



Tradition and innovation

E6-180 LOW TEMPERATURE CURE TOOLING PREPREG

E6-180 MATRIX is a thermosetting epoxy matrix designed for low temperature cure, with process temperatures ranging from 45°C to 55°C.

After initial curing, E6 tooling laminates can be postcured, to allow final service temperature up to 145°C.

E6 prepregs have 2 to 3 days outlife at 21°C.

Product Variants

E6-180N: Light black pigmented

Features

- Initial autoclave cure between 45°C and 55°C
- Carbon fabric weights between 193 g/m² and 1250 g/m²
- Tooling prepregs can be cured on epoxy tooling block or low-cost masters
- Tooling options of 1-8-1, 1-6-1 and 1-4-1 quasi-isotropic constructions
- Maximum Tg of 160°C
- Short postcuring cycle
- Maximum tool service temperature of 145°C.

Tooling Prepreg Shelf Life

6 months @ -18°C

2-3 days @ 21°C

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Tooling Construction Options

Tooling prepregs are offered as fabric surface plies and bulk plies. The surface plies are of a lighter weight fabric, and this assists with laminating details and corners. On the cured tooling, the surface ply provides a pit-free finish and an even surface. The bulk plies are of heavier fabrics and used to form the majority of the tooling laminate thickness. A typical tooling laminate is 5 to 6 mm in thickness, which confers rigidity to the final tool.

It is usual to lay-up tooling prepregs in a nominal quasi-isotropic construction, to provide the same coefficient of thermal expansion in all directions for the cured tool. This can be achieved by a I-8-I construction (surface ply-bulk plies-surface ply). A typical lay-up is:

$0^\circ \ 0^\circ, -45^\circ, +45^\circ, 90^\circ, 90^\circ, +45^\circ, -45^\circ, 0^\circ \ 0^\circ$

With E6 carbon fabric tooling prepregs, there are now three options for the bulk plies. The original 600 gsm 2x2 Twill (GG600T) for a I-8-I construction, and now an 800 gsm 2x2 twill (GG800T) or 1250 gsm dual layer fabric (GG1250D). As the twill weave is balanced in warp and weft, the GG800T can be laminated in a simpler quasi-isotropic I-6-I construction:

$0^\circ \ 0/90, \pm 45, 0/90, 0/90, \pm 45, 0/90 \ 0^\circ$

Likewise, the GG1250D is balanced, so provides the option for a I-4-I construction.

$0^\circ \ 0/90, \pm 45, \pm 45, 0/90 \ 0^\circ$

The I-6-I and I-4-I constructions offer cost savings through reduced laminating times.

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Tooling Lay Up

1. Thaw the frozen prepreg in the sealed bag at room temperature. Cut pieces of surface and bulk ply prepreg appropriate to the shape and dimensions of the tool. Ensure a suitable release agent is applied to the epoxy master model. For additional information, please contact the Microtex Technical Department.
2. Lay-up the surface fabric plies, in a nominated 0° direction, to cover the entire master model. For corners and fine detail, it is usual to use compliant ±45° strips of surface ply prepreg first to avoid bridging. All pieces of surface ply prepreg need to be overlapped by 2 to 5 mm.
3. De-bulk the first ply under a vacuum bag for approximately 15 minutes. All de-bulks should be performed using a perforated release film between prepreg and breather.
4. The stacking for the following bulk plies of the heavier fabric should be quasi-isotropic with a symmetrical and balanced sequence, as indicated on page 2. All pieces of bulk ply prepreg can be overlapped slightly. It is best to avoid overlaps occurring at the same point with adjacent ply layers, they should be staggered away from each other.
5. De-bulk every 2 to 4 plies, depending of the complexity of the shape, for 15 minutes under full vacuum.
6. The last ply will be surface fabric prepreg orientated in the nominated 0° direction, to complete the nominated symmetrical construction.
7. Perform a final vacuum de-bulk immediately before bagging the laminate for initial cure.
8. For the final bagging arrangement, solid (non-porous) release film must be used between prepreg and breather. A vacuum integrity check should be undertaken on the final bag before placing in the autoclave for curing.

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Available E6 Tooling Prepreg Products

Carbon Tooling Surface Plies				
Fabric	Weave Style	Fibre Areal Weight	Fibre Type	Nominal Ply Thickness
GG193P	Plain	193 g/m ²	Flat HS Carbon	0.23 mm
GG200T	2x2 Twill	200 g/m ²	3k HS Carbon	0.24 mm
GG245T	2x2 Twill	245 g/m ²	3k HS Carbon	0.29 mm

Carbon Tooling Bulk Plies				
Fabric	Weave Style	Fibre Areal Weight	Fibre Type	Nominal Ply Thickness
GG600T	2x2 Twill	600 g/m ²	12k HS Carbon	0.63 mm
GG800T	2x2 Twill	800 g/m ²	24k HS Carbon	0.84 mm
GG1250D	Dual Layer Fabric	1250 g/m ²	24k HS Carbon	1.28 mm

Glass fibre fabric prepreg versions can be made available on request.

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Recommended Tooling Autoclave Curing Cycles

Recommended 55°C Autoclave Cure	
Vacuum bag pressure:	0.9 bar
Autoclave pressure:	4-7 bar
Ramp rate:	0.5 to 1.0°C/minute
Cure cycle:	8 hours @55°C (+5/-0°C)
Cool rate:	0.5 to 1°C/min until 30°C

Alternative Autoclave Cure at 50°C	
Vacuum bag pressure:	0.9 bar
Autoclave pressure:	4-7 bar
Ramp rate:	0.5 to 1.0 °C/minute
Cure cycle:	11 hours @50°C (+5/-0°C)
Cool rate:	0.5 to 1°C/min until 30°C

Alternative Autoclave Cure at 45°C	
Vacuum bag pressure:	0.9 bar
Autoclave pressure:	4-7 bar
Ramp rate:	0.5 to 1.0°C/minute
Cure cycle:	24 hours @45°C (+5/-0°C)
Cool rate:	0.5 to 1°C/min until 30°C

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Recommended Post-curing Conditions

A slow controlled temperature ramp rate, not exceeding 0.33°C/min (20°C/Hour) is essential to develop the resin Tg.

The slow postcure also ensures the tool retains the correct profile and dimensions.

Start temperature	Initial tooling cure temperature minus 10°C.
Oven Ramp rate:	0.33°C/minute (20°C/hour)
Postcure Dwell Time	2 hours @ 160°C (+5/-0°C)

Do not exceed the 160°C postcuring temperature, as there is no gain to be made.

Matrix Properties

Resin Density @ RT (average Value): 1.20 g/cm³

Typical C.T.E. for a carbon tool (standard 1-8-1 quasi-isotropic tooling laminate)

+3.35 × 10⁻⁶ °C⁻¹

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Availability

E6-I80 series prepregs are available in a wide range of fabrics including carbon and glass fabrics.

Exotherm risk

This matrix system can undergo severe exothermic heat up during the curing process if incorrect procedures are followed. Great care must be taken to ensure that safe heating rates, dwell temperatures and lay-up/bagging procedures are properly executed, especially when moulding solid laminates with more than 6mm thickness. The risk of exotherm increases with lay-up thickness and increasing cure temperature. It is also important to recognize that the model or tool material and its thermal mass, combined with the insulating effect of breather/bagging materials can affect the risk of exotherm in particular cases. Curing E6 tools above 65°C is to be avoided.

Storage Conditions

This prepreg should be stored as received in a cool dry place or in a refrigerator. After removal from refrigerator storage, prepreg should be allowed to reach room temperature before opening the polyethylene bag, thus preventing condensation.

Precautions for Use

The usual precautions when handling uncured resins and fibrous materials should be observed, and a Safety Data Sheet is available for this product.

SDS Reference Codes: E6-I80N: SDS-I08

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