

Industrial Selector Guide



HexPly® Prepregs



HexMC®-i Molding Composite



HexForce® Reinforcements



HiMax™ Multiaxials



HexTool® Tooling Material



Polyspeed® Laminates
and Pultruded Profiles



Hexcel in Industrial Markets

Hexcel's Industrial business focuses on three key performance-driven market segments: Wind Energy, Automotive and other specialty areas with focus on Sports & Leisure and Marine. As wind blades have increased in size to power more efficient turbines, and car designers are challenged with driving down CO2 emissions, lightweighting has become a priority. Hexcel's products are driving weight reduction and promoting greater manufacturing efficiencies in support of these trends. Hexcel is the most integrated composite solutions provider in the industry, experienced at all stages in the composites chain, from carbon fiber and fabrics (glass and carbon) to resin formulation for thermosetting prepregs, laminates and pultruded elements, molding materials, composite tooling, honeycomb and adhesives.

HexPly® Prepregs

Hexcel prepregs provide a tougher, lighter and stiffer alternative to conventional materials. They are specially formulated resin matrix systems that are reinforced with man made fibers such as carbon, glass and aramid. Prepreg is the ultimate composite material. The thermoset resin cures at elevated temperatures, undergoing a chemical reaction that transforms the prepreg into a solid structural material that is highly durable, temperature resistant, exceptionally stiff and extremely lightweight.

HexTool® Tooling Material

HexTool® is Hexcel's composite tooling material that, for the first time, enables the tolerance accuracy achieved with metals to be combined with the extreme lightness of carbon fiber composites. HexTool® molds are easy to repair and the dimensions are simple to modify. This new concept for lightweight, efficient large-scale tools is cost-effective compared with conventional composite tools and metal molds, especially those made from Invar®.

Long tool life, ease of use, and the machinability of cured structures are some of the primary reasons HexTool® is being chosen for the tooling for parts on new generation aircraft worldwide.

HexMC®-i Molding Composite

HexMC®-i is a high performance sheet molding material, suitable for the high volume production of complex shapes and specifically designed for compression molding. With long fiber, and low resin content, HexMC®-i provides better mechanical properties than any other short or long fiber molding compound.

The HexMC®-i epoxy system provides short cure cycles, from two minutes at 150°C/ 302°F depending on part thickness. Complex shapes can be achieved and inserts can be integrated in the molding process. This product is particularly beneficial for sports goods, automotive and marine applications, as well as a wide range of industrial components.

HexForce® Reinforcements

Hexcel is the leading manufacturer of woven reinforcements for composites, in glass, carbon and aramid fibers. Woven fabrics are the result of at least 2 threads which are interlaced at 0° (the warp) and 90 (the weft) with the weave style varied according to the required performance. Fabrics are available in a wide range of weights and 3 main weave styles: plain weave, twill weave and satin weave. Woven fabrics provide strength and stiffness in 2 directions, resulting in excellent handling characteristics and good drape. It is also possible to mix fibers to provide hybrid fabrics.

HiMax™ Reinforcements

HiMax® Multiaxial fabrics also known as Non Crimp Fabrics are layers of unidirectional fiber that are assembled and stitched together. They provide strength and stiffness in multiple directions depending on the controlled orientation of the fibers. The range includes Biaxial, Triaxial, and Quadraaxial. These reinforcements provide composites with stiffness and strength and are key products for many industrial markets.



Polyspeed® Laminates

Polyspeed® laminates are fiber-reinforced epoxy resin impregnated materials that are supplied in a cured state. Hexcel manufactures a wide range of pressed laminates made with unidirectional or multidirectional carbon, glass and aramid reinforcements as well as hybrid laminates which combine glass, carbon and aramid fibers to meet specific customer mechanical properties requirements. Being precured, laminates are chemically stable and have established mechanical properties, making them ready-to-use for compounding with foam or adhesives.

Laminates are used in layer constructions and absorb physical impacts in the final products such as skis, snowboards, floor panels and many other industrial applications.



Polyspeed® Pultruded Carbon Profiles

Pultrusion is a continuous process for the manufacture of composite profiles. Hexcel's Vert-Le-Petit site pioneered pultruded profiles manufactured with unidirectional and orientated fiber, mainly with carbon fibers, and offers a wide variety of pultruded sections including:

- Rods from 2 to 32mm diameter
- Flat sections from 5 to 100mm wide, with 0.5 to 10mm thickness
- Tubes from 4 to 100mm diameter and 1 to 10mm thickness (including telescopic serial).
- Specific profile sections can also be developed

Polyspeed® pultruded profiles are made from either carbon fiber (standard, intermediate and high modulus), glass, quartz, basalt or other fibers as specified. The profile matrix is a Hexcel formulation based on epoxy and polyurethane thermoset resins allowing applications in the most severe environments up to 100°C as standard, and up to 200°C in certain specifications.

Hexcel pultruded profiles are used in many industrial applications including sports good, robotics, medical, building, telescope monopods and tripods.



Reinforcement Styles

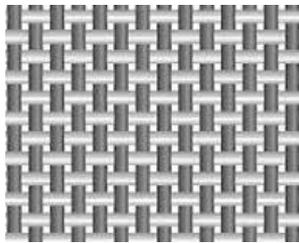


HexForce® Reinforcements

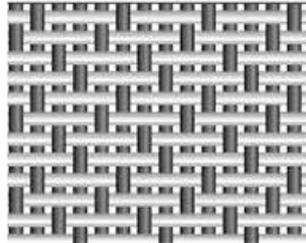
Woven Fabrics

Fabrics consist of at least two threads which are woven together: the warp and the weft. The weave style can be varied according to crimp and drapeability. Low crimp gives better mechanical performance because straighter fibers carry greater loads; a drapeable fabric is easier to lay up over complex forms.

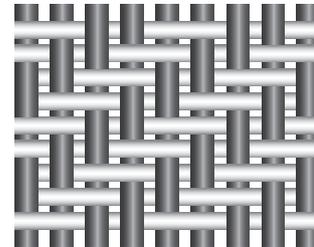
Main Weave Styles



*PLAIN WEAVE -
Low drapeability/high crimp*



*SATIN WEAVE (4, 5, 8, 11) -
Good drapeability/low crimp*

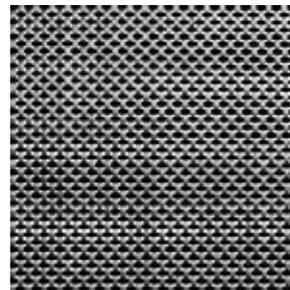


*TWILL WEAVE (2/1, 3/1, 2/2) -
Average drapeability/ average crimp*

PrimeTex® Reinforcements

PrimeTex® is a range of carbon fabrics processed for a smooth, closed weave and uniform cosmetic appearance. The filaments in each tow are spread out, creating a thinner and more closely woven fabric, providing better mechanical properties and less porosity in a composite. PrimeTex® fabrics can also lower the mass in a structure when lighter weight is a key requirement.

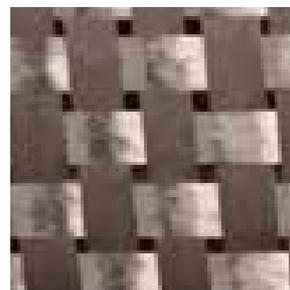
PrimeTex® gives a clear visual benefit to the finished product, enhances the mechanical properties in a laminate and allows high K tow fibers to be used, for the lowest areal weight. The PrimeTex® range is available with HR, IM and HM fiber, from 3K up to 24K. PrimeTex® is ideal for Automotive, Recreation (skis, bikes) and marine applications (hulls and spars).



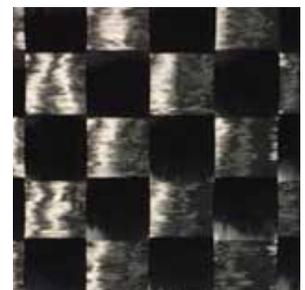
*HexForce® 43199 UE1250 -
Fiber coverage: 93%*



*PrimeTex® 43199 UE1250 S -
Fiber coverage: 99%*



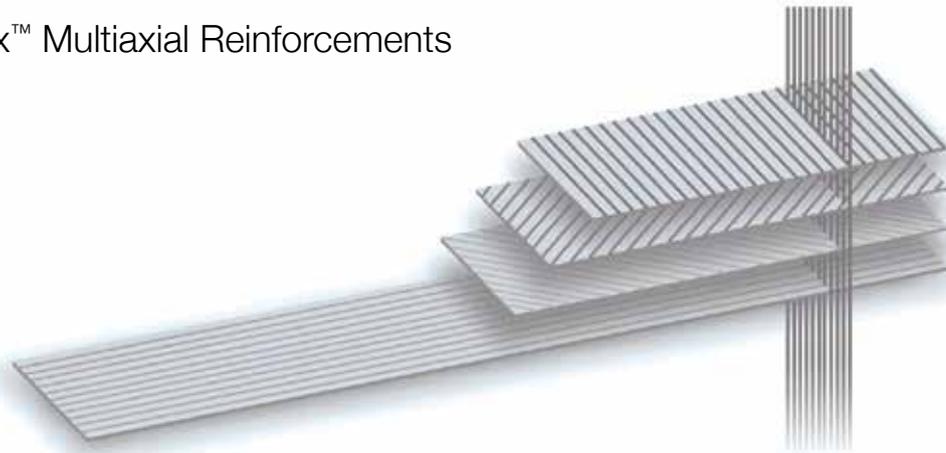
*HexForce® 48192 C 1270 -
Fiber coverage: 96%*



*PrimeTex® 48192 C 1270 S -
Fiber coverage: 99.5%*



HiMax™ Multiaxial Reinforcements



Multiaxial Fabrics

Hexcel's HiMax™ multiaxial reinforcements are a unique concept non-crimp technology for industrial applications that provide strength and stiffness exactly where required, as a result of the preplacement of oriented unidirectional tapes joined by a novel stitching technology. HiMax™ allows great flexibility of fiber orientation with previously unknown and still unmatched width adjustment capabilities.

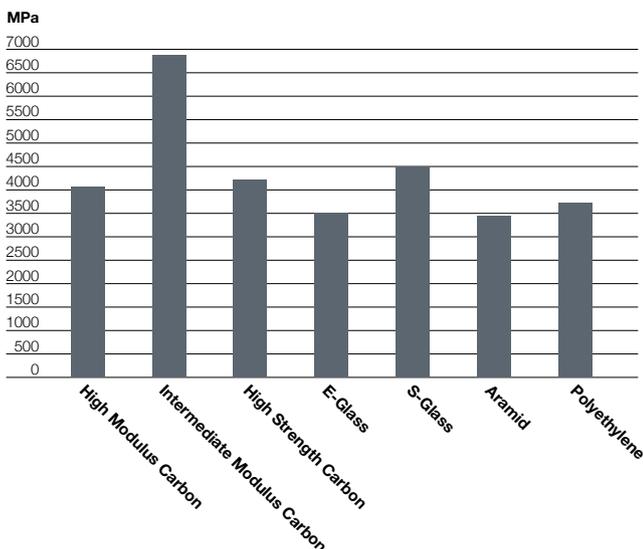
Thick materials can be manufactured using thin plies, providing customers with a cost effective solution that reduces production time. This new technology can accommodate a broad range of fibers, with total freedom regarding ply stack sequence and orientation. Using HiMax™ technology Hexcel is able to make light single ply reinforcements from 100g/m² - 2.3oz/yd² that are balanced and provide full fiber coverage, at competitive prices.

Fiber Properties

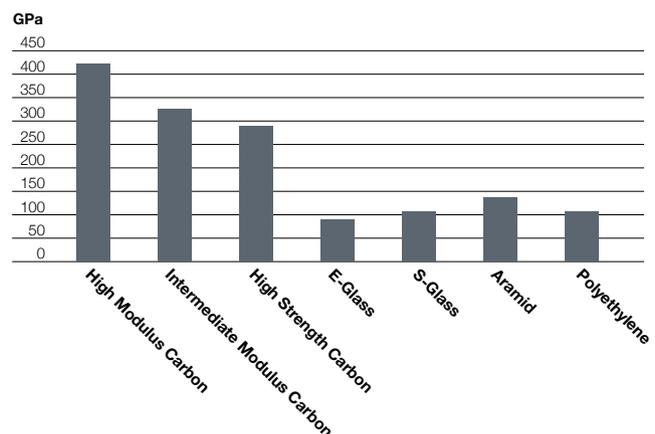
Fiber Properties

Fiber reinforcements provide composites with mechanical performance: excellent stiffness and strength, as well as good thermal, electric and chemical properties, while offering significant weight savings over metals. The range of fibers is extensive. The graphs below highlight the main criteria for fiber selection.

Tensile Strength



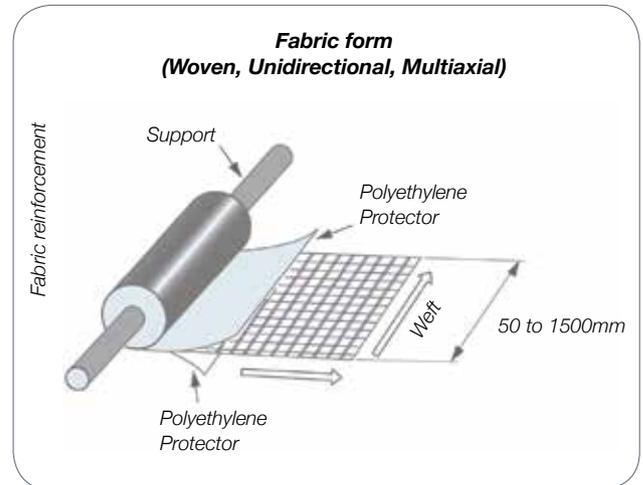
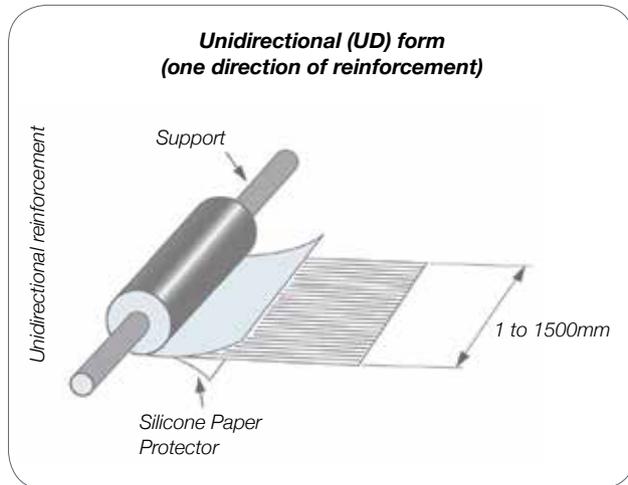
Tensile Modulus



Prepreg Properties

What is a prepreg?

A prepreg consists of a combination of a matrix (or resin) and fiber reinforcement. It is ready to use in the component manufacturing process. It is available in:



What is the role of the matrix?

The role of the matrix is to support the fibers and bond them together in the composite material. It transfers any applied loads to the fibers, keeps the fibers in their position and chosen orientation. The matrix also gives the composite environmental resistance and determines the maximum service temperature of a prepreg. When selecting prepregs the maximum service temperature is one of the key selection criteria for choosing the best prepreg matrix.

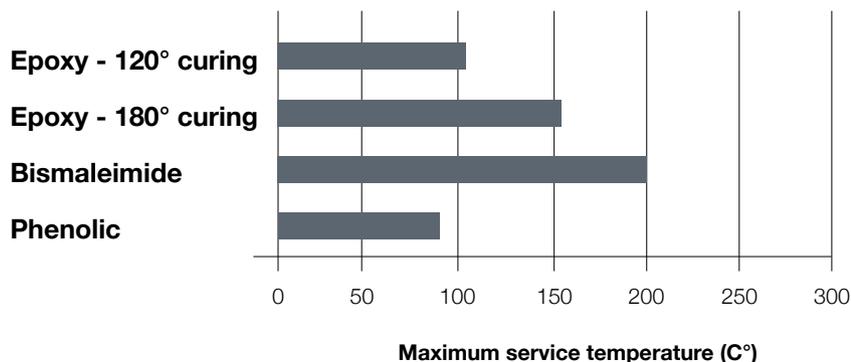
A prepreg matrix is:

A formulation of many components: *Resins, curing agents, tougheners, fire retardants, accelerators.*

Different chemistries available depending on end-use: *Epoxy, Phenolic, BMI, Cyanate Ester*

All thermosetting chemistries

What are the prepreg matrix properties?



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| HexPly [®] Resin System | Dry T _g Onset (DSC) °C (°F) | Typical Cure Cycle | | Cure Process | | Self Adhesive | Attributes | Flow | | Self Extinguishing | Outlife at Room Temperature (Days) | Storage at -18°C (0°F) months | Market |
|----------------------------------|--|--------------------|-------------|------------------|-------------|---------------|--|------------|------|--------------------|------------------------------------|-------------------------------|---|
| | | Temp °C (°F) | Time (mins) | Autoclave/ Press | Vacuum Only | | | Controlled | High | | | | |
| Epoxy | | | | | | | | | | | | | |
| M9.X | 125 (255) | 120 (250) | 30 | X | X | | Base line resin, various tack levels available | | X | | 42 | 18 | Wind energy, Automotive, Marine, General Industrial |
| M901 | 175 (350)* | 130 (265) | 10 | X | | | High T _g , fatigue and mechanical performance | | X | | 105 | 18 | Automotive, General Industrial |
| M10E | 115 (240) | 120 (250) | 30 | X | X | | Flexible cure (85°C-150°C) | | X | | 60 | 18 | Sporting Goods, General Industrial, Automotive, Marine |
| M10R | 120 (250) | 120 (250) | 60 | X | X | | Base line resin long shelf life | | X | | 60 | 18 | Marine, Automotive, General Industrial |
| M34 | 80 (180) | 75 (165) | 480 | X | X | X | Low temperature cure. FST behaviour | X | | X | 10 | 12 | Rail and Marine |
| M35-4 | 140 (285) | 135 (275) | 90 | X | | | Flexible cure | X | | | 60 | 12 | High Performance Cars / Sporting Goods / Bike |
| M47 | 130 (265) | 120 (250) | 90 | X | | | Structural | X | | X | 30 | 12 | High Performance Cars |
| M49 | 105 (220) | 120 (250) | 90 | X | X | | Aesthetic | | X | | 30 | 12 | Automotive, Sporting Goods, Carbon Look, General Industrial |
| M77 | 125 (255) | 150 (300) | 2 | X | X | | Extra fast cure | X | | | 42 | 18 | Automotive, Sporting Goods, General Industrial |
| M77CS | 130 (265) | 140 (285) | 3 | X | | | Fast cure, transparency, surface quality | X | | | 42 | 18 | Automotive, Carbon Look |
| M77HF | 130 (265) | 150 (300) | 3 | X | X | | Quick cure. Hot de-mold | | X | | 30 | 12 | Sporting Goods, General Industrial |
| M78.1 | 125 (255) | 130 (265) | 6 | X | X | | Very fast cure, excellent adhesion, environmental friendly | X | | | 14 | 18 | Sporting Goods |
| M79 | 95 (200) | 90 (195) | 130 | X | X | | Low temperature cure, low exotherm | X | | | 42 | 18 | Wind Energy, Marine, Other industrial applications |
| M81 | 200 (390) | 135 (275) | 180** | X | | | Tough | X | | | 14 | 12 | High Performance Cars |

All listed resin systems above may be used with Hexcel's range of reinforcement fabrics such as woven and multiaxial fabrics in carbon, glass and aramid fibers. Please contact Hexcel for more information. *postcure of 120min @150°C required ** = plus post cure



| Type | Laminate Weight Unground (g/m ²) | Fabric Weight (g/m ²) | Reinforcement | Weight Rate (g/m ²) | | Thickness Both Sides Ground (mm) | Width (mm) | Resin/T _g (°C) | Mechanical | |
|----------------|--|-----------------------------------|---------------|---------------------------------|------|----------------------------------|------------|---------------------------|-------------------------|------------------------|
| | | | | Warp | Weft | | | | Tensile Strength 0° Mpa | Tensile Modulus 0° Gpa |
| R | 1151 | 840 | R84 | 840 | 0 | 0.5 ± 0.05 | 38-1240 | Epoxy / 125° | 1100 ± 165 | 42 ± 6.3 |
| R | 1740 | 1200 | R120 | 1200 | 0 | 0.8 ± 0.05 | 38-1240 | Epoxy / 125° | 1100 ± 165 | 41 ± 6.2 |
| R-Combi | 1883 | 1337 | R94 LT397 | 1300 | 25 | 0.9 ± 0.05 | 38-1240 | Epoxy / 125° | 1050 ± 158 | 39 ± 5.9 |
| EV | 825 | 470 | 470R | 372 | 90 | 0.4 ± 0.05 | 38-1240 | Epoxy / 125° | 560 ± 84 | 27 ± 3.8 |
| EV | 1210 | 750 | 750R | 504 | 240 | 0.6 ± 0.05 | 38-1240 | Epoxy / 125° | 450 ± 68 | 20 ± 3 |
| EV | 1541 | 2 x 470 | 2x470R | 744 | 180 | 0.8 ± 0.05 | 38-1240 | Epoxy / 125° | 570 ± 86 | 25 ± 3.7 |
| Grid | 682 | 566 | 551GI | 240 | 300 | 0.75 | 38-1240 | Epoxy / 125° | 240 ± 36 | 11.5 ± 1.7 |

R= UD glass fiber, R-kombi= UD glass fiber + woven fabric, EV= bidirectional reinforcement, GRID= woven grid reinforcement



HexTool® Tooling Material

| | Dry T _g Onset (DMA) °C (°F) | Typical Cure Cycle | | Cure Process | | Self Adhesive | Attributes | Flow | | Self Extinguishing | Outlife at Room Temperature | Storage at -18°C (0°F) months | Market |
|---------------------|---|--------------------|-------------|-----------------------------|-------------|---------------|------------|------------|------|--------------------|-----------------------------|-------------------------------|---|
| | | Temp °C (°F) | Time (mins) | Autoclave/ Press | Vacuum Only | | | Controlled | High | | | | |
| HexTool® M61 | 275 (530) | 190 (375) | 240** | Post cure 16h at 220°C | | X | BMI | | | | 20 | 12 | Tooling - 180° C part cure cycle |
| HexTool® M81 | 220 (430) | 125 (255) | 360** | After post cure 2h at 205°C | | X | Epoxy | | | | 20 | 12 | Tooling - 120° C part cure cycle and fast prototyping for any composite parts |

** Plus post cure



HexMC®-i Molding Concept

| | Dry T _g Onset (DMA) °C (°F) | Typical Cure Cycle | | Cure Process | | Self Adhesive | Attributes | Flow | | Self Extinguishing | Outlife at Room Temperature (days) | Storage at -18°C (0°F) months | Market |
|---------------------|---|--------------------|-------------|------------------|-------------|---------------|------------|------------|------|--------------------|------------------------------------|-------------------------------|--|
| | | Temp °C (°F) | Time (mins) | Autoclave/ Press | Vacuum Only | | | Controlled | High | | | | |
| HexMC®-i M77 | 120 (250) | 150 (300) | 2 | X | | | | X | | | 42 | 18 | Automotive, Sporting Goods, General Industrial |
| HexMC®-i M81 | 210 (410) | 180 (355) | 30** | X | | | | X | | | 14 | 12 | Automotive, Sporting Goods |

* Higher T_g can be obtained with post cure cycle

** Plus post cure



HS Carbon Reinforcements

| Weight (gsm) | Style | PrimeTex® Quality | Weave | Weight Rate | | Fiber Count (Yarns/cm) | | Reinforcement Yarn | | Thickness (mm) |
|--|-------|-------------------|-----------|-------------|------|------------------------|------|--------------------|--------|----------------|
| | | | | Warp | Weft | Warp | Weft | Warp | Weft | |
| Balanced Fabrics - High Strength Fibers | | | | | | | | | | |
| 98 | G0801 | | PLAIN | 50 | 50 | 6.7 | 6.7 | 1K HS | 1K HS | 0.09 |
| 100 | 43098 | X | PLAIN | 50 | 50 | 2.3 | 2.3 | 3K HS | 3K HS | 0.09 |
| 120 | 41120 | | PLAIN | 50 | 50 | 9 | 9 | 1K HS | 1K HS | 0.12 |
| 160 | 43161 | X | PLAIN | 50 | 50 | 4 | 4 | 3K HS | 3K HS | 0.16 |
| 160 | 43162 | X | TWILL 2x2 | 50 | 50 | 4 | 4 | 3K HS | 3K HS | 0.16 |
| 193 | 48192 | X | PLAIN | 50 | 50 | 1.2 | 1.2 | 12K HS | 12K HS | 0.20 |
| 193 | 48194 | X | TWILL 2x2 | 50 | 50 | 1.2 | 1.2 | 12K HS | 12K HS | 0.20 |
| 200 | 43199 | X | PLAIN | 50 | 50 | 5 | 5 | 3K HS | 3K HS | 0.20 |
| 200 | 43200 | X | TWILL 2x2 | 50 | 50 | 5 | 5 | 3K HS | 3K HS | 0.20 |
| 245 | 43245 | X | TWILL 2x2 | 50 | 50 | 6 | 6 | 3K HS | 3K HS | 0.25 |
| 285 | G1174 | | TWILL 4x4 | 50 | 50 | 7 | 7 | 3K HS | 3K HS | 0.29 |
| 285 | 43285 | | TWILL 2x2 | 50 | 50 | 7 | 7 | 3K HS | 3K HS | 0.29 |
| 300 | 48302 | X | TWILL 2x2 | 50 | 50 | 1.9 | 1.9 | 12K HS | 12K HS | 0.30 |
| 330 | 49331 | X | PLAIN | 50 | 50 | 0.9 | 0.9 | 24K HS | 24K HS | 0.32 |
| 370 | 48370 | X | TWILL 2x2 | 50 | 50 | 2.4 | 2.4 | 12K HS | 12K HS | 0.38 |
| 400 | 46402 | | TWILL 2x2 | 50 | 50 | 5 | 5 | 6K HS | 6K HS | 0.40 |
| 400 | 48400 | X | PLAIN | 50 | 50 | 2.5 | 2.5 | 12K HS | 12K HS | 0.41 |
| 600 | 48600 | | TWILL 2x2 | 50 | 50 | 3.7 | 3.7 | 12K HS | 12K HS | 0.62 |
| 660 | 48661 | | TWILL 2x2 | 50 | 50 | 4.1 | 4.1 | 12K HS | 12K HS | 0.66 |

PrimeTex® is a range of carbon fabrics that have been processed for a smooth, closed weave and enhanced uniform appearance.

| Unidirectional Fabrics - High Strength Fibers | | | | | | | | | | |
|--|-------|--|-------|----|----|-----|-----|--------|-------|------|
| 175 | 43175 | | UD PW | 96 | 4 | 8.4 | 6.9 | 3K HS | EC511 | 0.18 |
| 185 | 43185 | | UD PW | 85 | 15 | 8.4 | 4 | 3K HS | 1KHS | 0.19 |
| 300 | 48300 | | UD PW | 99 | 1 | 3.7 | 3 | 12K HS | EC511 | 0.32 |
| 530 | 48520 | | UD | 94 | 6 | 6.2 | 4.4 | 12K HS | EC968 | 0.55 |



IM/HM Carbon Reinforcements

| Weight (gsm) | Style | PrimeTex® Quality | Weave | Weight Rate | | Fiber Count (Yarns/cm) | | Reinforcement Yarn | | Thickness (mm) |
|--|----------|-------------------|-----------|-------------|------|------------------------|------|--------------------|--------|----------------|
| | | | | Warp | Weft | Warp | Weft | Warp | Weft | |
| Balanced Fabrics - High Strength Fibers | | | | | | | | | | |
| 200 | 46200 W | X | TWILL 2x2 | 50 | 50 | 4.5 | 4.5 | 6K IM7 | 6K IM7 | 0.20 |
| 280 | 46280 W | X | SATIN 5 | 50 | 50 | 6.5 | 6.5 | 6K IM7 | 6K IM7 | 0.28 |
| 150 | 48152 ZY | X | TWILL 2x2 | 50 | 50 | 1.7 | 1.7 | HM63 | HM63 | 0.15 |
| 200 | 48200 ZY | X | TWILL 2x2 | 50 | 50 | 2.3 | 2.3 | HM63 | HM63 | 0.20 |
| 285 | 48287 ZY | X | SATIN 5 | 50 | 50 | 3.3 | 3.3 | HM63 | HM63 | 0.28 |



E Glass Reinforcements

| Weight (gsm) | Style | Weave | Weight Rate | | Fiber Count (Yarns/cm) | | Reinforcement Yarn | | Thickness (mm) |
|-----------------------------|-------|-------------|-------------|------|------------------------|------|--------------------|-------------|----------------|
| | | | Warp | Weft | Warp | Weft | Warp | Weft | |
| 25 | 00106 | PLAIN | 50 | 50 | 22 | 22 | EC5.5 | EC5.5 | 0.02 |
| 48 | 01080 | PLAIN | 56 | 44 | 24 | 19 | EC5 11 | EC5 11 | 0.04 |
| 70 | 02112 | PLAIN | 52 | 48 | 16 | 15 | EC7 22 | EC7 22 | 0.05 |
| 86 | 00235 | PLAIN | 49 | 51 | 12 | 12.5 | EC9 34 | EC9 34 | 0.06 |
| 105 | 00220 | 4H SATIN | 51 | 49 | 24 | 23 | EC7 22 | EC7 22 | 0.08 |
| 105 | 02116 | PLAIN | 51 | 49 | 24 | 23 | EC7 22 | EC7 22 | 0.08 |
| 125 | 01510 | PLAIN | 65 | 35 | 11.5 | 6.3 | EC9 34x2 | EC9 68 | 0.09 |
| 125 | 01522 | PLAIN | 53 | 47 | 9.6 | 8.5 | EC9 34x2 | EC9 34x2 | 0.09 |
| 160 | 01717 | PLAIN | 52 | 48 | 11.8 | 10.7 | EC9 68 | EC9 68 | 0.12 |
| 162 | 01039 | TWILL 2x2 | 51 | 49 | 11.8 | 11.5 | EC9 68 | EC9 68 | 0.12 |
| 202 | 01035 | TWILL 2x2 | 50 | 50 | 14 | 14 | EC9 68 | EC9 68 | 0.15 |
| 202 | 07628 | PLAIN | 59 | 41 | 17 | 11.8 | EC9 68 | EC9 68 | 0.15 |
| 202 | 01266 | PLAIN | 60 | 40 | 8.9 | 6 | EC9 136 | EC9 136 | 0.15 |
| 204 | 01184 | PLAIN | 51 | 49 | 7.4 | 7.2 | EC9 68x2 | EC9 136 | 0.15 |
| 206 | 00471 | PLAIN | 51 | 49 | 7.4 | 7.2 | EC9 68x2 | EC9 68x2 | 0.15 |
| 290 | 01202 | TWILL 2x2 | 50 | 50 | 7 | 7.2 | (EC9 68)x3 | EC9 204 | 0.23 |
| 290 | 01203 | PLAIN | 50 | 50 | 7 | 7.2 | (EC9 68)x3 | EC9 204 | 0.23 |
| 300 | 07581 | 8H SATIN | 51 | 49 | 22 | 21 | EC9 68 | EC9 68 | 0.23 |
| 300 | 07781 | 8H SATIN | 52 | 48 | 23 | 21 | EC 66 | EC66 | 0.23 |
| 390 | 01113 | TWILL 2x2 | 53 | 47 | 5.9 | 6.6 | (EC9 68)x5 | (EC9 136)x2 | 0.30 |
| 600 | 01038 | TWILL 2x2 | 50 | 50 | 7.3 | 7.3 | (EC9 136)x3 | (EC9 136)x3 | 0.52 |
| 600 | 01137 | 8 SATIN | 50 | 50 | 11.2 | 11.2 | (EC9 136)x2 | (EC9 136)x2 | 0.52 |
| Woven Unidirectional | | | | | | | | | |
| 190 | 1022 | UD 4H SATIN | 80 | 20 | 22 | 10.5 | EC9 68 | EC9 34 | 0.14 |
| 290 | 1543 | UD 4H SATIN | 90 | 10 | 19 | 11.8 | EC9 68 x2 | EC7 22 | 0.22 |
| 315 | 1031 | UD 4H SATIN | 87 | 13 | 19.5 | 11 | EC9 136 | EC9 34 | 0.24 |
| 430 | 1017 | UD PLAIN | 90 | 10 | 5.7 | 6.3 | (EC9 136)x5 | EC9 68 | 0.33 |



Finish for E Glass Fabrics

| Matrix | Description | Epoxy | Polyester | Vinyl Ester | Phenolic |
|-----------------|--------------|-------|-----------|-------------|----------|
| Finish | | | | | |
| TF 950 - Z 6040 | Epoxy Silane | X | X | X | |
| TF 970 | Amino Silane | X | X | X | |
| A 1100 | Amino Silane | X | | | X |
| TF970 CLEAR | Amino Silane | X | X | X | |



| Weight (gsm) | Style | Weave | Weight Rate | | Fiber Count (Yarns/cm) | | Reinforcement Yarn | | Thickness (mm) |
|--------------------------------|-----------------|-----------|-------------|------|------------------------|------|--------------------|----------|----------------|
| | | | Warp | Weft | Warp | Weft | Warp | Weft | |
| Polyamide Peel Ply | | | | | | | | | |
| 83 | T0470N | PW | 58 | 42 | 19 | 15 | PA66 235 | PA66 235 | 0.06 |
| 100 | T0098 | PW | 54 | 46 | 22 | 18.5 | PA66 235 | PA66 235 | 0.06 |
| Aesthetic Glass Fabrics | | | | | | | | | |
| 202 | 1035 TEXALIUM®* | TWILL 2X2 | 50 | 50 | 14 | 14 | EC9 68 | EC9 68 | 0.15 |
| 290 | 1202 TEXALIUM®* | TWILL 2X2 | 50 | 50 | 7 | 7.2 | (EC9 68)x3 | EC9 204 | 0.23 |

* TEXALIUM® : glass fabrics aluminum coated on one side

| | | | | | | | | | |
|----------------------------------|------------|------------------------|----|----|------|------|------------|------------|------|
| Injectex® E Glass Fabrics | | | | | | | | | |
| 295 | 21186 | TWILL 2X2 | 50 | 50 | 22.2 | 5.5 | EC9 68 | EC9 68x4 | 0.22 |
| 315 | EB315 | TWILL 2X2 POWDERED | 50 | 50 | 22.2 | 5.5 | EC9 68 | EC9 68x4 | 0.22 |
| 400 | 21180 | 3X / FORMABLE | 50 | 50 | 14.8 | 14.8 | EC9 68x2 | EC9 68x2 | 0.31 |
| 420 | EF420 | 3X / FORMABLE POWDERED | 50 | 50 | 14.8 | 14.8 | EC9 68x2 | EC9 68x2 | 0.31 |
| 1000 | 21156 | 3X / FORMABLE | 51 | 49 | 16.3 | 15.5 | EC13 300 | RO320 | 0.77 |
| 1030 | E1030 | 3X / FORMABLE POWDERED | 51 | 49 | 16.3 | 15.5 | EC13 300 | RO320 | 0.77 |
| Injectex® Carbon Fabrics | | | | | | | | | |
| 600 | GF600 1000 | 3X / FORMABLE | 50 | 50 | 7.4 | 7.4 | 6K HS | 6K HS | 0.60 |
| 630 | GF630 1000 | 3X / FORMABLE POWDERED | 50 | 50 | 7.4 | 7.4 | 6K HS | 6K HS | 0.60 |
| Aramid Carbon Hybrids | | | | | | | | | |
| 170 | 73172 | PLAIN | 37 | 37 | 3.4 | 3.4 | 3K HS | AR HM 1210 | 0.19 |
| | | | 13 | 13 | 1.7 | 1.7 | AR HM 1210 | 3K HS | |
| 170 | G0882 | TWILL 2x1 | 37 | 22 | 3.3 | 1.8 | 3K HS | 3K HS | 0.17 |
| | | | 13 | 28 | 1.8 | 3.3 | AR HM 1210 | AR HM 1210 | |
| 210 | 73210 | TWILL 2x2 | 22 | 22 | 2.2 | 2.2 | 3K HS | 3K HS | 0.22 |
| | | | 28 | 28 | 4.4 | 4.4 | AR HM1210 | AR HM1210 | |



| Ref | Compatibility | Storage at Room Temperature | Preforming | Applicable for | Injection Temperature | Curing Temperature of Resin System |
|------|---------------|-----------------------------|-------------------------------------|----------------|-----------------------|------------------------------------|
| HP03 | PU & Epoxy | 1 year | Starting at 80°C, Recommended 100°C | LRI | <45°C | >50°C |
| E01 | Epoxy | Up to 1 year | Starting at 80°C, Recommended 100°C | RTM/LRI | No restriction | Any |

Powdering: all fabrics can be epoxy powdered on 1 or 2 sides in order to facilitate preforming and dimensional stabilization



Aramid Fabrics

| Weight (gsm) | Style | Weave | Weight Rate | | Fiber Count (Yarns/cm) | | Reinforcement Yarn | | Thickness (mm) |
|--------------|-------|-----------|-------------|------|------------------------|------|--------------------|---------|----------------|
| | | | Warp | Weft | Warp | Weft | Warp | Weft | |
| 175 | 20967 | PLAIN | 51 | 49 | 6.7 | 6.5 | HM 1210 | HM 1210 | 0.2 |
| 175 | 20968 | TWILL 2x2 | 51 | 49 | 6.7 | 6.5 | HM 1210 | HM 1210 | 0.2 |
| 175 | 20914 | 4H SATIN | 51 | 49 | 6.7 | 6.5 | HM 1210 | HM 1210 | 0.2 |
| 320 | 21071 | 5H SATIN | 51 | 49 | 6.3 | 6.2 | HM 2400 | HM 2400 | 0.4 |



HiMax™ Multiaxial Reinforcements

Carbon Multiaxials

Available in a range of fiber types from 3k to 50k including PAN and Pitch fibers. Fabric weights from 50gsm up to 1600gsm can be produced with fabric widths from 25mm through to 1600mm.

- Unidirectionals, (Stitched, Heat Set Woven, Infusion and Bonded)
- +/- 22 Biaxials, (Standard and Lightweight)
- +/- 60 lightweight carbon multiaxials in 75gsm
- +/- 45 Biaxials, (Standard, Ultra lightweight, High Drape and Hybrid)
- 0/90 Biaxials, Triaxials, and Quadraxials. (Standard, Unbalanced, Heavyweight, Warp, Weft and Hybrid)

Glass Multiaxials

Available in a range of fabric weights from as low as 250gsm to 6000gsm and a variety of different fabric widths from 25mm to 2540mm.

- Unidirectionals (Stitched, Heat Set Woven and Infusion)
- +/-45 Biaxials (Standard, Combination, High-drape and Hybrid)
- 0/90 Biaxials (Standard, Combination, High-drape and Hybrid)
- Triaxials (Warp, Weft, Hybrid)
- Quadraxials (Standard and Mesh)

Aramid Multiaxials

Available in a range of fabric weights from as low as 160gsm to 600gsm and a variety of widths from 250mm to 2540mm.

- Standard +/- 45
- Hybrid +/- 45
- Hybrid 0/90

Hybrid Fabrics / Natural Fibres

A range of Carbon / Glass, Aramid / Glass hybrid fabrics can be supplied, as well as natural fibers such as Flax.

Fabrics For Infusion

Our Infusion fabrics have been specially developed to ensure rapid and consistent infusion rates during production. Additional features include:

- Infusion fabrics that incorporate a core manufactured from polypropylene, polyester, natural fibre and glass fabrics
- Multi-stack fabrics ideal for infusing large monolithic structures in fewer layers

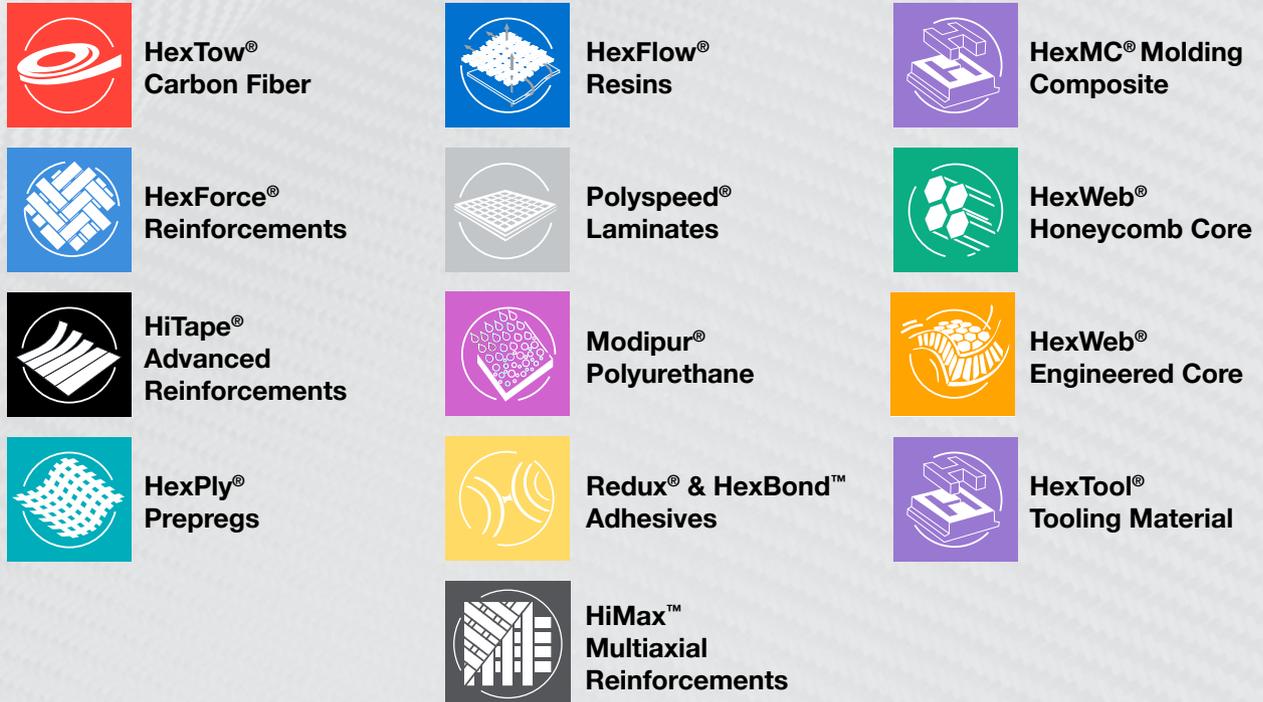
Recycled Fabrics

- reForm Fabric

DPA Fabrics

HiMax™ DPA (Dot Pattern Adhesive) fabrics are pre-tacked for ease of laying up multiple fabrics in preparation for infusion. Designed to provide the optimal level of tack while minimizing additional weight, DPA fabrics eliminate the need to apply spray-on adhesives to the fabric surface. This minimizes the risk of inconsistent application, and in turn reduces issues with restricted resin flow, contamination and excess weight. HiMax™ DPA fabrics have a controlled and consistent level of adhesive applied by machine in dots across the whole fabric, typically weighing just 3g/m². This enables manufacturers to simply unroll and apply the HiMax™ fabric to the mold, add a layer of core material or other fabric layers, and reposition if desired, before introducing resin. The spacing and spread of the adhesive has been optimized to reduce interference with the resin flow. The health and safety benefits are clear: solvent-based adhesives are no longer being sprayed randomly in the working environment

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
- HexMC® molding compounds
- HexFlow® RTM resins
- Redux® & HexBond™ adhesives
- HexTool® tooling materials
- HexWeb® honeycombs
- Acousti-Cap® sound attenuating honeycomb
- Engineered core
- Engineered products
- Polyspeed® laminates

For US quotes, orders and product information call toll-free 1-866-601-5430. For other worldwide sales office telephone numbers and a full address list, please go to:

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

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