The Design to Manufacturing Co.

MATERIAL

DIRAN 410MF07

OVERVIEW

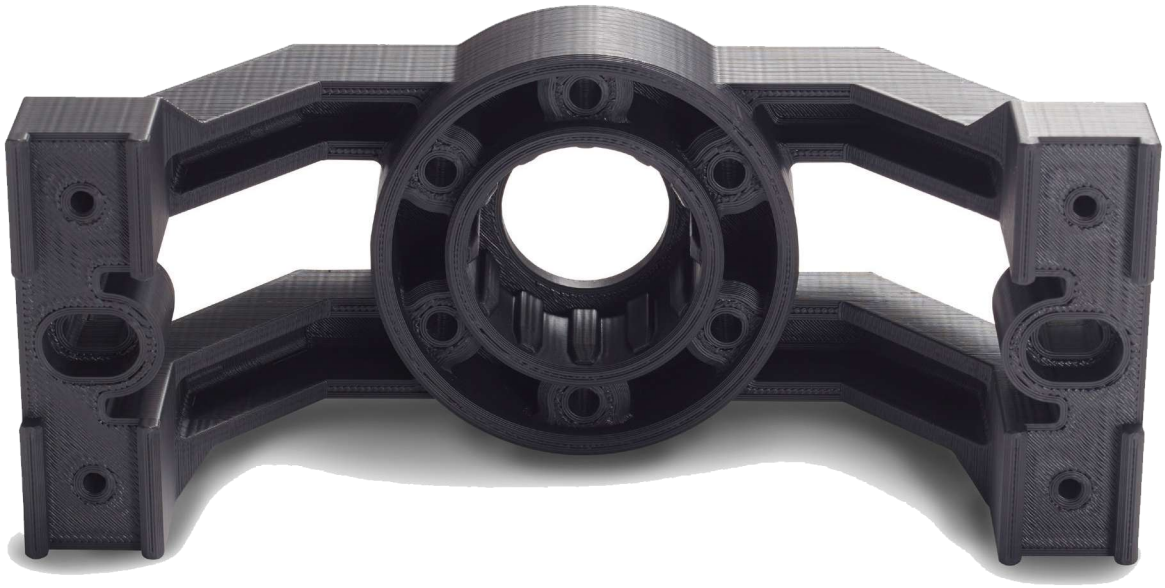
For more information or advice: theD2Mco.com/contact-us info@theD2Mco.com

Diran 410MF07

FDM Thermoplastic Filament

Perfect for manufacturing tooling applications.

The information presented are typical values intended for reference and comparison purposes only.
They should not be used for design specifications or quality control purposes.



Overview

Diran™ 410MF07 is a nylon-based thermoplastic FDM® material, mineral-filled 7% by weight. It demonstrates very good toughness and impact strength combined with resistance to hydrocarbon-based chemicals. Its smooth, lubricious surface quality offers low sliding resistance.

Typical applications include jigs, fixtures and other forms of general manufacturing tooling, and is particularly effective for applications needing a non-marring interface between the tool and the workpiece.

Contents:

Ordering Information

3D Printer Compatibility: F370™ and F370®CR

Support Material: SUP4000B™

Build Tray: F370/F370CR, High Temperature

Table 1. Diran 410MF07 Thermoplastic Filament Ordering Information

Part Number	Description
Filament Canisters	
333-90410	Diran 410MF07, 90 cu in, F123
333-60400	SUP4000B™, 60 cu in, F123
Printer Consumables	
123-00402-S	F123 Standard Head (All Layer Heights)
123-00314-S	F370/F370CR Build Tray, High Temperature

Physical Properties

Values are measured as printed. XY and XZ/ZX orientations were tested.

Table 2. Diran 410MF07 Thermoplastic Filament Physical Properties

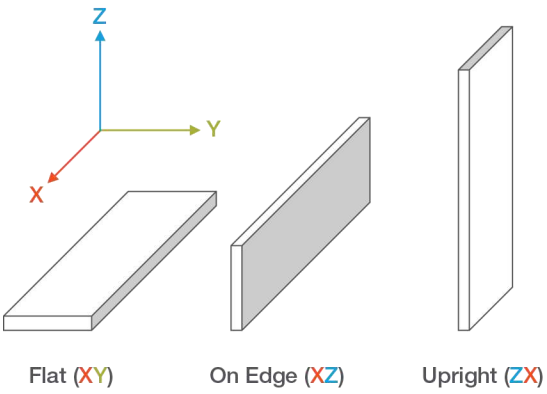
Property	Test Method	Typical Values XY	Typical Values XZ/ZX
HDT @ 66psi	ASTM D648 Method B	90 °C (194 °F)	90 °C (194 °F)
HDT @ 264psi	ASTM D648 Method B	70 °C (158 °F)	70 °C (158 °F)
Tg	ASTM D7426 Inflection Point	117.34 °C (243.21 °F)	117.34 °C (243.21 °F)
Mean CTE	ASTM E831 (40 °C to 140 °C)	56.60 µm/[m·°C] (31.44 µin/[in·°F])	112.6 µm/[m·°C] (62.56 µin/[in·°F])
Volume Resistivity	ASTM D257	1.50*10^15 Ω·cm	1.50*10^15 Ω·cm
Dielectric Constant	ASTM D150 1 kHz test condition	3.58	3.73
Dielectric Constant	ASTM D150 2 MHz test condition	2.85	2.95
Dissipation Factor	ASTM D150 1 kHz test condition	0.013	0.014
Dissipation Factor	ASTM D150 2 MHz test condition	0.000	0.012
Specific Gravity	ASTM D792 @ 23 °C	1.16	1.16

Mechanical Properties

Samples were printed with 0.010 in. (0.254 mm) layer height.

Print Orientation

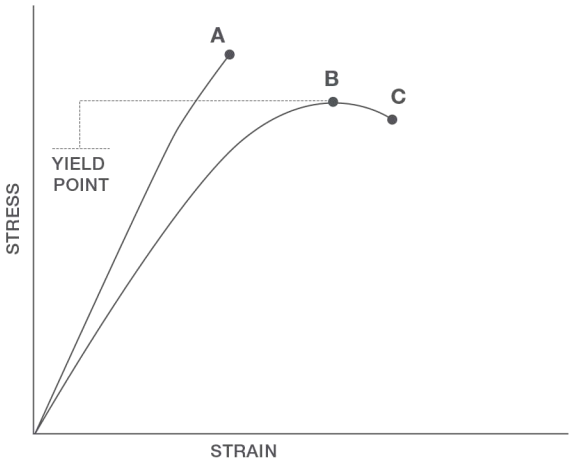
Parts created using FDM are anisotropic as a result of the printing process. Below is a reference of the different orientations used to characterize the material.



Flat (XY) On Edge (XZ) Upright (ZX)

Tensile Curves

Due to the anisotropic nature of FDM, tensile curves look different depending on orientation. Below is a guide of the two types of curves seen when printing tensile samples and what reported values mean.



A = Tensile at break, elongation at break (no yield point)
B = Tensile at yield, elongation at yield
C = Tensile at break, elongation at break

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Table 3. Diran 410MF07 Thermoplastic Filament Mechanical Properties

		XZ Orientation[1]	ZX Orientation[1]
Tensile Properties: ASTM D638			
Yield Strength	MPa	44.8 (1.5)	No Yield
	psi	6490 (220)	No Yield
Elongation @ Yield	%	4.3 (0.041)	No yield
Strength @ Break	MPa	40.4 (3.0)	30.7 (2.0)
	psi	5860 (440)	4460 (290)
Elongation @ Break	%	12 (3.2)	3.1 (1.0)
Modulus (Elastic)	GPa	1.69 (0.017)	1.46 (0.021)
	ksi	246 (2.4)	212 (3.0)
Flexural Properties: ASTM D790, Procedure A			
Strength @ Break	MPa	No break	46.7 (2.3)
	psi	No break	6770 (330)
Strength @ 5% Strain	MPa	59.9 (1.6)	-
	psi	8690 (230)	-
Strain @ Break	%	No break	3.1 (0.53)
Modulus	GPa	1.85 (0.043)	1.47 (0.065)
	ksi	268 (6.2)	213 (9.4)
Compression Properties: ASTM D695			
Yield Strength	MPa	75.8 (4.3)	163 (30)
	psi	11000 (630)	23600 (4300)
Modulus	GPa	1.54 (0.026)	1.46 (0.022)
	ksi	223 (3.8)	212 (3.2)
Impact Properties: ASTM D256, ASTM D4812			
Izod, Notched	J/m	442 (76)	26.8 (5.3)
	ft*lb/in	8.28 (1.4)	0.502 (0.10)
Izod, Unnotched	J/m	1420 (200)	142 (25)
	ft*lb/in	26.5 (3.8)	2.66 (0.46)

(1) Values in parentheses are standard deviations

Chemical Resistance

Diran410MF07 was tested for resistance to chemical exposure by soaking coupons in reagents for 72 hours. Afterwards the coupons were tensile tested following ASTM D638. Chemicals tested and percent change from control is listed below.

Table 4. Diran 410MF07 Change in Tensile Properties – 72 Hours

	Reagent	XZ	ZX
Tensile Strength	30% Nitric Acid	-54%	-63%
	30% Sulfuric Acid	-33%	-47%
	40% NaOH	0%	-24%
	Concentrated Ammonia	-47%	-57%
Elongation @ Break	30% Nitric Acid	-47%	-18%
	30% Sulfuric Acid	-28%	-23%
	40% NaOH	-41%	-20%
	Concentrated Ammonia	545%	-7%
Tensile Modulus	30% Nitric Acid	-70%	-50%
	30% Sulfuric Acid	1%	-9%
	40% NaOH	26%	8%
	Concentrated Ammonia	-49%	-30%

UV Aging

Diran 410MF07 was tested before and after UV exposure. Ten ASTM D638 upright (ZX) dogbones were tested in tensile after UV exposure and an additional 10 ASTM D638 ZX dogbones were the control (No UV Exposure). The UV exposed samples were cycled in the QUV chamber per ASTM G154 (Standard Practice for Operating Fluorescent Ultraviolet (UV) Lamp Apparatus for Exposure of Non-Metallic Materials) for 1000 hours, alternating for 8 hours at 60 °C (140 °F) and 4 hours at 50 °C (122°F) with humidity and condensation. The increase in stress in break is from the control samples.

Table 5. Diran 410MF07 UV Exposure Test Results

Material	Conditioning	Yield Strength		Stress at Break		Elongation at break	Increase in Stress at Break	Modulus	
		(psi)	(MPa)	(psi)	(MPa)	%	%	(ksi)	(GPa)
Diran 410MF07	No UV Exposure	3760	26.0	3780	26.0	2.5		195	1.34
	UV Exposure	3830	26.4	3840	26.5	2.3	1.80	227	1.56

Diran 410MF07 coupons were built on the F370 using the standard F123 head.

Appendix

Figure 1. 2nd heating scan, DSC, for Diran 410MF07

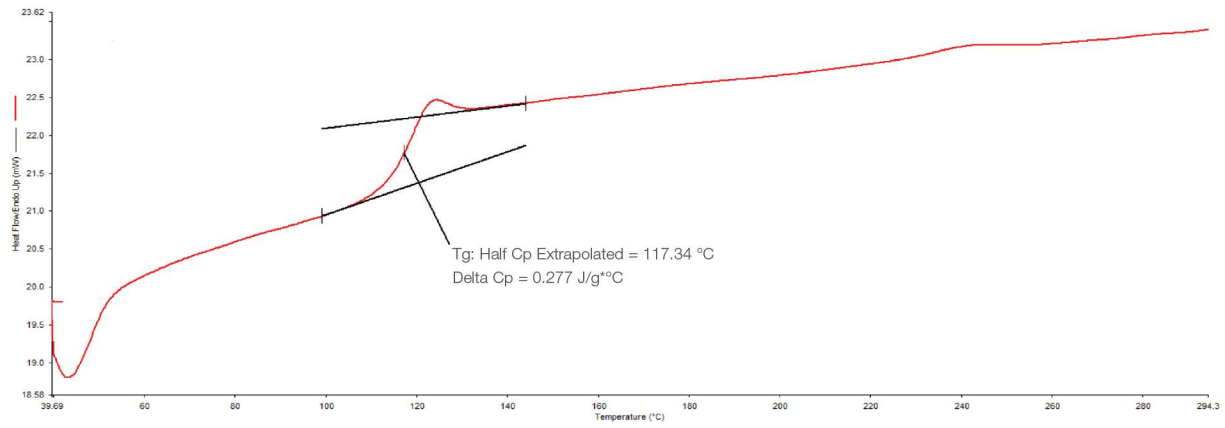

Figure 2. TMA CTE curve inplane with the layer

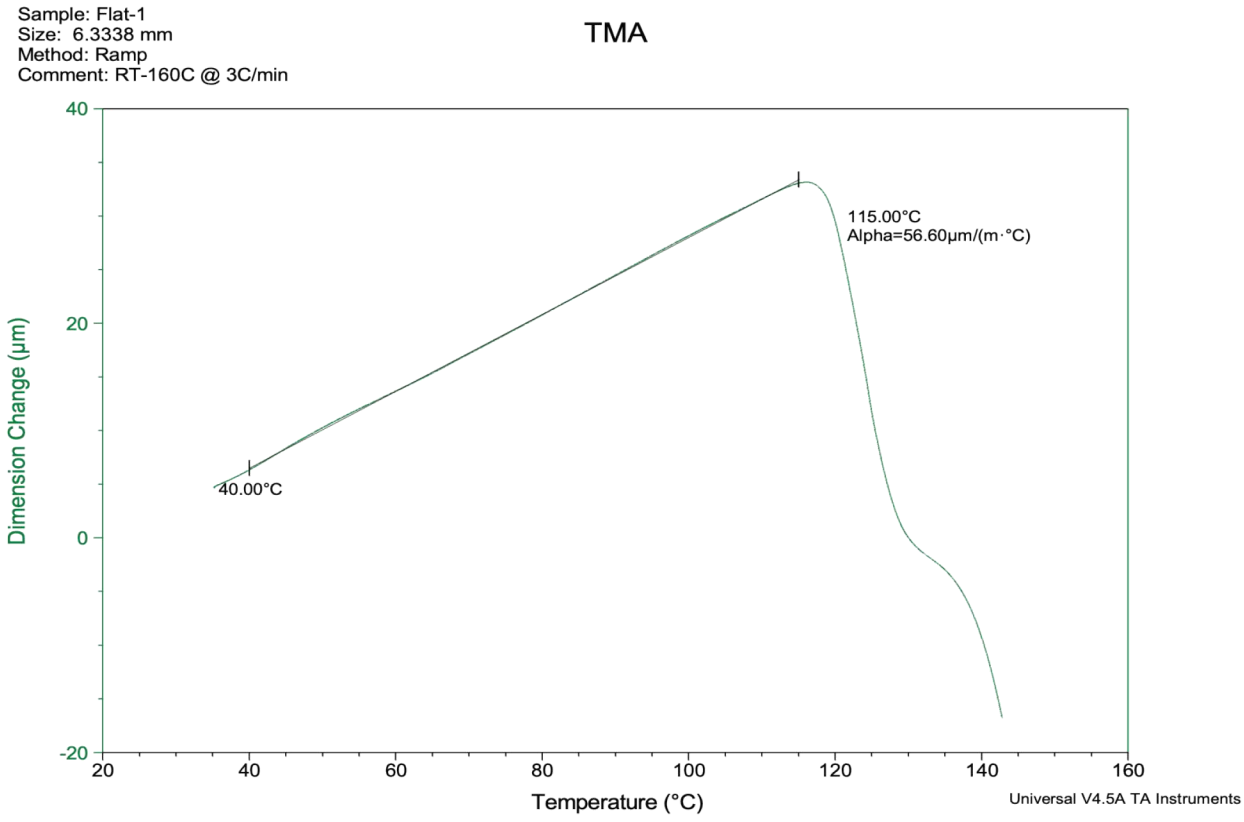

Figure 3. TMA CTE curve normal to the layer