

January 25, 2019

PRODUCT DESCRIPTION

LOCTITE® 3D Silicone Elastomeric 5015 is a single component light curable silicone specifically designed for prototyping via stereolithography or layer-by-layer additive manufacturing. It is a low viscosity yet high performance silicone that upon exposure to light, cures into a tough silicone elastomer.

The LOCTITE® 3D Silicone Elastomeric 5015 provides the following product characteristics:

Technology	Stereolithography 3D Resin
Appearance	Available in Clear, White, Black
Chemical Type	Silicone
Odor	Mild
Cure	Ultraviolet (UV) / Visible Light
Viscosity	Low
Flow Characteristic	Self-leveling, Newtonian fluid
Application	Prototyping
Specific Benefits	<ul style="list-style-type: none"> ● Elastomer ● Adhesion between layers ● Low shrinkage ● Short exposure time

FEATURES AND BENEFITS

The LOCTITE® 3D Silicone Elastomeric 5015 is intended for use in 3D prototyping where the self-leveling characteristic, fast speed of cure and low shrinkage are key properties for the application. Prototypes made of LOCTITE® 3D Silicone Elastomeric 5015 have a -65°C to 105°C continuous operating temperature.

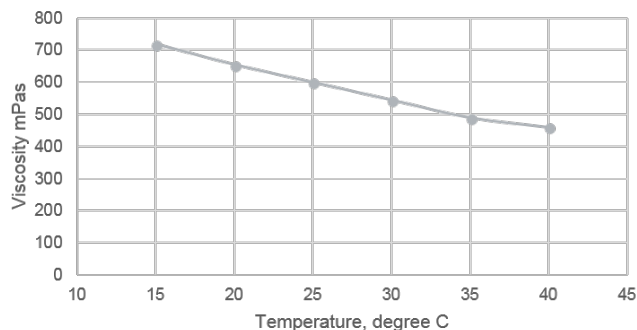
The LOCTITE® 3D Silicone Elastomeric 5015 silicone is unique in that it bonds to itself, eliminating any of the layer to layer interface problems during this light cure application.

TYPICAL PROPERTIES OF UNCURED MATERIAL

	Typical Value
Specific Gravity @ 25°C	0.99
Flash Point	see MSDS
Viscosity @ 25°C, mPa.s	600
Physica C&P, 50/1 @ 20 1/s or Brookfield C&P, SP52 @ 50 RPM	

The effect of temperature on viscosity for LOCTITE® 3D Silicone Elastomeric 5015 is shown in Graph 1.

Graph 1: Viscosity Change over Temperature



TYPICAL LIGHT CURING PERFORMANCE

LOCTITE® 3D Silicone Elastomeric 5015 can be cured by exposure to ultraviolet (UV) and visible light of sufficient intensity and wavelength. The cure rate and ultimate depth of cure depends upon; light intensity (mW/cm²), spectral distribution of the light source, exposure time and percent light transmittance of the printer window through which the light must pass, if applicable. LOCTITE® 3D Silicone Elastomeric 5015 will cure with DLP and SLA type 3D printers ranging from 320 to 420 nm.

Surface Cure

When exposed to a full spectrum light source, like the Medium Pressure Hg Arc Lamp @ 100 mW/cm² (UVA 320-400 nm) intensity, the LOCTITE® 3D Silicone Elastomeric 5015 will typically cure dry to the touch in < 90 seconds. For UV cure after 3D printing, the use of a full spectrum light source or special light cure chamber is suggested in order to effectively cure the surface to a tack free state for handling.

TYPICAL PROPERTIES OF CURED MATERIAL

	Typical Value		
	5015 Clear	5015 White	5015 Black
Cured with Medium Pressure Hg Arc Lamp @ 100 mW/cm ² (320-400 nm), for 60 seconds per side			
Hardness, Shore A, ASTM D2240	63	72	69
Tensile Strength, ASTM D412, N/mm ²	8.6	9.0	7.1
Modulus @50% Elongation, ASTM D412, N/mm ²	3.9	5.5	4.0
% Elongation @ break, ASTM D412, %	172	175	164

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TYPICAL LOCTITE® PR10 PRINTER SETTINGS

The following working curve values were determined on the LOCTITE® 3D Silicone Elastomeric 5015 for use in the LOCTITE® PR10 printer at 405 nm.

LOCTITE® PR10 Printer (405 nm)			
Working Curve Value	5015 Clear	5015 White	5015 Black
Critical Exposure (Ec), mJ/cm2	40.4	23.6	25.3
Penetration Depth (Dp), mm	0.974	0.478	0.365
Penetration Depth (Dp), mil	38.3	18.8	14.4

The initial recommended print settings for the LOCTITE® 3D Silicone Elastomeric 5015 for use in the LOCTITE® PR10 printer are shown below. The two key variables for successful print are the curing time and light intensity that determines the energy required to print each layer.

LOCTITE® PR10 Printer Settings			
Product	5015 Clear	5015 White	5015 Black
Initial Build Layer			
Layer Thickness (mm)	0.10	0.10	0.10
Rehab Time (s)	2.0	2.0	2.0
Curing Time (s)	15.0	15.0	15.0
Retraction Height (mm)	10.0	10.0	10.0
Retraction Speed Up	50.0	50.0	50.0
Time at Top (s)	1.0	1.0	1.0
Retraction Speed Down	75.0	75.0	75.0
Light Intensity (%)	100.0	100.0	100.0
Default Part Layer			
Layer Thickness (mm)	0.10	0.10	0.10
Rehab Time (s)	2.0	2.0	2.0
Curing Time (s)	8.0	8.0	11.0
Retraction Height (mm)	8.0	8.0	8.0
Retraction Speed Up	50.0	50.0	50.0
Time at Top (s)	1.0	1.0	1.0
Retraction Speed Down	75.0	75.0	75.0
Light Intensity (%)	100.0	100.0	100.0

TYPICAL PROPERTIES OF 3D PRINTED PARTS

Samples prepared using the recommended print settings on the Loctite® PR10 printer provided the following cured material properties.

3D Printed Part Physical Properties

Typical Value

After printing, specimens were hand wiped before being tested after 24 hours. Contact your local Loctite technical customer service team for further information

	5015 Clear	5015 White	5015 Black
Hardness, Shore A, ASTM D2240	51	53	52
Tensile Strength, ASTM D412, N/mm2	3.8	4.4	3.1
Modulus @50% Elongation, ASTM D412, N/mm2	2.9	3.1	2.3
% Elongation @ break, ASTM D412, %	135	148	139

After printing, specimens were exposed to additional light from a LOCTITE® CL36 light cure chamber for additional 5 minutes per side at 100 mW/cm² (405 nm LED light source). Contact your local Loctite technical customer service team for further information

	5015 Clear	5015 White	5015 Black
Hardness, Shore A, ASTM D2240	77	78	80
Tensile Strength, ASTM D412, N/mm2	8.4	7.7	6.7
Modulus @50% Elongation, ASTM D412, N/mm2	6.4	6.4	6.3
% Elongation @ break, ASTM D412, %	189	169	151

USE AND APPLICATION

This product is not recommended for use in pure oxygen and/or oxygen rich systems and should not be selected as a sealant for chlorine or other strong oxidizing materials.

For safe handling information on this product, consult the Material Safety Data Sheet (MSDS).

Directions for Use

1. This product is light sensitive; exposure to daylight, UV light or artificial lighting should be kept to a minimum during storage and handling.
2. The product should only be used or stored in appropriate light blocking (< 550nm) feed lines, applicators or storage vessels.

3. Shake or stir the LOCTITE® 3D Silicone Elastomeric 5015 well before use due to the possibility that the colorants may separate or precipitate over long storage periods.
4. For best 3D printing;
 - a. Mix the 3D resin before each print
 - b. Do not leave resin in printer when not in use
 - c. Filter the resin after each 3D print before reuse
5. The product is designed in the process to be initially cured by UV / visible light in layer by layer type application. Increased exposure intensity or time may be required for curing deeper sections or performance properties.
6. Functional strength between layers is achieved almost instantly upon printing. However, an additional UV cure is suggested after the removal of any residual liquid for both surface cure to remove the tackiness and for safe handling of the 3D prototype part.
7. Excess material can be easily wiped away with non-polar solvents.

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Storage

Store product in cool, dry location, in unopened containers at a temperature between 8°C and 28°C unless otherwise labeled. To prevent contamination of unused product, do not return any material to its original container.

Data Ranges

The data contained herein may be reported as a typical value and/or range. Values are based on actual test data and are verified on a periodic basis.

Note

The developmental product for which the data provided herein are furnished for informational purposes only and are believed to be accurate and reliable. Nevertheless, Henkel Corporation cannot and will not assume responsibility for the results obtained by others over whose production methods we have no control. Thus, it is the user's responsibility to determine the suitability of this developmental product for the user's purpose of any production methods mentioned herein and to adopt such precautions as may be advisable for the protection of property and of persons against any hazards that may be involved in the handling, storage, disposal and use thereof. In light of the foregoing, **HENKEL CORPORATION SPECIFICALLY DISCLAIMS ANY AND ALL WARRANTIES EXPRESSED OR IMPLIED,**