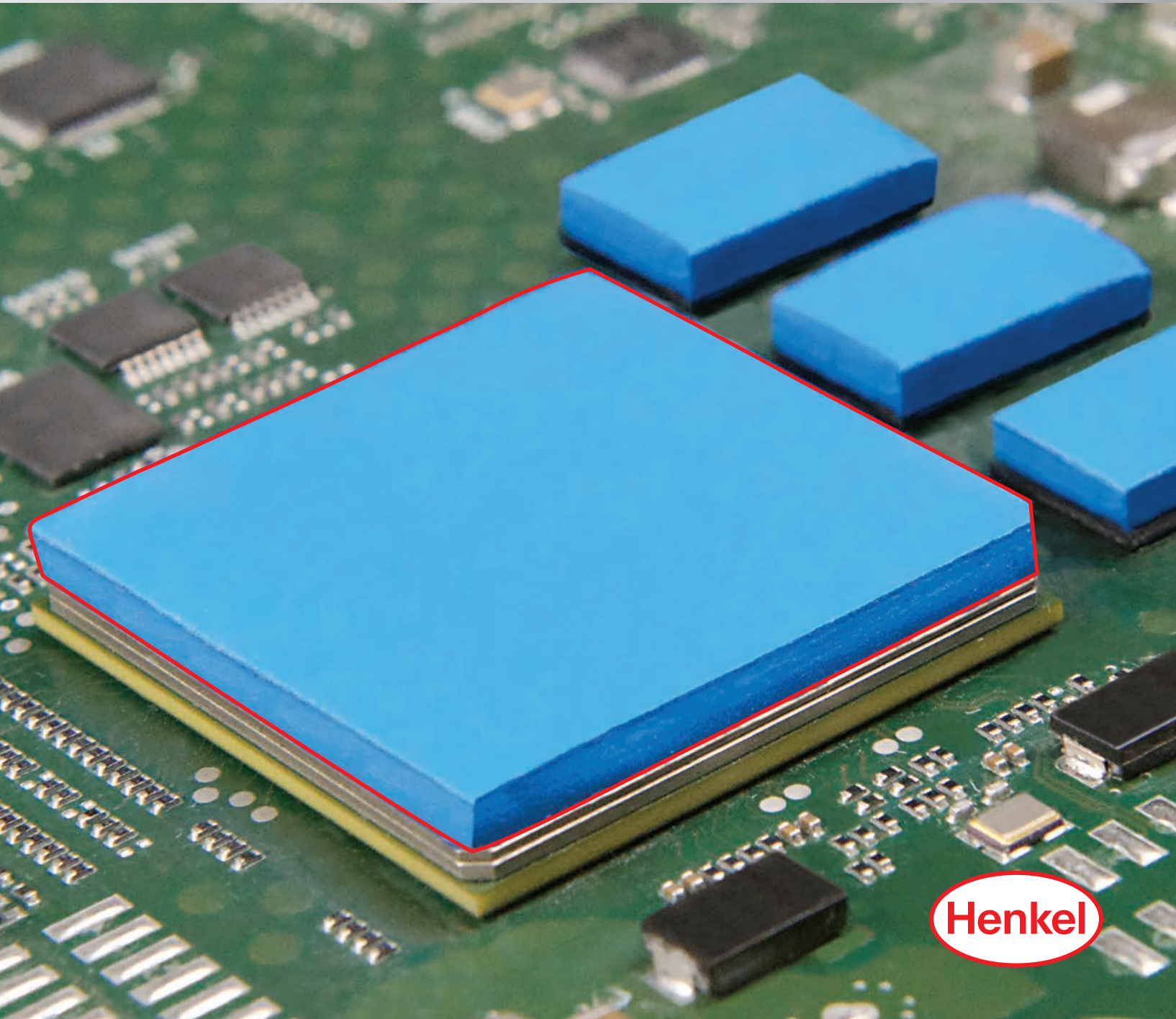


Selection Guide

# Thermal Interface Materials



# Gap Filler Liquid Dispensed Materials

## Introduction

Effective thermal management is key to ensuring consistent performance and long-term reliability of many electronic devices. With the wide variety of applications requiring thermal management, the need for alternative thermal material solutions and innovative material placement methods continues to grow. Henkel's family of dispensable liquid polymer materials with unique characteristics is especially designed for ultimate thermal management design and component assembly flexibility.

## Two-Part Gap Fillers

BERGQUIST two-part, cure-in-place materials are dispensed as a liquid onto the target surface. As the components are assembled, the material will wet-out to the adjacent surfaces, filling even the smallest gaps and air voids. Once cured, the material remains a flexible and soft elastomer, designed to assist in relieving coefficient of thermal expansion (CTE) mismatch stresses during thermal cycling. Gap Filler is ideally suited for applications where pads cannot perform adequately, can be used to replace grease or potting compounds, and is currently used in power supply, telecom, digital, and automotive applications.

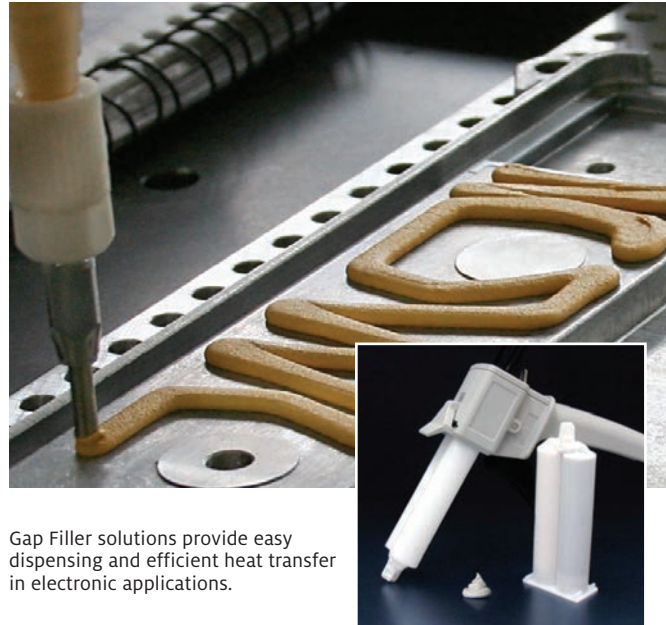
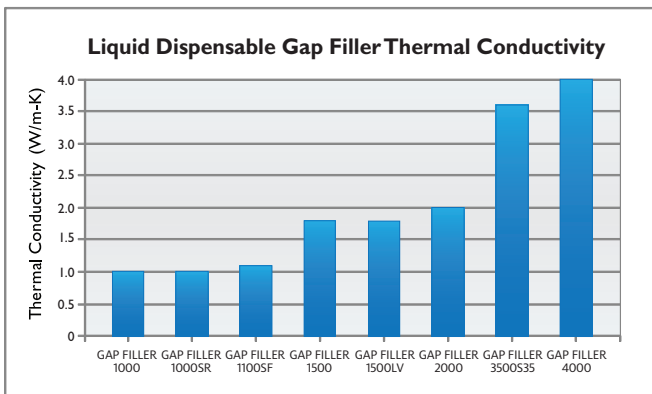
## Liquid Gap Filler Key Performance Benefits

### Ultra Low Modulus: Minimal Stress During Assembly

Because Gap Filler is dispensed and wet-out in its liquid state, the material will create virtually zero stress on components during the assembly process. Gap Filler can be used to interface even the most fragile and delicate devices.

### Excellent Conformability to Intricate Geometries

Liquid Gap Filler materials are able to conform to intricate topographies, including multi-level surfaces. Due to its increased mobility prior to cure, Gap Filler can fill small air voids, crevices, and holes, reducing overall thermal resistance to the heat generating device.



Gap Filler solutions provide easy dispensing and efficient heat transfer in electronic applications.

### Single Solution for Multiple Applications

Unlike pre-cured gap filling materials, the liquid approach offers infinite thickness options and eliminates the need for specific pad thicknesses or die-cut shapes for individual applications.

### Efficient Material Usage

Manual or semiautomatic dispensing tools can be used to apply material directly to the target surface, resulting in effective use of material with minimal waste. Further maximization of material usage can be achieved with implementation of automated dispensing equipment, which allows for precise material placement and reduces the application time of the material.

### Customizable Flow Characteristics

Although Gap Fillers are designed to flow easily under minimal pressure, they are thixotropic in nature which helps the material remain in place after dispensing and prior to cure. BERGQUIST Gap Filler offerings include a range of rheological characteristics and can be tailored to meet customer-specific flow requirements from self-leveling to highly thixotropic materials that maintain their form as dispensed.

## Frequently Asked Questions

### Q: How is viscosity measured?

**A:** Due to the thixotropic characteristics of most Gap Fillers, special consideration should be given to the test method(s) used to determine viscosity of these materials. Because the material viscosity is dependent on shear rate, different measurement equipment testing under varying shear rates will produce varied viscosity readings. When comparing apparent viscosities of multiple materials, it is important to ensure that the data was generated using the same test method and test conditions (therefore the same shear rate). Test methods and conditions for BERGQUIST products are noted in the individual Technical Data Sheets.

### Q: How are pot life and cure time defined?

**A:** Two-part Gap Filler systems begin curing once the two components are mixed together. Henkel defines the pot life (working life) of a two-part system as the time for the viscosity to double after parts A and B are mixed. Henkel defines the cure time of a two-part material as the time to reach 90 percent cure after mixing. Two-part Gap Fillers will cure at room temperature (25°C), or cure time can be accelerated with exposure to elevated temperatures.

### Q: Can I use my Gap Filler after the shelf life has expired?

**A:** Henkel does not advocate using Gap Filler beyond the recommended shelf life and is unable to recertify material that has expired. In order to ensure timely use of product, Henkel recommends a first-in-first-out (FIFO) inventory system.

### Q: How should I store my Gap Filler?

**A:** Unless otherwise indicated on Technical Data Sheets, two-part Gap Fillers should be stored in the original sealed container in a climate-controlled environment at or below 25°C and 50% relative humidity. If stored at reduced temperatures, materials should be placed at room temperature and allowed to stabilize prior to use. Unless otherwise noted, all cartridges and tubes should be stored in Henkel-defined packaging with the nozzle end down.

### Q: Do temperature excursions above 25°C affect the shelf life?

**A:** Short periods of time above the recommended storage temperature, such as during shipping, have not been shown to affect the material characteristics.

### Q: Does Gap Filler have adhesive characteristics?

**A:** Although Gap Fillers are not designed as structural adhesives, when cured, they have a low level of natural tack, which will allow the material to adhere mildly to adjacent components. This aids in keeping the material in the interface throughout repeated temperature cycling and eliminates pump-out from the interface.

### Q: Is Gap Filler reworkable?

**A:** In many cases, Gap Filler can be reworked. The ease of rework is highly dependent on the topography of the application as well as the coverage area.

### Q: What container sizes are available for Gap Fillers?

**A:** Two-part materials are available in several standard dual cartridge sizes including 50 cc (25 cc each of parts A and B) and 400 cc (200 cc each of parts A and B). Gap Fillers are also available in kits of 1200 cc (two stand-alone 600 cc containers, one of each part) and 10-gallon (two 5-gallon pails, one of each part) sizes for higher volume production. Other special and custom container sizes are available upon request.

### Q: How do I mix the two-part Gap Fillers?

**A:** Disposable plastic static mixing nozzles are used to mix parts A and B together at the desired ratio. Static mixers can be attached to the ends of cartridges or mounted on automated dispensing equipment. They are reliable, accurate and inexpensive to replace after extended down times. Unless otherwise indicated, mixing nozzles with a minimum of 21 mixing elements are recommended to achieve proper mixing.

### Q: What is the tolerance on the mix ratio?

**A:** Two-part materials should be mixed to the stated mix ratio by volume within a +/-5% tolerance to ensure proper material characteristics. If light-colored streaks or marbling are present in the material, there has been inadequate mixing. Henkel recommends purging newly tapped containers through the static mixer until a uniform color is achieved. In order to ensure consistent material characteristics and performance, BERGQUIST two-part systems are to be used with matching part A and B lot numbers.

### Q: What options are available for dispensing material onto my application?

**A:** Henkel can provide manual or pneumatic applicator guns for product supplied in dual cartridge form. Gap Filler supplied in high volume container kits can be dispensed via automated dispensing equipment for high-speed in-line manufacturing. Henkel and our other experienced automated dispensing equipment partners can further assist our customers in creating an optimized dispensing process. For information regarding dispensing equipment, contact your local Henkel representative. For some materials, screen or stencil application may be an option and should be evaluated on a case by case basis.

### Q: Should I be concerned about Gap Filler compatibility with other materials in my application?

**A:** Although not common, it is possible to encounter materials that can affect the cure of two-part Gap Fillers. A list of general categories of compounds that may inhibit the rate of cure or poison the curing catalyst in Gap Filler products is available to help assist with material compatibility evaluation. Please contact your local Henkel representative for more details.

## Gap Filler 1000 (Two-Part)

### Thermally Conductive, Liquid Gap Filling Material

#### Features and Benefits

- Thermal conductivity: 1.0 W/m-K
- Ultra-conforming, designed for fragile and low-stress applications
- Ambient and accelerated cure schedules
- 100% solids – no cure by-products
- Excellent low and high temperature mechanical and chemical stability



Gap Filler 1000 is a thermally conductive, liquid gap filling material. It is supplied as a two-component, room or elevated temperature curing system. The material is formulated to provide a balance of cured material properties highlighted by a low modulus and good compression set (memory). The result is a soft, thermally conductive, form-in-place elastomer ideal for coupling “hot” electronic components mounted on PC boards with an adjacent metal case or heat sink. Before cure, Gap Filler 1000 flows under pressure like a grease. After cure, it does not pump from the interface as a result of thermal cycling. Unlike thermal grease, the cured product is dry to the touch. Unlike cured gap filling materials, the liquid approach offers infinite thickness with little or no stress during displacement and eliminates the need for specific pad thickness and die-cut shapes for individual applications. Gap Filler 1000 is intended for use in thermal interface applications when a strong structural bond is not required.

#### TYPICAL PROPERTIES OF GAP FILLER 1000

PROPERTY	IMPERIAL VALUE	METRIC VALUE	TEST METHOD
Color / Part A	Grey	Grey	Visual
Color / Part B	White	White	Visual
Viscosity as Mixed (cPs) <sup>(1)</sup>	100,000	100,000	ASTM D2196
Density (g/cc)	1.6	1.6	ASTM D792
Mix Ratio	1:1	1:1	—
Shelf Life @ 25°C (months)	6	6	—
<b>PROPERTY AS CURED</b>			
Color	Grey	Grey	Visual
Hardness (Shore 00) <sup>(2)</sup>	30	30	ASTM D2240
Heat Capacity (J/g-K)	1.0	1.0	ASTM E1269
Continuous Use Temp. (°F) / (°C)	-76 to 347	-60 to 175	—
<b>ELECTRICAL AS CURED</b>			
Dielectric Strength (V/mil)	500	500	ASTM D149
Dielectric Constant (1,000 Hz)	5.0	5.0	ASTM D150
Volume Resistivity (Ohmmeter)	10 <sup>11</sup>	10 <sup>11</sup>	ASTM D257
Flame Rating	V-O	V-O	UL 94
<b>THERMAL AS CURED</b>			
Thermal Conductivity (W/m-K)	1.0	1.0	ASTM D5470
<b>CURE SCHEDULE</b>			
Pot Life @ 25°C (mins.) <sup>(3)</sup>	15	15	—
Cure @ 25°C (mins.) <sup>(4)</sup>	60 - 120	60 - 120	—
Cure @ 100°C (mins.) <sup>(4)</sup>	5	5	—

1) Brookfield RV, Heli-Path, Spindle TF @ 20 rpm, 25°C.  
 2) Thirty-second delay value Shore 00 hardness scale.  
 3) Time for viscosity to double.  
 4) Cure schedule (rheometer - time to read 90% cure)

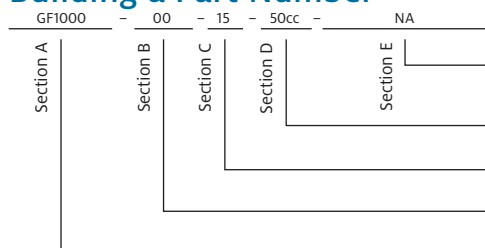
#### Typical Applications Include:

- Automotive electronics
- Computer and peripherals
- Between any heat-generating semiconductor and a heat sink
- Telecommunications
- Thermally conductive vibration dampening

#### Configurations Available:

- Supplied in cartridge and kit form

#### Building a Part Number



#### Standard Options

◀ example

NA = Selected standard option. If not selecting a standard option, insert company name, drawing number, and revision level.

Cartridges: 50cc = 50.0cc, 400cc = 400.0cc  
 Kits: 1200cc = 1200.0cc, or 10G = 10 gallon

Pot Life: 15 = 15 minutes

00 = No spacer beads  
 07 = 0.007" spacer beads

GF1000 = GAP FILLER 1000 Material

Note: To build a part number, go to [www.bergquistcompany.com/Part\\_Number\\_Builder.php](http://www.bergquistcompany.com/Part_Number_Builder.php).

## Gap Filler 1000SR (Two-Part)

### Thermally Conductive, Liquid Gap Filler Material

#### Features and Benefits

- Thermal conductivity: 1.0 W/m-K
- Excellent slump resistance (stays in place)
- Ultra-conforming, with excellent wet-out for low stress interface applications
- 100% solids – no cure by-products
- Excellent low and high temperature mechanical and chemical stability



Gap Filler 1000SR is a two-part, thermally conductive, liquid gap filling material that features exceptional slump resistance. The mixed system will cure at room temperature and can be accelerated with the addition of heat.

Unlike cured thermal pad materials, a liquid approach offers infinite thickness variations with little or no stress to sensitive components during assembly. As cured, Gap Filler 1000SR provides a soft, thermally conductive, form-in-place elastomer that is ideal for fragile assemblies or for filling unique and intricate air voids and gaps.

Gap Filler 1000SR exhibits low level natural tack characteristics and is intended for use in applications where a strong structural bond is not required.

#### TYPICAL PROPERTIES OF GAP FILLER 1000SR

PROPERTY	IMPERIAL VALUE	METRIC VALUE	TEST METHOD
Color / Part A	Violet	Violet	Visual
Color / Part B	White	White	Visual
Viscosity, High Shear (Pa-s) <sup>(1)</sup>	20	20	ASTM D5099
Density (g/cc)	2.0	2.0	ASTM D792
Mix Ratio	1:1	1:1	—
Shelf Life @ 25°C (months)	6	6	—
<b>PROPERTY AS CURED</b>			
Color	Violet	Violet	Visual
Hardness (Shore 00) <sup>(2)</sup>	75	75	ASTM D2240
Heat Capacity (J/g-K)	1.0	1.0	ASTM D1269
Continuous Use Temp. (°F) / (°C)	-76 to 347	-60 to 175	—
<b>ELECTRICAL AS CURED</b>			
Dielectric Strength (V/mil)	500	500	ASTM D149
Dielectric Constant (1,000 Hz)	5.1	5.1	ASTM D150
Volume Resistivity (Ohmmeter)	10 <sup>11</sup>	10 <sup>11</sup>	ASTM D257
Flame Rating	V-O	V-O	UL 94
<b>THERMAL AS CURED</b>			
Thermal Conductivity (W/m-K)	1.0	1.0	ASTM D5470
<b>CURE SCHEDULE</b>			
Pot Life @ 25°C (mins.) <sup>(3)</sup>	60	60	—
Cure @ 25°C (hrs.) <sup>(4)</sup>	20	20	—
Cure @ 100°C (mins.) <sup>(4)</sup>	10	10	—

1) Capillary Viscosity, Initial, 4,500 sec-1. Part A and B measured separately.  
 2) Thirty-second delay value Shore 00 hardness scale.  
 3) ARES Parallel Plate Rheometer - Working life as liquid, time for modulus to double.  
 4) ARES Parallel Plate Rheometer - Estimated time to read 90% cure.

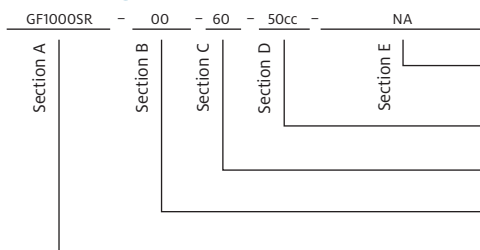
#### Typical Applications:

- Automotive electronics
- Computer and peripherals
- Between any heat-generating semiconductor and a heat sink
- Telecommunications

#### Configurations Available:

- Supplied in cartridge or kit form

#### Building a Part Number



#### Standard Options

##### ◀ example

NA = Selected standard option. If not selecting a standard option, insert company name, drawing number, and revision level.

Cartridges: 50cc = 50.0cc, 400cc = 400.0cc  
 Kits: 1200cc = 1200.0cc, or 10G = 10 gallon

Pot Life: 60 = 60 minutes

00 = No spacer beads  
 07 = 0.007" spacer beads

GF1000SR = GAP FILLER 1000SR Material

Note: To build a part number, go to [www.bergquistcompany.com/Part\\_Number\\_Builder.php](http://www.bergquistcompany.com/Part_Number_Builder.php).

## Gap Filler 1100SF (Two-Part)

### Thermally Conductive, Silicone-Free, Liquid Gap Filling Material

#### Features and Benefits

- Thermal conductivity: 1.1 W/m-K
- No silicone outgassing or extraction
- Ultra-conforming, designed for fragile and low-stress applications
- Ambient and accelerated cure schedules
- 100% solids – no cure by-products

Gap Filler 1100SF is the thermal solution for silicone-sensitive applications. The material is supplied as a two-part component, curing at room or elevated temperatures. The material exhibits low modulus properties, then cures to a soft, flexible elastomer, helping reduce thermal cycling stresses during operation and virtually eliminating stress during assembly of low-stress applications.

The two components are colored to assist as a mix indicator (1:1 by volume). The mixed system will cure at ambient temperature. Unlike cured thermal pad materials, the liquid approach offers infinite thickness variations with little or no stress during assembly displacement. Gap Filler 1100SF, although exhibiting some natural tack characteristics, is not intended for use in thermal interface applications requiring a mechanical structural bond.

#### Application

Gap Filler 1100SF can be mixed and dispensed using dual-tube cartridge packs with static mixers and manual or pneumatic gun or high volume mixing and dispensing equipment (application of heat may be used to reduce viscosity).

#### TEMPERATURE DEPENDENCE OF VISCOSITY

The viscosity of the Gap Filler 1100SF material is temperature dependent. The table below provides the multiplication factor to obtain viscosity at various temperatures. To obtain the viscosity at a given temperature, look up the multiplication factor at that temperature and multiply the corresponding viscosity at 25°C.

Temperature °C	Multiplication Factor	
	Part A	Part B
20	1.43	1.57
25	1.00	1.00
35	0.58	0.50
45	0.39	0.30
50	0.32	0.24

Example - Viscosity of Part A @ 45°:

Viscosity of Part A @ 25°C is 450,000 cPs.

The multiplication factor for Part A @ 45°C is 0.39.

Therefore: (450,000) x (0.39) = 175,500 cPs.

#### TYPICAL PROPERTIES OF GAP FILLER 1100SF

PROPERTY	IMPERIAL VALUE	METRIC VALUE	TEST METHOD
Color / Part A	Yellow	Yellow	Visual
Color / Part B	Red	Red	Visual
Viscosity as Mixed (cPs) <sup>(1)</sup>	450,000	450,000	ASTM D2196
Density (g/cc)	2.0	2.0	ASTM D792
Mix Ratio	1:1	1:1	—
Shelf Life @ 25°C (months)	6	6	—
<b>PROPERTY AS CURED</b>			
Color	Orange	Orange	Visual
Hardness (Shore 00) <sup>(2)</sup>	60	60	ASTM D2240
Heat Capacity (J/g-K)	0.9	0.9	ASTM E1269
Continuous Use Temp. (°F) / (°C)	-76 to 257	-60 to 125	—
<b>ELECTRICAL AS CURED</b>			
Dielectric Strength (V/mil)	400	400	ASTM D149
Dielectric Constant (1,000 Hz)	5.0	5.0	ASTM D150
Volume Resistivity (Ohmmeter)	10 <sup>10</sup>	10 <sup>10</sup>	ASTM D257
Flame Rating	V-O	V-O	UL 94
<b>THERMAL AS CURED</b>			
Thermal Conductivity (W/m-K)	1.1	1.1	ASTM D5470
<b>CURE SCHEDULE</b>			
Pot Life @ 25°C <sup>(3)</sup>	240 mins. (4 hrs.)	240 mins. (4 hrs.)	—
Cure @ 25°C (hrs.) <sup>(4)</sup>	24	24	—
Cure @ 100°C (mins.) <sup>(4)</sup>	10	10	—

1) Brookfield RV, Heli-Path, Spindle TF @ 2 rpm, 25°C.  
 2) Thirty-second delay value Shore 00 hardness scale.  
 3) Time for viscosity to double.  
 4) Cure schedule (rheometer - time to read 90% cure).

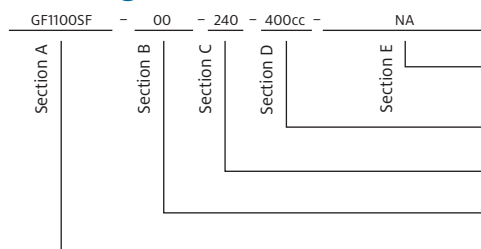
#### Typical Applications Include:

- Silicone-sensitive optic components
- Silicone-sensitive electronics
- Filling various gaps between heat-generating devices to heat sinks and housings
- Mechanical switching relay
- Hard disk assemblies
- Dielectric for bare-leaded devices

#### Configurations Available:

- Supplied in cartridge or kit form

#### Building a Part Number



#### Standard Options

◀ example

NA = Selected standard option. If not selecting a standard option, insert company name, drawing number, and revision level.

Cartridges: 400cc = 400.0cc  
 Kits: 1200cc = 1200.0cc, or 10G = 10 gallon

Pot Life: 240 = 240 minutes

00 = No spacer beads  
 07 = 0.007" spacer beads

GF1100SF = GAP FILLER 1100SF Material

Note: To build a part number, go to [www.bergquistcompany.com/Part\\_Number\\_Builder.php](http://www.bergquistcompany.com/Part_Number_Builder.php).

# Gap Filler 1400SL (Two-Part)

## Thermally Conductive, Self-Leveling, Liquid Gap Filling Material

### Features and Benefits

- Thermal conductivity: 1.4 W/m-K
- Self-leveling
- Very soft
- Vibration dampening



Gap Filler 1400SL is a two-part, thermally conductive, silicone based, liquid gap filling material. This material has an extremely low viscosity to enable self-leveling and filling of voids resulting in excellent thermal transfer.

Unlike cured thermal pad materials, a liquid approach offers infinite thickness variations with little or no stress to the sensitive components during assembly. As cured, Gap Filler 1400SL provides a soft, thermally conductive, form-in-place elastomer that is ideal for fragile assemblies and filling unique and intricate gaps.

Gap Filler 1400SL exhibits low level natural tack characteristics and is intended for use in applications where a strong structural bond is not required.

### Dispensing

Due to its low viscosity nature, Gap Filler 1400SL will settle upon storage. Each container must be thoroughly mixed before combining Part A and Part B via static mixer and dispensing into application.

TYPICAL PROPERTIES OF GAP FILLER 1400SL			
PROPERTY	IMPERIAL VALUE	METRIC VALUE	TEST METHOD
Color / Part A	Yellow	Yellow	Visual
Color / Part B	White	White	Visual
Viscosity as Mixed (cPs) <sup>(1)</sup>	5,000	5,000	ASTM D2196
Density (g/cc)	2.5	2.5	ASTM D792
Mix Ratio	1:1	1:1	—
Shelf Life @ 25°C (months) <sup>(2)</sup>	6	6	—
PROPERTY AS CURED			
Color	Yellow	Yellow	Visual
Hardness (Shore 00) <sup>(3)</sup>	40	40	ASTM D2240
Heat Capacity (J/g-K)	0.9	0.9	ASTM D1269
Siloxane Content, $\sum D_4 - D_{10}$ (ppm)	40	40	—
Continuous Use Temp. (°F) / (°C)	-76 to 392	-60 to 200	—
ELECTRICAL AS CURED			
Dielectric Strength (V/mil)	250	250	ASTM D149
Dielectric Constant (1000 Hz)	6.0	6.0	ASTM D150
Volume Resistivity (Ohm-meter)	10 <sup>11</sup>	10 <sup>11</sup>	ASTM D257
Flame Rating	V-O	V-O	UL 94
THERMAL AS CURED			
Thermal Conductivity (W/m-K)	1.4	1.4	ASTM D5470
CURE SCHEDULE			
Working Time @ 25°C (min) <sup>(4)</sup>	120	120	—
Cure @ 25°C (hrs.) <sup>(4)</sup>	24	24	—
Cure @ 100°C (mins.) <sup>(4)</sup>	30	30	—

(1) Brookfield Rheometer, Part A and Part B mixed 1:1 ratio.  
 (2) See application note for storage and handling recommendations.  
 (3) Thirty second delay value, Shore 00 scale.  
 (4) Parallel Plate Rheometer, see reactivity application note.

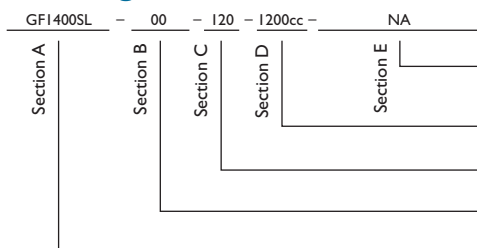
### Typical Applications Include:

- Automotive electronics
- Telecommunications
- Encapsulating semiconductors and magnetic components with heatsink
- Silicone sensitive applications
- Lighting
- Power Supplies

### Configurations Available:

- Available for order in 1200cc kits and 7 gallon pail formats

### Building a Part Number



### Standard Options

- ◀ example
- NA = Selected standard option. If not selecting a standard option, insert company name, drawing number, and revision level.
- Kits: 1200cc = 1200.0cc, or 7G = 7 gallon
- Working Time: 120 = 120 minutes
- 00 = No spacer beads
- GFI400SL = Gap Filler 1400SL Material

Note: To build a part number, go to [www.bergquistcompany.com/Part\\_Number\\_Builder.php](http://www.bergquistcompany.com/Part_Number_Builder.php).

# Gap Filler 1500 (Two-Part)

## Thermally Conductive Liquid Gap Filling Material

### Features and Benefits

- Thermal conductivity: 1.8 W/mK
- Optimized shear thinning characteristics for ease of dispensing
- Excellent slump resistance (stays in place)
- Ultra-conforming with excellent wet-out for low stress interface applications
- 100% solids – no cure by-products
- Excellent low and high temperature mechanical and chemical stability



Gap Filler 1500 is a two-part, high performance, thermally conductive, liquid gap filling material, which features exceptional slump resistance and high shear thinning characteristics for optimized consistency and control during dispensing. The mixed system will cure at room temperature and can be accelerated with the addition of heat. Unlike cured thermal pad materials, a liquid approach offers infinite thickness variations with little or no stress to the sensitive components during assembly. Gap Filler 1500 exhibits low level natural tack characteristics and is intended for use in applications where a strong structural bond is not required. As cured, Gap Filler 1500 provides a soft, thermally conductive, form-in-place elastomer that is ideal for fragile assemblies and filling unique and intricate air voids and gaps.

### TYPICAL PROPERTIES OF GAP FILLER 1500

PROPERTY	IMPERIAL VALUE	METRIC VALUE	TEST METHOD
Color / Part A	Yellow	Yellow	Visual
Color / Part B	White	White	Visual
Viscosity, High Shear (Pa-s) <sup>(1)</sup>	25	25	ASTM D5099
Density (g/cc)	2.7	2.7	ASTM D792
Mix Ratio	1:1	1:1	—
Shelf Life @ 25°C (months)	6	6	—
<b>PROPERTY AS CURED</b>			
Color		Yellow	Visual
Hardness (Shore 00) <sup>(2)</sup>	50	50	ASTM D2240
Heat Capacity (J/g-K)	1.0	1.0	ASTM D1269
Continuous Use Temp. (°F) / (°C)	-76 to 392	-60 to 200	—
<b>ELECTRICAL AS CURED</b>			
Dielectric Strength (V/mil)	400	400	ASTM D149
Dielectric Constant (1,000 Hz)	6.4	6.4	ASTM D150
Volume Resistivity (Ohmmeter)	10 <sup>10</sup>	10 <sup>10</sup>	ASTM D257
Flame Rating	V-O	V-O	UL 94
<b>THERMAL AS CURED</b>			
Thermal Conductivity (W/m-K)	1.8	1.8	ASTM D5470
<b>CURE SCHEDULE</b>			
	<b>SCHEDULE 1</b>	<b>SCHEDULE 2</b>	
Pot Life @ 25°C <sup>(3)</sup>	60 mins.	480 mins. (8 hrs.)	—
Cure @ 25°C <sup>(4)</sup>	5 hrs.	3 days	—
Cure @ 100°C <sup>(4)</sup>	10 mins.	30 mins.	—

1) Capillary viscosity, initial, 3000 sec-1. Part A and B measured separately.  
 2) Thirty-second delay value Shore 00 hardness scale.  
 3) Parallel Plate Rheometer - Working life as liquid.  
 4) Parallel Plate Rheometer - Estimated time to reach 90% cure.

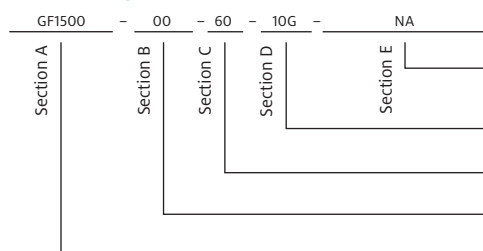
### Typical Applications Include:

- Automotive electronics
- Computer and peripherals
- Between any heat generating semiconductor and a heat sink
- Telecommunications

### Configurations Available:

- Supplied in cartridge or kit form
- With or without glass beads

### Building a Part Number



### Standard Options

#### ◀ example

NA = Selected standard option. If not selecting a standard option, insert company name, drawing number, and revision level.

Cartridges: 50cc = 50.0cc, 400cc = 400.0cc  
 Kits: 1200cc = 1200.00cc, 10G = 10 gallon

Pot Life: 60 = 60 min, 480 = 480 min

00 = No spacer beads, 07 = 0.007" spacer beads,  
 10 = 0.010" spacer beads

GF1500 = GAP FILLER 1500 (Two-Part) Material

Note: To build a part number, go to [www.bergquistcompany.com/Part\\_Number\\_Builder.php](http://www.bergquistcompany.com/Part_Number_Builder.php).



## Gap Filler 1500LV (Two-Part)

### Thermally Conductive, Liquid Gap Filler Material

#### Features and Benefits

- Thermal conductivity: 1.8 W/m-K
- Low volatility for silicone-sensitive applications
- Ultra-conforming, with excellent wet-out
- 100% solids — no cure by-products
- Excellent low and high temperature chemical and mechanical stability



Gap Filler 1500LV is a two-part, high performance, thermally conductive, liquid gap filling material. This material offers the high temperature resistance and low modulus of a silicone material with significantly lower levels of silicone outgassing for use in silicone-sensitive applications.

The mixed material will cure at room temperature and can be accelerated with the addition of heat. As cured, Gap Filler 1500LV provides a soft, thermally conductive, form-in-place elastomer that is ideal for fragile assemblies or for filling unique and intricate air voids and gaps.

Liquid dispensed thermal materials offer infinite thickness variations and impart little to no stress on sensitive components during assembly. Gap Filler 1500LV exhibits low level natural tack characteristics and is intended for use in applications where a strong structural bond is not required.

#### TYPICAL PROPERTIES OF GAP FILLER 1500LV

PROPERTY	IMPERIAL VALUE	METRIC VALUE	TEST METHOD
Color / Part A	Yellow	Yellow	Visual
Color / Part B	White	White	Visual
Viscosity, High Shear (Pa-s) <sup>(1)</sup>	20	20	ASTM D5099
Density (g/cc)	2.7	2.7	ASTM D792
Mix Ratio	1:1	1:1	—
Shelf Life @ 25°C (months)	6	6	—
<b>PROPERTY AS CURED</b>			
Color	Yellow	Yellow	Visual
Hardness (Shore 00) <sup>(2)</sup>	80	80	ASTM D2240
Heat Capacity (J/g-K)	1.0	1.0	ASTM D1269
Siloxane Content, SD4-D10 (ppm)	<100	<100	—
Continuous Use Temp. (°F) / (°C)	-76 to 392	-60 to 200	—
<b>ELECTRICAL AS CURED</b>			
Dielectric Strength (V/mil)	400	400	ASTM D149
Dielectric Constant (1,000 Hz)	6.2	6.2	ASTM D150
Volume Resistivity (Ohmmeter)	10 <sup>10</sup>	10 <sup>10</sup>	ASTM D257
Flame Rating	V-O	V-O	UL 94
<b>THERMAL AS CURED</b>			
Thermal Conductivity (W/m-K)	1.8	1.8	ASTM D5470
<b>CURE SCHEDULE</b>			
Working Time @ 25°C <sup>(3)</sup>	120 mins. (2 hrs.)	120 mins. (2 hrs.)	—
Cure @ 25°C (hrs.) <sup>(3)</sup>	8	8	—
Cure @ 100°C (mins.) <sup>(3)</sup>	10	10	—

<sup>1)</sup> Capillary Viscosity, 3000/sec, Part A and B measured separately.  
<sup>2)</sup> Thirty-second delay value Shore 00 hardness scale.  
<sup>3)</sup> Parallel plate rheometer, see reactivity application note.

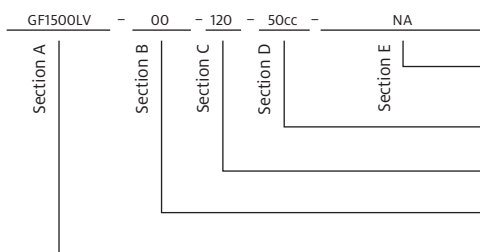
#### Typical Applications:

- Lighting
- Automotive electronics
- Silicone sensitive applications

#### Configurations Available:

- Supplied in cartridge or kit form

#### Building a Part Number



#### Standard Options

##### ◀ example

NA = Selected standard option. If not selecting a standard option, insert company name, drawing number, and revision level.

Cartridges: 50cc = 50.0cc, 400cc = 400.0cc  
 Kits: 1200cc = 1200.0cc, or 10G = 10 gallon

Pot Life: 120 = 120 minutes

00 = No spacer beads

07 = 0.007" spacer beads

10 = 0.010" spacer beads

GF1500LV = GAP FILLER 1500LV Material

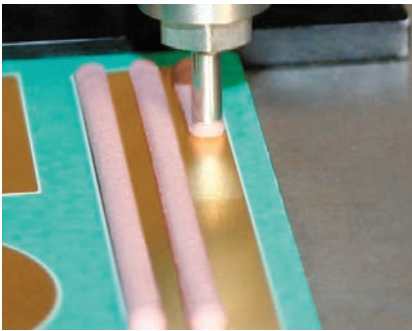
Note: To build a part number, go to [www.bergquistcompany.com/Part\\_Number\\_Builder.php](http://www.bergquistcompany.com/Part_Number_Builder.php).

## Gap Filler 2000 (Two-Part)

### Thermally Conductive, Liquid Gap Filling Material

#### Features and Benefits

- Thermal conductivity: 2.0 W/m-K
- Ultra-conforming, designed for fragile and low-stress applications
- Ambient and accelerated cure schedules
- 100% solids – no cure by-products
- Excellent low and high temperature mechanical and chemical stability



Gap Filler 2000 is a high performance, thermally conductive, liquid gap-filling material supplied as a two-component, room or elevated temperature curing system. The material provides a balance of cured material properties and good compression set (memory). The result is a soft, form-in-place elastomer ideal for coupling “hot” electronic components mounted on PC boards with an adjacent metal case or heat sink. Before cure, it flows under pressure like grease. After cure, it won’t pump from the interface as a result of thermal cycling and is dry to the touch.

Unlike cured gap filling materials, the liquid approach offers infinite thickness with little or no stress during displacement and assembly. It also eliminates the need for specific pad thickness and die-cut shapes for individual applications.

Gap Filler 2000 is intended for use in thermal interface applications when a strong structural bond is not required.

#### TYPICAL PROPERTIES OF GAP FILLER 2000

PROPERTY	IMPERIAL VALUE	METRIC VALUE	TEST METHOD
Color / Part A	Pink	Pink	Visual
Color / Part B	White	White	—
Viscosity as Mixed (cPs) <sup>(1)</sup>	300,000	300,000	ASTM D2196
Density (g/cc)	2.9	2.9	ASTM D792
Mix Ratio	1:1	1:1	—
Shelf Life @ 25°C (months)	6	6	—
<b>PROPERTY AS CURED</b>			
Color	Pink	Pink	Visual
Hardness (Shore 00) <sup>(2)</sup>	70	70	ASTM D2240
Heat Capacity (J/g-K)	1.0	1.0	ASTM D1269
Continuous Use Temp. (°F) / (°C)	-76 to 392	-60 to 200	—
<b>ELECTRICAL AS CURED</b>			
Dielectric Strength (V/mil)	500	500	ASTM D149
Dielectric Constant (1,000 Hz)	7	7	ASTM D150
Volume Resistivity (Ohmmeter)	10 <sup>11</sup>	10 <sup>11</sup>	ASTM D257
Flame Rating	V-O	V-O	UL 94
<b>THERMAL AS CURED</b>			
Thermal Conductivity (W/m-K)	2.0	2.0	ASTM D5470
<b>CURE SCHEDULE</b>			
	<b>SCHEDULE 1</b>	<b>SCHEDULE 2</b>	<b>SCHEDULE 3</b>
Pot Life @ 25°C <sup>(3)</sup>	15 mins.	60 mins.	600 mins. (10 hr)
Cure @ 25°C <sup>(4)</sup>	1-2 hrs.	3-4 hrs.	3 days
Cure @ 100°C <sup>(4)</sup>	5 mins.	15 mins.	1 hr

1) Brookfield RV, Heli-Path, Spindle TF @ 20 rpm, 25°C.  
 2) Thirty-second delay value Shore 00 hardness scale.  
 3) Time for viscosity to double.  
 4) Cure schedule (rheometer - time to read 90% cure).

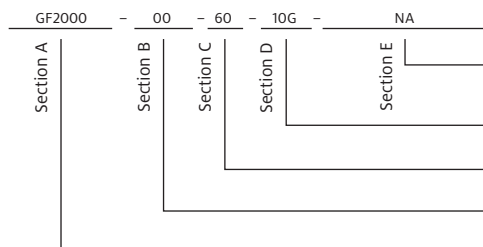
#### Typical Applications Include:

- Automotive electronics
- Computer and peripherals
- Between any heat-generating semiconductor and a heat sink
- Telecommunications
- Thermally conductive vibration dampening

#### Configurations Available:

- Supplied in cartridge or kit form

#### Building a Part Number



#### Standard Options

◀ example

NA = Selected standard option. If not selecting a standard option, insert company name, drawing number, and revision level.

Cartridges: 50cc = 50.0cc, 400cc = 400.0cc  
 Kits: 1200cc = 1200.0cc, or 10G = 10 gallon

Pot Life: 15 = 15 minutes, 60 = 60 minutes  
 600 = 600 minutes

00 = No spacer beads  
 07 = 0.007" spacer beads

GF2000 = GAP FILLER 2000 Material

Note: To build a part number, go to [www.bergquistcompany.com/Part\\_Number\\_Builder.php](http://www.bergquistcompany.com/Part_Number_Builder.php).

# Gap Filler 3500LV (Two-Part)

## Thermally Conductive, Liquid Gap Filler Material

### Features and Benefits

- Thermal conductivity: 3.5 W/m-K
- Low volatility for outgassing sensitive applications
- Ultra-conforming with excellent wet-out for low stress interfaces on applications
- 100% solids - no cure by-products



Gap Filler 3500LV is a two-part, high thermal conductivity, liquid gap filling material. This material offers the mechanical property benefits of a silicone material with the additional feature of low outgassing.

The mixed material will cure at room temperature or can be accelerated with the addition of heat.

The liquid approach offers infinite thickness variations with little to no stress to sensitive components during assembly. As cured, Gap Filler 3500LV provides a soft, form-in-place elastomer that is ideal for fragile assemblies or for filling intricate air voids.

### TYPICAL PROPERTIES OF GAP FILLER 3500LV

PROPERTY	IMPERIAL VALUE	METRIC VALUE	TEST METHOD
Color / Part A	Blue	Blue	Visual
Color / Part B	White	White	Visual
Viscosity, High Shear (Pa·s) <sup>(1)</sup>	45	45	ASTM D5099
Density (g/cc)	3.1	3.1	ASTM D792
Mix Ratio	1:1	1:1	—
Shelf Life @ 25°C (months)	5	5	—
<b>PROPERTY AS CURED</b>			
Color	Lite Blue	Lite Blue	Visual
Hardness (Shore 00) <sup>(2)</sup>	40	40	ASTM D2240
Heat Capacity (J/g-K)	0.8	0.8	ASTM D1269
Siloxane Content, $\sum D_4 - D_{10}$ (ppm)	40	40	—
Continuous Use Temp. (°F) / (°C)	-76 to 392	-60 to 200	—
<b>ELECTRICAL AS CURED</b>			
Dielectric Strength (V/mil)	275	275	ASTM D149
Dielectric Constant (1,000 Hz)	8.0	8.0	ASTM D150
Volume Resistivity (Ohmmeter)	10 <sup>10</sup>	10 <sup>10</sup>	ASTM D257
Flame Rating	V-O	V-O	UL 94
<b>THERMAL AS CURED</b>			
Thermal Conductivity (W/m-K)	3.5	3.5	ASTM D5470
<b>CURE SCHEDULE</b>			
Working Time @ 25°C <sup>(3)</sup>	240 mins. (4 hrs.)	240 mins. (4 hrs.)	—
Cure @ 25°C (hrs.) <sup>(3)</sup>	24	24	—
Cure @ 100°C (mins.) <sup>(3)</sup>	30	30	—

(1) Capillary Viscosity, 1,500/sec., Part A and B measured separately.  
 (2) Thirty-second delay value Shore 00 hardness scale.  
 (3) Parallel plate rheometer, see reactivity application note.

### Typical Applications:

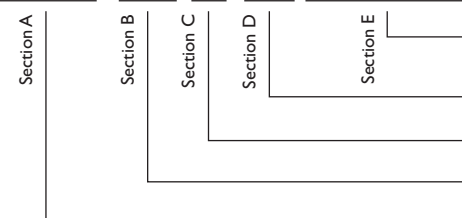
- Lighting
- Automotive in-cabin electronics
- Medical electronics
- Industrial controls
- Optics

### Configurations Available:

- Supplied in cartridge or kit form

### Building a Part Number

GF3500LV - 00 - 240 - 50cc - NA



### Standard Options

◀ example

NA = Selected standard option. If not selecting a standard option, insert company name, drawing number, and revision level.

Cartridges: 50cc = 50.0cc, 400cc = 400.0cc  
 Kits: 1200cc = 1200.0cc, or 10G = 10 gallon

Working Time: 240 = 240 minutes

00 = No spacer beads  
 07 = 0.007" spacer beads  
 10 = 0.010" spacer beads

GF3500LV = Gap Filler 3500LV Material

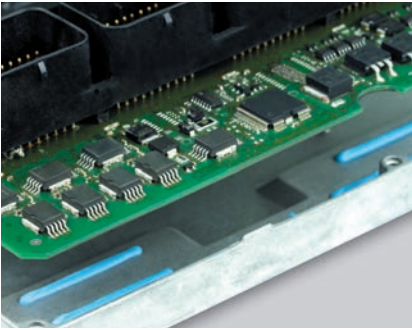
Note: To build a part number, go to [www.bergquistcompany.com/Part\\_Number\\_Builder.php](http://www.bergquistcompany.com/Part_Number_Builder.php).

## Gap Filler 3500S35 (Two-Part)

### Thermally Conductive Liquid Gap Filling Material

#### Features and Benefits

- Thermal conductivity: 3.6 W/m-K
- Thixotropic nature makes it easy to dispense
- Two-part formulation for easy storage
- Ultra-conforming – designed for fragile and low stress applications
- Ambient or accelerated cure schedules



Gap Filler 3500S35 is a two-component, liquid gap-filling material, cured at either room or elevated temperature, featuring ultra-high thermal performance and outstanding softness. Prior to curing, the material maintains good thixotropic characteristics as well as low viscosity. The result is a gel-like liquid material designed to fill air gaps and voids yet flow when acted upon by an external force (e.g., dispensing or assembly process). The material is an excellent solution for interfacing fragile components with high topography and/or stack-up tolerances to a universal heat sink or housing. Once cured, it remains a low modulus elastomer designed to assist in relieving CTE stresses during thermal cycling yet maintain enough modulus to prevent pump-out from the interface. Gap Filler 3500S35 will lightly adhere to surfaces, thus improving surface area contact. Gap Filler 3500S35 is not designed to be a structural adhesive.

#### TYPICAL PROPERTIES OF GAP FILLER 3500S35

PROPERTY	IMPERIAL VALUE	METRIC VALUE	TEST METHOD
Color / Part A	White	White	Visual
Color / Part B	Blue	Blue	Visual
Viscosity as Mixed (cPs) <sup>(1)</sup>	150,000	150,000	ASTM D2196
Density (g/cc)	3.0	3.0	ASTM D792
Mix Ratio	1:1	1:1	—
Shelf Life @ 25°C (months)	5	5	—
<b>PROPERTY AS CURED</b>			
Color	Blue	Blue	Visual
Hardness (Shore 00) <sup>(2)</sup>	35	35	ASTM D2240
Continuous Use Temp. (°F) / (°C)	-76 to 392	-60 to 200	—
<b>ELECTRICAL AS CURED</b>			
Dielectric Strength (V/mil)	275	275	ASTM D149
Dielectric Constant (1,000 Hz)	8.0	8.0	ASTM D150
Volume Resistivity (Ohmmeter)	10 <sup>9</sup>	10 <sup>9</sup>	ASTM D257
Flame Rating	V-0	V-0	UL 94
<b>THERMAL AS CURED</b>			
Thermal Conductivity (W/m-K)	3.6	3.6	ASTM D5470
<b>CURE SCHEDULE</b>			
Pot Life @ 25°C (mins.) <sup>(3)</sup>	60	60	—
Cure @ 25°C (hrs.) <sup>(4)</sup>	15	15	—
Cure @ 100°C (mins.) <sup>(4)</sup>	30	30	—

1) Brookfield RV, Heli-Path, Spindle TF @ 20 rpm, 25°C.  
 2) Thirty-second delay value Shore 00 hardness scale.  
 3) Time for viscosity to double.  
 4) Cure schedule (rheometer - time to read 90% cure).

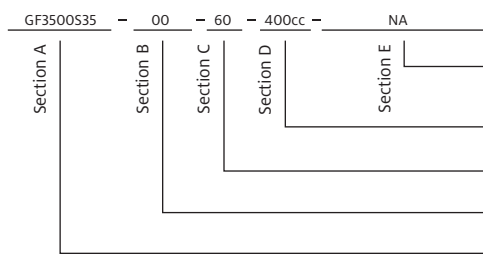
#### Typical Applications Include:

- Automotive electronics
- Discrete components to housing
- PCBA to housing
- Fiber optic telecommunications equipment

#### Configurations Available:

- Supplied in cartridge or kit form

#### Building a Part Number



#### Standard Options

##### ◀ example

NA = Selected standard option. If not selecting a standard option, insert company name, drawing number, and revision level.

Cartridges: 50cc = 50.0cc, 400cc = 400.0cc  
 Kits: 1200cc = 1200.0cc, or 6G = 6 gallon

Pot Life: 60 = 60 minutes

00 = No spacer beads  
 07 = 0.007" spacer beads

GP3500S35 = GAP PAD 3500S35 Material

Note: To build a part number, go to [www.bergquistcompany.com/Part\\_Number\\_Builder.php](http://www.bergquistcompany.com/Part_Number_Builder.php).

# Gap Filler 4000 (Two-Part)

## Thermally Conductive, Liquid Gap Filler Material

### Features and Benefits

- Thermal conductivity: 4.0 W/m-K
- Extended working time for manufacturing flexibility
- Ultra-conforming with excellent wet-out
- 100% solids – no cure by-products
- Excellent low and high temperature chemical and mechanical stability



Gap Filler 4000 is a two-part, high performance, thermally conductive, liquid gap-filling material. The mixed material will cure at room temperature and can be accelerated with the addition of heat. Gap Filler 4000 offers an extended working time to allow greater flexibility in the customer’s assembly process.

Liquid dispensed thermal materials offer infinite thickness variations and impart little to no stress on sensitive components during assembly. Gap Filler 4000 exhibits low level natural tack characteristics and is intended for use in applications where a strong structural bond is not required.

As cured, Gap Filler 4000 provides a soft, thermally conductive, form-in-place elastomer that is ideal for fragile assemblies or for filling unique and intricate air voids and gaps.

### TYPICAL PROPERTIES OF GAP FILLER 4000

PROPERTY	IMPERIAL VALUE	METRIC VALUE	TEST METHOD
Color / Part A	Blue	Blue	Visual
Color / Part B	White	White	Visual
Viscosity, High Shear (Pa-s) <sup>(1)</sup>	50	50	ASTM D5099
Density (g/cc)	3.1	3.1	ASTM D792
Mix Ratio	1:1	1:1	—
Shelf Life @ 25°C (months)	5	5	—
<b>PROPERTY AS CURED</b>			
Color	Blue	Blue	Visual
Hardness (Shore 00) <sup>(2)</sup>	75	75	ASTM D2240
Heat Capacity (J/g-K)	0.8	0.8	ASTM D1269
Continuous Use Temp. (°F) / (°C)	-76 to 392	-60 to 200	—
<b>ELECTRICAL AS CURED</b>			
Dielectric Strength (V/mil)	450	450	ASTM D149
Dielectric Constant (1,000 Hz)	7.9	7.9	ASTM D150
Volume Resistivity (Ohmmeter)	10 <sup>10</sup>	10 <sup>10</sup>	ASTM D257
Flame Rating	V-O	V-O	UL 94
<b>THERMAL AS CURED</b>			
Thermal Conductivity (W/m-K)	4.0	4.0	ASTM D5470
<b>CURE SCHEDULE</b>			
Working Time @ 25°C <sup>(3)</sup>	240 mins. (4 hrs.)	240 mins. (4 hrs.)	—
Cure @ 25°C (hrs.) <sup>(3)</sup>	24	24	—
Cure @ 100°C (mins.) <sup>(3)</sup>	30	30	—

<sup>1)</sup> Capillary Viscosity, 1,500/sec., Part A and B measured separately.  
<sup>2)</sup> Thirty-second delay value Shore 00 hardness scale.  
<sup>3)</sup> Parallel plate rheometer, see reactivity application note.

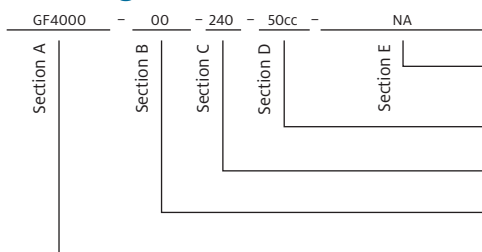
### Typical Applications:

- Automotive electronics
- Computer and peripherals
- Between any heat-generating semiconductor and a heat sink
- Telecommunications

### Configurations Available:

- Supplied in cartridge or kit form

### Building a Part Number



### Standard Options

◀ example

NA = Selected standard option. If not selecting a standard option, insert company name, drawing number, and revision level.

Cartridges: 50cc = 50.0cc, 400cc = 400.0cc  
 Kits: 1200cc = 1200.0cc, or 6G = 6 gallon

Pot Life: 240 = 240 minutes

00 = No spacer beads  
 07 = 0.007" spacer beads  
 10 = 0.010" spacer beads

GF4000 = GAP FILLER 4000 Material

Note: To build a part number, go to [www.bergquistcompany.com/Part\\_Number\\_Builder.php](http://www.bergquistcompany.com/Part_Number_Builder.php).

**AMERICAS****HEADQUARTERS:****UNITED STATES**

Henkel Electronic Materials, LLC  
14000 Jamboree Road  
Irvine, CA 92606  
USA  
Tel: +1.888.943.6535  
Fax: +1.714.368.2265

Henkel Electronic Materials, LLC  
20021 Susana Road  
Rancho Dominguez, CA 90221  
USA  
Tel: +1.310.764.4600  
Fax: +1.310.605.2274

Henkel Electronic Materials, LLC  
18930 W. 78th Street  
Chanhassen, MN 55317  
USA  
Tel: +1.952.835.2322  
Tel: +1.800.347.4572  
Fax: +1.952.835.0430

**BRAZIL**

Henkel Brazil  
Av. Prof. Vernon Kriebler, 91  
06690-070 Itapevi,  
Sao Paulo, Brazil  
Tel: +55.11.3205.7001  
Fax: +55.11.3205.7100

**ASIA-PACIFIC****CHINA**

No. 332 Meigui South Road  
WaiGaoQiao Free Trade Zone, Pu Dong  
Shanghai 200131, P.R. China  
Tel: +86.21.3898.4800  
Fax: +86.21.5048.4169

**JAPAN**

Henkel Japan Ltd.  
27-7, Shin Isogo-cho  
Isogo-ku Yokohama, 235-0017  
Japan  
Tel: +81.45.286.0161  
Email: jp.ae-csdesk@henkel.com

**KOREA**

Henkel Technologies (Korea) Ltd.  
6th Floor  
Dae Ryung Techno Town II  
33-33 Gasan-dong,  
Geumcheon-gu, Seoul 153-771  
Korea  
Tel: +82.2.6675.8000  
Fax: +82.2.6675.8191

**SINGAPORE**

Henkel Singapore Pte Ltd.  
401, Commonwealth Drive  
#03-01/02 Haw Par Technocentre,  
Singapore 149598  
Tel: +65.6266.0100  
Fax: +65.6472.8738 / +65.6266.1161

**EUROPE****BELGIUM**

Henkel Electronics Materials (Belgium)  
N.V. Nijverheidsstraat 7  
B-2260 Westerlo  
Belgium  
Tel: +32.1457.5611  
Fax: +32.1458.5530

**UNITED KINGDOM**

Henkel Ltd.  
Adhesives Limited Technologies House  
Wood Lane End  
Hemel Hempstead  
Hertfordshire HP2 4RQ  
Tel: +44.1442.278000  
Fax: +44.1442.278071

Across the Board,  Around the Globe.

[henkel-adhesives.com/thermal](http://henkel-adhesives.com/thermal)