N3XTDIMENSION®

TECHNICAL DATA SHEET

N3D-TOUGH784

High-strength material

SLA DLP LCD

N3D-TOUGH784 offers an excellent balance of rigidity and flexibility while maintaining good strength. N3D-TOUGH784 is suitable for snap-fit assemblies and other end-use applications requiring weatherability, impact resistance, and high elongation.

KEY FEATURES

- Moderately high rigidity
- Excellent tensile strength and flexibility
- Superior weatherability
- Plastic deformation

APPLICATIONS

- Jigs & fixtures
- Tooling
- Snap-fit assemblies
- Durable end-use parts
- Shoe insoles

MAIN MARKETS

- Automotive
- Consumer goods
- Industrial
- Transportation

KEY PROPERTIES

N3D-TOUGH784	
Liquid	
Appearance	Black
Viscosity @ 25°C	1000
Material	
Tensile Strength	50 MPa
Tensile Modulus	2020 MPa
Tensile Elongation at Break	45%
Flexural Strength	64 MPa
Flexural Modulus	1450 MPa
HDT @ 0.455 MPa	56°C
HDT @ 1.8 MPa	45°C
T_g, by DMA	104°C

ARKEMA

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MATERIAL PROPERTIES

Property	Units	Method	Green[1]	Final Properties[2]
Tensile Strength	MPa	ASTM D638	39 ± 1	50 ± 1
		ISO 527		35 ± 2
Tensile Modulus	MPa	ASTM D638	1660 ± 50	2020 ± 140
		ISO 527		2320 ± 200
Tensile Elongation at Break	%	ASTM D638	66 ± 5	45 ± 5
		ISO 527		30 ± 4
Flexural Strength	MPa	ASTM D790	52 ± 1	64 ± 3
		ISO 178		53 ± 1
Flexural Modulus	MPa	ASTM D790	1150 ± 30	1450 ± 70
		ISO 178		1550 ± 60
Notched Izod Impact Resistance	J/m	ASTM D256[3]		50 ± 5
	kJ/m^2	ISO 180-A[3]		4.9 ± 0.3
Unnotched Izod Impact Resistance	J/m	ASTM D4812		410 ± 130
	kJ/m^2	ISO 180-U		34.6 ± 14.2
HDT @ 0.455 MPa	°C	ASTM D648		56 ± 1
		ISO 75 B		55
HDT @ 1.8 MPa	°C	ASTM D648		45 ± 1
		ISO 75 A		46
Shore Hardness	Shore D	ASTM D2240		87
		ISO 7619		74
T_α, by DMA	°C	ASTM D4065		104
		ISO 6721		91
Water Absorption	% weight gain, 24 hours	ASTM D570		1.9
Solid Density	g/cm^3	Density kit[4]		1.18

1 Parts were printed in the XZ orientation with a 100 µm layer thickness on a 385 nm bottom-up DLP printer with an irradiance of 6 mW/cm^2. Samples were conditioned for 40-80 hours following ASTM D618 Procedure A before testing.

2 Parts were printed in the XZ orientation with a 100 µm layer thickness on a 385 nm bottom-up DLP printer with an irradiance of 6 mW/cm^2. Parts were post-cured for five minutes per side with approximately 29 J/cm^2 of UVV & UVA energy dosage. Samples were conditioned for 40-80 hours following ASTM D618 Procedure A before testing.

3 Parts were printed without a notch and a notch was generated with a manual notch cutting plane.

4 Solid density was determined on 10 mm x 10 mm x 10 mm 3D printed cubes via Archimedes principle.

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TECHNICAL DATA SHEET

LIQUID PROPERTIES

Property	Units	Method	Value
Appearance	—	—	Black
Viscosity, 25°C	cP	Brookfield SP #31	1000
Liquid Density	g/cm^3	Gardco cup	

PRINTING CONDITIONS

Reactivity values were generated on a 385 nm wavelength bottom-up 3D printer with an irradiance of 6 mW/cm^2.

Working-Curves	Units	Value
Critical Exposure (E_c)	mJ/cm^2	17.6
Penetration Depth (D_p)	mils	10.5

3D printing parameters that can be used as starting points on LCD and DLP 3D printers are shown in the table below. Although not explicitly stated, other 3D printing parameters may be realized through process development.

3D Printing Parameter	Units	Printing & Reactivity		
Layer Thickness	µm	100	100	200
Wavelength	nm	385	405	405
Intensity	mW/cm^2	6	3	3
Standard Exposure Time	Sec	5.5	12	17
Burn in Exposure Time	Sec	22	48	90

For additional guidance on print parameter setup for specific 3D printers, consult with Arkema technical service teams.

POST-CURING CONDITIONS

Post-curing conditions that can be used as starting points are shown in the table below. Although not explicitly stated, other post-processing conditions may be realized through process development.

	Dymax 5000	IntelliRay 400
Time (sec)	300	300
UVA Irradiance (mW/cm^2)	100 - 120	100 - 120
UVV Irradiance (mW/cm^2)	100 - 120	100 - 120

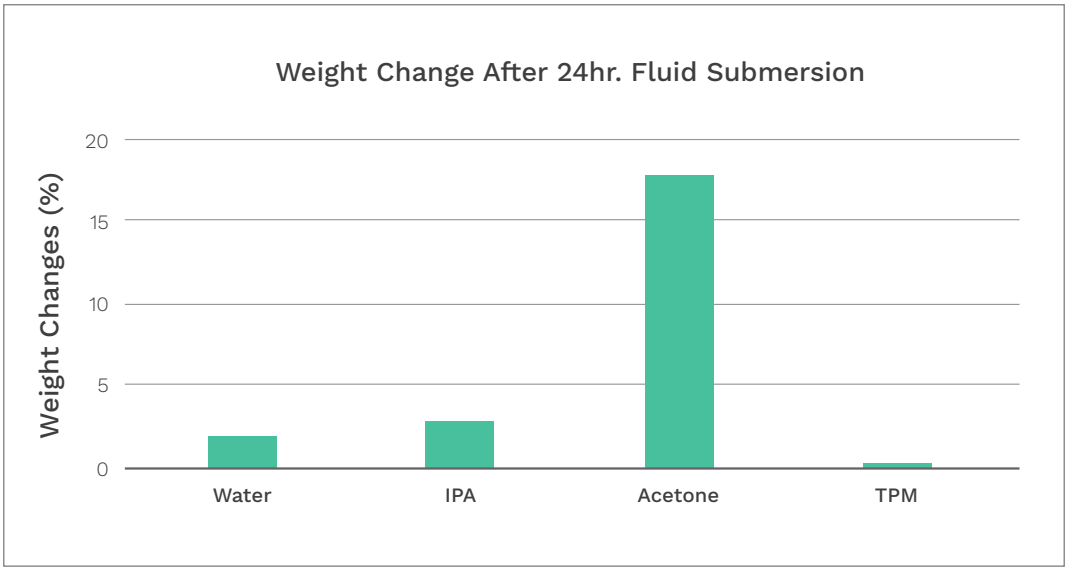
CLEANING PROCESS

Submerge 3D printed parts in traditional 3D printing solvents and agitate and/or sonicate for approximately 10 minutes. Incorporate two-stage cleaning baths for optimal cleaning. Use compressed air to remove any residual liquid material. Repeat steps as necessary until parts are free of residual material, and then proceed to post curing. Although not explicitly stated, other cleaning procedures may be realized that adequately clean 3D printed parts.

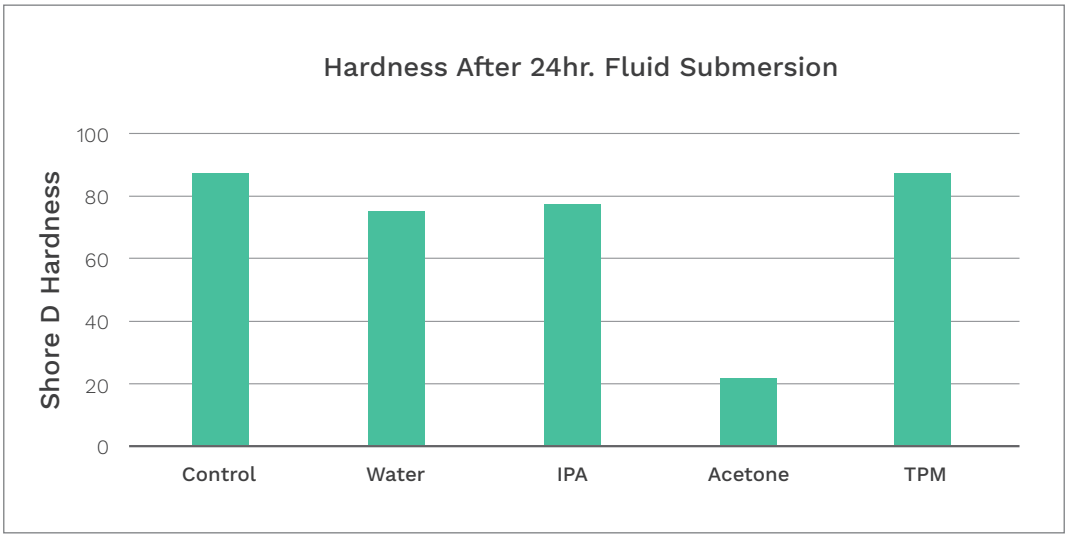
STORAGE & HANDLING

Manually shake bottle before use. Store bottles in a cool, dry place. Do not freeze. The material is light sensitive. Keep open bottles away from ambient lighting or sunlight, and shield material from ambient light. Once opened, packaging should be resealed immediately after use. See Safety Data Sheet for additional storage & handling considerations.

CHEMICAL RESISTANCE



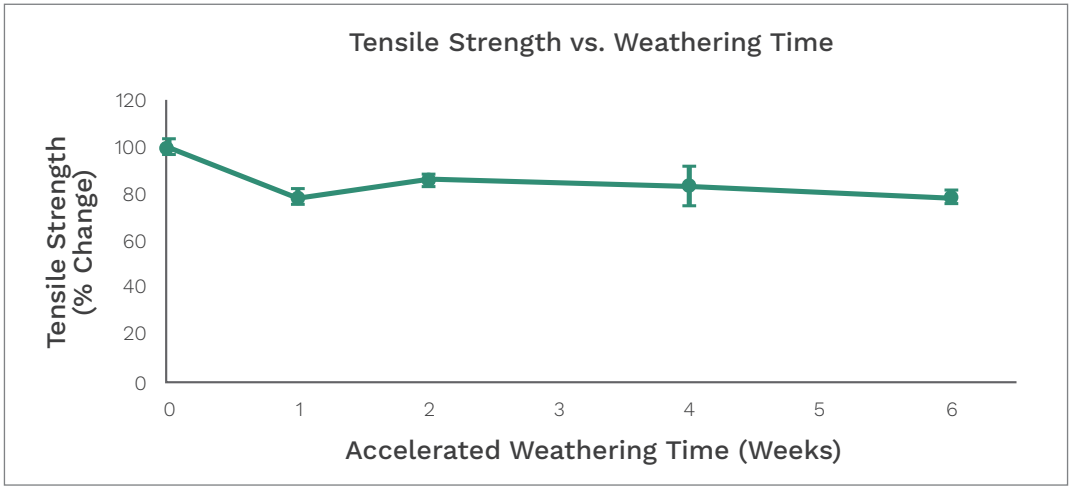
2” diameter discs (1/8” thickness) were 3D printed & post-processed, dried for 24 hours at 50°C, and submerged at room temperature conditions for 24 hours complying with ASTM D570 for water resistance and ASTM D543 for chemical resistance. Weight before and after submersion was measured & resulting percent changes were calculated.

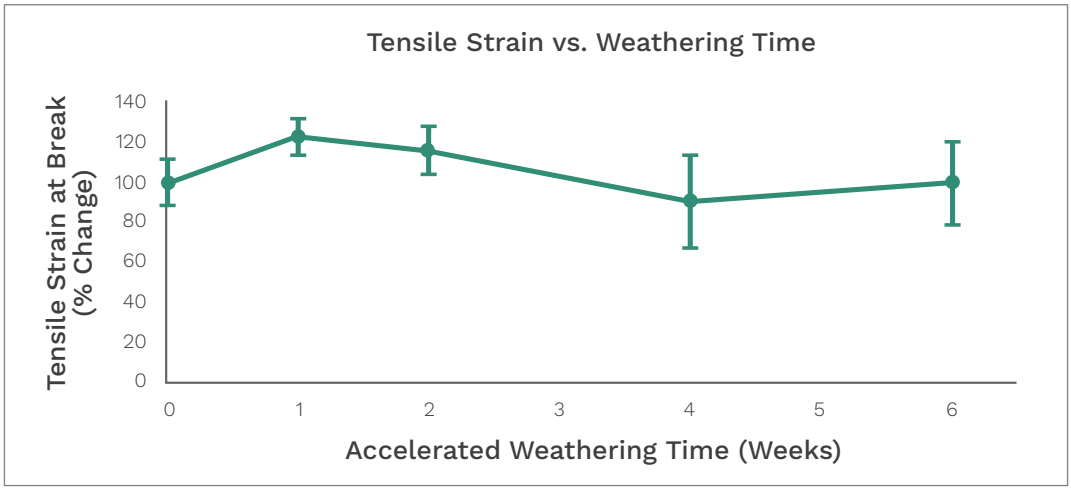


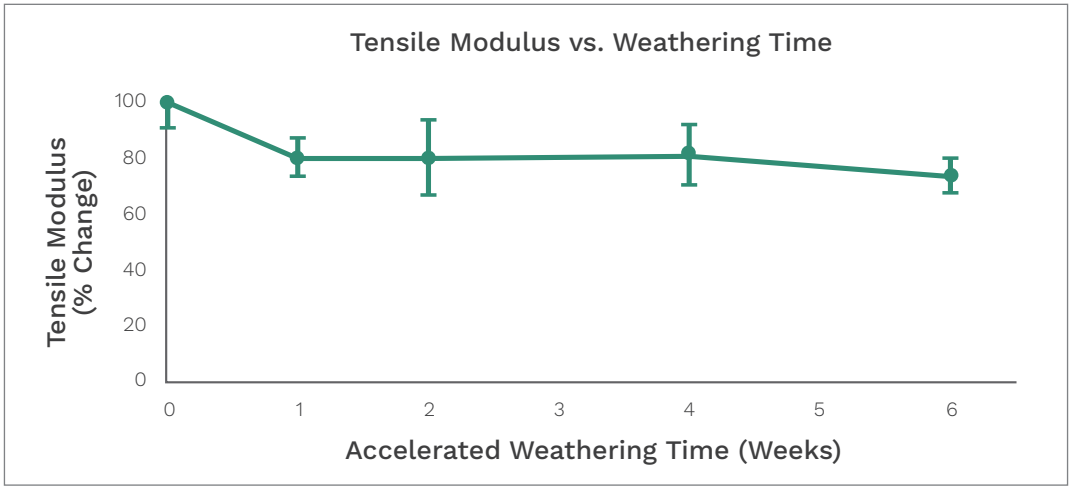
2” diameter discs (1/8” thickness) were 3D printed & post-processed, dried for 24 hours at 50°C, and submerged at room temperature conditions for 24 hours complying with ASTM D543 & ASTM D570. Resulting Shore D hardness was measured via ASTM D2240.

ACCELERATED WEATHERING

ASTM D638 Type IV tensile diagnostic parts were 3D printed & post-processed following standard protocols. Samples were exposed to UV irradiance and condensation at elevated temperatures for 1000 hours following ASTM D4329 Cycle A. Samples were removed after accelerated weathering and conditioned for 40-80 hours following ASTM D618 Procedure A before testing.







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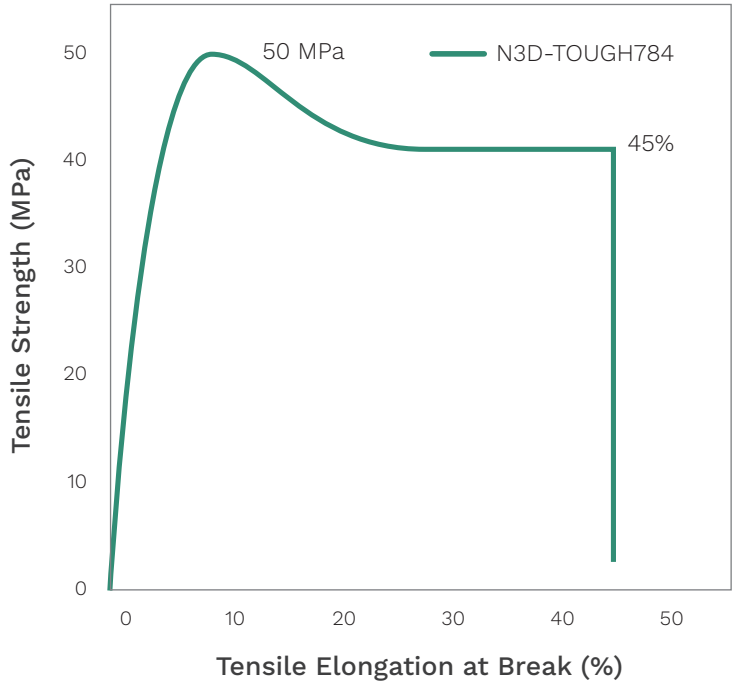
STRESS-STRAIN CURVE

Below is a representative graph of the strength as a function of strain showing the unique ductile behavior of N3D-TOUGH784.



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