

# HexMC<sup>®</sup> User Guide

# HexMC® USER GUIDE

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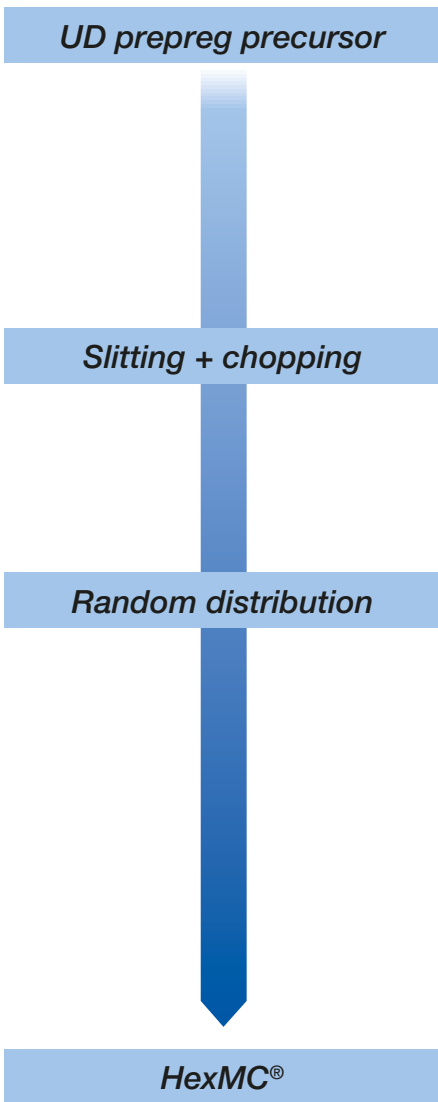
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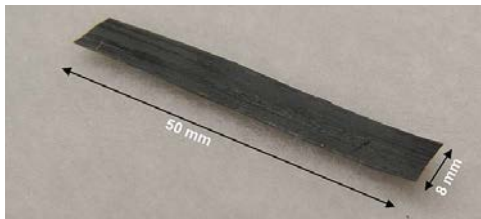
# HexMC® USER GUIDE

This document is intended as a guide to introduce HexMC® material and to assist the potential users in showing its benefits and how it is processed, its properties and the potential applications. Although great care has been taken to include as much detail as possible, every application is unique and should be thoroughly reviewed with your local Hexcel Sales and Technical Support Engineer.

## Material Description



- UD prepreg tape
- HexPly® M77 resin system
- High strength carbon fibre
- 62% fibre weight content



- Prepreg is slit and chopped into chips
- 50 mm long
- 8 mm wide



- Consistent random distribution ensured by Hexcel's production equipment



- Delivered in rolls
- 460 mm wide
- 2000 gsm
- ≈ 2 mm thick (uncured)

## Benefits of HexMC® M77 Material

HexMC® M77 is a high performance carbon epoxy material designed for compression moulding:

- Complex 3D net shaped parts
  - Thickness variation
  - Sharp angles, Stiffeners, Co-moulded inserts
  - Reinforced with continuous fibre material
- HexMC® technology bridges low performance/low cost SMC and high performance/high cost of autoclave/prepreg
- Cure from 2 minutes - 150° C (depending of part design).
- Co-curing possible with UD tape or continuous fibre in prepreg form – including HexPly® M77 fast curing system - to locally reinforce highly loaded parts
- Zero % waste achievable
- Attractive cosmetic surface aspect

## Physical Properties

- Long shelf life

Temperature	-18°C	23°C
HexMC® M77	18 months	6 weeks

- Recommended cure cycles\*

Temperature	100°C	120°C	130°C	140°C	150°C
Time	40 min	8 min	6 min	4 min	3 min

\*Pressure from 70 to 100 bar

- Tg\* : 120°C

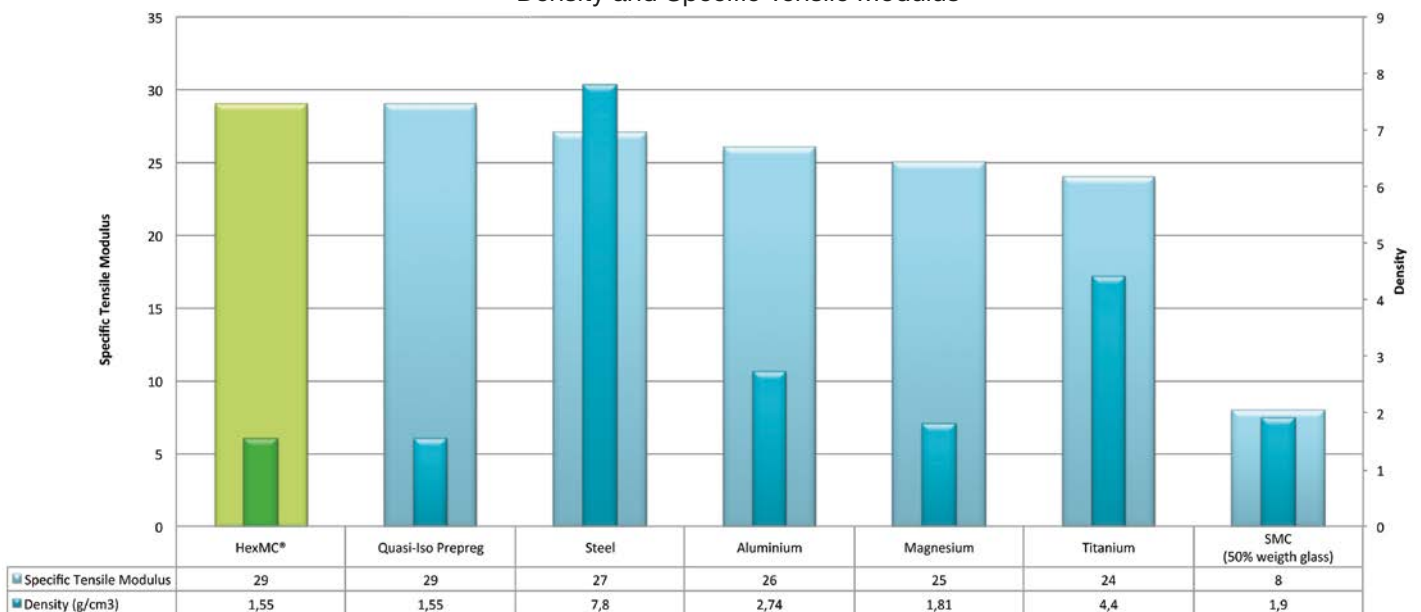
\* Dry, DMA onset, 5°C/min, 1Hz, 15µm

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## Mechanical Properties

	Test methods	Properties	Values	Units
Tensile	ASTM D3039	Strength	300	Mpa
		Modulus	38	Gpa
Flexural	ASTM D790	Strength	500	Mpa
		Modulus	30	Gpa
Compression	ASTM D6484	Strength	290	Mpa
		Modulus	38	Gpa
Short Beam Shear	ASTM D2344	Strength	70	Mpa
IPS	ASTM 7078	Strength	250	Mpa
		Modulus	15	Gpa
Poisson's ratio	-	-	0,30	-

HexMC® Properties  
Density and Specific Tensile Modulus



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## How to use HexMC® M77

### Main features:

- Compression moulding
- Rough lay-up/preforming
- Press process
- Metallic moulds
- Constant temperature level
- Net shape part

### Tips for Moulding:

Mould design and technology are the same as for Sheet Moulding Compound processing. Due to the high pressure level needed to use HexMC®, only metallic moulds can be used to support the compression moulding process:

A Steel mould is useful for high volume production rates. It is recommended to apply a surface treatment in order to increase the surface hardness. The surface can be also nickel or chrome plated for optimum surface finish.

An Aluminum mould can also be used for prototyping or low volume production.

**Important note: an external separator/release agent has to be used to ensure good demoulding of the part.**

For more details on mould design, contact Hexcel technical support who can provide advice to help you with your project.

### How to handle HexMC®

HexMC® is delivered in rolls, 460mm wide with an areal weight of 2000gsm. Uncured thickness is around 2mm.

HexMC® needs to be at room temperature (around 23°C) to make it sufficiently pliable and tacky to be cut, stacked or rolled to form a mould preform/charge. To cut it, several devices can be used; the common ones are listed below:

- Oscillating cutters can be used for small series production
- Die cutting devices can be used for medium series production
- Automated cutting solutions for mass production.

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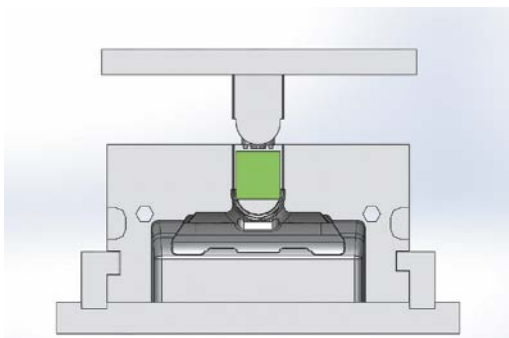
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## How to get the right mould charge?

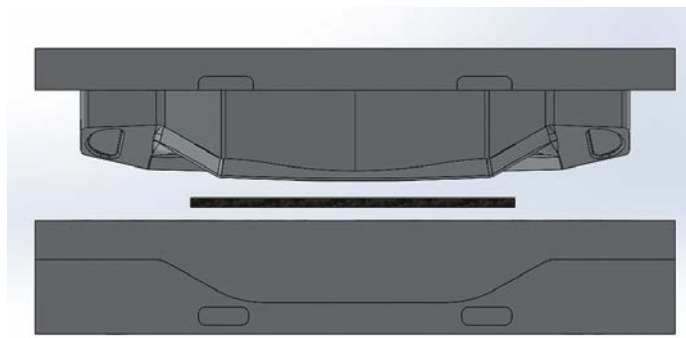
Depending on the required part shape, 2 main kinds of mould charges can be used:

- 3D charges are mainly used for very complex 3D parts from small to medium size.
- 2D charges are used for flat parts that require better mechanical performance. Larger parts can be achieved.

Examples:



Complex 3D part with 3D charge (green)



Thin part with 2D charge (black)

Once the charge type has been determined, it is easy to work out the quantity to be inserted into the mould. From your CAD file, the right volume of the part can be calculated and then, it needs to be multiplied by the final HexMC® density (1.55).

For example: if the part volume is 1000cm<sup>3</sup> then the mass to be introduced into the mould is :  
 $1000 \times 1.55 \times 1.02^* \approx 1580$  grams.

\* 1.02 is the average factor for resin escape during moulding

Several parts may be required to achieve the right weight parameter.

For more details on the moulding process, contact Hexcel technical support who can provide advice to help you with your project.



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## Cure Process

The charge is now placed inside the compression mould. Under temperature and pressure, the material flows and fills the mould, and then it will cure.

Thanks to the high Tg of HexMC® M77 the part can be demoulded immediately after curing from the hot mould. As the mould stays permanently at the same temperature this saves a lot of time during production.

The cure cycles listed below are not exhaustive and can be easily adapted depending on the part shape.

Temperature/Time	100°C/40min	120°C/8min	130°C/6min	140°C/4min	150°C/3min
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## Beyond HexMC®

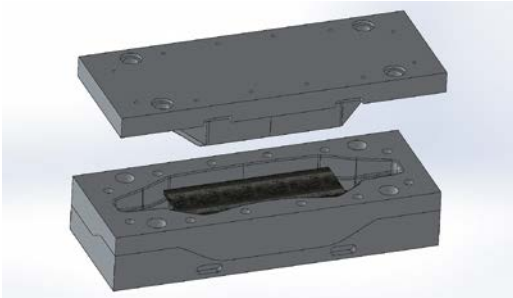
As Hexcel provides a range of HexPly® prepregs with the same M77 resin as the HexMC® product, HexMC® can be combined and co-cured with carbon UD prepreg tape and/or fabrics to increase the strength and stiffness of a part. Similar techniques can be used to meet specific surface aspect requirements.

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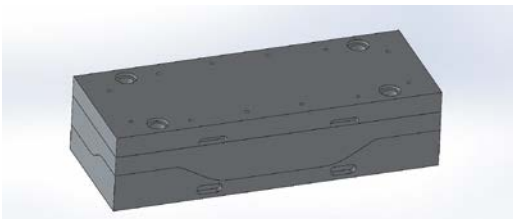
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## Quick Processing Guide

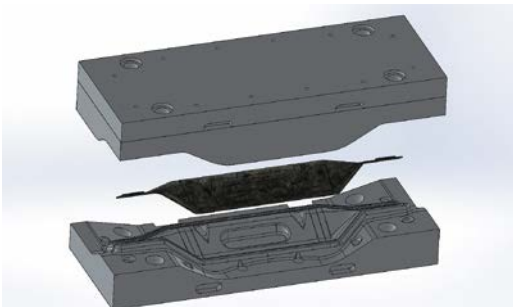
- 1/ Cut the material
- 2/ Weigh the material to the required mass
- 3/ Make the charge as defined



- 4/ Introduce the charge into the hot mold



- 5/ Close the mould by applying pressure
- 6/ Cure the material for the appropriate time



- 7/ Open the mould and remove the part (no need to cool)
- 8/ Finish the part with slight grinding of the edges to remove the flash of resin



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## Important

All information is believed to be accurate but is given without acceptance of liability. Users should make their own assessment of the suitability of any product for the purposes required. All sales are made subject to our standard terms of sale which include limitations on liability and other important terms.

## For More Information

Hexcel is a leading worldwide supplier of composite materials to aerospace and other demanding industries. Our comprehensive product range includes:

- Carbon Fibre
- Reinforcement Fabrics
- Carbon, glass, aramid and hybrid prepregs
- RTM Materials
- HexTOOL® composite tooling material
- Structural Film Adhesives
- Honeycomb Cores
- Engineered Core

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/OurCompany/sales-offices>

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