

**LOCTITE**<sup>®</sup>

We Make Additive Manufacturing Happen  
Our Material Solutions



Henkel

## Why Digital Light Processing (DLP) is the right technology for you?

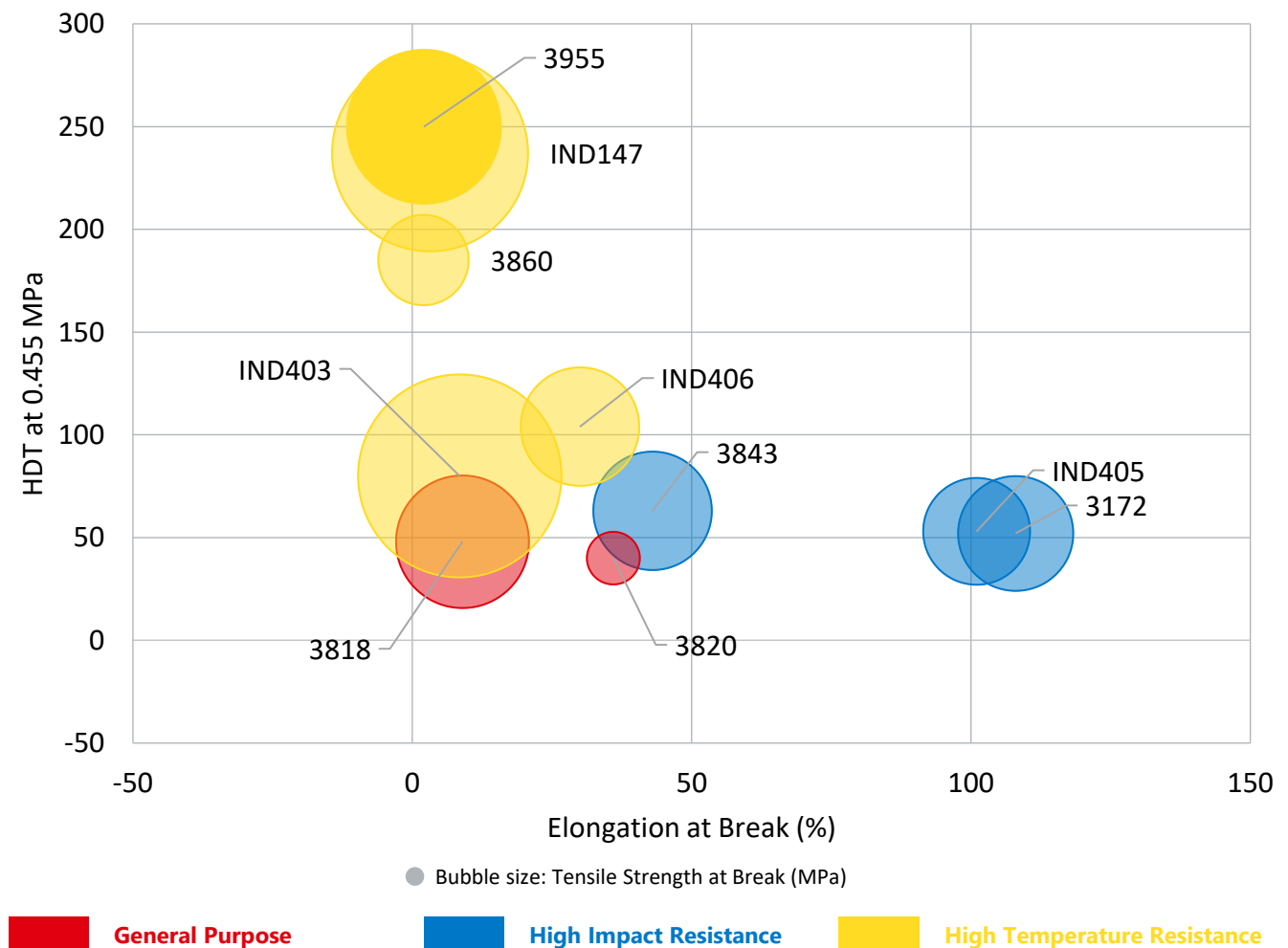
DLP printing has numerous advantages compared to other additive manufacturing technologies:

- » High resolution and great surface finish
- » Broad range of high-performance materials available from LOCTITE
- » Faster printing speeds
- » Excellent isotropic properties
- » Less infrastructure costs, less maintenance and lower energy consumption
- » Easy and convenient change over for managing multiple materials, with the same equipment

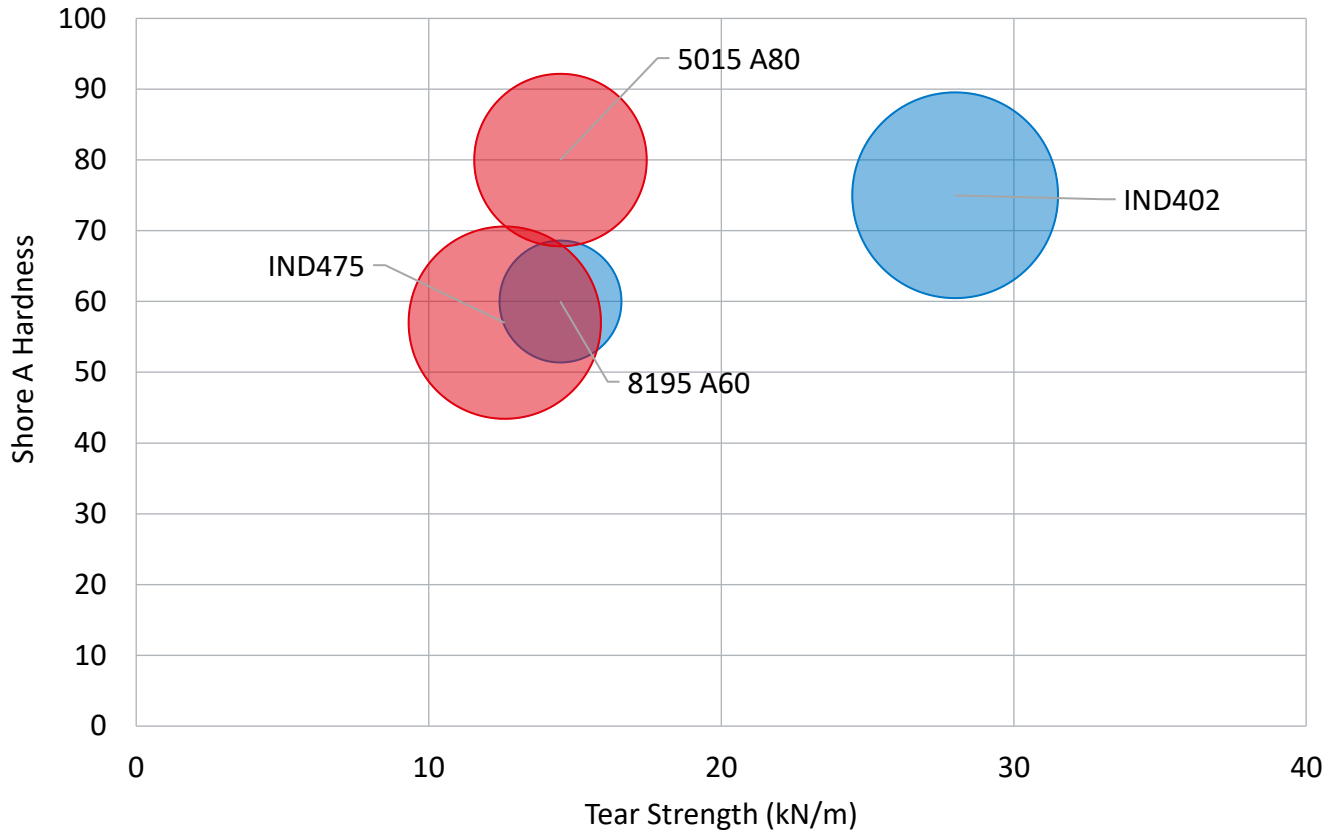
## A broad range of materials to meet your industrial requirements across multiple applications

Learn more about LOCTITE Engineering resins, customized for DLP production processes

### PHOTOPLASTIC RESINS



## PHOTOELASTIC RESINS



● Bubble size represents % Elongation

■ General Purpose

■ Industrial/End Use

## Selecting the right material

1 Process consideration	2 End use of the part	3 Special considerations
<ul style="list-style-type: none"> <li>» What technology are you using?</li> <li>» Part requirements                             <ul style="list-style-type: none"> <li>– Size</li> <li>– Surface finish</li> <li>– Level of accuracy</li> </ul> </li> <li>» Which SLA or DLP printer do you use?</li> </ul>	<ul style="list-style-type: none"> <li>» Current solution and issues</li> <li>» What is the application type? (industrial / Healthcare etc.)</li> <li>» What is the reference material? (PP / ABS / rubber)</li> <li>» To what environments will the part be exposed?</li> <li>» Temperature resistance</li> <li>» Impact resistance</li> <li>» Stiffness / elongation requirements</li> <li>» Physical properties</li> </ul>	<ul style="list-style-type: none"> <li>» Flame and Smoke Toxicity (FST)</li> <li>» Medical approval (skin contact, biocompatibility)</li> <li>» Environmental durability (long term aging resistance)                             <ul style="list-style-type: none"> <li>– Media resistance</li> <li>– UV aging</li> <li>– Thermal aging</li> </ul> </li> <li>» End to end cycle time</li> <li>» Cost considerations</li> </ul>

## Application case example – the right material choice

Adhesive Fixture for Bonding Assembly: Part weight reduction , lead time and cost reduction needed

Solution: Design optimization and LOCTITE 3D 3172 HDT50 High Impact

1 Process consideration	2 End use of the part	3 Special considerations
<ul style="list-style-type: none"> <li>» Existing DLP printer</li> <li>» Medium part size</li> <li>» High surface finish and precision required</li> <li>» Material needs to be validated on existing printer</li> </ul>	<ul style="list-style-type: none"> <li>» Current issue: heavy aluminum part with long lead times</li> <li>» Fixture required for adhesive bonding in assembly line</li> <li>» Parts used at room temperature and managed directly by operators</li> <li>» High stiffness and impact resistance needed</li> </ul>	<ul style="list-style-type: none"> <li>» No FST or medical approval needed</li> <li>» Parts need to be durable and delivered quickly</li> <li>» Costs need to be competitive vs. aluminum milling</li> </ul>



### 1. Requirements

- High Impact Resistance



### 2. Design optimization

- Light and ergonomic



### 3. Fully optimized

- Printed with 3172 HDT50 High Impact

50% cost reduction • 83% material reduction • Same functionality, more ergonomic • From 2 weeks to 5 hours production

## LOCTITE 3DP Product Overview

		Product	Colour	Packaging	HDT at 0.455 (MPa) in °C	Tensile Stress at Break (MPa)	Elongation at Break (%)	Young's Modulus (MPa)	Flexular Modulus (MPa)	IZOD Impact (Noched, J/M)	Shore Hardness	Ideal for	Industries
	ASTM			1 kg bottle, 5 kg jerry can, *metal can	ASTM D648	ASTM D638 (D412 <sup>5</sup> )	ASTM D638 (D412 <sup>5</sup> )	ASTM D638	ASTM D790	ASTM D256	ASTM D2240		
Photoplastic	General Purpose Resins	3818	Black	1 kg	48	57	9	2,165	2,264	-	-	Accurate prototyping, Models requiring outstanding appearance	Industry, Consumer Goods, Automotive
		3820	Clear	1 kg	N/A	23	36	680	N/A	34	60 D	Lighting, Functional Prototyping, Secondary Lightning Lenses	Industry, Automotive
	High Impact Resins	3172	Gray*	1 kg	51	39	105	1,494	1,150	73	63 D	Tooling, Manufacturing Aids, Housings, Insoles (similar to PP)	Industry, Automotive, Consumer Goods
			Clear	1 kg	40	38	141	1,245	1,022	43	70 D		
		3843	Matte Black*	1 kg, 5 kg	63	51	43	1,806	1,783	53	74 D	Manufacturing aids, Jigs and fixtures, Housings and covers. Insoles	Industry, Automotive, Consumer Goods
			White	1 kg, 5 kg	60	49	48	1,720	1,673	58	70 D		
			Clear	1 kg, 5 kg	63	44	41	1,752	1,878	65	68 D		
	IND405 <sup>3</sup>	Black*	1 kg, 5 kg	53	45	101	1,434	1,181	69	80 D	Tooling, Manufacturing Aids, Housings, Consumer Products	Industry, Consumer Goods	
		Clear	1 kg, 5 kg	53	52	127	1,378	1,500	72	79 D			
	High Temperature Resistant Resins	3860	Black	1 kg	185	39	2	3,500	-	-	80 D	Functional prototyping, Encapsulation, Mounts and housings	Industry, Automotive
		3955	Black	1 kg <sup>6</sup> , 5 kg <sup>6</sup>	>250	66	2.1	3,556	4,643	23	84 D	HVAC Components for Aircraft, Clips and Plugs for Control, Systems/Cabinets, Connectors, Electronic Housings	Industry, Automotive, Aerospace
		IND147 <sup>3</sup>	Black	1 kg, 5 kg	237	84	3.2	3,285	3,900	14,5	94 D	Tooling, Molds	Industry, Automotive
		IND403 <sup>3</sup>	Black	1 kg, 5 kg	80	87	8.5	2,750	2,900	27	80 D	Interior Applications, Molds	Industry, Automotive
		IND406	Black	1 kg, 5 kg	104	51	30	1,800	-	35	79	Tooling and molds, interior applications in automotive	Industry, Automotive, Consumer Goods

<sup>1</sup>For further information please see TDS, contact Technical Service Centre or Customer Service Representative. The physical properties provided in this document are typical results of printed parts and are provided for reference purposes only. <sup>2</sup>All data after post-cure. <sup>3</sup>Preliminary test data. <sup>4</sup>HDT: Heat Deflection Temperature. <sup>5</sup>Test method: D412. <sup>6</sup>Stored in metal cans. \* Data shown reflects properties from resin highlighted with “\*”, for additional information please refer to the respective TDS

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	ASTM			1 kg bottle, 5 kg jerry can, *metal can	ASTM D648	ASTM D638 (D412 <sup>5</sup> )	ASTM D638 (D412 <sup>5</sup> )	ASTM D638	ASTM D790	ASTM D256	ASTM D2240		
Photoelastic	Elastomeric Resins	5015	Clear, White, Black	1 kg	N/A	85	1605	N/A	N/A	N/A	80 A	Gaskets, Seal, Tubes, Functional prototyping	Industry, Healthcare
		8195	Gray*,Red	1 kg, 5 kg	N/A	3	81	4	–	–	60 A	Gaskets, Seal prototyping, Anatomical models	Industry, Healthcare, Consumer Goods
		IND402 <sup>3</sup>	Black, Gray	1 kg, 5 kg	–	6	230	42	–	–	76 A	Consumer products, Lattice structures for sportswear	Industry, Automotive, Consumer Goods
		IND475	White, Black, Gray	1 kg	–	3.9	201	2.3	–	–	60 A	Consumer products, Lattice structures for sportswear, Functional prototyping	Industry, Automotive, Consumer Goods

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## General Purpose Resins

For Functional Prototyping

Accelerate your product development process with rapid prototyping resins that deliver high accuracy and fine surface details.

### IDEAL FOR

- » Accurate prototyping
- » Models requiring outstanding appearance
- » Functional prototyping
- » Secondary Lighting lens applications

### PROPERTIES

- » Easy & fast to print
- » Exceptional surface finish
- » Great dimensional stability
- » Low shrinkage
- » Short exposure times during printing



### LOCTITE 3D 3818 High Accuracy

High resolution & fast printing

Formulated to deliver exceptional surface finish, low warpage and extremely high print accuracy, perfect for printing accurate performance prototypes.

#### Benefits:

- » Accurate & Exceptional surface finish
- » Fast printing
- » Dimensional stability during post curing

PROPERTY <sup>1</sup>	METHOD	
Colour	–	Black
Tensile Stress at Break (MPa)	ASTM D638	57
Elongation at Break (%)	ASTM D638	9
Young's Modulus (MPa)	ASTM D638	2,165
HDT at 0.455 MPa	DMA	47.6



### LOCTITE 3D 3820 Ultra Clear

Rigid resin for transparent components

Non brittle material that achieves clear properties on finished parts without the thorough post processing required by similar resins

#### Benefits:

- » Superior clear finish
- » Limited post processing required
- » Non brittle, stable

PROPERTY <sup>1</sup>	METHOD	
Colour	–	Clear
Tensile Stress at Break (MPa)	ASTM D638	23
Elongation at Break (%)	ASTM D638	36
Young's Modulus (MPa)	ASTM D638	680
IZOD Impact (Noched, J/m)	ASTM D256	34
Shore Hardness (D)	ASTM D2240	60
Print Appearance Transparency <sup>2</sup>	–	80 – 90%

<sup>1</sup>All data after post-cure in accordance with TDS.

<sup>2</sup>% value of visible light through a 3D printed object (standard 7.0 mm block).

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## High Impact Resins

Tough Materials for Final Parts Production

Unique high impact resistant 3D printing materials for durable, functional and production parts.

### IDEAL FOR

- » Manufacturing aids
- » Housings and coverings
- » Jigs and fixtures
- » Insoles

### PROPERTIES

- » Printable at room temperature
- » Excellent performance and durability vs. other resins in the market
- » Printable at high resolution
- » Outstanding surface finishing



### 3172 HDT50 High Impact

Tough & high impact material

Resin that functional parts production that require high stiffness with a good surface finish and high impact resistance. Attributes are similar to Polypropylene (PP).

#### Benefits:

- » Tough & durable
- » Superior impact strength
- » Nice surface finish, machine-able

PROPERTY <sup>1</sup>	METHOD	
Colour	–	Gray*, Clear
HDT at 0.455 MPa	ASTM D648	46°C
Tensile Stress at Break (MPa)	ASTM D638	44
Elongation at Break (%)	ASTM D638	124
Young's Modulus (MPa)	ASTM D638	1,315
IZOD Impact (Noched, J/m)	ASTM D256	57



### 3843 HDT60 High Toughness

High strength, semi-flexible resin

Semi-flexible resin with moderate temperature resistance HDT60, high impact strength, and versatility for a broad range of applications. Ideal for a wide variety of tooling applications on the production floor.

#### Benefits:

- » Moderate heat resistance, HDT 60° C
- » Tough with outstanding surface finish
- » Superior strength and impact resistant

PROPERTY <sup>1</sup>	METHOD	
Colour	–	Matte Black*, White, Clear
HDT at 0.455 MPa	ASTM D648	63°C
Tensile Stress at Break (MPa)	ASTM D638	51
Elongation at Break (%)	ASTM D638	43
Young's Modulus (MPa)	ASTM D638	1,806
IZOD Impact (Noched, J/m)	ASTM D256	53
Shore Hardness (D)	ASTM D2240	74

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## IND405 HDT50 High Elongation

High impact, high elongation resin

Rigid, high elongation and high tough one-part material with excellent surface finish properties. Properties are comparable to an unfilled thermoplastic like Polypropylene (PP).

### Benefits:

- » High impact resistance with high elongation
- » Easy to print (one-part material)
- » Tough and Durable
- » The toughest clear resin (only applicable for clear material)

PROPERTY <sup>1</sup>	METHOD	
Colour	–	Black* & Clear
HDT at 0.455 MPa	ASTM D648	53°C
Tensile Stress at Break (MPa)	ASTM D638	52
Elongation at Break (%)	ASTM D638	130
Young's Modulus (MPa)	ASTM D638	1,434
IZOD Impact (Noched, J/m)	ASTM D256	70

<sup>1</sup> All data after post-cure 3in accordance with TDS.

## High Temperature Resistant Resins

Temperature Resistant Materials for Final Parts Production

Unique 3D printing materials for functional production parts that withstands high temperature requirements.

### IDEAL FOR

- » Functional prototyping
- » Encapsulation
- » Mounts and housings
- » HVAC Components
- » Clips and Plugs for Control Systems/Cabinets
- » Connectors, Electronic Housings

### PROPERTIES

- » Printable at room temperature
- » Outstanding performance and durability vs. other resins in the market
- » Easy to print at high resolution



### 3860 HDT180 High Temperature

Rigid resin with high temperature resistance

Rigid resin that withstands high temperature stress and it is ideal for applications where high resolution and high HDT is required.

#### Benefits:

- » No deformation, more durable
- » Survives longer to temperature stress
- » Easy to print with high print resolution

PROPERTY <sup>1</sup>	METHOD	
Colour	–	Black
HDT at 0.455 Mpa	ASTM D648	185°C
Tensile Stress at Break (MPa)	ASTM D638	39
Elongation at Break (%)	ASTM D638	2
Young's Modulus (MPa)	ASTM D638	3,500
HDT at 0.455 MPa	ASTM D2240	80



### IND147 HDT230 High Heat

High temperature resin for tooling & molding

Rigid resin designed for tooling and molding applications owing to its high stiffness and high temperature resistance withstanding up to 230°C

#### Benefits:

- » Good dimensional stability
- » Good surface finish

PROPERTY <sup>1</sup>	METHOD	
Colour	–	Black
HDT at 0.455 Mpa	ASTM D648	238°C
Tensile Stress at Break (MPa)	ASTM D638	75
Elongation at Break (%)	ASTM D638	6
Young's Modulus (MPa)	ASTM D638	3,168
Flexural Modulus (MPa)	ASTM D790	3,900
Shore Hardness (D)	ASTM D2240	94

<sup>1</sup>All data after post-cure 3in accordance with TDS.



## IND403 HDT80 High Modulus

High modulus tough resin for tooling

Rigid resin ideal for tooling and end use parts up to 80°C service temperature. Great dimensional accuracy and printability at high resolution.

### Benefits:

- » High heat deflection temperature, HDT 80 °C
- » Tough with good dimensional stability
- » Good surface finish

PROPERTY <sup>1</sup>	METHOD	
Colour	–	Black
HDT at 0.455 Mpa	ASTM D648	80°C
Tensile Stress at Break (MPa)	ASTM D638	90
Elongation at Break (%)	ASTM D638	8
Young's Modulus (MPa)	ASTM D638	2,800
IZOD Impact (Noched, J/m)	ASTM D256	27



## IND406 HDT100 High Elongation

Our toughest high temperature resin

Tough resin designed for interior applications in Automotive, due to its high surface quality, dimensional accuracy and temperature resistance.

### Benefits:

- » High heat deflection temperature, HDT >100 °C
- » Tough and durable
- » Good surface finish

PROPERTY <sup>1</sup>	METHOD	
Colour	–	Black
HDT at 0.455 MPa	ASTM D648	108°C
Tensile Stress at Break (MPa)	ASTM D638	52
Elongation at Break (%)	ASTM D638	24
Young's Modulus (MPa)	ASTM D638	1,658
IZOD Impact (Noched, J/m)	ASTM D256	35
Shore Hardness (D)	ASTM D2240	79

<sup>1</sup>All data after post-cure 3in accordance with TDS.

## Flame Retardant Resin

FST Material with UL94 V0 flammability



### 3955 HDT280 FST\*

First photopolymer with flame retardancy that passes vertical burn and aerospace FST standards

Halogen free, high performance, high modulus material with excellent flexural and tensile physical properties

#### Benefits:

- » Fire Safety Material
- » Halogen Free
- » Excellent flexural and tensile physical properties
- » UL94 V-0 flammability
- » FST (AITM2-0002, AITM2-0007, AITM3-0005)

PROPERTY <sup>1</sup>	METHOD	
Colour	–	Black
Tensile Stress at Break (MPa)	ASTM D638	67
Elongation at Break (%)	ASTM D638	2
Young's Modulus (MPa)	ASTM D638	3,600
Flexural Modulus (MPa)	ASTM D790	4,600
Shore Hardness (D)	ASTM D2240	85

For further information please see TDS, contact Technical Service Centre or Customer Service Representative. The physical properties provided in this document are typical results of printed parts and are provided for reference purposes only. \* Flame and Smoke Toxicity (FST)

## Elastomeric Resins

Elastomeric Materials for Functional Prototyping and Final Parts Production

Unique 3D printing materials for durable, functional, production parts with elastomeric behavior.

### IDEAL FOR

- » Gaskets
- » Seal prototyping
- » Anatomical models
- » Consumer products
- » Tube's prototyping
- » Gaskets, seals prototyping
- » Lattice structures for sportswear

### PROPERTIES

- » Printable at room temperature
- » True elastomeric behavior
- » Stable -20 to +100°C
- » Good interlayer adhesion with low shrinkage
- » Outstanding performance and durability



### 8195 A60 High Rebound

Flexible & easy to print

One-part elastomeric material formulated to have firm compression properties with quick rebound performance to match soft rubber like materials.

Flexibility, high resilience and good energy return make this material ideal for gasketing, sealing and anatomical model type applications.

#### Benefits:

- » Excellent surface finish
- » Fast printing
- » High resilience & energy return

PROPERTY <sup>1</sup>	METHOD	
Colour	–	Gray* & Red
Tensile Stress at Break (MPa)	ASTM D638	3
Elongation at Break (%)	ASTM D638	81
Young's Modulus (MPa)	ASTM D638	4
Shore Hardness (A)	ASTM D2240	60



### 5015 A80 Elastomeric

Silicone based prototyping resin

Single component silicone tough material with little post processing needed to achieve great results. Ideal for elastomeric prototypes that require higher stiffness.

#### Benefits:

- » Stable at temperatures up to +100°C and down to -20°C
- » Good interlayer adhesion
- » Low shrinkage

PROPERTY <sup>1</sup>	METHOD	
Colour	–	Clear, White, Gray, Black
Tensile Stress at Break (MPa)	ASTM D412	8
Elongation at Break (%)	ASTM D412	160
Shore Hardness (A)	ASTM D2240	80

For further information please see TDS, contact Technical Service Centre or Customer Service Representative.  
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## IND475 A60 High Rebound

Easy to print

An industrial strength UV resin that cures to a soft, elastomeric material. IND475 is suitable for applications where resilience, snap back, and tear resistance is desired, such as lattice structures and functional prototyping. This single component resin is easy to print of a variety of platforms, making it a superior material for elastomeric applications.

### Benefits:

- » True elastomeric behavior
- » Fast Printing with low shrinkage behavior
- » High resilience / High energy return
- » Exceptional durability compression forces

PROPERTY <sup>1</sup>	METHOD	
Colour	–	White, Black & Gray
Tensile Stress at Break (MPa)	ASTM D638	3.9
Elongation at Break (%)	ASTM D638	201
Young's Modulus (MPa)	ASTM D638	2.3
Shore Hardness (A)	ASTM D2240	60



## IND402 A70 High Rebound

High rebound elastomers

Single component elastomer material with high elongation and high resilience, excellent tensile strength and high energy return while also not requiring thermal post processing.

### Benefits:

- » True elastomeric behavior
- » Excellent interlayer adhesion
- » Good rebound performance

PROPERTY <sup>1</sup>	METHOD	
Colour	–	Black
Tensile Stress at Break (MPa)	ASTM D638	6
Elongation at Break (%)	ASTM D638	230
Young's Modulus (MPa)	ASTM D638	42
Energy Return (J/m)	Internal method	33
Shore Hardness (A)	ASTM D2240	76

<sup>1</sup> All data after post-cure 3in accordance with TDS.



## Summary

- » Every application has its own unique requirements, and we are here to support your journey towards additive manufacturing at industrial scale
- » LOCTITE offers you a broad material portfolio of general purpose, high impact, high temperature resistant and elastomeric resins for a broad range of leading DLP systems
- » We work with industry leaders and equipment manufacturers to ensure our materials are validated within a qualified industrial workflow
- » LOCTITE materials allow you to produce functional, repeatable and reliable parts



## Value for You

### Promise of Loctite Branding

We leverage decades of industrial experience of solving real manufacturing challenges, across markets

### Technology Experts

We are the photopolymer technology experts

### Trusted Eco-System Partners

We work with ecosystem partners like service bureaus, OEM printer partner and experts in post processing to ensure production of functional, repeatable and reliable parts

### Validation

Unlocking Customer Readiness with validated

- » Workflows
- » Materials properties/ customization
- » Parts design
- » Quality management system



Test your application with our materials.

Contact our engineers to get support:

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Learn more about our application cases.

**Visit LoctiteAM.com**

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