

April, 2013

3M™ VHB™ Adhesive Transfer Tape F9460PC

Product Description

3M™ VHB™ Adhesive Transfer Tape F9460PC utilizes the 3M™ High Performance Acrylic Adhesive 100MP, which has excellent long term holding power with much higher adhesion strength than typical pressure sensitive adhesive systems. This 3M™ VHB™ Adhesive Transfer Tape is transparent and is ideal for use in many interior and exterior industrial applications to replace rivets, spot welds, liquid adhesives, and other permanent fasteners.



Technical Information Note

The following technical information and data should be considered representative or typical only and should not be used for specification purposes.

Typical Physical Properties

| Property | Values | | Notes |
|--------------------|-------------------------|-------------------------|---|
| Adhesive Thickness | 0.06 mm | 2.3 mil | The thickness listed is based on a calculation from manufacturing controlled adhesive coat weights using a density of 1.012 g/cc. While past data pages have listed nominal thicknesses, the coat weight (and theoretical caliper) has not changed. |
| Density | 1.012 g/cm ³ | 0.04 lb/in ³ | |
| Liner | 58# Polycoated Kraft | | |
| Liner Thickness | 0.106 mm | 4.2 mil | |

UL Listing

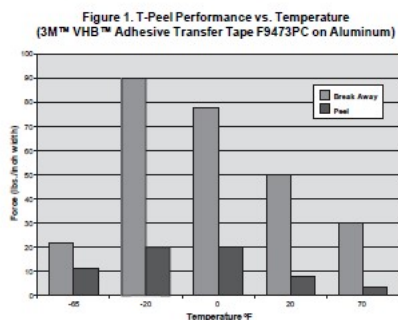
3M™ Adhesive 100MP has UL 746C listings with different temperature ratings on many commonly used substrate materials as indicated in the table below. Qualification for this listing requires high strength retention after extended exposure to high temperatures, humidity, cold, and cyclic conditions.

Substrates Temperature Rating

Stainless Steel, Glass/Epoxy, Enameled Steel, Ceramic, Phenolic: 110°C

ABS, Polycarbonate, Aluminum, Galvanized Steel: 90°C

Unplasticized PVC: 75°C



Our testing has shown that 3M™ Adhesive 100MP yielded 92% retention of peel adhesion after the roll was aged for more than 5 years at an elevated temperature of 150°F (65°C). The initial tack and liner release properties were still excellent. This testing result suggests that the tape is relatively unaffected by long-term exposure to elevated temperatures. Bonds made with 3M™ Adhesive 100MP can tolerate periodic short-term exposures to temperatures up to 500°F (260°C). 3M™ Adhesive 100MP is thermoplastic in nature, becoming softer as temperature increases and firmer as temperature decreases. As the adhesive becomes firmer, the performance generally increases. This performance increase is demonstrated graphically in Figure 1 for 3M™ VHB™ Adhesive Transfer Tape F9473PC. It shows the breakaway and peel forces as a function of temperature. The exception of the performance increase is at very low temperatures when high impact stresses along with high frequencies are encountered. At low temperatures, the tape becomes very firm and glassy; the ability to absorb impact energy is reduced.

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Dynamic Mechanical Properties

For engineers who have to use adhesive properties for modeling and analysis purpose, we suggest a Young's modulus of 4.5×10^2 kPa (measured at 23°C & 1 Hz) and a Poisson's ratio of 0.499. For detailed adhesive modulus and damping properties, please refer to the nomograph for 3M™ VHB™ Adhesive Transfer Tapes, which is available upon request through our technical service group. The nomograph presents adhesive modulus and damping properties as functions of temperature and frequency.

Typical Performance Characteristics

Additional Test notes

3M™ VHB™ Adhesive Transfer Tapes F9460PC, F9469PC, and F9473PC are made from the same adhesive system and are thermoplastic in nature, becoming softer as temperature increases and firmer as temperature decreases. As the adhesive becomes firmer, the adhesion performance generally increases. At low temperatures (lower than -40°F [-40°C]), the 3M™ VHB™ Adhesive Transfer Tape becomes very firm and glassy; the ability to absorb impact energy is reduced. In contrast, adhesion strength reduces with increasing temperatures. Typical adhesive strength properties at room temperatures are shown below.

Solvent Resistance

No apparent degradation when exposed to splash testing of many common solvents and fluids including gasoline, JP-4 fuel, mineral spirits, motor oil, ammonia cleaner, acetone and methyl ethyl ketone.

(3 splash testing cycles: 20 seconds submersion, & 20 seconds air dry.)

| Property | Values | | Method | Dwell/Cure Time | Substrate | Backing | Test Condition |
|--|-----------|------------------------|---------------------------------------|-----------------|-----------------|------------------------|---|
| Peel Adhesion | 12.3 N/cm | 112 oz/in | ASTM D3330, Method E - Modified | 72 hr | Stainless Steel | 2 mil Aluminum Foil | |
| Normal Tensile | 690 kPa | 100 lb/in ² | ASTM D897 | | Aluminum | | |
| Dynamic Overlap Shear | 550 kPa | 80 lb/in ² | ASTM D1002 | | Stainless Steel | | |
| Short Term Temperature Tolerance | 260 °C | 500 °F | | | | | 4-hour conditioning at the indicated temperature with 100 g static load. |

Table continued on next page

Typical Performance Characteristics (continued)

| Property | Values | | Method | Dwell/Cure Time | Substrate | Backing | Test Condition |
|---------------------------------|---|--------|--------|-----------------|-----------|---------|---|
| Long Term Temperature Tolerance | 149 °C | 300 °F | | | | | Maximum temperature where tape supports 250 g in static shear for 10,000 minutes. |
| Note | Static shear measured at various temperatures and gram loadings on stainless steel. 1/2 sq. yd (3.22 cm ²) overlap. Will hold listed weight for 10,000 minutes. | | | | | | |
| UV Resistance | Excellent UV resistance through outdoor weathering tests and weather-O-meter tests. | | | | | | |

| Static Shear | Test Condition |
|--------------|------------------|
| 1,000 g | Room Temperature |
| 1,000 g | 66°C (150°F) |
| 1,000 g | 93°C (200°F) |
| 1,000 g | 121°C (250°F) |
| 500 g | 149°C (300°F) |

Table continued on next page

Typical Performance Characteristics (continued)

| Static Shear | Test Condition |
|--------------|----------------|
| 500 g | 177°C (350°F) |

Property: Static Shear
Method: ASTM D3654

Available Sizes

| Property | Values | |
|---------------------------|---------------------------------------|----------|
| Note | Subject to Minimum Order Requirements | |
| Standard Length | 55 m | 60 yd |
| Normal Slitting Tolerance | 0.8 mm | ±1/32 in |

| Maximum Length | | Width |
|----------------|--------|-------------------------|
| 55 m | 60 yd | 1/4 in to 3/8 in widths |
| 220 m | 240 yd | 3/8 in to 1 in widths |
| 330 m | 360 yd | 1 in to 3 in |
| 330 m | 360 yd | 3 in and wider |

Property: Maximum Length

Electrical and Thermal Properties

| Property | Values | | Method |
|----------------------------------|--------------------------------------|--------------------------------------|------------|
| Insulation Resistance | $> 1 \times 10^6$ MΩ/in ² | | ASTM D1000 |
| Thermal Conductivity | 0.16 W/m/K | 1.1 (btu-in)/(h-ft ² -°F) | ASTM C177 |
| Coefficient of Thermal Expansion | 770×10^{-6} m/m/°C | | |

| Dielectric Strength | Method | Test Condition |
|---------------------|-----------|------------------|
| 1200 V | ASTM D149 | Room Temperature |
| 1000 V | ASTM D149 | 125°C |
| 1000 V | ASTM D149 | 175°C |
| 4.08 | ASTM D150 | 1kHz, 86°F(30°C) |

Property: Dielectric Strength

Weight Loss and Outgassing Performance

| Property | Values | Method |
|--------------------------------|---|--------------------|
| Total Mass Loss | 0.85 % | ASTM E595-77/84/90 |
| Volatile Condensable Materials | 0.00 % | ASTM E595-77/84/90 |
| Note | The testing was done per ASTM E595-77/84/90 as indicated in the NASA Reference Publication 1124, Revision 4, "Outgassing Data for Selecting Spacecraft Materials", June 1997. The results are reported as percentage of total mass loss (TML) and percentage of Volatile Condensable Materials (VCM), respectively, as shown below. | |

Handling/Application Information**Application Techniques**

Bond strength is dependent upon the amount of adhesive-to-surface contact developed. Firm application pressure helps develop better adhesive contact and improve bond strength.

To obtain optimum adhesion, the bonding surfaces must be clean, dry, and well unified. Some typical surface cleaning solvents are isopropyl alcohol/water mixture or heptane.*

Ideal tape application temperature range is 70°F to 100°F (21°C to 38°C). Initial tape application to surfaces at temperatures below 50°F (10°C) is not recommended because the adhesive becomes too firm to adhere readily. However, once properly applied, low temperature holding is generally satisfactory.

*Note: Be sure to follow the manufacturer's precautions and directions for use when using solvents.

Storage and Shelf Life

Humidity controlled storage: 60° to 80°F (16° to 27°C) and 40-60% R.H.

If stored properly, product retains its performance and properties for 24 months from date of manufacture. If the products have been exposed to severe weather conditions, we suggest to precondition the products at the above storage conditions for at least 24 hours before using them.

Industry Specifications

UL 746C

Trademarks

3M and VHB are trademarks of 3M.

References**Safety Data Sheet (SDS)**

https://www.3m.com/3M/en_US/company-us/SDS-search/results/?gsaAction=msdsSRA&msdsLocale=en_US&co=ptn&q=F9460PC

Family Group

| | F9460PC | F9469PC | F9473PC |
|-------------------------|----------------------|----------------------|----------------------|
| Adhesive Thickness (mm) | 0.06 | 0.13 | 0.26 |
| Liner | 58# Polycoated Kraft | 58# Polycoated Kraft | 58# Polycoated Kraft |
| Liner Thickness (mm) | 0.106 | 0.106 | 0.1 |

ISO Statement

This Industrial Adhesives and Tapes Division product was manufactured under a 3M quality system registered to ISO 9001 standards.

Recognition/Certification

TSCA: These products are defined as articles under the Toxic Substances Control Act and therefore, are exempt from inventory listing requirements. MSDS: These products are not subject to the MSDS requirements of the Occupational Safety and Health Administration's Hazard Communication Standard, 29 C.F.R. 1910.1200(b) (6)(v). When used under reasonable conditions or in accordance with the 3M directions for use, the products should not present a health and safety hazard. However, use or processing of the products in a manner not in accordance with the directions for use may affect their performance and present potential health and safety hazards. Note: One of 3M's core values is to respect our social and physical environment. 3M is committed to comply with ever-changing, global, regulatory and consumer environmental, health, and safety (EHS) requirements. As a service to our customers, 3M is providing information on the regulatory status of many 3M products. Further regulation information including that for OSHA, USCPSP, FDA, California Proposition 65, REACH and RoHS, can be found at 3M.com/regs.

Technical Information

The technical information, recommendations and other statements contained in this document are based upon tests or experience that 3M believes are reliable, but the accuracy or completeness of such information is not guaranteed.

Product Selection and Use

Many factors beyond 3M's control and uniquely within user's knowledge and control can affect the use and performance of a 3M product in a particular application. Given the variety of factors that can affect the use and performance of a 3M product, user is solely responsible for evaluating the 3M product and determining whether it is fit for a particular purpose and suitable for user's method of application.

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