

# Fused Deposition Modelling (FDM)

## ASA



### Applications

- ▶ Proof of concept
- ▶ Functional testing
- ▶ Vacuum forming tooling
- ▶ Product mock ups

### Features

- ▶ Production intent material properties
- ▶ Solid parts

### Benefits

- ▶ Building and testing parts with a material widely used in industry
- ▶ Build assembly fixtures without the need for waiting for CNC parts

## Mechanical Properties

TEST METHOD	STANDARD	ENGLISH		METRIC	
		XZ*	ZX*	XZ*	ZX*
Tensile Strength, Yield (Type I, 0.125", 0.2"/min)	ASTM D638	4,200 psi	3,850 psi	29 MPa	27 MPa
Tensile Strength, Ultimate (Type I, 0.125", 0.2"/min)	ASTM D638	4,750 psi	4,300 psi	33 MPa	30 MPa
Tensile Modulus (Type I, 0.125", 0.2"/min)	ASTM D638	290,000 psi	280,000 psi	2,010 MPa	1,950 MPa
Elongation at Break (Type I, 0.125", 0.2"/min)	ASTM D638	9%	3%	9%	3%
Elongation at Yield (Type I, 0.125", 0.2"/min)	ASTM D638	2%	2%	2%	2%
Flexural Strength (Method I, 0.05"/min)	ASTM D790	8,700 psi	6,900 psi	60 MPa	48 MPa
Flexural Modulus (Method I, 0.05"/min)	ASTM D790	270,000 psi	240,000 psi	1,870 MPa	1,630 MPa
Flexural Strain at Break (Method I, 0.05"/min)	ASTM D790	No Break	4%	No Break	4%

\* Orientation

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## Mechanical Properties (continued)

THERMAL PROPERTIES <sup>2</sup>	TEST METHOD	ENGLISH	METRIC
Heat Deflection (HDT) @ 66 psi	ASTM D648	208°F	98°C
Heat Deflection (HDT) @ 264 psi	ASTM D648	196°F	91°C
Vicat Softening Temperature (Rate B/50)	ASTM D1525	217°F	103°C
Glass Transition Temperature (T <sub>g</sub> )	DMA (SSYS)	226°F	108°C
Coefficient of Thermal Expansion (flow)	ASTM E831	4.90E-06 in/in/°F	8.79E-06 mm/mm/°C
Coefficient of Thermal Expansion (xflow)	ASTM E831	4.60E-06 in/in/°F	8.28E-06 mm/mm/°C

ELECTRICAL PROPERTIES	TEST METHOD	ORIENTATION	VALUE RANGE
Volume Resistivity	ASTM D257	XZ	1.0E14 - 1.0E15 ohm-cm
Dielectric Constant	ASTM D150-98	XZ	2.97 - 3.04
Dissipation Factor	ASTM D150-98	XZ	0.009
Dielectric Strength	ASTM D149-09, Method A	XZ	329 V/mil
Dielectric Strength	ASTM D149-09 Method A	ZX	414 V/mil