

# CRYSTIC® VE 671

## High Performance Vinyl Ester Resin for Pultrusion

### Introduction

Crystic VE 671 is a Bisphenol A epoxy-based vinyl ester resin with outstanding corrosion resistance to a wide range of chemical environments, including acids, alkalis, and oxidising agents at room and elevated temperatures. Crystic VE 671 has been designed for high performance pultrusion applications, such as composite rebar, where high mechanical strength is needed. The viscosity profile of the Crystic VE 671 allows for easy wet out of the glass, and very high glass content to be achieved. Crystic VE 671 is also suitable for hand lamination process.

### Formulation

#### Cold Curing

Crystic VE 671 should be allowed to attain workshop temperature (18°C - 25°C) before use. It requires the addition of accelerator and catalyst to start the curing reaction. The recommended accelerators are Crystic Accelerator G (1% Cobalt solution) which should be added at 2% - 3% into the resin, and Crystic Accelerator D (10% DMA Solution) which should be added at 0.5 – 1.5% into the resin. The accelerators should be mixed into the resin before adding the catalyst. The recommended catalyst is Butanox LPT which should be added at 1% - 2% into the resin. The catalyst should be thoroughly incorporated into the resin, using a low shear mechanical stirrer where possible. Standard MEKP (50%) catalyst is also suitable, but Butanox LPT will further reduce the possibility of excessive foam formation.

**N.B** Catalyst and accelerator must not be mixed directly together since they can react with explosive violence.

#### Hot Curing

Crystic VE 671 requires heat and the addition of a suitable heat activated catalyst to start the curing reaction. The recommended catalysts are TBPB and BPO type catalysts. For pultrusion application, the catalyst addition levels, and curing temperature will depend on the length of the die, line speed, and thickness of the part. For more information, please contact Scott Bader Technical Support.

### Additives

Crystic VE 671 may be pigmented by the addition of up to 5% of Crystic Pigment Paste. The addition of certain pigments, fillers or extra styrene may adversely affect the food taint, toxicity, and chemical resistant properties of laminates so, for critical applications, customers should satisfy themselves that any additions made will give the performance required.

### Typical Properties

The following table gives typical properties of Crystic VE 671 when tested in accordance with BS 2782.

Typical Liquid Resin Properties	Unit	Crystic VE 671
Appearance	-	Clear, Yellowish
Viscosity, Brookfield SP3 at 60RPM, 25°C	mPa.s	450
Volatile Content	%	40
Acid Value	mg KOH/g	< 12
Reactivity, Geltime at 25°C using: 1.2% Accelerator D + 3.0% Accelerator G + 2.0% Butanox LPT	minutes	17
Reactivity, Time to Peak	minutes	27
Reactivity, Peak Exotherm	°C	175
Stability from date of manufacture when stored in accordance with storage recommendations	months	9

Typical Cast Resin Properties*	Unit	Crystic VE 671
Barcol Hardness	-	40
Water Absorption, 7 days at 23°C	mg	40
Deflection Temperature under load † (1.80 MPa)	°C	100 – 105
Tensile Modulus	GPa	3.4
Tensile Strength	MPa	80
Tensile Elongation at break	%	4.5
Flexural Strength	MPa	130

\* Curing schedule – 24 hrs at 20°C + 3 hrs at 80°C

† Curing schedule – 24 hrs at 20°C + 5 hrs at 80°C + 3 hrs at 120°C

Typical Laminate Properties	Unit	23°C	65°C	93°C	107°C	121°C	149°C
Flexural Strength	MPa	208	196	188	100	38	22
Flexural Modulus	GPa	7.6	6.9	5.5	3.3	1.6	1.6
Tensile Strength	MPa	137	139	145	124	76	50
Tensile Modulus	GPa	9.2	8.9	8.5	6.2	4.3	-
Compressive Strength	MPa	214	-	-	-	-	-
Laminate Construction:	Veil, CSM, CSM, Woven Roving, CSM, Woven Roving, CSM (40% Glass content)						

### Post Curing

Satisfactory laminates for many applications can be made from Crystic VE 671 by curing at workshop temperature (25°C). For optimum properties and long-term performance, however, laminates should be post cured before being put into service. The laminate should be allowed to cure for 24 hours at 20°C, and then be oven cured for 3 hours at 80°C. For applications where high operating temperatures are expected, post curing at 100°C is advised.

### Chemical Resistance

Crystic VE 671 offers outstanding chemical resistance to a wide range of substances (acids, alkalis, oxidising agents, etc.) at room and elevated temperatures. For specific advice around chemical containment requirements, please contact Scott Bader Technical Support.

### Storage

Crystic VE 671 should be stored between 5°C and 25°C in the original, unopened container in a dry, well-ventilated place. Protect from freezing and direct sunlight. Avoid contact with oxidising agents. If stored outside of these recommendations, shelf life will be significantly reduced.

### Packaging

Crystic VE 671 is supplied in 200kg, 1000kg, or bulk containers.

### Health and Safety

Please see separate Material Safety Data Sheets

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