



HexTool® M81

Multi-Axial High Temperature Epoxy Tooling Compound



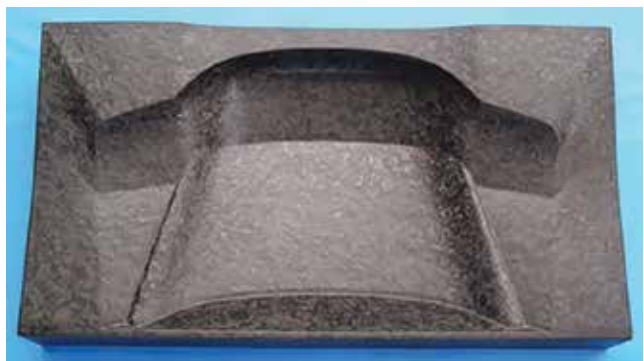
Product Data Sheet

Description

HexTool® M81 Tooling Compound is randomly layered strips of uni-directional prepreg which is consolidated into rolled goods. It can be utilised as multi-ply quasi-isotropic hand lay-up, and subsequently CNC milled to close tolerance. HexTool® M81 has proved to be dimensionally stable with the ability to hold vacuum integrity before and after machining. Fabricated from Hexcel's epoxy resin HexPly® M81, HexTool® M81 tools are ideally suited for 120°C to 150°C cure carbon fibre tools but can also accept several cure cycles at 180°C. This makes them also lighter weight, more energy efficient than tools made of steel or aluminium but also more cost-effective with tighter mould tolerance than standard composites tools.

Benefits

- Ability to machine tool surface without distortion permitting the manufacture of tools with complex shapes and tight tolerances
- Reparability and potential for modification of tool dimensions following engineering changes
- Elevated Tg and service temperature (average Tg onset DMA 220°C) allowing use of components cure from 120°C to 180°C
- Formulated to withstand more than 100 part cure cycles at 120°C
- Rapid material deposition as HexTool® is much thicker than standard composite tooling prepregs and do not require accurate lay up schedule thanks to our quasi isotropic property
- 21 days out life compare to just few days for tooling prepregs
- Coefficient of thermal expansion to match carbon/epoxy
- Vacuum integrity following machining





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Uncured Material Properties

Property	Value	Comment
Nominal Resin Content	55%	
Nominal Resin Content	38%	by weight
Nominal Bundle Size (Prepreg Strip Size)	8.0mm x 50mm	
Nominal HexTool® Ply Areal Weight	2000 g/m ²	
Specific Gravity	1.57	
Autoclave Work life at 21°C	20 days	
Storage Life	12 months	at -18°C

Cured Material Properties

Property	Value	Comment
Cured Ply Thickness	1.28 mm	
Tg Postcured	220°C	dry
Maximum Use Temperature	185°C	
Coefficient of Linear Thermal Expansion	5x10 ⁻⁶ /°C	In Plane ASTM E 228
Minimum Initial Cure Temperature	125°C	

* Cured material properties are for reference only and not to be considered certification values.

Mechanical Properties*

Property	Units	Condition	Temp °C	Method	Value
Tensile Strength	MPa	Dry	RT	ASTMD3039	175
			120°C	ASTMD3039	170
Tensile Modulus	GPa	Dry	RT	ASTMD3039	43
			120°C	ASTMD3039	40
Compression Strength	MPa	Dry	RT	ASTMD6484	250
			120°C	ASTMD6484	250
Compression Modulus	GPa	Dry	RT	ASTMD6484	30
			120°C	ASTMD6484	30
Short Beam Shear Strength	MPa	Dry	RT	EN2563	45
			120°C	EN2563	35

* Mechanical Properties are for reference only and not to be considered certification values. Results were obtained on 4mm thick laminates after machining bag side.



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Cured Prepreg Mechanical Properties

Specific cure cycles [temperature, pressure (amount and application of)] depend on autoclave type and dimensions, the extent and type of tooling used and the size and complexity of the lay-up. Please contact your local Hexcel Technical Support for consultation prior to cycle definition. The following cycles are typical for HexTool® M81.

Low Temp Cure Cycle and Post Cure

125°C Autoclave Cure Cycle

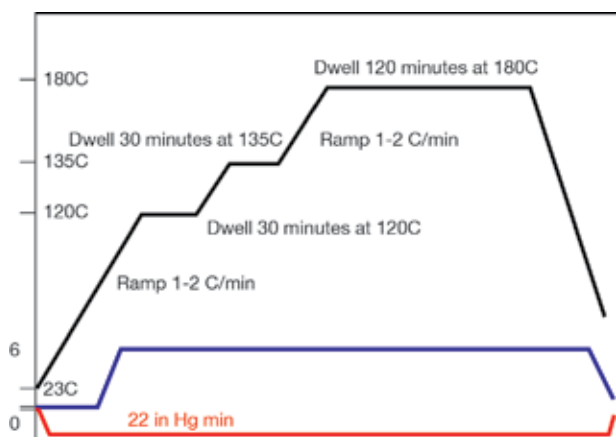
- Apply full vacuum (>0.85bar)
- Heat up to 125°C using a ramp between 0.5° and 1°C/min
- Apply 7bar gauge pressure when temperature reaches 50°C
- Hold at 125°C for 360 minutes
- Cool down using a 0.5°C/min ramp to 60°C
- At 60°C release pressure and vacuum

Free Standing Post Cure Cycle

- Heat up to 140°C using a ramp between 0.5° and 2°C/min
- Heat up to 205°C using a ramp between 0.25° and 1°C/min
- Hold at 205°C for 2 hours
- Cool down using a 0.5°C/min ramp to 150°C
- Cool down using a 1°C/min ramp to 60°C

Higher Temp Cure Cycle

(No post cure required)



- Introduce full vacuum of 22 inches Hg minimum. (Vacuum is to maintained throughout cure cycle)
- Begin heat up to 120°C at 1°-2° C/min.
- When leading Tc reaches 50° +/-2.5°C apply 6 bars pressure.
- Continue heat up to 120°C
- When lagging Tc reaches 120° +/-2.5°C, begin 30 minute soak.
- Continue heat up to 135°C
- When lagging Tc reaches 135° +/-2.5°C, begin 30 minute soak.
- Continue heat up to 180°C at 1°-2°C/min.
- When Lagging Tc reaches 180° +/-2.5°C, begin 120 minute hold.
- Cool part to 50°C at 0.5°-4°C /min. before releasing pressure.



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Storage and Handling

- Shelf Life¹: 12 months at -18°C (from date of manufacture).
- Out Life²: 21 days at Room Temperature
- Tack Life³ : 10 days at Room Temperature

¹ Shelf Life: the maximum storage life for HexPly® prepreg, upon receipt by the customer, when stored continuously, in a sealed moisture-proof bag, at -18°C. To accurately establish the exact expiry date, consult the box label.

² Out Life: the maximum accumulated time allowed at room temperature between removal from the freezer and cure.

³ Tack Life: the time, at room temperature, during which prepreg retains enough tack for easy component lay-up.

Store the product in its original (or equivalent) sealed packaging at -18°C. Prevent condensation on the product by warming to room temperature before opening vapour barrier bag (reseal for subsequent storage). The usual precautions when handling uncured synthetic resins and fine fibrous materials should be observed, see Material Safety Data Sheet. The use of clean disposable impervious gloves provides protection for the operator and avoids contamination of material and components.

For more information

Hexcel is a leading worldwide supplier of composite materials to aerospace and industrial markets.

Our comprehensive range includes:

- | | | |
|----------------------------|------------------------------|--|
| • HexTow® carbon fibers | • HexFlow® RTM resins | • Acousti-Cap® sound attenuating honeycomb |
| • HexForce® reinforcements | • Redux® adhesives | • Engineered core |
| • HexPly® prepregs | • HexTool® tooling materials | • Engineered products |
| • HexMC® molding compounds | • HexWeb® honeycombs | |

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/salesoffice>

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