



HexBond[®] Adhesives

Selector Guide

Providing practical and economical solutions
for joining composites and metal



- Hexcel adhesives have been used in the composites industry for more than 70 years.
- They have achieved worldwide acclaim for aerospace and industrial bonding.
- They are an efficient method for joining component pieces quickly and easily.



HexBond® Product Portfolio

Hexcel formulates and manufactures a comprehensive range of structural film adhesives, foaming adhesive films, paste adhesives, liquid shims and primers for aerospace and industrial markets.

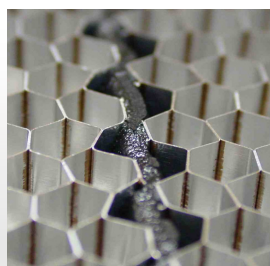
HexBond® Film Adhesives

Epoxy and bismaleimide (BMI) adhesives are supplied in film form on a roll and require heat and pressure to cure. These high-performance structural adhesives are ideal for manufacturing honeycomb sandwich structures, metal-to-metal bonding and composite bonding.



HexBond® Foaming Adhesive Films

When cured at elevated temperatures, these films expand, making them ideal for gap filling, honeycomb core edge bonding and core splicing. HexBond® foaming adhesive films are supplied in sheet form and are designed to be used in conjunction with HexBond® film adhesives or as a stand-alone product.



HexBond® Primers

Each HexBond® primer has been formulated to ensure the maximum possible performance is achieved from the compatible HexBond® film adhesive. HexBond® primers protect pretreated metal surfaces for a period of time prior to the process of bonding and ensure maximum bond durability. All HexBond® primers are free of chromium compounds.

HexBond® Shimming Adhesives

These are two-part epoxy adhesives which can be cured either at room temperature or an elevated temperature to achieve higher levels of mechanical performance.



HexBond® Paste Adhesives

A range of one- and two-component epoxy and BMI adhesives which can be used for bonding, potting, and filling composite and metallic structures. These products are supplied in a variety of different package forms including cartridges and small containers.

Whether using a film or a paste adhesive, Hexcel has a wide range of products to offer for almost all composite and honeycomb bonding requirements.

Adhesive Selection

The comprehensive range of HexBond® adhesives are suitable for many different applications. The first stage of design for bonding is the selection of the most suitable adhesive. This selector guide provides a summary of the main properties of the standard adhesive range.

Generic Type

Hexcel film adhesives are supplied in two generic types:

1. Epoxy - giving higher strengths, toughness and temperature resistance up to 200°C (390°F).
2. Bismaleimide - providing strong performance levels with higher temperature resistance up to 230°C (450°F).

Maximum Service Temperature

The temperature at which adequate strength is maintained varies according to adhesive type and can range from 70°C (120°F) to 230°C (450°F). Most film adhesives will retain their integrity to -55°C (-67°F).

Cure Temperature

Epoxy film adhesives generally fall into two categories for curing, 120°C (250°F) or 180°C. The choice depends on equipment availability or service temperature requirements (usually the higher the desired operating temperature the higher the cure temperature required).

Weight

For good overall properties and bonding to honeycomb core, film adhesives should have an areal weight between 150-400 gsm (0.03-0.08 psf). Where weight is critical, a lightweight film (60-150 g/m²) (0.01-0.03 psf) can be suitable if close tolerance joints are achievable.

Bondline Thickness Control

During heating under pressure the adhesive will tend to squeeze-out from a joint. Some film adhesives contain either a lightweight fabric "carrier" or microspheres, which automatically ensure an optimum minimum bondline thickness. This is useful for bonding small areas to prevent excessive squeeze-out. However, strength values can be slightly reduced by the presence of carriers, which can prevent the use of the reticulation technique on honeycomb core.

Qualifications

Many applications require adhesives to meet specification values to ensure selected strength properties. Hexcel films are qualified to a wide range of international and specific aerospace specifications. Further details are available on request.

Compatibility

For co-curing with prepreps (fiber reinforced matrix composites) to form a bonded sandwich structure, or as a "surface finishing" film for prepreg, both chemical and cure cycle compatibility are essential. Compatibility with surface pretreatment protection primers and honeycomb core jointing foams is also necessary.

Shimming Adhesives

Where the intention is to bond component parts and maintain continuity for assembly purposes, a shimming adhesive can be used maintaining integrity of the finished component. The aim is to prevent any gaps and maintain the union of surfaces.

Paste Adhesives

When selecting a paste adhesive, the principal considerations are product suitability, cure temperature and package form. This selector guide details the main properties and applications for the Hexcel range. Often there is a choice between using the adhesive with either a prolonged room temperature cure or a shorter elevated temperature cure. The different cure cycles can result in slight modifications to adhesive performance. Hexcel paste adhesives are generally provided in small tins, which are preferred when the application requires spreading of the adhesive across a wide surface. They can also be provided as cartridges or Semkits where the adhesive is to be applied manually as a bead or for potting or filling of edges and small cavities.

Film Adhesives

| Product | Target Market | Key Features | Product Performance | | | | | | | | | | |
|--------------------------------|-------------------|---|---------------------|------------------------|-------------------|-------------------------------------|----------------------------------|---------------------|------------------------------------|---------------------------------|--|---|------------------------|
| | | | Composite Bonding | Metal-to-Metal Bonding | Honeycomb Bonding | Maximum Service Temperature °C (°F) | Typical Cure Temperature °C (°F) | Cure Time (minutes) | Lap Shear at 25°C (77°F) MPa (psi) | Bell Peel at 25°C (77°F) N/25mm | Honeycomb Climbing drum peel at 25°C (77°F) (N/75mm) (lb.in/3in) | Flatwise Tensile at 25°C (77°F) MPa (psi) | Tg Dry by DMTA °C (°F) |
| Epoxy Film Adhesive Industrial | | | | | | | | | | | | | |
| HexBond® 679 | Industrial | Low-temperature cure adhesive (8h @ 70°C) fully compatible with HexPly® M79. Marine DNV certified. | ✓ | ✓ | ✓ | 65 (149) | 80 (176) | 240 | 23 (3340) | - | 165 (19) | - | 90 (194) |
| HexBond® ST1035 | Industrial | Excellent bonding for industry and leisure sport. Widely used for sandwich panels: foam and honeycomb. | ✓ | ✓ | ✓ | 100 (212) | 120 (250) | 60 | 40 (5800) | - | 325 to 390 (36 to 44) | - | 110 (230) |
| HexBond® 641 | Industrial | High performance adhesive with high peel and high shear strength. Excellent industrial honeycomb bonding. | ✓ | ✓ | ✓ | 150 (300) | 175 (350) | 60 | 37 (5400) | 185 | 350 (40) | 8 (1200) | 195 (385) |
| Epoxy Film Adhesive Aero | | | | | | | | | | | | | |
| HexBond® 312 | Aerospace / Space | Short cure cycle: 30 minutes at 120°C (250°F) for faster processing and good composite to composite bonding. | ✓ | ✓ | ✓ | 100 (212) | 120 (250) | 30 | 43 (6200) | 230 | 700 (80) | 9 (1300) | 105 (220) |
| HexBond® EA9686 STRUCTIL | Aerospace | Excellent for structural applications as leading edge bonding. High peel strength with high shear strength. | ✓ | ✓ | ✓ | 120 (248) | 120 (250) | 120 | 39 (5600) | 220 | 360 (57) | - | 130 (265) |
| HexBond® 319 | Aerospace | High peel performance for automotive and aerospace (engine nacelles, flaps, aileron bonding) applications. | ✓ | ✓ | ✓ | 150 (300) | 175 (350) | 60 | 36 (5200) | 170 | 600 (68) | 9 (1300) | 150 (300) |
| HexBond® ST1480 | Aerospace | Low weight film adhesives used for space applications. Ideal for assembly composite and sandwich composite structure. | ✓ | ✓ | ✓ | 170 (338) | 180 (355) | 90 | 28 (4060) | 125 | - | - | 195 (385) |
| HexBond® 340SP | Aerospace / Space | Low weight film adhesives with high Tg. Used for space applications. | ✓ | ✓ | ✓ | 175 (350) | 175 (350) | 60 | 32 (4640) | 125 | 550 (62) | N/A | 175 (350) |
| HexBond® 322 | Aerospace | Very high-temperature performance. For military, engine nacelles, missile bonding, aerospace, motor sport and high-temperature industrial applications. | ✓ | ✓ | ✓ | 180 (350) | 175 (350) | 60 | 22 (3000) | - | 260 (28) | 8 (1200) | 200 (390) |
| BMI Film Adhesive | | | | | | | | | | | | | |
| HexBond® EA9674 STRUCTIL | Aerospace | High-temperature performance. Used for bonding composite engine nacelles. | ✓ | ✓ | ✓ | 210 (410) | 180 (355) +post cure | 60 | 31 (4530) | - | 144 (16) | 7.7 (1000) | 220 (430) |
| HexBond® HP655 | Aerospace | Very high-temperature performance. Good co-cure with BMI prepregs. | ✓ | ✓ | ✓ | 240 (464) | 190 (376) +post cure | 240 | 26 (3800) | - | 200 (23) | 5 (700) | 280 (536) |

*Refer to individual product Technical Data Sheets for further information on Film Adhesive product forms, areal weight, supported/unsupported formats and carrier type.

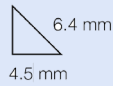


Foaming Adhesive Films

| Product | Target Market | Key Features | Associated Film Adhesive | Color | Product Performance | | | | |
|-----------------------------|------------------------|--|--------------------------|-------|-------------------------------------|----------------------------------|---------------------|-----------------|---|
| | | | | | Maximum Service Temperature °C (°F) | Typical Cure Temperature °C (°F) | Cure Time (minutes) | Expansion Ratio | Aluminum double lap shear MPa/psi (1.6 mm/0.06 in gap) at 22°C (70°F) |
| Epoxy Foaming Adhesive Film | | | | | | | | | |
| HexBond® 212-NA | Industrial / Aerospace | Suitable for vacuum and non-vacuum cure. Designed for lower temperature cure. | 312, ST1035 | Black | 100 (212) | 120 (250) | 60 | 1:2.0 | 8.5 (1200) |
| HexBond® 208/5-NA | Industrial / Aerospace | Higher foaming ratio. Best for lap shear strength. | 322 | Black | 120 (250) | 175 (350) | 60 | 1:2.2 | 10 (1450) |
| HexBond® 219/2-NA | Industrial / Aerospace | Highest service temperature foam. Fast reacting and best suited for thin sections. | 319, 322, 340SP, 641 | Grey | 150 (300) | 175 (350) | 60 | 1:2.0 | 9 (1300) |
| HexBond® ST1150 | Industrial / Aerospace | Dual cure 120°C or 180°C. Suitable for vacuum and non-vacuum cure. | ST1480, 319, 322 | Blue | 150 (300) | 180 (355) | 60 | 1:1.7 | 8.5 (1200) |
| BMI Foaming Adhesive Film | | | | | | | | | |
| HexBond® EA9833.1 STRUCTIL | Aerospace | Handling like an epoxy. Used for engine nacelle applications. | EA9674 STRUCTIL, HP655 | Green | 230 (445) | 180°C +post cure | 60 | 1:1.5 | 12.5 (1800) |

Primers

| Product | Associated Film Adhesive | Compatible Film Adhesive | Color | Drying Time | |
|-----------------|--------------------------|---|--------|--------------------------------------|---------------------------------------|
| | | | | Drying Time at 25°C (77°F) (minutes) | Drying Time at 70°C (158°F) (minutes) |
| Epoxy Primer | | | | | |
| HexBond® 112 | HexBond® 312 | 120°C Class Epoxy Adhesive Films | Yellow | 60 | 20 |
| HexBond® 119 | HexBond® 319, 641 | 150°C to 180°C Class Epoxy Adhesive Films | Blue | 60 | 30 |
| HexBond® 122 | HexBond® 322, 340SP | 180°C Class Epoxy Adhesive Films | Pink | 60 | 30 |
| BMI Primer | | | | | |
| HexBond® HP655P | HexBond® HP655 | BMI Adhesive Films | Yellow | 30 mins @ 177°C (350°F) | |

Epoxy Fillet

| Product | Key Features | Section | Linear Mass (g/m) | Shape | Length | Packaging | Color | Cure Temperature °C | Differential Scanning Calorimetry | |
|-------------------------------|--|----------------------|-------------------|---|--------|------------------|-------|---------------------|-----------------------------------|----------------|
| | | | | | | | | | Peak T (°C) | Enthalpy (J/g) |
| HexBond® EA9685-1 RC STRUCTIL | Ready to use product. Used in self-stiffened composite panels. Resin fills the cavity between the monolithic part and stiffener. Widely used in co-cure processes for structural composite parts. Typically used to replace prepreg noodles. | Isosceles triangle | 12.5 g/m |  | 1 m | 1 set = 35 x 1 m | Grey | 180°C | 187 | 485 |
| | | Equilateral triangle | 15.5 g/m |  | | | | | | |
| | | Isosceles triangle | 17 g/m |  | | | | | | |

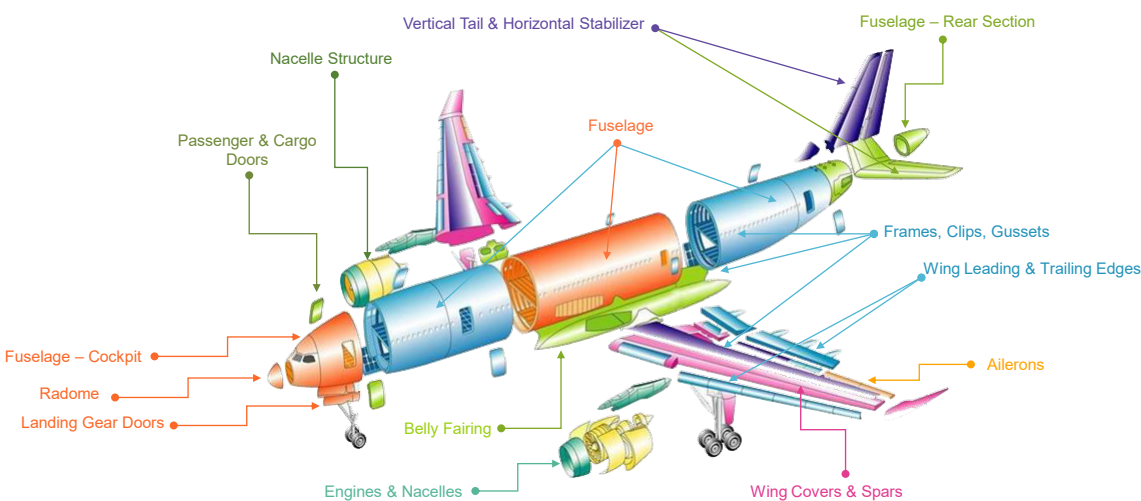
Paste Adhesives

| Product | Key Features | Application | Packaging | Mix Ratio Part A/Part B | Pot Life (100g mix) | Consistency | Cure Cycles | Compression (MPa) | Bell Peel (N/25 mm) | Tensile Lap Shear (MPa) | | Service Temperature Range (°C) |
|------------------------------|--|---|--|----------------------------|------------------------|----------------|---|-------------------------|------------------------|----------------------------|--|--------------------------------------|
| | | | | | 23°C | | | 23°C | 23°C | Elevated Temp. | | |
| Epoxy Paste Adhesive | | | | | | | | | | | | |
| HexBond® ST1060 | Long pot life at RT and high elongation at break (85% at 23°C). Suitable for bonding EPDM rubbers up to -40°C. High shear performance at very low temperature: σr = 32 MPa at -170°C. | Bonding of rubber EPDM (high deformation application) Space & cryogenic applications | Kit = 908 g | 100/200 | 120 mins | Thixotropic | 7 days at 23°C 60 mins at 60°C | - | 150 | 17 | 8 @ 60°C | -170°C to 60°C |
| HexBond® EA9309.3NA STRUCTIL | High shear and peel strength. Good tolerance to the surface preparation and the substrate type (elastomer, thermoplastic, thermoset and metal). Allows bondline thickness control with glass beads (0.12 mm). | Bonding of a variety of substrates | Kit = 908 g | 100/22 | 40 mins | Thixotropic | 7 days at 23°C 120 mins at 70°C 60 mins at 80°C | - | 300 | 35 | 7 @ 80°C | -55°C to 80°C |
| HexBond® EA9321 STRUCTIL | Multipurpose adhesive. Widely qualified for space applications. | Potting, Edge filling, Fairing and Bonding | Kit = 908 g Semkit Barrier 2.5 OZ - 60 g | 100/50 | 60 mins | Thixotropic | 7 days at 23°C 60 mins at 80°C | - | 75 | 27 | 15 @ 80°C 9 @ 120°C | -55°C to 120°C |
| HexBond® EA9392 STRUCTIL | Good mechanical performance over a wide range of temperatures. High toughness of bonded joints: toughened version of EA9394 adhesive. | Potting, Filling, Fairing and Bonding | Kit = 908 g | 100/32 | 130 mins | Thixotropic | 7 days at 23°C 60 mins at 65°C | - | 150 | 29 | 20 @ 80°C 10 @ 150°C 7 @ 180°C | -55°C to 180°C |
| HexBond® EA934NA STRUCTIL | High compression strength. Good mechanical performance over a wide range of temperatures. | Potting, Filling, Shimming, Fairing and Bonding | Kit = 908 g | 100/33 | 50 mins | Thixotropic | 7 days at 23°C 120 mins at 65°C 60 mins at 80°C | 80 | - | 22 | 13 @ 80°C 7 @ 150°C | -55°C to 150°C |
| HexBond® EA9394 STRUCTIL | General purpose adhesive for structural applications. Widely qualified for aerospace applications. High compression strength. | Potting, Filling, Shimming, Fairing and Bonding | Kit = 908 g Dual Cartridges 50 mL & 200 mL Semkit Injection 6 OZ - 155 g | 100/17 | 150 mins | Thixotropic | 7 days at 23°C 60 mins at 65°C | 68 | 90 | 30 | 22 @ 80°C 17 @ 120°C 12 @ 150°C 8 @ 180°C | -55°C to 180°C |
| HexBond® EA9395 STRUCTIL | Good mechanical properties over a wide temperature range. Non-metallic filled version of EA9394 adhesive. | Potting, Filling, Fairing and Bonding Radome repairs | Kit = 908 g Semkit Injection 6 OZ - 155 g | 100/17 | 150 mins | Thixotropic | 7 days at 23°C 60 mins at 65°C | - | 65 | 25 | 20 @ 80°C 11 @ 150°C 8 @ 180°C | -55°C to 180°C |
| HexBond® EA9396 STRUCTIL | General purpose bonding and repair adhesive. | Wet lay-up, repair, bonding by injection | Kit = 908 g | 100/30 | 80 mins | Low viscosity | 7 days at 23°C 60 mins at 65°C | - | - | 28 | 18 @ 110°C 15 @ 130°C 8 @ 180°C | -55°C to 180°C |
| HexBond® EA9390 STRUCTIL | Long pot life at room temperature. High service temperature. Excellent for repairs. | Wet lay-up, repair, bonding by injection | Kit = 908 g | 100/56 | > 5 hours | Low viscosity | 200 mins at 93°C 130 mins at 150°C | - | - | 22 | 22 @ 80°C 13 @ 180°C | -55°C to 180°C |
| HexBond® ST1007 | Low density (0.7g/cm³) adhesive with high service temperature for bonding fasteners and inserts. | Potting, Fastening and Filling | Kit of Pails = 9 kg part A + 3 kg part B Semkit Barrier 2.5 OZ - 60 g | 100/33 (Semkit Barrier) | < 60 mins | Thixotropic | 7 days at 23°C 60 mins at 65°C | 37 | - | 21 | 17 @ 80°C 13 @ 120°C 7 @ 180°C | -55°C to 180°C |
| HexBond® ST1020 | Very high service temperature (230°C) with good shear strength across the temperature range. Long pot life at room temperature. | Potting, Filling, Shimming, Fairing and Bonding | Kit = 908 g | 100/19 | > 8 hours | Thixotropic | 150 mins at 80°C 60 mins at 90°C | - | - | 30 | 20 @ 150°C 15 @ 200°C 8 @ 230°C | -55°C to 230°C |
| HexBond® EA9346.5 STRUCTIL | One-component low viscosity paste adhesive. High peel and high shear strength properties up to 135°C. | Structural Bonding | Tin = 908 g | N/A (One-component) | 7 days | Low viscosity | 60 mins at 120°C 60 mins at 180°C | - | 170 | 48 | 45 @ 70°C 8 @135°C | -55°C to 135°C |
| BMI Paste Adhesive | | | | | | | | | | | | |
| HexBond® EA9351MB STRUCTIL | Low density d = 0.6. BMI potting adhesive. | Potting, Filling and Stiffening of honeycomb sandwich structures | Pail = 3,5 kg | N/A (One-component) | 3 weeks | High viscosity | 60 mins at 175°C + PC 120 mins at 245°C | 80 @ 23°C 40 @ 210°C | - | 9 | 9 @ 210°C | -55°C to 230°C |

*HexBond® Paste Adhesives are mainly used for the Aerospace market but may also be used for industrial applications.

Typical Aerospace Applications

Hexcel is the preferred supplier of composite materials to the civil aerospace industry with materials present in virtually every commercial aircraft currently built in the western world.



Primary Structures

- Nose landing gear doors
- Trailing edge upper and lower panels
- Main and center landing gear doors
- Pylon fairings and nacelles
- Belly fairing panels
- Spoilers/flaps/ailerons
- Horizontal (HTP) and vertical (VTP) stabilizer
- Radome

Interiors

- Galley
- Floor panels
- Overhead stowage bins
- Wall partitions
- Lavatory
- Wardrobes
- Ceiling panels
- Sidewalls

These drawings illustrate typical applications for Hexcel Adhesives. They are generic and not intended to represent a specific commercial usage. For information on the full range of Hexcel products for aerospace go to our website www.hexcel.com.

Typical Industrial Applications

Suitable for a wide range of industries including:



- Automotive
- Buildings
- Marine
- Rail
- Sports goods
- Tooling
- Wind energy

Hexcel Product Family



For more information

Hexcel is a leading worldwide supplier of composite materials to aerospace and industrial markets. Our comprehensive range includes:

- HexTow® carbon fibers
- HexForce® reinforcements
- HiMax® multiaxial reinforcements
- HexPly® prepregs
- HexAM® additive manufacturing
- HexMC®-i molding compounds
- HexFlow® RTM resins
- HexBond® adhesives
- HexTool® tooling materials
- HexWeb® honeycomb
- Acousti-Cap® sound attenuating honeycomb
- Engineered core
- Engineered products
- Polyspeed® laminates

For U.S. quotes, orders and product information call toll-free 1-866-556-2662 or 1-800-688-7734. For other worldwide sales office telephone numbers and a full address list, please go to:

<https://www.hexcel.com/contact>

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