

**LOCTITE**<sup>®</sup>

**3D PRINTING**

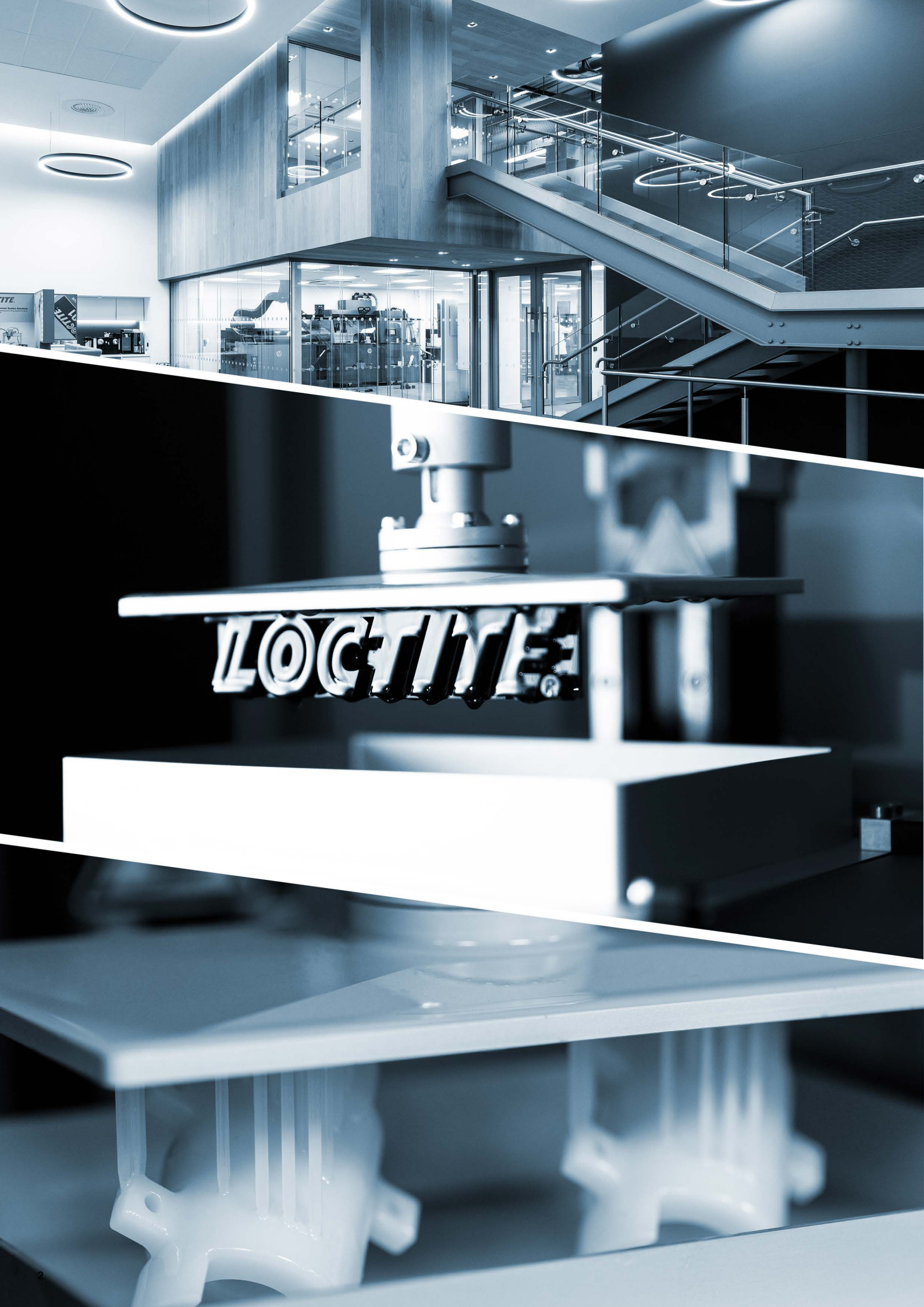
**3D PRINTING MATERIAL  
SOLUTIONS FOR HEALTHCARE**

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*LOCTITE 3D Printing*

Henkel

Henkel Adhesive Technologies



# Introduction

LOCTITE materials have always been on the forefront of Industrial assembly and manufacturing.

As industry further embraces Additive Manufacturing as a production solution, Henkel is again at the forefront with a broad portfolio of photopolymer resins. Covering tough, specialty, high temperature resistant, elastomer, prototyping, and medical resins, the LOCTITE 3D portfolio supports a wide range of industries, applications, and use cases.

LOCTITE 3D Photopolymer materials have been validated for use on an extensive range of printers giving customers the ability to select a production solution that fits their needs. Among others, our workflow validations and extensive material testing to ASTM standards put LOCTITE in a leading position in open-source materials.

LOCTITE 3D materials are available globally, and with Henkel's legacy of business excellence, customers have the security of working with one of the world's largest industrial materials companies that is committed to bringing LOCTITE Additive Manufacturing solutions to industry.

**For more information on material specifications and printer compatibility visit [www.LoctiteAM.com](http://www.LoctiteAM.com)**

# LOCTITE 3D Printing Resins for Healthcare Applications


## MEDICAL WORKFLOW VALIDATIONS

**MATERIAL**



- ✓ Product Code
- ✓ Version

**PRINT**



- ✓ Printer Model
- ✓ Build Style
- ✓ Operation Conditions

**WASH**



- ✓ Model
- ✓ Clearing Fluid
- ✓ Process
- ✓ Operating Conditions
- ✓ Duration

**POST-CURE**



- ✓ Model
- ✓ Process
- ✓ Operating Conditions
- ✓ Duration

LOCTITE 3D Printing delivers high performance photopolymers with a validated workflow to ensure reproducible, repeatable results are generated in accordance with our Technical Data Sheet and test results. For medical device solutions, it is recommended to consult with the LOCTITE 3D Printing team to ensure the use of a workflow that has been validated for the intended use or specific requirements.

**VALIDATION**



- ✓ Physical Properties
- ✓ Non-cytotoxic

# BIOCOMPATIBILITY

The biocompatibility of photopolymers in additive manufacturing (AM) needs to take into account the unique parameters of the manufacturing processes, which can influence the physical, chemical, and biological properties of AM-produced devices. The quality of AM-produced devices may consequently vary when identical parts are built using different materials, 3D printers or post processing steps. Here is where the importance of workflow validation comes into focus to ensure replicable biocompatibility results.

Our resins are validated across multiple DLP and LCD printing systems to fit your specific requirements. Biocompatibility (according to ISO 10993-5\*, ISO 10993-10\*, \*ISO 10993-11 and ISO 10993-23\*) is achievable for highlighted resin when they are processed according to a validated workflow.

- **ISO 10993-5:2009\*** describes test methods to assess the cytotoxicity of medical devices. These methods specify the incubation of cultured cells in contact with a device and/or extracts of a device either directly or through diffusion. These methods are designed to determine the biological response of mammalian cells in vitro using appropriate biological parameters.
- **ISO 10993-10:2021\*** describes the procedure for the assessment of medical devices and their constituent materials with regard to their potential to produce skin sensitization on contact. ISO 10993-10:2010 includes pretest considerations for compositional screening, including in silico and in vitro methods for dermal exposure, details of in vivo sensitization test procedures and key factors for the interpretation of the results.
- **ISO 10993-11:2017\*** specifies requirements and gives guidance on procedures to be followed in the evaluation of the potential for medical device materials to cause adverse systemic reactions.
- **ISO 10993-23:2021\*** describes the procedure for the assessment of medical devices and their constituent materials with regard to their potential to produce irritation on contact. The tests are designed to predict and classify the irritation potential of medical devices, materials or their extracts according to ISO 10993-1 and ISO 10993-2.

# ISO 13485 CERTIFIED QUALITY STANDARD FOR PRODUCTION FACILITY

Henkel's US laboratory and production facilities in California, USA, which are dedicated to developing and manufacturing resins for 3D printing, have achieved ISO 13485:2016 certification. ISO 13485 is an international quality standard that enables medical device manufacturers to specify and implement process and production controls, in addition to providing them with documentation and traceability. In Henkel's case specifically, it covers the design, manufacture, and distribution of 3D printing resins for medical applications.

ISO 13485 certification requires an organization to review many aspects of its operations with the goals of identifying, implementing and complying with industry quality standards and practices. Areas of emphasis include:

- Design control: All processes involved with product design are identified and documented, including user needs, workflow, design inputs and outputs, verification and validation
- Process and production controls: Managed with a quality management software, including over 2,000 pages of supporting documents
- Change management control: As problems are uncovered over a product's lifecycle, processes are audited and improved to eliminate or minimize the issue
- Product traceability: Cradle to grave visibility and surveillance from raw material to finished resin and from component to final printed part
- Risk management: Each process is documented and analyzed for risk based on probability and severity

With the ISO 13485 certification, Henkel is well positioned to support medical device manufacturers. Customers in that industry can benefit from additive manufacturing and have peace of mind knowing LOCTITE's portfolio of products and validated workflows are designed, developed and manufactured with quality in mind.



# LOCTITE 3D Printing Product Overview

## MEDICAL RESINS

|                |   | Color              | HDT at 0.455 MPa (°C) | Tensile Stress at Break (MPa)  | Elongation at Break (%)        | Young's Modulus (MPa) | IZOD Impact Notched (J/m) | Shore Hardness (3 sec) | Biocompatibility |              |              |              |
|----------------|---|--------------------|-----------------------|--------------------------------|--------------------------------|-----------------------|---------------------------|------------------------|------------------|--------------|--------------|--------------|
|                | Ideal For   |                    | ASTM D648             | ASTM D638 (D412 <sup>1</sup> ) | ASTM D638 (D412 <sup>1</sup> ) | ASTM D638             | ASTM D256                 | ASTM D2240             | ISO 10993-5      | ISO 10993-10 | ISO 10993-11 | ISO 10993-23 |
| <b>MED412</b>  | <ul style="list-style-type: none"> <li>Medical devices</li> </ul>   | Clear              | 40                    | 37                             | 110                            | 1,300                 | 50                        | 70 D                   | ✓                | ✓            | -            | ✓            |
|                |   | White              | 40                    | 28                             | 100                            | 1300                  | 50                        | 68 D                   | ✓                | ✓            | -            | ✓            |
| <b>MED413</b>  | <ul style="list-style-type: none"> <li>Medical equipment components</li> </ul>  | Clear              | 70                    | 40                             | 50                             | 1,600                 | 65                        | 76 D                   | ✓                | ✓            | -            | ✓            |
|                |   | White              | 69                    | 44                             | 55                             | 1,800                 | 58                        | 72 D                   | ✓                | ✓            | -            | ✓            |
| <b>MED414</b>  | <ul style="list-style-type: none"> <li>Wearables</li> <li>PPE</li> <li>Earbuds</li> </ul> Medical Devices <ul style="list-style-type: none"> <li>Hearing aid</li> <li>Orthoses</li> </ul>                 | Blue               | -                     | 4                              | 240                            | 15                    | -                         | 51 A (5 sec)           | ✓                | ✓            | -            | ✓            |
| <b>MED3394</b> | <ul style="list-style-type: none"> <li>Surgical tooling</li> <li>Hospital devices</li> <li>Clean room applications</li> <li>Medical products requiring sterilization &amp; chemical resistance</li> </ul> | Sheer Black, White | 100                   | 68                             | 12                             | 2,500                 | 26                        | 75                     | ✓                | ✓            | ✓            | ✓            |
| <b>MED9851</b> | <ul style="list-style-type: none"> <li>Prosthetics</li> <li>Orthotics</li> <li>Eyewear</li> </ul>   | Clear              | 68                    | 45                             | 40                             | 2,300                 | 50                        | 80 D                   | ✓                | ✓            | -            | ✓            |

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. All data after post-cure. HDT: Heat Deflection Temperature. <sup>1</sup> Test method for Elastomer: D412. For additional information please refer to the respective TDS,

# LOCTITE 3D Printing Product Overview

## MEDICAL COMPATIBLE RESINS

|                         |  | Color       | HDT at 0.455 MPa (°C) | Tensile Stress at Break (MPa)  | Elongation at Break (%)        | Young's Modulus (MPa) | Flexural Modulus (MPa) | IZOD Impact Notched (J/m) | Shore Hardness (3 sec) | Tear Strength (kN/m) | Biocompatibility |              |              |              |
|-------------------------|--|-------------|-----------------------|--------------------------------|--------------------------------|-----------------------|------------------------|---------------------------|------------------------|----------------------|------------------|--------------|--------------|--------------|
|                         | Ideal For  |             | ASTM D648             | ASTM D638 (D412 <sup>1</sup> ) | ASTM D638 (D412 <sup>1</sup> ) | ASTM D638             | ASTM D790              | ASTM D256                 | ASTM D2240             | ASTM D624            | ISO 10993-5      | ISO 10993-10 | ISO 10993-11 | ISO 10993-23 |
| <b>TOUGH</b>            |  |             |                       |                                |                                |                       |                        |                           |                        |                      |                  |              |              |              |
| <b>3172</b>             | <ul style="list-style-type: none"> <li>Medical equipment components,</li> <li>Manufacturing aids</li> <li>Jigs and fixtures</li> <li>Housings and covers</li> </ul>              | Gray        | 52                    | 39                             | 100                            | 1,500                 | 1,100                  | 73                        | 63 D                   | -                    | ✓                | -            | -            | ✓            |
| <b>3843</b>             | <ul style="list-style-type: none"> <li>Medical equipment components</li> <li>Manufacturing aids</li> <li>Jigs and fixtures</li> <li>Housings and covers</li> </ul>               | White       | 60                    | 49                             | 48                             | 1,700                 | 1,700                  | 58                        | 76 D                   | -                    | ✓                | -            | -            | ✓            |
|                         |  | Matte Black | 63                    | 51                             | 43                             | 1,800                 | 1,800                  | 53                        | 67 D                   | -                    | ✓                | -            | -            | -            |
| <b>IND405</b>           | <ul style="list-style-type: none"> <li>Medical equipment components</li> <li>Manufacturing aids</li> <li>Fluid routing prototypes</li> <li>Consumer goods prototyping</li> </ul> | Clear       | 53                    | 38                             | 96                             | 1,400                 | 1,300                  | 72                        | 76 D                   | -                    | ✓                | -            | -            | ✓            |
| <b>HIGH TEMPERATURE</b> |  |             |                       |                                |                                |                       |                        |                           |                        |                      |                  |              |              |              |
| <b>IND406</b>           | <ul style="list-style-type: none"> <li>Medical equipment components</li> <li>Manufacturing aids</li> <li>Jigs and fixtures</li> <li>Housings and covers</li> </ul>               | Black       | 107                   | 55                             | 25                             | 1,600                 | 1,900                  | 35                        | 79D                    | -                    | ✓                | -            | -            | ✓            |
| <b>ELASTOMER</b>        |  |             |                       |                                |                                |                       |                        |                           |                        |                      |                  |              |              |              |
| <b>IND475</b>           | <ul style="list-style-type: none"> <li>Grippers</li> <li>Other medical components</li> </ul>   | White       | -                     | 4.6                            | 160                            | 1.1                   | -                      | -                         | 62 A (5sec)            | 13                   | -                | -            | -            | ✓            |
| <b>PROTOTYPING</b>      |  |             |                       |                                |                                |                       |                        |                           |                        |                      |                  |              |              |              |
| <b>PRO410</b>           | <ul style="list-style-type: none"> <li>Medical equipment components</li> <li>Printer setup and calibration</li> <li>Rapid prototypes</li> </ul>                                  | Black       | 76                    | 48                             | 5                              | 1,900                 | 2,500                  | 28                        | 84 D                   | -                    | -                | -            | -            | ✓            |
| <b>PRO417</b>           | <ul style="list-style-type: none"> <li>Medical equipment components</li> <li>Manufacturing aids</li> <li>Jigs and fixtures</li> <li>Housings and covers</li> </ul>               | Black       | 49                    | 40                             | 100                            | 1,300                 | 900                    | 54                        | 73 D                   | -                    | ✓                | -            | -            | ✓            |

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## LOCTITE 3D MED412

TOUGH HIGH IMPACT RESIN



Strong, durable material with excellent elongation, impact strength and surface finish. It been designed to enable the manufacture of medical devices and their component parts that require good stiffness and wear resistance.

### Benefits

- Capable of meeting ISO 10993-5, -10 & -23 biocompatibility standards for medical applications
- Tough with superb elongation
- Good impact strength and surface finish

| PROPERTY <sup>1</sup>         | METHOD     | Clear | White |
|-------------------------------|------------|-------|-------|
| Color                         | -          | Clear | White |
| HDT at 0.455 MPa (°C)         | ASTM D648  | 40    | 40    |
| Tensile Stress at Break (MPa) | ASTM D638  | 37    | 28    |
| Elongation at Break (%)       | ASTM D638  | 110   | 100   |
| Young's Modulus (MPa)         | ASTM D638  | 1,300 | 1,300 |
| IZOD Impact Notched (J/m)     | ASTM D256  | 50    | 50    |
| Shore Hardness (D) 3 sec      | ASTM D2240 | 70    | 68    |

#### Note

- When this product is used to create a Regulated Medical Device, either the User assumes all responsibility to use this product only for Henkel supported and approved Indications for Use or the User must take all responsibility to register their indication for Use with the proper regulatory authority.
- Strict adherence to our Instructions for Use and Validated Workflow is critical in assuring a safe, bio compatible and effective printed appliance.
- Henkel resins may not be used in applications that are Class III medical devices and/or involve implantation in the human body.

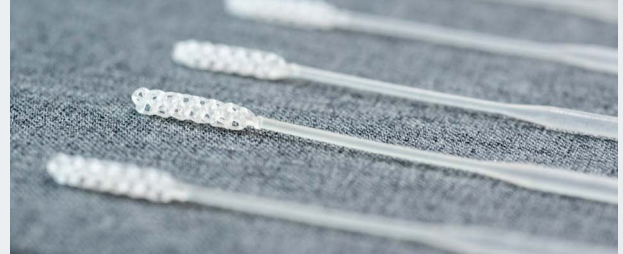
<sup>1</sup> All data after post-cure in accordance with TDS.

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## Case Study: 3D Printed Nasopharyngeal (NP) Swab

RAPID AGILITY AND INNOVATION



### Challenges

- Depleting supplies of NP Swabs impacting ability to test patients for Covid-19 during pandemic.
- Demand on supply resulting in longer lead times.
- Supply chain ability to respond to rapidly changing situation limited.
- Fabrication of material that does not contain any DNA to impact test.

### Solutions

- Consultative process to address
  - Lattice Structure Design to drive effective nasal secretion collection
  - Post process requirements
  - Sterilization techniques matched to Henkel resin
- LOCTITE 3D MED412 Resin high print accuracy & function (flexural & tensile)
- Ability to validate an FDA approved 3D printed Medical Device in short time frame

### Advantages

- FDA Approved Device under EUA
- Clinically validated for Safety & Conformance
- Able to print thousands of parts per week



## LOCTITE 3D MED413

TOUGH RESIN



High-performance, high modulus material with excellent flexural and tensile physical properties. Stiffness combined with toughness make this material ideal for use in a wide variety of impact resistant medical device applications.

### Benefits

- Capable of meeting ISO 10993-5, -10 & -23 biocompatibility standards for medical applications
- Parts can function at body temperature
- Outstanding surface finish
- Excellent machineability

| PROPERTY <sup>1</sup>         | METHOD     | Clear | White |
|-------------------------------|------------|-------|-------|
| Color                         | -          | Clear | White |
| HDT at 0.455 MPa (°C)         | ASTM D648  | 70    | 69    |
| Tensile Stress at Break (MPa) | ASTM D638  | 40    | 44    |
| Elongation at Break (%)       | ASTM D638  | 50    | 55    |
| Young's Modulus (MPa)         | ASTM D638  | 1,600 | 1,800 |
| IZOD Impact Notched (J/m)     | ASTM D256  | 65    | 58    |
| Shore Hardness (D) 3 sec      | ASTM D2240 | 76    | 72    |

#### Note

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- Henkel resins may not be used in applications that are Class III medical devices and/or involve implantation in the human body.

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

For further information please see TDS, contact Technical Service Centre or Customer Service Representative.

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## Case Study:

### End-Use Part for Head Lice Treatment

REDUCE DEVELOPMENT AND PRODUCTION COSTS



Photos source: Enventys Partners

### Challenges

- Designing and manufacturing a new head lice treatment device offering a better user experience with improved ergonomics for technicians.
- Demand for 200-300 devices annually, and each device requiring many plastic components, the costs were unjustified.
- Achieve cost-savings without sacrificing product quality.

### Solutions

- LOCTITE 3843, IND403 and MED413 matched the requirements for toughness, temperature and color needs, providing high part dimensional stability and an exceptional surface finish.
- The final material is also sterilizable, allowing FloSonix to reusable tips for head lice treatment.

### Advantages

- Component consolidation, adding assembly features, and final tuning parameters
- Initial prototyping and end-use manufacturing accomplished on a single printing platform (Origin)



## LOCTITE 3D MED414

### HIGH ELASTOMERIC RESIN



A high-performance, soft material boasting excellent elongation and tear strength properties. Shore A hardness combined with good tear resistance and strength make this material ideal for use in a wide variety elastomeric medical device and skin contact applications.

### Benefits

- Capable of meeting ISO 10993-5, -10 & -23 biocompatibility standards for medical applications
- True elastomeric behavior
- Good tear resistance
- Torsional flexibility
- Good balance of strength and elongation

| PROPERTY <sup>1</sup>         | METHOD     |      |
|-------------------------------|------------|------|
| Color                         | -          | Blue |
| Tensile Stress at Break (MPa) | ASTM D638  | 4    |
| Elongation at Break (%)       | ASTM D638  | 240  |
| Young's Modulus (MPa)         | ASTM D638  | 15   |
| Shore Hardness (A) 5 sec      | ASTM D2240 | 51   |

#### Note

- When this product is used to create a Regulated Medical Device, either the User assumes all responsibility to use this product only for Henkel supported and approved Indications for Use or the User must take all responsibility to register their indication for Use with the proper regulatory authority.
- Strict adherence to our Instructions for Use and Validated Workflow is critical in assuring a safe, bio compatible and effective printed appliance.
- Henkel resins may not be used in applications that are Class III medical devices and/or involve implantation in the human body.

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

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## Examining an Industry Challenge: Direct Print vs Casted Hearing Protection



### Challenges

- Provide a direct print alternative to conventionally casted audiology soft materials for PPE and Hearing Aids.
- Exceed the end part functionality compared to traditional manufacturing.
- Simplify production while reducing costs and time.
- Provide customization for design specific to end user anatomy and needs.

### Solutions

- Development for high throughput audiology printing
  - Shore A 50 Elastomer
  - Single print process capable of production for multiple end use pairs at once
  - Eliminates need for printing of casting shell and pouring silicone material
- LOCTITE 3D MED414 offers high print accuracy and excellent surface finish.
- Ability to validate ISO 10993 biocompatibility requirements for medical applications

### Advantages

- Ease of manufacturing with higher throughput.
- Reduction of waste in production process.
- Ability to provide custom products to customers sooner at lower cost.

## LOCTITE 3D MED3394

STERILIZABLE HIGH HDT RESIN



A high-performance material capable of withstanding multiple cycles of various sterilization methods, while maintaining critical performance properties. Excellent Heat Deflection Temperature HDT and tensile physical properties combined with resistance to chemical exposures make this an optimal material for medical applications.

### Benefits

- Ability to withstand multiple methods and rounds of sterilization while maintaining performance.
- Capable of meeting ISO 10993-5, -10, -11 & -23 biocompatibility standards for medical applications
- USP Class VI Certified
- Excellent chemical resistance
- High Dimensional Accuracy
- Good balance of HDT and toughness.

| PROPERTY <sup>1</sup>         | METHOD     | Sheer Black<br>White |
|-------------------------------|------------|----------------------|
| Color                         | -          | Sheer Black<br>White |
| HDT at 0.455 MPa (°C)         | ASTM D648  | 100                  |
| Tensile Stress at Break (MPa) | ASTM D638  | 68                   |
| Elongation at Break (%)       | ASTM D638  | 12                   |
| Young's Modulus (MPa)         | ASTM D638  | 2,500                |
| IZOD Impact Notched (J/m)     | ASTM D256  | 26                   |
| Shore Hardness (D) 3 sec      | ASTM D2240 | 75                   |

#### Note

- When this product is used to create a Regulated Medical Device, either the User assumes all responsibility to use this product only for Henkel supported and approved Indications for Use or the User must take all responsibility to register their indication for Use with the proper regulatory authority.
- Strict adherence to our Instructions for Use and Validated Workflow is critical in assuring a safe, bio compatible and effective printed appliance.
- Henkel resins may not be used in applications that are Class III medical devices and/or involve implantation in the human body.

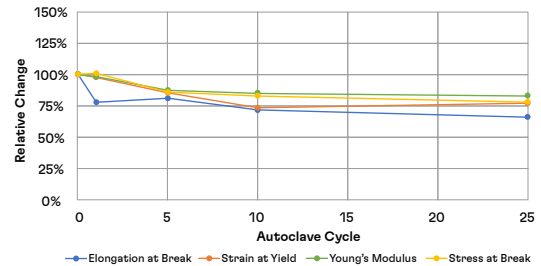
<sup>1</sup> All data after post-cure in accordance with TDS.

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.

## Examining an Industry Challenge: Photopolymer Durability in Autoclave Sterilization

MED3394 Tensile Properties up to 25 Autoclave Cycles



### Challenges

- High temperature and humidity of autoclave environment can cause warping and distort dimensional tolerances.
- Steam introduced to the polymer structure and removed under pressure can cause micro fractures, significantly diminishing mechanical performance.
- Customer demand for a material that can withstand multiple cycles of autoclave sterilization while delivering performance requirements for various medical applications.

### Solutions

Development of LOCTITE MED3394 Sheer Black & White

- Dimensional tolerance and mechanical properties remain within standard deviation of control following up to 25 autoclave cycles.
- High HDT, low water absorption and high solvent resistance
- Low hazard formula for medical applications

### Advantages

Single part, open system material

- Enables high performance single and multiple use devices.
- Enables applications where sterilization and disinfecting methods previously ruled out photopolymers.
- Enables many applications in the medical and biologics space.

## LOCTITE 3D MED9851

TOUGH HIGH IMPACT RESIN



Scan QR code to access the TDS

A high performance, high modulus material with excellent tensile and flexural physical properties. Stiffness combined with toughness make this material ideal for a wide variety of impact resistant medical device applications.

### Benefits

- Capable of meeting ISO 10993-5, -10 & -23 biocompatibility standards for medical applications
- Parts can function at body temperature or higher
- Good impact strength and surface finish

| PROPERTY <sup>1</sup>         | METHOD     |       |
|-------------------------------|------------|-------|
| Color                         | -          | Clear |
| HDT at 0.455 MPa (°C)         | ASTM D648  | 68    |
| Tensile Stress at Break (MPa) | ASTM D638  | 45    |
| Elongation at Break (%)       | ASTM D638  | 40    |
| Young's Modulus (MPa)         | ASTM D638  | 2,300 |
| IZOD Impact Notched (J/m)     | ASTM D256  | 50    |
| Shore Hardness (D) 3 sec      | ASTM D2240 | 80    |

#### Note

- When this product is used to create a Regulated Medical Device, either the User assumes all responsibility to use this product only for Henkel supported and approved Indications for Use or the User must take all responsibility to register their indication for Use with the proper regulatory authority.
- Strict adherence to our Instructions for Use and Validated Workflow is critical in assuring a safe, bio compatible and effective printed appliance.
- Henkel resins may not be used in applications that are Class III medical devices and/or involve implantation in the human body.

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

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.

## Case Study:

### 3D Printed Eyewear Frames

EXCELLENT PERFORMANCE AND CUSTOMIZATION



Demo piece designed by Spectra

### Challenges

- Provide a digital solution to the manufacture of frames for lifestyle and prescription eyewear.
- Reduce timeline and customer cost for customized eyewear.
- Match performance criteria for conventionally manufactured eyewear with ISO12870 and ISO10993 requirements.
- Provide customization for design and color options.

### Solutions

- Development for high throughput eyewear printing
  - Unique design and production with partners
  - Post process requirements
  - Service Bureau and point of care production
- LOCTITE 3D MED9851 resin high print accuracy & function (flexural & tensile).
- Ability to validate ISO 12870 ophthalmic requirements compliant material for direct printing of frames.

### Advantages

- Ease of design and appearance customization
- Clinically validated for Safety & Conformance
- Ability to reduce costs and turn around time for end customer

## TOUGH RESIN

### LOCTITE 3D 3172

TOUGH & HIGH IMPACT RESIN



Scan QR code to access the TDS

### LOCTITE 3D 3843

TOUGH RESIN



Scan QR code to access the TDS

Durable photopolymer resin that enables functional parts production where high stiffness with a good surface finish and high impact resistance are required. Parts manufactured with this resin can be machined, tapped or polished.

#### Benefits

- Capable of meeting ISO 10993-5 & -23 biocompatibility standards for medical applications
- Tough & durable
- Superior impact strength
- Nice surface finish, machine-able

| PROPERTY <sup>1</sup>         | METHOD     |       |
|-------------------------------|------------|-------|
| Color                         | -          | Gray  |
| HDT at 0.455 MPa (°C)         | ASTM D648  | 52    |
| Tensile Stress at Break (MPa) | ASTM D638  | 39    |
| Elongation at Break (%)       | ASTM D638  | 100   |
| Young's Modulus (MPa)         | ASTM D638  | 1,500 |
| Flexular Modulus (MPa)        | ASTM D256  | 1,100 |
| IZOD Impact Notched (J/m)     | ASTM D256  | 73    |
| Shore Hardness (D) 3 sec      | ASTM D2240 | 63    |

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

#### Benefits

- Capable of meeting ISO 10993-5 & -23 biocompatibility standards for medical applications
- Moderate heat resistance, HDT 60° C
- Tough with outstanding surface finish
- Superior strength and impact resistant

| PROPERTY <sup>1</sup>         | METHOD     | White | Matte Black |
|-------------------------------|------------|-------|-------------|
| Color                         | -          |       |             |
| HDT at 0.455 MPa (°C)         | ASTM D648  | 60    | 63          |
| Tensile Stress at Break (MPa) | ASTM D638  | 49    | 51          |
| Elongation at Break (%)       | ASTM D638  | 48    | 43          |
| Young's Modulus (MPa)         | ASTM D638  | 1,700 | 1,800       |
| Flexular Modulus (MPa)        | ASTM D256  | 1,700 | 1,800       |
| IZOD Impact Notched (J/m)     | ASTM D256  | 58    | 53          |
| Shore Hardness (D) 3 sec      | ASTM D2240 | 76    | 67          |

#### Note

- When this product is used to create a Regulated Medical Device, either the User assumes all responsibility to use this product only for Henkel supported and approved Indications for Use or the User must take all responsibility to register their indication for Use with the proper regulatory authority.
- Strict adherence to our Instructions for Use and Validated Workflow is critical in assuring a safe, bio compatible and effective printed appliance.
- Henkel resins may not be used in applications that are Class III medical devices and/or involve implantation in the human body.

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

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## TOUGH RESIN

### LOCTITE 3D IND405

HIGH IMPACT, HIGH ELONGATION RESIN



Scan QR code to access the TDS

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

- For clear color: capable of meeting ISO 10993-5 & -23 biocompatibility standards for medical applications
- High impact resistance with high elongation
- Easy to print
- Tough and durable

| PROPERTY <sup>1</sup>         | METHOD     |       |
|-------------------------------|------------|-------|
| Color                         | -          | Clear |
| HDT at 0.455 MPa (°C)         | ASTM D648  | 53    |
| Tensile Stress at Break (MPa) | ASTM D638  | 38    |
| Elongation at Break (%)       | ASTM D638  | 96    |
| Young's Modulus (MPa)         | ASTM D638  | 1,400 |
| Flexular Modulus (MPa)        | ASTM D256  | 1,300 |
| IZOD Impact Notched (J/m)     | ASTM D256  | 72    |
| Shore Hardness (D) 3 sec      | ASTM D2240 | 76    |

## HIGH TEMPERATURE RESIN

### LOCTITE 3D IND406

OUR TOUGHEST HIGH TEMPERATURE RESIN



Scan QR code to access the TDS

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

#### Benefits

- Capable of meeting ISO 10993-5 & -23 biocompatibility standards for medical applications
- High heat deflection temperature, HDT >100 °C
- Tough and durable
- Good surface finish

| PROPERTY <sup>1</sup>         | METHOD     |       |
|-------------------------------|------------|-------|
| Color                         | -          | Black |
| HDT at 0.455 MPa (°C)         | ASTM D648  | 107   |
| Tensile Stress at Break (MPa) | ASTM D638  | 55    |
| Elongation at Break (%)       | ASTM D638  | 25    |
| Young's Modulus (MPa)         | ASTM D638  | 1,600 |
| Flexular Modulus (MPa)        | ASTM D256  | 1,900 |
| IZOD Impact Notched (J/m)     | ASTM D256  | 35    |
| Shore Hardness (D) 3 sec      | ASTM D2240 | 79    |

#### Note

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## ELASTOMER RESIN

### LOCTITE 3D IND475

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 on a variety of platforms, making it a superior material for elastomeric applications.



Scan QR code to access the TDS

| PROPERTY <sup>1</sup>         | METHOD     |       |
|-------------------------------|------------|-------|
| Color                         | -          | White |
| Tensile Stress at Break (MPa) | ASTM D412  | 4.6   |
| Elongation at Break (%)       | ASTM D412  | 160   |
| Young's Modulus (MPa)         | ASTM D638  | 1.1   |
| Shore Hardness (A) 5 sec      | ASTM D2240 | 62    |
| Tear Strength (kN/m)          | ASTM D624  | 13    |

### Benefits

- For white color: capable of meeting ISO 10993-23 biocompatibility standards for medical applications
- True elastomeric behavior
- Fast printing with low shrinkage behavior
- High resilience and energy return
- Exceptional durability compression forces

#### Note

- When this product is used to create a Regulated Medical Device, either the User assumes all responsibility to use this product only for Henkel supported and approved Indications for Use or the User must take all responsibility to register their indication for Use with the proper regulatory authority.
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## PROTOTYPING RESIN

### LOCTITE 3D PRO410

HIGH-SPEED, HIGH-RESOLUTION PHOTOPOLYMER FOR PRECISE PROTOTYPING



Scan QR code to access the TDS

LOCTITE 3D PRO410 is a fast printing, rigid photopolymer that can be printed with very high-resolution. LOCTITE 3D PRO410 has been formulated to provide high print accuracy and an exceptional surface finish. This material prints three times faster than traditional Henkel 3D printing resins. This product is ideal for printing accurate prototypes, that will be exposed to temperatures up to 60°C. This product can be printed on DLP and LCD machines.

#### Benefits

- Capable of meeting ISO 10993-23 biocompatibility standards for medical applications
- Excellent surface finish
- 3X faster printing\*
- Accurate prototypes

\* vs other LOCTITE 3D printing resins

| PROPERTY <sup>1</sup>         | METHOD     |       |
|-------------------------------|------------|-------|
| Color                         | -          | Black |
| HDT at 0.455 MPa (°C)         | ASTM D648  | 76    |
| Tensile Stress at Break (MPa) | ASTM D638  | 48    |
| Elongation at Break (%)       | ASTM D638  | 5     |
| Young's Modulus (MPa)         | ASTM D638  | 1,900 |
| Flexular Modulus (MPa)        | ASTM D790  | 2,500 |
| IZOD Impact Notched (J/m)     | ASTM D256  | 28    |
| Shore Hardness (D) 3 sec      | ASTM D2240 | 84    |

#### Note

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- Henkel resins may not be used in applications that are Class III medical devices and/or involve implantation in the human body.

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### LOCTITE 3D PRO417

HIGH STRENGTH PHOTOPLASTIC FOR DIVERSE PROTOTYPE AND TOOLING APPLICATIONS



Scan QR code to access the TDS

A high-strength photoplastic with good impact resistance, moderate heat resistance and excellent surface finish. LOCTITE 3D PRO417 is ideal for a variety of performance prototype and tooling applications and can be machined, tapped, or polished for final finish. LOCTITE 3D PRO417 displays high green strength enabling it to print accurately and function at room temperature. It is compatible with a broad range of DLP and LCD machines.

#### Benefits

- Capable of meeting ISO 10993-5 & -23 biocompatibility standards for medical applications
- Moderate heat resistance, HDT 49°C
- Tough with outstanding surface finish
- Superior strength and impact resistant

| PROPERTY <sup>1</sup>         | METHOD     |       |
|-------------------------------|------------|-------|
| Color                         | -          | Black |
| HDT at 0.455 MPa (°C)         | ASTM D648  | 49    |
| Tensile Stress at Break (MPa) | ASTM D638  | 40    |
| Elongation at Break (%)       | ASTM D638  | 100   |
| Young's Modulus (MPa)         | ASTM D638  | 1,300 |
| Flexular Modulus (MPa)        | ASTM D790  | 900   |
| IZOD Impact Notched (J/m)     | ASTM D256  | 54    |
| Shore Hardness (D) 3 sec      | ASTM D2240 | 73    |

## 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 tough, specialty, high temperature resistant, elastomer, prototyping, and medical resins for a broad range of leading DLP and LCD 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 Brand

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

**NOTES**

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# LOCTITE®

## 3D PRINTING

Test your application with our materials.

Contact our engineers to get support:  
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Learn more about our application cases.  
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