

【Phrozen Filament Userguide】

Phrozen PLA Tough Series

Outline

Before printing the perfect object, it is important to first understand the material limitations we are handling and how it can be successfully printed under various conditions. With this in mind, Phrozen provides the following design suggestions to help you better understand the properties of each material and how you can best utilize them to bring your wildest creation to life.

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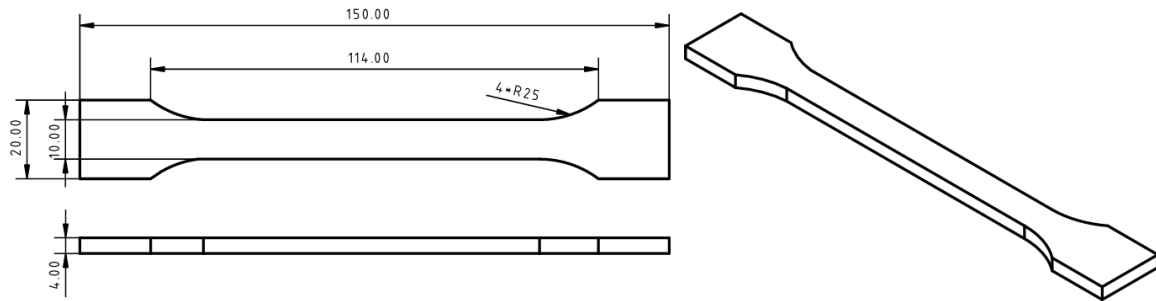
Section 1

TDS

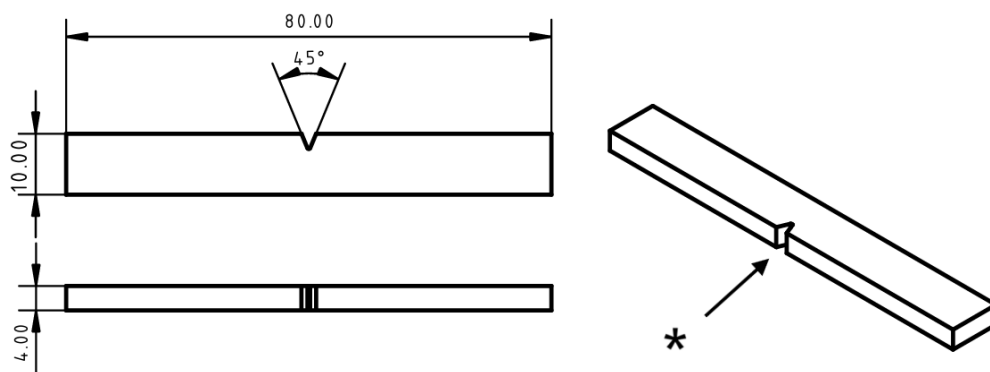
Tensile Properties	Norm	Values	
		Printing Direction (X-Y)	Printing Direction (Z)
Tensile Strength	ISO 527	40.0 - 44.3 MPa	27.1 - 30.3 MPa
Tensile Modulus	ISO 527	1585 - 1863 MPa	1441 - 1674 MPa
Elongation at Break	ISO 527	4.7 - 10.8 %	3.0 - 4.1 %
Impact Properties	Norm	Values	
		Printing Direction (X-Y)	Printing Direction (Z)
Notched Izod Impact Strength	ISO 180	62.2 - 75.8 J/m	14.4 - 16.0 J/m
Impact Properties	Norm	Values	
		Printing Direction (X-Y)	Printing Direction (Z)
Flexural Strength	ISO 178	56.6 - 70.1 Mpa	48.9 - 55.9 Mpa
Flexural Modulus	ISO 178	2728 - 2987 Mpa	2561 - 2710 Mpa
Thermal Properties	Norm	Values	
HDT at 0.45 MPa	ISO 75-2	53 °C	
Hardness	Norm	Values	
Shore D	ISO 7619-1	84 D	

*All test pieces were printed in an environment of $25 \pm 2^{\circ}\text{C}$ and $\text{RH}55 \pm 10\%$ right after removing the vacuum bag and were set aside to cool down completely before testing.

Performance values obtained in standard sample tests conducted by Phrozen are for design reference and comparison only. The actual performance of each 3D printed model might be impacted by other variables, including the printer, printing model, printing environment, printing parameters, etc.
Users are responsible for their legality, safety, and performance indicators when printing with Phrozen's material. Phrozen is not responsible for the materials and usage scenarios, nor is it responsible for any damage that occurs during the use of our materials.



ISO 527 Tensile Test Bar (unit: mm)



ISO 180 Impact Test Bar (unit: mm)

*Impact test direction

Filament Specifications

Diameter	1.75 mm
Density	1.23 cm ³
HDT at 0.45 Mpa	53 °C
Weight	1000 g

Recommended Printing Parameters

Printer	Phrozen ARCO
Nozzle Temperature	220 ± 10 °C
Heat Bed Temperature	60 °C
Printing Speed	<200 mm/s
Fan Speed	100 %

Specimen Printing Parameters

Nozzle Diameter	0.4 mm
Nozzle Temperature	210 °C
Heat Bed Temperature	60 °C
Layer Height	0.2 mm
Printing Speed	100 mm/s
Fan Speed	100 %
Infill Percentage	100 %

Drying Recommendations

Drying Temperature	45 - 55°C
Drying Time	4 – 6 hours

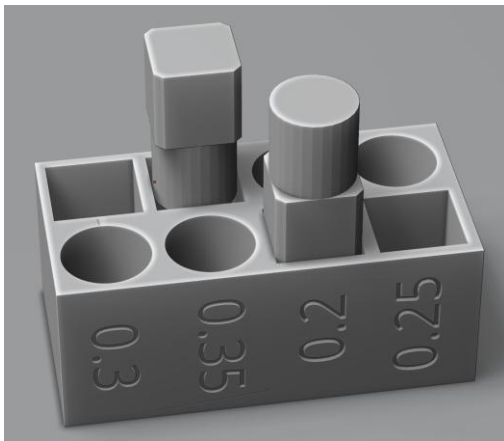
Section 2

Design Specifications

※Note: All indicators are the limit values of PLA and will vary depending on the machine, parameters, operating environment, and printing model used※

Size Tolerance, X-Y plane

This indicator is the minimum tolerance allowed when printing the pin and hole connection.

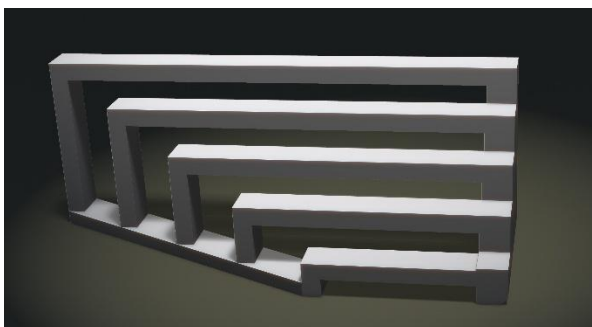


Recommended square aperture : ≥ 0.2 mm

Recommended circular aperture : ≥ 0.2 mm

Maximum Horizontal Bridge Span

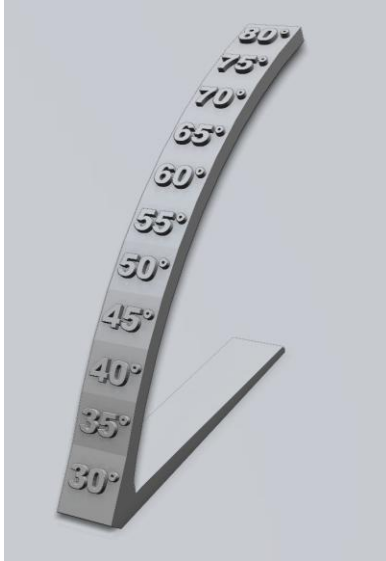
This indicator shows the maximum width between the supporting walls that can be printed without deforming the bridge.



Recommended distance : ≤ 20 mm

Maximum Hanging Angle

This indicator is the maximum angle that can be printed completely without support.



Recommended angle : < 60°