



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.

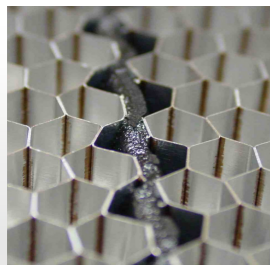


HexBond® Foaming Adhesive Films

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 prepregs (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	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	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	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.

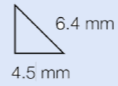

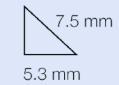
Foaming Adhesive Films

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							

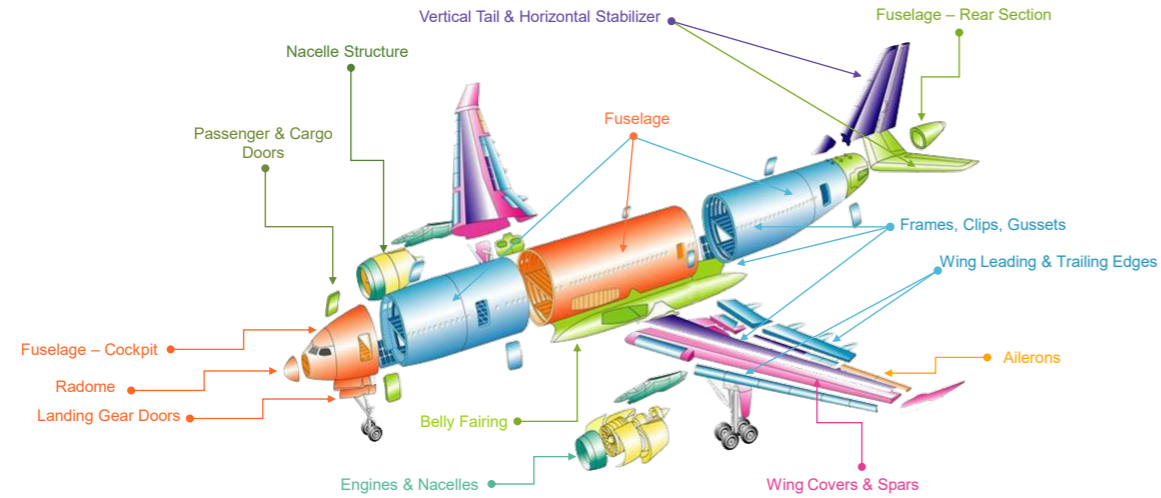
Paste Adhesives

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: $\sigma_r = 32$ 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® ST1040	Low viscosity paste adhesive delivering high peel and high shear strength properties up to 120°C. Good tolerance to the surface preparation.	Structural Bonding	Kit = 908 g	100/29	120 mins	Low viscosity	15 days at 23°C 120 minutes 65°C	-	240	45	28 @ 80°C 8 @ 110°C	-55°C to 110°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/cm ³) 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:

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

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