact Strength Izod according to ISO 180



Comparison of notched & unnotched Impact Strength Izod data for different build orientations.

Industrial Chemical Resitance

The resistance of 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 polymers can break or degrade, causing a change in the mechanical properties.

Test Method and Specimens

The following table shows the expected resistance against chemicals, based on literature data for ASA in general. It is recommended to perform own tests based on the specific application requirements, such as chemical concentration, temperature and exposure duration because the chemical tests have not been performed on printed Ultrafuse® ASA specimens.

Chemical Resistance (based on general ASA literature information)			
Media	**Conc. [wt-%]**	**Temperature [°C]**	**Resistance Time**
Acetic Acid	5	20	Years
	50	50	Days
Acetone		20	No Resistance
Amyl alcohol		20	Years
Benzoic acid		20	Years
Diesel fuel		20	Years
Ethyl alcohol	40	20	Years
Grease		20	Years
Kerosene		20	Days
Nitric acid	30	20	Months

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