

## Product Information

Electrical Insulation System

Impregnating resin

# ELAN-protect<sup>®</sup> UP 142

Single component, VOC-free, low emissions, high bond strength, thermal class 180 (H)

## Product description

ELAN-protect® UP 142 is a single component impregnating resin. The resin is based on specially modified, unsaturated polyester-imide, VOC-free. The material shows low emissions.

The formulation of the resin system contains no styrene or vinyltoluene as a reactive thinner. This offers varied advantages regarding reliability of processing.

The resin is characterised by a viscosity which is suitable for dip impregnation as well as for trickle and roll-dip processes. The resin compound has good stability and exhibits fast surface drying, too, even in thin film.

Due to the low emissions of the resin compound during cure an elaborate exhaust system will be unnecessary.

ELAN-protect® UP 142 is no dangerous goods and fulfils the directives 2011/65/EU, 2003/11/EC and 2006/121/EC. The raw materials are pre-registered acc. to the directive No. 1907/2006/EC (REACH). The material does not contain by recipe substances listed in Art. 57/Anex XIV 1907/2006/EC from 9<sup>th</sup> of October 2008 (SVHC).

## Areas of application

ELAN-protect® UP 142 is designated for the trickle and roll-dip impregnation of all conventional rotating and stationary windings, including traction application, where a tough and resilient crack free result is required.

## Properties of the cured resin

The resin compound cures to give a tough resilient material with excellent mechanical and electrical properties, even at higher temperatures.

Due to the excellent thermal properties the material can be used in thermal class 180 acc. DIN EN 60085 (former: H). The product has been recognized by UL under file no. E 73 288.

## Viscosity / Gel time

When delivered, the viscosity of the resin compound comes to  $1200 \pm 300$  mPa.s at 23 °C. During storage and processing, dependent from time and temperature, the viscosity increases slightly, this can be compensated by the addition of fresh material.

When produced, the gel time will be  $5 \pm 3$  minutes at 120 °C, this value will drop down during storage and processing, dependent from time and temperature. The addition of stabilizer is required, when the gel time becomes less than 50 % of the initial state.

## Processing methods

ELAN-protect® UP 142 is designed as an impregnating resin, suitable to be used by all common impregnating methods. In case of dipping pre-heating of the objects can be a possibility.

According to the principle of trickle impregnation, the objects will be heated up between 80 and 120 °C to attain short cycle times. The resin compound is then applied in a thin stream to the rotating preheated winding, adapts the temperature of the winding and becomes lower in viscosity.

When using the dip roll method the low viscosity of the resin compound, combined with a rapid thinning down as the temperature increases, allows excellent penetration of the resin compound even into compact windings.

Since the resin compound is a highly reactive system, the temperature during storage should not exceed 25 °C. The material has to be kept out of direct sunlight during storage and processing.

Curing of the resin should be carried out with current heating or by a pre-heated convection oven, rotation of the objects has to be continued until the resin compound has gelled, to avoid imbalances. The indicated curing times are valid after the objects have reached the cure temperature. A low temperature curing of 130-135 °C is possible however then the curing times will increase drastically. Therefore it is recommended to avoid such low curing temperatures.

It will be necessary to follow the instructions of the Material Safety Data Sheet (MSDS) for the resin.

### Properties of component as supplied

Property	Value	Unit
Shelf life at 23 °C	5	months
Appearance/Colour	clear, yellowish	-
Flow time at 23°C, Beck-test V 22 following ISO 2431	-	s
Viscosity at 23°C, Beck-test V 18 following DIN 53019	1200 ± 300	mPa.s
Density at 23 °C, Beck-test S 11 following ISO 2811-2	1,14 ± 0,03	g/cm <sup>3</sup>

### Gel time and curing conditions

Temperature	100	120	130	140	150	160	°C
Gel time, Beck-test H 17b-1 initial value when produced		5 ± 3					min
Curing time, selectable					2	1	h

### Mechanical properties in cured condition

Test criterion	Condition	Value	Unit
Condition in thick layer, Beck-test M1 following IEC 60464 part 2	Upper side	S 1	-
	Under side	U 1	
	Interior	I 1.1	
Bond strength, Beck-test M2 following IEC 61033, method A (Twisted Coil)	23 °C	>400	N
	155 °C	>100	
	180 °C	> 80	

### Temperature index

Test criterion	Condition	Value
Proof voltage, Beck-test M 15 following IEC 60172 (Twisted Pair)	1000 V	209
Bond strength, Beck-test M 16 following IEC 60290 (Helical Coil)	22 N	-

### Dielectrical properties in cured condition

Test criterion	Condition	Value	Unit
Volume resistivity after water immersion, Beck-test M 5 following IEC 60464 part 2	Initial value	$> 10^{16}$	$\Omega \cdot \text{cm}$
	7 d storing	$> 10^{14}$	
Volume resistivity at elevated temperatures, Beck-test M 13 following IEC 60464 part 2	155 °C	$> 10^{11}$	$\Omega \cdot \text{cm}$
	180 °C	-	
Electrical strength after water immersion, Beck-test 6b following IEC 60464 part 2	Initial value	196	kV/mm
	24 h storing	-	
Electrical strength at elevated temperatures, Beck test M 6a following IEC 60464 part 2	155 °C	235	kV/mm
	180 °C	175	
Temperature at relative permittivity $\text{tang}\delta=0,1$ Beck-test M 3b following IEC 60250	50 Hz, 1 V	112	°C
	1 kHz, 1 V	154	
	10 kHz, 1 V	$> 180$	

### Effect of liquid chemicals, including water

Test criterion	Condition	Value	Unit
Resistance to vapour of solvents, storage 7 days, Beck-test M 7 following IEC 60464 part 2	Acetone	not resistant	-
	Xylene	resistant	
	Methanol	resistant	
	Hexane	resistant	
	Carbon disulphide	-	
Water absorption, Beck-test M9 following ISO 62	24 h at 23 °C	3,4	mg
	0,5 h at 100 °C	4,3	
Effect of liquid chemicals after 7 days storing, Beck-test M 10 following ISO 175	Ammonia solution 10 %	-22	mg
	Acetic acid 5 %	5	
	Sodium hydroxide 1 %	-30	
	Hydrochloric acid 10 %	2	
	Sulfuric acid 30 %	13	
	Iso-octane	1	
	Toluol	0,8	
	Transformer oil	7	
	BecFluid® 9902	8	
	Solution of detergent	5	

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