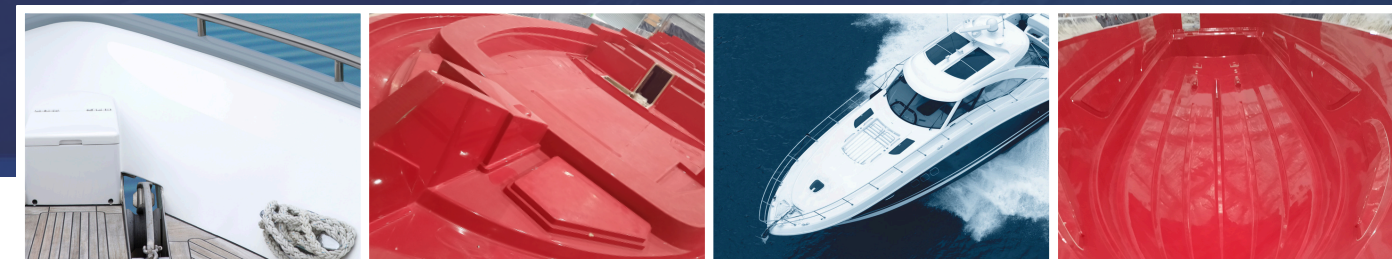


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ULTRATEC Lp™ TOOLING SYSTEM

Mould Manufacturing Product Guide



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Ultratec Lp™ Tooling System

A rapid curing, low shrinkage mould manufacturing system designed to produce long-life, high quality moulds for the fabrication of FRP composite parts

Ultratec Lp™ Tooling is a rapid mould manufacturing system that delivers high quality, temperature resistant moulds with unsurpassed dimensional stability and durability all with the workability of a standard laminating system. Due to its rapid curing and excellent handling properties it allows a fast but reliable mould production.

The Ultratec Lp™ Tooling system consists of three components:

Ultratec™ VE Tooling Gelcoat is a high performance vinyl ester gelcoat specifically formulated to minimize film porosity during application. It provides a long lasting, extremely durable high gloss finish.

Available in four different spray grade colours: Red, Green Black and Neutral. Neutral is recommended for Lite-RTM top moulds production to enable visibility of resin flow. Also available is an anti-static VE Tooling Gelcoat, **Ultratec™ 606 Red** which can also be used in this application eliminating static electric charge build up on mould surfaces.

Ultratec™ VE Tie Layer Resin is ideally suited for construction of barrier laminates/tie layers directly behind the Gelcoat and contains no mineral fillers, allowing easy consolidation to produce void-free skin laminates. In the event of post-fabrication damage to the mould surface, this resin also shows excellent adhesion to any polyester based repair systems.

Ultratec™ VE Tie Layer Resin or Nutech Tooling 6010 Resin are recommended for construction of this initial barrier laminate directly behind the Gelcoat.

Ultratec Lp™ Tooling Resin is a unique, unsaturated polyester based resin for use in the structural laminate. Supplied as a single component, pre-promoted, filled resin - it cures at room temperature with almost zero shrinkage, eliminating fibre print through and other shrinkage related distortions on the gelcoat surface.

Ultratec Lp™ Tooling Resin - Typical Properties in liquid state @ 25°C	
Viscosity Brookfield RVT sp.4/100rpm Cone & Plate viscosity	900 - 1200cP 450-550cP
Density	1.45gcm ⁻³
Appearance	Beige Liquid
Flash Point (Setaflash)	31°C
Geltime (1.5% Curox CATA 2000)	30 - 40 minutes
Shelf Life (when stored in original closed container in the shade)	3 months

Typical Mechanical Properties in Cured State (Fully Postcured casting unless otherwise stated)	Value	Test Method
Tensile Strength	85MPa	ISO/R 527 1966
Tensile Elongation	2.0%	ISO/R 527 1966
Flexural Strength	156MPa	ISO 178 1975
Heat Distortion Temperature	80°C	ISO 75 1974

Application Details

Workshop Conditions: In order to achieve the required degree of cure development, a minimum workshop temperature of 18°C is required. The ideal working temperature range is 20°C - 30°C. If the working temperature is too low, optimum cure and low shrink properties will not be achieved.

Preparation: The surface of the plug must be free from voids and defects with an appropriate release agent applied.

Tooling Gelcoat: **Ultratec™ VE Tooling Gelcoat and Ultratec™ 606 Red** are designed for spray applications and must be catalysed with Norox CHM-50 or Curox CP-50 EAA catalyst. Recommended catalyst level is 2%. Gelcoat thickness should be 0.6 - 0.8mm.

Advantages: The Gelcoat has been formulated for use with Norox CHM-50 catalyst which practically eliminates foaming typically associated with MEKP cured vinyl ester systems, resulting in reduced porosity in the cured film.

First Laminate Layer

Ultratec™ VE Tie Layer Resin: It is important that the first layer directly behind the gelcoat is fully consolidated to remove all entrapped air and produce a void free laminate. The first layer applied should comprise 1 - 2 plies of 225g/m chopped strand mat in combination with Ultratec VE Tie Layer Resin, catalysed with 1.5% (minimum) Norox MEKP 925H catalyst. Alternatively, Nutech Tooling 6010 Resin can be used for construction of the Tie layer, using 1.5% MEKP 925H catalyst (minimum). This initial barrier laminate must be fully cured before proceeding with application of Ultratec Tooling Resin structural laminates.

Advantages: No mineral fillers: Visual detection of air bubbles. Easy consolidation to produce void-free skin laminates.

Structural Laminate

Ultratec Lp™ Tooling Resin: Before use, mix Ultratec Lp™ Tooling Resin thoroughly to ensure that the product is homogeneous. CATA 2000 must be used to catalyse the resin. Catalyst levels between 1.5% and 1.75% are required for optimum cure development.

Ultratec Lp™ Tooling Resin is a low viscosity, pre-filled product with excellent glass fibre wetting properties. Following cure of the Vinyl Ester barrier laminate, apply Ultratec™ Tooling laminates at a resin to glass ratio of 4:1 by weight. The initial lay-up behind the Vinyl Ester should comprise 4 layers of 450g/m² chopped strand mat, or 1300 - 1800g/m² chopped glass rovings (via chopper gun application). Following gelation, the laminate temperature will rise to approximately 50-60°C and the colour will change from a mid brown to a lighter white/brown colour. Once this exothermic temperature subsides, further laminate layers can be applied at 1800 - 2100g/m² glass fibre content.

Advantages:

- Extremely low shrinkage on curing: ensures dimensions of the Plug are retained, with perfect surface reproduction.
- Rapid cure rate: Up to 80% faster mould production when compared with conventional systems.
- Colour change mechanism: Visual indication of state of cure.
- Class A surface profile: Exact reproduction of master or plug surface.
- Excellent dimensional stability: Long-term and consistent reproduction of parts.

Additional Information:

- For best results the whole Ultratec Lp™ Tooling laminate should be applied in the same work day. This will assist to avoid inter-laminar adhesion issues through excessive delays between lay ups.
- Prior to mould construction, small test laminates should be produced to ensure suitable process conditions and application techniques.
- Mould Break in - New Moulds: Moulded parts sticking to the mould surface can be related to a problem with the mould release agent application, or alternatively can be caused by porosity in the Tooling Gelcoat surface. Porosity allows for moulded parts to mechanically attach to the surface via the mould pores and can occur after a mould has been sanded and buffed.
- An application of a suitable mould sealer is recommended to close mould pores on the Tooling Gelcoat surface of new moulds.
- For new mould surfaces, the use of a Polyvinyl Alcohol (PVA) film forming barrier release agent is recommended for the first few parts pulled from the mould - particularly for mould surfaces that show some porosity. The release agent manufacturer's surface preparation and application instructions should be followed thoroughly.
- Prior to demoulding laminated parts or mould constructions, a minimum Barcol 934 Hardness of 20 should typically be achieved for the structural laminate. Tooling laminates constructed with Ultratec Tooling resin will typically cure to achieve minimum Barcol Hardness values above 40.