

# LOCTITE<sup>®</sup> EA 3984<sup>™</sup>

Known as LOCTITE 3984  
September 2020

## PRODUCT DESCRIPTION

LOCTITE<sup>®</sup> EA 3984<sup>™</sup> provides the following product characteristics:

<b>Technology</b>	Epoxy
<b>Chemical Type</b>	Epoxy
<b>Appearance (uncured)</b>	Light grey liquid <sup>LMS</sup>
<b>Appearance (cured)</b>	Light grey solid <sup>LMS</sup>
<b>Fluorescence</b>	Positive under UV light
<b>Components</b>	One component - requires no mixing
<b>Cure</b>	Heat cure
<b>Cure Benefit</b>	Production - high speed curing
<b>Application</b>	Assembly of disposable medical devices.
<b>Key Substrates</b>	Stainless steel and Plastics

LOCTITE<sup>®</sup> EA 3984<sup>™</sup> is suitable for a wide range of applications that require fast cure, excellent environmental resistance and high adhesion. The product cures rapidly when exposed to temperatures as low as 100 °C and achieves excellent adhesion to plastics, metals and glass. LOCTITE<sup>®</sup> EA 3984<sup>™</sup> was specifically designed for bonding stainless steel cannulae into hubs, syringes and lancets for needle assemblies. Suitable for use in the assembly of **disposable medical devices**.

## ISO-10993

LOCTITE<sup>®</sup> EA 3984<sup>™</sup> has been tested to Henkel's test protocols based on ISO 10993 biocompatibility standards, as a means to assist in the selection of products for use in the medical device industry.

## TYPICAL PROPERTIES OF UNCURED MATERIAL

Specific Gravity @ 25 °C	1.38
Flash Point - See SDS	
Viscosity, Brookfield SSA - RVT, 25°C, mPa·s (cP):	
Spindle 14, speed 20 rpm	22,000 to 28,000 <sup>LMS</sup>

## TYPICAL CURING PERFORMANCE

### Cure Schedule

Typical cure times were estimated as >99% conversion using differential scanning calorimetry:

- @ 100 °C, 25 minutes
- @ 125 °C, 24 minutes
- @ 150 °C, 17 minutes

## TYPICAL PROPERTIES OF CURED MATERIAL

Cured for 30 minutes @ 125 °C.

### Physical Properties:

Coefficient of Thermal Expansion, ISO 11359-2, K <sup>-1</sup> :	
Pre Tg (Alpha 1)	52×10 <sup>-6</sup>
Post Tg (Alpha 2)	172×10 <sup>-6</sup>
Glass Transition Temperature, ASTM E 228, °C	74
Shore Hardness, ISO 868, Durometer D	≥75 <sup>LMS</sup>
Linear Shrinkage, in/in ASTM D 792,	1.2
Water Absorption, ISO 62, %:	
2 hours in boiling water	1.6
7 days in water @ 22 °C	0.37
Elongation, at break, ISO 527-3, %	1.1
Tensile Strength, ISO 527-3	N/mm <sup>2</sup> 38 (psi) (5,540)
Tensile Modulus, ISO 527-3	N/mm <sup>2</sup> 3,902 (psi) (566,000)

## TYPICAL PERFORMANCE OF CURED MATERIAL

### Adhesive Properties

Cured for 30 minutes @ 120 °C.

Lap Shear Strength, :

Aluminum (etched):	
0.125 mm gap	N/mm <sup>2</sup> ≥13.8 <sup>LMS</sup> (psi) (≥2,000)

Cured for 30 minutes @ 100 °C.

### Needle Pullout Strength:

Material	22 Gauge Cannula	27 Gauge Cannula:
ABS	N 227	N 142
	(lb) (51)	(lb) (32)
Acrylic	N 254	N 147
	(lb) (57)	(lb) (33)
Polycarbonate	N 107	N 116
	(lb) (24)	(lb) (26)
Polyethylene	N 13	N 53
	(lb) (3)	(lb) (12)
Polyethylene (plasma treated)	N 200	N 138
	(lb) (45)	(lb) (31)
Polypropylene	N 27	N 36
	(lb) (6)	(lb) (8)
Polypropylene (plasma treated)	N 147	N 116
	(lb) (33)	(lb) (26)
Polystyrene	N 222	N 133
	(lb) (50)	(lb) (30)
Polyurethane	N 196	N 138
	(lb) (44)	(lb) (31)

Cured for 30 minutes @ 125 °C.

Block Shear Strength, ISO 13445:

Acrylic	N/mm <sup>2</sup>	4
	(psi)	(580)
G-10 Epoxy	N/mm <sup>2</sup>	17
	(psi)	(2,450)
Nylon	N/mm <sup>2</sup>	6
	(psi)	(820)
Polybutylene Terephthalate	N/mm <sup>2</sup>	11
	(psi)	(1,640)
Polycarbonate	N/mm <sup>2</sup>	2
	(psi)	(305)
Aluminum (grit blasted)	N/mm <sup>2</sup>	32
	(psi)	(4,580)
Steel (grit blasted)	N/mm <sup>2</sup>	45
	(psi)	(6,590)

**TYPICAL ENVIRONMENTAL RESISTANCE**

**Thermal Stability of Needle Assemblies**

Aged @ 60°C and tested @ 22 °C

Needle Pullout Strength, % initial strength retained:

Plastic:	4 Weeks	8 Weeks:
Polycarbonate:		
22 Gauge Cannula	190	190
27 Gauge Cannula	110	110
Polypropylene (plasma treated):		
22 Gauge Cannula	120	150
27 Gauge Cannula	105	105
Polystyrene:		
22 Gauge Cannula	100	110
27 Gauge Cannula	100	100

**Sterilization Resistance of Needle Assemblies**

Sterilized as indicated and tested @ 22 °C

Needle Pullout Strength, % initial strength retained:

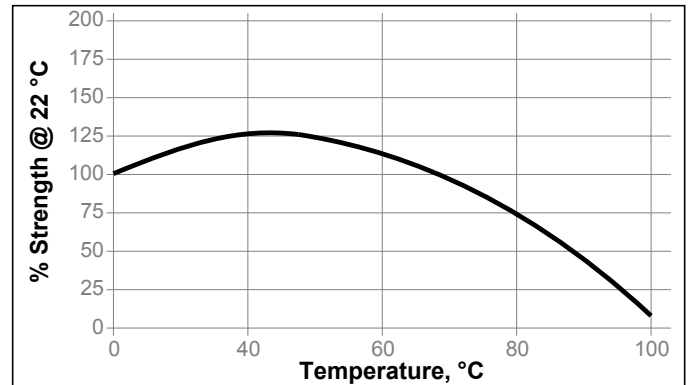
Plastic	Gamma	ETO	Autoclave	
	30 kGy	1 cycle	1 cycle	5 cycles
Polycarbonate:				
22 Gauge Cannula	105	100	110	30
27 Gauge Cannula	90	80	100	75
Polypropylene (plasma treated):				
22 Gauge Cannula	90	100	65	35
27 Gauge Cannula	80	70	110	65
Polystyrene:				
22 Gauge Cannula	90	75	N/A	N/A
27 Gauge Cannula	75	80	N/A	N/A

N/A - Not Applicable. The polystyrene was not compatible with the autoclave sterilization process.

**Hot Strength**

Cured for 30 minutes @ 125 °C. The bonded specimens were tested at the indicated temperature:

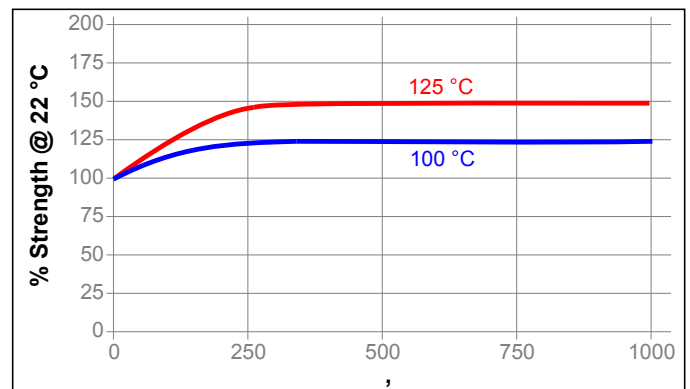
Block Shear Strength, ISO 13445, Polycarbonate



**Heat Aging**

Cured for 30 minutes @ 125 °C. The bonded specimens were conditioned as indicated and tested at 22 °C.

Block Shear Strength, ISO 13445, Polycarbonate



**Chemical/Solvent Resistance**

Cured for 30 minutes @ 125 °C. The bonded specimens were conditioned as indicated and tested at 22 °C.

Block Shear Strength, ISO 13445, Polycarbonate

Environment	°C	% of initial strength			
		24 h	100 h	500 h	1000 h
95% RH	40	-----	100	90	135
Ambient Water Submersion	22	-----	120	115	165
Isopropanol	22	120	-----	-----	-----
Heptane	22	210	-----	-----	-----

**GENERAL INFORMATION**

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 Safety Data Sheet (SDS).

**Directions For Use:**

1. Adhesive must be room temperature just prior to use.
2. Clean and dry surfaces to be bonded.
3. Apply adhesive evenly to both surfaces.
4. Assemble parts and allow to cure at 100 °C for 25 minutes or until completely firm.
5. Refer to cure schedule for alternate cure information.

**Loctite Material Specification<sup>LMS</sup>**

LMS dated August 09, 2002. Test reports for each batch are available for the indicated properties. LMS test reports include selected QC test parameters considered appropriate to specifications for customer use. Additionally, comprehensive controls are in place to assure product quality and consistency. Special customer specification requirements may be coordinated through Henkel Quality.

**Storage**

Store product in the unopened container in a dry location. Storage information may be indicated on the product container labeling.

**Optimal Storage: 2 °C to 8 °C. Storage below 2 °C or greater than 8 °C can adversely affect product properties.**

Material removed from containers may be contaminated during use. Do not return product to the original container. Henkel Corporation cannot assume responsibility for product which has been contaminated or stored under conditions other than those previously indicated. If additional information is required, please contact your local Technical Service Center or Customer Service Representative.

**Conversions**

$(^{\circ}\text{C} \times 1.8) + 32 = ^{\circ}\text{F}$   
 $\text{kV/mm} \times 25.4 = \text{V/mil}$   
 $\text{mm} / 25.4 = \text{inches}$   
 $\mu\text{m} / 25.4 = \text{mil}$   
 $\text{N} \times 0.225 = \text{lb}$   
 $\text{N/mm} \times 5.71 = \text{lb/in}$   
 $\text{N/mm}^2 \times 145 = \text{psi}$   
 $\text{MPa} \times 145 = \text{psi}$   
 $\text{N}\cdot\text{m} \times 8.851 = \text{lb}\cdot\text{in}$   
 $\text{N}\cdot\text{m} \times 0.738 = \text{lb}\cdot\text{ft}$   
 $\text{N}\cdot\text{mm} \times 0.142 = \text{oz}\cdot\text{in}$   
 $\text{mPa}\cdot\text{s} = \text{cP}$

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## Reference 1.3