

LOCTITE®

IND405™

PhotoPlastic

HDT50

High Elongation

Clear

5110 Port Chicago Hwy
Concord CA 94520

07/17/2020

Preliminary v3.2



IND405™ HDT50 High Elongation Clear

Description

LOCTITE® 3D IND405™ is a high elongation and high toughness material with outstanding impact resistance and excellent surface finish. This stiff and durable high performance material is ideal for a wide variety of tools in the production floor, including manufacturing aids and final parts such as housings and consumer goods applications. The unique set of performance attributes makes it comparable to an unfilled thermoplastic like polypropylene. Parts can be printed with various DLP printers and machined, tapped, or polished for final finish.

Available Colors: Black, Clear

Mechanical Properties	Method	Green	Post Processed
Tensile Stress at Break	ASTM D638	35 ± 3 MPa ^[21]	52 ± 3 MPa ^[2]
Tensile Stress at Yield	ASTM D638	23 ± 1 MPa ^[21]	39 ± 1 MPa ^[2]
Young's Modulus	ASTM D638	847 ± 26 MPa ^[21]	1378 ± 41 MPa ^[2]
Elongation at Failure	ASTM D638	166 ± 14 % ^[21]	127 ± 6 % ^[2]
Maximum Flexural Stress	ASTM D790		69 ± 2 MPa ^[1]
Flexural Modulus	ASTM D790		1500 ± 76 MPa ^[1]
Flexural Strain at Break	ASTM D790		Does not Break ^[1]
Impact Strength—IZOD Notched	ASTM D256		71.6 ± 3 J/m ^[6]
Impact Strength—IZOD Unnotched	ASTM D256		>1500 J/m ^[6]
Other Properties			
HDT @ 0.455 MPa	ASTM D648		53°C ^[16]
Shore Hardness "D" (0s,3s)	ASTM D2240		79,76 ^[10]
Water Absorption	Internal		2% ^[11]
Liquid Density	ASTM D1475		1.050 ^[12]
Solid Density (Green)	ASTM D1475		1.126 ^[12]
Solid Density (Post Processed)	ASTM D1475		1.134 ^[12]
Liquid Properties			
Viscosity @ 25°C (77°F)	ASTM D7867		2300 cP ^[5]

"All specimen are printed unless otherwise noted. All specimen were conditioned in ambient lab conditions at 19-23C / 40-60% RH for at least 24 hours." ASTM Methods: D638 Type IV, 50mm/min, D790-B, 2mm/min, D256 Notched IZOD (Machine Notched), 6 mm x 12 mm, D648, D2240, Type "D" (0, 3 seconds), D1475, D7867

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|-------------------------------|--------------------------------|--------------------------------|
| 1) TaskID Reference: FOR16318 | 10) TaskID Reference: FOR18476 | 19) TaskID Reference: FOR18208 |
| 2) TaskID Reference: FOR16273 | 11) TaskID Reference: FOR16322 | 20) TaskID Reference: FOR18531 |
| 3) TaskID Reference: FOR5556 | 12) TaskID Reference: FOR17633 | 21) TaskID Reference: FOR19711 |
| 4) TaskID Reference: FOR9594 | 13) TaskID Reference: FOR18202 | 22) TaskID Reference: FOR20002 |
| 5) TaskID Reference: FOR16316 | 14) TaskID Reference: FOR18207 | |
| 6) TaskID Reference: FOR16321 | 15) TaskID Reference: FOR18206 | |
| 7) TaskID Reference: FOR10162 | 16) TaskID Reference: FOR18829 | |
| 8) TaskID Reference: FOR16266 | 17) TaskID Reference: FOR18201 | |
| 9) TaskID Reference: FOR16274 | 18) TaskID Reference: FOR18611 | |

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Clear Color Properties

Method: ASTM E308, Total Transmission

Part State	L*	a*	b*	C*	h	dE
Green / no post-processing ^[8]	92.425	-1.205	2.195	2.5	118.735	NA
Dymax 5000EC 10 minutes / side ^[9]	92.255	-0.52	1.265	1.37	112.28	1.17
Loctite CL36 60 min/side ^[22]	92.18	-0.32	0.89	0.94	109.88	1.831366

QUV exterior weathering conditions (ASTM G-154—Cycle 1): Clear color

Method: ASTM G-154—Cycle 1 & ASTM E308, Total Transmission

QUV Exposure Time (Hrs)	L*	a*	b*	C*	h	dE
0	90.86	-0.65	1.03	1.22	122.49	NA
240	91.06	-0.47	1.42	1.49	108.47	0.47

QUV exterior weathering conditions (ASTM G-154—Cycle 1): Clear color mechanical properties

Method: ASTM G-154—Cycle 1

QUV Exposure Time (Hrs)	Tensile Stress at break (MPa)	Yield Stress (MPa)	Young's Modulus (MPa)	Elongation at break (%)
0	49 ± 3	42 ± 1	1412 ± 60	116 ± 12
300	41 ± 3	40 ± 1	1343 ± 103	78 ± 12
520	41 ± 2	44 ± 1	1469 ± 35	63 ± 16
800	38 ± 1	45 ± 1	1478 ± 51	46 ± 16

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Machine Settings

LOCTITE® IND405™ is formulated to print optimally on any DLP machine. It is recommended to print with 385-405 nm wavelength projectors with irradiance between 3-7 mW/cm². Layer time is given below at 5 mW/cm²:

Ec (mJ/cm ²)	6.2
Dp (mm):	0.15

Layer Thickness	25 µm	50 µm	100 µm
First Layer Exposure Duration	10 s	20 s	40 s
Burn In Region Exposure Duration	6 s	12 s	25 s
Model Exposure Duration	2 s	3 s	6 s

Recommended printing Temperature range: 20°C to 45°C

Post Processing

LOCTITE® IND405™ requires post processing to achieve specified properties. Prior to post curing, support structures should be removed from the printed part, and the part should be washed in a compatible cleaner. LOCTITE® recommends either IPA or Cleaner C in 2 minute interval wash cycles. Use compressed air to remove residual solvent from the surface of the material between intervals. Exact times and methods can be found by contacting us at www.loctiteAM.com.

Post Curing

LOCTITE® IND405™ requires post curing to achieve specified properties. A wide array of post cure equipment can be used to cure LOCTITE® IND405™ appropriately. A list of validated devices with detailed information can be found by contacting us at www.loctiteAM.com.

Additional Development Options

Colors: LOCTITE® IND405™ formula can be made in additional pigment colors.

LCD printers: LOCTITE® IND405™ currently testing, there's potential.

Limitations

Vat Printer: LOCTITE® IND405™ formula is not possible.

Post Cure: LOCTITE® IND405™ requires UV/Visible light post curing.



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