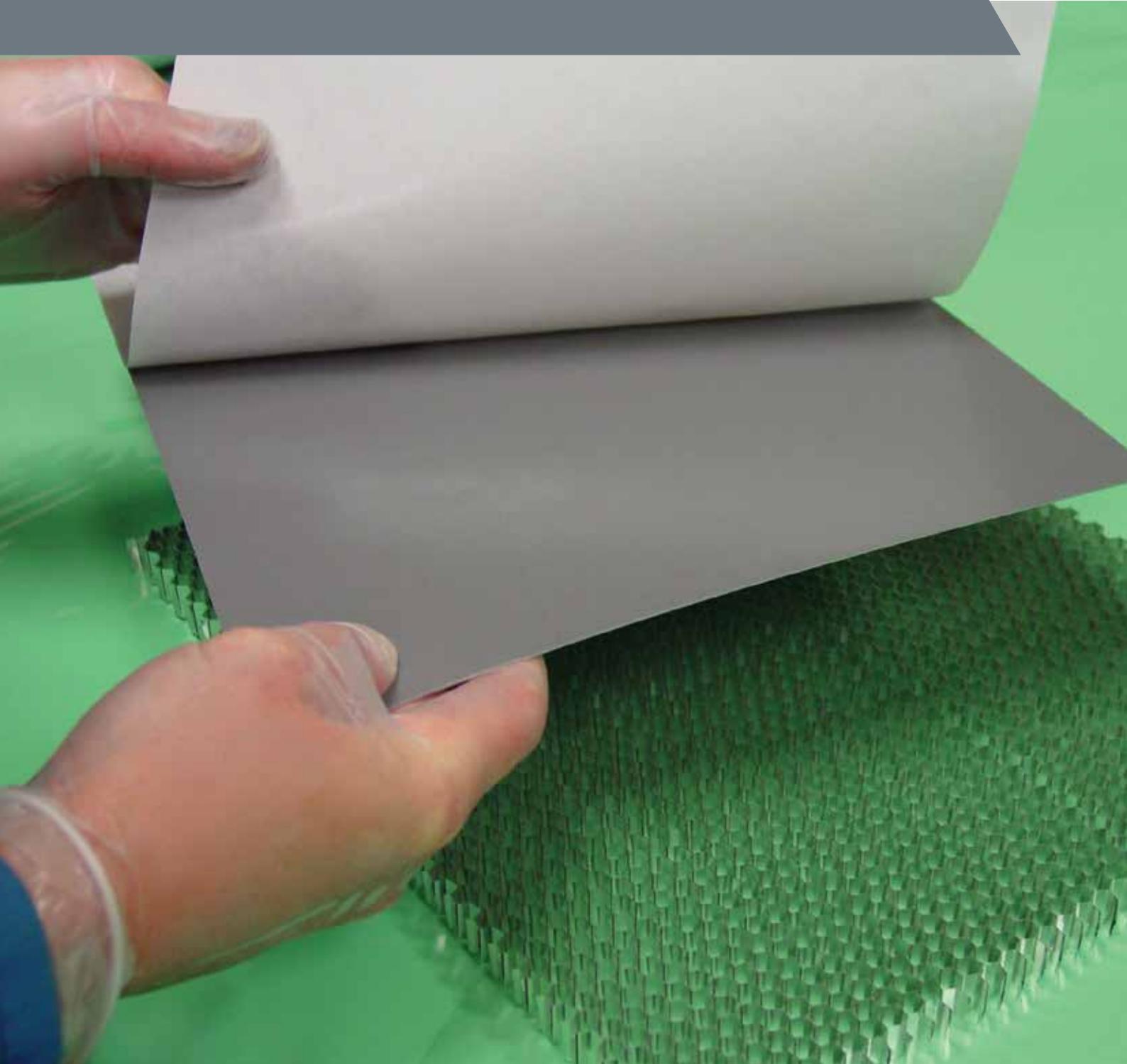




HexBond™ Adhesives

Selector Guide

Providing practical and economical solutions for joining composites and metal.





HexBond™ Adhesives

Selector Guide

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

HexBond™ Film Adhesives, Foaming Films, Primers, Liquid Shims and Paste Adhesives

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 metal to metal and composite bonding and for the manufacture of honeycomb sandwich structures.

HexBond™ Foaming Adhesive Films

When cured at elevated temperature 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.

HexBond™ Primers

Each HexBond™ primer has been formulated to ensure the maximum possible performance is achieved from the corresponding HexBond™ film adhesive. HexBond™ primers protect pretreated metal surfaces prior to 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 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 gives 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 - giving good performance at even 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 down to -55°C (-67°F).

Cure Temperature

Film adhesives generally fall into ca. 120°C (250°F) curing or ca. 180°C (350°F) curing categories. Choice depends on equipment availability, energy economy, or service temperature requirements (usually the higher the desired operating temperature the higher the cure temperature required).

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 ensure an optimum minimum bondline thickness automatically. This is useful for bonding small areas to prevent excessive squeeze-out. However strength values can be slightly reduced by the presence of carriers and they can prevent the use of the reticulation technique on to honeycomb core.

Weight

For good overall properties and bonding to honeycomb core, areal weights of film adhesives in the range 150-400 g/m² (0.03-0.08 psf) should be used. 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.

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 prepgres (fibre 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 dissimilar surfaces such as metal to composite a shimming adhesive can be used to ensure the security of the bond.

Paste Adhesives

When selecting a paste adhesive the principle considerations are product suitability, cure temperature and package form. This selector guide details the main properties and applications for the Hexcel adhesives 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 either in small tins, which are preferred when the application requires spreading of the adhesive across a wide surface, or as cartridges or Semkits, which are best when the adhesive is to be applied as a bead, or for potting or filling of edges and small cavities.

Film Adhesives

Product	Applications				Product Performance		
	Composite		Metal to Metal	Honeycomb	Maximum Service Temperature °C (°F)	Typical Cure Temperature °C (°F)	Cure Time (minutes)
	Surfacing	Bonding					
Epoxy Film Adhesive							
HexBond™ 609	-	-	✓	✓	85 (185)	120 (250)	60
HexBond™ 312	-	✓	✓	✓	100 (212)	120 (250)	30-60
HexBond™ 677	-	✓	✓	-	75 (167)	150 (300)	04
HexBond™ 308	-	-	✓	✓	125 (260)	170 (350)	60
HexBond™ 319	-	✓	✓	✓	150 (300)	175 (350)	60
HexBond™ 641	✓	✓	✓	✓	150 (300)	175 (350)	60
HexBond™ 322	-	✓	✓	✓	175 (350)	175 (350)	60
HexBond™ 340SP	-	✓	✓	-	175 (350)	175 (350)	60
HexBond™ EA9686 STRUCTIL	-	-	-	✓	110 (230)	120 (250)	120
HexBond™ ST1035	-	-	-	✓	100 (212)	120 (250)	60
HexBond™ ST1480	-	-	-	✓	170 (340)	180 (355)	90
BMI Film Adhesive							
HexBond™ HP655	-	✓	✓	-	230 (445)	190 (376) +post cure	240
HexBond™ EA9674 STRUCTIL	-	✓	✓	✓	210 (410)	180 (355) +post cure	60
Core Stabilising Film							
Cordux™ 654	-	-	-	✓	120 (250)	-	-

Product Performance				Key Features
Lap shear at 25°C (77°F) MPa (psi)	Honeycomb Climbing drum peel at 25°C (77°F) (N/76mm)	Flatwise Tensile at 25°C (77°F) MPa (psi)	Tg Dry by DMTA °C (°F)	
33 (4800)	200	7 (1000)	105 (220)	Ideal for industrial bonding applications such as: building panels, rail carriage doors, flooring partitions. Flexible cure cycle from 100 - 150°C (212 - 300°F).
40 (5800)	650	9 (1300)	105 (220)	Short cure cycle: 30 minutes at 120°C (250°F) for faster applications and good composite to composite bonding.
20 (3000)	374	7 (1000)	103 (218)	Used with HexPly® M77 as a fast curing epoxy prepreg/adhesive system. Can be used for bonding aluminium or steel to CFRP composites.
47 (6500)	460	8 (1200)	100 (212)	Superior ageing performance for continuous operation up to 120°C (250°F).
36 (5200)	600	9 (1300)	120 (250) 200 (390)	High peel performance for automotive and aerospace (engine nacelles, flaps, aileron bonding) applications.
40 (6000)	620	12.5 (1800)	120 (250) 195 (385)	High performance adhesive with high peel and high shear strength. Exceptional honeycomb bonding.
20 (3000)	240	8 (1200)	200 (390)	Very high temperature performance. For military, engine nacelles, missile bonding, aerospace, motor sport and high temperature industrial applications.
32 (4640)	550	N/A	145 (290) 200 (390)	Low weight film adhesives with high T _g . Used for space applications.
39 (5600)		-	130 (265)	Excellent for structural applications as leading edge bonding. High peel strength with high shear strength.
40 (5775)	400	-	110 (230)	Excellent bonding for industry and leisure sport. Widely use for sandwich panels: foam and honeycomb.
28 (4060)		-	195 (385)	Low weight film adhesives used for space applications. Ideal for assembly composite/composite and sandwich composite structure.
26 (3800)	200	5 (700)	220 (430)	Very high temperature performance. Good co-cure with BMI preangs.
31 (4530)	210	7.7 (1000)	220 (430)	High Temperature performance. Used for bonding composite engine nacelles.
-	-	-	-	Disposable backing material for cell stabilisation.

Foaming Adhesive Films

Product	Associated Film Adhesive	Colour	Maximum Service Temperature °C (°F)	Typical Cure Temperature °C (°F)
HexBond™ 212-NA	312, 609	Black	100 (212)	120 (250)
HexBond™ 208/5-NA	308, 322	Black	120 (250)	175 (350)
HexBond™ 219/2-NA	319, 322, 340SP, 641	Grey	150 (300)	175 (350)
HexBond™ ST1150	ST1480, 319, 322	Blue	150 (300)	180 (355)
BMI Foaming Adhesive Film				
HexBond™ EA9833,1 STRUCTIL	EA9674 STRUCTIL, HP655	Green	230 (445)	180°C +post cure

Shimming Adhesive

Product	Applications					Maximum service temperature (°C/°F)			
	Metal to Metal & Composite bonding	Potting	Structural repair	Liquid shim	Cured at 25°C (77°F)	Cured at elevated temperature	Typical elevated cure temperature (°C/°F)	Lap shear at 25°C (77°F) (MPa, psi)	
HexBond™ 870 A/B	✓	✓	-	✓	60 (140)	NA	NA	43 (6200)	
HexBond™ EA9394 STRUCTIL	✓	✓	✓	✓	80 (175)		65 (150)	30	

Primers

Product	Associated Film Adhesive
HexBond™ 112	HexBond™ 312, 609
HexBond™ 119	HexBond™ 319, 641
HexBond™ 122	HexBond™ 308, 322, 340SP

Product Performance			Key Features
Cure Time (minutes)	Expansion Ratio	Aluminium double lap shear MPa/psi (1.6 mm/0.06 in gap) at 22°C (70°F)	
60	1:2.0	8.5 (1200)	Suitable for vacuum and non vacuum cure. Designed for lower temperature cure.
60	1:2.2	10 (1450)	Higher foaming ratio. Best for lap shear strength.
60	1:2.0	9 (1300)	Highest service temperature foam. Fast reacting and best suited for thin sections.
60	1:1.7	8.5 (1200)	Dual cure 120°C or 180°C. Suitable for vacuum and non vacuum cure.
60	1:1.5	12.5 (1800)	Handling like an epoxy.

Product Performance						Product Form	Key Features
Compressive strength at 25°C (77°F) MPa, (psi)	Bell peel at 25°C (77°F) (N/25mm, lbf/inch)	Tg Dry 25°C (77°F) cure	Tg Dry - elevated temperature cure (°C/°F)	Pot life (100g) (minutes)	Colour when mixed		
98 (14210)	NA	55 (130)	NA	120	Grey	Two component thixotropic, gap filling high performance liquid shim adhesive, mix ratio 2:1 resin:hardener by volume.	
70 (10150)	90	80 (175)		150	Grey	Two component thixotropic, gap filling, high performance liquid shim adhesive.	

Colour	Drying Time	
	Drying Time at 25°C (77°F) (minutes)	Drying Time at 70°C (158°F) (minutes)
Yellow	60	20
Blue	60	30
Pink	60	30

Paste Adhesives

Reference	Package	Mix Ratio A / B	Pot Life 100g	Consistency	Cure Temperature and Time
			23°C		
Epoxy Paste Adhesive					
HexBond™ EA9321 STRUCTIL	Kit = 908g Cartridges	100/50	60 minutes	Thixotropic	5 days RT 1 hr 80°C
HexBond™ EA9390 STRUCTIL	Kit = 908g	100/56	> 5 hours	Low viscosity	200 minutes 93°C 130 minutes 150°C
HexBond™ EA9394 STRUCTIL	Kit = 908g Cartridges	100/17	150 minutes	Thixotropic	5 days RT 60 minutes 65°C
HexBond™ EA9396 STRUCTIL	Kit = 908g	100/30	90 minutes	Low viscosity	5 days RT 60 minutes 65°C
HexBond™ ST1020	Kit = 908g	100/19	> 8 Hours	Thixotropic	60 minutes 90°C 180 minutes 80°C
HexBond™ ST1040	Kit = 908g	100/24	120 minutes	Low viscosity	120 minutes 65°C 15 days 25°C
HexBond™ ST1007	Cartridges Semikit 6oz 60g	Cartridge Semikit Barrier	60 minutes	Moderate viscosity	60 minutes 65°C 5 days RT
HexBond™ EA9309.3NA STRUCTIL	Kit = 908g, Cartridges	100/22	40 mins	Thixotropic	5 days at 23°C 2hrs at 70°C 1hr at 80°C
HexBond™ EA934 NA STRUCTIL	Kit = 908g	100/33	50 mins	Thixotropic	5 days at 23°C
HexBond™ EA9346.5 STRUCTIL	1 tin 908g	N/A	7 days	Low viscosity	1 hr at 120°C 1 hr at 180°C
HexBond™ EA9392 STRUCTIL	Kit = 908g	100/32	130 minutes	Thixotropic	5 days at 23°C
HexBond™ EA9395 STRUCTIL	Kit = 908g Cartridges	100/17	150 minutes	Thixotropic	5 days at 23°C
HexBond™ ST1030	Kit = 908g	100/49	> 5 hrs	Low viscosity	220 minutes at 93°C
HexBond™ ST1060	Kit = 908g	100/200	2 hrs	Thixotropic	5 days at 23°C
HexBond™ 873 A/B	200ml Cartridges	100/50	240 mins	Thixotropic	7 days at 23°C 4hrs at 80°C
BMI Paste Adhesive					
HexBond™ EA9351MB STRUCTIL	Pail = 3,5kg	N/A	-	High viscosity	60 minutes 175°C + Post Cure 120 minutes 245°C

Epoxy Fillet				
Reference	Section	Length	Linear Mass	Packaging
HexBond™ EA9685-1 STRUCTIL	Equilateral triangle : 5 mm or Isosceles triangle : 7 mm, 5 mm	1 m	12,5 g/m 15,5 g/m 17 g/m	1 set = 35 x 1 m

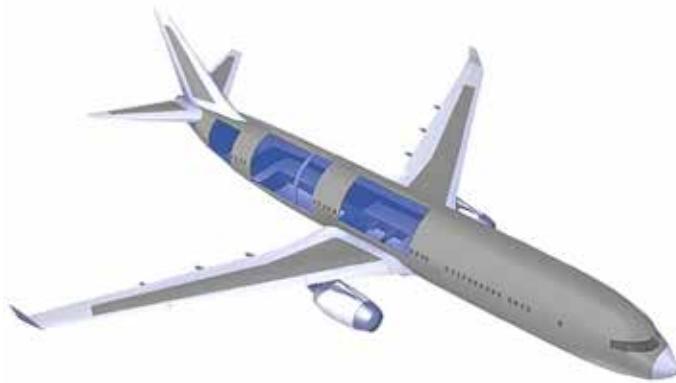
Bell Peel N/25 mm	Tensile Lap Shear MPa		Service Temperature Range (°C)	Applications	Key Features
	23°C	23°C Elevated Temp.			
75	27 MPa	9 MPa 120°C	-55°C to 120°C	Bonding	Widely qualified for space applications.
-	20 MPa	15 MPa 180°C	-55°C to 200°C	Repairing Wet Lay up	High service temperature. Excellent for repairs.
90	30 MPa	17 MPa 120°C 12 MPa 150°C	-55°C to 180°C	Potting / Filling Bonding	Widely used general purpose adhesive for structural applications.
-	33 MPa	20 MPa 120°C 12 MPa 150°C	-55°C to 180°C	Bonding Wet Lay up	General purpose bonding and repair adhesive.
-	30 MPa	20 MPa 150°C 15 MPa 200°C 8 MPa 230°C	-55°C to 230°C	Bonding Potting / Filling	High service temperature with good shear strength across the temperature range.
240	45 MPa	28 MPa 80°C 5 MPa 120°C	-55°C to 120°C	Bonding High Peel Strength	Strong adhesive with good peel performance.
-	21 MPa	13 MPa 120°C 7 MPa 180°C	-55°C to 180°C	Potting Fastening inserts d = 0,7	Low density adhesive with high service temperature for bonding fasteners and inserts.
300	35 MPa	7 MPa 80°C	up to 80°C	Bonding	High shear and peel strength. Good tolerance to the surface preparation and the substrate type (Elastomer, thermoplastic, thermoset and metal). Allows bondline thickness control.
-	22 MPa	7 MPa 150°C	-55°C to 150°C	Bonding, potting, filling, fairing	High compression strength. Good mechanical performance over a wide range of temperatures.
170	48 MPa	45 MPa 70°C	up to 135°C	Bonding	Low viscosity one component paste adhesive. High peel and high shear strength properties.
150	29 MPa	10 MPa 150°C	-55°C to 180°C	Bonding, potting, filling, shimming	Good mechanical performance over a wide range of temperatures. High toughness of bonded joints.
65	25 MPa	11 MPa 150°C	-55°C to 180°C	Bonding	Outstanding mechanical properties over a wide temperature range. Non-metallic filler - suitable for radome repair.
-	22 MPa	12 MPa 200°C	up to 200°C	Wet lay-up repair, injection, bonding	Very high service temperature and long pot life at room temperature.
150	17 MPa	5 MPa 80°C	-55°C to 80°C	Bonding, fastening	Long pot life at RT and high elongation at break (85% at 23°C). Suitable for bonding EPDM rubbers up to -40°C.
80	37 MPa	27 MPa 80°C	up to 135°C	Bonding	High shear and peel strength. Good tolerance to the surface preparation and the substrate type (Elastomer, thermoplastic, thermoset and metal). Allows bondline thickness control.
-	9 MPa	10 MPa 230°C	-55°C to 230°C	Potting d = 0,6	Low density BMI potting adhesive

Colour	Cure Temperature	DSC		Key Features
		Peak T°C	Enthalpy J/g	
Grey	180°C	187	485	Used in self-stiffened composite panels. Resin fills the cavity between the monolithic part and stiffener. Widely used in co-cure process for structural composite parts

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



Interiors



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

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

Typical Industrial Applications

Suitable for a wide range of industries including:

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



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 (carbon fibres, prepgres, honeycombs, etc) go to our website www.hexcel.com.

Hexcel Product Family



**HexTow®
Carbon Fiber**



**HexFlow®
Resins**



**HexMC®-i Molding
Composite**



**HexForce®
Reinforcements**



**Polyspeed®
Laminates &
Pultruded Profiles**



**HexWeb®
Honeycomb Core**



**HiTape®
Advanced
Reinforcements**



**Modipur®
Polyurethane**



**HexWeb®
Engineered Core**



**HexPly®
Prepregs**



**HexBond™
Adhesives**



**HexTool®
Tooling Material**



**HiMax™
Multiaxial
Reinforcements**



**HexAM™
Additive
Manufacturing**

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® prepgres
- HexMC®-i molding compounds
- HexFlow® RTM resins
- HexBond™ adhesives
- HexTool® tooling materials
- HexWeb® honeycombs
- Acousti-Cap® sound attenuating honeycomb
- Engineered core
- Engineered products
- Polyspeed® laminates & pultruded profiles
- HexAM™ additive manufacturing

For US quotes, orders and product information call toll-free 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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