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# 3M™ VHB™ Tape GPH-160GF

## Product Description

**Finite Element Analysis (FEA)** data is available for this product at: **3m.com/FEA**

3M™ VHB™ Tape GPH-160GF is a 0.062 in (1.6 mm) thick gray double-sided acrylic foam tape with a red polyethylene film liner. The conformable foam provides good contact between substrates even when they are slightly mismatched. 3M™ VHB™ Tape GPH-160GF tape is part of the 3M™ VHB™ Tape GPH series which bonds a variety of substrates including many metal, plastic and painted materials. This tape family has superior high-temperature performance, making it often suitable for assembly prior to powder coat or liquid paint processes involving a paint bake cycle and applications with high operating temperatures. Ideal for stiffeners applied to architectural metal panels, elevator door panels, equipment enclosures, metal cabinets, appliance, signage etc.

## Product Features

- Fast and easy-to-use permanent bonding method provides high strength and long-term durability
- Virtually invisible fastening keeps surfaces smooth
- Can replace mechanical fasteners (rivets, welds, screws) or liquid adhesives
- High temperature resistance (short term (minutes, hours) to 450°F (230°C)) allowing assembly prior to powder coat or liquid paint processes involving a paint-bake cycle
- High initial tack
- Eliminates drilling, grinding, refinishing, screwing, welding and associated re-work
- Creates a permanent seal against water, moisture and more
- Pressure sensitive adhesive bonds on contact to provide immediate handling strength
- Allows the use of thinner, lighter weight and dissimilar materials

# 3M™ VHB™ Tape GPH-160GF

## 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 | | Method | Notes |
|---|---|---|---|---|
| Color | Gray | | | |
| Total Tape Thickness | 1.6 mm | 0.062 in | ASTM D3652 | |
| Thickness Tolerance | ±10 % | | | |
| Adhesive | Acrylic | | | |
| Adhesive Carrier | Conformable Acrylic Foam (closed cell) | | | |
| Density | 710 kg/m³ | 45 lb/ft³ | ASTM D3574 | Foam with adhesive |
| Liner | Red PE film with 3M™ VHB™ print | | | |

## Typical Performance Characteristics

| Property | Values | | Method | Backing | Notes | Substrate | Temp C | Temp F | Test Name | Dwell Time | Dwell Time Units | Cure Environmental Condition |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 90° Peel Adhesion | 19 lb/in | | ASTM D3330 | 2 mil Aluminum Foil | 12 in/min (300 mm/min)<br>Stainless Steel<br>72 hr dwell @ 72 °F (23 °C) & 50% RH | | | | | | | |

**Table continued on next page**

## Typical Performance Characteristics (continued)

| Property | Values | | Method | Backing | Notes | Substrate | Temp C | Temp F | Test Name | Dwell Time | Dwell Time Units | Environmental Condition |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Normal Tensile | 720 kPa | 105 lb/in² | ASTM D897 | | 1 in² (6.45 cm²), Jaw Speed 2 in/min (50.8 mm/min). Peak force to separate is measured.<br>72 hr dwell @ 72 °F (23 °C)<br>Aluminum Substrate | | | | | | | |
| Overlap Shear Strength | 570 kPa | 80 lb/in² | ASTM D1002 | | 1 in² (6.45 cm²), Jaw speed 0.5 in/min (12.7 mm/min). Peak force to separate is measured.<br>72 hr dwell @ 72 °F (23 °C)<br>Stainless Steel | | | | | | | |
| Short Term Temperature Resistance | 230 °C | 450 °F | | | No change in room temperature dynamic shear properties following 4 hour conditioning at indicated temperature with 100 g/static load. (Represents minutes, hour in a process type temperature exposure). | | | | | | | |
| Long Term Temperature Tolerance | 150 °C | 300 °F | | | Maximum temperature where tape supports at least 250 g load per 0.5 in² in static shear for 10,000 minutes. (Represents continuous exposure for day or weeks). | | | | | | | |
| Static Shear | 1000 g | | ASTM D3654 | | Tested at various temperatures and gram loadings. 0.5 in² (3.23 cm²). Will hold listed weight for 10,000 minutes (approximately 7 day).<br>@ 23°C (73°F) | Stainless Steel | | | | | | |

**Table continued on next page**

## Typical Performance Characteristics (continued)

| Property | Values | | Method | Backing | Notes | Substrate | Temp C | Temp F | Test Name | Dwell Time | Dwell Time Units | Environmental Condition |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Static Shear 177C Stainless Steel | 500 g | | ASTM D3654 | | Tested at various temperatures and gram loadings. 0.5 in² (3.23 cm²). Will hold listed weight for 10,000 minutes (approximately 7 day). | Stainless Steel | 177C | 350F | | | | |
| 90° Peel Adhesion Stainless Steel | 34 N/cm | | ASTM D3330 | 2 mil PET | 12 in/min (300 mm/min) | Stainless Steel | 23C | 72F | 90° Peel Adhesion | 72 | hr | 50%RH |

## Available Sizes

| Property | Values | | Test Name |
|---|---|---|---|
| Standard Roll Length | 32.9 m | 36 yd | |
| Minimum Available Width | 6.4 mm | 0.25 in | |
| Maximum Available Width | 1118 mm | 44 in | |
| Normal Slitting Tolerance | ± 0.8 mm | ± 1/32 in | |
| Core Size | 76.2 mm | 3.0 in | ID |

## Converted Parts

In addition to standard and custom roll sizes available from 3M through the distribution network, 3M™ VHB™ Tapes are also available in limitless shapes and sizes through the 3M Converter network. For additional information, contact 3M Converter Markets at 1-800-223-7427 or on the web at www.3M.com/converter.

## Special Considerations

1. Do not use primers with 3M GPH tapes. GPH tapes work best at high temperatures when adhered directly to the substrate.
2. 3M GPH Tapes are compatible with chemicals typically used in paint pre-treatment processes (spray and dip). Tests, completed by a supplier of pre-treatment chemicals have determined that the tape does not cause premature degradation of chemical solutions. It is understood that paint pre-treatment processes may differ between systems and it may be advisable to conduct compatibility and/or degradation tests to confirm compatibility with your specific system.

# 3M™ VHB™ Tape GPH-160GF

## UL746C Listings

**3M™ VHB™ Tapes**
**UL746C Listings - File MH 17478**
**Category QOQW2 Component - Polymeric Adhesive Systems, Electrical Equipment**

| 3M™ VHB™ Tapes/ Product Families | Substrates | Temperature Rating Minimum | Maximum |
|---|---|---|---|
| 4914, 4920, 4930, 4950 | Aluminum, Galvanized Steel, Enameled Steel, Stainless Steel, Ceramic, Glass/Epoxy | -35°C | 110°C |
| | PBT | -35°C | 90°C |
| | ABS, Polycarbonate, Rigid PVC | -35°C | 75°C |
| 4920, 4930, 4950, | Acrylic | -35°C | 90°C |
| 4955, 4959, 4959F | Glass / Galvanized Steel*, Glass / Glass*, Galvanized Steel / Aluminum*, Aluminum / Aluminum* | -35°C | 120°C |
| 4945 | Phenolic, Aluminum, Galvanized Steel, Alkyd Enamel, Enameled Steel | -35°C | 110°C |
| | ABS, Polycarbonate, Polyamide, Stainless Steel, Acrylic/Polyurethane Paint, Polyester Paint | -35°C | 90°C |
| | Unplasticized PVC | -35°C | 75°C |
| 4905, 4910 | Polycarbonate, Aluminum, Acrylic/Polyurethane Paint | -35°C | 90°C |
| GPH-060GF, GPH-110GF, GPH-160GF | Acrylic/Urethane Paint, Aluminum, Enameled Steel, Epoxy (glass filled), Epoxy Paint, Polyester Paint, Galvanized Steel, Glass, Phenolic. PBT, Stainless Steel, Polyethylene Ether/Polystyrene | -35°C | 90°C |
| | Acrylic | -35°C | 80°C |
| | ABS, Rigid PVC | -35°C | 75°C |

*Substrates can be used with or without primer(s)/Coating. 3M Silane Coating, 3M Adhesion Promoter 4298UV and 3M Tape Primer 94 are used with glass substrate. 3M Primer AP111, 3M Adhesion Promoter 4298UV and 3M Tape Primer 94 are used with aluminum and galvanized steel substrates. Comprehensive list available on UL Product iQ™ website

## Design Considerations

Adhesion to the substrate is important in achieving bonding success. Adhesives must flow onto the substrate surfaces in order to achieve intimate contact area and allow the molecular force of attraction to develop. The degree of flow of the adhesive on the substrate is largely determined by the surface energy of the substrate. 3M™ VHB™ Tape GPH series products bond well to high (HSE) and medium (MSE) surface energy materials. The image below shows typical materials in these categories.

Achieving good contact is also important. The necessary thickness of tape depends on the rigidity of substrates and their flatness irregularity. While the 3M™ VHB™ Tapes will conform to a certain amount of irregularity, they will not flow to fill gaps between the materials. For bonding rigid materials with normal flatness, consider use of tapes with thickness of 45 mils (1.1 mm) or greater. As the substrate flexibility increases thinner tapes can be considered.

Using the right amount of tape is important to handle the expected stresses. Because 3M™ VHB™ Tapes are viscoelastic by nature their strength and stiffness is a function of the rate at which they are stressed. They behave stronger with relatively faster rate of stress load (dynamic stresses) and will tend to show creep behavior with stress load acting over a long period of time (static stresses). As a general rule, for static loads, approximately four square inches of tape should be used for each pound (57 $cm^2$ of tape per kg) of weight to be supported in order to prevent excessive creep. For dynamic loads a useful design factor is 12 lb/in2 (85 kPa) for most dynamic stresses in general applications.

Allow for thermal expansion/contraction. 3M™ VHB™ Tapes can perform well in applications where two bonded surfaces may expand and contract differentially. Assuming good adhesion to the substrates, the tapes can typically tolerate differential movement in the shear plane up to 3 times their thickness.

Bond Flexibility: While an advantage for many applications where allowing differential movement is a benefit, the tape bonds are typically more flexible than alternative bonding methods. Suitable design modifications or periodic use of rigid fasteners or adhesives may be needed if additional stiffness is required.

Performance in Severe Cold Temperature can be challenging. Applications which require performance at severe cold temperatures must be thoroughly evaluated by the user if the intended use will subject the tape product to high impact stresses. A technical bulletin “3M™ VHB™ Tape Cold Temperature Performance” (70-0707-3991-0) is available for additional information.

## Design Considerations (continued)


This illustration demonstrates the effect of surface energy on adhesive interfacial contact. High surface energy materials draw the adhesive closer for high bond strength.

| (High) | | (Medium) | | (Low) |
|---|---|---|---|---|
| **Surface Energy (Dynes/cm)** | | | | |
| Aluminum | Polyimide | ABS | PVA | EVA |
| Stainless Steel | Phenolic | Polycarbonate | Polystyrene | Polyethylene |
| Copper | Nylon | PVC | Acetal | Polypropylene |
| Zinc | Alkyd Enamel | PPE | PVDF Paint | PVF |
| Tin | Polyester | Acrylic | Powder Paint | Silicone |
| Lead | Epoxy Paint | PU Enamel | | PTFE |
| Anodized Aluminum | Polyurethane | Powder Paint | | |
| Glass | | | | |

**NOTES:** There are a wide variety of formulations, surfaces finishes and surface treatments available on substrate materials which can affect adhesion. This chart is intended to provide only a rough estimate of the adhesion levels which can be expected on some common materials relative to a reference surface such as aluminum.

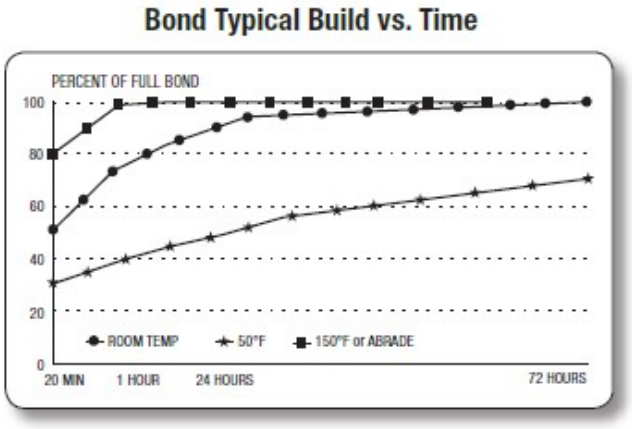
Foam type can affect and/or limit maximum adhesive strength.

## Handling/Application Information

## Application Techniques

Clean: Most substrates are best prepared by cleaning with a 50:50 mixture of isopropyl alcohol (IPA*) and water prior to applying 3M™ VHB™ Tapes.
Exceptions to the general procedure that may require additional surface preparation include:
• Heavy Oils: A degreaser or solvent-based cleaner may be required to remove heavy oil or grease from a surface and should be followed by cleaning with IPA/water.
• Abrasion: Abrading a surface, followed by cleaning with IPA/water, can remove heavy dirt or oxidation and can increase surface area to improve adhesion.
• Adhesion Promoters: Priming a surface can significantly improve initial and ultimate adhesion to many materials such as plastics and paints.
• Porous surfaces: Most porous and fibered materials such as wood, particleboard, concrete, etc. need to be sealed to provide a unified surface.
• Unique Materials: Special surface preparation may be needed for glass and glass-like materials, copper and copper containing metals, and plastics or rubber that contain components that migrate (e.g. plasticizers).
Refer to 3M Technical Bulletin “Surface Preparation for 3M™ VHB™ Tape Applications” for additional details and suggestions. (70-0704-8701-5)
*Note: These cleaner solutions contain greater than 250 g/l of volatile organic compounds (VOC). Please consult your local Air Quality Regulations to be sure the cleaner is compliant. When using solvents, be sure to follow the manufacturer’s precautions and directions for use when handling such materials.
Pressure: Bond strength is dependent upon the amount of adhesive-to-surface contact developed. Firm application pressure develops better adhesive contact and helps improve bond strength. Typically, good surface contact can be attained by applying enough pressure to insure that the tape experiences approximately 15 psi (100 kPa) pressure. Either roller or platen pressure can be used. Note that rigid surfaces may require 2 or 3 times that much pressure to make the tape experience 15 psi.
Temperature: Ideal application temperature range is 70°F to 100°F (21°C to 38°C). Pressure sensitive adhesives use viscous flow to achieve substrate contact area. Minimum suggested application temperature for the 3M™ VHB™ Tape GPH family is 50°F (10°C). Minimum application temperature does vary by 3M™ VHB™ tape family and ranges from 32°F to 60°F (0°C to 15°C)
Note: Initial tape application to surfaces at temperatures below these suggested minimums is not recommended because the adhesive becomes too firm to adhere readily. However, once properly applied, low temperature holding is generally satisfactory. To obtain good performance with all 3M™ VHB™ Tapes, it is important to ensure that the surfaces are dry and free of condensed moisture.
Time: After application, the bond strength will increase as the adhesive flows onto the surface (also referred to as “wet out”). At room temperature approximately 50% of ultimate bond strength will be achieved after 20 minutes, 90% after 24 hours and 100% after 72 hours. This flow is faster at higher temperatures and slower at lower temperatures. Ultimate bond strength can be achieved more quickly (and in some cases bond strength can be increased) by exposure of the bond to elevated temperatures (e.g. 150°F [66°C] for 1 hour). This can provide better adhesive wetout onto the substrates. Abrasion of the surfaces or the use of primers/ adhesion promoters can also have the effect of increasing bond strength and achieving ultimate bond strength more quickly.

## Handling/Application Information (continued)




## Storage and Shelf Life

All 3M™ VHB™ Tapes have a shelf life of 24 months from date of manufacture when stored at 40°F to 100°F (4°C to 38°C) and 0-95% relative humidity. The optimum storage conditions are 72°F (22°C) and 50% relative humidity. Performance of tapes is not projected to change even after shelf life expires; however, 3M does suggest that 3M™ VHB™ Tapes are used prior to the shelf life date whenever possible.
The manufacturing date is available on all 3M™ VHB™ Tapes as the lot number, typically marked on the core or on a label on the outer roll lap. The lot number, typically a 4 digit code, is a Julian date (Y D D D). The first digit refers to the year of manufacture, the last 3 digits refer to the days after January 1. Example: A lot number of 7266 (or 17266) would translate to a date of manufacture of Sept. 23 (266th day of year) in 2017.

## Industry Specifications

EN 45545 test report details (ISO 5659-2, ISO 9239-1, ISO 5660-1, ISO 5658-2), UL 746C (File MH17478)

## Trademarks

3M and VHB are trademarks of 3M.

## ISO Statement

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

## Technical Information

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## Warranty, Limited Remedy, and Disclaimer

3M warrants for 24 months from the date of manufacture that 3M™ VHB™ Tape will be free of defects in material and manufacture. 3M MAKES NO OTHER WARRANTIES OR CONDITIONS, EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, ANY IMPLIED WARRANTY OR CONDITION OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, OR ARISING OUT OF A COURSE OF DEALING, CUSTOM, OR USAGE OF TRADE. This warranty does not cover damage resulting from the use or inability to use 3M™ VHB™ Tape due to misuse, workmanship in application, or application or storage not in accordance with 3M recommended procedures (except to the extent 3M approves and issues a specific application warranty, for which the customer must apply, receive 3M approval, and meet all applicable warranty and process requirements, the additional details, terms, and conditions of which are available from 3M). If a 3M product does not conform to this warranty, then the sole and exclusive remedy is, at 3M's option, replacement of the 3M product or refund of the purchase price.

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